IFRS 16: A NECESSITY FOR EFFICIENT MARKET VALUES?

AN EX-POST STUDY ON THE VALUATION EFFECTS OF RECOGNIZED OPERATING LEASES

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Abstract:

This study examines if the adoption of IFRS 16 has resulted in a lower disparity between market values and their intrinsic (true) values in an ex-post setting. With financial statements being an important source of information for the investment decisions of investors, we aim to understand whether the uniform treatment of previously off-balance sheet operating leases following IFRS 16 has facilitated share price information. As such, we investigate the difference in value relevance between recognized and disclosed operating leases. Two distinctive valuation models are used to estimate the firm intrinsic values of Nordic public firms, which is subsequently set in relation to the firm market value to establish an estimate of market misvaluation. In addition, we investigate whether the change in misvaluation is different for firms mainly owned by less sophisticated investors. Comparing the misvaluation pre- and post-IFRS 16 adoption, we find that the new standard has resulted in increased market misvaluation. Moreover, we observe that this increased misvaluation is more prominent for firms owned by less sophisticated investors. Our results also provide further nuance, by suggesting that the observed valuation effects of IFRS 16 is related to firm size and the level of analyst coverage. Value relevance of operating leases increases for relatively smaller firms with less analyst coverage. These findings indicate that, while there is a difference in value relevance between disclosed and recognized operating leases, regulators need to consider different investor-groups when assessing the ex-post effects of new accounting standards.

Keywords:

IFRS 16, Operating Leases, Value Relevance, Misvaluation, RRV-model, Residual Income Valuation Model

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1. Introduction

The efficient functioning of financial markets is dependent on companies presenting financial information that can serve as a basis for investment decisions and share price formation by investors. Despite this, some accounting standards do not always contribute to the full picture of a company being presented. This can result in discrepancies between the presented financial information and the true economic reality of the company. One such instance relates to off-balance sheet leases. Acknowledging this, IASB issued a new lease accounting standard called IFRS 16, adopted from fiscal years starting in January 2019 and replacing IAS 17, the previous lease accounting standard. As opposed to the new standard, operating leases were reported off-balance sheet in IAS 17, requiring investors to make adjustments and assumptions to capitalize such leases. With the introduction of IFRS 16, off-balance sheet leases estimated to nearly $3 trillion are expected to have been recognized on the balance sheet (IASB, 2016), portraying the extent of information previously disclosed merely in the notes to the financial statements. With the capitalization of off-balance sheet leases, IFRS 16 allows for uniformity in treatment of such leases by market participants.

For investors, treating operating leases correctly has important implications for investment and asset allocation decisions. For regulators, this poses significant considerations in ensuring faithful company financials when establishing accounting standards. This, therefore, raises the question of whether IASB has fulfilled its objective of facilitating share price formation through IFRS 16. Many studies have examined the difference in value relevance (the market's usefulness of accounting information for decision-making) between disclosed and recognized accounting information. However, the research finds contrasting results. Banks and credit agencies have been proven to consider off-balance sheet leases when estimating credit risk (Altamuro et al., 2014; Sengupta and Wang, 2011), and similar results are found when examining investors' treatment of such leases in the retail industry (Ling, Naranjo and Ryngaert, 2012). On the contrary, previous studies have also found that recognized information has a higher value relevance, where one main explanation is the questionable reliability of disclosed information (e.g. Davis-Friday et al., 2004; Bratten, Choudhary and Schipper, 2013). Additionally, the value relevance research conducted on IFRS 16 specifically comprises mostly ex-ante studies (e.g. Giner and Pardo, 2018), given the recent introduction of the standard. Common for many of these studies, however, is that they scrutinize investors in general, disregarding that treatment of off-balance sheet information depends on investors' level of expertise and understanding of accounting (Dearman and Shields, 2005). Within this field of research, less sophisticated (retail) investors have shown to disregard disclosed information to a larger extent than more sophisticated investors in their share price formation (e.g. Yu, 2013; Hirshleifer and Teoh, 2003), motivating consideration of different investor groups when examining value relevance of accounting information.

This study aims to examine whether the introduction of IFRS 16 has contributed to a lower discrepancy between firm intrinsic (fair) values and market values, in light of previously off-balance sheet leases being treated similarly by all market participants. Moreover, we are interested in testing if the change in valuation differs between sophisticated and less sophisticated investors, to account for the differences in accounting information usage between these two types of investor-groups. Using a sample of Nordic listed firms, the ex-post IFRS 16 effects on valuation in the Nordic market has, to the best of our knowledge, not been examined.

To estimate the firm intrinsic value, we employ the valuation model derived by Rhodes-Kropf, Robinson and Viswanathan (2005), allowing us to use a regression-based valuation approach. In addition, we use the Residual Income Valuation (RIV) model to also account for a valuation technique based on fundamental capital value literature. By using two direct valuation methods, we circumvent the possible increase in total firm value resulting from higher debt levels following the introduction of IFRS 16. The sample firms are classified as either heavily or non-heavily affected by IFRS 16, to create treatment and control firms for our tests. After relating the estimated intrinsic value to the firm market value, to get a measure for misvaluation, a difference-in-difference (DD) regression is utilized to estimate the change in the relation between the market and intrinsic value before and after IFRS 16 adoption. This is followed by a triple difference (DDD) regression model to estimate if the change has been different for firms mainly owned by less sophisticated investors. An improved share price formation following IFRS 16 is examined by comparing the intrinsic value to the quoted market value, to understand whether misvaluation has been reduced or not in the market.

Our main results suggest that the adoption of IFRS 16 has had an increasing effect on market misvaluation. Both the DD- and DDD-estimates are observed to be positive when using both the RRV- and RIV-model. Setting these estimates in relation to the pre-IFRS 16 market-to-intrinsic values, the results indicate that the new standard increases market misvaluation, with firms appearing to become more overvalued. This effect was observed to be more pronounced for retail investors, which shows that while IFRS 16 is value relevant for investors in general, it is more so for retail investors. Statistical significance was obtained for the results in our main model (RRV-model). However, we did not obtain any statistical significance with regards to our results based on the RIV-model. Although the DD- and DDD-estimates are consistent with the proposed direction of market misvaluation, the lack of significance indicates a contradiction to our findings. By running the RIV-model sample firms in the RRV-model, we conclude that the observed discrepancy stems from sample differences rather than model differences. As the RIV-model sample comprise relatively larger firms with a higher degree of analyst coverage, this allows us to draw more nuanced conclusions about the effect of size and analyst coverage. More specifically, our results further suggest that the observed effect of IFRS 16 is dependent on firm size and the degree of analyst following. Value relevance appears, therefore, to increase for relatively smaller firms with a lower level of analyst coverage. The observed findings are consistent with the literature identifying a difference between disclosed and recognized accounting information in terms of value relevance (e.g. Barth, Clinch and Shibano, 2003; Lim et al., 2017; Schipper, 2007; Callahan, Smith and Spencer, 2013). Moreover, our results are also in line with Yu (2013), where the author observed that value relevance increases in cases where institutional ownership and analyst coverage are low.

By examining the effects of IFRS 16 adoption on share price formation, and the resulting implications on market misvaluation, we contribute to the literature by assessing whether value relevance for operating leases differs when recognized rather than disclosed. With current research on IFRS 16 mostly being ex-ante studies, this study contributes to research by examining the IFRS 16 effects on an ex-post setting and, as such, to an initial understanding of the market valuation effects of the new standard. Moreover, by finding that the value relevance differs in the context of retail investors, we contribute to a field of research less examined in the scope of value relevance of accounting information. This, in combination with our findings concerning the effects of firm size and analyst coverage on value relevance, will provide regulators with a more nuanced understanding of how different investor groups will be affected by newly proposed accounting standards. Hence, our contributions will further facilitate the anticipations of expected ex-post effects from new standards.

The remainder of the thesis proceeds as follows: Section 2 provides a background of the new standard and an overview of the previous literature. Section 3 presents the methodology employed throughout the paper, and the data and final sample are described in section 4. In section 5, our results are presented, and section 6 discusses the results. The thesis ends with section 7, concluding our findings, describing the limitations of the study and presenting suggestions for future research.

2. Background and Previous Literature

2.1 Background to IFRS 16

In 2016, the International Accounting Standards Board (IASB) issued a new standard on lease accounting, IFRS 16, with an effective date for fiscal years starting on January 1st, 2019 and onwards (ASC Topic 842 for US GAAP equivalent). The previous leasing accounting standard IAS 17 was established in 1982 and required firms to classify their leases as either *finance leases* or *operating leases*. Leases that transferred substantially all the risks and rewards of the leased asset to the lessee[1] were required to be classified as finance leases. In essence, these were leases that were regarded to be economically similar to borrowing and purchasing the underlying asset (IASB, 2016). Finance leases were therefore required to be capitalized on the lessee's balance sheet as an asset with an equivalent lease debt, and the lease rental expenses being divided between depreciation and financial expenses in the income statement. The remaining leases not fulfilling the criteria for a finance lease were classified as operating leases, with lease rental expenses being classified as operating expenses in full on the income statement and not reported on the balance sheet. Instead, future rental commitments were disclosed in the notes to the financial statements. During the use of IAS 17 and the equivalent standard of the Financial Accounting Standards Board (FASB), FAS 13, the use of operating leases grew significantly with companies required to use the standards disclosing nearly $3 trillion of off-balance sheet leases in 2016 (IASB, 2016). In order to improve transparency, IASB started working on a new lease accounting standard, which resulted in IFRS 16.

With the adoption of IFRS 16, no difference is made between finance or operating leases. Instead, all leases are required to be treated in a similar way to finance leases in IAS 17, with

[1] The lessee is the party leasing the asset from the lessor.

capitalization of all leases on the lessee's balance sheet (with the exception for short-term and low-value leases). See Figure 5 and 6 in appendix A for an illustration of how IFRS 16 will affect the lessee's financial statements. The rationale behind IFRS 16 is to acknowledge the lease of an asset as a financing choice, i.e. as an alternative to borrow money to finance the purchase of an asset, by recognizing that choice in the balance sheet (IASB, 2016). As such, both an asset and a financial liability will be recognized. In IAS 17, however, the lessee did not provide the complete picture of the assets it controlled and used in operations and the often non-cancelable lease payments (IASB, 2016). Consequently, with IFRS 16, key financial metrics such as EBITDA and leverage ratios are expected to change for companies with significant off-balance sheet leases (IASB, 2016; Morales-Diaz et al., 2018).

The expected benefit of IFRS 16 is that the standard will improve the quality of financial reporting by providing a more faithful representation and greater transparency of a company's financial position and leverage. By eliminating the two different lease classifications, the new standard is also expected to enhance the comparability of financial information between companies that lease vs. buy assets (IASB, 2016). Furthermore, IASB highlights that this is done to improve the information available to investors when making investment decisions. More specifically, IASB points out that while some investors adjusted for off-balance sheet leases when applying IAS 17, other investors did not. Therefore, using IAS 17 where merely disclosure in the notes was required might be acceptable to more sophisticated users of financial statements, while it is less helpful for the majority of less sophisticated investors (IASB, 2016). Additionally, the investors who did adjust for off-balance sheet leases used methods that varied widely and resulted in inaccurate numbers. With IFRS 16, the same information will therefore be available to all market participants, which reduces the need for them to make these adjustments in share price formation and investment decisions (IASB, 2016). This lowers the margin of error for off-balance sheet adjustments and creates a more uniform treatment among market participants. With this context, the objective of this paper is to examine whether this intended reduction in information asymmetry between companies and investors has resulted in market prices that are closer to their fundamental, intrinsic values.

2.2. Literature Review

2.2.1 IFRS 16 and capitalization of leases

Since IFRS 16 was first announced in 2016, the research on IFRS 16 specifically is rather scarce. Instead, most research has been focused on the capitalization of off-balance sheet leases in general. The common conclusion of this research is that capitalization of off-balance sheet leases negatively affects key financial ratios such as leverage ratios, profitability measures and profit margins, which in turn could negatively affect firm market values (Beattie et al., 1998; Bennet and Bradbury, 2003; Fülbier et al., 2008; Duke et al., 2009; Cornaggia et al., 2013). After the announcement of IFRS 16, Morales-Díaz et al. (2018) also examined the effect on key financial ratios of European firms and used a capitalization model more aligned with the approved standard of IFRS 16 for capitalizing operating leases. More specifically, the authors used a more flexible lease term by accounting for a possible exercise of cancelation or extension options and used the lessee's incremental borrowing rate as the discount rate, and also found results consistent with previous research. Consequently, both research examining off-balance sheet leases and IFRS 16 specifically, respectively, concludes that most companies will experience deteriorating financial ratios once operating leases are capitalized.

Another area of research has been whether IFRS 16 will affect the decision making of investors, given that operating leases will be capitalized. In a qualitative study, van Kints et al. (2019) find that the new leasing standard has a positive effect on the quality of investment decision making for sophisticated and professional market participants. Although already considering off-balance sheet items, the new standard results in the balance sheet being a more complete source of information, improving the professionals' ability to consider all relevant information in their investment decision. In turn, this results in higher consensus regarding how to treat off-balance sheet leases. In a related study, Giner and Pardo (2018) show that market participants already consider off-balance sheet leases in market valuations. The paper however acknowledges that this might be different for less sophisticated investors and that IFRS 16 therefore could benefit the decision-making process of such investors. Despite this, the paper does not test for this explicitly. Common for the papers examining the effects of IFRS 16, however, is that they are all *ex-ante* studies, given the recent introduction of the standard. Therefore, studies showing that off-balance sheet leases are considered and capitalized by investors cannot rule out the possibility of measurement error, in the sense that capitalization methods differ from IFRS 16 capitalized leases (Dhaliwal et al., 2011).

2.2.2 Market assessment of accounting information and value relevance

In an effort to find a relationship between the use of accounting information and share prices, Beaver (1968) is one of the earliest studies suggesting that financial reporting affects market valuations. Following this paper, other studies emerged that examined the market's assessment of accounting information (e.g. Francis and Schipper, 1999; Holthausen and Watts, 2001; Barth, Beaver and Landsman, 2001; Bartov, Goldberg and Kim, 2005). In this field of research, *value relevance* is a term often used when accounting information is considered in the behavior of market participants' decision-making and thus have a relationship with share prices. Common for papers examining value relevance is an assumption of market efficiency in the semi-strong form, meaning that share prices fully reflect all publicly available information and adjusts immediately when new such information becomes available (Fama, 1970). In the context of accounting information, this evidently means that the value relevant information included in financial reports is fully reflected in the share price of the respective company. Without this type of information efficiency, results from studies of value relevance become less reliable. Consequently, this is an assumption necessary to make also in our study.

The previous research is however not decisive on whether there is a difference in value relevance between recognized and disclosed accounting information[2]. Different industries and accounting items have been examined within the scope of research that finds no significant difference in value relevance. Investigating if credit rating agencies consider off-balance sheet

[2] Recognized information refers to information presented and recognized in the financial statements of the company. Disclosed information refers to information described with text or numbers in the notes to the financial statements.

leases and the debt associated with it, both Altamuro et al. (2014) and Sengupta and Wang (2011) found that they take off-balance sheet financing into account when measuring credit risk. Additionally, Altamuro et al. (2014) also found that banks consider the debt of off-balance sheet leases in their credit assessment of borrowers. Investing the retail industry, where real estate ownership and leases is excessive, Ling, Naranjo and Ryngaert (2012) found that investors consider off-balance sheet leases when assessing firm risk of public retail firms in the US. Another area of accounting where the difference between recognized and disclosed information is relevant is research and development (R&D) expenditures. Within this field, Shah, Liang and Akbar (2013) examined whether there is a difference between disclosed and recognized R&D expenditures in terms of value relevance pre- and post IFRS adoption, and the authors found no difference after the adoption of IFRS.

Following the announcement of IFRS 16 in 2016, there are also some ex-ante studies attempting to understand the market effects of the standard. As mentioned above, one such study is Giner et al. (2018) and their results show that market participants value the debt of off-balance sheet leases in the same way as recognized debt on the balance sheet in their share price formation, using a sample of public retail firms in Spain. Moreover, on behalf of the European Financial Reporting Advisory Group (EFRAG), Europe Economics (2017) also examined the ex-ante effects of IFRS 16, and they also found that investors and market participants take operating leases and their related debt into consideration similarly as recognized debt in their investment decisions. As such, this scope of research would suggest that IFRS 16 will not result in any difference in value relevance between recognized and disclosed operating leases.

The opposing sphere of literature investigating recognized and disclosed accounting information identifies a difference in value relevance (e.g. Barth, Clinch and Shibano, 2003; Lim et al., 2017; Schipper, 2007; Callahan, Smith and Spencer, 2013). Ahmed et al. (2006) provide evidence on how valuations of derivative financial instruments differ depending on whether accounting information is recognized or disclosed. The study was conducted post the adoption of SFAS No.133, which mandated the recognition of all financial derivatives on the balance sheet. Recognized derivatives were found to be value relevant since their associated valuation coefficients were significantly positive and greater than zero. On the contrary, disclosed derivatives lacked value relevance, with non-significant valuation coefficients that were close to zero. This supported Davis-Friday et al. (1999), who found results that were not adequately robust, suggesting that disclosed postretirement benefit (PRB) liabilities affect stock prices less than recognized PRB liabilities. Moreover, investigating the oil and gas industry, Aboody (1996) found significantly stronger stock price reactions for firms with recognized write-down information compared to firms with disclosed information. Other studies have found similar results, suggesting that investors' trading behavior and stock valuation differ when assessing leases recognized on the balance sheet compared to disclosed leases (Hales, Venkataraman and Wilks, 2012; Nelson and Tayler, 2007). Although Hales, Venkataraman and Wilks (2012) do not comment on value relevance, their findings do suggest that there is a difference between recognized and disclosed accounting information. Lim et al. (2017) provide evidence that this holds true for credit agencies as well, finding that although taking operating leases into account, credit ratings are less sensitive for leases than for recognized debt.

The evidence presented in this sphere of research is almost exclusively in favor of accounting information recognition when evaluating value relevance. Nevertheless, the opposite relation is found by Nelson and Tayler (2007). Examining off-balance sheet leases, the authors suggest that when investors conduct the required extra analysis in order to treat disclosed information as if it had been recognized, it affects their judgement more than in cases where information is recognized at inception. Their results, therefore, imply that it is not always the case that recognized information affects judgment more than disclosed information. The results by Nelson and Tayler (2007) can, however, not be generalized for all disclosed accounting information. This is indicated by Hirshleifer and Teoh (2003) who find that investors' limited attention causes them to treat recognized and disclosed information differently. Mitra and Hossain (2009) also found that investors evaluate accounting information more effectively when recognized rather than disclosed, as it allows them to understand the information at a higher degree.

Studies attempting to identify explanations as to why disclosed and recognized information is assessed differently by investors find reliability differences between disclosed and recognized accounting information as one explanation. Following the adoption of SFAS No. 10610, Davis-Friday et al. (2004) investigates the shift in market perception of disclosed and recognized liabilities for postretirement benefits (PRBs) other than pensions. The authors find a significantly higher measurement of error for disclosed PRB liabilities compared to recognized ones, implying that disclosed information is perceived as less reliable than recognized information by the market. Furthermore, while finding that market participants value and process recognized and disclosed information equally, Bratten, Choudhary and Schipper (2013) show that this is true only when disclosed information is reliable and salient, in addition to being easily processed.

2.2.3 Value relevance for retail investors

Though extensive, the existing literature on disclosure vs. recognition largely assesses investors on a generalized basis. This may neglect the nuances of capital markets as different investors are shown to treat disclosed and recognized information differently. Besides the perceived reliability of disclosed accounting information, these discrepancies in treatment depend on investors’ level of competence and understanding of disclosures (e.g. Dearman and Shields, 2005). Barth et al. (2003) and Hirshleifer and Teoh (2003) show that less sophisticated investors find it difficult to understand disclosed off-balance-sheet pension liabilities because such investors pay limited attention to disclosed information and lack the necessary experience in order to assess it. Moreover, Yu (2013) found that value relevance is dependent on the type of investor in question. This was done by examining how the degree of institutional ownership and analyst coverage affect the value relevance of SFAS No. 158, which mandated the recognition of previously disclosed off-balance-sheet pension liabilities. The author found that recognition increased value relevance in cases with low levels of institutional ownership and analyst following. This increase became, however, less pronounced for firms with a high degree of institutional ownership and analyst following. These studies, therefore, indicate that an assessment of value relevance requires the consideration of both institutional and retail investors.

However, when investigating value relevance in the context of retail investors, one needs to assess how such investors utilize accounting information, and whether the way this information is presented matters. Evidence from previous research can be categorized in two contradicting silos; evidence that retail investors do not use accounting information from financial statements as their primary source for investment decisions and evidence that they do if presented correctly.

In their literature review, Cascino et al. (2014) concluded that retail investors generally prefer information provided by intermediaries (e.g. financial advisors/analysts or public media) as opposed to unfiltered (raw) information from financial statements. Moreover, evidence indicate that retail investors tend to rely on stock trailing returns and trends more than accounting information (e.g., Grinblatt and Keloharju, 2000; Barber and Odean, 2008; Kaniel, Saar and Titman, 2008; Blankespoor et al., 2019). Blankespoor et al. (2019) used an archival setting in order to assess monitoring and acquiring costs that impede retail investors' use of accounting information. Participants were presented with automated media articles that conveyed both current accounting information and past stock returns. Although investors had the accounting information readily at hand, their results showed that retail investors opted for trailing stock return as a basis for their trades. Alas, these studies question the necessity of including retail investors in an assessment of value relevance of disclosed vs. recognized information with regards to IFRS 16.

As indicated by Yu (2013), there is opposing evidence stating that investors do utilize accounting information as grounds for investment decisions. Lawrance (2013) investigates whether improved financial reports (clearer and more concise) benefit retail investors in terms of investment performance. The study shows that investors, on average, increase their shareholdings in firms with more clear and concise financial reports. More importantly, retail investors improve their investment performance from such firms, indicating that they will use, and benefit from, accounting information if made less complex. By the same token, studies show that it is the relatively more experienced and better-educated investors that rely more on unfiltered data from financial statements (Elliott et al., 2008). However, retail investors appear only to focus on the income statement, balance sheet and, to some extent, the cash flow statement. Notes and disclosures of financial statements seem to be disregarded when less sophisticated investors use accounting information (Cascino et al. 2014). These findings are consistent with Hirshleifer and Teoh (2003) and Peng and Xiong (2006) who argue that both naive and sophisticated investors face limited attention. This means that investors can only assess a certain amount of maximum information in a specific period. This, hence, causes investors to treat recognized and disclosed information differently. Therefore, these studies support the need of examining retail investors separately when assessing the value relevance of disclosed and recognized information in the context of IFRS 16.

2.2.4 Contribution

The composition of previous literature presented in this section allows us to widen the scope of our research and investigate the relation between value relevance, market efficiency and investor-type groups. Therefore, our study contributes to the literature by providing an assessment of whether disclosed or recognized accounting information are more value relevant in the context of IFRS 16 and if value relevance is dependent on the type of investor in question. Since the current research on IFRS 16 are all *ex-ante* studies, we contribute to this research gap by conducting an *ex-post* study on IFRS 16 and whether the eliminated need for investors to do their own adjustments for off-balance sheet leases has resulted in market values closer to their fair value.

The latter part of our contribution will provide standard setters with a more detailed understanding of the ramifications that new accounting standards have on investor behavior for different investor-type groups, an issue that has been largely overlooked in the previous literature. With this, we respond to concerns by both Giner et al. (2018) and IASB (2016) by providing an understanding as to whether capitalization of off-balance sheet leases has facilitated share price formation for less sophisticated investors.

The indecisiveness of previous studies in terms of value relevance between recognized and disclosed accounting information makes any prediction of the valuation effect of IFRS 16 difficult. Most of the studies on value relevance and capitalization of off-balance sheet leases has, however, examined the US or other European markets. In this study, we explore the less examined Nordic market, which in a global context can be regarded as smaller and arguably less liquid than larger markets, motivating further investigation of value relevance in this market.

3. Methodology

The following section presents the methodology and empirical frameworks employed to examine the valuation effects of IFRS 16, and the methods used to investigate whether the valuation effects significantly differ for less sophisticated investors. To begin with, the intrinsic valuation is calculated for each quarter between 2017-2020 using two distinctive valuation models, to get observations both pre- and post IFRS 16 adoption in year 2019. Secondly, our sample firms are divided into two sub-samples, classified as either heavily or non-heavily affected by IFRS 16 in terms of relative change in non-current assets. In a similar procedure, the sample firms are further classified as either mainly owned by institutional investors or retail (less sophisticated) investors, respectively. Finally, a difference-in-difference regression methodology is applied to examine the difference pre- and post IFRS 16 in the relation between market and intrinsic value for each firm. This will enable us to understand if market values for firms more heavily affected by IFRS 16 have come closer to their intrinsic value following the recognition of off-balance sheet leases. Additionally, a triple difference regression model is used to study whether the valuation effects are different for our sub-sample of firms with different type of majority owners.

3.1 Valuation Methods

The relationship between accounting figures and firm valuation has been researched by both accounting and finance scholars, as outlined in the section of previous literature. This has resulted in several different valuation methods being developed. These can be divided into two main groups; valuation models based on the *statistical relation between accounting figures and firm values* and *fundamental valuation models based on capital value theory* (Skogsvik, 2002). In this study, both type of valuation methods will be employed. The statistical valuation method used will be our main model and is derived by Rhodes-Kropf, Robinson and Viswanathan (2005), hereafter called RRV, and the Residual Income Valuation (RIV) model is our secondary model and is the fundamental valuation model used.

3.1.1 RRV-model

The valuation technique derived by RRV is based on a regression approach to estimate the intrinsic value of a firm, and has been applied by several other papers within accounting literature thereafter (e.g. Fu, Lin and Officer, 2013; Hertzel and Li, 2010; Hu, Lin and Lai, 2016; Borochin and Yang, 2017 and Chang, Luo and Ren, 2013). As a starting point, the logarithm of the market-to-book ratio is decomposed into two components, namely the market-to-intrinsic value (M/V) and the intrinsic-to book value (V/B), as follows:

$$Ln\left(\frac{M}{B}\right) = Ln\left(\frac{M}{V}\right) + \ Ln\left(\frac{V}{B}\right) \tag{1}$$

where *M* is the market value of equity, *B* is the book value of equity and *V* is the intrinsic (true) value of equity. The part of Ln(M/B) that captures misvaluation is the Ln(M/V), that is, the difference between current market price and intrinsic value, while the second component, Ln(V/B), captures long-run growth opportunities for the firm. Since logarithms are used, Ln(M/B) will be positive if the firm is overvalued, and negative if undervalued. If one assumes that a perfect measure of the intrinsic value (V) exists, where future cash flows and discount rates can be perfectly estimated, no pricing error could be found, and Ln(M/V) would always be zero. Accordingly, Ln(M/B) would always be equal to Ln(V/B). However, since the market do not have all information known by managers, V is unobservable and must therefore be estimated. This is done by establishing a model where a firm's intrinsic value is a linear function of its book value of equity, net income and leverage, as follows:

$$Ln(M_{it}) = \ \beta_{0jt} + \ \beta_{1jt}Ln(B_{it}) + \ \beta_{2jt}Ln(|NI_{it}|) + \ \beta_{3jt}I^{-}Ln(|NI_{it}|) + \ \beta_{4jt}LEV_{it} + \ \varepsilon_{it} \tag{2}$$

where:

B_{it} = book value of equity for firm *i* at time *t*
LEV_{it} = market leverage ratio for firm *i* at time *t*, which is defined as total debt in relation to the market value of equity
$|NI_{it}|$ = the absolute value of net income for firm *i* at time *t*
I^{-} = a dummy variable equal to one for firms reporting negative net income in a given year and zero otherwise

Since the function is estimated with logarithms, using the absolute value of net income allows us to also include firms reporting negative net income in a given point in time. Furthermore, with the help of the dummy variable for net income, we can include negative net income observations without affecting the interpretation of β_2 as an earnings multiple in the estimation of the intrinsic value. Each parameter of the linear function is allowed to vary over time and across industries, reflecting changes in accounting figures at the firm level and variations in investment opportunities and optimal capital structures across different industries (Rhodes-Kropf et al., 2005). This therefore allows us to use quarterly data in the RRV-model.

The subscript j represents the industry each sample firm is operating in. Rather than merely examining firm-specific misvaluation, RRV also acknowledge that a firm's mispricing can be the result of industry-level divergence from fundamental value. This can be the result of overheated industries in relation to other sectors and current industry valuations deviating from long-run sector-specific valuations (Rhodes-Kropf et al., 2005). Consequently, equation 2 is run for each industry and for each quarter between 2017-2020 to estimate the coefficients β_{jt}, using the Fama and French 12 industry definitions (Fama and French, 1997), being the same approach adopted by RRV. Subsequently, the sector-specific part of the misvaluation is included by taking the time series average of the estimated industry coefficients from equation 2 ($\hat{\beta}_{jt}$) for each quarter between 2017-2020, $\bar{\beta}_j = \frac{1}{T} \times \sum_t \hat{\beta}_{jt}$, while the residual ($\varepsilon_{jt}$) captures the firm-specific misvaluation. Using average industry coefficients, rather than e.g., median, ensures that we also consider the top and worst performing firms in the respective industry, to understand the valuation multiples of the total sector. Taking the industry misvaluation into consideration, the final measure of misvaluation is given by:

$$Ln\left(\frac{M}{V}\right)_{it} = Ln(M_{it}) - \left[\bar{\beta}_{0j} + \bar{\beta}_{1j} Ln(B_{it}) + \bar{\beta}_{2j} Ln(|NI_{it}|) + \bar{\beta}_{3j} I^{-} Ln(|NI_{it}|) + \bar{\beta}_{4j} LEV_{it}\right] \quad (3)$$

where firm and time (quarterly) specific data for each accounting item is multiplied with the average industry coefficient of its respective sector. The difference calculated in equation 3 will equal the error term (ε_{jt}), which together with the effect of the industry coefficients captures the effective misvaluation for each firm. That is, the combination of firm- and industry-specific misvaluation.

In their derivation of the RRV-model, the authors first tested a regression model without any leverage. However, when including leverage as the last accounting item, the valuation model allows firms to have different costs of capital, depending on their debt level in relation to the industry average at a given time. Including leverage therefore makes the model more dynamic, since firms are then allowed to differ from industry-average multiples to account for the higher cost of capital. Furthermore, by taking the time-series average of the industry coefficients, we can account for variation in return and growth expectations over time and across industries (Rhodes-Kropf et al., 2005).

Table 17 in appendix F displays the different time-series average industry coefficients used to calculate the intrinsic value. As shown, both book value of equity and net income is positively associated with market value with positive industry coefficients, which is to be expected. Leverage is in turn negatively related to market value, indicating that the market punishes firms with too much leverage through higher costs of capital, which is also the expected outcome. Lastly, the net income dummy variable is negative for most industries, denoting that the market punishes firms for having negative net income figures. However, for some industries the coefficient is positive and thus reporting negative net income figures is not penalized by the market. This is not uncommon for some industries, since e.g., the retail industry, which have a positive coefficient, have seasonal effects in their sales and therefore regularly report negative quarterly net income figures.

Having explained the full extent of the RRV-model, we can elaborate on the rationales for choosing this valuation model as our main model. Firstly, explicitly including the effect industry valuations has on firm valuation gives us a model that goes beyond focusing merely on firm-level factors as explanations for potential firm misvaluation (Fu, Lin and Officer, 2013). Secondly, using realized accounting data reduces our dependence on forecasts or other assumptions for key metrics. As such, we can apply the RRV-model to a large sample of firms, which reduces selection bias since the model is not dependent on forecasting procedures. This in turn reduces uncertainty in the measurement (Hu, Lin and Lai, 2016). Lastly, the RRV-model allows for the inclusion of firms with negative net income, both for historic and current figures, which gives us both a larger sample and a sample reflecting a broader variability of firms.

3.1.2 RIV-model

Assuming the clean surplus relation holds and that the value of shareholders' equity is equal to the present value of future dividends, the RIV-model can be perceived as mathematically equivalent to the dividend discount model (DDM) (Ohlson, 1995). However, in contrast to the DDM, the RIV-model allows for an analysis based on accounting figures such as earnings and book values instead of only dividends. This implies that the RIV-model is undeterred by the dividend irrelevance theorem (Miller and Modigliani, 1961) or other critique that the DDM has faced due to its use of dividends as a measure of value creation (e.g. Penman, 2013). The most elementary RIV-model can be expressed as follows:

$$V_0 = B_0 + \sum_{t=1}^{\infty} \frac{RI_t}{(1 + r_E)^t} \tag{4}$$

where:

V_0 = value of owners' equity at $t = 0$
B_0 = book value of owners' equity at $t = 0$
RI_t $= NI_t - B_{t-1} * r_E = B_{t-1} * (ROE_t - r_E)$
r_E = equity cost of capital

This demonstrates the basic notion of the RIV-model, namely that the value of owners' equity comprises of the sum of book value of owners' equity at $t = 0$ and the present value of residual income (RI). RI represents the profit in excess of cost of capital that a firm is expected to earn, where NI_t is the net income of the year and $B_{t-1} * r_E$ is the required capital charge for equity owners. This can be rewritten as $B_{t-1} * (ROE_t - r_E)$, where ROE_t is the firm's return on equity at time t. The present value of RI can be perceived as the total goodwill that is assumed to explain the difference between the market value and book value of owners' equity (Ohlson, 1995; Feltham and Ohlson, 1995).

The above specified RIV-model requires forecasting residual income into infinity. This is, however, a difficult exercise in practice as forecasting errors are likely to increase in magnitude with longer forecasting horizons (Frankel and Lee, 1998). In order to overcome this, an assumption of steady state is made, allowing for the estimation of a terminal value. This assumption implies that a steady state is reached at the end of the explicit forecast period, where the firm enters a competitive equilibrium with a constant long-term growth rate (Koller, Goedhart and Wessels, 2010; Penman, 2013). The forecast horizon can be split into two components: the explicit forecast horizon and the steady state. This allows the elementary RIV-model to be restated as follows (Brief and Lawson, 1992):

$$V_0 = B_0 + \sum_{t=1}^{T} \frac{RI_t}{(1 + r_E)^t} + \frac{V_T - B_T}{(1 + r_E)^T} \qquad (5)$$

Similar to equation 4, value of owners' equity is the sum of the book value of owners' equity at $t = 0$ and the present value of residual income. Residual income calculations are, however, split between the present value of RI during the explicit forecast horizon up to steady state and a terminal value. The terminal value can be perceived as the present value of expected future goodwill at $t = T$, the beginning of the steady state year.

3.1.2.1 The implication of goodwill on the terminal value

In accordance with both stated RIV-models, for a firm to create value, it needs to earn returns in excess of the cost of capital (Penman, 2013). The present value of this excess profitability can be perceived as business goodwill when RI is positive or business badwill when negative (Skogsvik, 1998). However, firms and industries eventually reach a competitive equilibrium. Business goodwill is, therefore, not expected to last in perpetuity and RI will approach zero over time (Porter, 1980; Ohlson, 1995; Fama and French, 2000). This implies, ceteris paribus, that the terminal value will be equal to zero at $t = T$, as no excess profitability can be expected in a competitive equilibrium. Nevertheless, the current state of accounting practices give rise to another component of total goodwill, namely the conservative accounting measurement bias (Feltham and Ohlson, 1995). Driven by accounting conservatism that causes relatively low book values and high returns, this conservative measurement bias is expected to persist over time (Skogsvik, 2002). Skogsvik (1998) emphasized that a decomposition of goodwill into two components is advantageous in order to highlight this accounting measurement bias. Thus, the total goodwill of a firm can be stated as:

$$q(GW)_t = q(BGW)_t + q(CMB)_t \tag{6}$$

where:

$q(GW)_t$ = equity owners' relative total goodwill at time t
$q(BGW)_t$ = equity owners' relative business goodwill or badwill at time t
$q(CMB)_t$ = equity owners' relative conservative measurement bias at time t

Multiple researchers have incorporated this conservative measurement bias into the RIV model, and considerable attention have been paid to the terminal value (e.g. Runsten, 1998; Penman, 1998; Skogsvik, 1998). By studying the financial statements, Runsten (1998) developed industry specific coefficients that account for conservatism in accounting. These permanent measurement bias (PMB) coefficients can be directly incorporated into the RIV model to estimate terminal value in the following manner:

$$V_0 = B_0 + \sum_{t=1}^{T} \frac{RI_t}{(1+r_E)^t} + \frac{B_T * PMB}{(1+r_E)^T} \tag{7}$$

where:

PMB[3] $=$ equity owners' relative conservative measurement bias at time = T

3.1.2.2 The adjusted RIV-model

As will be discussed in the data section, we use financial statement data in our RIV-model. However, since the implementation of IFRS 16 occurred in 2019, we are subjected to financial data observed two years post implementation. This implies that the explicit forecast horizon and the terminal value calculations have to be complemented in our post IFRS 16 valuations. We do this by utilizing analyst forecasts in accordance with Ang and Chang (2006) for years subsequent to 2020. Nevertheless, not all firms have analyst coverage, and the majority of those who do only have estimates until 2023. This limits our model to an explicit forecast horizon of three years. In applying such a short explicit forecast horizon, it becomes hard to justify the presumption of a competitive equilibrium assumption after three years. Moreover, the PMB coefficients by Runsten (1998) in equation 7 becomes unsuitable in this setting, as total firm goodwill is expected to include both the conservative measurement bias and business goodwill/badwill (Skogsvik, 1998).

Similar to Skogsvik and Skogsvik (2010), we address this by incorporating a correction term that accounts for both business goodwill/badwill and the conservative measurement bias at $t = T$ in the following manner:

[3] Note that PMB is equivalent to $q(CMB)_t$ in the decomposition of total goodwill.

$$V_{i,0} = B_{i,0} + \sum_{t=1}^{T} \frac{RI_{i,t}}{(1 + r_{E,i})^t} + \frac{B_{i,T} * q(GW)_{i,T}}{(1 + r_{E,i})^T} \quad (8)$$

where:

$q(GW)_{i,T} =$ five-year median $(P/B - 1)$, prior to $t = 0$.

However, in contrast to Skogsvik and Skogsvik (2010), this correction term is not a weighted average of $(P_0/B_0 - 1)$ and the PMB coefficients estimated by Runsten (1998). The reason for this is because our sample includes both small- and mid-capitalization firms. We, therefore, do not believe that the empirical evidence of U.S. firms reaching a steady state in about five to six years by Penman (1991) holds for the sample of firms in this study, as opposed to Skogsvik and Skogsvik (2010).

3.1.2.3 Required Rate of Return on Owners' Equity (r_E)

The Capital Asset Pricing Model (CAPM) of Litner (1965) and Sharpe (1964) has been used in order to estimate firm-specific required rate of return on owners' equity, as follows:

$$r_E = r_f + \beta_j * E(r_m - r_f) \quad (9)$$

where:

r_E	= estimated required rate of return on owners' equity
r_f	= risk-free rate of return
β_j	= beta, systematic non-diversifiable risk
$E(r_m - r_f)$	= expected market risk premium

We use the 10-year government bond for each country as a proxy for the risk-free rate, giving us risk-free rates stated in the same currency as the cash flows in the company (Koller, Goedhart and Wessels, 2010). The beta for each company is estimated by regressing weekly stock returns against the market index three years prior to the date of valuation. The expected market risk premium is assumed to be constant at a rate of 6%, in accordance with Francis, Olsson and Oswald (2000).

3.1.2.4 Quarterly observations on annual valuations

Given that we use annual accounting information and analyst forecasts, the intrinsic values from our RIV-model can be perceived as at the beginning of year $t = 0$ or at the end of year $t = -1$. However, since this study is based on quarterly estimations of market misvaluation, we compound our valuations forward by one, two or three quarters depending on the date of valuation. This allows for alignment between estimated intrinsic values and market values observed on a quarterly basis. For instance, our first valuation can be perceived to be at the beginning of (1st of January) 2017 or at the end of (31st of December) 2016. In order to get an estimate of misvaluation for 2017Q1, we compound the valuation forward by one quarter. Note that market value observations for the last quarter of the year coincide with the time frame of the original valuation.

3.1.3 Model comparison

One similarity between the RRV- and RIV-model is that both are direct valuation models, meaning that equity is calculated directly instead of e.g. first calculating the total firm value[4] and deducting net debt to get the equity value. In addition, using direct valuation models allows us to avoid the increase in firm value resulting from increased debt levels, following the recognition of off-balance sheet leases with IFRS 16. A main difference between the two models, however, is that the RIV-model is more dependent on forecasts or other assumptions about the future development of companies, while the RRV-model uses already reported accounting figures in its valuation. This reduces uncertainty in the RRV-model. The RIV-model is, on the other hand, more intuitive and practical and, thus, more broadly used by investors and other market participants. This allows the user to reverse engineer input variables in order to decipher the underlying market assumption regarding firm specific profitability, growth and risk. Lastly, another important advantage is that the RIV-model, as opposed to the RRV-model, allows for the inclusion of bankruptcy risk in accordance with Skogsvik and Skogsvik (2003).

3.1.4 Valuation specifications

3.1.4.1 Valuation dates

Since IFRS 16 was mandatorily adopted for fiscal years starting in 2019, using annual data as the basis for the valuation of our sample firms would limit our post-IFRS 16 observations to merely two fiscal years per firm. Consequently, the valuation is made based on quarterly financial figures, with the valuation dates being each calendar year quarter between 2017-2020. This allows us to have a maximum of eight valuation observations before and after the adoption of IFRS 16, respectively, with a total of 16 observations per sample firm. This enables a sufficient sample size for the purposes of this study.

3.1.4.2 Early adopters of IFRS 16

While IFRS 16 was mandatorily adopted in 2019, early adoption of the standard was allowed (IASB, 2016). Accordingly, rather than using fiscal years starting in 2019 as the IFRS 16 adoption year for all sample firms, early adopters were controlled for by manually scrutinizing the IFRS 16 adoption year for the firms. More specifically, sample firms with a change in non-current assets[5] equal to or above 5% between 2016 Q4 and 2017 Q1, or between 2017 Q4 and 2018 Q1, were scrutinized. The threshold of 5% is used as a prudent threshold, and changes in non-current assets below this figure is considered ordinary business practice. This resulted in a total of 323 firms being controlled for manually, of which a total of four firms were identified as early adopters of IFRS 16. All of these firms adopted IFRS 16 in fiscal year 2018. For the remaining sample firms, fiscal year 2019 is used as the year of IFRS 16 adoption.

[4] Total firm value, also called Enterprise Value, can be decomposed as the sum of market value of equity and net debt.
[5] Non-current assets comprise of Property, Plant and Equipment (PPE), Right-of-use assets, Intangible assets (including goodwill), Long-term financial assets, Deferred tax assets, Long-term deferred assets and other long-term assets.

3.2 Difference-In-Difference Regression

In order to examine the change in the relation between market and intrinsic value pre- and post-IFRS 16 adoption, we want to isolate the effect of the accounting standard introduction. Consequently, we adopt a difference-in-difference (DD) regression approach to test for the valuation change between a treatment group and a control group of firms, where the effect of IFRS 16 on the sample firms is what determines which group they are classified into.

Using a DD regression is a common method to examine different effects of a certain treatment or change, making it suitable to estimate the valuation effects of IFRS 16, being a new accounting standard. With this method, we can account for unobserved differences between the two sub-samples, being the treated and control firms, while also adjusting for observed changes for the treatment firms that is also experienced by the control firms (Daske et al., 2008 and Florou and Pope, 2012). The sample firms are therefore affected by similar macroeconomic effects and trends, with the introduction of IFRS 16 being the focus of the difference between the two sub-samples, limiting alternative explanations (Florou and Pope, 2012). Accordingly, we also test if the two groups experience parallel trends. Furthermore, to ensure that we are actually looking at the valuation change, we exclude firms that do not have observations both pre- and post IFRS 16 adoption (Daske et al., 2018). To estimate the change in valuation, the following DD regression model is used:

$$Misvaluation_{it} = \beta_0 + \beta_1 Post_t + \beta_2 Treatment_{it} + \beta_3 Post_t * Treatment_{it} + \sum \beta_j \, Controls_j + \varepsilon_{it} \quad (10)$$

where:

$Misvaluation_{it}$	= Market value in relation to intrinsic value (M/V) for firm *i* at time *t*
$Post_t$	= Time variable that equals one for IFRS 16 adoption years and zero otherwise
$Treatment_{it}$	= Treatment variable that equals one for firms in the treated group and zero otherwise
$Post_t * Treatment_{it}$	= Interaction variable that equals one for firms in the treated group post IFRS 16 adoption

The last variable, $Controls_j$, denotes the set of control variables used in the regression, including the various fixed effects. As control variables, we use firm total assets (*Size*) and profitability (*EBITDA*[6]) at each valuation date. These control variables are added to also control for contemporaneous effects that also could affect the estimated intrinsic value (Daske et al., 2008). We control for size since larger firms tend to be more liquid compared to smaller and less actively traded firms, affecting the quoted firm market value, and profitability is controlled for since it is documented to be associated with market valuations (e.g. Florou and Pope, 2012). EBITDA is used as the profitability control measure as it is the earnings figure mostly affected by the introduction of IFRS 16 (see Figure 6 in appendix A). In addition, we include both firm

[6] Earnings before interest, taxes, depreciation and amortization.

and time (quarterly) fixed effects, which allows us to control for unobservable time-invariant firm characteristics that could affect our valuation results. We also add industry-time fixed effects as a control variable in our most stringent test, giving us an indicator that allows us to control for common effects on the valuation change in a given industry and quarter. In all regressions, we use robust standard errors clustered at the firm level, to allow for both heteroskedasticity and autocorrelation in our tests (Bertrand, Duflo and Mullainathan, 2004).

The main variable of interest in the DD regression is the interaction variable, since its estimated coefficient ($\hat{\beta}_3$) is what captures the average change in market misvaluation for treatment firms from the pre- to post-period that is attributable to the adoption of IFRS 16. Therefore, this coefficient is what is called the difference-in-difference (DD) estimate.

3.2.1 Treatment and Control group

Since we employ a DD regression method, we are using a quasi-experimental setting, meaning that the sample firms are not randomly assigned into the treatment or control group. Instead, the firms are divided by calculating the change in non-current assets between the first quarter of post-IFRS 16 adoption year (2019Q1 for most firms) and the last quarter of pre-IFRS 16 adoption year (2018Q4 for most firms) for each sample firm. We use the first quarter of IFRS 16 adoption year, rather than the full fiscal year, since this reduces the possibility that the change in non-current assets is a result of explanations besides IFRS 16, such as new investments. Using the full fiscal year allows for a 12-month investment period, while the first quarter reduces this period to 3 months. When calculating the change in non-current assets, the sample firms are sorted and the top 25th percentile of firms with the largest percentage change in non-current assets are included in the treatment group, i.e. the firms heavily affected by IFRS 16. This is done to use a statistical measure for creating the treatment and control groups, rather than using an arbitrary threshold of change in non-current assets. In addition, this ensures that we have treatment firms that are distinctly more affected by the new standard than the control firms, as opposed to having a more even split of e.g. 50%.

3.3. Triple Difference Regression

To examine the effect of IFRS 16 on firm valuation more closely, we aim to study how the change in valuation differs between firms mainly owned by retail investors[7] as opposed to institutional investors[8]. For this purpose, a triple difference (DDD) regression model is used, where the treatment and control firms are further divided into either of these two types of owners. Using a DDD regression model follows the same rationale as using the DD regression, with the aim of isolating the effect of IFRS 16 on firm valuation change. Furthermore, a DDD regression allows us to add the additional dimension of different type of owners to the model, while still isolating the effect of IFRS 16 on valuation.

The DDD regression model is an extension of equation 10, as follows:

[7] Retail investors are defined as less sophisticated and non-professional investors, who owns and trade shares for their own personal wealth management.
[8] Institutional investors are defined as sophisticated and professional investors, including banks, insurance companies, pension funds, mutual funds, investment advisors and other institutions managing wealth for purposes other than private gain.

$$Misvaluation_{it} = \beta_0 + \beta_1 Post_t + \beta_2 Treatment_{it} + \beta_3 Ownership_{it} + \beta_4 Post_t * Treatment_{it} + \beta_5 Post_t * Ownership_{it} + \beta_6 Treatment_{it} * Ownership_{it} + \beta_7 Post_t * Treatment_{it} * Ownership_{it} + \sum \beta_j \, Controls_j + \varepsilon_{it} \quad (11)$$

where:

$Ownership_{it}$ = Investor variable that equals one for firms mainly owned by retail investors and zero for firms mainly owned by institutional investors.

In the DDD regression, the main variable of interest is the interaction variable between all the three independent variables, namely the time, treatment and ownership variable. The estimated coefficient ($\hat{\beta}_7$) gives us the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for heavily affected firms owned by retail investors. The control variables and fixed effects are the same as used in equation 10.

3.3.1 Retail vs. Institutional investors

When classifying the sample firms as either retail or institutionally owned, we want to understand what type of investors are mainly driving the quoted market price for each specific firm. Therefore, we use data on free float shares[9] in relation to total shares outstanding to understand the fraction of total shares that are actually traded. This measure is used together with the percentage of total shares owned by institutional investors, to calculate an indicator variable. Using this data, the indicator variable tells us how much of free float shares that are owned by institutional investors. This variable is calculated for each firm between 2017Q1 and 2020Q4, where the average indicator variable is calculated for the pre- and post IFRS 16 adoption quarters for each firm. Subsequently, similar to our classification of treatment and control groups, the firms are sorted and the top 25th percentile of firms with the smallest percentage share of free float owned by institutional investors are classified as firms owned by retail investors. Again, rather than using an arbitrary threshold, this results in two groups of firms with noticeably different ownership structures. This sorting is done both pre- and post-IFRS 16 adoption, and thus while allowing for firms to change ownership classification between the pre- and post-IFRS 16 time period, no firms in the sample changes their ownership classification between these periods.

The fraction of free float shares is used since that is the total number of shares available for the public to trade, as opposed to the total shares outstanding. Using this measure is therefore consistent with the aim of this study being to examine whether firm market prices has come closer to their intrinsic value, since the actual trade of shares is what will affect firm market prices at any given time. On the contrary, merely using institutional ownership as an indicator would not capture the effect of shares actually being traded on the market and thus the trades establishing quoted market prices.

[9] Free float shares are defined as total shares outstanding excluding shares owned by governments, company managers, key employees and strategic investors. Accordingly, free float shares represent the shares available for public trade. This definition is similar to e.g. Ding, Ni and Zhong (2016) and El-Nader (2018).

3.4 Robustness Tests

3.4.1 Bankruptcy risk

When estimating the cost of equity in the RIV-model, we do not consider that companies face the risk of going bankrupt. Not doing so results in an inconsistency between the estimated residual incomes for each time period, which are conditional on firm survival, and the discount rate, where bankruptcy risk is neglected. Consequently, we perform an additional test where the bankruptcy risk is included in the cost of equity.

Early studies on the prediction of bankruptcy risk includes Beaver (1966) and Altman (1968), and following their respective bankruptcy prediction models, several other models have emerged (e.g. Wilcox, 1973; Ohlson, 1980 and Skogsvik, 1987), where most research use accounting-based models. While the model by Altman (1968) is still being used, the model is estimated using US firms, making it less comparable to our Nordic sample firms. Furthermore, in order to adjust the cost of equity for bankruptcy risk, the model used must give us probabilities of failure. This is not generated by Altman (1968), and while this requirement is fulfilled by Ohlson (1980), this model is also based on US firms. Accordingly, we use the bankruptcy prediction model developed by Skogsvik (1987) in this study. This model is estimated with a sample of Swedish firms, which better reflects our sample of Nordic firms.

After calculating the bankruptcy risk for each firm, the cost of equity is adjusted with the following formula, as suggested by (Skogsvik, 2006):

$$r^*_{e,i} = \frac{r_{e,i} + p(fail)_i}{1 - p(fail)_i} \qquad (12)$$

where $p(fail)_i$ is the probability of bankruptcy and $r^*_{e,i}$ is the adjusted cost of equity with bankruptcy risk incorporated. The bankruptcy risk is assumed to be constant over time.

The proportion of failing firms used in the estimation sample by Skogsvik (1987) is disproportionate to the proportion of failing firms in the total population of companies. This results in overestimated firm bankruptcy risks, and to adjust for this bias we apply the Skogsvik and Skogsvik (2013) correction model to receive adjusted probabilities of failure (see equation 13 in appendix B).

3.5 Data Limitations

As opposed to other studies using a DD regression model (e.g. Daske et al., 2008 and Florou and Pope, 2012), finding a control group that is not affected by the treatment at all is not a viable alternative in this study. Most firms employing the domestic GAAP of their home country in Europe are private firms, and since we need the quoted market values of the firms, these are out of scope. Furthermore, using US GAAP firms as our control group would result in the treatment and control group not experiencing the same macroeconomic effects, besides that of IFRS 16, since US and Nordic firms experience different trends and operate in different legal jurisdictions. Therefore, we acknowledge this as a limitation to our method.

4. Data

4.1 Sample Selection

We use several databases in this study to collect the needed data. Accounting data is collected from the Compustat database, analyst forecasts and institutional ownership from Capital IQ and data on free float shares and weekly stock returns for the beta calculations from Thomson Reuters EIKON. Furthermore, industry classifications are provided by the Kenneth French Data Library. The data is collected for the years 2017-2020 on a quarterly basis, giving us a total of 16 valuation dates and quarters, with eight quarters for the pre- and post-IFRS 16 time period, respectively. Analyst forecast data is obtained until 2023, being the end of the explicit forecast period used in the RIV-model. Consequently, we construct a panel data structure suitable for our tests. This study is conducted with a sample of public firms in the Nordic region[10] (Sweden, Norway, Denmark and Finland), including smaller growth firms listed on First North. Only public firms are included since private firms are not required to use IFRS in their reporting and do not have a quoted market price. The Nordic market is chosen to ensure a sufficiently large estimation sample, as opposed to only examining firms in one country. Moreover, these Nordic countries are similar in terms of business practices and culture, in addition to similarities in legal systems and macroeconomic trends (Hooghiemstra et al., 2019; Larimo, 2003).

Similar to other valuation studies, financial firms are excluded from the sample (e.g. Frankel and Lee, 1998). Such firms are exposed to different regulations and reporting requirements affecting financial items, making financial companies less suited for the valuation models used in this study. Utility firms are excluded by the same rationale. Furthermore, we exclude some public firms listed in First North not reporting under IFRS. Firms not having at least one observation both pre- and post-IFRS 16 adoption are also omitted, ensuring that we can examine the valuation change for each firm (Daske et al., 2018). In addition, only firms with fiscal years coinciding with calendar years are included, to ensure that the data pertains to the valuation dates examined. In the RIV-model, firms with negative equity are excluded, since ROE calculated on negative equity value gives us less informative results and, in combination with negative earnings, misleading ROE ratios. When estimating the firm intrinsic values, outliers are winsorized at the 1st and 99th percentile to mitigate the effect of extreme values that could skew the valuation results.

Table 1 presents the size of the final sample. The final sample for the RIV-model is smaller than the corresponding sample for the RRV-model due to exclusion of firms without analyst forecast data. From an initial sample of 1718 and 1463 firms for the RRV- and RIV-model, respectively, the final sample consist of 411 and 253 firms, respectively. See Table 9 in appendix C for an industry and country distribution of the final RRV- and RIV-sample.

[10] Icelandic firms are excluded due to insufficient data.

Table 1. Final sample

This table presents the final sample of unique firms used in the RRV- and RIV-model respectively, after considering the selection criteria used to reduce the sample size. The RRV-model is based on data collected from Compustat, while the RIV-model is based on data collected from Capital IQ, resulting in different numbers of firms available before data reduction. Other includes missing accounting and market data, currency adjustments and extreme observations.

	RRV-model	**RIV-model**
Firms available	1718	1463
Firms not reporting under IFRS	-470	-408
Financial firms, Banks & Utility firms	-247	-137
Firms without both pre- and post-IFRS 16 observations	-287	-226
Firms with broken fiscal years	-26	-50
Missing data & Other	-277	-389
Final number of firms	**411**	**253**

4.2 Descriptive Statistics

Table 2 and 3 provides a summary of the median key variables used throughout this study for the RRV- and RIV-sample, respectively. The selection criteria and data management elaborated on above resulted in a total number of 5750 observations for the RRV-model and 4234 observations for the RIV-model. The number of unique firms in each quarter range between 207-398 and 213-252 firms for the RRV- and RIV-sample, respectively, and equals the number of valuation observations for each quarter.

The median size of the sample firms is stable throughout the time period studied, as indicated by the different size variables such as market value, book value of equity and total assets. Since larger firms are more likely to have a higher level of analyst coverage, the use of analyst forecasts in the RIV-model results in this sample containing larger firms. In 2020Q4, the sample firms are significantly larger in relation to the previous quarters, which is a result of such firms having released their 2020Q4 results at the time the data was collected. Furthermore, we can observe increases in both leverage ratios, D/M and D/E, for the post-IFRS 16 period compared to the pre-IFRS 16 period. This is true for both the RRV- and RIV-model, and is the expected change given the capitalization of previously off-balance sheet leases. Moreover, we also observe a small increase in profitability after IFRS 16 adoption 2019, as measured by the EBITDA-margin, with the increase being slightly higher in the RRV-sample on average. This is expected given the positive impact of IFRS 16 on the EBITDA figure (see Figure 6 in appendix A). However, as seen in both samples, the median EBITDA-margin decreases again between 2019Q4-2020Q2, which most likely is a result of lockdowns and reduced business related to covid-19, with an increase in profitability again after 2020Q2. This is also portrayed by the median ROE in the RIV-sample significantly declining for the first two quarters of 2020, followed by an increase in profitability thereafter.

Table 2. Descriptive statistics of key variables in the RRV-model

This table presents descriptive data of the main variables used in the RRV-model for each quarter between 2017-2020. The number of observations represents the number of intrinsic value observations in each quarter. The data is presented in MSEK to provide comparability, using the average exchange rates in 2020. Market value is denoted by M, total debt is denoted by D and E is equal to the book value of equity. EBITDA is an abbreviation of earnings before interest, taxes, depreciation and amortization.

Year	**2017**				**2018**				**2019**				**2020**			
Quarter	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Number of firms	328	343	348	362	352	357	354	382	390	387	383	398	393	394	372	207
Number of observations	328	343	348	362	352	357	354	382	390	387	383	398	393	394	372	207
Median Market Cap	2 834	3 062	2 935	2 698	2 935	3 099	3 205	2 406	2 684	2 743	2 808	2 976	2 073	2 700	3 935	8 053
Median Book Value	1 316	1 263	1 241	1 223	1 392	1 397	1 471	1 318	1 328	1 372	1 436	1 379	1 380	1 358	1 576	2 808
Median Total Assets	2 837	2 777	2 577	2 628	3 199	3 336	3 298	2 765	2 887	3 221	3 296	2 975	3 261	3 212	3 515	6 496
Median D/M-ratio	0.12	0.13	0.12	0.12	0.14	0.14	0.14	0.14	0.20	0.21	0.20	0.18	0.27	0.21	0.16	0.14
Median D/E-ratio	0.33	0.34	0.31	0.30	0.36	0.38	0.35	0.32	0.45	0.48	0.45	0.44	0.47	0.44	0.41	0.40
Median Net Income	19	21	20	19	16	21	27	18	15	19	22	17	8	8	19	60
Median EBITDA-margin	8.6%	9.5%	10.0%	9.5%	8.8%	9.6%	10.1%	9.0%	10.5%	11.1%	11.9%	10.7%	9.9%	10.6%	13.0%	13.2%

Table 3. Descriptive statistics of key variables in the RIV-model

This table presents descriptive data of the main variables used in the RIV-model for each quarter between 2017-2020. The number of observations represents the number of intrinsic value observations in each quarter. The data is presented in MSEK to provide comparability, using the average exchange rates in 2020. Market value is denoted by M, total debt is denoted by D and E is equal to the book value of equity. EBITDA is an abbreviation of earnings before interest, taxes, depreciation and amortization and ROE is an abbreviation of return on equity, calculated as net income divided by the opening book value of equity for each quarter.

Year	**2017**				**2018**				**2019**				**2020**			
Quarter	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Number of firms	213	213	213	227	222	222	222	246	252	252	252	245	245	245	245	219
Number of observations	213	213	213	227	222	222	222	246	252	252	252	245	245	245	245	219
Median Market Cap	8 057	8 326	9 133	7 948	7 666	8 347	8 181	5 992	7 083	7 438	7 154	8 262	5 844	7 547	9 393	12 133
Median Book Value	3 079	2 959	2 941	3 029	2 733	2 686	2 728	2 526	2 669	2 676	2 761	3 014	3 082	3 234	3 546	4 053
Median Total Assets	7 191	7 078	7 139	7 285	7 172	7 381	7 498	6 577	7 504	7 402	7 523	7 748	8 105	8 013	7 880	9 855
Median D/M-ratio	0.16	0.15	0.16	0.16	0.15	0.16	0.17	0.19	0.20	0.21	0.23	0.19	0.31	0.24	0.20	0.16
Median D/E-ratio	0.46	0.50	0.49	0.45	0.46	0.50	0.50	0.48	0.59	0.64	0.60	0.56	0.63	0.61	0.56	0.54
Median Net Income	68	79	94	87	65	84	112	62	59	73	67	55	39	48	94	88
Median EBITDA-margin	12.0%	12.6%	13.5%	11.1%	12.0%	12.2%	12.6%	11.0%	12.5%	13.4%	13.7%	10.8%	11.8%	12.2%	14.2%	13.0%
Median ROE	11.9%	13.8%	15.1%	16.8%	12.4%	14.6%	14.5%	15.7%	11.0%	12.5%	12.1%	13.1%	7.3%	9.0%	13.1%	13.5%
Median Cost of Equity	5.82%	5.81%	5.81%	5.86%	5.84%	5.84%	5.84%	5.85%	5.84%	5.84%	5.82%	5.85%	5.85%	5.84%	5.85%	5.98%

5. Results

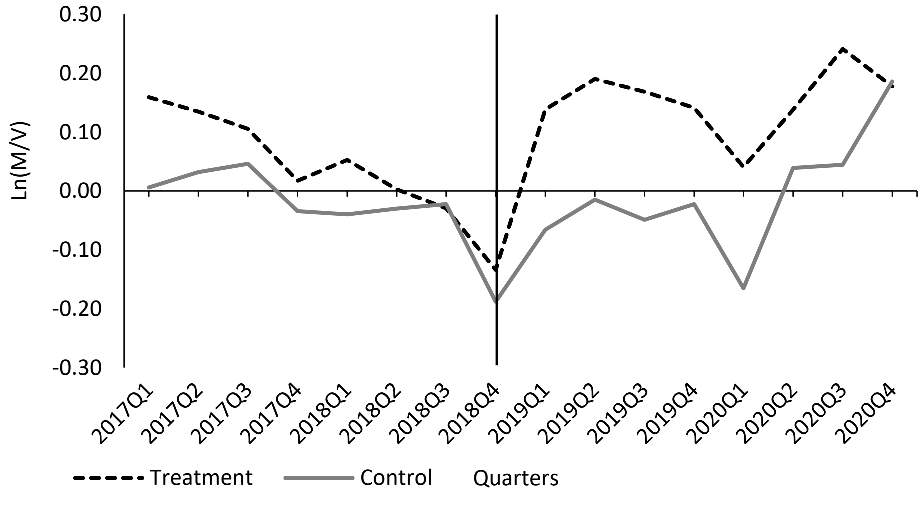
5.1 RRV-Model

5.1.1 Valuation results

A simple way to test the effect of IFRS 16 on market misvaluation is by tracking the average market-to-intrinsic value over time. Figure 1 plots the average market misvaluation for treatment (heavily affected) and control (non-heavily affected) firms between 2017-2020, on a quarterly basis. Note that market misvaluation is defined as the natural logarithm of M/V since we use the RRV-model. Albeit not perfect, a parallel trend is observed prior to the adoption of IFRS 16. This ensures us, to a large extent, that our difference-in-difference estimates are not influenced by correlated and unobservable variables that are linked to the adoption of the standard. We observe that the misvaluation for the treatment firms is further away from zero after the mandatory adoption of IFRS 16. More specifically, firms heavily affected by IFRS 16 appear to have become more overvalued. The observations also indicate that the difference in market misvaluation between treatment and control firms have increased in the post-IFRS 16 periods, suggesting that the recognition of operating leases might have contributed to an increase of market values.

Figure 1. Parallel trend graph for the RRV-model

This figure presents the average firm misvaluation, denoted as Ln(M/V), for each quarter between 2017-2020 for the RRV-model. M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The average intrinsic valuations are winsorized at the 1st and 99th percentiles.



These observations are further substantiated in our difference-in-difference results. Table 4 presents the DD-regression results using the RRV-model. The reported DD-estimate of 0.1146 in column (1) is the regression interaction variable and can be interpreted as the average change in market misvaluation for treatment firms from the pre- to post-period that is attributable to the adoption of IFRS 16. The positive DD-estimate indicates a positive IFRS 16 effect that increases Ln(M/V) with a statistical significance level of 5%. However, to assess whether or not this effect has resulted in market values coming closer to their intrinsic values, we need to study the pre-IFRS 16 misvaluations of our sample. Column (1) of Table 4 presents the average misvaluation for treatment and control firms in the pre- and post-periods. For treatment firms, this amounted to 0.0191 in the pre-IFRS 16 period, suggesting a close alignment between market and intrinsic values. The corresponding misvaluation post-IFRS 16 amounted to 0.1579, resulting in a total increase of average Ln(M/V) of 0.1388. This indicates a higher degree of overvaluation in the post-period, as suggested by Figure 1. Furthermore, the total increase in average M/V for the treatment group can be perceived as comprising of 0.1146 (the DD-estimate) and a trend effect of 0.0242, corresponding to the total increase in Ln(M/V) of our control group. Our results, therefore, indicate that the adoption of IFRS 16 has had a positive effect on market misvaluation that resulted in a higher degree of overvaluation.

Table 4. Difference-in-difference (DD) regression results for the RRV-model

This table presents DD regression results for the change in firm valuation for the RRV-model, including descriptive data for the pre- and post-IFRS 16 period. The dependent variable is firm misvaluation, denoted as Ln(M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the Ln(M/V) observations. Heavily affected and non-heavily affected firms are the treatment and control group, respectively. The reported DD-estimate is the interaction variable from the DD regressions and is interpreted as the average change in market-to-intrinsic value from the pre- to post-IFRS 16 period for the treatment group in relation to the control group. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to get the average industry coefficients in the RRV-model and to estimate the industry-time fixed effects used in the model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$

	(1)		(2)	(3)	(4)
	Heavily affected	Non-heavily affected			
Pre-IFRS 16	0.0191	-0.0342			
Post-IFRS 16	0.1579	-0.0100			
Difference pre-post	0.1388	0.0242			
DD-estimate	0.1146**		0.1082**	0.1020*	0.0800
	(0.0548)		(0.0551)	(0.0533)	(0.0549)
Firm controls	No		Yes	Yes	Yes
Firm & time FE	No		No	Yes	Yes
Industry–time FE	No		No	No	Yes
N	5 750		5 680	5 679	5 679
Adjusted R^2	0.0073		0.0103	0.6294	0.6358

To quantify the economic significance of the observed IFRS 16 effect, we use basic logarithm rules and solve for M/V in the presented components of our DD-regression. This provides us with an IFRS 16 effect of 0.1281[11]. A high degree of economic significance is therefore

[11] $0.1281 = \left(e^{\overline{\ln(\frac{M}{V}) Post\ (Treatment)}} - e^{\overline{\ln(\frac{M}{V}) Pre\ (Treatment)}}\right) - \left(e^{\overline{\ln(\frac{M}{V}) Post\ (Control)}} - e^{\overline{\ln(\frac{M}{V}) Pre\ (Control)}}\right)$

suggested by our results as the average increase in market misvaluation due to the adoption of IFRS 16 is observed to be 12.81%.

The incorporation of control variables in column (2) decreases our DD-estimate to 0.1082, although still being statistically significant at the 5% level. In column (3), we present the DD-estimator when incorporating both control variables and firm fixed effects. In this model, we observe that the DD-estimate is 0.1020, with a significance at the 10% level. Lastly, in column (4) we present our most stringent model, where the regression includes control variables, firm and industry-time fixed effects. The DD-estimate from this model is 0.0800. However, this estimate is not significant below the 10% level. This shows that our results are robust when including control variables and firm fixed effects but fall short in our most stringent model.

5.1.2 Institutional vs. Retail Investors

In order to assess the effect of IFRS 16 on market misvaluation for retail investors, we use the DDD-regression presented in the method section. Table 5 presents the regression results using the RRV-model, with a reported DDD-estimate of 0.2829 in column (1) and a statistical significance level of 5%. This estimate is the triple interaction variable from our DDD-regression and can be interpreted as the average change in market misvaluation from the pre- to post-IFRS 16 period for treatment firms classified as owned by retail investors.

Table 5. Triple-difference (DDD) regression results for the RRV-model

This table presents DDD regression results for the change in firm valuation for the RRV-model. The dependent variable is firm misvaluation, denoted as Ln(M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the Ln(M/V) observations. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to get the average industry coefficients in the RRV-model and to estimate the industry-time fixed effects used in model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

	(1)	(2)	(3)	(4)
DDD estimate	0.2829**	0.2742**	0.2062*	0.2038*
	(0.1344)	(0.1386)	(0.1207)	(0.1190)
Firm controls	No	Yes	Yes	Yes
Firm & time FE	No	No	Yes	Yes
Industry–time FE	No	No	No	Yes
N	5 711	5 647	5 646	5 646
Adjusted R^2	0.0475	0.0483	0.6326	0.6385

An intuitive way to understand the observed DDD-estimate of 0.2829 is by setting it in relation to our DD-estimate of 0.1146 in Table 4. Both the DD-estimate and DDD-estimate provide us with the average change in market-to-intrinsic value attributable to the adoption of IFRS 16. However, the DDD-estimate isolates said effect for firms owned by retail investors. Our results therefore indicate a more pronounced effect of IFRS 16 for retail investors, leading to a larger average change in Ln(M/V). Furthermore, since the average market misvaluation for treatment firms owned by retail investors amounted to 0.0191 prior to IFRS 16 (see Table 10 in appendix D), the observed effect of 0.2829 would, ceteris paribus, imply an increase from valuations fairly close to their intrinsic values, to an increase toward overvaluation as a consequence of the standard. Thus, the DDD-estimate indicates that the observed increase in both average market misvaluation and the degree of overvaluation are larger for retail owned treatment firms than that of firms heavily affected by IFRS 16 in general, including those institutionally owned. By setting the DDD-estimate of 0.2829 in relation to our DD-estimate of 0.1146, it also becomes clear that the economic impact of IFRS 16 on retail owned firms is more significant than that of heavily affected firms in general.

The incorporation of control variables in column (2) decreases our estimator to 0.2742, however, but it is still statistically significant at the 5% level. In column (3), we present the DDD-estimate when incorporating both control variables and firm fixed effects. In this model, we observe a DDD-estimate of 0.2062, with a statistical significance at the 10% level. Lastly, in column (4) we present our most stringent DDD-model, where the regression includes control variables, firm fixed and industry-time fixed effects. The estimator from this model is 0.2038 and has a statistical significance at the 10% level. Consequently, we observe robust results also when including control variables and firm fixed effects, with the exception of our most stringent model.

5.1.3 Analysis RRV-model

In summary, the presented results suggest that the adoption of IFRS 16 has had a positive effect on market mispricing that results in a higher degree of overvaluation. This effect is also shown to be more pronounced when examining retail investors separately. Similar to Hales, Venkataraman and Wilks (2012), this indicate that investors' trading behavior differ when assessing recognized operational leases on the balance sheet as opposed to disclosed ones. The observed findings are, therefore, also consistent with the literature identifying a difference between disclosed and recognized accounting information in terms of value relevance (e.g. Barth, Clinch and Shibano, 2003; Lim et al., 2017; Schipper, 2007; Callahan, Smith and Spencer, 2013). However, the suggested increase in market misvaluation stands in stark contrast to the research stating that the recognition of operating leases will have a negative impact on market prices (Beattie et al., 1998; Bennet and Bradbury, 2003; Fülbier et al., 2008; Duke et al., 2009; Cornaggia et al., 2013). This counterintuitive increase in market misvaluation, where firms seem to become more overvalued, is, on the other hand, in line with Nelson and Tayler (2007), where investors are suggested to lose out on the beneficial extra analysis conducted when manually capitalizing previously disclosed accounting information. As such, this results in the investors not valuing the now recognized information as much as if they had capitalized it themselves.

Our findings regarding retail owned firms are in line with Yu (2013), as the author observed that value relevance increases in cases where institutional ownership and analyst coverage are low. These results are also consistent with previous research stating that retail investors focus mainly on the financial statements, as opposed to the notes to the financial statements (Cascino et al. 2014). On the other hand, the perceived higher degree of market misvaluation of retail owned firms in relation to institutionally owned firms are not in congruence with the proposed positive relation between improved financial reports (clearer and more concise) and investment performance observed by Lawrance (2013).

5.2 Additional Tests

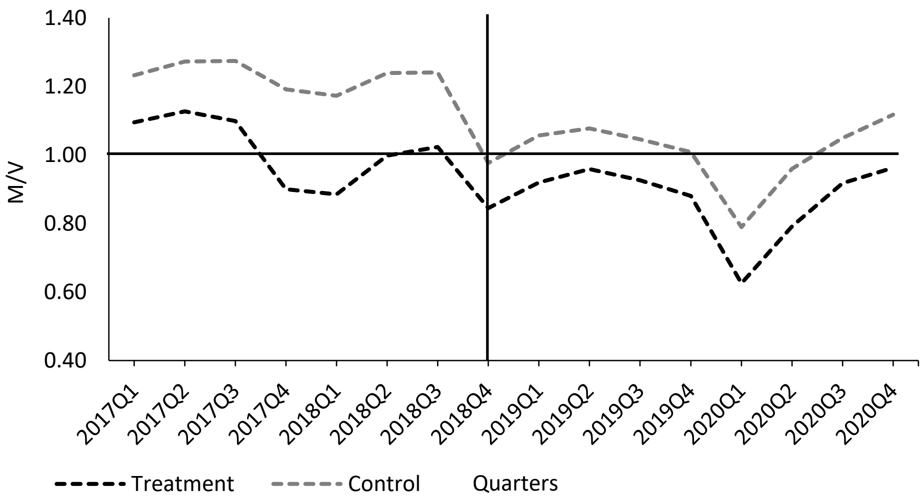
5.2.1 RIV-model

5.2.1.1 Valuation results

The RIV-model is used in order to assess the robustness of our results from the RRV-model. Figure 2 plots the average market misvaluation for treatment and control firms between 2017-2020, on a quarterly basis. As opposed to the RRV-model, the M/V-ratio is not the natural logarithm for the RIV-model. This makes 1 rather than 0 the point of reference for perfect market valuations. We observe that average market misvaluation for treatment firms appear further away from 1 after the adoption of IFRS 16. This increase in misvaluation appear, however, to contradict our previous results as average M/V changes towards higher degrees of undervaluation rather than overvaluation. Figure 2 also shows that the difference in market misvaluation between treatment and control firms have decreased in the post-IFRS 16 period, suggesting that the recognition of operating leases have resulted in a decrease of market values.

Figure 2. Parallel trend graph for the RIV-model

This figure presents the average firm misvaluation, denoted as (M/V), for each quarter between 2017-2020 for the RIV-model. M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the RIV-model. The average intrinsic valuations are winsorized at the 1st and 99th percentiles.



The difference-in-difference results further reconcile the observed trend. Table 6 presents the DD-regression results using the RIV-model. The reported DD-estimate of 0.0683 in column (1) is the interaction variable from the regression and can, as in the RRV-model, be interpreted as the average change from the pre- to post-period in market misvaluation for heavily affected firms attributable to the adoption of IFRS 16. The positive DD-estimate indicates a positive IFRS 16 effect that increases M/V. To assess if this effect has led to market values becoming more or less in line with their intrinsic values, we need to study the pre-IFRS 16 misvaluations of our sample. Column (1) of Table 6 presents average misvaluation for treatment and control firms pre- and post IFRS 16. For treatment firms, this amounted to 0.9906 in the pre period, indicating that market values were, on average, very close to their intrinsic values. The corresponding misvaluation in the post-IFRS 16 period amounted to 0.8710, with a total decrease in M/V of -0.1195. This portrays the change towards undervaluation in the post period we observed in Figure 2. Nonetheless, this total decrease in average M/V of the treatment group can be perceived as comprising of 0.0683 (the DD-estimate) and a trend effect of -0.1878, corresponding to the average decrease in M/V of our control group. Thus, average M/V would, ceteris paribus, increase from 0.9906 in the pre-period to a value above 1 in the post-period as a consequence of the isolated IFRS 16 effect of 0.0683. These results, therefore, indicate that the observed positive effect of the standard result in higher degrees of misvaluation towards overvaluation when merely considering the effect of IFRS 16.

Table 6. Difference-in-difference (DD) regression results for the RIV-model

This table presents DD regression results for the change in firm valuation for the RIV-model, including descriptive data for the pre- and post-IFRS 16 period. The dependent variable is firm misvaluation, denoted as M/V. M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the RIV-model. The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the M/V observations. Heavily affected and non-heavily affected firms are the treatment and control group, respectively. The reported DD-estimate is the interaction variable from the DD regressions and is interpreted as the average change in market-to-intrinsic value from the pre- to post-IFRS 16 period for the treatment group in relation to the control group. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to estimate the industry-time fixed effects used in the model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$

	(1)		**(2)**	**(3)**	**(4)**
	Heavily affected	Non-heavily affected			
Pre-IFRS 16	0.9906	1.1991			
Post-IFRS 16	0.8710	1.0113			
Difference pre-post	-0.1195	-0.1878			
DD-estimate	0.0683		0.0849	0.0402	0.0411
	(0.0781)		(0.0798)	(0.0728)	(0.0836)
Firm controls	No		Yes	Yes	Yes
Firm & time FE	No		No	Yes	Yes
Industry–time FE	No		No	No	Yes
N	3 733		3 677	3 677	3 677
Adjusted R^2	0.0329		0.0696	0.5450	0.5597

Although we find consistency in the direction of the IFRS 16 effect between the RIV- and RRV-model, the RIV results indicate that the impact is not as economically significant as previously observed. The average increase in M/V due to the adoption of IFRS 16 was observed at 12.81% using the RRV-model, whilst it is only 6.83% using the RIV-model.

Moreover, we find that none of the presented DD-estimates are significant at the 10% level or below. The incorporation of control variables in column (2), however, increases our DD-estimator to 0.0849. In column (3), we present the DD-estimate when incorporating both control variables and firm fixed effects. In this model, we observe that the DD-estimate is 0.0402. Lastly, in column (4) we present our most stringent model, where the regression includes control variables, firm and industry-time fixed effects. The DD-estimate from this model is 0.0411. The statistical insignificance of these results suggests that the adoption of IFRS 16 did not have a significant effect on market misvaluation, even if the direction of the observed IFRS 16 effect was in congruence with the results when using the RRV-model.

5.2.1.2 Institutional vs. retail investors

Table 7 presents our DDD-regression results using the RIV-model. The reported DDD-estimate of 0.1476 in column (1) is the triple interaction variable from our DDD-regression. This can be interpreted as the average change in market misvaluation from the pre- to post-IFRS 16 period for treatment firms classified as owned by retail investors.

Table 7. Triple-difference (DDD) regression results for the RIV-model

This table presents DDD regression results for the change in firm valuation for the RRV-model. The dependent variable is firm misvaluation, denoted as (M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the RIV-model. The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the (M/V) observations. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to estimate the industry-time fixed effects used in model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$

	(1)	(2)	(3)	(4)
DDD estimate	0.1476	0.1247	0.1182	0.0834
	(0.1856)	(0.1878)	(0.1873)	(0.1943)
Firm controls	No	Yes	Yes	Yes
Firm & time FE	No	No	Yes	Yes
Industry–time FE	No	No	No	Yes
N	3 733	3 677	3 677	3 677
Adjusted R^2	0.0383	0.0760	0.5453	0.5596

Setting the observed DDD-estimate in relation to the DD-estimate of 0.0683 in Table 5, our results suggests that the effect of IFRS 16 is more pronounced for firms owned by retail investors, indicating a larger average change in market misvaluation. Furthermore, since the average market misvaluation for treatment firms owned by retail investors amounted to 0.9873 prior to IFRS 16 (see Table 11 in appendix D), the observed effect of 0.1476 would, ceteris paribus, imply an increase from valuations fairly close to their intrinsic values, to an increase toward overvaluation as a consequence of the standard. In other words, the higher DDD-estimate suggests a higher degree of overvaluation for retail owned treatment firms than that of firms heavily affected by IFRS 16 in general, including institutionally owned treatment firms.

A higher economic significance of IFRS 16 is, thus, observed for retail owned firms compared to firms heavily affected by the standard in general. Market misvaluation is observed to increase more than twice as much if the firm in question is classified as owned by retail investors (14.76% vs. 6.83%). Nonetheless, the economic significance observed from these results is still lower than that suggested by our DDD-estimate when using the RRV-model.

Similar to our DD-regression when using the RIV-model, we observe that none of the DDD-estimates in Table 7 are significant below the 10% level. The incorporation of control variables in column (2) decreases our DDD-estimate to 0.1247. In column (3), we present the DDD-estimate when incorporating both control variables and firm fixed effects. In this model, we observe a DDD-estimator of 0.1182. Lastly, in column (4) we present our most stringent DDD-model, where the regression includes control variables, firm fixed effects and industry-time fixed effects. The estimator from this model is 0.0834. The statistical insignificance of these results suggests that the adoption of IFRS 16 did not have a significant effect on market misvaluation for retail owned firms, even if the direction of the observed effect was consistent with the results when using the RRV-model.

5.2.1.3 Analysis RIV-model

The results presented are in line with the proposed effect on market misvaluation when using the RRV-model, with the DD-regression results being positive and the DDD-estimate showing a more pronounced effect for firms owned by retail investors. However, although economically significant, the results based on the RIV-model were statistically insignificant. This lack of significance contradicts our main results as it indicates that the adoption of IFRS 16 did not affect market valuations. As such, the results are consistent with previous research suggesting no difference in value relevance between recognized and disclosed accounting information (e.g. Altamuro et al., 2014; Sengupta and Wang, 2011; Ling, Naranjo and Ryngaert, 2012; Akbar, 2013). More specifically, these ex-post results support the ex-ante findings of Giner et al. (2018) stating that that investors and market participants take operating leases into consideration similarly as recognized leases in their investment decisions.

The observed similarity regarding firms owned by retail investors, when using the two models, suggest that the value relevance of IFRS 16 increases when considering retail investors. However, given that we observe no significant DDD-estimates in the RIV-model, it indicates that the distinction between retail- and institutional investors does not reveal any nuances in the perceived value relevance of IFRS 16.

5.2.2 Incorporation of bankruptcy risk

As a robustness check to the RIV-model, we include bankruptcy risk when estimating firm intrinsic values as advised in Skogsvik (1987) and Skogsvik (2006). Table 8 presents our DD- and DDD-regression results from the bankruptcy adjusted RIV-model. We observe a DD-estimate of 0.0691 and DDD-estimates of 0.1467 in column (1), with positive coefficients also in column (2) to (4) when including our control variables and fixed effects. These results are very similar the corresponding estimates when no adjustments for bankruptcy is made. Similar to the RIV-model, all regressions show no statistical significance, despite also showing economic significance in terms of increased market misvaluation. This implies that the inclusion of bankruptcy risk does not change the results of market misvaluation observed in the RIV-model.

Table 8. Difference-in-difference (DD) and Triple-difference (DDD) regression results for the RIV-model when including bankruptcy risk

This table presents DD- and DDD regression results for the change in firm valuation for the RIV-model when including bankruptcy risk in the cost of equity. The dependent variable is firm misvaluation, denoted as (M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value. The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the (M/V) observations, using the RIV-model. The reported DD-estimate is the interaction variable from the DD regressions and is interpreted as the average change in market-to-intrinsic value from the pre- to post-IFRS 16 period for the treatment group in relation to the control group. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to estimate the industry-time fixed effects used in model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

	(1)	**(2)**	**(3)**	**(4)**
DD estimate	0.0691	0.0857	0.0409	0.0423
	(0.0783)	(0.0799)	(0.0730)	(0.0839)
Adjusted R^2	0.0332	0.0698	0.5445	0.5589
DDD estimate	0.1467	0.1238	0.1180	0.0818
	(0.1861)	(0.1883)	(0.1879)	(0.1950)
Adjusted R^2	0.0386	0.0762	0.5448	0.5589
Firm controls	No	Yes	Yes	Yes
Firm & time FE	No	No	Yes	Yes
Industry–time FE	No	No	No	Yes
N	3 733	3 677	3 677	3 677

6. Discussion

6.1 Impact of Analyst Following

The regression estimates of market mispricing show an increase in misvaluation directed towards overvaluation for both the main (RRV) and secondary (RIV) model. While the observed estimates are statistically significant in the main model, they are not statistically significant for the secondary model. This, therefore, calls into question whether the discrepancy in our findings stem from model differences or sample differences. Since we use analyst forecasts to derive the firm intrinsic values in the RIV-model, our sample is biased towards larger firms with a higher level of analyst coverage. This is portrayed in Table 2 and 3 in the data section, where the median market capitalization of our RIV-model sample firms is significantly larger than corresponding values of our RRV-model sample firms.

In order to assess these model- vs. sample differences, we run our RIV-model sample in the primary model instead. The obtained market-to-intrinsic values are subsequently used in our DD- and DDD-regressions to get new regression estimates and understand the average change in market misvaluation attributable to IFRS 16. Similar to all our previous DD-estimates, we observe a proposed positive average effect on market misvaluation as a consequence of the standard (see Table 16 in appendix E). Ambiguous results were, however, obtained in the DDD-regressions. A positive effect was observed when including firm and industry-time fixed effects, consistent with our previous results of a more pronounced effect for retail investors. However, a small negative effect is observed when excluding fixed effects in our regressions. Common for all the observed DD- and DDD-estimate is that they are less statistically significant than when using the RIV-model market mispricing. Thus, the obtained results are very close to those of our secondary model. This implies that the discrepancy in our results cannot be attributed to model differences, but rather sample differences between the RRV- and RIV-model.

These results, therefore, suggest that the obtained insignificance of our DD- and DDD-estimates, when using the RIV-model, stem from the fact that the sample comprise of larger firms that have a higher degree of analyst following. In light of this, we are able to make more nuanced inferences by setting the results from our primary model against the results from our secondary model. The significant results from our primary model in relation to the non-significant results from our secondary model suggest that value relevance of IFRS 16 is dependent on firm size and the degree of analyst following. In other words, the discrepancy of our results indicate that value relevance increases for relatively smaller firms with a lower level of analyst coverage.

Moreover, the observed difference in the statistical significance of our DDD-estimates indicate that the effect of IFRS 16 on retail investors is also likely to be affected by firm size and analyst coverage. That is, value relevance of IFRS 16, when considering retail investors, will be lower for firms that are large and have a high degree of analyst coverage. Similar to our main results, this is consistent with Yu (2013), who also find a lower degree of value relevance when recognizing previously off-balance sheet items for firms with higher levels of analyst coverage and institutional ownership. However, while our previous results supported only one part of the author's claim, these inferences support both. That is, besides the level of institutional ownership, the degree of analyst coverage needs also to be accounted for when assessing value relevance of off-balance sheet leases.

6.2 Implications for Regulators and Accounting Usefulness

IASB highlights that IFRS 16 is expected to improve the information available to investors when making investment decisions. More specifically, the regulators stressed that while sophisticated investors adjusted for off-balance sheet leases when applying IAS 17, other, less sophisticated investors did not. Consequently, IFRS 16 was expected to help the investors not able to adjust for off-balance sheet items on their own but still used financial statements as a source of information (IASB, 2016). Our results indicate that IFRS 16 has resulted in an increased market misvaluation, with firms becoming relatively more overvalued, and that this effect is more pronounced for retail investors. The results, therefore, suggest that IFRS 16 was value relevant, and particularly so for retail investors. Since retail investors can be perceived as non-sophisticated investors, we can conclude that the ex-post effects of IFRS 16 are in line with the ex-ante expectations of IASB. However, in our previous discussion of the proposed inferences from sample differences, we observed that IFRS 16 did not have any effect on large firms and with a high degree of analyst following. This suggest that IASB's ex-ante expectations of IFRS 16 only holds true for smaller firms that have either low or no analyst coverage. More importantly, this lack of value relevance was observed for retail investors as well when being the majority owners of larger firms. An explanation for these results can be that retail investors' reliance on financial statements decreases in the presence of a high degree of analyst following. Thus, the results can be perceived as consistent with Cascino et al. (2014) who concluded that retail investors generally prefer information provided by intermediaries (financial advisors/analysts or public media) as opposed to unfiltered financial statement information.

6.3 Valuation Persistence

As portrayed in Figure 1, the first quarter of IFRS 16 adoption (2019Q1) results in a large jump of market valuations for both the treatment and control firms. While the increased valuation discrepancy between treatment and control firms remains high for the rest of 2019, the difference thereafter decreases. This therefore questions the persistence of the valuation effects resulting from IFRS 16, as it seems to be mainly a short-term and temporal market reaction before the market values are adjusting. However, looking at Figure 3 and 4 below, this increase in misvaluation seems to persist for all quarters post IFRS 16 adoption when only examining firms mainly owned by retail investors. On the other hand, conclusions about valuation persistence are harder to draw for the institutionally owned firms. Although Figure 4 shows a sharp increase in the valuations of the treatment firms following IFRS 16 adoption in 2019Q1, the difference between treatment and control remains rather volatile. As such, the increased misvaluation following IFRS 16 adoption seems to be more persistent for firms owned by retail investors, while institutionally owned firms are slightly driving down the total misvaluation for all firms after 2019.

Rather than taking this perceived increase in misvaluation at face value, another plausible explanation of the valuation persistence can be offered. This study is conducted on a sample of Nordic firms, a market in which not many stocks are possible to short, as this possibility is less widespread compared to larger financial markets[12]. The Nordic market is therefore imperfect in this regard. Consequently, misvaluation in the form we are experiencing in this study, with firms becoming relatively more overvalued, is harder to exploit. Instead, investors need to sell stocks that they already own to take advantage of this. Therefore, the means that could correct for this mispricing are not available to the same extent in the Nordic market, making overvalued

[12] Of 411 firms, 129 firms in our final RRV-sample are possible to short sell, comprising 31.4% of the total sample firms. Of these firms, 95.3% are classified as mainly institutionally owned and 4.7% as firms mainly owned by retail investors. Data on Nordic firms available for short selling is provided by Pareto Securities.

stocks more likely to persist. As outlined by Barber and Odean (2007), even when possible, less sophisticated investors are not likely to short sale. Instead, short selling is mostly done by institutional investors, while retail investors instead sell stocks they already own. This could therefore provide another explanation as to why we see the valuation effects of IFRS 16 persisting relatively more for retail investors.

Figure 3. Parallel trend graph for the RRV-model – Retail investors

This figure presents the average firm misvaluation, denoted as Ln(M/V), for each quarter between 2017-2020 for firms classified as owned by retail investors in the RRV-model. M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The average intrinsic valuations are winsorized at the 1st and 99th percentiles.

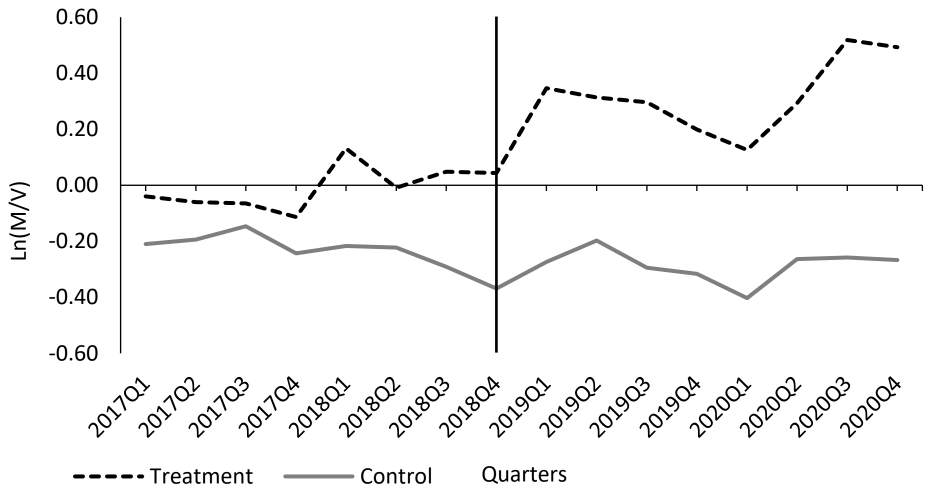
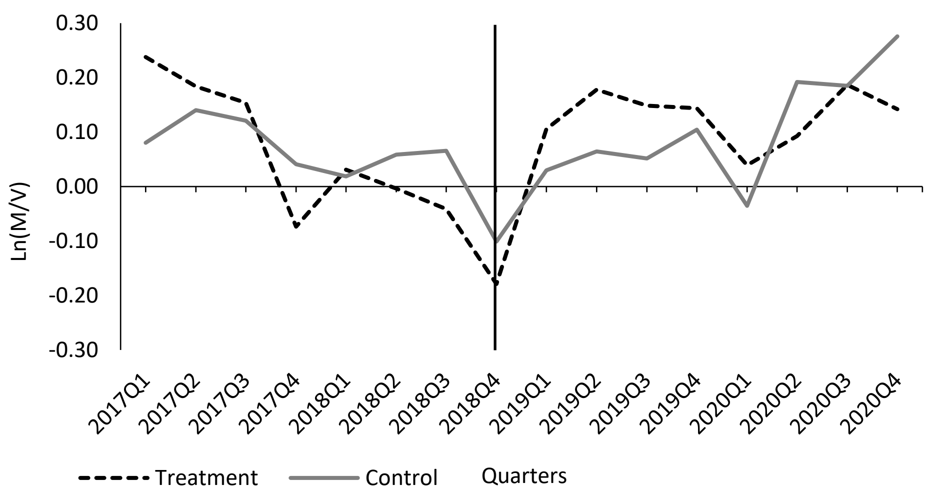


Figure 4. Parallel trend graph for the RRV-model – Institutional investors

This figure presents the average firm misvaluation, denoted as Ln(M/V), for each quarter between 2017-2020 for firms classified as owned by institutional investors in the RRV-model. M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The average intrinsic valuations are winsorized at the 1st and 99th percentiles.



7. Conclusion

This study aims to examine if the mandatory adoption of IFRS 16 has contributed to a lower discrepancy between firm intrinsic (fair) values and market values. Furthermore, we investigate if the change in market-to-intrinsic values attributable to the standard differs for firms owned by less sophisticated (retail) investors. This allows for a more nuanced assessment of the value relevance of IFRS 16, since the previous literature suggests that sophisticated investors are more likely to account for off-balance sheet leases. The RRV- and RIV-model are employed to estimate firm intrinsic values. These estimations are subsequentially applied in our difference-in-difference (DD) regressions to address the change in market misvaluation attributable to the adoption of IFRS 16. Lastly, a triple difference (DDD) regression approach is utilized to assess if the corresponding change in market misvaluation is different for firms owned by retail investors.

Our results suggest that the adoption of IFRS 16 has resulted in increased levels of firm market misvaluation. Both the DD- and DDD-estimates are observed to be positive when using the RRV- and RIV-model. Setting these estimates in relation to the pre-IFRS 16 market-to-intrinsic values, the results indicate that the standard increases market misvaluation. More specifically, firms appear to become more overvalued in relation to their estimated intrinsic values. This effect was observed to be more pronounced for firms owned by retail investors, which shows that while IFRS 16 is value relevant for investors in general, it is more so for retail investors. Furthermore, the regression estimates in both valuation models are consistent in terms of the proposed direction of market misvaluation and economically significant. While the results are statistically significant in the main model (RRV-model), we did not, however, obtain any statistical significance with regards to our results based on the secondary model (RIV-model). This lack of statistical significance indicates a contradiction in our findings, as the secondary model results suggest that IFRS 16 did not have a significant effect on market values.

When running the RIV-sample firms in our RRV-model, we conclude that the observed discrepancy in our results stems from sample differences rather than model differences. As we use relatively larger firms that have a higher level of analyst coverage in our RIV-model, this allows us to draw more nuanced conclusions about the effect of size and analyst coverage on the value relevance of IFRS 16. More specifically, our results suggest that the observed effect of IFRS 16 is dependent on firm size and the degree of analyst following. Value relevance appears, therefore, to increase for relatively smaller firms with a lower degree of analyst coverage. The observed findings are consistent with the literature identifying a difference between disclosed and recognized accounting information in terms of value relevance (e.g. Barth, Clinch and Shibano, 2003; Lim et al., 2017; Schipper, 2007; Callahan, Smith and Spencer, 2013). Moreover, our results are also in line with Yu (2013), observing that value relevance increases in cases where institutional ownership and analyst coverage are low.

By examining the effects of IFRS 16 adoption on share price formation, and the resulting implications on market misvaluation, we contribute to the literature by assessing whether previously off-balance sheet leases are value relevant. With current research on IFRS 16 mostly being ex-ante studies, this also study contributes to the literature by examining the IFRS 16 effects on an ex-post setting. As such, we contribute to an initial understanding of the market valuation effects of the new standard. Lastly, by finding a difference in value relevance for distinctive groups of investors, this study contributes to a field of research that has been less examined in the scope of value relevance of accounting information. Following these findings, regulators are provided with additional guidelines in anticipating the expected effects of new proposed accounting standards for different types of investors.

We should also note some limitations to our study. The first relates to our measure of misvaluation, which is based on estimating an unobservable intrinsic value for each firm at a given time. We acknowledge that using valuation models for this purpose gives us an imperfect measure, as it would indicate that there is a correct intrinsic value to estimate in the first place. Consequently, the valuation techniques employed should be viewed as attempts to come close to establishing the intrinsic value of a firm and may therefore inevitably include smaller errors. Related to this is the essential assumption in this study of market efficiency in the semi-strong form for our results to provide reliability. Moreover, in the RIV-model, a rather short explicit forecast period of three years is used. This therefore makes it less likely that all sample firms have reached their steady state. However, this is partly accounted for by also including business goodwill/badwill as part of the permanent measurement bias in the terminal value calculation. Lastly, having looked at a sample of firms in the Nordic market, our results may not be generalized for other markets and regions.

To provide further guidance for regulators in their future development of accounting standards, one suggestion for future research is to examine which specific parts of the financial statements that different type of investors use in their decision-making process. For instance, future research could study whether different sets of ratios (e.g. profitability, leverage or return ratios) are more or less value relevant for different investor-groups. Such a study would enable regulators to better decompose the expected implications of novel standards, since it would further contribute to the understanding of the expected effect new standards have on different investor groups' investment decisions.

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9. Appendix

Appendix A. The effect of IFRS 16 on the financial statements

Figure 5. Balance sheet effect of IFRS 16

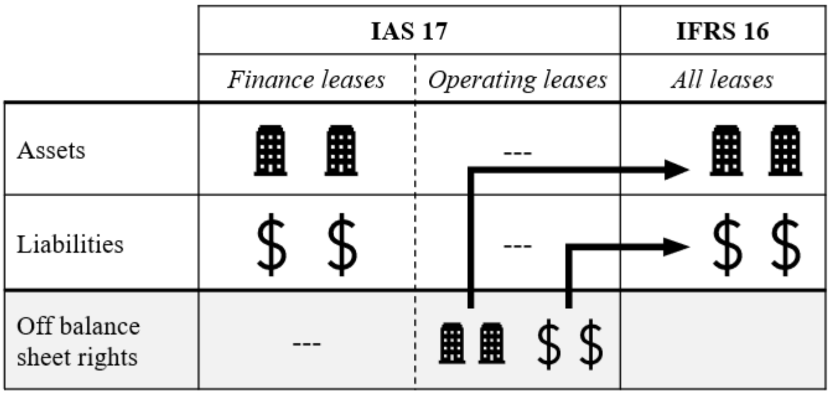
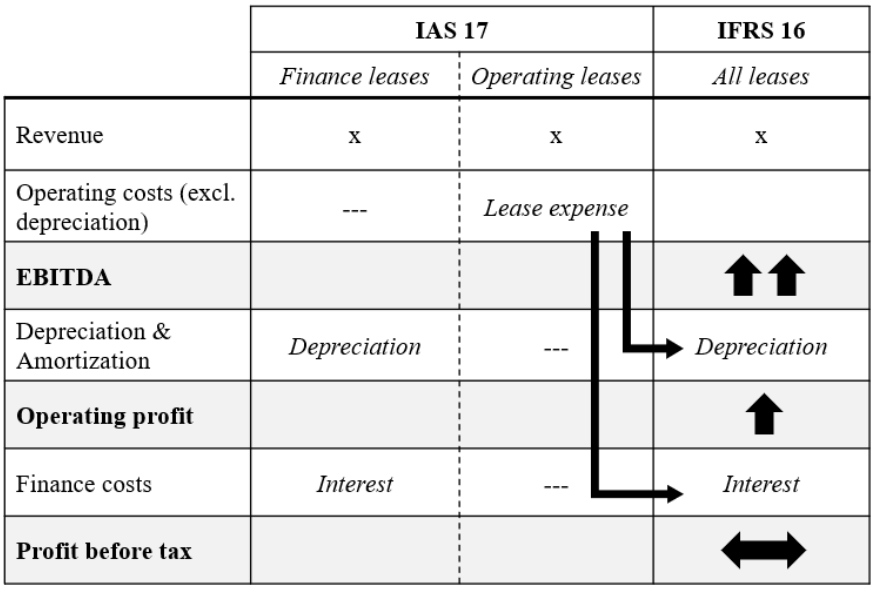


Figure 6. Income statement effect of IFRS 16



Appendix B. Adjustment formula for bankruptcy risk (Skogsvik and Skogsvik, 2013)

The following adjustment formula is used to get an unbiased estimate of bankruptcy risk, in accordance with Skogsvik and Skogsvik (2003):

$$p(fail)_{POP} = p(fail)_{EST} \times \left[\frac{\phi \times (1 - prop)}{prop \times (1 - \phi) + p(fail)_{EST} \times (\phi - prop)}\right] \qquad (13)$$

where:

ϕ = proportion of failure companies in the population of companies

$prop$ = proportion of failure companies in the estimation sample of companies
$p(fail)_{EST}$ = the probability of failure in the estimation sample
$p(fail)_{POP}$ = the probability of failure in the population

We assume the proportion of failure companies in the population (ϕ) to be 2%, and using the bankruptcy prediction model of Skogsvik (1987), $prop$ is equal to 13.46%.

Appendix C. Sample distribution

Table 9. Sample firms distributed per industry and country

This table shows the distribution of the sample firms per industry and country for the RRV- and RIV-model separately. Financial institutions and utility firms are excluded from the sample. The industry classification is based on Fama and French 12 industry definitions. Other includes construction, transportation and hotel firms.

	Number of Firms	
Industry	**RRV-model**	**RIV-model**
Consumer Nondurables	35	21
Consumer Durables	9	8
Manufacturing	83	51
Energy	5	9
Chemicals	6	5
Business Equipment	85	48
Telecom & TV	7	5
Utilities	0	0
Shops, Retail	42	24
Healthcare, Medical	48	33
Money, Finance	0	0
Other	90	49
Final number of firms	**411**	**253**

Country	**RRV-model**	**RIV-model**
Sweden	216	127
Finland	84	55
Norway	63	48
Denmark	48	23
Total number of firms	**411**	**253**

Appendix D. Descriptive data for DDD regression

The presented DDD-estimate of 0.2829 (0.1474) is the triple interaction variable from our DDD-regression using the RRV-model (RIV-model) and can be interpreted as the average change in market misvaluation from the pre- to post-IFRS 16 period for treatment firms classified as owned by retail investors. This can, with the help of descriptive pre- and post-IFRS 16 valuation data in Table 10 (Table 11), be calculated as the difference between the two DD-estimates. That is, the DD-estimate for the heavily affected firms of 0.2082 (0.0415) and the DD-estimate for the control group of -0.0747 (-0.1061). These estimates can be defined as the difference in average change of market misvaluation from the pre- to post-IFRS 16 period for firms owned by retail investors vs. firms owned by institutional investors. The DD-estimate for the heavily affected firms can, thus, be interpreted as the average change in market misvaluation for such retail owned firms adjusted for the corresponding change for such institutionally owned firms (trend effect within heavily affected firms). The DD-estimate for the control firms can be interpreted as the average change in market misvaluation for such retail owned firms adjusted for the corresponding change in such firms owned by institutional investors. The sum of these two estimates gives us the DDD-estimate of 0.2829 (0.1476), which is adjusted for the trend effect within firms heavily affected by IFRS 16 and the trend effect for retail owned firms in general (DD-estimate for control group).

Table 10. Triple-difference (DDD) regression results for the RRV-model including descriptive valuation data

This table presents DDD regression results for the change in firm valuation for the RRV-model, including descriptive data for the pre- and post-IFRS 16 period. The dependent variable is firm misvaluation, denoted as Ln(M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the Ln(M/V) observations. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to get the average industry coefficients in the RRV-model and to estimate the industry-time fixed effects used in model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$

	(1)		**(2)**	**(3)**	**(4)**
	Heavily affected	Non-heavily affected			
Panel A: Retail owned firms					
Pre-IFRS 16	0.2981	-0.2701			
Post-IFRS 16	-0.0085	-0.2484			
Difference pre-post	0.3067	-0.0217			
Panel B: Institutionally owned firms					
Pre-IFRS 16	0.1309	0.1007			
Post-IFRS 16	0.0324	0.0476			
Difference pre-post	0.0985	0.0531			
DD estimate (A-B)	0.2082	-0.0747			
DDD estimate	0.2829**		0.2742**	0.2062*	0.2038*
	(0.1344)		(0.1386)	(0.1207)	(0.1190)
Firm controls	No		Yes	Yes	Yes
Firm & time FE	No		No	Yes	Yes
Industry–time FE	No		No	No	Yes
N	5 750		5 680	5 679	5 679
Adjusted R^2	0.0073		0.0103	0.6294	0.6358

Table 11. Triple-difference (DDD) regression results for the RIV-model including descriptive valuation data

This table presents DDD regression results for the change in firm valuation for the RIV-model, including descriptive data for the pre- and post-IFRS 16 period. The dependent variable is firm misvaluation, denoted as (M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the RIV-model. The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the (M/V) observations. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to estimate the industry-time fixed effects used in model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.10$

	(1)		**(2)**	**(3)**	**(4)**
	Heavily affected	Non-heavily affected			
Panel A: Retail owned firms					
Pre-IFRS 16	0.8973	1.0710			
Post-IFRS 16	0.9873	1.3421			
Difference pre-post	-0.0901	-0.2710			
Panel B: Institutionally owned firms					
Pre-IFRS 16	0.8605	0.9939			
Post-IFRS 16	0.9921	1.1589			
Difference pre-post	-0.1316	-0.1649			
DD estimate (A-B)	0.0415	-0.1061			
DDD estimate	0.1476		0.1247	0.1182	0.0834
	(0.1856)		(0.1878)	(0.1873)	(0.1943)
Firm controls	No		Yes	Yes	Yes
Firm & time FE	No		No	Yes	Yes
Industry–time FE	No		No	No	Yes
N	3 733		3 677	3 677	3 677
Adjusted R^2	0.0383		0.0760	0.5453	0.5596

Appendix E. Difference-in-difference (DD) and Triple difference (DDD) regression results

Table 12. Difference-in-difference (DD) full regression output for the RRV-model

This table presents DD regression results for the change in firm valuation for the RRV-model. The dependent variable is firm misvaluation, denoted as Ln(M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the Ln(M/V) observations. Heavily affected and non-heavily affected firms are the treatment and control group, respectively. The reported DD-estimate is the interaction variable from the DD regressions and is interpreted as the average change in market-to-intrinsic value from the pre- to post-IFRS 16 period for the treatment group in relation to the control group. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to get the average industry coefficients in the RRV-model and to estimate the industry-time fixed effects used in the model presented in column (4). Since we have early adopters of IFRS 16 (before fiscal year 2019), the *Post* variable will not be absorbed. Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

	(1)	**(2)**	**(3)**	**(4)**
	Misvaluation	*Misvaluation*	*Misvaluation*	*Misvaluation*
Post	0.0242	0.0259	0.1138	0.1256*
	(0.0258)	(0.0256)	(0.0795)	(0.0715)
Treatment	0.0533	0.0636	-	-
	(0.0655)	(0.0668)	-	-
*Post * Treatment*	0.1146**	0.1082**	0.1020*	0.0800
	(0.0548)	(0.0551)	(0.0533)	(0.0549)
Total Assets	-	9.25E-07*	1.57E-06	1.89E-06
	-	(4.94E-07)	(1.44E-06)	(1.53E-06)
EBITDA-margin	-	0.0001	0.0001	0.0001
	-	(0.0002)	(0.0001)	(0.0001)
Intercept	-0.0342	-0.0483	-0.0854*	-0.0933**
	(0.0319)	(0.0340)	(0.0450)	(0.0424)
N	5 750	5 680	5 679	5 679
Adjusted R^2	0.0073	0.0103	0.6294	0.6358

Table 13. Triple difference (DDD) full regression output for the RRV-model

This table presents DDD regression results for the change in firm valuation for the RRV-model. The dependent variable is firm misvaluation, denoted as Ln(M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the model derived by Rhodes-Kropf, Robinson and Viswanathan (2005). The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the Ln(M/V) observations. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to get the average industry coefficients in the RRV-model and to estimate the industry-time fixed effects used in model presented in column (4). Since we have early adopters of IFRS 16 (before fiscal year 2019), the *Post* variable will not be absorbed. Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

	(1)	**(2)**	**(3)**	**(4)**
	Misvaluation	*Misvaluation*	*Misvaluation*	*Misvaluation*
Post	0.0531*	0.0525*	0.1339	0.1403*
	(0.0271)	(0.0267)	(0.0825)	(0.0751)
Treatment	-0.0152	-0.0151	-	-
	(0.0631)	(0.0643)	-	-
Ownership	-0.2961***	-0.2960***	-	-
	(0.0763)	(0.0781)	-	-
*Post * Treatment*	0.0454	0.0433	0.0560	0.0338
	(0.0609)	(0.0608)	(0.0608)	(0.0629)
*Post * Ownership*	-0.0747	-0.0637	-0.0466	-0.0353
	(0.0636)	(0.0636)	(0.0579)	(0.0579)
*Treatment * Ownership*	0.2551	0.2512	-	-
	(0.2041)	(0.2172)	-	-
Triple interaction	0.2829**	0.2742**	0.2062*	0.2038*
	(0.1344)	(0.1386)	(0.1207)	(0.1190)
Total Assets	-	2.66E-07	1.45E-06	1.85E-06
	-	(4.31E-07)	(1.41E-06)	(1.50E-06)
EBITDA-margin	-	-0.0003***	-0.0001***	-0.0002***
	-	(0.0000)	(0.0000)	(0.0000)
Intercept	0.0476	0.0461	-0.0867*	-0.0944
	(0.0323)	(0.0352)	(0.0450)	(0.0427)
N	5 711	5 647	5 646	5 646
Adjusted R^2	0.0475	0.0483	0.6326	0.6385

Table 14. Difference-in-difference (DD) full regression output for the RIV-model

This table presents DD regression results for the change in firm valuation for the RIV-model. The dependent variable is firm misvaluation, denoted as (M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the RIV-model. The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the (M/V) observations. Heavily affected and non-heavily affected firms are the treatment and control group, respectively. The reported DD-estimate is the interaction variable from the DD regressions and is interpreted as the average change in market-to-intrinsic value from the pre- to post-IFRS 16 period for the treatment group in relation to the control group. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to estimate the industry-time fixed effects used in the model presented in column (4). Since we have early adopters of IFRS 16 (before fiscal year 2019), the *Post* variable will not be absorbed. Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

	(1)	**(2)**	**(3)**	**(4)**
	Misvaluation	*Misvaluation*	*Misvaluation*	*Misvaluation*
Post	-0.1878***	-0.1897***	-0.8199**	-0.6781**
	(0.0436)	(0.0436)	(0.3466)	(0.3243)
Treatment	-0.2086***	-0.2264***	-	-
	(0.0761)	(0.0750)	-	-
*Post * Treatment*	0.0683	0.0849	0.0402	0.0411
	(0.0781)	(0.0798)	(0.0728)	(0.0836)
Total Assets	-	2.61E-08	2.21E-06	2.06E-06
	-	(1.66e-07)	(2.17E-06)	(2.42E-06)
EBITDA-margin	-	-0.0006***	-0.0001	-0.0000
	-	(0.0001)	(0.0001)	(0.0001)
Intercept	1.1991***	1.1960***	1.4249***	1.3543***
	(0.0402)	(0.0420)	(0.1879)	(0.1772)
N	3 733	3 677	3 677	3 677
Adjusted R^2	0.0329	0.0696	0.5450	0.5597

Table 15. Triple difference (DDD) full regression output for the RIV-model

This table presents DDD regression results for the change in firm valuation for the RIV-model. The dependent variable is firm misvaluation, denoted as (M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value, using the RIV-model. The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the (M/V) observations. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to estimate the industry-time fixed effects used in model presented in column (4). Since we have early adopters of IFRS 16 (before fiscal year 2019), the *Post* variable will not be absorbed. Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

	(1)	**(2)**	**(3)**	**(4)**
	Misvaluation	*Misvaluation*	*Misvaluation*	*Misvaluation*
Post	-0.1649***	-0.1699***	-0.7893**	-0.6590**
	(0.0416)	(0.0416)	(0.3423)	(0.3223)
Treatment	-0.1668*	-0.1878**	-	-
	(0.0904)	(0.0881)	-	-
Ownership	0.1832*	0.1895*	-	-
	(0.1060)	(0.1077)	-	-
*Post * Treatment*	0.0333	0.0561	0.0099	0.0188
	(0.0933)	(0.0964)	(0.0840)	(0.0933)
*Post * Ownership*	-0.1061	-0.0931	-0.0719	-0.0489
	(0.1387)	(0.1396)	(0.1474)	(0.1540)
*Treatment * Ownership*	-0.1880	-0.1750	-	-
	(0.1731)	(-0.1720)	-	-
Triple interaction	0.1476	0.1247	0.1182	0.0834
	(0.1856)	(0.1878)	(0.1873)	(0.1943)
Total Assets	-	1.03E-07	2.05E-06	1.99E-06
	-	(1.54E-07)	(2.10E-06)	(2.34E-06)
EBITDA-margin	-	-0.0006***	-0.0001	-0.0001
	-	(0.0001)	(0.0001)	(0.0001)
Intercept	1.1589***	1.1522***	1.4212***	1.3521***
	(0.0433)	(0.0457)	(0.1860)	(0.1771)
N	3 733	3 677	3 677	3 677
Adjusted R^2	0.0383	0.0760	0.5453	0.5596

Table 16. Difference-in-difference (DD) regression results for the RRV-model when using the RIV-sample firms

This table presents DD- and DDD regression results for the change in firm valuation for the RRV-model when using the sample firms from the RIV-model. The dependent variable is firm misvaluation, denoted as Ln(M/V). M is defined as the firm market value at a given time and V is the estimated intrinsic value. The intrinsic value is estimated for the available firms in each quarter between 2017-2020 to get the Ln(M/V) observations, using the RIV-model. The reported DD-estimate is the interaction variable from the DD regressions and is interpreted as the average change in market-to-intrinsic value from the pre- to post-IFRS 16 period for the treatment group in relation to the control group. The reported DDD-estimate is the triple interaction variable from the DDD regressions and is interpreted as the average change in market-to-intrinsic value attributable to the adoption of IFRS 16 for the heavily affected firms owned by retail investors. As control variables, we include total assets and EBITDA (earnings before interest, taxes, depreciation and amortization). We further include firm, time and industry–time fixed effects. Fama and French 12 industry definitions are used to get the average industry coefficients in the RRV-model and to estimate the industry-time fixed effects used in model presented in column (4). Robust standard errors clustered at the firm level are reported in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

	(1)	**(2)**	**(3)**	**(4)**
DD estimate	0.0176	0.0046	0.0141	-0.0312
	(0.0852)	(0.0589)	(0.0564)	(0.0625)
Adjusted R^2	0.0019	0.0054	0.7098	0.7186
DDD estimate	-0.0395	-0.0252	0.1576	0.1633
	(0.1689)	(0.1696)	(0.1282)	(0.1325)
Adjusted R^2	0.0366	0.0410	0.7060	0.7149ss
Firm controls	No	Yes	Yes	Yes
Firm & time FE	No	No	Yes	Yes
Industry–time FE	No	No	No	Yes
N	2 975	2 959	2 959	2 959

Appendix F. Industry coefficients in the RRV-model

Table 17. Average industry coefficients in the RRV-model

This table presents the time-series average industry coefficients used to calculate the intrinsic value for our sample firms in the RRV-model. The regression used is derived by Rhodes-Kropf, Robinson and Viswanathan (2005) and is run quarterly for each industry between 2017-2020, using Fama and French 12 industry definitions. The dependent variable is firm market value. The variable $E_t(\hat{\beta}_0)$ is the time-series average of the constant for each industry regression. The variables $E_t(\hat{\beta}_1)$, $E_t(\hat{\beta}_2)$, $E_t(\hat{\beta}_3)$ and $E_t(\hat{\beta}_4)$ are the time-series averages of the book value of equity, the absolute value of net income, the net income dummy variable and the market leverage ratio for each industry regression, respectively. Financial institutions and utility firms are excluded from the sample. Standard errors are reported in parentheses.

	Industries											
Parameter	Consumer Nondurables	Consumer Durables	Manufacturing	Energy	Chemicals	Business Equipment	Telecom & TV	Utilities	Shops, Retail	Healthcare, Medical	Money, Finance	Other
$E_t(\hat{\beta}_0)$	1.27	3.29	1.79	3.39	2.05	2.51	2.40	n.a.	1.41	2.75	n.a.	1.54
	(0.51)	(1.15)	(0.33)	(1.83)	(0.83)	(0.31)	(1.20)	n.a.	(0.50)	(0.44)	n.a.	(0.30)
$E_t(\hat{\beta}_1)$	0.85	0.50	0.71	0.48	0.79	0.73	0.76	n.a.	0.83	0.80	n.a.	0.83
	(0.10)	(0.27)	(0.07)	(0.32)	(0.16)	(0.06)	(0.27)	n.a.	(0.10)	(0.07)	n.a.	(0.06)
$E_t(\hat{\beta}_2)$	0.21	0.45	0.31	0.26	0.31	0.21	0.25	n.a.	0.26	0.13	n.a.	0.15
	(0.09)	(0.23)	(0.07)	(0.34)	(0.16)	(0.06)	(0.31)	n.a.	(0.09)	(0.05)	n.a.	(0.06)
$E_t(\hat{\beta}_3)$	-0.33	0.41	-0.07	-0.09	0.23	-0.33	-0.62	n.a.	0.10	-0.50	n.a.	-0.32
	(0.31)	(0.49)	(0.31)	(0.91)	(0.48)	(0.18)	(0.72)	n.a.	(0.26)	(0.22)	n.a.	(0.17)
$E_t(\hat{\beta}_4)$	-0.57	-1.11	-0.18	-0.34	-3.02	-1.20	-1.26	n.a.	-0.70	-1.32	n.a.	-0.14
	(0.10)	(1.40)	(0.02)	(0.27)	(1.21)	(0.35)	(1.39)	n.a.	(0.26)	(0.35)	n.a.	(0.04)
R^2	0.91	0.97	0.93	0.85	0.98	0.82	0.97	n.a.	0.93	0.83	n.a.	0.90