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The impact of IFRS 13 implementation on information asymmetry and liquidity in Nordic real estate markets

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Abstract:

The overall objective of financial reporting is to provide information that is useful for investors and other stakeholders. The implementation of the International Accounting Standard 40 (IAS 40) in 2005 by public companies in the EU securities market required firms to disclose the fair value of their investment properties. In 2013, International Financial Reporting Standard 13 (IFRS 13) was implemented with additional guidance on fair value measurement, making the fair value measurement and disclosure more standardized between companies applying the standard. Previous studies have shown that IAS 40 implementation reduced information asymmetry and improved liquidity among real estate companies in the European Union (EU) and that IFRS 13 implementation improved quality of disclosure. We investigate if IFRS leads to further reduction on information asymmetry and increase in liquidity in the Nordic real estate market. We do not observe any significant effect of post IFRS 13 on information asymmetry and liquidity. This can be an indication that IFRS 13 did not help to reduce the uncertainty around fair value valuation for investment properties.

Keywords:

fair value accounting, information asymmetry, liquidity, IFRS 13, Nordic real estate market

Tutors:

Mariya Ivanova and Henrik Andersson

Authors' note

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1. INTRODUCTION

1.1 Background

The overall objective of financial reporting is to provide information that is useful for investors and other stakeholders (Sundgren et al, 2018). The content and format of financial statements are imposed by accounting standards. They vary across different countries, which decreases economic efficiency in the globalized world we live in currently. The International Accounting Standards Board (IASB) prepares and issues accounting standards, International Financial Reporting Standards (IFRS), which aim to harmonize financial reports and make them comparable internationally. In 2002, IAS Regulation was adopted by The Council of the EU requiring listed companies to prepare their consolidated accounts in agreement with IAS from 2005 onwards. Directed towards Investment Property, The International Accounting Standard 40 (IAS 40) was implemented in 2005 for all companies listed in an EU securities market and it applied to accounting related to property held to earn rental income or for capital appreciation (or both). It required real estate firms to disclose the fair value of their investment properties in their balance sheets or disclose it in the notes (Ghosh et al, 2020). Prior to this standard, firms reported their property applying domestic accounting standards using historical cost for investment properties (in some countries fair value disclosure was optional). The objective of IAS 40 was to provide a more accurate and reliable disclosure of investment property value, enabling investors and other stakeholders to make more informed decisions.

In 2013, International Financial Reporting Standard 13 (IFRS 13) was implemented with additional guidance on fair value measurement and provided more clarity on what needs to be disclosed and in which way, making the fair value measurement and disclosure more standardized between companies applying the standard. (Ghosh et al., 2020) IFRS 13 provides a fair value hierarchy that classifies the inputs into Level 1, 2 and 3. Unadjusted market prices are classified as Level 1 inputs, adjusted prices of market prices as Level 2 inputs and unobservable inputs as Level 3 inputs. Valuation techniques for which adequate size of data is available is required by IFRS 13, while the use of observable data should be maximized, and unobservable data minimized. (European Public real Estate Association, 2013) Companies must categorize the fair value measurement within the aforementioned three levels, based on the lowest level of inputs significant to the measurement. (Busso, 2014) In the case of investment property, a significant range of methodologies is needed to reflect the range of factors contributing towards the value of property (e.g. condition, location, infrastructure).

Therefore, it is highly likely that valuers will apply significant unobservable inputs or make adjustments to observable inputs. This causes the valuation to be classified into Level 3 in the fair value hierarchy and it can be considered unreliable by investors. (European Public real Estate Association, 2013). Investment properties are often classified and valued at Level 3 of the fair value hierarchy using unobservable inputs.

Our review of previous research indicates that information asymmetry has decreased, and liquidity increased after the implementation of IAS 40 standard. The implementation of IAS 40 might be considered a major change as it made fair value disclosure mandatory providing a new source of information for the investors and stakeholders. However, IFRS 13 acts as a supplement to IAS 40, specifying how the disclosure should be made. The economic consequences of the implementation of this supplementary standard have not been studied to the same degree.

1.2 Purpose and objective

We will study how the implementation of IFRS 13 directive on fair value disclosure affected the information asymmetry on the stock market. We hypothesize that the more precise and objective disclosure requirements included in IFRS 13 will lead to a decreased information asymmetry. Therefore, this research aims to contribute to research on effects of regulation directives regulating financial reports measuring the change of information asymmetries across market participants. Our second hypothesis is related to liquidity. As better-informed market participants trade more frequently and the theory indicates a negative correlation between information asymmetry and liquidity, we hypothesize that the liquidity will increase post IFRS 13. We will analyze two time periods, right before and after the implementation of IFRS 13.

To the best of our knowledge few other studies have investigated the effect of IFRS 13 on information asymmetry for public real estate companies. A study by Sundgren et al. (2018) analyzed the difference in disclosure standards between IFRS 13 and IAS 40 and found that the disclosure quality is significantly higher with IFRS 13. They further analyzed the associations between disclosure quality and market liquidity but found limited support for a positive correlation. They could see a significant relationship between some of the measures for disclosure quality and market liquidity, however others were insignificant.

We believe that our findings can both contribute to existing research about IFRS 13 and the development of fair value measurement related to the real estate industry and investment properties. It can add knowledge about disclosure contributions in financial reports and the economic effect of those. It can also be of general interest for discussions of future accounting regulation directives in reducing information asymmetry and increasing liquidity in the market.

1.3 Scope

The scope of this research is limited to the real estate industry in Nordic. We investigate publicly traded real estate firms, as these invest and derive income from their investment properties, such as buildings and land, to earn rent and obtain capital appreciation. These firms are more affected by the fair value method adoption, as opposed to firms that use their properties for production or supply of their products. (Ghosh et al. 2020) We have limited our study to the Nordic market. The reason is both as no research yet has focused on this market narrowly and because previous research indicated higher compliance with accounting rules in most of the Nordic countries (Glaum et al., 2013). We assume studying countries with high compliance is preferable as if we want to capture the effect of an accounting rule, the market participants must trust it has been implemented in the preparation of financial reports. Only complete and unbiased financial reports can be effective in reducing information asymmetry. (Glaum et al., 2013)

1.4 Disposition

This thesis consists of five sections. Section 2 presents established theories regarding fair value accounting, international accounting standards and information asymmetry. Followingly, section 3 introduces our two hypotheses and describes the methodology of our tests. In section 4, descriptive statistics, correlation analysis, regression analysis and robustness test results are shown including robustness tests. Discussion of our results, possible explanations behind them and suggestions for further research follows in section 5. At last, section 6 concludes the thesis.

2. THEORETICAL FRAMEWORK

2.1. Role of accounting information

Accounting information plays an important role in market-based economies. It enables capital providers to evaluate the potential return of investments possibilities and once they have committed it allows them to monitor the use of their capital. Therefore, there are two main

reasons why outsiders demand accounting information from the company. First reason is the information asymmetry between capital providers and entrepreneurs with investment opportunities, which can cause capital providers to under-price firms with high profitability and over-price firms with low profitability potentially leading to market failure. This problem has been long recognized in the literature and it is also known as the 'lemons problem'. Second reason is the agency problems that result from the separation of ownership and control. (Beyer et al., 2010) The manager (agent) always has more information than shareholders, which can result in managers making decisions in their own interest. (Boshkoska, 2015)

Accounting information should have high levels of transparency. Transparency in financial reporting is connected to impartial, clear and complete display of a company's financial position (Zyla, 2012). Transparent and comprehensive financial reporting is critical for investors to gain insight into the firm's financial standing and make investment decisions (Ghosh et al., 2020) and on macroeconomic scale, it leads to more efficient capital allocation and robust capital markets. (Zyla, 2012)

Additionally, the cost of providing information via the financial statements should not exceed its benefits, which is the foundation of the cost-benefit principle (Beke, 2013).

2.2 Fair value valuation in accounting

Connected to the accounting information, valuation of assets and liabilities has an integral part for the capital provider in determining if the company is overvalued or undervalued.
In this thesis we look at investment properties reported using fair value measurement. According to the literature, fair value is described as an exit price, which would be received upon selling an asset or paying to transfer the liability between market participants at the day of measurement (Robinson, 2020).

The concept of fair value has been acknowledged for decades and it has related to the ideas of economic thinkers as Turgot, Cantillon and Smith, who viewed freely made private bargains the best for serving the public welfare (Donleavy, 2019). In the past years, a debate has taken place over the usefulness and definition of fair value (Busso, 2014).

The proponents of fair value think that it provides more relevant information to investors. This has been supported by extensive research, which suggests that fair value methods in financial

reporting provide more transparent and relevant financial information than the historical cost method. (Ghosh et al., 2020) The main factors influencing the tendency towards fair value accounting are globalization, the rising economic importance of intellectual property and the investors preference for more relevant and transparent financial statements (Zyla, 2012).

Even though this method is related to the demand of a globalized and information-based economy we live in today, it has many opponents as well (Marra, 2016). Critics argue that fair value accounting leads to noisy information or manipulated values in many cases. Fair values may be subject to uncertainty and measurement error and it is possible that weaknesses in the fair-value methodology could generate more uncertainty (Ghosh et al., 2020).

2.3 IAS 40

In 2002, the Council of EU ratified the IAS Regulation, which made IFRS statutory for publicly traded companies on European regulated markets beginning on or after 1st of January 2005. IFRS has to be used as a basis for their consolidated financial statements for fiscal years since then (Regulation (EC) No 1606/2002). The primary motivation for the EU to adopt IFRS was to provide a common basis for financial reporting that was based on high-quality global standards and thus promote efficient cross-border investment both within and beyond the EU. Regulators intended IFRS to mitigate differences in information quality across firms and facilitate comparisons by market participants. (Muller et al., 2011)

The primary effect of IFRS adoption for investment property is the application of IAS 40. It has made the disclosure of fair value mandatory, while still allowing firms between two models, cost and fair value. Following the cost model, firms have to apply requirements of IAS 16 - Property, Plant and Equipment (IAS 40:56) where the value of investment property included in the balance sheet is calculated as its cost less accumulated depreciation and impairment losses (IAS 16.30). However, these firms are still required to disclose fair value in the footnotes, unless there are some exceptional circumstances which make the fair value determination unreliable (IAS 40:79(e)). Applying the fair value model, firms have to disclose the fair value directly in the balance sheet (IAS 40:33), incorporating all changes of the fair value in the income statement (IAS 40:35).

2.4 IFRS 13

IFRS 13, a new standard about fair value, originally issued in May 2011 and starting from January 2013 it was mandatory to annual periods for public companies in European Economic Area (Directive 2013/34/EU). This standard replaces the requirements incorporated in other standards, and it acts as an accompaniment for other standards (IAS 40). It is affecting fair value definition, measurement and related disclosure (Busso, 2014). It defines fair value as "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date" (IFRS 13:9). In comparison with IAS 40, IFRS 13 has more detailed requirements on fair value measurement and disclosure. There has been a debate between academics and practitioners related to advantages and disadvantages of more detailed rules in accounting standards. While on one hand the proponents argue that it brings verifiability and comparability, the opponents argue that the financial reports become longer and more complex without the information quality increase. (Fuad er al, 2019)

To help investors understand the source of inputs included in the fair value measurement, IFRS 13 provides a fair value hierarchy that classifies the inputs into Level 1, 2 and 3. Unadjusted market prices are classified as Level 1 inputs, adjusted prices of market prices as Level 2 inputs and unobservable inputs as Level 3 inputs. (European Public real Estate Association, EPRA, 2013) When it comes to inputs included in the measurement, a general principle is to "maximize the use of relevant observable inputs and minimize the use of unobservable inputs" used in valuation techniques (IFRS 13:67).

The adoption of IFRS 13 in 2013 meant that fair value disclosure requirements became more complex. The former requirements in IAS 40 were much less detailed than the current ones in IFRS 13. In essence, IAS 40 only included a sentence requiring the disclosure of "the methods and significant assumptions applied in determining the fair value of investment property..." (IAS 40:75d), whereas IFRS 13 includes more detailed application guidance. IFRS 13 states that an entity shall disclose information that helps users of its financial statements assess the valuation techniques and inputs used during the valuation. Additionally, for valuations using significant unobservable inputs (Level 3), information regarding the effect on profit, loss or another comprehensive period shall be disclosed. (PKF International, 2017)

2.5 Information Asymmetry

Not much is known about the role and relative effectiveness of accounting standards to the information environment around a company (Beyer et al., 2010). One key concept related to the information environment in the accounting, finance, and economics literature is information asymmetry (Lof and van Bommel, 2021). Information asymmetry is a condition where one party in a relationship has more or better information than another (Bergh et al., 2018).

Information asymmetry between investors occurs when one or more investors possess private information about the firm's value while other uninformed investors only have access to public information. Information asymmetry creates an adverse selection problem in the market as informed investors trade on the basis of their private information. (Brown and Hillegeist, 2007) Information asymmetry is believed to be determined by many factors including disclosure standards and regulations, corporate governance and information intermediation by third parties (Lof and van Bommel, 2021). Information asymmetry is likely to be stronger in smaller stocks (Lof and van Bommel, 2021). The study by Brown and Hillegeist (2007) confirmed this by finding a negative association between the average level of information asymmetry and the overall quality of the annual report, disclosure quality and investor relations activities. Their results also indicated that the reason behind this is that high disclosure quality reduces the incentives for investors to search for private information, which in turn, results in fewer private information events. High quality disclosures crowd out or dampen the incentives to engage in costly private information search activities.

Within the context of capital markets, information asymmetry reduces liquidity, affects asset prices, financing and investment decisions. (Lof and van Bommel, 2021)
It is of interest to managers to regularly disclose financial information with the aim to limit information asymmetry between well-informed and uninformed investors and to increase the quantity of asset transactions (Ajina et al., 2015) One of the reasons is that information imbalance gives rise to a higher perceived risk, which may be transferred into a required premium to those assets investors perceive riskier (Siqueira et al., 2017).

2.6 Efficient market hypothesis

Efficient market hypothesis (EMH) is regarded as one of the building blocks of modern financial theory. This hypothesis was developed by Eugene Fama who established this theory in his article 'Efficient Capital Markets: A Review of Theory and Empirical Work' in 1970. It

is regarded as one of the building blocks of modern financial theory. EMH states that in an efficient market, all available information is fully incorporated in the security prices (Fama, 1970), with the result that stock prices are following a random walk. The efficient market theory indicates that stock prices always are at fair levels, given all available information, and that it makes no sense to buy and sell securities frequently, which generates large trading costs without increasing expected performance (Bodie et al., 2011). This ensures accurate signals for firms making production-investment decisions and investors. (Fama, 1970)

There are three different versions of EMH, namely the weak form, semi-strong form and strong form. They differ in what is included in the phrase 'all available information'. (Bodie et al., 2011)

The weak form assumes that stock prices reflect all historical market trading data. This form of the hypothesis holds that if such historical market trading data ever would provide signals about the future, all investors would have already learnt to exploit them. (Bodie et al., 2011)

In the semi-strong form, stock prices do not only reflect the historical prices but also all publicly available information related to the firm. Examples of such information are new security issues, annual reports, balance sheet composition and news from financial media. As this information is publicly available to all investors, it is expected to be already reflected in stock prices. (Bodie et al., 2011)

In the strong, more extreme form stock prices reflect 'all available information' includes all information available including private information only available to company insiders.
This form of the hypothesis implies that no investor can generate abnormal returns based on the monopolistic access to information (e.g. management). (Bodie et al., 2011)

In this thesis we assume a semi-strong form of EMH. We want to investigate how the information included in the financial reports related to the fair value disclosure affects the information asymmetry for the observed stocks included in our sample. We want to see if the increased amount of public information available after the implementation of IFRS 13 reduces the information gap between investors. The information asymmetry occurs when one or more investors possess private information about the firm's value while other uninformed investors only have access to public information, which is in line with this version of EMH. Only

information that is not publicly available is contributing to the information gap. We can not assume a weak form of EMH as this would imply that the publicly available information related to the company could be used to obtain abnormal returns. Neither can we assume a strong form of EMH, as this would imply that both public and private information is already reflected in stock prices and there would be no information gap between investors and no information asymmetry present.

2.7 Stock Liquidity

In markets with perfect liquidity, the market participants should be able to convert securities into cash and conversely. However, the real-world markets are not perfectly liquid.

As suggested in market microstructure literature, stock liquidity is reduced by information asymmetry. Investors have access to different degrees of information related to stocks they invest in. (Yu-Thomps et al., 2016)

Additionally, the theory indicates that increased disclosure increases the stock liquidity, as it diminishes the information asymmetry in the stock market. Consequently, this increases the confidence of investors, which leads to a higher frequency of transactions. (Ajina et al., 2015)

Research measuring liquidity in the past has identified multiple dimensions of market liquidity and therefore created numerous proxies to estimate it. The study conducted by Aitken and Comerton-Forde (2003) divided these proxies into two categories, trade-based and order-based measures. The proxy used in this study, annual turnover ratio, is classified by literature as a trade-based measure. Proxies in this category are advantageous for easily accessible data. The disadvantage is using historical data, which does not necessarily reflect the future state of trading. (Aitken and Comerton-Forde, 2003) Bid-ask spread has been also traditionally considered to be a proxy for illiquidity, as it is an important measure for transaction costs. (Yu-Thompson et al., 2016) This is further pointing to the link between information asymmetry and liquidity.

2.8 Previous studies on the effects of fair value implementation

Several previous studies have explored the effects of implementation of IAS 40 in the EU. The number of studies on the effect of implementation of IFRS 13 is very limited at the time of preparation of this thesis.

Ghosh et al. (2020), the study that is closest to ours, studies the effect of fair value method adoption included in IAS 40 on information asymmetry across market participants. It shows that the increase in financial reporting transparency, in the form of mandatory fair value disclosure, leads to decreased information asymmetry and increased liquidity. They have studied 169 firms across 15 countries in the EU in the time span of 1st of January 2002 until 31st of December 2017, comparing value pre and post 2005´s IAS implementation. The proxy for information asymmetry has been VCV, which they deem to be better than the commonly used bid-ask spread. (Ghosh et al., 2020)

Muller et al. (2011) have also studied the effect of IAS 40 implementation on the information asymmetry, including178 European real estate firms between the years 2003 and 2007. They had found similar results as Ghosh et al. (2020), which showed that the information asymmetry has decreased after IAS 40 implementation, however the effect was stronger for those firms that voluntarily disclosed fair value in the notes even prior it was mandatory. They suggest that these results might reflect the interpretation of reliability differences in firm´s disclosed numbers.

According to the study done by Sundgren et al. (2018), the quality of disclosure is significantly higher after the implementation of IFRS 13 in relation to IAS 40, as they disclose significantly more information related to the key assumptions applied in the fair value measurement. Furthermore, their results indicated a lower bid-ask spread for companies issuing higher quality disclosures. They did not find any significant positive economic consequences of IFRS13 implementation in the form of increased analyst following or market liquidity. IFRS 13 did not solve any market imperfections. (Sundgren et al., 2018)

2.9 Hypothesis

Based on the theory and previous studies, indicating a reduction in information asymmetry and increase in liquidity in European real estate firms upon implementation of IAS 40, and an increase in quality of disclosure with the implementation of IFRS 13, we want to test the following hypothesis:

Hypothesis 1 (*H1*): *The adoption of IFRS 13 reduces information asymmetry between investors.*

Hypothesis 2 (*H2*): *The adoption of IFRS 13 increases stock liquidity.*

3. METHOD

3.1 Choice of Method

To investigate the effects of IFRS13 implementation on information asymmetry and stock liquidity we will do a quantitative study study. We choose this method since other studies with similar research questions have chosen it (Ajina et al., 2015; Ghosh et al.,2020; Muller et al., 2011) By using historical data, we want to see if we can see an effect of the IFRS 13 implementation on the market.

Our aim is to compare the information asymmetry and liquidity before and after the implementation of IFRS 13. We are going to include multiple control variables, firm characteristics, that are typically associated with asymmetric information and can interfere with our result. The selected control variables are *Firm size, Return volatility, Turnover, Leverage* and *Dividend yield.*

We will to a large part replicate the study by Ghosh et al. (2020) that analyzed the effect of implementation of IAS 40 using similar multivariable regression models but study the time frame around IRS 13 implementation instead. Since the conflicting views on information asymmetry measurement, we will do different regression analysis with different dependent variables as approximations for information asymmetry. We will use the newly introduced *VCV,* that was used in study by Ghosh et al. (2020), and the more commonly used *Bid-Ask Spread*. A criticism towards the *Bid-Ask Spread* proxy is that it can be confounded with noisy information, such as currency and market liquidity variations (Ghosh et al., 2020). Furthermore, we will include additional control variables in our test, *Turnover* and *Return Volatility,* that were used in previous similar studies and showed a significant correlation with information asymmetry. We decided to omit those control variables from their study that did not show a significant correlation or were not relevant to our study (e.g. *ROA*). In their study they also tested the effect on *Net asset value (NAV)* deviation post IAS 40. We will not include those tests due to the limitations of our study.

3.2 Data Selection

The data selection includes all publicity-traded real estate firms in the nordic. The firms are selected from the Real Estate Industry classification in the Capital IQ database, consisting of Real Estate Management and Development firms and Equity Real Estate Investment Trusts (REITs). The profits from these firms come from leasing and sale of portfolio properties, project development, management of real estate, and the provision of corresponding services (Zabierek, 2014).

We want to study the effects of IFRS13 on improving the information asymmetry between investors. It is of importance that the main asset of these firms is investment property, so that the valuation of these assets has an effect on the value of the firm and by that the stock value. From our list of companies, we have only included firms with investment properties as their main asset.

The study will include a time frame of data from 2009 until 2017, prior and subsequent to the introduction of IFRS 13. It can take time for companies to adopt new accounting guidelines and we will therefore exclude data for 2013. We wanted to narrow the data interval as close to the event as possible but not too much to get too few data points, therefore four years before and after were chosen. We have only included companies that have been listed during the majority of the selected time range. Our data include 31 companies from the Nordic (15 companies in Sweden, 8 companies in Denmark, 4 companies in Finland and 4 companies in Norway), see Appendix 1. Company specific data and stock data is collected from *Capital IQ*.

3.3 Variables

All variables used in our study are listed in Appendix 2.

3.3.1 Dependent variables

Since information asymmetry is not directly observable, different proxies have been proposed in the literature (Lof and van Bommel, 2021). The first regression model includes the more commonly used measures for information asymmetry, the *Bid-ask Spread*. The second and third regression model include the new measure of information asymmetry in security markets proposed by Lof and van Bommel (2021), the *VCV*. As a measure for stock liquidity the *Annual turnover ratio* will be used.

3.3.1.1 Bid-Ask Spread

The *Bid-Ask Spread* is commonly used as a proxy for information asymmetry. The *Bid-Ask Spread* is calculated as the annual average of daily closing bid-ask spreads as a percentage of the average price.

The literature suggests that the *Bid-Ask Spread* is determined by three factors: inventory holding costs, transaction costs and asymmetric information costs (Attig et al., 2006). The information asymmetry component of the spread assesses perceived differences in information across investors (Muller et al., 2011). Criticism of the proxy has been that *Bid-Ask Spread* indicates not only asymmetric information, but also other determinants of illiquidity (Lof and van Bommel, 2021).

Numerous studies have tried to measure the components of the *Bid-Ask Spread* (Glosten and Harris, 1988; Stoll, 1989) using various models. Stoll (1989) has found that 43 percent of the *Bid-Ask Spread* can be connected to adverse information cost. Most of the research measuring components of the *Bid-Ask Spread* has been done for quote-driven markets, while we will study an order-driven market. The difference is that at the quote-driven intermediary market makers decide the bids and asks, while in order-driven markets buy and sell orders are directly matched between bettors (Fleppa et al., 2017).

3.3.1.2 Volume Coefficient of Variation (*VCV1, VCV2*)

In the study by Ghosh et al. (2020) they used a new measure of information asymmetry in security markets proposed, the *VCV*. *VCV* is computed by dividing the annual standard deviation of daily trading volumes by the annual average of daily trading volumes.

In statistics theory, the coefficient of variation is also known as relative standard deviation, which is a standardized measure of dispersion of a probability distribution (Tutorialspoint.com, 2021). The intuition behind the measure is that the distribution of trading volume depends on the correlation of individual orders. Observed trading volume is assumed to follow a normal-like distribution. When traders are uninformed and have uncorrelated liquidity needs, most orders will be netted out against each other, so that the order imbalance is relatively low, and the normal distribution curve will be less distributed. On the other hand, the correlated liquidity demand from informed traders, leads to increased trading of liquidity providers and a more

skewed and dispersed distribution of trading volume, which is then reflected in a higher *VCV* value. (Lof and van Bommel, 2021)

The study by Lof and van Bommel showed that *VCV* strictly increased in the proportion of informed trade. Empirically they could also see that *VCV*, computed from daily observations of trading volume of US stocks, correlated with firm-level measures of asymmetric information, like low breadth of institutional ownership, low analyst coverage, small size, lower trading turnover, higher bid-ask spreads, more volatile and less liquid. The study could also show that *VCV* steeply decreases around earnings announcements and other information disclosures. (Lof and van Bommel, 2021)

Volume is measured in different ways; daily trading volume in market currency, daily turnover or volume market shares, which is daily volume in a single stock as a fraction of total market volume on the same day. Other factors besides individual firm-level information, such as sentiment or liquidity shocks, can drive variation in trading activity. The coefficients of variation of all these volume measures were shown to be nearly identical, which implies that *VCV* is not sensitive to aggregate market-level variation in trading volume. (Lof and van Bommel, 2021)

We will in our study, like the study by Ghosh et al (2020), use trading volume (*VCV1*) and turnover (*VCV2*) as volume measures (Lof and van Bommel, 2021).

3.3.1.3 Liquidity (Annual turnover ratio)

Research measuring liquidity in the past has identified that it has multiple dimensions and therefore created numerous proxies to estimate it. The study conducted in 2003 by Aitken and Comerton-Forde divided these proxies into two categories, trade-based and order-based measures.

In our study we will use the *Annual turnover ratio* as a measure, which is classified by literature as a trade-based measure. Average *Annual turnover ratio* was calculated as the number of firm shares traded annually divided by the number of shares outstanding at the end of year.

Proxies in this category are advantageous for usually easily accessible data. The disadvantage is using historical data, which does not necessarily reflect the future state of trading. (Aitken et

al., 2003) Bid-ask spread has also traditionally been considered to be a proxy for illiquidity, as it is an important measure for transaction costs. (Yu-Thompson et al., 2016)

3.3.2 Independent variables and Control variables

3.3.2.1 IFRS 13 adoption (*Post*)

Post variable (*IFRS)* is the main variable that we want to investigate to study the effect of introducing IFRS 13 accounting guidelines. The variable is a dummy variable, with the value 0 for observations from years 2009-2012 and 1 for observations from years 2014-2017. We have chosen to construct the variable in this way based on the design of previous studies that have a similar variable analyzing the effect on IAS 40 and IFRS 13 (Ghosh et al., 2020; Sundgren et al., 2018; Muller et al., 2011). If our hypothesis holds, we expect a negative correlation.

3.3.2.2 Firm Size

Firm size is a commonly used control variable analyzing information asymmetry. Larger firms are believed to be associated with lower information asymmetry (Ghosh et al, 2020). This was investigated in the study by Chari et al. (1988), that examined the differences between stock returns of small and large firms around quarterly earnings announcement dates. The study showed that small firms show large positive abnormal returns and a sizable increase in the variability of returns around these dates. The reasoning for this is that earning announcements for large firms contain less new information than small firms. Another hypothesis is that larger firms are followed more closely in the market, resulting in more information being available for them. (Chari et al., 1988). This is consistent with the fact that the number of analysts following has also shown to impact the information environment and reduce information asymmetry, as in the study by Muller et al. (2011). It is reasonable to believe that a larger firm has more analysts following them which decreases the information asymmetry.

In past years real estate companies have performed strongly on the stock market and their market capitalization value increased. Therefore, we want to include this control variable to take in consideration the effect of size changes. We anticipate a negative correlation between firm size and the information asymmetry variables.

We calculated *Firm Size* as the natural logarithm of the firm's market capitalization value. The logarithmic value is used because it follows a straighter correlation with the dependent variables compared to the original data, which correlation follows a logarithmic line.

3.3.2.3 Dividend yield

Dividend yield is a less common control variable in information asymmetry research. We still choose to include this due to its presence in the study by Ghosh et al. (2020) where dividend yield was used as a control variable and shown to negatively correlate to information asymmetry. This is consistent with the study by Li and Zhao (2008) that found firms with higher information asymmetry less likely to pay, initiate, or increase dividends. Firms paying dividends are usually larger, with lower growth potential and higher cash flows. (Li and Zhao, 2008). We anticipate a negative correlation between dividend yield and the information asymmetry variables. *Dividend yield* is calculated by dividing the annual dividend paid by the firm with the firm's stock price.

3.3.2.4 Return volatility

Return volatility is a commonly used control variable analyzing information asymmetry and liquidity. Several studies including the research from Ascioglu et al. (2012), Cheriyan and Lazar (2019), and Stoll (1978) has shown a positive correlation between the information asymmetry, using bid-ask spread as proxy, and return volatility, as uncertainty is higher for volatile stocks (Stoll, 1978). This can be explained by volatility having an impact on risk of stock management and cost of inventory holding. (Ascioglu et al., 2012) We have therefore chosen to include this variable. We will calculate *Return volatility* as the annual standard deviation of daily returns. We expect a positive relationship between information asymmetry and *Return volatility.*

3.3.2.5 Turnover

Another common control variable used in studying information asymmetry is *Turnover*. *Turnover* itself is a measure of stock liquidity. We calculated *Turnover* as the annual average of daily trading volume as a percentage of daily market capitalization. The higher the value the more liquid is the stock. Since asymmetric information reduces liquidity Lof and van Bommel (2021) turnover has a negative correlation with information asymmetry. This result can be shown both in the study Lof and van Bommel (2021) and Muller et al. (2011) This can be explained by the liquidity effect, which occurs when the stock is traded frequently, causing a

decrease in the bid-ask spread and information asymmetry (Bodie et al., 2011). We anticipate the same results, a negative correlation between *Turnover* and information asymmetry.

3.3.2.6 Leverage

Leverage is also a common control variable in information asymmetry research even though many studies lack motivation to why it's used. We choose to include this variable as firms with a high proportion of public debt have been reported to have higher incentives to improve the quality of their financial reports (Jung et al., 2021). Based on this, we believe that firms with higher leverage need to deliver financial reports with higher quality and increased information to current and future potential lenders. This is supported by the study of Frankel et al. (2020), where they studied the effect of banks monitoring on the quality of financial reporting, and significant results indicated that borrower´s reporting quality has been shown to increase after loan initiation. We measure *Leverage* as the long-term debt divided by total assets (calculated with the end balance numbers) we expect negative correlation with information asymmetry.

3.3.3 Interaction variable

3.3.3.1 Large firm size *(Large)*

We will include an additional variable *Large*, that is a dummy variable, equal to 1 for firms with market cap larger than the average firm market capitalization in our sample. This variable will be used in combination with *Post*, as an interaction variable *Large_Post* in our analysis. We want to investigate if we can see there is a specific effect for large companies on information asymmetry or liquidity introducing IFRS 13. As described above there are several motivations and previous studies showed that larger firms are believed to be associated with lower information asymmetry (Ghosh et al., 2020). This can suggest that the effect, if any, would be stronger for larger firms. As in the study by Ghosh et al. (2020), we would like to analyze this dimension as well.

3.4 Regression model

The dataset in our study is referred to as panel data. Panel data is a dataset in which the behavior of entities is observed across time (Torres-Reyna, 2007). The entities in our study are companies and the time intervals are years. Panel data allows us to control for variables we cannot observe or measure like differences in business practices across companies or variables that change over time, like national policies, but not across entities, that is it accounts for

individual heterogeneity (Torres-Reyna, 2007). Our panel data consisted of 31 groups (firms) and a total of 245 observations.

Fixed and Random Effects Model are two different statistical techniques to analyze panel data. The models are designed to study the relationship between independent and dependent variables within an entity. (Torres-Reyna, 2007) Both these methods will be used and thereafter a Hausman test will be conducted to choose the optimal model among these two.

3.4.1 Fixed Effect Model

Each entity has its own individual characteristics that may or may not influence the independent variables. The fixed-effects model assumes that something within the individual may impact or bias the independent or dependent variable and controls for this by assuming correlation between entity's error term and independent variables. The model removes the effect of those time-invariant characteristics to assess the net effect of the independent variables on the dependent variable. The model assumes that those time-invariant characteristics are unique to the entity and therefore the entity's error term and the constant (which captures individual characteristics) do not correlate with other entities. (Torres-Reyna, 2007)

The fixed effect model:

$$Y_{it} = a_i + \beta * X_{it} + u_{it}$$

where:

Y_{it} =dependent variable, i = entity (i=1....n) and t = time

X_{it} =independent variable

β =coefficient for the independent variable

α_i= unknown intercept for each entity, time-invariant characteristics (fixed effect)

u_{it}= error term

3.4.2 Random Effect Model

In the random effects model the variation across entities is assumed to be random and therefore there is no correlation between the entity's error term and dependent and independent variables. (Torres-Reyna, 2007)

The random effect model:

$$Y_{it} = \beta * X_{it} + u_i + \varepsilon_{it}$$

where:

Y_{it} =dependent variable, where i = entity and t = time

X_{it} =independent variable

β =coefficient for the independent variable

u_{it}= error term, between entities (random effects)

ε_{it}= error term, within entity

4. RESULTS AND ANALYSIS

4.1 Descriptives statistics

The descriptive statistics for the variables used in the analysis, studying the period 2009-2012 and 2014-2017 is presented in Table 1. A total of 245 observations is included, almost the same number of observations before and after the introduction of IFRS13 is available. Compared to the European study of introduction of IAS 40 by Gosh et al. (2020) studying the period 2002–2017, the average *VCV1* and *VCV2* is higher, average annual turnover ratio is lower, average dividend yield is lower and the average Leverage is higher. Compared to the European study of introduction IAS 40 by Muller et al. (2011) studying the period 2002–2006 the mean bid-ask spread is lower. This indicates that Nordic sample used in this study and during the period that is analyzed has a higher information asymmetry and lower liquidity than the European average, but a lower level of information asymmetry than the time period during IAS 40 introduction.

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Bid-Ask Spread	245	2.329	3.044	.106	17.891
VCV1	245	2.599	2.339	.385	15.167
VCV2	245	2.596	2.346	.378	14.829
Annual turnover ratio	245	.304	.327	.001	2.424
Post	245	.506	.501	0	1
Dividend yield	245	2.664	5.634	0	76
Return volatility	245	.023	.017	.007	.131
Turnover	245	.001	.001	0	.01
Firm size	245	5.443	2.116	-.379	8.268
Leverage	245	.431	.192	0	.838
Large	245	.461	.5	0	1
Large Post	245	.229	.421	0	1

Table 1. Descriptive statistics over variables used in the study.

4.2 Pairwise Variables Correlation

We checked the pairwise correlation between the variables to investigate correlation between our independent variables, please see table in Appendix 3. We can identify a negative correlation between *Post* and all proxies for information asymmetry *Bid-Ask Spread, VCV1, VCV2* (significant only for *Bid-Ask Spread*). This can be a first indication for support for our first hypotheses. The correlation between *Annual turnover ratio* and *Post* is on the other hand negative, indicating that our second hypothesis is wrong.

VCV1 and *VCV2* have almost perfect positive correlation confirming these variables to be identical. *Bid-Ask Spread* and *VCV1 and VCV2* have a significant positive correlation supporting that these can both be proxies for information asymmetry. *Annual turnover ratio* has a significant negative correlation with *Bid-Ask Spread, VCV1 and VCV2* indicating that for our sample companies with higher information asymmetry have lower liquidity, which is in line with the theory.

We can see that the independent variables *Firm size* and *Return Volatility* have a large negative correlation with each other, indicating that the larger the firms the less volatile is the stock

price. This correlation between independent variables (multicollinearity) can cause problems for our analysis since we assume no correlation between the independent variables.

4.3 Hypothesis testing

4.3.1 IFRS 13 and decrease of Information Asymmetry (*H1*)

We performed fixed and random regression model analysis to investigate the effect on information asymmetry. The following regression equations were tested, and the results are presented in Appendix 4.

$$Bid - Ask\ Spread_{i,t} = \beta_0 + \beta_1 * Post_{i,t} + \beta_2 * Dividend\ yield_{i,t} + \beta_3 * Return\ volatility_{i,t} + \beta_4 * Turnover_{i,t} + \beta_5 * Firm\ size_{i,t} + \beta_6 * Leverage_{i,t} + \varepsilon_{i,t}$$

$$VCV1_{i,t} = \beta_0 + \beta_1 * Post_{i,t} + \beta_2 * Dividend\ yield_{i,t} + \beta_3 * Return\ volatility_{i,t} + \beta_4 * Turnover_{i,t} + \beta_5 * Firm\ size_{i,t} + \beta_6 * Leverage_{i,t} + \varepsilon_{i,t}$$

$$VCV2_{i,t} = \beta_0 + \beta_1 * Post_{i,t} + \beta_2 * Dividend\ yield_{i,t} + \beta_3 * Return\ volatility_{i,t} + \beta_4 * Turnover_{i,t} + \beta_5 * Firm\ size_{i,t} + \beta_6 * Leverage_{i,t} + \varepsilon_{i,t}$$

4.3.1.1 Hausman test

To choose between these two models we conducted a Hausman test, which test if the unique errors (u_i) are correlated with the regressors, where the null hypothesis is that they are not. (Torres-Reyna, 2007)

The results of our tests are presented in Tables 2,3 and 4. The results show a p-value that is not significant, and the null hypothesis cannot be rejected for the regression model with B*id-ask spread* as a dependent variable. For the regression model with *VCV1* and *VCV2* the p-value is significant, and the null hypothesis can be rejected. Therefore, the preferred model for our data set is a random effects model for Bid-Ask spread and fixed effects model for *VCV1* and *VCV2*.

Hausman (1978) specification test

	Coef.
Chi-square test value	1.977
P-value	.922

Table 2. Results of Hausman test for Bid-Ask Spread.

Hausman (1978) specification test

	Coef.
Chi-square test value	24.637
P-value	0

Table 3. Results of Hausman test for VCV1.

Hausman (1978) specification test

	Coef.
Chi-square test value	28.871
P-value	0

Table 4. Results of Hausman test for VCV2.

4.3.1.2 Results

The regression results for H1 are presented in *Tables 5, 6 and 7*. The analysis shows that we can´t say with a significant level that *Post* has an influence on any of the information asymmetry proxies.

The control variables *Return volatility*, *Turnover* and *Firm size* show expected results with *Bid-Ask Spread*. *Dividend yield* showed an opposite significant result. No significant influence from leverage. The control variables *Firm size* and *Leverage* show expected results with *VCV1 and VCV2* as proxies for information asymmetry. *Return volatility* shows a significant opposite result and *Turnover* an opposite and significant result for *VCV2*. No significant influence from *Dividend yield.*

Regression results

Bid-Ask Spread	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	-.225	.201	-1.11	.265	-.619	.17	
Dividend yield	.04	.019	2.11	.035	.003	.077	**
Return volatility	95.219	9.048	10.52	0	77.486	112.952	***
Turnover	-531.35	85.926	-6.18	0	-699.762	-362.937	***
Firm size	-.548	.091	-6.03	0	-.727	-.37	***
Leverage	-.064	.69	-0.09	.926	-1.417	1.288	
Constant	3.774	.698	5.41	0	2.406	5.143	***

Mean dependent var	2.329	SD dependent var	3.044
Overall r-squared	0.712	Number of obs	245.000
Chi-square	388.407	Prob > chi2	0.000
R-squared within	0.513	R-squared between	0.864

**** p<.01, ** p<.05, * p<.1*

Table 5. Result of regression analysis with random effects model

Regression results

VCV1	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	.048	.294	0.16	.87	-.532	.629	
Dividend yield	.017	.026	0.65	.519	-.035	.069	
Return volatility	-38.171	14.588	-2.62	.01	-66.931	-9.411	***
Turnover	180.239	126	1.43	.154	-68.162	428.64	
Firm size	-.791	.266	-2.97	.003	-1.316	-.266	***
Leverage	2.882	1.174	2.46	.015	.568	5.196	**
Constant	6.262	1.626	3.85	0	3.057	9.468	***

Mean dependent var	2.599	SD dependent var	2.339
R-squared	0.090	Number of obs	245.000
F-test	3.416	Prob > F	0.000
Akaike crit. (AIC)	988.934	Bayesian crit. (BIC)	1013.443

**** p<.01, ** p<.05, * p<.1*

Table 6. Result of regression analysis with fixed effects model

Regression results

VCV2	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	.003	.288	0.01	.992	-.565	.571	
Dividend yield	.032	.026	1.25	.214	-.019	.083	
Return volatility	-44.976	14.275	-3.15	.002	-73.119	-16.833	***
Turnover	223.774	123.296	1.81	.071	-19.296	466.844	*
Firm size	-.826	.261	-3.17	.002	-1.34	-.312	***
Leverage	2.61	1.148	2.27	.024	.346	4.874	**
Constant	6.657	1.591	4.18	0	3.52	9.793	***

Mean dependent var	2.596	SD dependent var	2.346
R-squared	0.108	Number of obs	245.000
F-test	4.196	Prob > F	0.000
Akaike crit. (AIC)	978.303	Bayesian crit. (BIC)	1002.812

*** p<.01, ** p<.05, * p<.1

Table 7. Result of regression analysis with fixed effects model

4.3.1.3 Size Impact on information asymmetry

We add the interaction variable between *Post* and *Large* to investigate if there is an effect for large companies on information asymmetry introducing IFRS 13, see Table 8. No significant effect can be seen for our interaction variable *Large_Post*, but introducing this additional variable affects the model and results in a significant result for the variable *Post*.

$$Bid - Ask\ Spread_{i,t} = \beta_0 + \beta_1 * Post_{i,t} + \beta_2 * Dividend\ yield_{i,t} + \beta_3 * Return\ volatility_{i,t} + \beta_4 * Turnover_{i,t} + \beta_5 * Firm\ size_{i,t} + \beta_6 * Leverage_{i,t} + \beta_7 * Large\_Post_{i,t} + \varepsilon_{i,t}$$

Regression results

Bid-Ask Spread	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	-.439	.249	-1.76	.078	-.926	.049	*
Dividend yield	.042	.019	2.20	.027	.005	.079	**
Return volatility	93.599	9.073	10.32	0	75.816	111.382	***
Turnover	-511.403	86.759	-5.89	0	-681.448	-341.359	***
Firm size	-.605	.098	-6.19	0	-.796	-.413	***
Leverage	-.038	.685	-0.06	.956	-1.379	1.304	
Large_Post	.535	.366	1.46	.144	-.182	1.252	
Constant	4.064	.719	5.65	0	2.654	5.474	***

Mean dependent var	2.329	SD dependent var	3.044
Overall r-squared	0.717	Number of obs	245.000
Chi-square	397.295	Prob > chi2	0.000
R-squared within	0.515	R-squared between	0.870

**** p<.01, ** p<.05, * p<.1*

Table 8. Result of regression analysis introducing interaction variables.

The same was analyzed with *VCV1* and *VCV2* but no significant effect was seen for the interaction variable *Large_Post* or any effect on the other variables in the regression equation.

4.3.2 IFRS 13 and increased liquidity (*H2*)

To test the hypothesis that introducing IFRS 13 is positively affected which increases stock liquidity, we perform a random regression analysis with *Annual turnover ratio* as the dependent variable. *Turnover* is removed as a control variable from this model because of the natural high correlation with *Annual turnover ratio.* The following regression equation was tested, and the results are presented in table Appendix 5.

$$Annual\ turnover\ ratio_{i,t} = \beta_0 + \beta_1 * Post_{i,t} + \beta_2 * Dividend\ yield_{i,t} + \beta_3 * Return\ volatility_{i,t} + \beta_4 * Firm\ size_{i,t} + \beta_5 * Leverage_{i,t} + \varepsilon_{i,t}$$

4.3.2.1 Hausman test

To choose between these two models we conducted a Hausman test that is presented in Table 9 (Torres-Reyna, 2007). The result of our tests shows a p-value that is not significant, and the

null hypothesis can not be rejected for the regression model. Therefore, the preferred model for our data set is a random effects model.

Hausman (1978) specification test

	Coef.
Chi-square test value	1.045
P-value	.959

Table 9. Results of the Hausman test show the preferred model is a random effects model.

4.3.2.2 Results

The analysis does not show a significant correlation between *Post* and *Annual turnover ratio (*see Table 10*).* *Firm size* has a positive significant correlation, the larger firm the larger stock liquidity. *Return volatility* has a significant positive correlation, which is opposite the theory as increased liquidity should result in a less volatile market.

Regression results

Annual turnover ratio	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	-.053	.032	-1.64	.1	-.116	.01	
Dividend yield	-.002	.003	-0.74	.46	-.008	.004	
Return volatility	7.994	1.492	5.36	0	5.07	10.918	***
Firm size	.061	.02	3.11	.002	.023	.099	***
Leverage	.169	.125	1.35	.175	-.075	.413	
Constant	-.255	.142	-1.80	.071	-.533	.022	*

Mean dependent var	0.304	SD dependent var	0.327
Overall r-squared	0.109	Number of obs	245.000
Chi-square	33.014	Prob > chi2	0.000
R-squared within	0.126	R-squared between	0.101

**** p<.01, ** p<.05, * p<.1*

Table 10. Result of regression analysis with random effects model analyzing Annual turnover ratio.

4.3.2.3 Size Impact on stock liquidity

We add the interaction variable *Post_Large* to the model to investigate if we can see there is an effect for large companies on stock liquidity introducing IFRS 13. A significant effect for large companies on reduced liquidity after introduction of IFRS 13 can be seen (Table 11).

$$Annual\ turnover\ ratio_{i,t} = \beta_0 + \beta_1 * Post_{i,t} + \beta_2 * Dividend\ yield_{i,t} + \beta_3 * Return\ volatility_{i,t} + \beta_4 * Firm\ size_{i,t} + \beta_5 * Leverage_{i,t} + \beta_6 * Large\_Post_{i,t} + \varepsilon_{i,t}$$

Regression results

Annual turnover ratio	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	.022	.039	0.56	.579	-.055	.099	
Dividend yield	-.003	.003	-0.93	.353	-.009	.003	
Return volatility	8.331	1.469	5.67	0	5.451	11.211	***
Firm size	.079	.02	3.87	0	.039	.119	***
Leverage	.143	.123	1.16	.245	-.098	.384	
Large_Post	-.186	.058	-3.23	.001	-.299	-.073	***
Constant	-.344	.144	-2.40	.016	-.626	-.063	**

Mean dependent var	0.304	SD dependent var	0.327
Overall r-squared	0.124	Number of obs	245.000
Chi-square	44.830	Prob > chi2	0.000
R-squared within	0.168	R-squared between	0.093

**** p<.01, ** p<.05, * p<.1*

Table 11. Result of regression analysis with random effects model analyzing Annual turnover ratio.

4.4 Robustness tests

4.4.1 Heteroskedasticity

Regression errors in time series models often exhibit heteroskedasticity (Song and Taamoutib, 2021) Heteroskedasticity is the opposite to homoskedasticity, that the variance of the regression errors is constant, which is one of our basic assumption in the regression model (Hayes and Cai, 2007). As a robustness test we redo the regression analysis but control for

heteroskedasticity, the results are shown in Table 12 and 13. We lose the significance value for the coefficient for the *Post* variable in the regression model with dependent variable *Bid-Ask Spread*. We can still have a negative significance effect for *Large_Post* on *Annual turnover ratio*.

Regression results

Bid-Ask Spread	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	-.439	.36	-1.22	.223	-1.144	.267	
Dividend yield	.042	.051	0.81	.417	-.059	.142	
Return volatility	93.599	19.589	4.78	0	55.206	131.992	***
Turnover	-511.403	155.389	-3.29	.001	-815.96	-206.846	***
Firm size	-.605	.175	-3.46	.001	-.947	-.262	***
Leverage	-.038	.82	-0.05	.963	-1.644	1.569	
Large_Post	.535	.448	1.19	.232	-.343	1.413	
Constant	4.064	1.521	2.67	.008	1.083	7.045	***

Mean dependent var	2.329	SD dependent var	3.044
Overall r-squared	0.717	Number of obs	245.000
Chi-square	261.578	Prob > chi2	0.000
R-squared within	0.515	R-squared between	0.870

**** p<.01, ** p<.05, * p<.1*

Table 12. Result of regression analysis for Bid-Ask Spread with control for heteroskedasticity.

Regression results

Annual turnover ratio	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	.022	.052	0.42	.674	-.08	.123	
Dividend yield	-.003	.002	-1.58	.113	-.006	.001	
Return volatility	8.331	3.392	2.46	.014	1.682	14.98	**
Firm size	.079	.032	2.46	.014	.016	.142	**
Leverage	.143	.185	0.78	.438	-.219	.505	
Large_Post	-.186	.074	-2.50	.012	-.331	-.04	**
Constant	-.344	.262	-1.31	.189	-.858	.169	

Mean dependent var	0.304	SD dependent var	0.327
Overall r-squared	0.124	Number of obs	245.000
Chi-square	18.053	Prob > chi2	0.006
R-squared within	0.168	R-squared between	0.093

**** p<.01, ** p<.05, * p<.1*

Table 13. Result of regression analysis for Annual turnover ratio with control for heteroskedasticity.

4.4.2 Multicollinearity

Multicollinearity occurs when independent variables are more correlated with each other than they are correlated with the dependent variable.(Pinder, 2016)

To investigate if there was any impact on our model caused by multicollinearity between the control variables *Firm size* and *Turnover*, we tested the regression models without one of these variables at time. We did not get any change in the results of our analysis.

We have also conducted a variance inflation factor (VIF) analysis as a second test for multicollinearity. Literature indicates a rule of thumb of VIF above 10 indicating serious or excessive collinearity (Salmerón et al., 2018). We have conducted multiple collinearity diagnostics for all of our regression models. The test results indicate a low multicollinearity between our variables.

Collinearity Diagnostics

Variable	VIF	SQRT VIF	Tolerance	R-Squared
Dividend yield	1.01	1.00	0.9938	0.0062
Return volatility	1.56	1.56	0.6415	0.3585
Firm size	1.99	1.41	0.5027	0.4973
Leverage	1.03	1.02	0.9685	0.0315
Large_Post	1.36	1.17	0.7357	0.2643
Mean VIF	1.39			

Table 14. Result of collinearity diagnostics for the regression included in 4.3.1.3.

4.5 Summary of results

We can't see any significant effect and decrease of information asymmetry or any significant change on the stock liquidity after introduction of IFRS 13. We can see that large firms after the IFRS13 introduction have a significantly lower stock liquidity measured in annual turnover ratio.

5. DISCUSSION

5.1 Analysis of regression results

In our thesis we cannot see any significant and clear relationship between the *Post* variable in the regression models and the information asymmetry approximations. Neither can we see any significant and clear relationship between the Post variable and stock liquidity.

Our results show that the bid-ask spread and *VCV1* and *VCV2* have a significant positive correlation supporting that the newly introduced measure *VCV1* and *VCV2* may be a proxy for information asymmetry.

We can see that our control variables return volatility, turnover and firm size are showing expected results in correlation with bid-ask spread, in line with the theory presented. Increased firm size, lower return volatility and increased turnover is related with lower information asymmetry. For the proxies *VCV1* and *VCV2* of information asymmetry, the control variable firm size is showing expected results, with a negative correlation. Return volatility and *VCV1* and *VCV2* are instead showing opposite results to the theory, a negative significant correlation. Turnover had a significant positive correlation with VCV2, which is also the opposite sign than we the theory says. In the study by Lof and van Bommel (2021), the study originally introduced *VCV1* and *VCV2* as a proximation for information asymmetry, they found a positive pairwise correlation between return volatility and *VCV1* and *VCV2* and negative return volatility and *VCV1* and *VCV2,* which they used as support for their proposal of this matrix. We get the same sign in our pairwise correlation but this changes when we put it in a multi regression analysis. This can be a reason to question the reliability of this measure as a proximation for information asymmetry and indication that further supporting studies need to be done.

Control variables that do not show any significant impact on information asymmetry are dividend yield and leverage. There is a less strong support in the literature that these variables would affect information asymmetry and liquidity.

We can see a significant effect for *Large_Post* and *Annual turnover ratio,* that larger companies after the IFRS 13 implementation have a significantly lower annual turnover ratio. This result seems unlikely due to the fact of the strong growth in the stock market that the real estate

companies, at least in Sweden if you study the OMX Stockholm Real Estate index (SX8600GI), have had during the years after 2013 (TradingView, 2021).

Annual turnover ratio, our proxy for liquidity is showing positive significant correlation with both firm size and return volatility. This means that the larger the firm size and the higher stock volatility the more liquid is the stock. The theory says the opposite: that volatility increases information asymmetry and illiquidity. We would expect a negative relationship between return volatility and liquidity, using annual turnover ratio as proxy. Our results indicate an opposite relationship between volatility and liquidity, that seems unlikely and can be a false positive result or something wrong with our regression model.

5.2 Effect of IFRS 13

The studies by Ghosh et al. (2020) and Muller et al. (2011) have indicated that introduction of IAS 40 and the obligation for firms to account for investment properties' fair value reduce information asymmetry among investors and increased stock liquidity in capital markets for real estate companies. The logic behind this is that fair value accounting increases transparency and reduces different private investors' views of the investment property value and thereby reduces the information gap between informed and less informed investors and reduces information asymmetry in the market.

We cannot see the same effect and further improvement of market efficiency of the implementation of IFRS13. These results are not in line with the study by Sundgren et al. (2018) that found any significant correlation between disclosure quality and bid ask spread, but not for other measures of market liquidity. They did an analysis with 289 observations including 57 publicly traded real estate companies within the EU, from 2009 to 2014. We analyzed a lower number of companies but a longer time frame. The study by Sundgren et al. (2018) indicated that IFRS 13 implementation did increase the quality of the financial reports. This has not been analyzed nor confirmed in our study.

If we follow the reasoning supported by the study by Brown and Hillegeist (2007), increased quality of fair value valuation after the implementation of IFRS 13 would lead to reduced private information search and decreased information asymmetry. As we could not see a decrease in information asymmetry, it might be questioned if the quality of reporting has improved under IFRS 13. Opponents of more detailed disclosure requirements, believe that the

increasing length of notes to the financial statements does not contribute to the quality of information as they are too complex and create an information overload (Sundgren et al., 2018). IFRS 13 introduced new disclosure requirements, which includes more detailed information in interim financial reports and more extensive disclosures in valuations where unobservable inputs are used.

Another reason why we could not see a decrease in information asymmetry can be that IFRS 13 is only a supplementing rule, with the purpose to make the valuation more standardized and objective. IFRS 13 contains a framework for measuring fair value, expanding the requirement on disclosure and making it more objective. Investment properties are often classified at Level 3 of the fair value hierarchy using unobservable inputs. IFRS 13 states that an entity shall disclose information that helps users of its financial statements assess the valuation techniques and inputs used to develop those measurements and for recurring fair value measurements using significant unobservable inputs (Level 3) as in most of our case, the effect of the measurements on profit or loss or other comprehensive income for the period. Our results indicate that the accounting guidelines do not significantly solve the uncertainties around the fair value of investment properties. It seems to remain and so does the information asymmetry between investors.

It can therefore be questionable if IFRS 13 provides any benefits for the real estate market and for the improvement of the fair value disclosure for investment properties. The cost-benefit principle in accounting states that the cost of providing information via financial reporting should not exceed its benefits, which in this case of IFRS 13 can be a concern to raise, as its implementation was accompanied with additional costs, but the benefits remain to be proven.

5.3 Reliability, validity and comparability

We consider our study to have a high reliability based on the detailed description of our research method and the data collection process. Therefore, it should be easily replicable by others. Our model was to a large extent built on the previous study done by Ghosh et al. (2020).

The purpose of our thesis was to measure the change in the information asymmetry. However, there is no optimal way to measure it and different studies have drawn various conclusions about the extent to which information asymmetry is captured by the most commonly used proxies. To increase the reliability of our study we have used various information asymmetry

proxies, namely Bid-Ask Spread, *VCV1* and *VCV2* which were described in detail in the 3.3 Method section. We have chosen the bid-ask spread as it has been used in numerous previous research measuring information asymmetry and the content to which this proxy measures it has also been a focus of previous studies. The *VCV1* and *VCV2* proxies have been introduced recently, however they have already been included in a consequent study by Ghosh et al. (2020) that considered them a more precise proxy than bid-ask spread.

5.4 Suggestions for future research

The combination of the extent of our study and the limited previous research in this area leave plenty of space for future research. During the process of writing this thesis we have identified the need of gaining insights in how much weight investors give to the more detailed fair value disclosures. Particularly, how reliable they deem disclosures using modeling with Level 3 unobservable inputs which are applied in the majority of property valuations. We believe a greater focus on sell-side analysts valuation processes with regards to new disclosures practices related to IFRS 13 implementation could produce interesting findings. Additionally, to develop a full picture of IFRS 13 aftermath, additional studies will be needed that examine the disclosed quality after the implementation of this standard. Future studies on this topic are therefore recommended.

6. CONCLUSION

We have in our study used multiple regression analysis to analyze the effect of IFRS 13 implementation on information asymmetry and liquidity on Nordic real estate firms. Real estate industry has been a focus since the majority of the firm's assets are investment properties which by the previous introduction of IAS 40 had to disclose the fair value measurement. In our study we analyzed data from 31 firms during a four-year period before and after introduction in 2013.

Our study aimed to contribute to the growing research about IFRS 13, the concept of fair value measurement and its overall economic effect. IFRS 13 was implemented with additional guidance on fair value measurement and provided more clarity on what needs to be disclosed and in which way, with the purpose of bringing verifiability and comparability between companies. Opponents argue that the financial reports become longer and more complex without the information quality increase.

Information asymmetry was analyzed using the bid-ask spread and VCV1 and VCV 2 as proxy. As a proxy for liquidity annual turnover was used. We could not observe any significant change on information asymmetry or liquidity after the IFRS 13 implementation. Our results indicate that IFRS 13 did not help to reduce the uncertainty around fair value valuation for investment properties between investors and further closing the gap between more and less informed investors. To conclude, no improved economic consequences as reduced information asymmetry or increased liquidity on the stock market were identified.

7. REFERENCES

Articles

Aitken, M., and Comerton-Forde, C. (2003): "How should liquidity be measured?", *Pacific Basin Finance Journal, 11*(1), pp.45-59.

Ajina, A., Sougne, D., and Lakhal, F. (2015): "Corporate disclosures, information asymmetry and stock-market liquidity in France", *The Journal of Applied Business Research, 31*(4), pp.1223-1238.

Ascioglu, A., Hegde, S., Krishnan, G., and Mcdermott, J. (2012): "Earnings management and market liquidity", *Review of Quantitative Finance and Accounting, 38*, pp.257-274.

Attig, N., Fong, W., Gadhoum, Y., & Lang, L. H. P. (2006): "Effects of large shareholding on information asymmetry and stock liquidity", *Journal of Banking & Finance, 30*(10), pp.2875-2892.

Beyer Anne, Cohen, Daniel, A., Lys Thomas, Z., and Wahlter Beverly, R. (2010): "The financial reporting environment: Review of the recent literature", *Journal of Accounting and Economics, 50*(2-3), pp.296-343.

Boshkoska, Meri (2025): "The Agency Problem: Measures for Its Overcoming", *International Journal of Business and Management,* 10(1), pp.204-209.

Brown, S., & Hillegeist, S. A. (2007): "How disclosure quality affects the level of information asymmetry", *Review of Accounting Studies, 12*(2-3), pp.443-477.

Busso, D. (2014): "Does IFRS 13 improve the disclosure of the fair value measurement?: An empirical analysis of the real estate sector in Europe", *GSTF Journal on Business Review (GBR), 3*(4), pp.1-7.

Chari, V. V., Jagannathan Ravi, and Ofer Aharon, R. (1988). Seasonalities in security returns: The case of earnings announcements. *Journal of Financial Economics, 21*(1), pp.101-121.

Cheriyan, N. K., & Lazar, D. (2019): “Relationship between liquidity, volatility and trading activity: An intraday analysis of indian stock market”, *International Journal of Economics and Financial Issues, 19*(1), pp.17-22.

Donleavy, G. (2019): “An inquiry into the origins of fair value”, *Accounting History, 24(2),* pp.163–166.

Eugene F. Fama. (1970): “Efficient capital markets: A review of theory and empirical work”, *The Journal of Finance, 25*(2), pp.383-417.

Fama, E. F. (1970): “Efficient capital markets: A review of theory and empirical work”, *Journal of Finance (Wiley-Blackwell), 25*(2), pp.383-417.

Ghosh, C., Liang, M., and Petrova, M. (2020): “The effect of fair value method adoption”, *The Journal of Real Estate Finance and Economics, 60*(1/2), pp.205-237.

Glaum, M., Schmidt, P., Street, D. L., and Vogel, S. (2013): “Compliance with IFRS 3- and IAS 36-required disclosures across 17 european countries: Company- and country-level determinants”, *Accounting and Business Research, 43*(3), pp.163-204.

Glosten & Harris, (1988): “Estimating the components of the bid/ask spread. Journal of Financial Economics” *Journal of Financial Economics*, 21(1), 123-142.

Hayes, A. F., and Cai, L. (2007): “Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation”, *Behavior Research Methods, 39*(4), pp.709-722.

Jung, H., Mun, T., Roh, T., & Lim, M. (2021): “Does debt financing affect the sustainability of transparent accounting information?” *Sustainability* 13(7): 4052.

Laux, C., & Leuz, C. (2009): “The crisis of fair-value accounting: Making sense of the recent debate”, *Accounting, Organizations and Society, 34*(6), pp.826-834.

Li, K., and Zhao, X. (2008): “Asymmetric information and dividend policy”, *Financial Management (Wiley-Blackwell), 37*(4), pp.673-694.

Lof, M., & van Bommel, J. (2021): “*Asymmetric information and the distribution of trading volume”*.

Marra, A. (2016): “The pros and cons of fair value accounting in a globalized economy”, *Journal of Accounting, Auditing & Finance, 31*(4), pp.582-591.

Muller, K. A., Riedl, E. J., and Sellhorn, T. (2011): “Mandatory fair value accounting and information asymmetry”, *Management Science, 57*(6), pp.1138-1153.

Ramanna, K. (2013): “Why “Fair value” is the rule”, *Harvard Business Review.* Retrieved from https://hbr.org/2013/03/why-fair-value-is-the-rule

Fleppa, R., Nüeschb, S. and Franckc, E. (2017): “The liquidity advantage of the quote-driven market: Evidence from the betting industry”, *The Quarterly Review of Economics and Finance, 64,* pp.306-317.

Salmerón, R., García, C. B., and García, J. (2018): “Variance inflation factor and condition number in multiple linear regression”, *Journal of Statistical Computation and Simulation, 88*(12), pp.2365-2384.

Siqueira, L. S., Amaral, H. F., & Correia, L. F. (2017): “The effect of asymmetric information risk on returns of stocks traded on the BM&FBOVESPA”, *Revista Contabilidade & Finanças, 28*(75), pp.425-444.

Song, X., & Taamoutib, A. (2020): “A nonparametric measure of heteroskedasticity”, *Journal of Statistical Planning and Inference, 212,* pp.45-68.

Stoll, H. R. (1978): “The pricing of security dealer services: An empirical study of nasdaq stocks”, *The Journal of Finance, 33*(4), pp1153-1172.

Stoll, H. R. (1989): "Inferring the components of the bid-ask spread: Theory and empirical tests on JSTOR", *The Journal of Finance, 44*(1), pp.115-134.

Sundgren, S., Mäki, J., and Somoza-López, A. (2018): "Analyst coverage, market liquidity and disclosure quality: A study of fair-value disclosures by European real estate companies under IAS 40 and IFRS 13", *The International Journal of Accounting, 53*(1), pp.54-75.

Yu-Thompson, Y., Lu-Andrews, R., and Fu, L. (2016): "Liquidity and corporate governance: Evidence from family firms", *Review of Accounting & Finance, 15*(2), pp.144-173.

Books

Bodie, Z., Marcus, A. J., & Kane, A. (2011): "*Investments and portfolio management"* (9th ed., Global ed.). New York: McGraw-Hill Irwin.

Beke, J. (2013): "*International accounting harmonization adopting universal information methods for a global financial system"* (first ed.). Palgrave.

Pinder, J. P. (2016)**:** "*Introduction to business analytics using simulation"* (1st Edition) San Diego, United States: Elsevier Science & Technology.

Robinson, T. R. (2020). "*International financial statement analysis"*. Newark, UNITED STATES: John Wiley & Sons, Incorporated.

Zabierek, P. (2014): "*Real estate operating companies".* Oxford University Press.

Zyla, M. L. (2012): "*Fair value measurement: Practical guidance and implementation: Practical guidance and implementation"* (2nd ed.). Somerset: John Wiley & Sons, Incorporated.

Internet Sources

European Public real Estate Association, EPRA. (2013): "*EPRA position paper on IFRS 13, Fair Value Measurement & Illustrative Disclosures". EPRA.* Retrieved from

https://www.epra.com/media/EPRA_Position_Paper_on_IFRS_13_February2013_1361873708702.pdf [2021-04-12]

PKF International. (2017): "*Accounting summary - IFRS 13 fair value measurement".* PKF International. Retrieved from https://www.pkf.com/media/8d891e81c5e049a/ifrs-13-fair-value-measurement-summary.pdf [2021-05-12]

Torres-Reyna, Oscar. (2007): *"Panel data analysis fixed and random effects using stata".* Retrieved from https://dss.princeton.edu/training/Panel101.pdf [2021-04-02]

TradingView. (2021): *"OMX Stockholm Real Estate GI"*. Retrieved from https://se.tradingview.com/symbols/NASDAQ-SX8600GI/ [2021-05-03]

Tutorialspoint.com. (2021): "*Statistics - relative standard deviation"*. Retrieved from https://www.tutorialspoint.com/statistics/relative_standard_deviation.htm [2021-04-06]

Appendix 1. Real Estate Companies

Nordic Real Estate Companies (Source: Capital IQ)		
Sweden		
Fastighets AB Balder	Develops, owns, and manages residential and commercial properties, and hotels in Sweden, Denmark, Finland, Norway, the United Kingdom, and Germany.	Listed: 2005-today Large Cap Stockholm
AB Sagax	Operates as a property company in Sweden, Finland, France, Germany, the Netherlands, Spain, and Denmark. The company invests in commercial properties primarily in the warehouse and light industry segment.	Listed: 2007-today Large Cap Stockholm
Castellum AB	One of Sweden's largest listed real estate companies and active in 17 Swedish growth regions as well as in Copenhagen and Helsinki.	Listed: 1997-today Large Cap Stockholm
Fabege AB	A property company, focuses primarily on the development and management of commercial premises in Sweden. Its property portfolio comprises office, retail, industrial/warehouse, residential, hotel, and garage properties.	Listed: 1992-today Large Cap Stockholm
Wihlborgs Fastigheter AB	A property company, owns, develops, operates, and manages commercial properties in the Öresund region, Sweden. Its property portfolio includes office, retail, industrial/warehousing, education/care, and hotel properties.	Listed: 2005-today Large Cap Stockholm
Wallenstam AB	Develops, builds, sells, and manages residential and commercial properties for people and businesses in Gothenburg, Stockholm, and Helsingborg, Sweden.	Listed: 1984-today Large Cap Stockholm
Hufvudstaden AB	Engages in the ownership, development, and management of commercial properties in Stockholm and Gothenburg, Sweden. It owns and manages offices, retail stores, and restaurant properties, as well as multi-storey car parks.	Listed: 1998-2000 Large Cap Stockholm
Ljungberg AB	Owns, develops, and manages real estate properties primarily in Sweden. Its property portfolio comprises office and retail spaces; house restaurants; residential units; and cultural, service, and educational facilities.	Listed: 1994-today Large Cap Stockholm
Kungsleden AB	Long-term property owner, focused on commercial properties in Sweden's growth regions.	Listed: 1999-today Large Cap Stockholm
Klövern AB	Operates as a real estate company in Sweden. The company primarily focuses on renting offices, as well as offer premises for companies and organizations in healthcare, education, and retail; and warehousing and logistics.	Listed: 2003-today Large Cap Stockholm
FastPartner AB	Develops, owns, and manages commercial properties in Sweden.	Listed: 1994-today Large Cap Stockholm
Diös Fastigheter AB	Develops, owns, and rents commercial and residential properties in Sweden.	Listed: 2006-today Mid Cap Stockholm

HEBA Fastigheter AB	Owns and rents real estate properties in Sweden. Its properties include residential apartments located in Stockholm, Huddinge, Lidingö, and Täby of Sweden.	Listed: 1994-today Mid Cap Stockholm
Corem Property Group AB	A real estate company, owns, manages, and develops industrial, warehouse, logistics, and retail properties in central and southern Sweden and Denmark.	Listed: 2007-today Mid Cap Stockholm
Stendörren Fastigheter AB	Operates as a real estate company. The company owns, develops, and manages warehouses, logistics, industrial premises, and office spaces primarily located in Greater Stockholm and Mälardalen.	Listed: 2011-today Mid Cap Stockholm
Denmark		
Jeudan A/S	Provides property services. The company invests in and operates office, residential, and retail properties. The company also provides a range of property-related consulting and building services.	Listed: 1993-today Large Cap Copenhagen
Prime Office A/S	Operates as a real estate company. It primarily invests in centrally located office buildings in Germany. Prime Office A/S is based in Aarhus, Denmark.	Listed: 2008-today Small Cap Copenhagen
EgnsINVEST Ejendomme Tyskland A/S	Owns, operates, and develops properties. It also leases its properties.	Listed: 2008-today First North Köpenhamn
German High Street Properties A/S	Invests in and rents high-street properties in Germany and in the Nordic countries.	Listed: 2007-today Small Cap Copenhagen
Copenhagen Capital A/S	A real estate investment firm. It primarily focuses on investing in the Greater Copenhagen area.	Listed: 2007-today Small Cap Copenhagen
Park Street Nordicom A/S	Operates as a real estate investment and asset management company in Europe. The company owns and manages a portfolio of commercial properties located primarily in Greater Copenhagen, Jutland, Fyn, and other Zealand and Bornholm.	Listed: 1994-today Small Cap Copenhagen
Cemat A/S	Engages in the operation, development, and sales of the Polish property company CeMat ’70 S.A. in Warsaw. Its portfolio includes land for office, warehouse and production facilities, and investment development sites.	Listed: 1993-today Small Cap Copenhagen
Victoria Properties A/S	Victoria Properties A/S focuses on acquisitions, administration, and operation of commercial and residential properties in Denmark.	Listed: 1993-today Small Cap Copenhagen
Finland		
Citycon Oyj	A real estate investment company, operates as an owner, manager, and developer of mixed-use centers for urban living in the Nordic region. It develops retail, office space, and housing properties.	Listed: 2007-today Large Cap Helsinki
Investors House Oyj	Operates as a real estate investment company in Finland and Estonia. It owns, operates, leases, and manages university town and provincial center properties in 11 locations.	Listed: 2007-today Small Cap Helsinki

Sponda Plc	A property investment company specialising in commercial properties in Finland's largest cities. It's business concept is to own, lease and develop retail and office properties and shopping centres into environments that promote the business success of its clients.	Listed: 1998-2017
Technopolis Plc	Develops and operates business premises. The company was founded in 1982 and is based in Oulu, Finland.	Listed: 2009-2019
Norway		
Olav Thon Eiendomsselskap ASA	Engages in the property rental business in Norway and Sweden. The company is also involved in the property development and management business.	Listed: 1983-2017 OB Match
Eiendomsspar ASA	Operates as a real estate company in Norway. It owns and operates offices, shops, hotels, and housing and warehouse properties.	Listed: 2012-today OB Match
Norwegian Property ASA	A real estate investment company, acquires, develops, manages, and sells commercial real estate properties in Norway.	Listed: 2006-today OB Match
Storm Real Estate ASA	An investment company, acquires and manages real estate properties in Russia.	Listed: 2010-today OB Match

Appendix 2. Variablers

Variables (i = firm, t =year)				
Variabel	***Definition***	***Unit***	***Measurement***	***Source***
Dependent variables				
Bid-Ask Spread$_{i,t}$	Bid-Ask Spread	%	The Bid-Ask Spread of firm *i*'s stock in year t is defined as the annual mean of the daily percentage bid–ask spread. Bid-Ask Spread for firm i, day τ is calculated as the daily ask price less the bid price, divided by the average of bid and ask prices. $Bid-Ask\ spread_{i,\tau} = \frac{Ask\ price_{i,\tau} - Bid\ price_{i,\tau}}{(Ask\ price_{i,\tau} + Bid\ price_{i,\tau})/2}$	(Muller et al, 2011)
VCV1$_{i,t}$	The coefficient of variation of trading volume	#	The ratio of annual standard deviation of the daily trading volume to the annual mean of daily trading volume. Trading volume in reported currency (V_{RC}) is calculated for firm i, day τ: $V_{RC,i,\tau} = shares\ traded_{i,\tau} \times closing\ price_{i,\tau}$	(Lof and van Bommel, 2021)
VCV2$_{i,t}$	The coefficient of variation of daily	#	The ratio of annual standard deviation of daily turnover ratio divided by the annual mean of the daily turnover ratio. Turnover ratio (V_{TO}) is calculated for firm i, day τ : $V_{RC,i,\tau} = \frac{shares\ traded_{i,\tau}}{shares\ outstanding_{i,\tau}}$	(Lof and van Bommel, 2021)

	turnover			
Annual turnover ratio $_{i,t}$	Annual Turnover ratio	#	Average annual turnover ratio, calculated as the number of firm *i*'s shares traded annually divided by the number of shares outstanding at the end of year *t*.	(Ghosh et al, 2020)
Independent variable				
$Post_{i,t}$	Post IFRS 13 adoption period	#	Dummy variable, 1 for observations after 1FRS 13 introduction, years 2014-2017, and 0 for observations before 1FRS 13, years 2009-2012	(Ghosh et al, 2020)
Control variables				
$Firm\ size_{i,t}$	Firm size	#	The natural logarithm of the firm *i´*s market capitalization value in Million Euro on the closest trading date to the end of the period in year *t.*	(Sundgren et. al, 2018)
$Dividend\ yield_{i,t}$	Dividend yield	%	Dividend yield in percent for firm *i* on the closest trading date to the end of the period in year *t*.	(Ghosh et al, 2020)
$Return\ volatility_{i,t}$	Return Volatility	#	Return Volatility for firm *i* in year *t* is the annual standard deviation of daily returns. Daily return for day τ is calculated: $\frac{Close\ price_{\tau}}{Close\ Price_{\tau-1}} - 1$	(Lof and van Bommel, 2021).
$Turnover_{i,t}$	Turnover	#	Turnover for firm *i* in year *t* is the annual average of daily trading volume as a percentage of daily market capitalization.	(Lof and van Bommel, 2021).
$Leverage_{i,t}$	Leverage	#	Leverage for firm *i* in year *t* is the Long-term debt divided by total assets, calculated with the end balance numbers.	(Ghosh et al, 2020)
$Large_{i,t}$	Large firm size	#	Dummy variable, equal to 1 for firms with market cap larger than the average firm market capitalization in year t observed in the sample, and 0 otherwise.	(Ghosh et al, 2020)
$Large\_Post_{i,t}$	Large firm size - Post IFRS 13 adoption period	#	Interaction variable calculated as $Post_{i,t}$*$Large_i$	(Ghosh et al, 2020)

Appendix 3. Pairwise Correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Bid-Ask Spread	1.000										
(2) VCV1	0.244*	1.000									
(3) VCV2	0.246*	0.981*	1.000								
(4) Annual turnover ratioo	-0.258*	-0.239*	-0.254*	1.000							
(5) Post	-0.120*	-0.090	-0.099	-0.089	1.000						
(6) Dividend yield	0.045	0.010	0.034	-0.010	0.045	1.000					
(7) Return volatility	0.716*	0.028	0.006	0.140*	-0.102	-0.003	1.000				
(8) Turnover	-0.226*	-0.236*	-0.238*	0.940*	-0.066	-0.013	0.150*	1.000			
(9) Firmsize	-0.715*	-0.288*	-0.290*	0.148*	0.126*	0.044	-0.596*	0.106*	1.000		
(10) Leverage	-0.107*	0.081	0.083	0.045	-0.135*	0.053	-0.125*	0.007	0.163*	1.000	
(11) Large	-0.424*	-0.296*	-0.291*	0.266*	-0.003	0.040	-0.307*	0.242*	0.748*	0.064	1.000

*$p<.1$

Pairwise correlation over dependent and independent variables used in the study.

Appendix 4. Regression Results (H1)

A) *Result of regression analysis with fixed effects model for Bid-Ask Spread, VCV1 and VCV2*

Regression results

Bid-Ask Spread	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
Post	-.212	.231	-0.92	.359	-.666	.243
Dividend yield	.046	.021	2.21	.028	.005	.086
Return volatility	90.467	11.427	7.92	0	67.94	112.994
Turnover	-483.025	98.692	-4.89	0	-677.589	-288.461
Firm size	-.618	.209	-2.96	.003	-1.029	-.207
Leverage	-.492	.919	-0.53	.593	-2.304	1.321
Constant	4.372	1.274	3.43	.001	1.861	6.883

Mean dependent var	2.329	SD dependent var	3.044
R-squared	0.514	Number of obs	245.000
F-test	36.696	Prob > F	0.000
Akaike crit. (AIC)	869.236	Bayesian crit. (BIC)	893.745

*** p<.01, ** p<.05, * p<.1

Regression results

VCV1	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
Post	.048	.294	0.16	.87	-.532	.629
Dividend yield	.017	.026	0.65	.519	-.035	.069
Return volatility	-38.171	14.588	-2.62	.01	-66.931	-9.411
Turnover	180.239	126	1.43	.154	-68.162	428.64
Firm size	-.791	.266	-2.97	.003	-1.316	-.266
Leverage	2.882	1.174	2.46	.015	.568	5.196
Constant	6.262	1.626	3.85	0	3.057	9.468

Mean dependent var	2.599	SD dependent var	2.339
R-squared	0.090	Number of obs	245.000
F-test	3.416	Prob > F	0.000
Akaike crit. (AIC)	988.934	Bayesian crit. (BIC)	1013.443

*** p<.01, ** p<.05, * p<.1

Regression results

VCV2	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
Post	.003	.288	0.01	.992	-.565	.571
Dividend yield	.032	.026	1.25	.214	-.019	.083
Return volatility	-44.976	14.275	-3.15	.002	-73.119	-16.833
Turnover	223.774	123.296	1.81	.071	-19.296	466.844
Firm size	-.826	.261	-3.17	.002	-1.34	-.312
Leverage	2.61	1.148	2.27	.024	.346	4.874
Constant	6.657	1.591	4.18	0	3.52	9.793

Mean dependent var	2.596	SD dependent var	2.346
R-squared	0.108	Number of obs	245.000
F-test	4.196	Prob > F	0.000
Akaike crit. (AIC)	978.303	Bayesian crit. (BIC)	1002.812

**** p<.01, ** p<.05, * p<.1*

B) *Result of regression analysis with random effects model for Bid-Ask Spread, VCV1 and VCV2*

Regression results

Bid-Ask Spread	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
Post	-.225	.201	-1.11	.265	-.619	.17
Dividend yield	.04	.019	2.11	.035	.003	.077
Return volatility	95.219	9.048	10.52	0	77.486	112.952
Turnover	-531.35	85.926	-6.18	0	-699.762	-362.937
Firm size	-.548	.091	-6.03	0	-.727	-.37
Leverage	-.064	.69	-0.09	.926	-1.417	1.288
Constant	3.774	.698	5.41	0	2.406	5.143

Mean dependent var	2.329	SD dependent var	3.044
Overall r-squared	0.712	Number of obs	245.000
Chi-square	388.407	Prob > chi2	0.000
R-squared within	0.513	R-squared between	0.864

**** p<.01, ** p<.05, * p<.1*

Regression results

VCV1	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
Post	-.183	.265	-0.69	.49	-.703	.337
Dividend yield	.014	.025	0.58	.56	-.034	.063
Return volatility	-27.178	11.646	-2.33	.02	-50.003	-4.353
Turnover	-80.191	111.014	-0.72	.47	-297.775	137.393
Firm size	-.485	.112	-4.35	0	-.703	-.266
Leverage	1.866	.875	2.13	.033	.152	3.581
Constant	5.223	.871	6.00	0	3.516	6.929

Mean dependent var	2.599	SD dependent var	2.339
Overall r-squared	0.144	Number of obs	245.000
Chi-square	27.834	Prob > chi2	0.000
R-squared within	0.064	R-squared between	0.281

**** p<.01, ** p<.05, * p<.1*

Regression results

VCV2	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
Post	-.22	.261	-0.84	.399	-.732	.292
Dividendyield	.028	.024	1.13	.258	-.02	.075
Returnvolatility	-33.528	11.562	-2.90	.004	-56.19	-10.867
Turnover	-41.422	110.086	-0.38	.707	-257.187	174.344
Firmsize	-.522	.113	-4.64	0	-.743	-.301
Leverage	1.811	.873	2.07	.038	.099	3.523
Constant	5.528	.874	6.33	0	3.815	7.241

Mean dependent var	2.596	SD dependent var	2.346
Overall r-squared	0.153	Number of obs	245.000
Chi-square	31.421	Prob > chi2	0.000
R-squared within	0.082	R-squared between	0.268

**** p<.01, ** p<.05, * p<.1*

Appendix 5. Regression Results (H2)

A) *Result of regression analysis with fixed effects model for Annual turnover ratio*

Regression results

Annual turnover ratio	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	-.05	.036	-1.40	.164	-.12	.021	
Dividend yield	-.003	.003	-0.81	.418	-.009	.004	
Return volatility	8.454	1.702	4.97	0	5.098	11.81	***
Firmsize	.064	.032	1.98	.049	0	.128	**
Leverage	.228	.142	1.60	.11	-.052	.509	
Constant	-.308	.197	-1.56	.12	-.697	.081	

Mean dependent var	0.304	SD dependent var	0.327
R-squared	0.126	Number of obs	245.000
F-test	6.046	Prob > F	0.000
Akaike crit. (AIC)	-44.901	Bayesian crit. (BIC)	-23.893

*** p<.01, ** p<.05, * p<.1*

B) *Result of regression analysis with random effects model for Annual turnover ratio*

Regression results

Annualturnoverratio	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Post	-.053	.032	-1.64	.1	-.116	.01	
Dividendyield	-.002	.003	-0.74	.46	-.008	.004	
Returnvolatility	7.994	1.492	5.36	0	5.07	10.918	***
Firmsize	.061	.02	3.11	.002	.023	.099	***
Leverage	.169	.125	1.35	.175	-.075	.413	
Constant	-.255	.142	-1.80	.071	-.533	.022	*

Mean dependent var	0.304	SD dependent var	0.327
Overall r-squared	0.109	Number of obs	245.000
Chi-square	33.014	Prob > chi2	0.000
R-squared within	0.126	R-squared between	0.101

*** p<.01, ** p<.05, * p<.1*