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The unintended consequence of the unbundling regulation of MiFID II on the liquidity of European listed companies

Abstract

In this thesis, the relation between the implementation of MiFID II, analyst coverage, and market liquidity is empirically examined. Over the period 2015 – 2019, the effects of the unbundling regulation were tested in 3,540 European listed firms. The number of analysts covering a company was observed by dynamic and static variables. The variables indicating market liquidity are effective spread and volume traded. This thesis concludes that over the period 2016 – 2018, a decrease in analysts following European listed companies was observed. Moreover, this effect is the most observable for small and large capitalisation companies. This is in line with what is argued by market professionals and previous literature. The second part of this thesis elaborates on the effects of the decrease in analyst coverage on market liquidity indicators. In this part, it is concluded that there is a negative effect of the decrease in analyst coverage on the market liquidity. A negative relation between analyst coverage and effective spread and a positive relation to volume traded was found. This indicates that when analyst coverage decreases, the spread becomes wider and volume traded is less. This relation became stronger closer to the official implementation date of the MiFID II. The main goal of the MiFID II is to improve market transparency and efficiency. Transparency for investors has been improved, but efficiency seems to not have been improved. The results in this thesis suggest a positive relation between analyst coverage and market liquidity during the implementation of MiFID II. This suggests that the unbundling regulation has an unintended consequence on analysts covering European listed companies. This decrease in coverage reduces information to the market and therefore lowers the efficiency of the European financial stock exchanges.

Keywords: MiFID II, Analyst coverage, Liquidity, Effective spread, Volume traded

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1. **Introduction**

New regulations are constantly being implemented to reduce risks and improve efficiencies in financial markets. There has been complete restructuring of the existing market infrastructure by implementation of the Dodd-Frank Act. Since 2004, the functioning of the financial markets in Europe has changed drastically by the implementation of the Markets in Financial Instruments Directive (MiFID). The overall aim of this regulation was to improve transparency across the markets and to harmonise the European financial markets (PWC, 2015). However, the newly implemented regulation has had some unintended consequences for the sector (Giraud, 2009). The second directive was introduced by the European Commission on 3 January 2018 and aims to improve transparency across the financial markets in Europe. A large debate has started about the consequences of this regulation on research analysts providing information to the market. International Financial Law Review (2018) stated that there is clear evidence that MiFID II is starting to backfire on its creators. Several surveys conducted across financial professionals have indicated that MiFID II has had negative effects on the research produced by sell-side analysts (CFA Institute, 2019; Peel Hunt, 2018). In 2019, several academics tested for these relations and also came to the same conclusions, including Fang, Hope, Huang, and Moldovan (2019), Guo and Mota (2019), and Lang, Pinto, and Sul (2019). In continuing the philosophy of these professionals and academics, I aimed to research the relations between MiFID II, analyst coverage, and market efficiencies in my thesis. Hence, the main research question of this thesis is:

Is the MiFID II producing unintended consequences for European listed companies by lowering market liquidity due to decreasing analyst coverage?

Fang, Hope, Huang, and Moldovan (2019), Guo and Mota (2019), and Lang, Pinto, and Sul (2019) have already researched the impact of MiFID II on analyst coverage but did not properly test the results for different company sizes. Since there may be a large difference in effects of the regulation, this is tested in my thesis. Moreover, the effects of MiFID II were already present before the official implementation date, according to Oliver Wyman (2017). Previous research has not properly tested for this relation. My thesis therefore tested if the effects of the regulation were already visible before the official implementation date. This thesis also tested the effects of analyst coverage on the market liquidity. From previous literature, it was expected that a decrease in analysts' coverage would have a negative effect on the market liquidity (Balakrishnan, Billings, Kelly & Ljungqvist, 2014; Ellul & Panayides, 2016). Research already conducted has calculated the market liquidity by volume traded and effective spread (Ellul & Panayides, 2016). According to Goyenko, Holden, and Trzcinka (2009), the effective spread is the best liquidity indicator and was used in this thesis for that reason. Furthermore, liquidity was also tested by the volume traded. Conventional and unconventional

variables were developed as indicators for analyst coverage in the empirical regression. The conclusions of my thesis using these two measures for liquidity and the new indicators for analyst coverage are an addition to the literature. In addition, the equality of the means of the liquidity indicators after a 50% decrease in analyst coverage was also statistically been tested by Bayesian t-tests calculations. The answers on the previously elaborated topics are given with help of the following sub-questions:

1. What is the effect of the implementation of the MiFID II on analyst coverage of European listed companies and from which year is this observable?
2. What is the effect of the implementation of the MiFID II on analyst coverage of different sizes of European listed companies?
3. What are the effects of analyst coverage loss on the market liquidity during the implementation period of the MiFID II?
4. What is the effect of MiFID II on analyst coverage and market liquidity of the European financial market?

The remainder of this paper is structured as follows. Chapter 2 discusses the present consensus of the MiFID II, the importance of research analysts, and their effect on market liquidity. Furthermore, the hypotheses are presented in this section. In chapter 3, the variables and collected data used for testing these hypotheses are discussed. The methodology for the empirical and statical estimates is presented in chapter 4. Chapter 5 discusses the results of the performed analyses, and chapter 6 concludes the thesis.

2. Literature review

In this chapter, the most recent and relevant knowledge of the MiFID I and II, analyst coverage, and market efficiency is presented. Furthermore, this chapter tries to connect the three topics since they function as a fundament for this empirical research. Section 2.1 discusses the composition of MiFID II and the impact on the financial industry. Next, section 2.2 describes the role of analysts covering listed companies. Moreover, the effect of these analyses on the market and companies are discussed. Section 2.3 covers literature on the effect of analyst coverage on market liquidity.

2.1. MiFID II

In 2004, the European Parliament replaced the Investment Services Directive with the MiFID. This new regulation aimed to deliver more transparency, efficiency, competitiveness, fairness, and integration in the European financial markets. A balanced consideration between a flexible and innovative financial market on the one hand, and the aim to provide investor protection and reduce

systematic risk on the other hand, was created to deliver MiFID's goals. When this balance is not properly met, there are consequences for the quality of the European financial market (Davies, Dufour, & Scott-Quinn, 2005).

In response to the financial crisis of 2008 and as an addition to MiFID I, MiFID II was implemented in all member states of the European Union as of January 2018. The formal discussions about improving MiFID I through MiFID II started in 2014. Due to the difficulties in implementation and large consequences for the financial system, the implementation of MiFID II was postponed. On 30 June 2016 the European Parliament announced that MiFID II would become national law by July 2017 and would be fully applicable by 3 January 2018 (Guo & Mota, 2019). The new regulation is considered one of the most impactful changes in the financial markets of the past 10 years (Hopfensperger, 2018).

The MiFID II mainly impacts the financial world in different aspects. First, MiFID II has significant impact on market structure. By introducing the organised trading facility, non-equity instruments are now also captured in the MiFID agreement. Previously, under MiFID I, only equity trading products were subject to the regulation. Second, the new directive also sharpened the regulation for algorithmic trading. Next, product governance is another area where MiFID II is trying to deliver progress. The MiFID II requires investment firms to responsibly distribute their products across the market, and these firms must ensure that all parties are well informed about the products. Moreover, after a certain period, firms need to evaluate their products and performance. In order to decrease market abuse, transaction reporting regulations have increased. New products and data sources have to be reported, which should bring more transparency across the European financial markets. In addition to MiFID I, more products and data fields have been added to the reporting requirement.

Under MiFID I, investment firms were required to take 'reasonable steps' in delivering results for their clients. Under MiFID II, this has changed to 'all sufficient steps' in delivering results for their clients. In addition, investment firms must expose their best activities of the previous year. In this way, more transparency will be achieved (KB Associates, 2017).

Another element by which MiFID II is changing the European financial landscape is the new inducement and unbundling regulation (KB Associates, 2017). The newly introduced unbundling regulation has been widely discussed by academics and professionals within the industry. Andrew Henderson, partner at Eversheds Sutherland in London, talked about the impacts and philosophy of MiFID II. 'When paying for third party services, use your client's money with the same standards of care as you would if it were your own money' is what should be in the principles of asset managers according to the regulators (Henderson, 2018, 05:40).

Before the implementation of MiFID II, it was very common to pay for research in 'soft dollars'. This form of payment is mostly a combination of payments by future commission revenues or services that will be delivered and cash dollar payments. This practice was prohibited after the second directive came into place. From now on, research can only be paid by cash—'hard dollars' (Fang, Hope,

Huang, & Moldovan, 2019). These soft dollar payments can cause conflicts of interest. For investment firms, it was not uncommon to choose brokerage houses by which were delivering personal favours instead of which was the best and cheapest. By the unbundling of payments for research, MiFID II ends the practice of soft dollar payments and therefore potential conflicts of interest (Guo & Mota, 2019). The MiFID II regulation tries to provide transparency in research costs by unbundling research costs from the price of execution. The process of unbundling would clarify the costs of research and forces the asset managers to send proper costings to their clients. Research can be allocated in two ways after the MiFID II regulation. One method is for asset managers to buy research through a research payment account. In practice, the process of buying research starts with a client agreement for buying research for a certain amount. Then, the different sources of research must be evaluated and ranking by their quality to the clients of the asset managers, and they must be able to justify this quality. The managers must also justify to their clients why they use certain research houses. The other way to collect research is by conducting research in-house (Henderson, 2018).

Ferrarini and Moloney (2012) argued that MiFID I did not always achieve its goals. Moreover, they suggested that new regulations can have a large impact and could also have unexpected outcomes. Due to the complexity of regimes within the different member states, different political influences, and conflicting incentives of multiple industries, MiFID I did not always achieve the balanced solution. Both academics and financial professionals have argued that MiFID II might have unintended consequences for the financial system. In 2015, Deloitte interviewed 17 prominent financial companies about their main concerns and impacts of MiFID II. More than 60% of the interviewees had concerns about investment research. With this new regulation, an unbundling of research was introduced, which mostly has effects on sell-side analysts. Deloitte's analysts expected that this new regulation would decrease the number of analysts and try to increase the quality of them. Eventually, this would lead to more transparency in research costs, as the fee is unbundled from the transaction fee (Deloitte, 2015). The new regulation has changed the landscape of research, and this has had effects on the number of research analysts. The Boston Consulting Group (BCG) has argued that paying for research will decrease investment banking research budgets by 25%. In reaction, the banks would decrease the number of analysts for the European markets (BCG, 2016). The Corporate Finance Institute conducted a survey in 2018 of almost 450 companies in 25 European countries. Their aim was to test whether the implementation of the MiFID II was performing properly. This survey mostly questioned asset managers, private wealth managers, brokers, and investments banks. The respondents concluded that there has been an overall decrease in research expenses of 6.3%, with a larger amount for the larger investment funds (11%) (CFA Institute, 2019).

Moreover, a report by Oliver Wyman in 2017 suggested that because investment firms have to pay for research themselves, they would decrease their research spending by around 10 – 30%. Furthermore, they expected to see this change in analyst expenditure to happen in the short term. Even though

MiFID II only holds for European listed companies, it is expected that this trend in decreasing research expenditure would be implemented worldwide. This is mainly due to the complexity and costs of the process (Oliver Wyman, 2017). The transparency in research costs would start a war in price between competing research houses and banks. Even so, McKinsey (2017) has argued that banks and research houses currently have more research capacity than demand, resulting in a decrease in research analysts (McKinsey, 2017).

Besides the professionals in the financial industry, academics are also making the same conclusions about the negative relation between the introduction of MiFID II and analysts covering European companies. Recently, Fang, Hope, Hung, and Moldovan (2019) empirically showed that analyst coverage in Europe decreased in the MiFID II period. In line with this finding, Lang, Pinto and Sul (2019), and Gua and Mota (2019) presented the same conclusions about this relationship in their papers. In addition, Fang, Hope, Huang, and Moldovan (2019) tested the effect of MiFID II on buy-side analyst coverage, since a shift towards in-house analysts is expected. They concluded that there has been a significant increase in buy-side analysts. This could be a result of a shift towards in-house research (Fang, Hope, Huang, & Moldovan, 2019).

As it is clear that MiFID II has had a negative effect on analyst coverage, it is interesting to discuss whether this effect is different for different company sizes. The following part of this chapter elaborates on this.

According to Oliver Wyman (2017), mainly small and mid-cap investment firms will be the ones to suffer from the new regulation. Research costs are not linearly connected to the amount under management by the funds and will therefore be less of a problem for the larger investment firms. For banks and other research providers an increased competition will be present and therefore low-middle sized research companies must specialise in order to maintain a part of the market share for paid research. It is without any doubt that the restructuring of this part of the financial market has had a negative impact on the number of analysts covering European companies. Furthermore, the effects of the regulation were already visible before the official implementation date. Companies were already participating and lowering the number of analysts (Oliver Wyman, 2017).

In an article from Bloomberg in 2018, Justina Lee argued that small cap companies experienced a 7% decrease in analyst coverage after implementing MiFID II. This decrease in analyst coverage has consequences in liquidity for the small cap companies. Small cap companies are now paying research institutions to deliver information about their companies to increase market liquidity. Keith Hiscock said: ‘The danger is that liquidity is going to be a lot lower and that many companies are going to say: what’s the point of being in the stock market? ’ (Bloomberg, 2018, para. 5). This reflects the current sentiment for small cap companies in the changing European financial market. As an unintended consequence of these outcomes, it can be argued that for small and mid-cap companies, a decrease in the volume traded has been presented (Lee, 2018).

In the small and mid-cap investor survey of Peel Hunt in 2018, the same negative sentiment around MiFID II was present. This survey was conducted with over 100 UK-based fund managers through questionnaires and interviews. Almost the half (48%) stated that MiFID II has led to less research for small and mid-cap companies. A large majority (70%) expected the decrease in analyst coverage for small and mid-cap companies to become even greater. As a consequence, the majority of the investment fund managers expected a negative impact on liquidity of the small cap listed companies (Peel Hunt, 2018). Another survey from the Chartered Financial Analyst Institute (CFA Institute) (2019) concluded that research coverage has been decreasing, especially for small and mid-cap equity. Around half of the questioned companies thought that there had been a decrease in coverage of small and mid-cap equity. For the large cap companies, no significant changes were expected in analyst coverage. If this trend continues, it could deliver illiquidity for the small and mid-cap sector, and this could make it harder to raise capital (CFA Institute, 2019).

In contrast, Yifeng Guo and Lira Mota (2019) developed a hypothesis which expected a larger decrease in analysts for large cap companies. They suggested that the duplicated services would be eliminated first, and this would mostly be applicable to larger companies. Their results confirmed a larger drop in large cap companies than in small and mid-cap (Guo and Mota, 2019). The article from Lang, Pinto, and Sul (2019) is in line with this argumentation. They argued that the effect of the reduction in analyst coverage is the greatest for larger, older, and less volatile companies. This could be explained by the fact that for these companies, it is the hardest to justify additional research by analysts (Lang, Pinto, and Sul, 2019).

Some professionals have offered positive sentiments around the unbundling regulation of MiFID II. One of the goals of the regulation was to increase competition in the financial research market. The CFA Institute (2019) noted that 40% of those surveyed believed that the research market has become more competitive. However, they are not sure if this new landscape will deliver the best results for the end investor (CFA Institute, 2019).

Andrew Bailey, Chief Executive of the Financial Conduct Authority at the European Independent Research Providers Association spoke about the positive effects of unbundling. One of the positive effects that he described is that the majority of asset managers are not charging their clients for the research but are instead decreasing their own revenues. This was far behind the expectations since surveys conducted in 2017 suggested that clients would still be charged for the research costs. Overall, he argued that a decrease in commissions for research has been accomplished and that more sophisticated new technologies are being used by managers. Pricing of research is still not fully in equilibrium and will still make winners and losers. However, a decrease of 20 – 30% in research budgets does not ensure that more information will be published and used in the financial markets. He admitted there are concerns for smaller cap companies in losing analyst coverage but he called the proof inconclusive (European Independent Research Providers Association, 2019).

In line with what has been presented above, it can be concluded that MiFID II has brought change to

the existing financial markets, and this has had negative and positive effects on all the actors. It is clear that analysts covering European listed companies have been decreasing during the MiFID II period. According to the industry professionals, this effect is larger for the small and mid-cap companies. The next part of the thesis reviews the literature around the effects of decreasing analysts for the financial markets.

2.2. Analyst coverage

Since its development by Eugene Fama in 1960, the Efficient Market Hypothesis (EMH) has made its way through exception in worldwide economic literature. This theory implies that capital markets function most efficiently when they fully reflect all the relevant information that is available (Malkiel, 1989). Several moments in the past can be defined as moments of malfunctioning of the financial markets. For example, the financial crisis in 2008 can be partly explained by a mismatch in information about the products traded (Kotz, 2009). In the past years, there have been moments when there were possibilities in arbitrage that could deliver a form of profit. While exploiting this arbitrage is still costly, it is inconsistent with the fact that markets are always in equilibrium and include all the possible information. Sanford, Grossman, and Stiglitz (1980) constructed a model with an equilibrium based on the flow of information from the informed to the misinformed. The prices in the model are dependent on the transfer of information across the financial market. In their paper, they concluded that traders with information can benefit if they can use this information in a more efficient way than the misinformed. The EMH claims that all information should be implemented in the prices at any time, if this theory holds there cannot be benefitted from having more information than others. Everyone will be an informed trader and eventually it will no longer be beneficial to pay for information. It is not realistic to suggest that all information is always available for every market participant. As a result, there will always be a search for the best and most accurate information in order to make profits. However, they argue that when prices for information are low(er) and the quality of the information is sufficient, there is a possibility for an equilibrium in their model (Sanford, Grossman, & Stiglitz, 1980).

Analysts are one source of information for financial markets. Generally, analysts specialise in particular industries and cover numerous specific stocks within this industry. The focus is normally on the larger firms within the specialised industry. Normally, the task of an analyst is translating firm-specific and macro-economic data into a buy or sell conclusion. After this conclusion is made, it is communicated to investors, company management, and other market participants. By this path, new information can be distributed formally and informally to the market.

In the seventies and eighties, a lot of research focused on the accuracy of analysts' forecasts. Over time, researchers tried to test if analysts were outperforming naïve, but also less naïve time-series models. Barefield and Comiskey (1975), Brown and Rozeff (1978), Fried and Givoly (1982), and

Brown, Griffin, Hagerman, and Zmijewski (1987) concluded that analysts were indeed outperforming these models. From this point, the literature started to discus and test if specific analysts could outperform others. Amongst other things, Mikhail, Walther, and Willis (1997) showed that there was a proven difference in forecast quality between analysts.

From 1990 till now, research has focused on the correlation between publicly available information and its influence on forecasts. There is no consensus yet about the over- or under-reaction of analysts' forecasts to publicly available information. Lys and Sohn (1990), Elliott, Philbrick, and Wiedman (1995), and Bradshaw, Richardson, and Sloan (2001) found that analysts underreact to publicly available information. In contrast, De Bondt and Thaler (1990) and Easterwood and Nutt (1999) concluded that analysts are overly optimistic concerning positive public information.

Another topic that has been tested by academics is the usefulness of analysts and whether their forecasts correctly absorb all the information that is available on the market. These forecasts will be most correctly compiled when all past and present information is included. Studies have tested whether financial statement information, management forecasts, and other financial indicators are properly used to determine a forecast. In other words, they tested the ability of analysts to efficiently forecast a company's future. Bradshaw (2011) empirically showed that analysts are not efficiently adapting all the available information. This could suggest that analysts have more market knowledge than publicly available.

Frankel and Li (2004) testing the effect of different sources of information on the financial markets on information asymmetry. They used three different types of sources: financial statements, analyst coverage, and relevant news. In order to empirically test the hypothesis, they constructed a model which used the amount of predictive power of company insiders as the indicator of information asymmetry. They presented some interesting conclusions about the role of analysts on information asymmetry. As one of their dependent variables for analyst activity, they used the logarithmic number of analysts covering a firm. Furthermore, they claimed to find a significant negative relation between analyst coverage and the ability of insiders to exploit their information. This concludes that more analyst activity ensures less information asymmetry between managers and investors. They also tested this effect with two different sources of information and did not find the same significance in their regressions. This suggests that analyst coverage is the most important source in decreasing information asymmetry between different actors in the financial market (Frankel & Li, 2004).

Hong and Kacperczyk (2010) tested the effect of competition on biased analyst earnings forecasts. They concluded that the more analysts that are following a firm, the less biased the forecasts that are given by the analysts. They tested this by several different regression methods and concluded that competition reduces analyst optimism. Moreover, they argued that this can have an effect on stock prices (Hong & Kacperczyk, 2010). Elgers, Lo and Pfeiffer (2001) also confirmed that it takes time before published and forecast information affects the stock price. The length of time before information affects stock prices is longer for firms with few analysts following the company than for

companies with many analysts following. This suggests again that information produced by analysts ensures market efficiencies (Elgers et al. ,2001).
Hong, Lim, and Stein (2000) presented a different view on the effect of low analyst coverage. They suggested that the more information on the market that is available, the harder it becomes to make use of moment in trading stocks. It is assumed that analyst coverage is a feasible proxy for the flow of information on the market. They found that trading on momentum of companies with the lowest 30% of analyst coverage delivered 60% more profit compared to the third with the highest coverage by analysts (Hong, Lim, & Stein, 2000).
Another paper by Barth and Hutton (2003) concerned the role of analysts as information intermediaries. First, they tried to determine whether forecast revisions by analysts are of value. They concluded that forecasts of the next year's earnings are positively related to the actual performance of the company. Hereby they proofed the importance in directing investments by analysts' forecasts. They concluded that information and capital, flows better through the financial system when there are more financial intermediaries. Again, they found that the lower analyst coverage is, the slower the market reacts to changes in cash flow and accruals (Barth & Hutton, 2003).

2.3. Analyst coverage and efficient markets

Based on the presented literature, it can be argued that analysts bring more information to the market, and this might have a positive effect on the market efficiency. This is shown by the time it takes to adjust prices for companies that have few analysts following them. In addition, there seems to be a negative relation between the analyst coverage and effective spread. This indicates a decrease in market efficiency when coverage decreases. If an unintended effect of MiFID II is a decrease in analysts' coverage, then according to the presented literature, this can have an effect on the European market efficiency. This next part reviews the existing literature on testing market liquidity and activity. According to Amihud and Mendelson (1986), the creation of value by analysts can be explained by the Gordon Growth Model. The model is built up as follows: $P = D/(r - g)$, where r represents the discount rate, g the dividend growth rate, P the stock price, and D the future dividends. They suggested that more efficient information flows across the financial markets decrease trading costs for stocks by increasing liquidity. This has a negative effect on the discount rate and will increase the stock prices (Amihud and Mendelson, 1986).

2.3.1. Stock prices and the effect of analyst coverage

Gleason and Lee (2000) have written about the impact of analyst forecast revisions and market price discoveries. Their research has concluded that analysts' forecasts have an important impact by providing information about the performance of companies. Moreover, these forecast are performed

by analysts every quarter. Another conclusion they have made concerns the impact of previous analysts that were following companies. When lower analyst coverage is observed, there is a higher price impact on the stock market. Besides, they concluded that adjustments in forecasts of a company's performance shows between four to six quarters after the statement. If the change in analyst perception is more controversial than previous perceptions, the effect on the stock price is also found to be larger (Gleason & Lee, 2000).

In line with this research, several other academics have written about the impactful role of analysts as sources of information and a reason for properly functioning financial markets. Brennan, Jegadeesh and Swaminathan (1993) have written about the effect of the number of analysts following a firm on the adjustment of a firm's stock price to new information. The classical view in this literature comes from the model from Kyle (1985), which predicts that the more analysts there are following a company, the faster information will be transferred into the price. This suggests that there is a positive relation between analysts following a company and the efficiency of the stock market (Hong, Lim, & Stein, 2000).

2.3.2. Market liquidity and the effect of analyst coverage

PricewaterhouseCoopers (PWC) described liquidity as 'a multi-dimensional concept, generally referring to the ability to execute large transactions with limited price impact, and tends to be associated with low transaction costs and immediacy in execution' (PWC, 2015, p. 8). This definition emphasizes the importance of liquidity as a motor for the functioning of financial markets. Liquidity distributes economic resources and capital across the actors in the market. For example, capital flows between investors, borrowers, and savers are facilitated by a liquid financial market, and this contributes positively to the economy. Furthermore, liquidity is an effective source of information, and this is reflected into stock prices. Even so, liquid capital markets ensure the effectiveness of monetary policies. Lastly, liquidity in the financial market brings stability by making it possible to manage risks.

There are large differences in the amount of liquidity across sectors, countries, and asset classes. The lower the liquidity, the more premium, in forms of liquidity premium, will be paid. The latter also exists in the reverse relationship. Sufficient liquidity on the financial markets ensures the correct distribution of economic wealth. In short, liquidity is an important aspect in well-functioning financial markets (PWC, 2015). As previously argued by PWC (2015), liquidity is a multi-dimensional concept. This institution divides liquidity in several dimensions with different measurements. One of these dimensions is the depth of the market, meaning the willingness and possibility of trading. Trading volume is seen as a proper indicator for this dimension. Besides, there are multi-dimensional measures which test for liquidity in different ways (PWC, 2015).

Goyenko, Holden, and Trzcinka (2009) reviewed several other liquidity measures in their paper and tested which proved to be the best measure of liquidity. In order to give a proper answer to this question, they used highly frequent data sets as benchmarks in comparison with quarterly and yearly indicators. To determine the best indicator of liquidity, they compared high-frequency data liquidity with the tested indicator. As benchmark indicator for liquidity, the effective spread was taken. They distinguished between three different measures: effective spread, realised spread, and effective spread (605). The latter is presented as the most reliable source of liquidity measure. This is a share-volume-weighted average effective spread and implements a buy or sell element.

In their conclusion, they stated that there are no significant differences in accuracy between high-frequency data and monthly or yearly data. They stated that 'using high-frequency measures is simply not worth the cost' (Goyenko, Holden, and Trzcinka, 2009, p. 46).

Two other papers have focused on the complete coverage termination of analysts following listed companies. Following the previously presented literature, these papers also showed a positive relation between a decrease in analyst coverage and a deterioration in the efficiency of the stock market. Kelly and Ljungqvist (2007) argued that analyst coverage impacts the efficiencies of the stock market. Moreover, they have researched the contribution of sell-side equity research on the share price and market value of firms that lost their coverage completely. They tested whether sell-side analyst research affects information efficiency, defined as liquidity, probability of informed trading, and variance ratios. For all the tested variables, they concluded that coverage termination leads to a decrease in information efficiency. They also concluded that for the larger institutions, the amount of research is of lesser importance than for smaller or private investors. This might be explained by the fact that larger investors have more and other sources; there might be in-house research available (Kelly & Ljungqvist, 2007). As described earlier, a large flow of information can influence companies' ability to properly be evaluated. Balakrishnan, Billings, Kelly and Ljungqvist (2014). wrote that managers can influence the liquidity of their own firm by publishing more information than necessary. The more information is published, the more liquid a company's share can become. In this paper, they tested liquidity by a logarithmic liquidity indicator (AIM). The total sample, corrected for exogenously coverage termination, consisted of 2,180 different firms. One of the empirical analyses performed tested whether coverage termination had an impact on the liquidity of the stocks. They found that after coverage termination for the sample group, there was a significant increase in the AIM compared to the control group. After controlling for fixed firm effects and control variables, the results stayed consistent. Next, they tested the causal relation between liquidity and information disclosure. They found that there is a strong negative causal relation between these variables. They concluded that companies can increase liquidity after coverage termination by voluntarily distributing company information (Balakrishnan et al., 2014).

In 2016, Ellul and Panayides researched the effect of complete analyst coverage termination on market quality. They described market quality based on price discovery and liquidity. They selected

the sample period from 1994 – 2007 in order to test for any effect on analyst coverage and market liquidity of the new regulations that were implemented. For example, they found that Regulation Fair Disclosure (Reg FD) had a negative effect on the quality and quantity of analyst coverage. A part of their hypothesis tested whether analyst coverage termination led to deteriorating liquidity and price efficiencies. Overall, they found negative relationships between the indicators of market quality and analyst coverage. As indicators for market quality, they used volume traded and volume weighted effective spread. Moreover, they showed that volume traded decreases and effective spread increases after coverage termination. They concluded that coverage termination has a negative significant impact on liquidity, indicating that an increase in complete coverage loss will decrease liquidity in the market for at least one year. Furthermore, they tested for price inefficiencies after coverage termination by pricing errors' standard deviation. This variable is the inverse of information efficiency and is found to have a negative relation with coverage termination. In conclusion, the overall market quality dropped after coverage termination (Ellul & Panayides. 2016).
In line with Ellul and Panayides (2016) and PWC (2015), Chea (2005) also highlighted the importance of trading volume as an indicator for liquidity on the financial markets. In his paper, he tested whether information asymmetry by scheduled announcement has effects on volume traded. With this hypothesis, he tested if (trading) liquidity has a significant relation with information asymmetry. As an indicator for information asymmetry, Chea used analyst coverage. This variable is seen as a common indicator for information distribution in the financial market. He found that information asymmetry holds a negative relation with volume traded during scheduled announcements. Again, this article emphasises the effects of information asymmetry by analyst coverage on the financial markets (Chea, 2005).

2.4. The effect of the MiFID regulation on market liquidity and analyst coverage.

In 2011, Johan and Lo published an article which connects exchange trading rules with market liquidity. They measured liquidity by velocity, volatility, and relative bid-ask spread. They tested whether regulation can really influence the effectiveness of the financial markets. In order to analyse this relation, the effect of different regulations was analysed across 42 different exchanges over the period 2006 – 2008. In their research, they particularly tested for the impact of MiFID I on market liquidity. The following hypothesis was constructed to empirically show the effect of the regulation: 'MiFID I encourages trading activity, and reduces market volatility and bid-ask spread'. In contrast with the hypothesis, the results showed that MiFID I is decreasing liquidity on the European market. This is in line with the expectations of these academics and their presented literature (Cumming, Johan, & Lo, 2011).
This section of the literature review combines the two separate trends during MiFID II: the decrease in analysts' coverage and the decrease in market liquidity. In their paper, Lang, Pinto, and Sul (2019)

published that the MiFID II decreases analysts' coverage due to the unbundling of the research process. Furthermore, this has had a negative impact on the information environment of the financial market. First, the effect of MiFID II on analyst coverage was tested by a firm FE model. Analyst coverage was calculated by quarterly analyst forecast data, and the MiFID II dummy variable started from the first quarter of 2018. Their results indicate that in the post-MiFID II period, analyst coverage has dropped by 10% across the European listed companies. This is in line with what is argued by the industry professionals, as presented before. Next, they divided the sample group in three percentiles and tested for the effect of MiFID II on company size. They found that analyst coverage decreased the most for large and mid-cap companies. This finding is not in line with findings described in section 2.1, which argued that the effect should be the largest on small cap companies. Lang, Pinto, and Sul tried to connect the decrease in analyst coverage by MiFID II to inefficiencies in the market. First, this was tested by analysing the absolute value of cumulative abnormal returns around earning announcements in comparison to their control group of US firms. Second, they tested this effect with the variable earnings announcement information content. Lastly, the bid-ask spread was used to analyse the effects on market liquidity. To conclude, Lang, Pinto, and Sul (2019) found that even though analysts seem to produce better research, MiFID II has led to an decrease in the number of analysts, which in turn led to a deterioration of the functioning of the market liquidity (Lang, Pinto and Sul, 2019).

A recently published paper of Gua and Mota (2019) also investigated the relation between the unbundling regulation under MiFID II and the sell-side research production. Gua and Mota (2019) and Lang, Pinto, and Sul (2019) both concluded that after the implementation of the MiFID II, a decrease in analysts following European listed companies can be observed. In addition, both papers argue that the decrease in coverage is the largest for large cap companies. Even so, they both concluded that the quality of research is improving although the quantity is decreasing (Gua & Mota, 2019). Surveys of market participants have concluded that quality is decreasing and smaller firms are losing the most analyst coverage (CFA Institute, 2019). Fang, Hope, Huang, and Moldovan (2019) have researched the effects of the unbundling regulation on the number of sell- and buy-side analysts. Besides, they tested these effects on the market efficiencies. In contrast with previously published literature, they constructed a variable which indicates the change in sell-side analysts between 2017 and 2018. Although the effects of the new regulation are mostly likely already visible from the official announcement date, this variable is new in addressing the MiFID II consequences on analyst coverage. However they tested for liquidity, their contribution to the literature is not very large since they only use the Amihud ratio in explaining it (Fang, Hope, Huang, & Moldovan, 2019).

With this thesis, I aimed to bring more clarity in the effect of the MiFID II on analysts following European listed companies. Moreover, I tested which companies are mostly affected by the decrease in analyst coverage. In the next part, the effects of a decrease in analyst coverage are empirically tested. These effects were also tested for the different company size classes. In the last part, these

methods were used with a different sample group. By the help of a probit model, companies that were not expecting a coverage decrease but did experience a coverage decrease were included in the sample. It was expected that for these companies, the effect of decrease should be the same as with the other sample.

2.5. Hypotheses development

This thesis tested whether the implementation of MiFID II has had unintended consequences for the European financial market. In order to answer this question, different hypotheses were developed and different empirical techniques used. The empirical techniques can be divided in three parts.
First, the consequences for analyst coverage by the unbundling regulation were tested. As argued by Fang, Hope, Huang, and Moldovan (2019), Guo and Mota (2019), and Lang, Pinto, and Sul (2019), a decrease has been observed in the number of analysts covering European companies after the implementation phase of MiFID II. This observation was tested by empirical estimations and is presented in this paper. Oliver Weyman (2017) argued that the effect of the MiFID II could already be observed before the actual implementation date in January 2018, since actors were anticipating the new regulation. This thesis tested this by including the pre-MiFID II period in the sample period. Moreover, Fang, Hope, Huang, and Moldovan (2019), Guo and Mota (2019), and Lang, Pinto, and Sul (2019) have found the largest effects of this decrease for mid- and large cap companies. However, this is not in line with what has been seen by financial professionals (CFA Institute, 2019; Peel Hunt, 2018). Therefore this thesis tested whether an effect on analyst coverage is present and for which company sizes it is the largest. In order to answer these questions, the following hypotheses were constructed:

H1 A: During the MiFID II implementation period and the period the MiFID II came into force (2016 – 2018) a continuous decrease in analyst coverage can be observed.

H1 B: After the MiFID II came into force in 2018, the largest decrease in analyst coverage can be observed.

H1 C: During the MiFID II implementation period and the period the MiFID II came into force (2016 – 2018), small cap companies experienced the largest decrease in analyst coverage.

H1 D: After the MiFID II came into force in 2018, small and large cap companies experienced the largest decrease in analyst coverage.

The second part of this thesis tested the relation between the decrease in analyst coverage and the efficient function market during the MiFID II implementation period and the period when the MiFID

II came into force (2016 – 2018). For example, Kelly and Ljungqvist (2007) have written that a financial market is not functioning properly when information is derived from the participants. A decrease in analyst coverage by the MiFID II regulation would decrease the flow of information (Balakrishnan et al., 2014). Eventually, this would have negative actions on the function of the European financial markets by means of a liquidity decrease (Kelly & Ljungqvist, 2007; Ellul & Panayides, 2016). This thesis tested whether these relations can be found in the data. Moreover, past research has not tested the market liquidity on volume traded and effective spread. This could be an addition to the literature because of their widely acknowledged function in measuring liquidity. In addition, this thesis also tested whether the possible effects on market liquidity are different for different company sizes. If there is a large decrease observed in analyst coverage for specific company sizes, there might be a different effect on the liquidity of these stocks. Oliver Wyman (2017) and Peel Hunt (2018) argued that smaller companies are facing more deterioration in liquidity after MiFID II due to the decrease in analysts. Following this reasoning, this thesis contributes to this discussion. The following hypotheses were constructed to answer these points:

H2 A: During the MiFID II implementation period and the period the MiFID II came into force, a negative relationship between analyst coverage and effective spread is observed.

H2 B: During the MiFID II implementation period and the period the MiFID II came into force, a negative relationship between analyst coverage and volume traded is observed.

H2 C: During the MiFID II implementation period and the period the MiFID II came into force, a larger negative relationship between analyst coverage and effective spread is observed for small cap companies.

H2 D: During the MiFID II implementation period and the period the MiFID II came into force, a larger negative relationship between analyst coverage and volume traded is observed for small cap companies.

H2 E: The strongest effect of analyst coverage on the market liquidity can be observed in 2018.

In the last part of this thesis, the effect of a decrease in liquidity by the MiFID II was tested on a different sample group to correct for the endogeneity in the first sample group. A sample group was created with companies that, on basis of their financial performance, should not have been unfollowed but were unfollowed. This method was also used by Ellul and Panayides (2016) to correct for companies that were unfollowed because of weak performance instead of an exogenous element. In this thesis, the exogenous element represents the implementation of MiFID II. As in the previous part, with this second sample, the effect on the market efficiency was analysed. The following hypotheses try to answer the question whether the MiFID II regulation holds a negative relation with the market

liquidity due to decreased analyst coverage.

H3 A: During the MiFID II implementation period and the period the MiFID II came into force, a negative relationship with the effective spread is observed.

H3 B: During the MiFID II implementation period and the period the MiFID II came into force, a positive relationship with the trading volume is observed.

H3 C: During the MiFID II implementation period and the period the MiFID II came into force, a negative relationship between analyst coverage and effective spread is observed.

H3 D: During the MiFID II implementation period and the period the MiFID II came into force, a negative relationship between analyst coverage and volume traded is observed.

H3 E: The strongest effect of analyst coverage on the market liquidity can be observed in 2018.

3. Data

This chapter elaborates on the data used to answer the hypotheses. First, the construction of the two different sample groups are discussed and described. Next, the dependent and independent variables are reviewed in sections 3.2 and 3.3.

3.1. Sample

This thesis focuses on the impact of the regulation MiFID II on European listed companies on analyst coverage and market efficiencies. Two different panel data groups were constructed to test these relations.

The first sample group (group A) was constructed by collecting all the active publicly listed companies in the European Union (28 countries) listed on the main stock exchanges. The time frame was determined based on the philosophy of Fang, Hope, Huang, and Moldovan (2019) for the companies selected. This sample period was able to show the effects of the MiFID II since the regulation became fully applicable in 2016, and the effects are still developing. Combining the company characteristics and the time frame, the data was collected from the database Amadeus for a total of 9,619 companies. Furthermore, companies were included in the sample group if they had received at least one quarterly analyst forecast recommendation over the period 2015 – 2019. Correcting for the latter, 3,450 companies remained in the sample group. These analyst recommendations were received from the Institutional Brokers Estimate System and by International Securities Identification Number codes merged with the companies obtained from Amadeus. This method of sample selection is consistent with what is already been presented in the literature by Lang, Punto, and Sul (2019) and Fang, Hope, Huang, and Moldovan (2019). Table 1 shows the distribution

of companies in sample group A by country. Companies listed in France, Germany, Sweden, Poland, Italy and Finland represent more than 50% of the sample group. Remarkably, almost 30% of the sample consists of companies listed in the UK. These seven countries represent more than 80% of the sample group. Therefore, conclusions must be interpreted in favour of these countries.

The second sample group (group B) was constructed to include the possible effect from the MiFID II by making the effect of a decrease in analyst coverage endogenous. Ellul and Panayides (2016) used a methodology to test for the effects of the implementation of Reg FD on their sample group. In line with their philosophy, this method was used to test for effects of the MiFID II. Starting with the first sample group, a probit model was applied. This model predicts by company for every quarter whether that company would experience a decrease in their analyst coverage of at least 50%[1]. This prediction is determined by looking at company financials. When it is predicted that the company should not have experienced this decrease for more than 50% of the time in the period q1 2015 – q1 2019 (more than 9 out of the 17 quarters), the company was added to the sample group. By applying this method, an attempt to filter for endogenous termination was done because termination is now predicted by company performance indicators. For this reason, it could be an improvement in the sample group for explaining the effect of MiFID II. The financial indicators that were used to predict a decrease in coverage are market capitalisation, return on asset, debt-to-equity ratio, stock price return, bid-ask spread, and volume traded. After the probit model was run and companies were removed from the sample group, the second sample group consisted of 1,382 companies.

The effect of analyst coverage on market liquidity during MiFID II was also tested for different market capitalisation of companies. For both of the sample groups, three different groups were constructed: small, medium, and large capitalisation. First, the average market capitalisation between 2015 and 2019 of each company in the sample group was calculated. Second, these averages were divided into three groups based on three terciles: small, medium, and large. Lang, Punto, and Sul (2019) also divided companies by size by constructing terciles in their research. Table 2 presents the number of companies in sample group A and sample group B.

[1] Compared to the first quarter in 2015 or the first time analyst coverage is observed for the company.

Table 1. Number of companies within the sample group divided by country of the stock exchange listing – sample group A.

Ranking	Country	Number of companies	Percentage	Ranking	Country	Number of companies	Percentage
1	United Kingdom	1,053	29.7%	15	Luxembourg	27	0.8%
2	France	449	12.7%	16	Portugal	24	0.7%
3	Germany	413	11.7%	17	Bulgaria	22	0.6%
4	Sweden	393	11.1%	18	Estonia	14	0.4%
5	Poland	257	7.3%	19	Cyprus	13	0.4%
6	Italy	213	6.0%	20	Croatia	12	0.3%
7	Finland	131	3.7%	21	Romania	12	0.3%
8	Netherlands	105	3.0%	22	Slovenia	10	0.3%
9	Spain	92	2.6%	23	Hungary	9	0.3%
10	Belgium	82	2.3%	24	Lithuania	8	0.2%
11	Denmark	61	1.7%	25	Malta	5	0.1%
12	Ireland	60	1.7%	26	Czech Republic	4	0.1%
13	Austria	34	1.0%	27	Latvia	3	0.1%
14	Greece	34	1.0%		Total	3,540	100%

Table 2: Number of companies in sample group A and sample group B.

		Total	Small cap	Mid-cap	Large cap
Sample A	Number of companies	3,540	1,143	1,143	1,143
	Percentage companies of total	100%	32.29%	32.29%	32.29%
Sample B	Number of companies	1,382	754	628	1
	Percentage companies of total	100.0%	54.56%	45.44%	0.07 %

3.2. Dependent variables

This section describes the dependent variables that were used in the regression analyses. First, the analyst coverage is widely elaborated on. Next, the volume traded and the effective spread are discussed.

3.2.1. Analyst coverage

Analyst coverage is one of the main dependent variables in this research. The indicator for analyst coverage was constructed by taking the maximum number of forecasts of earnings or dividend per share by analysts per company per quarter. This indicator for analysts following specific firms is most

commonly used in the literature (Gomes, Gorton, & Madureira, 2007).

After collecting the number of sell-side analysts for each company in the sample group, the dependent variables were constructed. Fang, Hope, Huang, and Moldovan (2019) and Lang, Punto, and Sul (2019) measured analyst coverage on a yearly basis, and this approach was also used in this thesis. First, the yearly logarithmic number of analyst forecasting a company was constructed (logarithmic absolute analyst coverage).This variable was built by taking the maximum logarithmic number of analysts following a specific company in one year (four quarters). Through its construction, the variable filters for large swings in the data and accurately represents the trend for companies over time. To correct for the large differences between companies in the number of analysts following a company, the logarithmic values were used in the empirical analyses.

Some research focusses on the effect of complete coverage loss on the efficiency of the financial markets when testing the effects of the regulation, for example, Fang, Hope, Huang, and Moldovan (2019), Lang, Punto, and Sul (2019), and Ellul and Panayides (2016). In this thesis, a more dynamic measurement was used for the tests. This variable gives insights in the effects of change in analyst coverage across all companies and shows the effect when companies lose their coverage completely. The maximum change in analyst coverage compared to the average number of analysts that have followed a company in 2015 (change analysts coverage) was also constructed. Fang, Hope, Huang, and Moldovan (2019) constructed a similar variable but compared the change in analysts to 2017. Many arguments have already been presented showing that the effects of the MiFID II were already visible before the actual implementation date. To test for the full effect of the MiFID II in this thesis, the change in analyst coverage was compared to 2015, before the official plans for MiFID II were published. This variable was again constructed on a quarterly basis and transformed to a yearly variable. First, the change in number of analysts compared to the average of 2015 was calculated. Next, the maximum change of four quarters in every year was used to develop the new variable.

Another variable that was used to show the impact of the MiFID II on analyst coverage is a dummy variable. This dummy variable measured whether a company lost 50% or more of its coverage by analysts compared to the first quarter in 2015 or the first time this company was ever followed (dummy lost 50% analyst coverage). If this was observed in a quarter, the value 1 was given, otherwise the value was 0. Again this variable was transformed from a quarterly variable to a yearly variable by taking the maximum value of the four quarters in a year. This variable was created in response to the philosophy that complete coverage loss misses the dynamic change over time in measuring the effect on analyst coverage. This variable gives a better perspective on the effect of changes in analysts' coverage and the effects on the financial market.

To test another dimension of the effect of analyst coverage, but in the perspective of the MiFID II several interaction terms were constructed (analyst coverage indicator * 2018, analyst coverage indicator * 2017, and analyst coverage indicator * 2016). These interaction terms combined the effect of analyst coverage with the dummy variables MiFID2018, MiFID2017, and MiFID2016. The

dummy MiFID2018 was given the value 1 for the year 2018 and the value 0 for all the other years. The same holds for the dummy variables MiFID2017 and MiFID2016. This interaction term shows the effect of analyst coverage in the years following the implementation of the MiFID II. This type of variable was used in the literature before by Guo and Mota (2019) and Ellul and Panayides (2016) to test the effect of analyst coverage in specific years and on market efficiency indicators. Table 3 shows the summary statistics for the yearly and quarterly variables of sample group A. An interesting observation from Table 4 is the difference in change in analyst coverage between the two sample groups. Sample group A shows a mean change in analyst coverage compared to 2015 of -0.024. The same measure for sample group B is almost twice as negative.

3.2.2 Trading volume

In the second and third empirical parts of this thesis, the effect of the regulation was tested on market liquidity. In contrast with the first empirical part, all the regressions were conducted on a quarterly basis. Trading volume is seen as one of the variables that indicates market liquidity (PWC, 2015; Ellul & Panayides, 2016). In this thesis, trading volume was therefore used to show the effect on market liquidity due to the decrease in analyst coverage during the MiFID II implementation period (volume traded). The data was obtained on a quarterly basis by Datastream via the Thomson Reuters Eikon database. Due to large differences in the data points between companies, the logarithmic scale was applied, and the variable was winsorised by 5%. This method was also applied by Fang, Hope, Huang, and Moldovan (2019).

Table 3. Summary statistics of variables indicating analyst coverage – sample group A.

	Quarterly Variables				
	Observations	Mean	Standard Deviation	Min.	Max.
Change Analyst Coverage compared to max. analysts 2015 q1 – q4	60,180	-0.0242761	0.3726509	-1	1
Logarithmic Absolute Analyst Coverage	49,191	1.2741	1.087722	0	3.7135
Dummy Lost 50% Analyst Coverage	60,180	0.2058824	0.404348	0	1
	Yearly Variables				
	Observations	Mean	Standard Deviation	Min.	Max.
Change Analyst Coverage compared to max. analysts 2015 q1 – q4	17,700	-0.0428462	0.3933426	-1	1
Logarithmic Absolute Analyst Coverage	14,484	1.252028	1.056494	0	3.091043
Dummy Lost 50% Analyst Coverage	17,700	0.2135593	0.4098307	0	1

This table presents the summary statistics of variables indicating yearly and quarterly analyst coverage from the companies of sample group A from 2015 Q1 – 2019 Q1. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverage shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The variables were all winsorised by 5% lower band and 95% upper band.

3.2.3. Effective Spread

Another variable by which market liquidity is tested is effective spread. This measure indicates the costs of trading by measuring the difference between the bid-ask spread divided by the mid-price. Goyenko, Holden, and Trzcinka (2009) reviewed the best measures of liquidity and concluded that the best measure to test changes in liquidity is the effective spread from Rule 605. The following formula represents the effective spread (605):

(1)

$$\boldsymbol{Effective\ Spread\ (605)_k} = \{\boldsymbol{I_k * 2 * (P_k - m_k)\ for\ marketable\ buys} \mid \boldsymbol{-I_k * 2 * (P_k - m_k)\ for\ marketable\ sells}\}$$

The formula indicates that the trading price ($\boldsymbol{P_k}$) minus the mid-price ($\boldsymbol{m_k}$) times two times an indicator for a buy or sell trading initiative represents the basis of the effective spread. The same methodology as Lee and Ready (1991) was used to develop this indicator. When aggregating this formula over time, it must be corrected for share-volume traded and divided by mid-point price of the time $\boldsymbol{i_k}$ (Goyenko, Holden, & Trzcinka, 2009). In their paper presented in 2016, Ellul and Panayides used the same formula for a similar sort of testing. All the data to develop the effective spread was obtained via Datastream via the Thomson Reuters Eikon database (bid price, ask price, trading volume, average stock price). Besides, this variable was winsorised by 5%, where the values in the winsorised range are replaced with the next highest and lowest values. This makes the regressions less biased towards outliers (Hellerstein, 2008). Figure 1 shows the yearly mean effective spread of the sample group A. This graph indicates that over time, an increase in effective spread can be observable.

3.3. Independent variables

In order to control for differences in firm characteristics in the analyses, several control variables were added to the regressions, including logarithmic market capitalisation as an indicator for company size, return on asset and debt-to-equity ratios to control for firm performance, and the stock return, bid-ask spread, and volume traded to filter for the overall market effects. Lee and Ready (1991), Goyenko, Holden, and Trzcinka (2009), Fang, Hope, Huang, and Moldovan (2019), and Lang, Punto, and Sul (2019) also used the same or similar control variables in their analyses. Again, all the control variables were winsorised by 5% to filter for the effects of outliers in the data.

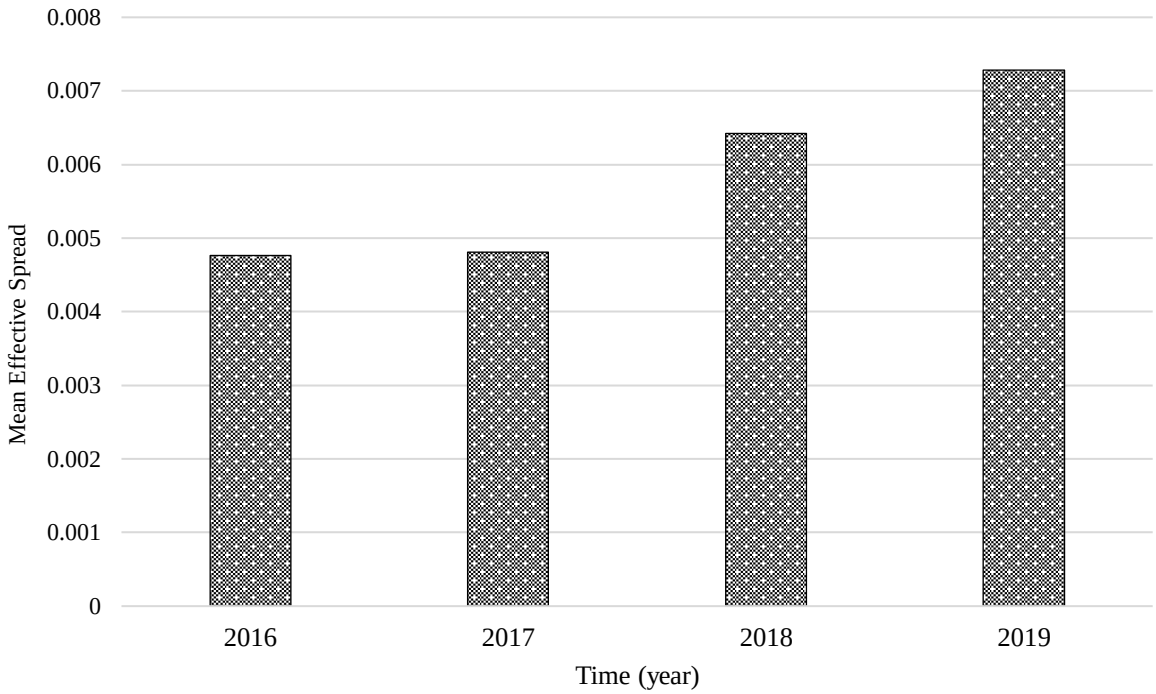

Figure 1. Yearly mean effective spread of 3,540 companies over the period 2016 – 2019 for sample group A.

3.4. Summary statistics

This section presents the summary statistics of the previously discussed dependent and independent variables. Table 4 describes the independent variables of the sample groups A and B. Next, Table 5 shows all the dependent variables divided by company size of sample group A. Observing the data in Table 5, a couple of noteworthy outcomes have to be discussed. First, it is directly observable that the amount of analyst coverage is the least for the smaller companies and the largest for the larger companies. If we interpret the variable logarithmic absolute analyst coverage, we can see that the mean analyst coverage is 0.296 for the smaller companies and 2.293 for the larger. companies.

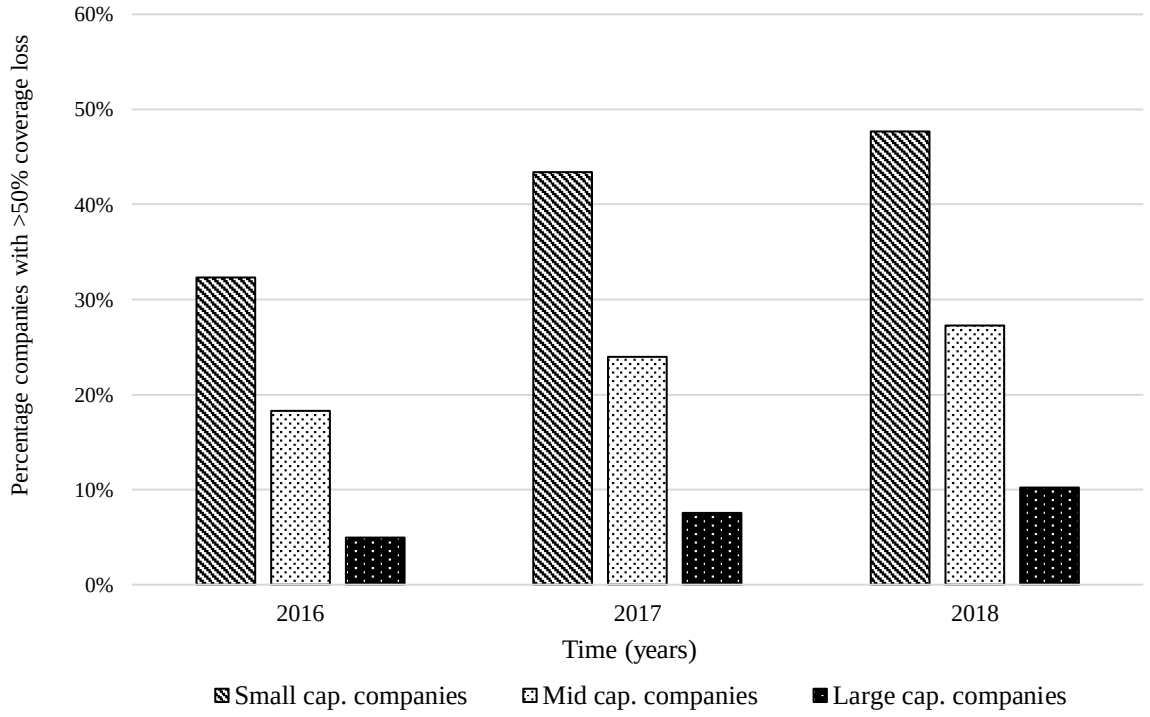

Figure 2. Dummy lost 50% analyst coverage for 3,450 European listed companies, divided by company size – sample group A.

Second, when we look at the variable change, another interesting conclusion can be made. For large and mid-cap companies, this variable shows a positive mean over the total sample period. In contrast, this mean is negative for the small cap companies. This indicates that the smaller companies were experiencing the largest decrease in analyst coverage. Figure 2 shows the developments of the dummy variable loss 50% coverage over the sample period. What directly can be seen is the increase in percentage of small companies that lost 50% coverage. In 2016, more than 30% of small companies lost 50% or more of their coverage compared to 2015. This increased to more than 45% in 2018, the year the MiFID II started being fully effective. Another remarkable observation is found when we take a closer look at the medium and large companies. According to Figure 2, larger companies were experiencing less loss of coverage than the medium and small size companies. This observation is in line with the results of the literature review by both professionals and academics. The effect of decreasing analysts tends to be larger for small companies because of the decreasing interest. Furthermore, it can be observed that the liquidity indicators are larger for larger companies than for the smaller companies. For example, when we look at volume traded, the average amount of stocks that a small size company was trading is 6.93. When we compare this to larger companies, this is 32.3% higher (9.17). The other indicator for liquidity is the effective spread. This variable is on

average 0.0052 for the total sample group, and when divided by company size, the same pattern exists. Smaller companies were experiencing a higher effective spread which indicates a lesser liquidity of the stocks. Lastly, the control variables are all well-constructed and do not show inexplicable outliers.

Table 4. Summary statistics of quarterly firm control variables – sample group A and sample group B.

SAMPLE A	Observations	Mean	Standard Deviation	Min.	Max.
Market Capitalisation	47,160	1,526,178	2,963,487	9139	1.17E+07
Return on Asset	47,628	0.4785998	15.04371	-44.29	19.12
Debt-to-Equity Ratio	47,596	62.57112	71.34445	0	265.14
Return on Stock	51,441	0.0024841	0.1651648	-0.3087819	0.3539898
Bid-Ask Spread	37,522	0.1050595	0.1608661	0	0.61
Volume Traded	51,897	2,4012.6	47567.94	20.3	184794.3
SAMPLE B					
Market Capitalisation	8,228	52,816.33	50,677.25	9139	5.14E+05
Return on Asset	8,110	-2.598445	15.94447	-44.29	19.12
Debt-to-Equity Ratio	8,146	57.89011	72.57325	0	265.14
Return on Stock	9,053	-0.0105574	0.1754224	-0.3087819	0.3539898
Bid-Ask Spread	6,553	0.1017198	0.1506972	0	0.61
Volume Traded	9,063	7,315.153	23660.06	20.3	184794.3

This table presents the control variables from the companies in the sample groups A and B from 2015 Q1 – 2019 Q1. The variables market capitalisation, return on asset, debt-to-equity ratio, return on stock, bid-ask spread, and volume traded were winsorised by 5% – 95%.

Table 5. Summary statistics of dependent variables on quarterly basis by total sample group and by company size – sample group A.

SAMPLE A	Observations	Mean	Standard Deviation	Min.	Max.
Change Analysts Coverage	60,180	-.0242761	.3726509	-1	1
Logarithmic Absolute Analyst Coverage	49,191	1.260815	1.063168	0	3.091043
Dummy Lost 50% Analyst Coverage	60,180	.0675307	.250941	0	1
Effective Spread	37,378	.005251	.0703414	-.16	.2
Volume Traded	51,865	7.788477	2.615366	3.034953	12.12701
SAMPLE A small cap					
Change Analysts Coverage	19,431	-.1017674	.4181705	-1	1
Logarithmic Absolute Analyst Coverage	13,579	.2967508	.4434551	0	1.94591
Dummy Lost 50% Analyst Coverage	19,431	.1121919	.3156105	0	1
Effective Spread	12,013	.0069581	.0633979	-.16	.2
Volume Traded	16,864	6.924556	2.35794	3.034953	12.12701
SAMPLE A mid-cap					
Change Analysts Coverage	19,431	.0272978	.3882046	-1	1
Logarithmic Absolute Analyst Coverage	16,321	.9352343	.6839765	0	3.091043
Dummy Lost 50% Analyst Coverage	19,431	.0642273	.2451637	0	1
Effective Spread	11,785	.0060359	.0777785	-.16	.2
Volume Traded	16.580	7.2727	2.315307	3.034953	12.12701
SAMPLE A large cap.					
Change Analysts Coverage	19,431	.0064333	.2834665	-1	1
Logarithmic Absolute Analyst Coverage	18,263	2.29351	.7480105	0	3.091043
Dummy Lost 50% Analyst Coverage	19,431	.0240852	.1533178	0	1
Effective Spread	12,519	.0028864	.0708778	-.16	.2
Volume Traded	17,472	9.166591	2.57512	3.034953	12.12701

This table presents the dependent variables of the companies in the sample group A. from 2015 Q1 – 2019 Q1. Moreover, the differences between the variables for the company sizes can be observed. The variables effective spread and volume traded are winsorised by 5% - 95%. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it is followed.

4. Methodology

This chapter presents the methodologies used. The hypotheses were tested in three phases, and the empirical part of this thesis is therefore also divided in three parts. The first part tested whether MiFID II had an effect on analyst coverage of European listed companies. Next, the effect of analyst coverage was empirically tested on market liquidities during the implementation period of the MiFID II. Lastly, the effect of change in analyst coverage by MiFID II on the stock market efficiency was evaluated.

4.1. The effect of MiFID II on analyst coverage

As widely discussed by the literature and presented in the data, there seems to be a relation between the implementation of the MiFID II in 2018 and the number of analysts that were covering European listed companies. In the literature review, the effects of different variables on analyst coverage were discussed. For the first part of this thesis, the model of Fang, Hope, Huang and Moldovan (2019) was used as the basis of the regressions. This model tests the effect of the three different analyst coverage indicators for the dummy variables MiFID2016, MiFID2017, and MiFID2018. These dummies were set to 1 for the year they represent and otherwise 0. In addition, control variables were added to the regressions. In testing the overall effect of MiFID II on analyst coverage, a yearly time frame from 2015 – 2018 was used. In order to control for specific time effects, they were added to the model as fixed effects. First, the overall effect of MiFID II on analyst coverage was tested. Second, the effects for different company sizes were empirically tested. For every company size class, the same analyses were made. The following formula represents the basis of the above described models:

(2)

$$\text{Analyst Coverage Indicator} = \beta 1\ \text{MiFID2016} + \beta 2\ \text{MiFID2017} + \beta 3\ \text{MiFID2018} + \beta 4\ \text{LnMarketCap} + \beta 5\ \text{ROA} + \beta 6\ \text{DTE} + \beta 7\ \text{StockReturn} + \beta 8\ \text{BASpread} + \beta 9\ \text{VolumeTraded} + \text{Year FE} + \varepsilon$$

4.2. The effect of analyst coverage on the stock market liquidity

First, the methodology behind the empirical test showing the relation between analyst coverage and the liquidity of the market is presented. The indicators for the market liquidity are volume traded and effective spread. These variables were therefore used as dependent variables in the regression. In this model, the effects were tested on a quarterly basis. The liquidity variables were regressed with the MiFID time dummies to see if this held any relations. Again, the FE models were used to correct for time and firm-specific unobserved heterogeneity. This gave the regression models (3) and (4).

(3)

Analyst Coverage Indicator $= \beta 1$ MiFID2016 + $\beta 2$ MiFID2017 + $\beta 3$ MiFID2018 + $\beta 4$ LnMarketCap + $\beta 5$ ROA + $\beta 6$ DTE + $\beta 7$ StockReturn + $\beta 8$ BASpread + $\beta 9$ VolumeTraded + Year FE + ε

(4)

Liquidity Indicators = $\beta 1$ MiFID2016 + $\beta 2$ MiFID2017 + $\beta 3$ MiFID2018 + $\beta 4$ LnMarketCap + $\beta 5$ ROA + $\beta 6$ DTE + $\beta 7$ StockReturn + $\beta 8$ BASpread + $\beta 9$ VolumeTraded + Year FE + ε

Subsequently, the four variables testing the effect of analyst coverage on market liquidity were implemented into the models. The effect of these variables was tested separately on the dependent variables. This was also done for different company sizes within the sample. With all the tests, the control variables were added to the regressions. Moreover, the combined effect of analyst coverage over time on the market liquidity indicators was also tested by adding the interaction terms to the regressions. Because of the large representation of companies listed in the UK in the sample group, the regressions were also performed without these companies. By doing this, it can be seen whether the results can be interpreted the same for every country in the EU. Models (5) and (6) were used as the basis for these regressions:

(5)

Liquidity Indicators = $\beta 1$ analyst coverage indicators + $\beta 2$ LnMarketCap + $\beta 3$ ROA + $\beta 4$ DTE + $\beta 5$ StockReturn + $\beta 6$ BASpread + $\beta 7$ VolumeTraded + Year FE + ε

(6)

Liquidity Indicators = $\beta 1$ Analyst Coverage Indicator * 2018 + $\beta 2$ Analyst Coverage Indicator * 2017 + $\beta 3$ Analyst Coverage Indicator * 2016 + $\beta 4$ LnMarketCap + $\beta 5$ ROA + $\beta 6$ DTE + $\beta 7$ StockReturn + $\beta 8$ BASpread + $\beta 9$ VolumeTraded + Year FE + ε

Next, the difference in market liquidity between the moment before and after companies lost 50% of their coverage was tested by matching the first quarter when a company experienced coverage loss with the same quarter as the liquidity indicators. This moment is indicated as time zero ($t = 0$) for every company. Thereafter, the statistical difference in liquidity between the four quarters before (-4q) and after (+4q) moment $t = 0$ were tested. The difference between the two groups in time was calculated with t-tests, and the whole year before coverage termination was taken as benchmark. Ellul and Panayides (2016) used this method to test the same relations in a different time frame.

4.3. The effect of a decrease in analyst coverage by MiFID II on the stock market efficiency

Next, the statistical calculations and above presented models were tested on a different sample group. The sample group B included companies which were not predicted to be unfollowed but were unfollowed. As was expected, the weakly performing companies were unfollowed and the well-performing were not. The sample group B only holds companies that were unfollowed due to reasons other than performance. As noted before, MiFID II is decreasing analyst coverage; this could be an explanation for the companies that were left in the sample group. Presuming this, the effect of the coverage loss on the market liquidity is due to the decrease in coverage. This reasoning has already been used by Ellul and Panayides in 2016. Furthermore, the t-tests showing the difference in the first time a company loses 50% coverage were also performed.

4.4. Robustness tests

To test the robustness of the data, several tests were performed on the data of companies in sample group A. This thesis shows the change of variables on analyst coverage indicators and liquidity indicators over time. In order to analyse this properly, FE models were used in the estimations. With FE models, the relationship between predictor and outcome variables may be explored. In this thesis, it is assumed that the 3,540 individual companies influence the variables analyst coverage indicators and liquidity indicators separately. By using the FE models, time-invariant characteristics are controlled and the net effect is therefore best observable. All the companies over time can separately have an effect on the tested variables. Moreover, the companies' error terms and constants should not be correlated to other companies. The Hausman test shows whether a random effect or FE best explains the relations in the data. This method tested whether the unique errors in the model were correlated to the regressors. Because of a lower probability than 0.05 in rejecting the null hypotheses, it was clear that a FE model was the best to use (Baum, 2006). Also, a testparm test was run to determine whether time-fixed effects should be added. The results indicated that the null hypothesis should be rejected and therefore time-fixed variables should be added to the model. In most of the regression analyses in this thesis, time-fixed effects were corrected by adding year dummies to the model (Baum, 2006). Next, the modified Wald tested for heteroscedasticity present in the data. After running this test, it was clear that heteroscedasticity was observed. For this reason, all the regressions were performed with robust standard errors (Hoechle, 2007). The next chapter presents the results of the analyses performed and elaborates on the interpretation of the results.

5. Results

In order to answer the research question proposed in chapter 1, different hypotheses were developed and several empirical techniques were used. Chapter 5 elaborates on the empirical results which support the conclusion to the research question. As presented in the methodology, the empirical part can be divided in three parts. Section 5.1 explains the effect the MiFID II on the analyst coverage of European listed companies. Section 5.2. shows the effect of analyst coverage on market liquidity indicators and connects this to MiFID II. In section 5.3, a different sample group was used to test the effects on market liquidity of companies that were performing properly and were therefore unfollowed for reasons other than performance. By performing these analyses, a different approach in testing the effect on analyst coverage and the effects on the market liquidity was conducted. Combined, the results in the three parts supports an answer to the main question: *Is the MiFID II producing unintended consequences for European listed companies by lowering market liquidity due to decreasing analyst coverage?*

5.1. The effect of MiFID II on decreases in analyst coverage

The first regression analyse is presented in Table 6. This table shows the results from the FE panel data regressions on analyst coverage from 2016 – 2018. Several interesting results are presented in this table. Starting with the variable change analyst coverage, all three indicators for time show a negative relation which increases significantly over time. With exception of the year 2018, the same significant negative relation holds for the logarithmic absolute analyst coverage variable and time. This effect also increased in the years 2016 and 2017 but does not show an negative relation in 2018. In contrast, a positive relation was found between analyst coverage and the year 2018. However, this relation was not found to be significant, in contrast to all other outcomes. The last variable showing the effect of MiFID II on analyst coverage is the dummy loss 50% analyst coverage. This variable shows the percentage of companies which lost more than 50% of their analyst coverage. As the results suggest, there is a positive relation found between this variable and the years of MiFID II. This indicates that more companies over time have experienced more than 50% loss in analyst coverage compared to the first quarter in 2015 or the first time they had analyst coverage. This effect is the strongest in 2017. Moreover, the results for this variable are all highly significant. Overall, this table shows a clear negative relations between the MiFID II years and analyst coverage. Furthermore, this relation seems to be the strongest in 2017 and 2018.

Academics have already presented a negative relation between analyst coverage and MiFID II years, but have not presented the separate effects for each year. The variable change analyst coverage (compared to max coverage 2015) shows that the effect is getting larger over time but does not

indicate for which companies this effect is the largest.

Table 7 presents the effect of MiFID II on analyst coverage for different company sizes. Similar variables presented in Table 6 were used to test the relations but a difference in the effect on company sizes was found. Table 7 shows a clear negative relation between analyst coverage for small cap companies. Logarithmic absolute analyst coverage and change analyst coverage both signalled a negative relation. Both the effect on change analyst coverage and absolute analyst coverage showed the highest significant negative relation in 2017. Furthermore, these relations were all found to be significant with exception of 2018 for absolute analyst coverage. This negative relation between analyst coverage and MiFID II years can also be observed in the dummy variable loss 50% coverage. Here, only a positive relation was found, indicating that there are more companies experiencing more than 50% coverage loss. From these results, it is clear that during the MiFID II years, a negative relation between small cap companies and analyst coverage was present. Table 6 also shows this relation for the complete sample group.

For the mid-cap companies, mostly positive relations between the MiFID years and analyst coverage are presented. This shows that there is a reverse relation for mid-cap companies compared to small cap companies. Moreover, this positive relationship is the most significant for absolute analyst coverage and change analyst coverage in 2017 and 2018. These are the years for which the negative relation is the most significant for small cap companies. The dummy variables show a weaker but significant positive relation for mid-cap companies.

Lastly, the effect for large cap companies is presented in Table 7. A less obvious relation can be observed for this size class, with the exception of 2018. In this year, both absolute analyst coverage and change analyst coverage hold a negative relation. Especially for the variable change analyst coverage, there is a remarkable change in the coefficient; the relation changes from significantly positive (2016 and 2017) to negative (2018). The dummy variable also shows an increase in companies that lost 50% of their coverage over time. In contrast, for small cap companies the effect is the largest in 2017. For the large cap companies, the decrease in analyst coverage starts later but is also observable. For mid-cap companies, this trend is not seen; these companies mostly hold a positive relation over the MiFID II implementation period.

Table 6. The effect of MiFID II implementation years on analyst coverage indicators – sample group A.

VARIABLES	Change Analyst Coverage	Logarithmic Absolute Analyst Coverage	Dummy Loss 50% Analyst Coverage
SAMPLE A	Total	Total	Total
2016	-0.0118	-0.00913	0.110***
	(0.00731)	(0.00693)	(0.00762)
2017	-0.0355***	-0.0132	0.179***
	(0.00962)	(0.0101)	(0.00927)
2018	-0.0539***	-0.000807	0.199***
	(0.0110)	(0.0124)	(0.0105)
Firm Control Variables	YES	YES	YES
Time-Fixed Effects	NO	NO	NO
Observations	10,166	9,192	10,166
Number of Firms	3,008	2,945	3,008
R_2	0.016	0.008	0.083

In this table, the regression outcomes of model 2 are reported. As dependent variables, indicators for analyst coverage were used. The following variables function as indicators: change analyst coverage, logarithmic absolute analyst coverage, and dummy loss 50% analyst coverage. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity . Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverage shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when it is in the indicated year. The included firm control variables are presented in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 7: The effect of MiFID II implementation years on analyst coverage indicators divided by company size – sample group A.

VARIABLES	Logarithmic Absolute Analyst Coverage			Change Analyst Coverage			Dummy Loss 50% Analyst Coverage		
SAMPLE A	Small cap	Mid-cap	Large cap	Small cap	Mid-cap	Large cap	Small cap.	Mid-cap	Large cap
2016	-0.0482***	-0.011	0.00303	-0.0835***	0.0152	0.0267***	0.194***	0.127***	0.0321***
	(0.0176)	(0.0169)	(0.00955)	(0.0178)	(0.015)	(0.0087)	(0.0185)	(0.0161)	(0.00822)
2017	-0.0853***	0.00835	-0.0305***	-0.160***	0.0493***	0.0293***	0.292***	0.193***	0.0597***
	(0.0181)	(0.0171)	(0.00987)	(0.0177)	(0.015)	(0.00876)	(0.0185)	(0.0161)	(0.00825)
2018	-0.0105	0.0527***	-0.0107	-0.145***	0.0466***	-0.00664	0.274***	0.204***	0.0714***
	(0.0189)	(0.0173)	(0.0106)	(0.0184)	(0.0151)	(0.00919)	(0.0193)	(0.0161)	(0.00861)
Firm Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time-Fixed Effects	NO	NO	NO	NO	NO	NO	NO	NO	NO
Observations	2,297	3,090	3,805	2,944	3,343	3,879	2,944	3,343	3,879
Number of Firms	888	979	1,078	936	991	1,081	936	991	1,081
R_2	0.019	0.00406	0.0259	0.0567	0.00993	0.0191	0.142	0.0881	0.0336

In this table, the regression outcomes of model 2 are reported. As dependent variables, indicators for analyst coverage were used. The following variables function as indicators: change analyst coverage, logarithmic absolute analyst coverage, and dummy loss 50% analyst coverage. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity . Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverage shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when it is in the indicated year. The included firm control variables are presented in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

5.2. The effect of decreases in analyst coverage on the stock market efficiency

In the previous part, the negative relation between analyst coverage and years during the MiFID II was presented. Smaller companies have been suffering the most from the newly implemented regulation. Section 5.2 provides the results on the relation between analyst coverage and market liquidity indicators. As discussed in chapter 4, volume traded and effective spread were used as indicators for liquidity. In order to correct for heteroscedasticity and correlated standard errors, all the presented regressions were performed with year fixed effects and with robust standard errors. Furthermore, firm control variables were added to the regressions to account for large differences in performance between companies.

The first analyses tested the overall relationship between the market liquidity indicators and analyst coverage. The variables absolute analyst coverage, change analyst coverage, and dummy loss 50% analyst coverage were used to test for analyst coverage.

In Table 8, several relations can be observed. Starting with absolute analyst coverage and change analyst coverage, these variables hold negative relations with the effective spread and positive relations with trading volume. With exception of the logarithmic absolute analyst coverage on effective spread, all the estimations are significant at the 10% level. The dummy loss 50% analyst coverage also holds the expected relation with the market liquidity indicators. The relation between dummy loss 50% analyst coverage and volume traded is also highly significant. Thus analyst coverage has had an impact on market liquidity for the years that MiFID II has been implemented. Next, this relation was tested empirically, and the impact on company size was also accounted for. Furthermore, the same relation wass proofed by testing the equality in means of the effective spread and volume traded when a company loses 50% or more of its coverage.

In Tables 9 and 10, the different effects of analyst coverage on market liquidity for various company sizes are presented. Previous results have shown that analyst coverage loss appears to be the largest for small and large cap companies. Besides, according to the results in Table 8, the relation between analyst coverage and market liquidity is positive. The relation is constructed by the negative relation between analyst coverage and effective spread and the positive relation with volume traded. The effect of analyst coverage loss on the market liquidity is therefore positive. The more coverage that is lost, the less efficiently the market functions.

In Table 9, the relation between the effective spread and analyst coverage for different company sizes are shown. The relation between change analyst coverage and the effective spread is as expected. Furthermore, a significant relation can be observed for the effect on large cap companies for this variable. For the other variables, dummy loss 50% analyst coverage and logarithmic absolute analyst coverage, the same significance is found with the a psotive and negative relation. It therefore can be concluded that analyst coverage has had a negative effect on the market liquidly for large cap

companies during MiFID II. When the other company sizes are observed, less obvious relations are present. Small cap. companies hold a negative relation with dummy loss 50% analyst coverage and a positive relation with logarithmic absolute analyst coverage. For the mid-cap company size, the relation between change analyst coverage and absolute analyst coverage signals a negative relation. Regarding these results, the most clear relation is between larger companies and the effect on market liquidity by analyst coverage. There is a significant negative relation between analyst coverage and the effect spread during the MiFID II.

Table 10 shows the results of the relation between analyst coverage and volume traded during MiFID II. Directly observable is the positive relation between change analyst coverage and absolute analyst coverage on volume traded and the negative relation between the dummy variable and volume traded. In contrast to what has been presented before, the largest significant effect on volume traded of mid-cap companies is by change analyst coverage and absolute analyst coverage. It was expected that the largest effects would be visible for small and large cap companies. These results are not present in the relation with change analyst coverage and absolute analyst coverage. However, this relation is seen in the regression with the dummy variables. The dummy loss 50% analyst coverage holds a negative relation with all company sizes but is larger and more significant for small and large cap companies. There is a positive relation observed across all company sizes between analyst coverage and volume traded. This indicates that more analyst coverage positively affected the volume traded during the MiFID II. As described in section 5.1, there is a negative relation between analyst coverage and the MiFID II. The next regressions tested changes in analyst coverage and different years during MiFID II. Table 11 shows both the effect of change in analyst coverage and MiFID II years on the total sample group and on the different sub-sample groups dived by company size for both the liquidity indictors. Starting with the effects on the total sample group for the effective spread, the results indicate that for the interaction terms change analyst coverage * 2018, change analyst coverage * 2017, and change analyst coverage * 2016, mostly the expected relation is found. The interaction term for 2018 shows the strongest negative relation between change in analyst coverage and the effective spread for the total sample. This relation also is highly significant. The interaction term change analyst coverage * 2017 also shows a negative significant relation with effective spread. For analyst coverage * 2016, a positive relation is observed; this could mean that the negative effect starts showing in 2017. In line with this finding is the fact that the negative effects on effective spread are increasing over time for the total sample group.

These effects were also tested for different company sizes and similar results were found. For the small cap companies, the same negative relation is present in the interaction terms change analyst coverage * 2018 and change analyst coverage * 2017. Moreover, the negative relation between change analyst coverage * 2018 and effective spread is found to be significant at the 10% level. Again, the variable change analyst coverage * 2016 shows a positive relation with the effective spread. For the mid-cap companies, the same relations are present but with different significances. For

the larger companies, all the interaction terms show a negative relation with the indicator for market liquidity. The largest negative relation is found in the interaction term change analyst coverage * 2018 and appears to be significant at the 5% level. Previously, it was argued that larger effects would be expected for small and larger companies, and these regressions are indeed indicating these results. A negative relation is observed between change in analyst coverage and effective spread during the MiFID II years. In addition, this effect is significant and is larger for the small and large cap companies in the 2018.

These regressions were also performed with the other variable indicating market liquidity, volume traded. All the coefficients of the interaction terms have a positive relation with the dependent variable. The largest positive effect is observable in the interaction term change analyst coverage * 2018. Moreover, this relation is also found to be significant at the 5% level. The coefficients of the other interaction terms are also significant but on a 10% level. This shows that analyst coverage is positively related to volume traded, and that this is especially significant in the year 2018. Next, the same regressions were performed on the sample groups divided by company size. Again, all the interaction terms show a positive relation between the tested variables. Furthermore, the coefficients for the small cap companies are the lowest and the least significant. The mid-cap companies show a strong significant positive effect over the tested MiFID II years. The effective spread of the mid-cap companies was not affected by the analyst coverage in the MiFID II year. In contrast, the volume traded was affected during this period by analyst coverage. The largest effect is present in the large cap companies. Again, the effect is highly significant with the interaction term change analyst coverage * 2018. For all the company sizes, an increased positive effect was found over time. This shows again that the closer in time to the implementation date of the MiFID II, the more the effects of this regulation are observable. To conclude, the regression with the interaction terms on the market liquidity indicators show that there is a positive relation between analyst coverage and market liquidity. This effect appears to be more present in the years close to and during the MiFID II implementation date. Over time, the effect on the market liquidity was stronger, and the results became more significant. The regression with the interaction terms constructed with logarithmic absolute analyst coverage and dummy loss 50% analyst coverage can be found in the appendix in Tables 16 and 17.

Next, the equality in means of the effective spread and volume traded were tested when a company lost more than 50% of their analyst coverage for the first time. It is clear that there were negative effects of the implementation of the MiFID II on analyst coverage and on the efficiencies of the market. These t-test show the effect on market liquidity when a company loses 50% of their analyst coverage. First, the results of the effective spread are analysed. Before a company loses 50% of analyst coverage, the mean effective spread is 0.0069. When a coverage loss of 50% is observed, the mean effective spread of the companies increases to 0.0093. The higher the effective spread, the less efficiently the market functions. This means that an increase in effective spread is observed when

coverage loss appears. An equal variance tailed t-test was performed to test the equality of the means. The probability that the mean effective spread is larger after companies lost 50% analyst coverage is 0.9268. These results show again that analyst coverage has an important impact on the effective spread. The same analyses were performed for the mean volume traded of companies. Before companies lost 50% of their analyst coverage, the mean volume traded was 1.915, and this decreased to 1.907 after companies lost coverage. This result shows that there is less trading after companies lose their coverage. The probability that the mean volume traded is less after companies lose their analyst coverage is 0.8632. These results again show a decrease in market liquidity after a loss in analyst coverage during the MiFID II years.

It can be concluded that there is a negative relation between analyst coverage and the efficiencies of the market. Moreover, during the implementation of MiFID II, analyst coverage decreased significantly and market liquidity shows significant relations with this trend. Especially in the year 2018, a significant effect on market liquidity by analyst coverage is observable.

Table 8. The effect of analyst coverage on effective spread and volume traded during the MiFID II implementation period – sample group A.

VARIABLES	Effective Spread			Volume Traded		
SAMPLE A	Total	Total	Total	Total	Total	Total
Logarithmic Absolute Analyst Coverage	-0.00373			0.0214***		
	(0.00238)			(0.00432)		
Change Analyst Coverage		-0.00456**			0.0126***	
		(0.00192)			(0.00412)	
Dummy Loss 50% Analyst Coverage			0.00100			-0.0109***
			(0.00189)			(0.00352)
Firm Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	26,877	29,714	29,714	26,880	29,717	29,717
Number of Firms	3,223	3,291	3,291	3,222	3,290	3,290
R_2	0.002	0.002	0.002	0.026	0.030	0.030

In this table, the regression outcomes of model 5 are reported. As dependent variables, indicators for market liquidity have been used. The following variables function as indicators*:* effective spread and volume traded. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables have been implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the amount of analyst covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 9. The effect of analyst coverage on effective spread during the MiFID II implementation period divided by company size – sample group A.

VARIABLES	Effective Spread			Effective Spread			Effective Spread		
SAMPLE A	Small cap	Mid-cap	Large cap	Small cap	Mid-cap	Large cap	Small cap	Mid-cap	Large cap
Logarithmic Absolute Analyst Coverage	0.000239	-0.00313	-0.00864*						
	(0.00334)	(0.00383)	(0.00522)						
Change Analyst Coverage				-0.00265	-0.00399	-0.0109**			
				(0.00222)	(0.00358)	(0.00537)			
Dummy Loss 50% Analyst Coverage							9.95e-05	-0.000468	0.0110*
							(0.00234)	(0.00336)	(0.00603)
Firm Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,000	9,081	10,796	8,910	9,798	11,006	8,910	9,798	11,006
Number of Firms	1,014	1,083	1,126	1,069	1,095	1,127	1,069	1,095	1,127
R_2	0.007	0.002	0.003	0.005	0.002	0.003	0.005	0.002	0.003

In this table, the regression outcomes of model 5 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5%, and 10% is shown by the following signs: ***, **, *.

Table 10. The effect of analyst coverage on volume traded during the MiFID II implementation period divided by company size – sample group A.

VARIABLES	Volume Traded			Volume Traded			Volume Traded		
SAMPLE A	Small cap	Mid-cap	Large cap	Small cap	Mid-cap	Large cap	Small cap	Mid-cap	Large cap
Logarithmic Absolute Analyst Coverage	0.00866	0.0151***	0.00901**						
	(0.00715)	(0.00471)	(0.00443)						
Change Analyst Coverage				0.00296	0.0167***	0.00685			
				(0.00539)	(0.00440)	(0.00518)			
Dummy Loss 50% Analyst Coverage							-0.0136***	-0.00319	-0.0110*
							(0.00415)	(0.00420)	(0.00570)
Firm Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	6,981	9,068	10,795	8,879	9,782	11,002	8,879	9,782	11,002
Number of Firms	1,011	1,082	1,126	1,066	1,094	1,127	1,066	1,094	1,127
R_2	0.142	0.155	0.286	0.158	0.170	0.309	0.159	0.168	0.310

In this table, the regression outcomes of model 5 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it is followed. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 11. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group A.

VARIABLES	Effective spread				Volume Traded			
SAMPLE A	Total	Small cap	Mid-cap	Large cap	Total	Small cap	Mid-cap	Large cap
Change Analyst Coverage * 2018	-0.00713***	-0.00552*	-0.00426	-0.0176***	0.0187***	0.0181*	0.0281***	0.0310***
	(0.00231)	(0.00322)	(0.00412)	(0.00568)	(0.00519)	(0.00927)	(0.00736)	(0.0103)
Change Analyst Coverage * 2017	-0.00515**	-0.00304	-0.00695	-0.00595	0.00845*	0.00215	0.0247***	0.0226**
	(0.00244)	(0.00283)	(0.00437)	(0.00693)	(0.00464)	(0.00838)	(0.00632)	(0.00941)
Change Analyst Coverage * 2016	0.00123	0.00180	0.00343	-0.00718	0.0107**	0.00385	0.0240***	0.00610
	(0.00271)	(0.00350)	(0.00470)	(0.00770)	(0.00539)	(0.00876)	(0.00866)	(0.00963)
Firm Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	29,714	8,910	9,798	11,006	29,717	8,914	9,796	11,007
Number of Firms	3,291	1,069	1,095	1,127	3,290	1,069	1,094	1,127
R_2	0.002	0.006	0.002	0.003	0.030	0.056	0.040	0.024

In this table, the regression outcomes of model 6 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction term change analyst coverage * 2018/2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 12. T-test for the equality of the means of effective spread and volume traded after a loss of 50% of analyst coverage during the MiFID II implementation period – sample group A.

	Group Statistics				T-test for Equality Means (A-B)			
Effective Spread	Observations	Mean	Standard Error	Standard Deviation	*t*	*df*	*Pr(T < t)*	*Pr(T > t)*
Before 50% Coverage Loss (A)	3,165	0.0069	0.00128	0.0724	-1.4523	7757	0.0732	0.9268
After 50% Coverage Loss (B)	4,594	0.0093	0.00105	0.0717				
Combined	7,759	0.0084	0.00082	0.0719				
Volume Traded					*t*	*df*	*Pr(T < t)*	*Pr(T > t)*
Before 50% Coverage Loss (A)	4,405	1.915	0.0053	0.3564	1.0948	10405	0.8632	0.1368
After 50% Coverage Loss (B)	6,002	1.907	0.0048	0.3729				
Combined	10,407	1.911	0.0035	0.366				

This table presents the t-test results for the difference between the periods before and after loss of more than 50% of analyst coverage for sample A. The t-tests were performed for the variables effective spread and volume traded. The difference is shown between the two groups: before 50% coverage loss (A) and after 50% coverage loss (B). This analysis calculates the statistical difference of two groups with equal variances.

5.3. The effect of decreases in analyst coverage by MiFID II on the stock market efficiency

Section 5.3 elaborates on the regression results performed with a different sample group. As discussed in the methodology, only the companies that were not expected to be losing more than 50% were included in this sample group. This regression tries to filter for companies that lost coverage due to weak performance. After running this probit regression and eliminating companies that were supposed to be unfollowed, 1,382 companies remained in the sample group, with 628 companies considered small cap and 754 considered mid-cap.

The same regressions were executed as in the previous section but with a sample that might better explain the effect of MiFID II on analyst coverage and market liquidity.

The first estimations discussed are presented in Table 13. Here, the regressions with logarithmic absolute analyst coverage, change analyst coverage, and dummy loss 50% analyst coverage on the effective spread and volume traded are shown. The results are in line with the outcomes presented in section 5.2. With this different sample group, the same relations hold, emphasising that a decrease in analyst coverage has had a negative consequences for market liquidity during the MiFID II period. Moreover, logarithmic absolute analyst coverage and change analyst coverage hold a negative relation with effective spread and a positive relation with volume traded. For the variable change analyst coverage, these relations appear to be significant too. Furthermore, the relation between analyst coverage and volume traded are all significant and in the same direction as found before. It can be again concluded that less analyst coverage has a negative impact on effective spread and volume traded. These effects were also tested on the different size companies. Following the same regression method as previously used in section 5.2, more results can be found in the appendix in Tables 25 and 26.

Table 14 shows the relations between the interaction terms and the effect on the market liquidity indicators. (This method was discussed in section 5.2. and in the methodology.) This sample group focused on the endogenous effect of the MiFID II on a company's analyst coverage. Combining this with the interaction terms, indicating the effect of analysts' coverage in specific years, should give the best interpretation of the effect of MiFID II on the market efficiencies. Starting with the overall effects of the interaction terms on effective spread and volume traded, the variables change analyst coverage * 2018 and change analyst coverage * 2017 have negative and significant relations with the effective spread. The largest negative effect is found between change analyst coverage * 2017 and effective spread. This indicates that over time, the negative effect on the market liquidity became larger but was the largest in 2017. The variable change analyst coverage * 2016 holds a positive relation with the effective spread, which shows that the negative effect starts in 2017. This relation was also tested for the different company sizes. As previously discussed, it was expected that the largest negative relation would be found in the smaller cap companies. Looking at the results, the largest negative relation is found in the smaller cap companies with the variable change analyst

coverage * 2017.

Furthermore, these estimations were also performed with volume traded as a dependent variable. For the total sample, the outcome of the regression between volume traded and the interaction terms is consistent. For all the interaction terms, positive relations were found. These relations are significant and strongest for the interaction term change analyst coverage * 2018. When this effect is estimated for the different company sizes, it becomes clear where the most of these effects originate. Presented in Table 14, there is a strong positive relation between the interaction terms and volume traded for mid-cap companies. As seen before, this relation is increasing over time. For the small cap companies, the relation is less obvious. However, the positive relation between change analyst coverage * 2018 and volume traded is still observable.

Also for this sample group, a t-test for equality of the means was performed. After the decrease in 50% of analyst coverage, an increase in the effective spread and a decrease in volume traded are observable. This shows that market liquidity decreased during the MiFID II when companies lost 50% of their analyst coverage. The results of this estimation are presented in Table 15.

This sample group serves as a test whether the relations found in section 5.2 are also present after filtering for potential exogenous effects on analyst coverage. As already discussed, the three sections conclude the same. Overall, a negative relation was found between the MiFID II years and analyst coverage. This was tested by three variables indicating the analyst coverage over time. The years 2016, 2017, and 2018 all hold negative relations with analyst coverage. Moreover, the strongest effects are seen with the dummy variable 2018, the year when the MiFID II was officially implemented.

In the different section of this chapter, the relations between analyst coverage and effect on the market liquidity is empirically shown. It is clear that a positive relation holds between analysts covering a company and the liquidity a company experiences. Especially with the interaction term change analyst coverage * 2018 and the market liquidity indicators, positive relations were found. Testing the equality of the means after analyst coverage is lost by 50% during the period 2016 – 2018 shows the same results. The effective spread increased and volume traded decreased after companies lost 50% of their analyst coverage.

With the results presented in the three different sections, it can be concluded that the during the MiFID II implementation period, the change in analyst coverage is positively related with the market liquidity. During this period, also a decrease in analyst coverage was observed.

Table 13. The effect of analyst coverage on effective spread and volume traded during the MiFID II implementation period – sample group B.

VARIABLES	Effective Spread			Volume Traded		
SAMPLE B	Total	Total	Total	Total	Total	Total
Logarithmic Absolute Analyst Coverage	-0.00405			0.0174***		
	(0.00318)			(0.00579)		
Change Analyst Coverage		-0.00420*			0.00922*	
		(0.00230)			(0.00497)	
Dummy Loss 50% Analyst Coverage			0.000431			-0.0119***
			(0.00225)			(0.00420)
Firm Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	11,851	13,866	13,866	11,852	13,867	13,867
Number of Firms	1,371	1,382	1,382	1,371	1,382	1,382
R_2	0.003	0.003	0.003	0.044	0.048	0.049

In this table, the regression outcomes of model 5 are reported. As dependent variables, indicators for market liquidity have been used. The following variables function as indicators*:* effective spread and volume traded. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables have been implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the amount of analyst covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group B were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 14. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group B.

VARIABLES	Effective spread			Volume Traded		
SAMPLE B	Total	Small cap.	Mid-cap.	Total	Small cap.	Mid-cap.
Change Analyst Coverage * 2018	-0.00533*	-0.00527	-0.00668	0.0136**	0.0139	0.0253***
	(0.00290)	(0.00338)	(0.00525)	(0.00647)	(0.00887)	(0.00909)
Change Analyst Coverage * 2017	-0.00659**	-0.00198	-0.0124**	0.00550	-0.00260	0.0253***
	(0.00287)	(0.00293)	(0.00547)	(0.00588)	(0.00848)	(0.00779)
Change Analyst Coverage * 2016	0.00317	0.00215	0.00364	0.0106	0.00348	0.0234**
	(0.00319)	(0.00344)	(0.00599)	(0.00682)	(0.00854)	(0.0112)
Frim Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	13,866	7,540	6,316	13,867	7,543	6,314
Number of Firms	1,382	753	628	1,382	753	628
R_2	0.004	0.004	0.004	0.049	0.056	0.050

In this table, the regression outcomes of model 6 are reported. Sample group B was divided by company size into small cap and mid-cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction term change analyst coverage * 2018/2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group B were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 15. T-test for the equality of the means of effective spread and volume traded after a loss of 50% of analyst coverage during the MiFID II implementation period – sample group B.

	Group Statistics				T-test for equality means (A-B)			
Effective Spread	Observations	Mean	Standard Error	Standard Deviation	*t*	*df*	*Pr(T < t)*	*Pr(T > t)*
Before 50% Coverage Loss (A)	1,794	.0074985	.0017583	.0744734	-1.0729	4638	0.1417	0.8583
After 50% Coverage Loss (B)	2,846	.009878	.0013682	.0729889				
Combined	4,640	.008958	.00108	.0735675				
Volume Traded					*t*	*df*	*Pr(T < t)*	*Pr(T > t)*
Before 50% Coverage Loss (A)	2,531	1.865272	.0066903	.3365818	1.0522	6256	0.8536	0.1464
After 50% Coverage Loss (B)	3,727	1.855829	.0058354	.3562471				
Combined	6,258	1.859648	.0044045	.3484309				

This table presents the t-test results for the difference between the periods before and after loss of more than 50% of analyst coverage for sample B. The t-tests were performed for the variables effective spread and volume traded. The difference is shown between the two groups: before 50% coverage loss (A) and after 50% coverage loss (B). This analysis calculates the statistical difference of two groups with equal variances.

6. Discussion

In this section the meaning and interpretations of the previously presented results are discussed. The results will be evaluated in the same way as the structure in section 5.

Starting with the results of the first section of this chapter. As Figure 2 suggests, there seems to be a negative relation between the MiFID II (2016 – 2018) period and the number of analysts covering European listed companies. This relation is in line with what is argued in the literature by professionals and academics (CFA Institute, 2019; Peel Hunt, 2018; Fang, Hope, Huang, & Moldovan, 2019; Guo & Mota, 2019; Lang, Pinto, & Sul, 2019). Furthermore, there seems to be a difference in the effect for different company sizes. After reviewing the regression outcomes in chapter 5, the same conclusions can be made. During the MiFID II years there has been a decrease in analyst coverage. This decrease became stronger over time and is different for company sizes. One may argue that the smaller companies are suffering the most in coverage by the MiFID II implementation (Peel Hunt, 2018; Oliver Wyman. 2017). Others may argue that the large cap companies are experiencing the largest decrease in coverage because there is little room left for analysts following similar companies (Guo & Mota, 2019).

Looking at the results in Table 7, the largest negative effect between analyst coverage and the MiFID years is found for the small cap companies. For all the three indicators for analyst coverage this relation holds and appears to be the largest in 2017. This indicates that this the smaller European listed companies are affected the most. Besides, larger companies are also experiencing a negative effect on analyst coverage during the MiFID II implementation years. The literature already suggested that the effect of the MiFID II might have the most impact on the small and large cap companies. The results in this theses are in line with these conclusions.

The second section test if there are significant relations between the MiFID II years and changes in analysts coverage. The time dummy variables tested represent years in which MiFID II should have had an effect on analyst coverage. The variables testing the effect on analyst coverage are logarithmic absolute analyst coverage, change analyst coverage, and a dummy variable set to 1 if a company loses 50% of their analyst coverage. In line with the presented literature (Fang, Hope, Huang, & Moldovan, 2019; Guo & Mota, 2019; Lang, Pinto, & Sul, 2019; Ellul & Panayides, 2016) a negative relation was expected between the MiFID II years and logarithmic absolute analyst coverage and change analyst coverage. Moreover, a positive relation was expected with dummy loss 50% analyst coverage and the MiFID II years. This would suggest that in the MiFID II years, the amount of analyst coverage has decreased. There is no literature which presents the different yearly effect of analyst coverage between 2016 – 2018. It was therefore not completely clear if the effect on analyst coverage was stronger over time or if companies were already anticipating on the newly implemented regulation. If the latter is true, the effect of MiFID II on analyst coverage could already be visible before the official

implementation date in 2018. As shown in the results, there is different effect observable for the different MiFID II years. Besides, the literature presented in chapter 2 did not expect a clear relationship between company sizes and analyst coverage during MiFID II.

All the outcomes in Table 8 are in line with the expectations based on the literature. For example, the effective spread was expected to hold a negative relation with the variables absolute analyst coverage and change analyst coverage but a negative relation with the dummy variable loss 50% analyst coverage. This relation suggests that a decrease in analyst coverage increases the effective spread. The larger the effective spread, the less efficiently the market functions (PWC, 2015). For volume traded, it was expected that absolute analyst coverage and change analyst coverage hold a positive relation and the dummy variable loss 50% analyst coverage holds a negative relation. This would indicate that the number of analysts following a company has a positive effect on the volume traded for this company. When this relation holds, it would suggest that analyst coverage positively affects the volume traded of a company and therefore market liquidity for this company.

Looking at the results in the Table 8, this can be confirmed. The results also indicate that the analyst coverage indicators have a positive relation with the volume traded.

As discussed in the previous paragraphs, the decrease in analyst coverage is best found for the small and large cap companies. This could indicate that the effect on the market liquidity of these stocks is also the largest. Looking at the results in Table 9 and 10 this cannot completely be confirmed. This relation is not found often for the small cap companies. Which is against the outcomes of the surveys that were conducted (CFA Institute, 2019; Peel Hunt, 2018). However this effect is observable for the large cap companies and is also observable for the mid-cap companies. Table 11 shows the effect of the change in analyst coverage combined with different MiFID II years. As expected, the effect on effective spread and volume traded by this interaction terms becomes stronger over time. Which could mean that MiFID II has an anticipated effect but is the strongest around the official implementation date. For all the different company sizes, the coefficient of the regressions between effective spread and the interaction terms is found the most negative in 2018. With exception of the small cap companies, the same relation holds for the regressions with volume traded, the interaction terms and mid and large cap companies. This might indicate that the first company types that will be economize on are the small cap companies. The effect of the decrease in analyst budget can therefore already be visible before the official MiFID implementation.

Also the outcomes in Table 12 suggest that the market liquidity decreases after the number of analyst decreases. Previous literature (Ellul & Panayides, 2016) has shown the same type of analyses, but with complete coverage loss as indicator. This table shows that a decrease in analyst coverage of 50% has a negative impact on the market liquidity of a company.

The last section of analyses discusses the regression results with another sample group (B). Table 13, 14 and 15 show that the same relations as presented and discussed before. The number of analyst covering a company are positively related to the liquidity indicators. By performing the same

regressions with another sample group, the outcomes will be confirmed. This sample group (B) is filtering for company performance effects and gives a better understanding of the effect of MiFID II. As can be seen in Table 14, the interaction term change analyst coverage * 2018, shows the strongest positive relation between the analyst coverage and liquidity indicators. This section emphasizes the already shown results and is very useful in answering the hypotheses of this thesis.
The next chapter will elaborate on the conclusions, limitations and recommendations for further research.

7. Conclusions, limitations, and recommendations for future research

The last years of the implementation of MiFID II in the financial system have been widely discussed. Academics have written about the regulation and professionals have formed their opinions. Early literature written about the effects of new regulation has shown that unintended consequences are not uncommon. The MiFID I has already shown effects that were not anticipated. This thesis shows the consequences of the unbundling regulation of MiFID II for analysts and market liquidity in the European market. This unbundling regulation forces institutions to lower their spending on analyst coverage because of the lower incomes. Market professionals have suggested that mainly small and mid-cap companies would suffer from this consequence of the regulation by decreasing analyst budgets. In contrast, academics have found the strongest negative effect in larger companies. The true impact has remained unclear, and this thesis therefore tested for the effect empirically.
The answers to the hypotheses form the summary of the results of the discussed empirical methodology. By reviewing the first part of chapter 5 and 6, it can be concluded that MiFID II has a significant negative effect on the number of analysts covering European listed companies (H1 A). Moreover, this effect is the largest in 2018, the year the MiFID II officially came into place (H1 B). Over the years 2016 – 2018, a constant negative effect on analyst coverage can be observed for the smaller companies and is strongest in 2017. When this is compared to middle and large cap companies, a difference can be observed. The mid-cap companies hold a mostly positive relation with the analyst coverage indicators over the years. For the larger companies, a negative effect was sometimes found, but mostly in 2018. Overall, the negative effect for smaller companies was the largest and most significant over time (H1 C). The last hypothesis (H1 D) is rejected. For the small cap companies, the strongest effect appears in 2017, and for larger companies, this is seen in 2018. This might indicate it there is anticipated for the regulation by first decreasing coverage for the small cap companies. After the implementation of the regulation the companies decreased analyst budgets for larger companies.
For the second part of the results, the effects of analyst coverage on market liquidity indicators were tested. The results show that overall, there is a negative relation between the effective spread and analyst coverage (H2 A). For volume traded, this relation was found to be positive and in line with the

expectations (H2 B). Both the hypotheses can be confirmed, showing that a analyst coverage during 2016 – 2018 has a positive relation with the market liquidity in Europe. This effect is also observed for different company sizes and time effects. The largest effect on market liquidity change was observed for the larger companies and is not in line with the expectations. Therefore, hypotheses H2 C and H2 D must be rejected. The effects on effective spread and volume traded over time were tested by the interaction terms. Interpreting these results, it can be concluded that over time the effect on the market by analyst coverage loss increases. This is the most observable for small and large cap companies, and for all the company sizes, the effect was strongest in 2018 (H2 E). Lastly, the same regressions were performed with another sample group that filtered for analyst coverage loss by company-specific effects. The results are mostly in line with what was presented in section 5.2. Overall, the same positive relation between analyst coverage and market liquidity holds. Hypotheses H3 A – D can be confirmed. The results of the regression with the interaction terms show that in the years 2017 and 2018, the effects of the unbundling regulation on market liquidity has started to have negative results.

To conclude, my thesis tries to answer the following main research question: Is the MiFID II producing unintended consequences for European listed companies by lowering market liquidity due to decreasing analyst coverage?

After evaluating the results and the previously presented literature, I conclude that the MiFID II has an unintended consequence for analysts covering European listed companies. In addition, the results also show that during this time, there was a negative effect of the decrease in analyst coverage on market liquidity. Combined with the other results, this indicates that the MiFID II has led to deteriorating market liquidity through a decrease in analysts providing information to the market. The results in this thesis were carefully evaluated and conclusions constructed with thought. The methodology used in this thesis has been proven correct by other academics.

Although the results indicate unintended consequences of the MiFID II implementation, they have to be interpreted with attention. In chapter 3, the composition of the sample groups is discussed. Almost 30% of this sample consists of companies listed on a UK stock exchange. Therefore, the results presented in this thesis are in favour of these companies. For this reason, the regressions were also performed without the UK firms. No remarkably different results were found in these regressions. These regressions can be found in the appendix in Tables 18 – 23. However, five different countries deliver more than 70% of the companies present in the sample group. This fact must be taken into account when discussing the results of this thesis. Another limitation is the relatively low explanatory power of the regressions. Even though the results are mostly significant, the R-squared ranges from 0.2% to more than 5% in the models. The explanatory power of the model by using these variables is not strong, but similar studies have also found these results. Moreover, this indicates that more research should be conducted to explain the relation between the MiFID II regulation, analyst coverage, and market efficiencies.

The conclusions of the regressions with sample group B by company size must also be interpreted with care. By the way sample group B is constructed, it is biased towards small and mid-cap companies. However, the outcomes in section 5.3 are almost entirely in line with the presented literature and results of the regressions in section 5.2.

As Frank and Li described in 2004, more analyst activity ensures less information asymmetry between managers and investors. Given this philosophy, it could be interesting to empirically test whether insider trading has increased or became more profitable after the decrease in analyst coverage by MiFID II. It is clear that during 2016 – 2018, a decrease in analyst coverage can be observed. As the public information that these analysts produce decreases, the value of private information of company insiders could increase. It could be interesting to research whether exploiting this increased information asymmetry is more profitable to insiders after the implementation of the MiFID II.

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Appendix

Appendix Part I – Regressions on sample group A.

Table 16. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group A.

VARIABLES	Effective spread				Volume Traded			
SAMPLE A	Total	Small cap.	Mid-cap.	Large cap.	Total	Small cap.	Mid-cap.	Large cap.
Logarithmic Absolute Analyst Coverage * 2018	0.00310**	0.0102**	-0.00397	0.00183	-0.00591***	0.0180	0.00493	-0.00249
	(0.00139)	(0.00504)	(0.00389)	(0.00369)	(0.00227)	(0.0121)	(0.00677)	(0.00412)
Logarithmic Absolute Analyst Coverage * 2017	0.000315	0.00336	-0.00283	0.00309	-0.0106***	0.00218	0.000367	-0.00380
	(0.00130)	(0.00441)	(0.00365)	(0.00341)	(0.00188)	(0.00930)	(0.00492)	(0.00343)
Logarithmic Absolute Analyst Coverage * 2016	0.00131	-0.00124	-0.000586	0.00174	0.00159	0.00689	0.0107**	0.00355
	(0.00118)	(0.00407)	(0.00319)	(0.00292)	(0.00165)	(0.00836)	(0.00485)	(0.00269)
Frim Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	26,957	7,032	9,114	10,811	26,880	7,002	9,078	10,800
Number of Firms	3,227	1,016	1,085	1,126	3,222	1,014	1,082	1,126
R_2	0.002	0.007	0.002	0.002	0.027	0.045	0.032	0.018

In this table, the regression outcomes of model 6 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction term logarithmic absolute analyst coverage * 2018/2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 17. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group A.

VARIABLES	Effective spread				Volume Traded			
SAMPLE A	Total	Small cap.	Mid-cap.	Large cap.	Total	Small cap.	Mid-cap.	Large cap.
Dummy Loss 50% Analyst Coverage * 2018	0.00247	0.00331	0.00205	0.0151*	-0.0167***	-0.0304***	-0.0158**	-0.0386***
	(0.00248)	(0.00343)	(0.00427)	(0.00790)	(0.00512)	(0.00924)	(0.00796)	(0.0114)
Dummy Loss 50% Analyst Coverage * 2017	0.000795	-0.00329	0.00115	0.00632	-0.00297	-0.0200***	-0.00752	-0.0246**
	(0.00252)	(0.00334)	(0.00465)	(0.00871)	(0.00409)	(0.00700)	(0.00603)	(0.0106)
Dummy Loss 50% Analyst Coverage * 2016	0.000712	0.00215	-0.00105	0.00834	-0.0103**	-0.00526	-0.00672	-0.0178
	(0.00255)	(0.00345)	(0.00461)	(0.00955)	(0.00444)	(0.00693)	(0.00784)	(0.0111)
Frim Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	29,834	8,972	9,841	11,021	29,717	8,914	9,796	11,007
Number of Firms	3,294	1,070	1,097	1,127	3,290	1,069	1,094	1,127
R_2	0.002	0.006	0.002	0.002	0.030	0.058	0.036	0.024

In this table, the regression outcomes of model 6 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction dummy loss 50% analyst coverage * 2018/2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group A were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Appendix Part II - Regressions without U.K. on the sample group A.

Table 18. The effect of analyst coverage on effective spread and volume traded during the MiFID II implementation period – sample group A. without UK.

VARIABLES	Effective Spread			Volume Traded		
SAMPLE A	Total	Total	Total	Total	Total	Total
Logarithmic Absolute Analyst Coverage	-0.00652**			0.0235***		
	(0.00329)			(0.00553)		
Change Analyst Coverage		-0.00652**			0.0135**	
		(0.00260)			(0.00537)	
Dummy Loss 50% Analyst Coverage			0.000373			-0.00986**
			(0.00246)			(0.00432)
Frim Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	19,215	21,472	21,472	19,218	21,474	21,474
Number of Firms	2,269	2,317	2,317	2,268	2,316	2,316
R_2	0.002	0.002	0.002	0.027	0.028	0.028

In this table, the regression outcomes of model 5 are reported. As dependent variables, indicators for market liquidity have been used. The following variables function as indicators*:* effective spread and volume traded. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables have been implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the amount of analyst covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group A without the UK were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 19. The effect of analyst coverage on volume traded during the MiFID II implementation period divided by company size - sample group A. without UK.

VARIABLES	Volume Traded			Volume Traded			Volume Traded		
SAMPLE A	Small cap.	Mid-cap	Large cap.	Small cap.	Mid-cap	Large cap.	Small cap.	Mid-cap.	Large cap.
Logarithmic Absolute Analyst Coverage	0.00342	0.0186***	0.0112**						
	(0.00922)	(0.00544)	(0.00531)						
Change Analyst Coverage				-0.00831	0.0191***	0.0106			
				(0.00706)	(0.00527)	(0.00647)			
Dummy Loss 50% Analyst Coverage							0.00355	-0.00190	-0.0150***
							(0.00522)	(0.00465)	(0.00551)
Frim Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4,855	6,391	7,939	6,383	6,987	8,056	701	751	813
Number of Firms	701	751	813	740	761	813	740	761	813
R_2	0.144	0.189	0.284	0.152	0.199	0.301	0.152	0.196	0.302

In this table, the regression outcomes of model 5 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group A without UK were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5%, and 10% is shown by the following signs: ***, **, *.

Table 20. The effect of analyst coverage on effective spread during the MiFID II implementation period divided by company size - sample group A. without UK

VARIABLES	Effective Spread			Effective Spread			Effective Spread		
SAMPLE A	Small cap.	Mid-cap.	Large cap.	Small cap.	Mid-cap..	Large cap.	Small cap.	Mid-cap.	Large cap.
Logarithmic Absolute Analyst Coverage	-0.000257	-0.00656	-0.0143*						
	(0.00501)	(0.00507)	(0.00738)						
Change Analyst Coverage				-0.00355	-0.00617	-0.0171**			
				(0.00314)	(0.00464)	(0.00754)			
Dummy Loss 50% Analyst Coverage							-0.00123	-0.00246	0.0142**
							(0.00325)	(0.00414)	(0.00715)
Frim Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4,874	6,401	7,940	6,412	7,000	8,060	6,412	7,000	8,060
Number of Firms	704	752	813	742	762	813	742	762	813
R_2	0.005	0.002	0.003	0.004	0.002	0.003	0.004	0.002	0.003

In this table, the regression outcomes of model 5 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group A without UK were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5%, and 10% is shown by the following signs: ***, **, *.

Table 21. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group A. without UK

VARIABLES	Effective spread				Volume Traded			
SAMPLE A	Total	Small cap.	Mid-cap.	Large cap.	Total	Small cap.	Mid-cap.	Large cap.
Change Analyst Coverage * 2018	-0.00856***	-0.00678	-0.00490	-0.0244***	0.0186***	0.0178	0.0279***	0.0332**
	(0.00306)	(0.00435)	(0.00528)	(0.00783)	(0.00655)	(0.0117)	(0.00884)	(0.0135)
Change Analyst Coverage * 2017	-0.00828**	-0.00462	-0.0112**	-0.0109	0.00731	-0.000979	0.0256***	0.0260**
	(0.00326)	(0.00385)	(0.00568)	(0.00968)	(0.00590)	(0.0104)	(0.00759)	(0.0126)
Change Analyst Coverage * 2016	0.000232	0.000717	0.00612	-0.0178	0.0170**	0.00874	0.0294**	0.0102
	(0.00398)	(0.00539)	(0.00646)	(0.0115)	(0.00723)	(0.0118)	(0.0115)	(0.0123)`
Frim Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	21,579	6,472	7,032	8,075	21,474	6,416	6,997	8,061
Number of Firms	2,320	743	764	813	2,316	742	761	813
R_2	0.003	0.007	0.004	0.004	0.034	0.059	0.055	0.033

In this table, the regression outcomes of model 6 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators: effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction change analyst coverage * 2018 /2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group A without UK were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 22. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group A. without UK

VARIABLES	Effective spread				Volume Traded			
SAMPLE A	Total	Small cap.	Mid-cap.	Large cap.	Total	Small cap.	Mid-cap.	Large cap.
Logarithmic Absolute Analyst Coverage * 2018	0.00446**	0.0155**	-0.00429	0.00267	-0.00255	0.0266*	0.00921	-0.000605
	(0.00195)	(0.00707)	(0.00545)	(0.00460)	(0.00277)	(0.0153)	(0.00870)	(0.00467)
Logarithmic Absolute Analyst Coverage * 2017	0.000701	0.00495	-0.00484	0.00484	-0.0105***	0.00119	0.000407	-0.00190
	(0.00181)	(0.00635)	(0.00508)	(0.00439)	(0.00233)	(0.0116)	(0.00615)	(0.00388)
Logarithmic Absolute Analyst Coverage * 2016	0.00181	-0.00289	-0.00147	0.00255	0.00510**	0.00496	0.0159**	0.00505
	(0.00166)	(0.00621)	(0.00455)	(0.00397)	(0.00206)	(0.0111)	(0.00632)	(0.00321)
Frim Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	19,289	4,906	6,428	7,955	19,218	4,876	6,398	7,944
Number of Firms	2,273	706	754	813	2,268	704	751	813
R_2	0.003	0.009	0.003	0.003	0.036	0.052	0.051	0.028

In this table, the regression outcomes of model 6 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction logarithmic absolute analyst coverage * 2018/2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group A without UK were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 23. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group A. without UK

VARIABLES	Effective spread				Volume Traded			
SAMPLE A	Total	Small cap.	Mid-cap.	Large cap.	Total	Small cap.	Mid-cap.	Large cap.
Dummy Loss 50% Analyst Coverage * 2018	0.00289	0.00528	0.00159	0.0170*	-0.0182***	-0.0305***	-0.0156*	-0.0429***
	(0.00323)	(0.00473)	(0.00554)	(0.00931)	(0.00607)	(0.0114)	(0.00941)	(0.0118)
Dummy Loss 50% Analyst Coverage * 2017	0.00140	-0.00375	0.00245	0.00697	-0.00189	-0.0198**	-0.00634	-0.0249**
	(0.00336)	(0.00465)	(0.00611)	(0.0100)	(0.00500)	(0.00859)	(0.00725)	(0.0114)
Dummy Loss 50% Analyst Coverage * 2016	0.00145	0.00302	-0.00185	0.0152	-0.0133**	-0.00778	-0.00508	-0.0184
	(0.00353)	(0.00497)	(0.00617)	(0.0125)	(0.00555)	(0.00881)	(0.00962)	(0.0119)
Frim Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	21,579	6,472	7,032	8,075	21,474	6,416	6,997	8,061
Number of Firms	2,320	743	764	813	2,316	742	761	813
R_2	0.002	0.007	0.003	0.003	0.034	0.061	0.050	0.035

In this table, the regression outcomes of model 6 are reported. Sample group A was divided by company size into small cap, mid-cap, and large cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction dummy loss 50% analyst coverage * 2018/2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group A without UK were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Appendix Part III – Analyses on sample group B.

Table 24: Probit regression of the variable: change analyst coverage

VARIABLES	Change Analyst Coverage					
SAMPLE A	Coefficient	Standard error	Z	P>|Z	95% Confidence interval	
Logarithmic market cap.	0.1715528	0.00453	37.86	0.000	0.1626722	0.1804335
Return on asset	0.0029511	0.000582	-5.07	0.000	-0.004092	-0.00181
Debt-to-equity	0.0000114	0.000104	0.11	0.913	-0.000193	0.0002156
Stock return	0.3019732	0.04595	-6.57	0.000	-0.392038	-0.211908
Bid-ask spread	0.0385606	0.062935	0.61	0.540	-0.084912	0.1620331
Logarithmic volume traded	0.0884401	0.02935	3.01	0.003	0.030908	0.1459721
Constant	2.599642	0.06111	-42.54	0.000	-2.719421	-2.479863
LR Chi2(6)	2,331					
Prob > Chi2	0					
Pseudo R_2	0.0534					

In this table the Probit regression outcomes are presented. This shows the correctness in predicting the explanatory value: change analyst coverage. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The variables predicting this variable are: logarithmic market capitalization, return on asset, debt-to-equity ratio, stock return, bid-ask spread and logarithmic volume traded. The time sample holds from 2015 until 2019 and the new sample group B. is constructed out of the companies including sample group A. All variables are winsorized by a level of 5% on the upper and lower band.

Table 25. The effect of analyst coverage on effective spread during the MiFID II implementation period divided by company size - sample group B.

VARIABLES	Effective Spread		Effective Spread		Effective Spread	
SAMPLE B	Small cap.	Mid-cap.	Small cap.	Mid-cap.	Small cap.	Mid-cap.
Logarithmic Absolute Analyst Coverage	0.000498	-0.00771				
	(0.00345)	(0.00518)				
Change Analyst Coverage			-0.00214	-0.00727		
			(0.00226)	(0.00455)		
Dummy Loss 50% Analyst Coverage					0.000537	0.000271
					(0.00247)	(0.00415)
Frim Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	6,033	5,808	7,540	6,316	7,540	6,316
Number of Firms	743	627	753	628	753	628
R_2	0.006	0.003	0.004	0.003	0.004	0.003

In this table, the regression outcomes of model 5 are reported. Sample group B was divided by company size into small cap and mid-cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group B were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5%, and 10% is shown by the following signs: ***, **, *.

Table 26. The effect of analyst coverage on volume traded during the MiFID II implementation period divided by company size - sample group B.

VARIABLES	Volume Traded		Volume Traded		Volume Traded	
SAMPLE B	Small cap.	Mid-cap.	Small cap.	Mid-cap.	Small cap.	Mid-cap.
Logarithmic Absolute Analyst Coverage	0.00869	0.0156***				
	(0.00687)	(0.00573)				
Change Analyst Coverage			0.00132	0.0156***		
			(0.00537)	(0.00540)		
Dummy Loss 50% Analyst Coverage					-0.0138***	-0.00506
					(0.00418)	(0.00508)
Frim Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	6,031	5,804	7,536	6,309	7,536	6,309
Number .f Firms	743	627	753	628	753	628
R_2	0.142	0.165	0.160	0.179	0.162	0.177

In this table, the regression outcomes of model 5 are reported. Sample group B was divided by company size into small cap and mid-cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As independent variables, analyst coverage indicators were used and firm control variables implemented. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. Absolute analyst coverage was transformed to logarithmic values. The dummy variable loss 50% analyst coverages shows 1 when a company loses 50 % of their analyst coverage compared to the number of analysts covering in first quarter of 2015 or the first time it was followed. The time sample holds from 2015 until 2019, and the companies in sample group B were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5%, and 10% is shown by the following signs: ***, **, *.

Table 27. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group B.

VARIABLES	Effective spread			Volume Traded		
SAMPLE B	Total	Small cap.	Mid-cap.	Total	Small cap.	Mid-cap.
Logarithmic Absolute Analyst Coverage * 2018	-0.00179	0.0102*	-0.0112**	-0.000514	0.0229*	0.00169
	(0.00362)	(0.00531)	(0.00553)	(0.00701)	(0.0124)	(0.00961)
Logarithmic Absolute Analyst Coverage * 2017	-0.00398	0.00264	-0.00726	-0.00254	-0.00268	0.00564
	(0.00336)	(0.00453)	(0.00530)	(0.00494)	(0.00923)	(0.00651)
Logarithmic Absolute Analyst Coverage * 2016	-0.00141	0.000557	-0.00374	0.00551	0.00284	0.0112
	(0.00292)	(0.00417)	(0.00445)	(0.00479)	(0.00830)	(0.00693)
Frim Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	11,858	6,037	5,811	11,852	6,035	5,807
Number of Firms	1,371	743	627	1,371	743	627
R_2	0.003	0.006	0.003	0.042	0.049	0.042

In this table, the regression outcomes of model 6 are reported. Sample group B was divided by company size into small cap and mid-cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction term Logarithmic Absolute Analyst Coverage * 2018 /2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group B were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.

Table 28. The effect of analyst coverage during MiFID II implementation years on effective spread and volume traded in total and divided by company size – sample group B.

VARIABLES	Effective spread			Volume Traded		
SAMPLE B	Total	Small cap.	Mid-cap.	Total	Small cap.	Mid-cap.
Dummy Loss 50% Analyst Coverage * 2018	0.00473	0.00321	0.00745	-0.0199***	-0.0297***	-0.0159
	(0.00319)	(0.00372)	(0.00550)	(0.00708)	(0.00974)	(0.0101)
Dummy Loss 50% Analyst Coverage * 2017	0.000801	-0.00230	0.00419	-0.0129**	-0.0189***	-0.0115
	(0.00309)	(0.00349)	(0.00563)	(0.00522)	(0.00708)	(0.00742)
Dummy Loss 50% Analyst Coverage * 2016	0.000477	0.00176	-0.000940	-0.00335	-0.00373	-0.00250
	(0.00310)	(0.00359)	(0.00567)	(0.00561)	(0.00699)	(0.00986)
Frim Control Variables	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	13,878	7,547	6,321	13,867	7,543	6,314
Number of Firms	1,382	753	628	1,382	753	628
R_2	0.003	0.004	0.003	0.049	0.059	0.046

In this table, the regression outcomes of model 6 are reported. Sample group B was divided by company size into small cap and mid-cap. As dependent variables, indicators for market liquidity were used. The following variables function as indicators*:* effective spread and volume traded. This table presents the outcomes of the regressions with volume traded and effective spread. The panel data regressions were performed with time-fixed effects and with robust standard errors to account for heteroskedasticity. Furthermore, all variables were winsorised by a level of 5% on the upper and lower band. As an independent variable, a change in the analyst coverage interaction term over time is used. The variable change analyst coverage was compared to the maximum number of analysts covering a firm in the four quarters of 2015. The interaction term Dummy Loss 50% Analyst Coverage * 2018/2017/2016 shows the relation between the change in analyst coverage during a specific MiFID II year. The time sample holds from 2015 until 2019, and the companies in sample group B were used. The MiFID II was tested by the dummy variables 2016, 2017, and 2018. This dummy shows 1 when the indicated year is found in the data. The included firm control variables are presented and discussed in section 3.3. Robust standard errors are presented in parentheses. Significance of 1%, 5% and 10% is shown by the following signs: ***, **, *.