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The Difference in Bias and Inaccuracy Between Commissioned and Traditional Sell-Side Equity Research

Evidence from Nordic Investment Banks after MiFID II Implementation

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Abstract

This thesis investigates whether there is a difference in the bias and inaccuracy of the EPS estimates in sponsored and traditional sell-side equity research. As a result of the EU regulation MiFID II's requirement that asset managers and broker-dealers unbundle the cost of investment research from the cost of trade execution, several Nordic investment banks have begun offering research that is paid for by the covered company. Naturally, some concern has been raised as to the independence and bias of this type of research and the conflicts of interest that may arise. This paper examines the validity of this concern by comparing bias and inaccuracy of EPS estimates in the two types of research made by five Nordic investment banks: Danske Bank, DNB, SEB, ABG, and Nordea.

To perform this comparison, we constructed a proprietary dataset including EPS estimates and actuals, firm-characteristic variables, and a dummy variable indicating whether a specific estimate belongs to sponsored or traditional sell-side research. We then estimated five multiple fixed effects regression models on three different datasets to determine whether there was a significant difference in bias and inaccuracy between the sponsored and traditional sell-side samples. Since the sponsored sample is substantially smaller than the traditional sell-side sample, we entropy balanced the samples in our regressions.

From our descriptive statistics, we find that companies paying for sponsored research are on average smaller, younger, have more volatile earnings and returns, are less levered, have less institutional ownership, and have less analyst coverage than companies covered by traditional sell-side research. When contrasting the frequency of industry observations in our sponsored and traditional samples, companies in the Software and Healthcare-related industries are among the most frequently observed in the sponsored sample. In contrast, Oil & Gas, Industrial Machinery, and Packaged Foods and Meat companies are among the most frequently observed in the traditional sample. Furthermore, the share of Swedish companies in the sponsored research sample indicates that sponsored research is more common in Sweden than in the other Nordic countries. Lastly, we find indications that the number of EPS estimates per company is lower for the sponsored sample than the traditional sell-side sample.

Overall, in our regressions, we fail to find sufficient evidence indicating that the inaccuracy

and bias in the sponsored research sample is significantly different from the inaccuracy and bias in the traditional sell-side research sample. There are some weak indications that, if anything, sponsored research is more accurate and less positively biased than traditional sell-side research. Followingly, we conclude that sponsored and traditional sell-side EPS estimates appear to be of similar quality.

Preface

This Master's thesis concludes our Master of Science in Economics and Business Administration at the Norwegian School of Economics. First and foremost, we would like to extend our gratitude to our supervisors Tzu-Ting Chiu and Xiang Zheng.

Despite the current relevance of sponsored equity research in the Nordic capital markets, the idea of writing a thesis on the topic would have never occurred to us had it not been for Tzu-Ting. From day one, we were introduced to the topic, given relevant research, and suggested approaches to best tackle the thesis work. This guidance has been invaluable.

Despite working from Frankfurt and technically not being employed by NHH at the start of our thesis work, Xiang always answered our inquires promptly and provided us with pivotal input on our data collection process and empirical analysis. Xiang has been critical to our successful completion of this thesis, and we thank him dearly for his contribution.

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1 Introduction and Background

1.1 Introduction to our thesis

This paper uses the EU regulation MiFID II to examine whether equity research paid for by the covered company is more biased and inaccurate than traditional sell-side research, where commissions from trading execution services cover the cost of research. As is elaborated upon later in the paper, MiFID II requires asset managers and broker-dealers to unbundle the cost of investment research and advisory services from the cost of trade execution. Especially in the Nordics, this has led investment banks to offer commissioned, or sponsored, research. Sponsored research is research paid for by the company covered by the research. Naturally, there have been raised concerns relating to the independence, bias, and conflicts of interest inherent in this type of research. As is elaborated upon in section 1.2, this concern has been the topic of a growing number of news articles in the last few years (Lee, 2018)(Almgren, 2019)(Bøhren, 2021a)(Bøhren, 2021b). This paper examines the legitimacy of the concern by comparing the bias and inaccuracy of EPS estimates in sponsored and traditional sell-side research made by five Nordic investment banks. We also provide insights into what kinds of companies pay for equity research in the Nordic market through descriptive statistics from our dataset.

The following section 1.2. provides some background on MiFID II and the effects the regulation has had on the equity research market. Section 2 in our paper outlines the academic literature relevant to our study, while section 3 and 4 outlines the methodology. Section 5 presents the findings from our regressions, section 6 discusses our findings, and section 7 concludes the paper.

1.2 Background on MiFID II and the equity research market

This paper analyses the differences in inaccuracy and bias between commissioned and traditional sell-side research for select Nordic brokerages post-MiFID II implementation. The paper's problem statement would not be relevant had it not been for the rise of commissioned research, and the rise of commissioned research would likely not have

happened had it not been for MiFID II's unbundling regulations. As such, this background section consists of four main chapters that are structured chronologically – beginning with the regulatory passing of MiFID and ending with the current debate on the validity and integrity of commissioned research.

In 1.2.1, we give a brief background of MiFID I and its subsequent revision MiFID II. In 1.2.2, regulatory motivations for unbundling and its implications for commercial players are discussed. In 1.2.3, we explore the sell-side response to MiFID II by analyzing changes in business and pricing models, reviewing market volume predictions given before MiFID II, and reviewing research and survey data on market volumes post-MiFID II. In 1.2.4, the rise of commissioned research is discussed, and stances that advocate and stances that are critical to commissioned research are presented.

1.2.1 Markets in Financial Instruments Directive (MiFID)

MiFID I

MiFID is an abbreviation of the Markets in Financial Instruments Directive. MiFID I (2004/39/EC) was drafted in 2004 and came into effect in 2007, replacing the Investment Services Directive (ISD) (UK Government, 2007). MiFID is a European Union law effective in all member states of the European Economic Area, which comprises 27 EU member states and Liechtenstein, Iceland, and Norway.

MiFID I led to increased investor protection and facilitated brokerage service offerings across borders within the European Economic Area. More specifically, the law caused legislative effects within financial instruments, investment advice, execution of trades, and asset management. For consumers of financial services, the implications of the legislative changes were that they would be classified by degree of professionality, providers would potentially need more information about their financial knowledge and investment needs due to increased information requirements, and recipients of financial advice and financial instrument investors would receive increased protection. MiFID classifies financial instruments investors into three tiers of professionality, where i) is non-professional clients, ii) professional clients, and iii) qualified counterparties (Finansleksikon, 2021).

MiFID II

In 2014 the European Parliament passed MiFID II and its regulation MiFIR (Markets in Financial Instruments Regulation). MiFID II and MiFIR have been in effect since 3 January 2018. The motivation for introducing MiFID II was further reforming EEA derivatives and securities regulations introduced during MiFID I and adapting the regulatory environment to recent technological changes (Finanstilsynet, 2020).

1.2.2 Unbundling

Regulatory motivations

Covering the complete scope of MiFID II is beyond this thesis. Consequently, this section covers areas of MiFID II relevant to our research question, which are regulatory changes of requirements relating to the provision of research. In the abstract, MiFID II's regulations related to the provision of research seek to protect investors through removing structures with inherent agency problems.

An introduction to a) buy-side fund management compensation structures and b) sell-side provision of research to the buy-side is given to illustrate conflicts related to the provision of research pre-MiFID II.

(a) *Fund management costs*

Fund managers on the buy-side manage funds on behalf of investors. Typically, fund managers charge a fee for managing investor funds. In addition, investors incur costs related to operating a fund that does not fall in fund managers' hands. Of these additional costs, a considerable share is related to brokerage dealing commissions (CFA Institute, 2019).

(b) *Provision of research*

Before MiFID II and its strict unbundling requirements, fund managers typically received additional goods and services beyond those explicitly paid for in the brokerage dealing commissions. A great majority of the additional goods and services included was research. This compensation structure can be traced back to 1960s when brokerage commission rates were fixed. Since the rates were fixed,

brokerages had to compete for buy-side clients by differentiating themselves through auxiliary service offerings. Despite the downfall of fixed commission rates a long time ago, the practice of providing auxiliary services remained until MiFID II was passed (Van Dijk, 2019).

Inducement to trade

The regulatory concern with the form of provision outlined in b) is that bundled offerings can induce buy-side firms to use a particular sell-side provider for trading and execution services. This can negatively impact investors, as buy-side firms may not select the sell-side firms that provide the best trading and execution services.

Overconsumption of research

Since costs related to brokerage dealer commissions were typically covered by investors but incurred by fund managers, there were regulatory concerns about overconsumption of research. In addition, it was believed that research included in bundled form further enabled buy-side actors to acquire research (labeled as trading and execution costs) and transfer the associated costs to investors.

Brokerage-only firms at a disadvantage

Due to the potential synergies from providing both research and execution services, it was thought that players providing only execution or research services would be at a competitive disadvantage to full-service providers. Reducing this competitive asymmetry was also one of the regulatory motivations behind MiFID II.

Regulatory implications for the provision of research

The section above outlined the regulatory motivations behind MiFID. This section serves to give an overview of the concrete regulatory implications of MiFID II for sell-side and buy-side actors.

For actors on the buy side, central regulatory changes due to MiFID II are (PwC, 2016):

- Research should not be bundled with execution services to induce clients to trade.
- Sell-side firms are obligated to review and categorize their service offering based on whether it is research or not. If the service is categorized as research, payment is

required.

- Sell-side firms must identify the unbundled cost of trading, so they can separately charge for other costs related to execution, other advisory services, and research.

For buy-side actors, central regulatory effects of MiFID II include (PwC, 2016):

- Payments for research must be explicit. In addition, buy-side firms must demonstrate that the research contributes to better investment decisions, ruling out the possibility that the research is an inducement.
- Buy-side firms must deliver reporting of a standard that can facilitate payments for research and demonstrate that the research is providing sufficient value.

1.2.3 Sell-side response

Updated pricing - and business models

Leading up to MiFID II, various institutions on the sell-side were marketing and experimenting with different pricing options for their research service offering. JP Morgan was widely publicized in the media for proposedly leading a price war to grab market share, pricing subscriptions for their read-only analyst portal at as little as USD 10,000 per year (Morris and Canny, 2017). Barclays allegedly planned to charge GBP 30,000 for read-only access to its European research and upwards of GBP 350,000 for its most premium package, including field trips and corporate visits (Morris and Canny, 2017). Morgan Stanley presumably quoted a small client USD 25,000 for five annual subscriptions of primary equity research access and five hours of analyst time, while analysts were anticipated to charge hourly one-on-one rates of USD 2,500 per hour (Canny et al., 2017).

While concrete pricing options are scarce and subject to uncertainty due to the confidential nature of research subscription plans, the basic fee structure of such plans follows a generalizable pattern. Integrity Research argues that the basic research subscription plan consists of three to four tiers, where the first tier is read-only access to online portals, and the highest tier is "first call" priority access (Bragg, 2018). The exact illustration outlined by integrity is in table 1.

Table 1: Generic equity research service levels

Generic Equity Research Service Levels				
Service	**Basic Level**	**Limited**	**Premium**	**Ultra**
Written Research	Included	Included	Included	Included
Analyst Calls	No	Capped	Proactive	Top priority
Analyst Meetings	No	Capped	Proactive	Top priority
Sales Support	Limited	Capped	Proactive	Top priority
Models	No	Capped	Unlimited	Unlimited
Data	No	Capped	Included	Included
Conferences	Limited	Capped	Unlimited	Unlimited
Corporate Access	No	Limited 1-1 meetings	Unlimited	Top priority
Cost Level	**$**	**$$**	**$$$**	**$$$$**
Format	**Subscription**	**Custom**	**Custom**	**Custom**

Note: Generalized; actual service levels will vary by provider Source: Integrity Research

Information on pricing and subscription models post-MiFID II among Nordic brokerages is not as widely available as information on pricing for Bulge Bracket institutions. However, Alexander Opstad, Head of Equities at DNB Markets in 2017, was interviewed by Norwegian Business Journal E24.no on the matter. Opstad revealed that DNB Markets were likely to charge a price for their read-only services and that direct contact with analysts would come at a substantial premium, indicating that the practices of global institutions like JP Morgan, Morgan Stanley, and Barclays are common among Nordic brokerages as well (Framstad, 2017).

The anticipated decline in research commissions

Before MiFID II and its unbundling regulations were known, global equities and investment banking revenues trended downwards, with global revenues declining by 21% from USD 87 billion in 2009 to USD 68 billion in 2016 (Figure 11) (McKinsey, 2017).

However, data from the most significant investment banks during the same period indicate that Research Departments faired relatively well compared to Sales and Trading Departments, as Sales and Trading full-time equivalents (FTEs) fell by ∼30-40% between 2011 and H1 2016 and Research FTEs fell by 12% in the same period (Figure 12) (McKinsey, 2017).

Before MiFID II implementation, experts and expert institutions on the matter predicted substantially accelerated declines in research commissions as research would have to be explicitly paid for. A consensus scenario by McKinsey in 2017 predicted a 30% decline in commission pools three years post-MiFID II implementation, and the most bearish

scenario was a 50% decline over the same period (Figure 13) (McKinsey, 2017).

In a 2017 report on MiFID II, unbundling, and its effect on the research industry, Oliver Wyman estimated that research costs on average made up only ∼1-3 basis points (bps) of the total ∼60 bps that end investors bore in 2016 (Wyman, 2017). For asset managers, absorbing these costs would roughly translate to a 2-4% operating cost increase and a 4-7% profit decrease – a scenario Oliver Wyman argued would be unfeasible, given the high pressure to cut costs in the asset management industry. In line with McKinsey's outlined scenarios, Oliver Wyman's predicted a base case reduction in research spending of 20-30% after the implementation of MiFID II (Wyman, 2017).

Research findings post-MiFID II

Between July 2018 and March 2019, the UK Financial Conduct Authority conducted a review including 40 buy-side surveys and ten firm site visits across the buy-side and sell-side. The review found a reduction of 20-30% in equity research budgets for UK-managed equity portfolios, which translated to approximately GBP 70 million saved for the first half of 2018 relative to the same period in the year prior (FCA, 2019). The FCA's findings are consistent with the CFA Institute's findings based on survey data collected from 12,633 respondents based in the EU, UK, and Switzerland. The CFA finds an average decline in research budgets among surveyed buy-side participants of 6.3%, but this figure varies substantially dependent on AUM – for firms managing more than EUR 250 billion in assets, the reduction in research spend was 11% (CFA Institute, 2019).

Data from before and after MiFID II on total equity research FTEs follow a trend cohesive with that of the FCA and CFA Institute findings, as the most significant global investment banks experienced the starkest headcount decline since Coalition Development began compiling statistics on equity research FTEs in 2012 (Figure 1) (Bloomberg, 2019). In addition, research on firm coverage of European firms found a positively significant decline in firms covered after MiFID II implementation (Fang et al., 2020).

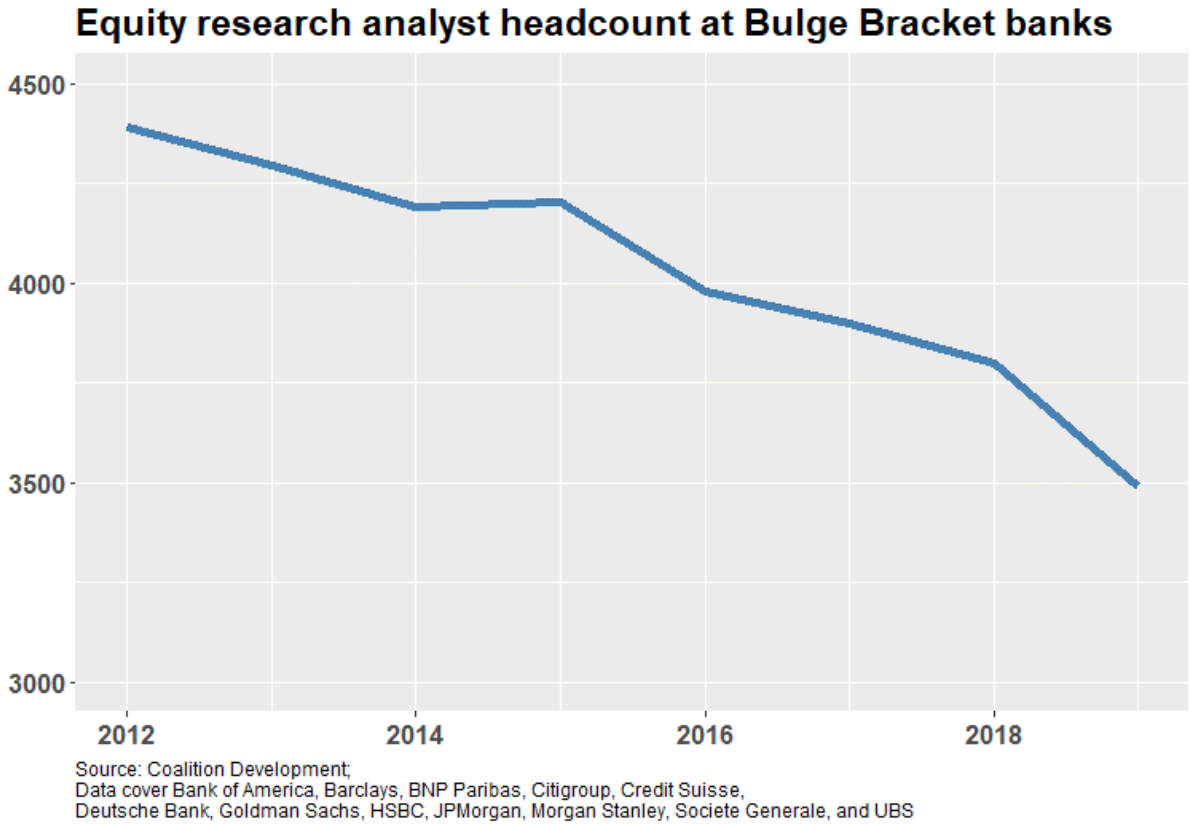

Figure 1: Equity research analyst headcount

1.2.4 The rise of commissioned research

Commissioned research

Commissioned research, commonly referred to as paid-for or sponsored research, is a form of research where the company analyzed pays a research provider to cover them. This model has long been practiced in credit but has also gained traction in equities, particularly after the implementation of MiFID II.

Edison Investment Research Ltd and Hardman & Co are independent research providers who have provided commissioned research over a prolonged period. Edison reported to Bloomberg that revenue growth post-MiFID II was the highest in recent memory, and Harman reports that revenue from sponsored research grew 50% in the first half of 2019 vs. the same period in 2018. For covering a company over a year, both research providers report to Bloomberg that they charge approximately GBP 50,000 a year, whereas French independent research provider AlphaValue reports that it offers sponsored coverage at an annual rate of EUR 20,000 per year (Lee, 2018).

Commissioned research in the Nordics

Redeye, established in 2000, and Analysguiden, established in 2013, were among the first providers of commissioned research in the Nordics and started as independent research providers (Redeye, 2021) (Aktiespararna, 2021). However, the commissioned research market is not only growing among independent research providers. Particularly in the Nordics, traditional sell-side brokerages have decided to adopt the model in addition to providing traditional sell-side research. Among the traditional sell-side players that entered the market for commissioned research at or around MiFID II implementation are DNB Markets, Danske Bank Markets, Nordea Markets, SEB, and ABG Sundal Collier. In terms of pricing, the larger brokerages differ from the smaller independent research providers – Nordea and SEB report annual coverage prices in the range of SEK 0.4-0.6 million, whereas Analysguiden charges approximately SEK 0.25 million annually per company for their services (Almgren, 2019). The Swedish market for commissioned research was estimated at SEK 75-100 million across 290 companies in 2019 (Figure 2) (Almgren, 2019).

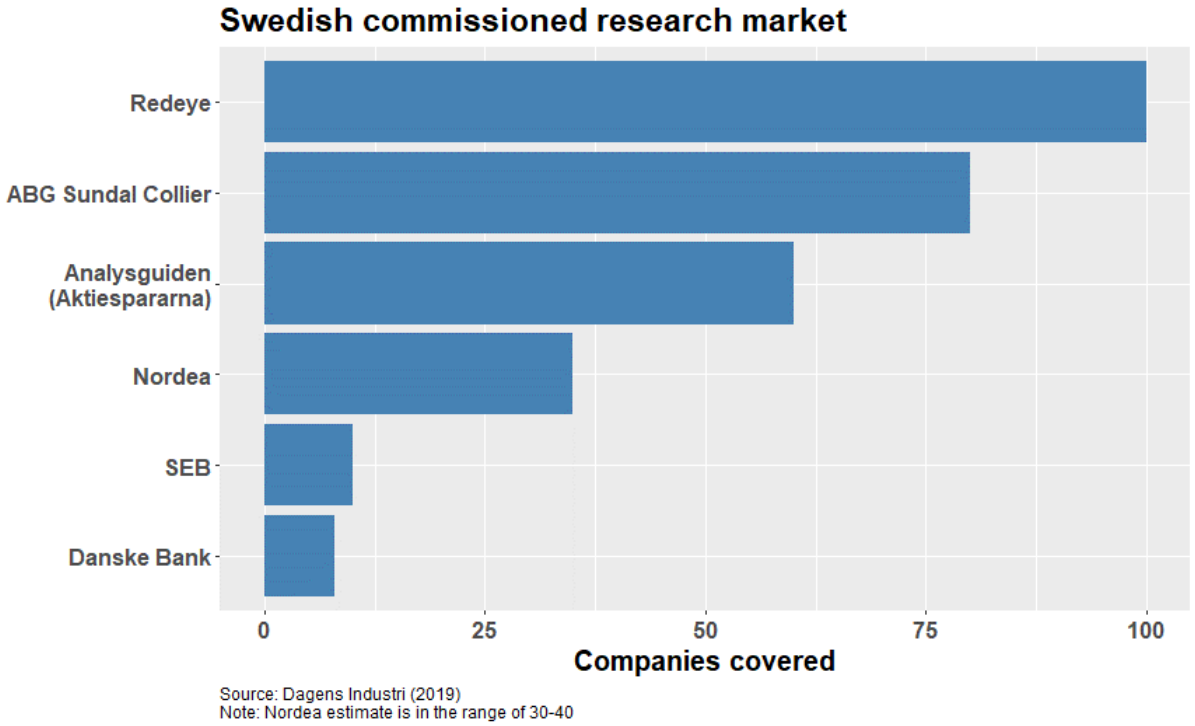

Figure 2: Swedish commissioned research market

Commissioned research and conflicts of interest

The stark increase of commissioned research has not come without public and industry scrutiny. "It is outsourcing investor relations", "The conflict of interest in that specific configuration will be unavoidable", "The trouble this causes is it is not seen as independent" are among the statements industry experts voiced about commissioned research in a Bloomberg article from 2018 titled "This Stock Research Is Paid For By the Company. Do You Trust It?" (Lee, 2018).

Similar concerns have been raised in the Nordics. Sindre Støer, the Norwegian Securities Dealers Association CEO, was quoted in national news saying that sponsored research is "marketing, not research" (Bøhren, 2021a). Carnegie, Handelsbanken Capital Markets, and Swedbank are among the Nordic brokerages that have decided to abstain from offering commissioned research. Head of Global Sales Equities at Handelsbanken Capital Markets, Peter Karlsson, argues that "trust is Alpha Omega when it comes to research. Commissioned research may challenge this, and we have therefore decided to choose a different direction" (Almgren, 2019). Fredrik Lunde, Head of Securities at Carnegie Norway, argues a similar case – "Carnegie is currently offering research on an independent basis, and it is hard to see how commissioned research is independent or that a company would pay for analyses with negative conclusions. Therefore, we have decided to wait and see how this plays out" (Bøhren, 2021b).

The case for commissioned research

Despite criticism from central industry experts and institutions, multiple actors apart from the providers of commissioned research argue its case.

Perspectives from consumers of commissioned research

Audhild Aabø, portfolio manager at Nordea Investment Management, believes that commissioned research contributes positively to the information flow in the market, especially when there are no alternative analyses. When asked by E24.no if she trusts commissioned research less than traditional research, she responds that there are underlying incentives for equity research analysts to be more positive than negative in traditional research as well (Bøhren, 2021b). Andreas Lorentzen, Portfolio Manager at Delphi, has used commissioned research to get a preliminary overview of companies he analyzes.

However, he argues that he trusts commissioned research less than traditional research, as the commissioned reports he has read appear less thorough than reports covered through traditional research. Despite this, the mere fact that a broker offers commissioned research does not reduce his trust to the brokerage in general (Bøhren, 2021b).

Perspectives from purchasers of commissioned research

Kenneth Lundahl is President and CEO of Balco, a Swedish company that IPOed in 2017 and is covered through commissioned research by SEB. In an interview with SvD Näringsliv, Lundahl says that Balco is satisfied with SEB's service. However, he argues that Balco's satisfaction does not stem from SEB's analyses, but rather the access to relevant networks and investors SEB's overall service has given Balco (Almgren, 2019).

Perspectives from providers of commissioned research

Jon Olaisen, Head of Research at ABG Sundal Collier, argues that commissioned research is particularly well-suited for small and medium enterprises that need more liquid shares and accurate pricing. According to ABG's research based on 83 companies it covers through commissioned research, the average trading volume in the 12 months following ABG's initiation of coverage was 25% higher relative to the 12 months prior (Bøhren, 2021b). Nicklas Fhärm, Head of Corporate Research at SEB, thinks that criticism surrounding potential conflicts of interest and commissioned research are justified, but that it is critical for the future of commissioned research that the analyses are of high quality (Almgren, 2019). Followingly, Fhärm argues that the producers of commissioned research have an incentive to treat the analysis in this type of research as they would treat analyses in traditional research.

2 Literature review

This section presents four parts of the literature on equity research relevant to our paper. Section 2.1. introduces the issues and flaws of traditional sell-side research relating to bias and conflicts of interest, as identified in older parts of the literature. Section 2.2 presents relevant findings in American studies comparing the quality of sponsored research to the quality of traditional sell-side research. Section 2.3. describes findings from more recent literature on the effects of MiFID II on research quantity and quality. Lastly, section 2.4. presents the results of two recent master theses examining the validity of the sponsored research market in Sweden both qualitatively and quantitatively.

2.1 Issues with traditional sell-side research

The literature examining the conflict of interest inherent in the equity research department of investment banks is comprehensive. Lin and McNichols (1998) find that analysts working at investment banks that served as lead and co-underwriters in equity offerings gave more favorable growth forecasts and recommendations than unaffiliated analysts. According to their findings, investors account for this in their evaluations to some extent and expect underwriter research analysts to be more likely to recommend "Hold" when "Sell" is more appropriate. Within the same scope of research, Dugar and Nathan (1995) show that financial analysts at brokerage firms that provide investment banking services (investment banker analysts) issue more optimistic earnings forecasts relative to analysts at brokerage firms who do not provide investment banking services (noninvestment banker analysts). They also find that capital market participants account for this bias and rely less on investment banker analysts in their evaluations.

Michaely and Womack (1999) similarly find significant bias in recommendations by underwriter research analysts when examining the difference in performance between stocks getting "Buy" recommendations from affiliated research analysts compared to unaffiliated research analysts. In contrast to the previous two papers, they find that the market does not account for the full extent of the bias. Agrawal and Chen (2007) echo the general findings that optimism in stock recommendations is positively related to the importance of investment banking and brokerage businesses to an analyst's employer.

However, in line with Lin and McNichols (1998) and Dugar and Nathan (1995), they believe investors account for these biases sufficiently and are not mislead by biased research analysts. O'Brien et al. (2005) find that affiliated research analysts are slower than unaffiliated analysts to downgrade from "Buy" and "Hold" recommendations and faster to upgrade from "Hold" recommendations when covering client companies. Affiliated analysts are also found to be faster at issuing recommendations after an offering and less likely to drop coverage of client companies. Overall, the authors conclude that investment banking ties seem to influence equity research analysts' behavior.

Malmendier and Shanthikumar (2014) identify a group of biased research analysts they name "strategic distorters". These analysts issue overly optimistic recommendations to induce investors to trade through the investment bank and curry favor with management while simultaneously issuing less optimistic forecasts to retain a good reputation. The authors show strategic distortion to be widespread among analysts, and affiliation and investment-banking pressure through underwriting mandates to be highly predictive of this distortion. Like O'Brien et al. (2005), they find that analysts affiliated with a stock's underwriter issue more "Buy" and "Strong Buy" recommendations than equivalent unaffiliated analysts and that they are slower to downgrade stock recommendations.

Cowen et al. (2006) find that analysts at firms that fund research through both underwriting and trading services issue less optimistic forecasts and recommendations than brokerage firms who generate revenue only through sales and trading. This indicates that the bias observed in the literature is driven by trade generation, not underwriting activities. Jackson (2005) finds here that optimistic analysts in fact generate more activity for their brokerage firms which creates a conflict of interest for the analysts between reputation and trading commissions.

Whether due to trading or underwriting, the literature overall finds significant evidence of bias in the traditional sell-side equity research of affiliated investment banks due to the conflicts of interest inherent in the activity. These findings of bias and conflict of interest in sell-side research played a large part in the rationale behind the MiFID II regulation.

2.2 Sponsored vs. traditional sell-side equity research

Several studies have examined whether there is a difference in bias, accuracy, market reaction, and other dimensions between paid-for research and traditional sell-side research in the US. While this part of the literature compares the research of pure sponsored research companies with traditional brokers providing only sell-side research, the insights are still highly relevant to our topic.

The most influential paper on the mentioned topic is Billings et al. (2014), which looks at differences between sponsored and sell-side research in the US. They find no significant differences in accuracy or bias of paid-for and sell-side research, nor any objective evidence indicating that paid-for stock recommendations or forecast-based valuations are of lower quality than the traditional sell-side research. Instead, the study finds weak evidence that paid-for analysts' two-year-ahead forecasts are more accurate than those of sell-side analysts. They further find that paid-for recommendations are correlated with year-ahead abnormal stock returns, suggesting that paid-for analysts' forecasts and recommendations provide value to investors. This aligns with Kirk (2011), who finds that paid-for reports have information value for investors based on 2-day abnormal returns. The author also finds that companies covered by sponsored research experience an increase in institutional ownership, sell-side analyst following, and liquidity after the initiation of coverage, indicating that buy-side analysts and institutional investors value paid-for research. Overall, the findings of Billings et al. (2014) suggest that the accuracy, bias, and value to investors of paid-for research is equivalent to that of matched sell-side research. They do, however, find results indicating that the market understates the value of paid-for research.

Similarly, Buslepp (2009) finds no significant difference in bias and accuracy between EPS forecasts issued by paid-for analysts and forecasts issued by traditional analysts for the same company. Further, the market further does not appear to react differently to sponsored research compared to traditional sell-side research. However, the study finds that sponsored research companies issue more favorable "Buy/Hold/Sell" stock recommendations than analysts at traditional brokerage firms do. The sponsored recommendations appear overly optimistic, as portfolios of stock based on the sponsored recommendations are found to underperform compared to similar recommendations issued by traditional sell-side analysts.

The author believes this exaggerated optimism resulted from sponsored recommendations being upgraded quickly and downgraded slowly, compared to traditional recommendations.

Overall, sponsored forecasts are found to be revised less often than forecasts from traditional brokers in Buslepp (2009), which is consistent with the theory of Agrawal and Chen (2012). Agrawal and Chen (2012) predict that researchers paid by trading commission revenues are more incentivized to issue updated revisions reflecting changing expectations than independent researchers. The overly optimistic recommendations paired with the infrequent revisions of forecasts lead Buslepp to conclude that sponsored research "may not be an adequate substitute for research from analysts at traditional brokerage firms" (Buslepp, 2009, p. 83).

So, while Billings et al. (2014) and Buslepp (2009) find no significant difference in bias, accuracy, and market reaction between sponsored and traditional sell-side estimates, the latter finds that sponsored stock recommendations are overly optimistic. In explaining this difference, the author draws upon the findings of Malmendier and Shanthikumar (2007) and Mikhail et al. (2007), that highlight that recommendations are more difficult to evaluate objectively than EPS forecasts and that the forecasts tend to be directed towards sophisticated institutional investors who are more likely to recognize the conflict of interest.

Billings et al. (2014) and Kirk (2011) also examine the differences in firm characteristics between companies that engage paid-for analysts and those covered by traditional sell-side research. Both papers find that companies that pay for research "tend to be smaller and younger, with larger and more volatile stock returns and fewer institutional holdings" than companies only covered by traditional sell-side research (Billings et al., 2014, p. 14). Billings et al. (2014) further find that the top five SIC industries among companies purchasing sponsored research are Business Services (20.69%), Chemicals and Allied Products (14.42%), Equipment (9.09%), Instruments and Related Products (8.46%), and Engineering, Accounting, Research, Management & Related Services (3.76%).

2.3 Effect of MiFID II on the equity research market

Another relevant part of the literature examines the effects of MiFID II on the European equity research market. Guo and Mota (2019), Fang et al. (2020), and Lang et al. (2019),

are the main articles that directly examine how MiFID II has impacted quantity, quality, and other aspects of equity research. Related is also Pope et al. (2019), who looked at the effects of Swedish analysts adopting the RPA equity research model post-MiFID II, and Wang and Zheng (2020), who examine the effects of the announcement of MiFID II for different categories of analysts.

2.3.1 Effect on analyst coverage

Guo and Mota (2019), Fang et al. (2020), and Lang et al. (2019) all find that MiFID II has led to a decrease in analyst coverage of European firms. This decrease in coverage amounts to 7.45%, according to Guo and Mota (2019), while Lang et al. (2019) estimate the decrease to be between 10-15%. Fewer sell-side analysts cover European firms after MiFID II implementation, and the probability of completely losing coverage post-MiFID II for European firms increases compared to North American firms (Fang et al., 2020). Relatedly, Pope et al. (2019) find that, after the adoption of the RPA model, coverage of Swedish companies by Swedish analysts falls relative to non-Swedish analysts by an average of 0.62 companies.

The literature differs as to the localization of the coverage decrease. Guo and Mota (2019) find the decrease to be concentrated in large firms, with a coverage decrease of 10.53% on average compared to an almost unchanged coverage of small firms. Similarly, Lang et al. (2019) find that medium and large firms experience the most significant decrease, while they find no evidence of a reduction among small firms. The effect is most prominent for larger, older companies with less volatile returns, more extensive coverage, and more accurate consensus forecasts. The authors' explanation is that it is more difficult for the "marginal analyst to justify their incremental contribution" for these types of companies (Lang et al., 2019, p. 2).

However, Fang et al. (2020) find a larger loss of sell-side coverage among smaller firms that have lower institutional ownership and do not issue financing, as these are the firms that are less important to the sell-side. Similarly, Pope et al. (2019) find that the reduction in coverage is greater for smaller firms with lower market cap and fewer institutional investors. The authors attribute this to an oversupply of research due to the research being treated as an unpriced service.

2.3.2 Effect on research quality

While the extent of research coverage decreases, the quality of the research appears to have increased after MiFID II. Guo and Mota (2019) find that the forecast error on average has decreased by 19.19% for affected firms after the implementation of MiFID II. They also find that individual forecast revision generates a more significant absolute market-adjusted abnormal return after the regulation, which is another sign of coverage quality improvement. Fang et al. (2020) similarly find that individual analyst earnings forecasts are more accurate, and stock recommendations garner greater market reactions in Europe post-MiFID II, using the US and Canada as a control group. Pope et al. (2019) and Lang et al. (2019) echo these findings of increased research quality. However, the latter find that analysts issue more favorable recommendations and beatable EPS forecasts post MiFID II to gain favor with management. Pope et al. (2019) find that the market reaction to Swedish analysts' forecast revisions increases by 42% on average after RPA adoption. Wang and Zheng (2020) find that EU analysts issue more accurate and less bold forecasts on average than their non-EU peers already after the announcement of the regulation.

The literature provides several related explanations for the increase in forecast quality following MiFID II. Guo and Mota (2019) point to the increased analyst competition in quality resulting from selling research as a stand-alone product. They believe this increased competition has led to inferior analysts being competed out of business, which could explain the decrease in coverage quantity and the increase in coverage quality. They also highlight that most asset managers have decided to charge research costs against their own profit and loss post-MiFID II, which likely makes them more selective and quality-seeking when choosing research providers as unbundling puts an explicit price on research. After unbundling, analysts are evaluated directly by the research services they provide, which should incentivize them to provide better research. So overall, Guo and Mota (2019) explain the increase in research quality by 1) inferior researchers being forced out of the analyst market and 2) the remaining analysts providing better research. Similarly, Fang et al. (2020) point to sell-side research turning into a profit center and researchers subsequently using research quality as a product-differentiation mechanism as substantial explanatory factors behind the increase in quality.

2.3.3 Effect on the overall information environment

While there is an overall agreement in the literature that coverage quantity has decreased and individual coverage quality increased, the overall effect on the information environment appears ambiguous. Lang et al. (2019, p. 9) find that "while individual forecasts are more informative, the overall information environment for the average firm tends to deteriorate". They believe that the increase in individual forecast quality is insufficient to offset the reduction in forecast quantity. They point to higher bid-ask spreads and that more of the information content in earnings remains to be disclosed at the earnings announcement date. The authors thus believe MiFID II to have had an overall negative effect on the information environment. However, both Pope et al. (2019) and Wang and Zheng (2020) find results suggesting that MiFID II is associated with an improved information environment for covered firms.

2.3.4 Other effects of MiFID II on equity research

As for other effects of MiFID II on equity research, Fang et al. (2020) find that buy-side investment firms turn to more in-house research due to being charged "hard cash" for the research. Their finding that buy-side analysts increase their participation and engagement in earnings conference calls corroborates this finding. They also find that analysts provide more industry and stock recommendations after MiFID II to cater to the buy-side. Lastly, the authors find some evidence that stock-market liquidity decreases after MiFID II. Lang et al. (2019) find that post-MiFID II there are a greater number of disaggregated line items forecasted in equity reports, a longer lag between forecasts, and more reports accompanied by “Buy/Sell” recommendations. These recommendations change more frequently than before, are less likely to be “Hold” and more likely to include “Strong Buy” or “Sell” recommendations.

2.4 Studies on sponsored research in Sweden

The research most directly relevant to our study’s theme and subject matter is two recent Swedish master theses, Norberg and Eriksson (2020) and Wijk (2019), that examine the sponsored research market in Sweden post-MiFID II. The first takes a qualitative approach by interviewing 12 industry professionals, mainly Swedish CFOs and analysts, in the

sponsored research market. The company representatives explain that their reasoning for buying commissioned research is to create awareness and interest in their company among investors as the traditional sell-side mainly covers large companies (Norberg and Eriksson, 2020). The respondents observe positive effects from the research through increased stock liquidity, an inflow of new investors, and increased institutional ownership. As for issues surrounding the independence and bias of sponsored research, the respondents differ in their answers. Some analysts experience being controlled and limited in their sponsored coverage and describe a pressure to evaluate companies that pay for coverage more positively than others. Other analysts downplay the issue of independence and claim that the paid-for nature of the research does not impact the validity of the analysis (Norberg and Eriksson, 2020).

Wijk (2019) compares the quality of sponsored research to the quality traditional sell-side research in Sweden by looking at abnormal returns and the effect of the research on stock prices. He finds that the market views sponsored equity research as new and valuable information. According to the research, the market overall does not appear to consider sponsored research as inferior to traditional sell-side research when looking at abnormal returns and stock price reactions.

2.5 Our contribution

The highlighted literature in this review outlines issues associated with traditional sell-side research, the difference in quality and quantity compared to sponsored research, the effect of MiFID II on the equity research offering, and an overview of the Swedish sponsored research market. We contribute to the existing literature by comparing the quality of the sponsored and traditional sell-side research made by the same type of research provider, namely Nordic investment banks. This should provide a more "apples-to-apples" comparison than that found in Billings et al. (2014). Further, while there is plenty of research on the effects of MiFID II more broadly, we focus on one of the effects, namely the rise of sponsored research among investment banks. We also go further than the analysis of the mentioned master theses, as we do a comprehensive, quantitative study of the differences in EPS forecast accuracy and bias for the entire Nordic research market.

3 Data collection

This section consists of three main chapters. In 3.1, our sample collection methodology is detailed. In 3.2, the whole data retrieval and manipulation process, from downloading raw data in IBES and combining data from Capital IQ to finalizing multiple samples for our analysis, is discussed. In 3.3, descriptive statistics of the final datasets are shown.

3.1 Analyst sample selection

As MiFID II is an EU directive, it was natural to begin our search for an analyst sample by looking at Europe in its entirety. Therefore, we began compiling a list from the Eikon database of 151 companies providing equity research in Europe. In doing this, we noted certain commonalities among brokers that led us to create clusters of brokerages based on factors like geography, size, product offering, and client base. Subsequently, we chose a comparable sample group with a similar scope and activity, and similar exposure to the MiFID II regulation, which enables a tighter research design less subject to measurement error due to inadequately controlled for between firm variation. The final sample consists of Nordic large-cap investment banks providing both traditional sell-side and sponsored equity research for institutional investors, illustrated in figure 3. It is worth noting that the matrix details only major players in the Nordic market, and as such, international actors like Goldman Sachs, Morgan Stanley, JP Morgan, and Bank of America, among others, are not included.

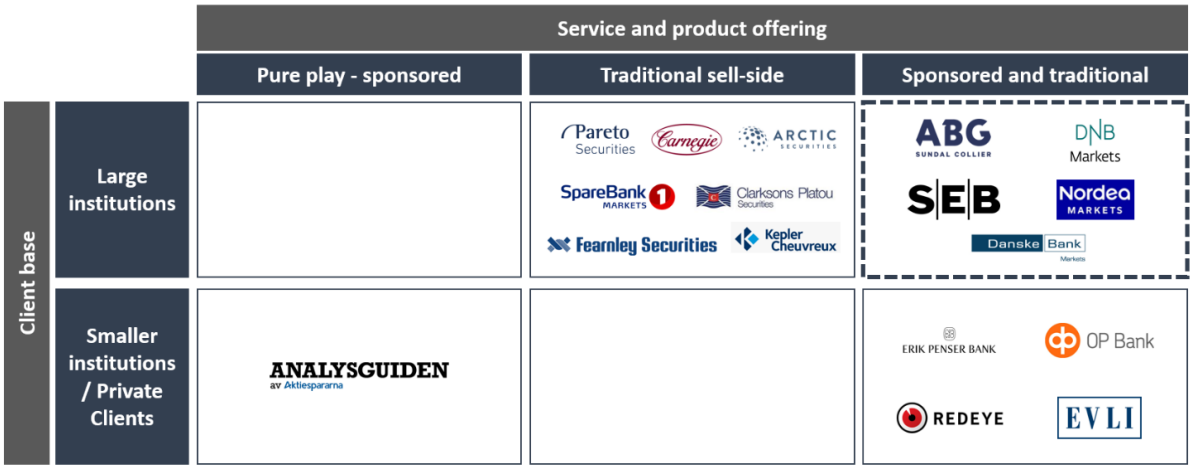

Figure 3: Broad market classification

The 'product offering' restriction excludes investment banks that only provide traditional sell-side research like Carnegie and SpareBank1 Markets and independent research providers providing only sponsored research like Analysguiden. The 'client base' restriction excludes research providers like Redeye and Erik Penser that target private clients and smaller institutions. The large-cap requirement in our sample definition further excludes smaller researchers such as Evli Bank. Lastly, the geographic limitation to the Nordics excludes Kepler Chevreux and Pareto as they only offer sponsored research outside the Nordics. This leaves us with a research provider sample consisting of DNB Markets, ABG Sundal Collier, Nordea Markets, SEB, and Danske Markets. These sample findings appear to align with a similar exercise done by E24 earlier this year (Bøhren, 2021b). Figure 3 categorizes some big players in the Nordic equity research market and highlights the market segment that contains our sample companies in the top right square.

3.2 Constructing the dataset

In broad terms, the final datasets were constructed by retrieving data on EPS estimates and actuals, constructing dependent and independent variables for the econometric models, deleting irrelevant observations, adding firm-characteristic control variables, and winsorizing relevant variables in the final samples. Table 2 illustrates the entire process from data collection to final manipulation. The numbers in the right column show the corresponding sub-chapters for each step. The use of EPS, as opposed to other P&L items, coincides with relevant literature (Billings et al., 2014) (Guo and Mota, 2019) (Fang et al., 2020).

Table 2: Constructing our datasets step-by-step

	N	Chapter
Adjusted EPS estimates in IBES in period 01.01.2015 - 20.08.2020	2,829,976	3.2.1
Less: Observations not belonging to Nordea, DNB, Danske, SEB and ABG	-2,729,345	3.2.1
Less: NAs for EPS estimates and currency discrepancies	-8,923	3.2.3
Less: Observations with announcement years in 2015 and 2016	-38,719	3.2.4
Less: Observations with NAs in control variables and FPIs not equal to 1	-35,907	3.2.5
Final sample observations – All	**17,082**	
Additional filter applied: Only Nordea and DNB selected	-7,314	3.2.6
Nordea and DNB sample	**9,768**	
Additional filter applied: Paired sponsored and traditional	-9,479	3.2.6
Paired sample	**289**	

3.2.1 IBES

EPS estimates and corresponding actuals for 2015-2020 were retrieved from IBES, with an estimator code for the research provider belonging to every estimate. The 2020 data does not cover the entire year, as we collected our data in August 2020. This initial dataset consisted of 2,829,976 observations. By comparing dates and EPS values in IBES with the information on research reports found online in a thorough and comprehensive matching process, we identified the analyst codes belonging to each of the five brokerage houses in our sample. Estimates from all other analysts were subsequently removed from the dataset, leaving us with 100,631 observations.

3.2.2 Constructing a binary variable for research type

Thereafter, we added a binary variable to the dataset - valued 1 if an estimate comes from sponsored research and 0 otherwise. To identify what estimates were sponsored, we collected the names of all companies reported as currently being or previously having been covered by sponsored research on the online sponsored research portals of the five brokerage houses. As we assumed that some previously sponsored research on companies no longer covered by the brokerage houses would have been removed from the portals, we used Eikon to identify any additional sponsored coverage we might have missed for the research providers that publish reports in the database, namely DNB and Nordea.

Next, we needed to account for that 1) a company can be covered by both sponsored and traditional sell-side simultaneously by different research providers and 2) that a company can be covered by traditional sell-side in one period and sponsored in another period by the same researcher. The first issue is controlled for by constructing a combination of the name of the research provider and the name of the company for every estimate as a variable in the dataset. This distinguishes estimates made by different brokerage houses on the same company from each other. The second issue is remedied by identifying the initiation and termination dates of sponsored coverage by the brokerage houses on the different companies. These dates are identified by looking at the first and last reports on the online sponsored portals and cross-referencing with Eikon for DNB and Nordea. The possibility remains that there are earlier reports than the ones available online and in Eikon, but we estimate this margin of error to be relatively low.

By identifying which companies, research providers, and time intervals constitute our sponsored research sample, we arrive at a binary variable that distinguishes sponsored estimates from traditional sell-side estimates.

3.2.3 Inaccuracy, bias, NAs, and currency misalignment

Next, we constructed the two dependent variables in our analysis: forecast inaccuracy and forecast bias. In constructing a variable for the inaccuracy of analyst estimates, there are two main approaches in the literature. The first approach, which is used by, among others, Fang et al. (2020) and Wang and Zheng (2020), scales the difference between the EPS actual and the EPS forecast (the forecast error) with the actual EPS leaving us with the variable:

$$\text{Inaccuracy} = \left| \frac{\text{EPS actual} - \text{EPS forecast}}{\text{EPS actual}} \right|$$

We calculate the absolute inaccuracy as this gives us a measure of total inaccuracy rather than negative or positive bias. There are, however, two significant issues with using this variable. Firstly, the denominator can be zero, rendering the entire expression invalid and unnecessarily removing valuable data from the analysis. Secondly, inaccuracy will approach infinity as the EPS actual approaches zero with this expression. This relationship in our dataset is shown graphically in figure 4.

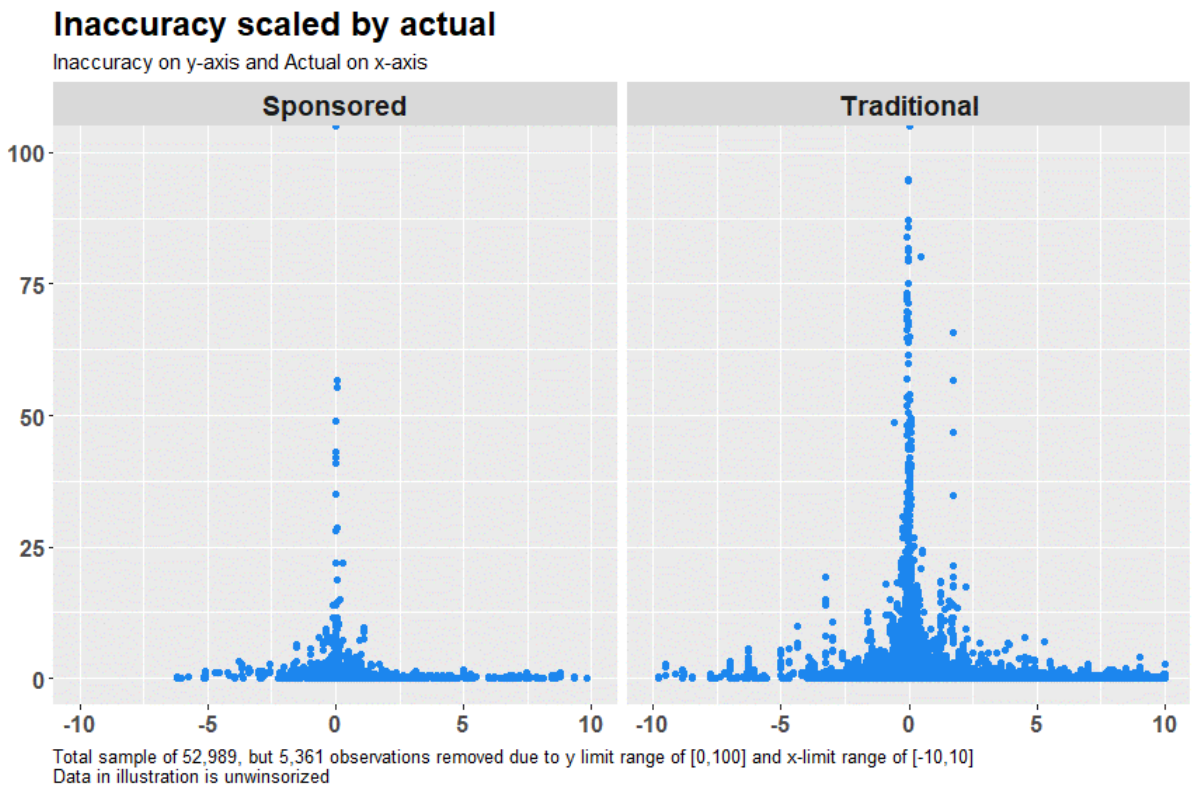

Figure 4: Inaccuracy scaled by EPS actual

As such, estimates on companies with very low EPS will consistently be higher in inaccuracy than for companies with high EPS. The inaccuracy variable then fails to capture the true inaccuracy of the forecast but rather in large part captures the size of the company's EPS. This would pose a significant issue for our analysis as the EPS actual of companies being covered with traditional sell-side research is, on average, much higher than the EPS for companies covered by sponsored research (Figure 5).

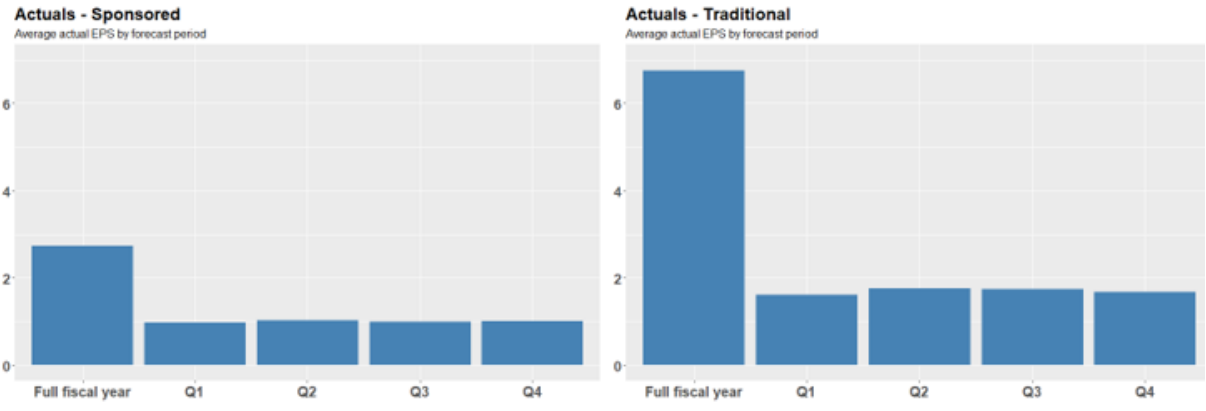

Figure 5: EPS Actuals - Sponsored vs. Traditional Sell-Side

Thus, any observed difference in inaccuracy between the two types of research would in large part represent this difference in EPS actuals.

To avoid this issue, we use the measure of inaccuracy employed by Billings et al. (2014), Hong and Kubik (2003), and Guo and Mota (2019), and others, where the forecast error (EPS actual - EPS forecast) is scaled by the stock price rather than the EPS actual. We here use the stock price two days before the announcement day of the forecast. Thus, the inaccuracy variable used in our analysis is:

$$\text{Inaccuracy} = \left| \frac{\text{Forecast error}}{\text{Stock price two days before announcement day}} \right|$$

As illustrated in figure 6, the issue of inaccuracy increasing as the denominator approaches zero is much less present when scaling by share price.

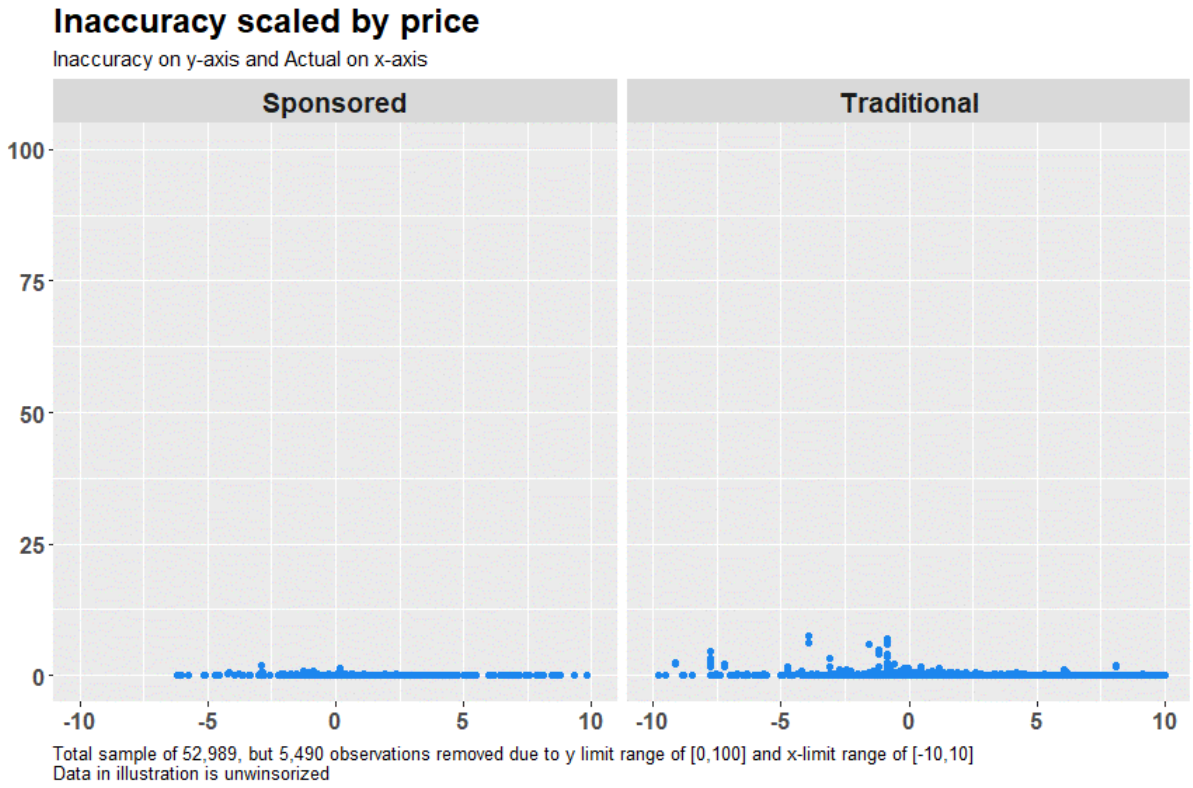

Figure 6: Inaccuracy scaled by price

By calculating the non-absolute number of this inaccuracy variable, we also construct a measure for forecast bias:

$$\text{Bias} = \frac{\text{Forecast error}}{\text{Stock price two days before announcement day}}$$

This is the second dependent variable in our analysis and is used to measure differences in bias, either negative or positive, between the traditional sell-side sample and the sponsored sample.

Lastly, we remove 8,565 observations where we were unable to retrieve EPS actuals, and the Inaccuracy and Bias variables yielded a result of NA. This is the case for very recent estimates, where an actual had not been reported yet. This leaves us with a dataset consisting of 92,066 observations. For certain observations in IBES, the currency of the estimate and the actual are not the same. Observations where this is the case have been removed, reducing the sample to 91,708 observations.

3.2.4 Unbalanced panel data and removal of irrelevant periods

After cleaning the dataset, we ran descriptive statistics on the number of observations per brokerage by year. The statistics were run on the whole sample, as well as the sponsored sample exclusively. In tables 3 and 4, the statistics show that the availability of research across years and research type (Sponsored / Traditional) vary substantially by brokerage.

Table 3: Sponsored and traditional sell-side observations

Sponsored and traditional observations - By year and research provider

Research Provider	2015	2016	2017	2018	2019	2020	Total
Nordea	6,337	7,184	5,512	5,173	5,473	4,610	**34,289**
DNB	4,588	4,649	3,948	2,500	6,106	4,286	**26,077**
Danske Bank	5,221	4,802	5,052	4,999	4,358	113	**24,545**
SEB	3,381	3,438	3,637	3,207	115	79	**13,857**
ABG	–	–	–	–	795	1,068	**1,863**
Total	**19,527**	**20,073**	**18,149**	**15,879**	**16,847**	**10,156**	**100,631**

Table 4: Sponsored share of total observations

Sponsored shares - By year and research provider

Research Provider	2015	2016	2017	2018	2019	2020	Total
Nordea	0%	0%	0%	3%	7%	8%	**3%**
DNB	0%	0%	0%	1%	1%	2%	**1%**
Danske Bank	0%	0%	0%	0%	1%	97%	**1%**
SEB	0%	0%	0%	2%	83%	96%	**2%**
ABG	n.m.	n.m.	n.m.	n.m.	90%	98%	**95%**
Total	**0%**	**0%**	**0%**	**2%**	**8%**	**16%**	**3%**

Specifically, we infer from the tables above that:

- **Nordea** started issuing Sponsored research in 2017 (0% in table above due to rounding), and they have consistently issued traditional sell-side research in IBES since 2015.
- **DNB Markets** started issuing Sponsored research in 2018, and they have consistently issued traditional sell-side research in IBES since 2015.
- **Danske Bank Markets** started issuing Sponsored research in 2018 (0% in table above due to rounding), and they have issued traditional sell-side research in IBES since 2015. However, it appears that Danske Bank stopped issuing their traditional research in IBES in the end of 2019 / beginning of 2020, as the sponsored share is close to 100% in 2020.
- **SEB** started issuing Sponsored research in 2018, and they have issued traditional sell-side research in IBES since 2015. It appears that SEB stopped issuing traditional research in IBES at the beginning of 2019, as the sponsored share is around 80% in 2019 and close to 100% in 2020.
- **ABG's** IBES published research appears to be exclusively sponsored, and that is likely why the research is only from 2018-2020 – as this is the period they began issuing sponsored research under their sponsored research platform Introduce.

We emphasize that the sponsored variable is subject to some measurement error, as the variable was constructed based on a combination of data from company websites, IBES, and Eikon. Companies that were for instance not covered by sponsored research at the time of data gathering, but that were covered in years prior, may not be captured in the variable. This may for example explain why ABG's sponsored share was closer to 90% than 100% in 2019. Since there are no sponsored observations for 2015 or 2016, we decided to remove observations with announcement dates in these years - reducing the dataset from 91,708 observations to 52,989 observations. The 2020 estimates do not include estimates for the entire year, as we collected our data in August 2020.

3.2.5 Adding control variables

Removal of companies not cross validated

Coincident with relevant literature on the subject, we have added firm characteristics

variables to our dataset to control for differences between firms. The firm characteristics variables are retrieved from CapitalIQ. To cross-validate that the variables retrieved from CapitalIQ correspond to the correct firms in the IBES-data, we manually controlled company descriptions, names, tickers, and countries with data in IBES and data from the research providers' websites. In doing so, we found five tickers in IBES that we could not cross-validate with our other data sources. Observations belonging to these tickers were removed from the dataset, reducing the number of observations by five from 52,989 to 52,984.

Firm characteristics variables - description and rationale

Existing literature finds that forecast optimism is negatively correlated with firm size (Brous and Kini, 1993) (Das et al., 1998) (Matsumoto, 2002). In line with Buslepp (2009), we control for this with the variable ln_market cap, which is the natural logarithm of the firm's market cap.

We control for time traded on public markets with Firm_age, which is the number of years the company has traded publicly. The motivation behind including Firm_age is to control for the possibility that younger companies, which may have external financing needs, may exceed earnings expectations to garner investor attention (Buslepp, 2009). We use the natural logarithm of firm age in the dataset so that our final variable is ln_Firm_age.

The book to market ratio is controlled for with Price_Book, which is the price to book ratio. Price_Book is included to control for growth, as the literature suggests that high growth companies have a greater incentive to beat earnings forecasts than their lower growth counterparts. The effect is assumed to come from the strong market reaction that negative earnings surprises among high growth firms evoke (Doyle et al., 2003) (Chan et al., 2003).

We control for leverage with Leverage, which is total liabilities over total assets. The variable is added to control for the impact of debt on the motivations to meet or exceed earnings expectations (Buslepp, 2009). Buy and hold returns are encapsulated in Return_6M, which are the current 6-month buy and hold returns. Return_6M is added to control for operating performance, as prior research has shown a positive relationship between a firm's current operating performance and its ability to beat expectations (Heflin and Hsu, 2008). In addition to Return_6M, we have added ROA – return on assets – as

another control for operating performance.

Inst_share - the institutional shareholder base as a share of the total shareholder base - has been added to control for factors associated with a firm's analyst following (Pope et al., 2019). In addition, Num_estimates – which is the number of analysts that have issued full-year estimates in CapitalIQ – has been added to control for analyst following directly. Price_vol is the company's 1-year share price volatility and has been added to control for inherent differences in volatility among firms in line with Lang et al. (2019).

We also construct a forecast horizon variable consisting of the number of days between the announcement date of the estimate and the actual announcement date. The hypothesis is that there should be a higher inaccuracy for estimates made further away from the EPS actual announcement date. In our regression, we use the natural logarithm, so the name of the variable is ln_ForecastHorizon.

Finally, we remove observations with NAs from our dataset that would automatically be removed from the regressions. We also remove all observations where the Forecast Period Indicator (FPI) is not equal to 1, leaving only observations of annual figure estimates in the sample. As such, we rule out distortions in inaccuracy differences between the samples due to varying FPI compositions. This leaves us with a final dataset of 17,082 observations.

3.2.6 Creating subsamples and winsorizing final datasets

The last step before we are ready to estimate our regressions is to create the subsamples that are necessary for our various regression models. For reasons elaborated upon later, we create one subsample consisting only of data from Nordea and DNB and another subsample only including companies covered by both traditional and sponsored equity research. This leaves us with a total sample of 17,082 observations, a Nordea and DNB sample of 9,768 observations, and a small sponsored and traditional sample of 289 observations. Lastly, the continuous variables in all three datasets have been winsorized at the 1st and 99th percentiles by replacing observations outside these parameters with the 1st and 99th percentiles to limit extreme values (Hastings et al., 1947).

3.3 Descriptive statistics

Overall, from running descriptive statistics on our datasets, we find that without controlling for firm characteristics, the inaccuracy and bias in the sponsored sample is larger than in the traditional sample. In addition, companies that engage sponsored research have a lower share of institutional investors and are on average younger, smaller, and riskier (as measured by earnings and return volatility) than companies covered through traditional research.

Companies in Software -and Healthcare-related industries have the highest frequency of observations in the Sponsored sample, whereas companies in Oil & Gas, Industrial Machinery, and Packaged Foods and Meats have the highest frequency in the traditional sample. In addition, the great majority of observations in the sponsored sample are located in Sweden, making up ∼80% of the sponsored sample. In contrast, companies in Sweden make up ∼40% of the traditional sample, indicating that Sweden had come much further in adopting sponsored research than the other Nordic countries until mid-2020.

We also find indications that the number of observations per company is higher in the traditional sample than in the sponsored sample, which is in line with previous research which finds that sponsored research estimates were updated less frequently than traditional research estimates.

3.3.1 Uncontrolled bias and inaccuracy higher for sponsored research

When not controlling for firm characteristics, we find that the mean and median bias and inaccuracy is higher for the sponsored sample than the traditional sample. In addition, the variance in inaccuracy and bias is higher for the sponsored sample than for the traditional sample. Differences in distributions across the samples are visualized in figure 7.

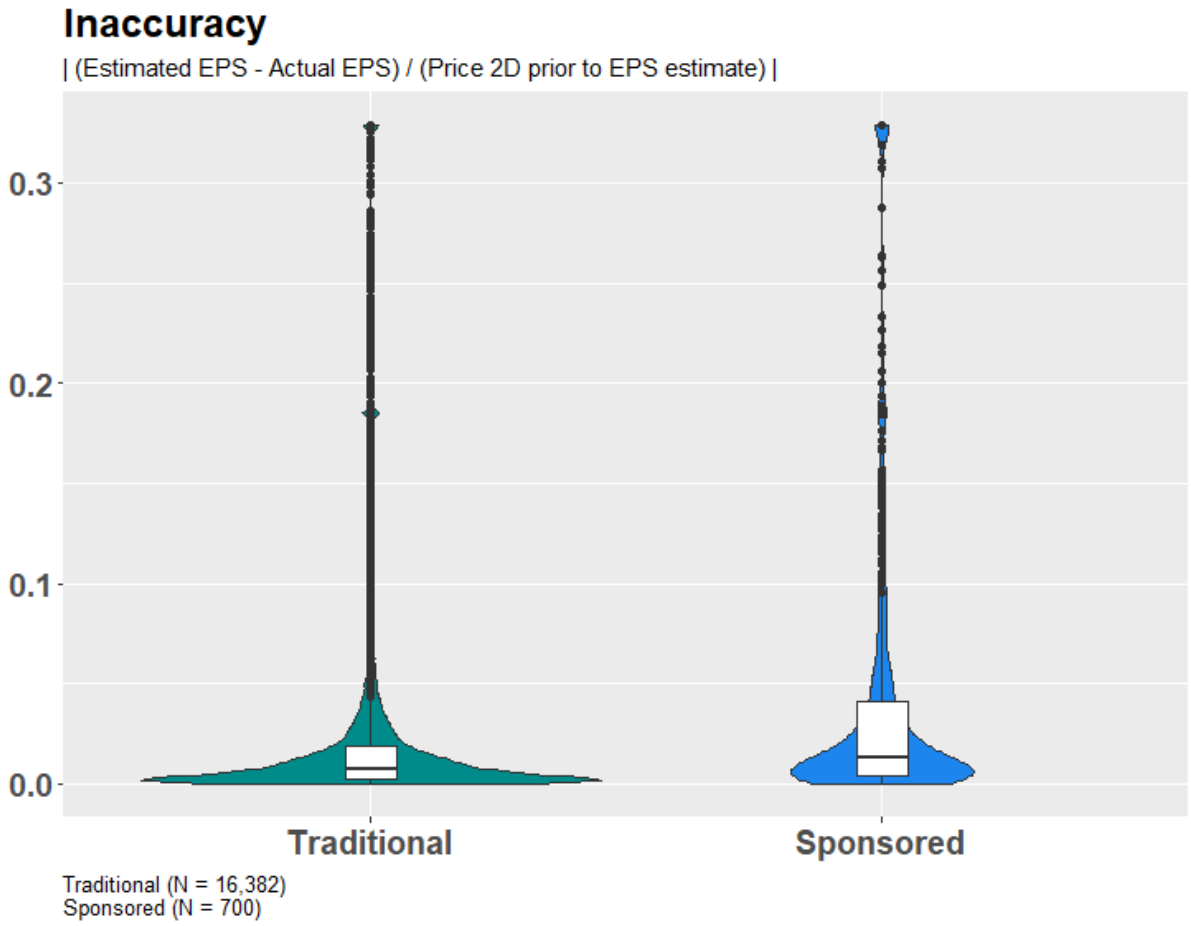

Figure 7: Inaccuracy distribution

3.3.2 Sponsored companies are younger, smaller, and riskier

In line with Billings et al. (2014), and Kirk (2011) we find that companies that pay for sponsored research are on average smaller and younger, have more volatile earnings and returns, and have less institutional ownership than companies that are only covered by traditional sell-side research. Additionally, we find that companies engaging sponsored research are less levered and covered by fewer sell-side analysts than companies in the traditional sell-side sample. The only firm characteristics variable where the samples are not statistically different is Price Book. Descriptive statistics on the variables is shown in detail in table 5.

Table 5: Descriptive statistics on the variables in the dataset

Variable	Traditional Research (1)				Sponsored Research (2)				(1) - (2)	
	N	Mean	STD	Median	N	Mean	STD	Median	Mean Diff	P-Value
Bias	16,382	0.01	0.05	0.00	700	0.03	0.08	0.01	-0.02	0.00
Inaccuracy	16,382	0.02	0.05	0.01	700	0.04	0.07	0.01	-0.02	0.00
lnForecastHorizon	16,382	4.99	1.01	5.31	700	4.91	0.95	5.16	0.08	0.02
Price Book	16,382	3.62	3.51	2.65	700	3.45	3.68	2.22	0.17	0.23
Return On Assets	16,382	6.03	5.97	4.83	700	3.31	8.86	3.80	2.72	0.00
Leverage	16,382	55.85	15.51	56.59	700	47.56	20.47	49.73	8.29	0.00
Institutional Share	16,382	40.79	19.38	39.23	700	29.81	21.44	23.66	10.98	0.00
6-month return	16,382	5.48	20.98	4.38	700	2.21	29.89	0.49	3.27	0.00
Price Volatility	16,382	29.14	12.29	26.22	700	40.93	17.48	37.13	-11.79	0.00
lnFirmAge	16,382	2.68	0.75	2.97	700	2.17	0.86	2.37	0.51	0.00
lnMarketCap	16,382	7.93	1.49	7.84	700	5.01	0.94	5.01	2.92	0.00
Number of estimates	16,382	11.01	7.87	8.00	700	1.88	1.06	2.00	9.13	0.00

In contrast to the findings in the existing literature, we find that more volatile returns are not accompanied by higher returns, but in fact lower average returns. Figure 8 shows the distribution in accounting returns across the samples, whereas figure 9 shows the distribution in buy-and-hold returns. Explicit price volatility distributions are illustrated in figure 10.

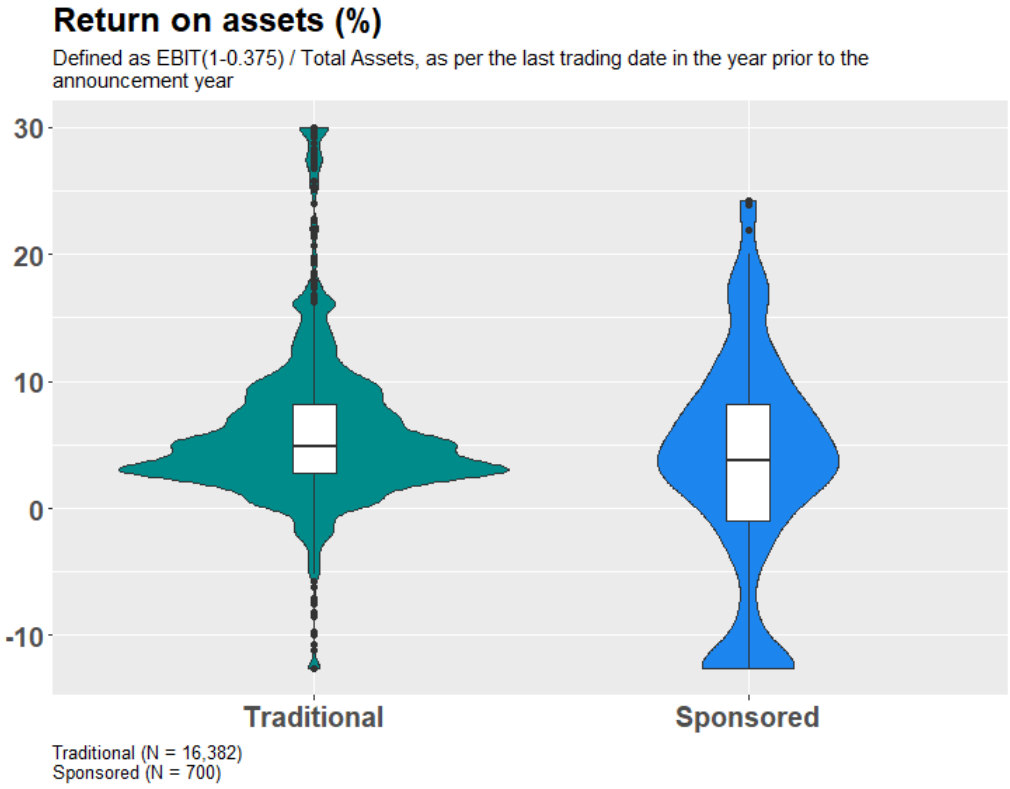

Figure 8: ROA distribution

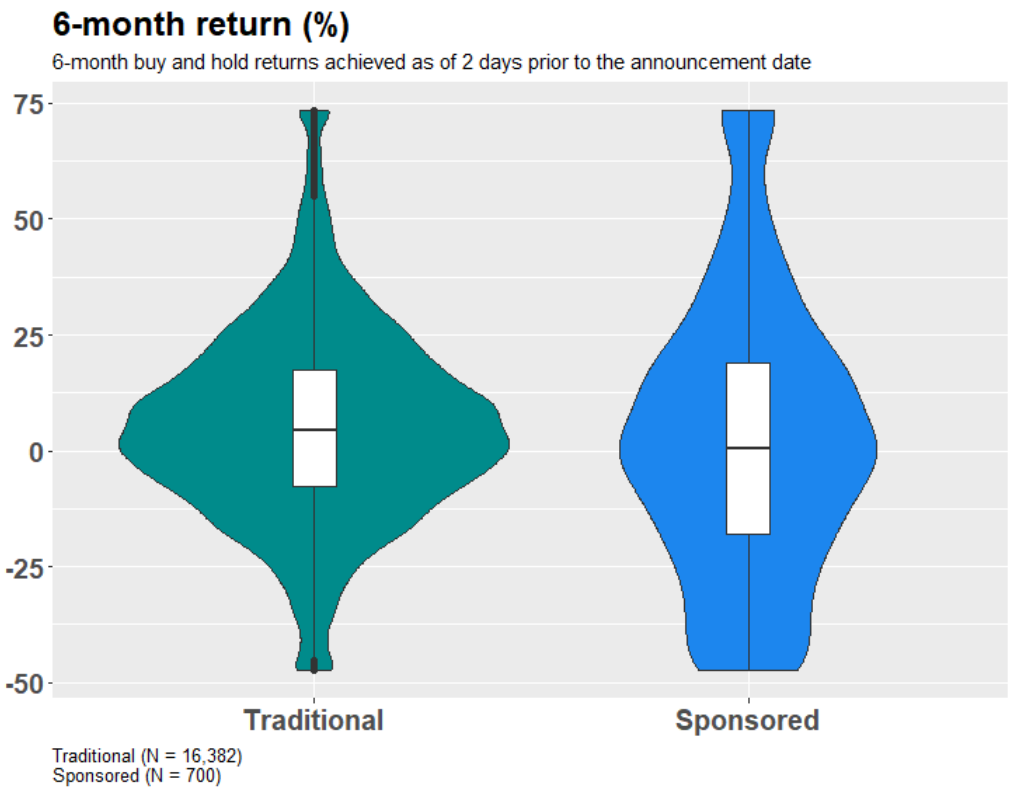

Figure 9: 6-month return distribution

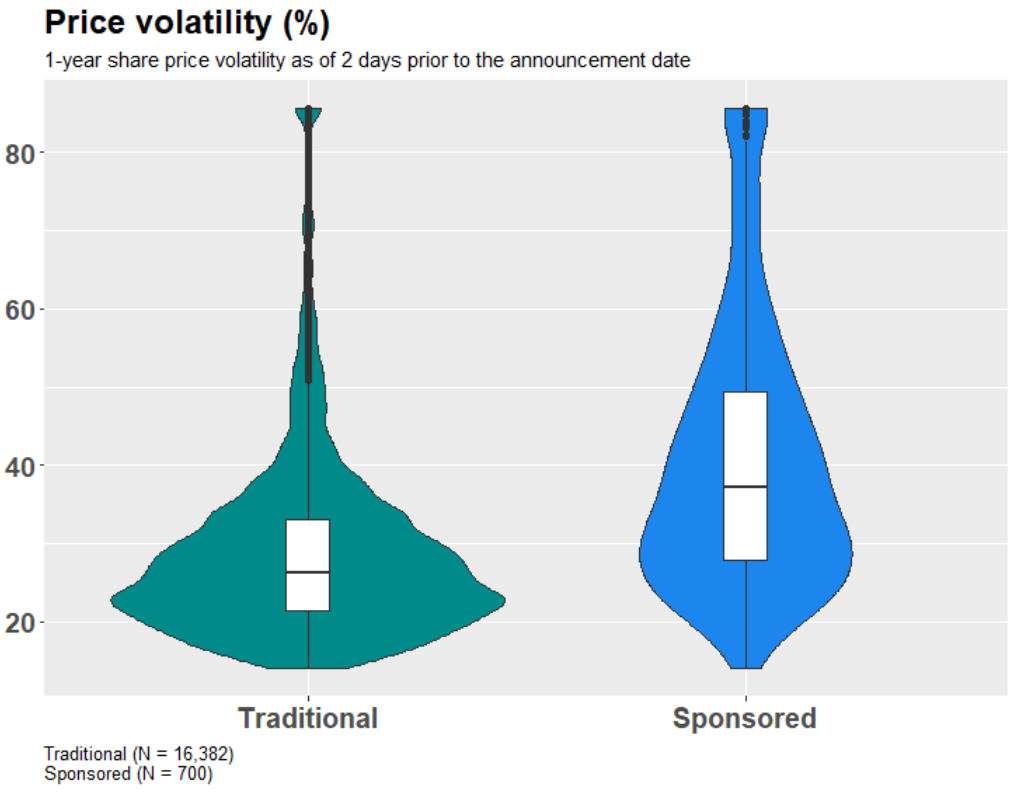

Figure 10: Price volatility distribution

Box - and violin plots for all variables across the traditional and sponsored samples can be found in the appendix (Figure 14-19).

3.3.3 Industry and country - Sponsored vs. Traditional sell-side

When constructing the dataset, both the SIC industry classification standard and Capital IQ's CIQ industry classification standard were included. This was done to cross-reference the observation count across the classification standards to better understand the industry composition in the final sample. Observation shares for the 10 most frequent SIC industries in the traditional sample are shown in table 6. The most frequent SIC industry in the sponsored sample is Business Services, which constitutes 19% of the total sample.

Table 6: Top 10 SIC industries in traditional sample

SIC Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Petroleum and Natural Gas	10%	4%
Machinery	8%	3%
Business Services	7%	19%
Retail	7%	4%
Food Products	6%	2%
Healthcare	5%	9%
Transportation	5%	n.a.
Pharmaceutical Products	4%	9%
Construction	4%	2%
Real Estate	4%	5%

We find that the CIQ Industry classification standard is more granular than the SIC standard, particularly within industries prevalent in the sponsored sample – namely Tech and Software, as well as Healthcare. The CIQ industries Application Software and Research and Consulting Services are, for instance, labeled Business Services in SIC, which among many other industries includes Security and Alarm Services and Environmental Manufacturing Services. The SIC industry Pharmaceutical Products consists of the CIQ industries Biotechnology and Pharmaceuticals. Since the CIQ industry classification provides more context on the differences in industry composition between the sponsored and traditional sample, only descriptive statistics based on the CIQ classification are shown in the remainder of this section. However, the same tables for the SIC standard can be found in the appendix (Table 20-23).

Table 7 shows an overview of observations shares by industry for the ten most prevalent

industries in the Traditional sample. Capital intensive and mature industries like Industrial Machinery, Construction and Engineering, and Oil and Gas make up substantially higher shares of the traditional sample than the sponsored sample.

Table 7: Top 10 CIQ industries in the traditional sample

CIQ Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Industrial Machinery	7%	2%
Packaged Foods and Meats	6%	2%
Construction and Engineering	4%	2%
Oil and Gas Equipment and Services	4%	2%
Real Estate Operating Companies	4%	4%
Health Care Equipment	3%	5%
Casinos and Gaming	3%	3%
Marine	3%	n.a.
Pharmaceuticals	3%	3%
Oil and Gas Storage and Transportation	3%	1%

Table 8 shows an overview of observations shares by industry for the ten most prevalent industries in the sponsored sample. Application software, Healthcare related industries (Biotechnology, Health Care Equipment, and Pharmaceuticals), and gaming companies (Interactive Home Entertainment) are substantially more prevalent on a share basis in the Sponsored sample than in the Traditional Sample.

Table 8: Top 10 CIQ industries in the sponsored sample

CIQ Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Application Software	1%	7%
Biotechnology	2%	6%
Interactive Home Entertainment	1%	5%
Health Care Equipment	3%	5%
Real Estate Operating Companies	4%	4%
Trading Companies and Distributors	2%	4%
Casinos and Gaming	3%	3%
Pharmaceuticals	3%	3%
Aerospace and Defense	1%	3%
Research and Consulting Services	1%	3%

Table 9 and table 10 compare the rank-ordered prevalence of the top 10 in the Traditional and Sponsored samples, respectively. The samples are similar in terms of the rank-ordered prevalence of Real Estate Operating Companies, Health Care Equipment, Casinos and Gaming, and Pharmaceuticals. It is worth noting that the difference in the rank-ordered prevalence of Health Care Equipment across the traditional and sponsored samples is 2

(which appears low), but the difference in shares is 2 percentage points (which appears high).

Table 9: Rank-ordered prevalence of top 10 traditional sell-side industries

CIQ Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Industrial Machinery	1	25
Packaged Foods and Meats	2	14
Construction and Engineering	3	25
Oil and Gas Equipment and Services	4	22
Real Estate Operating Companies	5	5
Health Care Equipment	6	4
Casinos and Gaming	7	7
Marine	8	n.a.
Pharmaceuticals	9	8
Oil and Gas Storage and Transportation	10	40

Table 10: Rank-ordered prevalence of top 10 sponsored industries

CIQ Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Application Software	50	1
Biotechnology	20	2
Interactive Home Entertainment	40.5	3
Health Care Equipment	6	4
Real Estate Operating Companies	5	5
Trading Companies and Distributors	16	6
Casinos and Gaming	7	7
Pharmaceuticals	9	8
Aerospace and Defense	45	9
Research and Consulting Services	46	10

Table 11 shows the differences in country shares of total observations between the sponsored and traditional samples. We find that the sponsored sample is dominated by companies located in Sweden.

Table 11: Shares of company country - Traditional vs. Sponsored

Country	Traditional	Sponsored
Sweden	40%	78%
Norway	19%	3%
Denmark	16%	1%
Finland	15%	14%
Bermuda	2%	n.a.
United Kingdom	2%	1%
Malta	1%	1%
Switzerland	1%	2%
Luxembourg	1%	n.a.
Singapore	0%	n.a.
Canada	0%	n.a.
United Arab Emirates	0%	n.a.
Belgium	0%	n.a.
Iceland	0%	n.a.
France	0%	n.a.
Germany	0%	n.a.
Chile	0%	n.a.
Estonia	0%	n.a.
Lithuania	0%	n.a.
Latvia	0%	n.a.
Greece	0%	n.a.
United States	n.a.	0%

Table 12 shows the distribution of observations by country and research provider as a share of total observations by each research provider. For most brokerages the country distribution is similar to the distribution of traditional research shown in table 11, with small deviances that reflect local market conditions. The country distribution of ABG's observations, however, is more similar to the sponsored distribution in table 11. This seems natural, given that ABG's sample primarily consists of sponsored observations (Table 4).

Table 12: Distribution of observations by country and researcher

	Nordea	**DNB**	**Danske Bank**	**SEB**	**ABG**
Sweden	40%	40%	39%	45%	88%
Finland	19%	9%	18%	15%	1%
Norway	15%	29%	17%	16%	1%
Denmark	14%	10%	18%	12%	5%
Bermuda	3%	4%	3%	3%	0%
United Kingdom	2%	1%	2%	2%	2%
Malta	1%	0%	1%	1%	1%
Switzerland	1%	1%	0%	0%	1%
Canada	1%	0%	0%	0%	0%
Germany	1%	0%	0%	0%	0%
Luxembourg	1%	1%	1%	1%	0%
Chile	0%	0%	0%	0%	0%
France	0%	0%	0%	0%	0%
Greece	0%	0%	0%	0%	0%
Iceland	0%	0%	0%	0%	0%
Singapore	0%	0%	0%	0%	0%
United Arab Emirates	0%	1%	0%	0%	0%
Belgium	0%	2%	0%	1%	0%
Estonia	0%	0%	0%	1%	0%
Latvia	0%	0%	0%	0%	0%
Lithuania	0%	0%	0%	0%	0%
United States	0%	0%	0%	0%	1%
	100%	**100%**	**100%**	**100%**	**100%**

3.3.4 EPS estimates per company

Table 13 and 14 show the number of EPS estimates published per company on average between the five researchers each year. The first table shows the sponsored sample, while the second table shows the traditional sell-side sample.

Table 13: EPS estimates per company (sponsored sample)

Research Provider	**2017**	**2018**	**2019**	**2020**	**Total**
Nordea	2.2	3.0	4.0	1.1	**3.2**
DNB	n.m.	2.6	3.1	1.0	**2.8**
Danske Bank	n.m.	3.0	3.4	1.0	**2.9**
SEB	n.m.	2.5	5.4	1.1	**3.5**
ABG	n.m.	n.m.	3.4	1.3	**2.8**
Total	**2.2**	**2.8**	**3.8**	**1.2**	**3.0**

Table 14: EPS estimates per company (traditional sell-side sample)

Research Provider	**2017**	**2018**	**2019**	**2020**	**Total**
Nordea	7.4	7.8	7.3	1.3	**6.4**
DNB	6.7	7.0	6.9	1.2	**5.9**
Danske Bank	6.6	6.6	5.8	n.m.	**6.3**
SEB	6.7	5.3	1.3	n.m.	**6.0**
ABG	n.m.	n.m.	n.m.	n.m.	**n.m.**
Total	**6.9**	**6.7**	**6.6**	**1.2**	**6.2**

We observe that for 2018 and 2019, there are indications that substantially more EPS estimates were published per company in the traditional sell-side sample than in the sponsored sample. This is in line with Buslepp (2009), which finds that sponsored forecasts are revised less often than forecasts from traditional sell-side brokers. The author also finds that sponsored research is especially slow at publishing downgrades and new estimates reflecting negative news, which could help explain the difference in estimates per company between the two types of research. This finding is partly why the author concludes that sponsored research "may not be an adequate substitute for research from analysts at traditional brokerage firms" (Buslepp, 2009, p. 83). Our finding is also consistent with the theory of Agrawal and Chen (2012), which predicts that researchers paid by trading commission revenues will be more incentivized to issue updated revisions than independent researchers.

Overall, there can be many explanations for the difference in the frequency of publishing estimates, but it could be considered a negative development for the overall information environment resulting from the increased use of sponsored research. It is especially concerning if the difference is due to analysts refraining from publishing estimates reflecting adverse developments in sponsored research.

4 Research design

The following section presents the research design for our analysis, both by giving a general overview of our fixed-effects regressions and by presenting our regression models in detail.

4.1 Fixed effects regressions

Our analysis estimates several multiple fixed effects regressions with forecast inaccuracy and bias as the dependent variable. We include in the regressions a sponsored/not sponsored dummy variable to estimate the difference in inaccuracy and bias between the sponsored and traditional sell-side research. We also include several control variables in line with relevant literature, diminishing concerns about omitted variable bias. The control variables are elaborated upon in section 3.2.5. of the paper.

Both regressions controlling for fixed effects within Company-Broker pairs and regressions controlling for company fixed effects and broker fixed effects separately are included. The pairwise fixed effects approach provides a tighter structure, which can better capture individual-specific effects. All the regressions use robust standard errors, clustered either by the company or by the Company-Estimator identification. Thus, the estimated regressions where we separate broker and company fixed effects can be expressed as:

$$\begin{aligned}\text{Bias or Inaccuracy } &= \beta_0 + \beta_1 \text{ Sponsored } + \beta_2 \text{ ForecastHorizon } + \beta_3 \text{ NumEstimates } + \\ &\text{Firm controls } + \text{ Year } FE + \text{ Broker } FE + \text{ Company } FE + \varepsilon\end{aligned}$$

While the regressions with paired fixed effects are expressed as:

$$\begin{aligned}\text{Bias or Inaccuracy } &= \beta_0 + \beta_1 \text{ Sponsored } + \beta_2 \text{ ForecastHorizon } + \beta_3 \text{ NumEstimates } + \\ &\text{Firm controls } + \text{ Year } FE + \text{ CompanyBroker } FE + \varepsilon\end{aligned}$$

The traditional sell-side sample is substantially larger than the sponsored sample, making the panel unbalanced. To adjust for this, we entropy balance the samples in line with the methodology in Hainmueller and Xu (2013). Entropy balancing is a preprocessing technique applied to achieve covariate balance on observational studies with a binary treatment.

We use entropy balancing over other matching and propensity score methods applied in the literature to avoid manual iterations, which in some cases may counteract bias reduction for treatment effect estimation (Ho et al., 2007) (Iacus et al., 2012) (Diamond and Sekhon, 2013). Entropy balancing distinguishes itself from other methods, as it is a reweighting method where covariate balance is directly integrated into the weight function. Initially, the practitioner defines balance constraints on the dataset. Thereafter, the search algorithm reweights the dataset in a combination of weights that a) satisfies the balance constraints and b) is as close to the uniform base weights as possible, as measured in an entropy sense. Hainmueller and Xu (2013) argue that the technique effectively adjusts for both stochastic and deterministic differences in the initial samples. The result of entropy balancing the two samples where this was necessary is shown in table 15 and 16.

Table 15: Entropy balancing for regression model 1

	Pre Entropy Balancing					
	Traditional Research			**Sponsored Research**		
	Mean	**Variance**	**Skewness**	**Mean**	**Variance**	**Skewness**
ln Forecast Horizon	4.99	1.03	-1.88	4.91	0.90	-1.53
Price Book	3.62	12.29	2.67	3.46	13.53	2.62
ROA	6.03	35.69	1.59	3.31	78.47	-0.17
Leverage	55.85	240.60	-0.16	47.56	419.10	-0.20
Institutional Share	40.79	375.50	0.13	29.81	459.60	0.79
6M Return	5.49	440.30	0.37	2.21	893.30	0.42
Price Volatility	29.14	150.90	2.09	40.93	305.40	1.02
ln Firm Age	2.68	0.56	-1.20	2.17	0.74	-0.33
ln Market Cap	7.93	2.21	-0.01	5.01	0.89	0.51
Number of Estimates	11.01	61.99	0.95	1.88	1.12	1.35

	Post Entropy Balancing					
	Traditional Research			**Sponsored Research**		
	Mean	**Variance**	**Skewness**	**Mean**	**Variance**	**Skewness**
ln Forecast Horizon	4.91	0.90	-1.53	4.91	0.90	-1.53
Price Book	3.46	13.53	2.62	3.46	13.53	2.62
ROA	3.31	78.47	-0.17	3.31	78.47	-0.17
Leverage	47.56	419.10	-0.20	47.56	419.10	-0.20
Institutional Share	29.81	459.60	0.79	29.81	459.60	0.79
6M Return	2.21	893.30	0.42	2.21	893.30	0.42
Price Volatility	40.93	305.40	1.02	40.93	305.40	1.02
ln Firm Age	2.17	0.74	-0.33	2.17	0.74	-0.33
ln Market Cap	5.01	0.89	0.51	5.01	0.89	0.51
Number of Estimates	1.88	1.19	1.64	1.88	1.12	1.35

Table 16: Entropy balancing for regression model 5

	Pre Entropy Balancing					
	Traditional Research			Sponsored Research		
	Mean	Variance	Skewness	Mean	Variance	Skewness
ln Forecast Horizon	4.94	1.08	-1.77	5.02	0.58	-1.60
Price Book	3.46	11.32	2.73	2.58	5.09	1.94
ROA	5.82	34.58	1.37	0.83	71.40	-0.57
Leverage	56.37	242.30	-0.16	47.69	456.90	-0.28
Institutional Share	40.44	364.60	0.14	23.11	393.50	1.74
6M Return	5.34	470.20	0.41	2.51	989.10	0.52
Price Volatility	30.13	174.70	2.10	43.80	471.40	0.77
ln Firm Age	2.67	0.56	-1.18	2.17	0.79	-0.37
ln Market Cap	7.89	2.20	0.02	5.00	0.66	0.14
Number of Estimates	10.80	59.51	0.98	1.92	1.00	1.13

	Post Entropy Balancing					
	Traditional Research			Sponsored Research		
	Mean	Variance	Skewness	Mean	Variance	Skewness
ln Forecast Horizon	5.02	0.58	-1.60	5.02	0.58	-1.60
Price Book	2.58	5.09	1.94	2.58	5.09	1.94
ROA	0.83	71.40	-0.57	0.83	71.40	-0.57
Leverage	47.69	456.90	-0.28	47.69	456.90	-0.28
Institutional Share	23.11	393.50	1.74	23.11	393.50	1.74
6M Return	2.51	989.10	0.52	2.51	989.10	0.52
Price Volatility	43.80	471.40	0.77	43.80	471.40	0.77
ln Firm Age	2.17	0.79	-0.37	2.17	0.79	-0.37
ln Market Cap	5.00	1.16	0.65	5.00	0.66	0.14
Number of Estimates	1.92	1.00	9.78	1.92	1.00	1.13

In our analysis, we run five different regression models, each containing several regressions varying in terms of sample, fixed effects, and panel balance. The five regression models are described in the section below.

4.2 The regression models

In the following section we describe the five regression models we use to explore our hypotheses, with each model containing several regressions. We also state the specific null hypotheses we analyze with each model.

4.2.1 Regression model 1 (Full sample; Inaccuracy)

Using our first model, we run four regressions on inaccuracy as the dependent variable, using the entire dataset as the sample. We run a regression controlling for broker and company fixed effects separately and a regression controlling for Company-Broker pairwise fixed effects. We estimate these two regressions both before and after entropy balancing,

leaving us with a total of four regressions.

Hypothesis 1: There is no difference in inaccuracy between the sponsored and traditional sell-side EPS estimates in our full dataset.

4.2.2 Regression model 2 (Full sample; Bias)

Using our second model, we run the same four regressions as in regression model 1 but using forecast bias rather than inaccuracy as the dependent variable.

Hypothesis 2: There is no difference in bias between the sponsored and traditional sell-side EPS estimates in our full dataset.

4.2.3 Regression model 3 (Paired sample; Inaccuracy and Bias)

In our third model, we estimate regressions on a subsample of the dataset that only includes estimates for companies covered by both traditional and sponsored research at various points in the relevant period. This includes cases where one broker changes their coverage type during the period or where several brokerages cover a company with differing coverage types. We run one regression on inaccuracy and one on bias, controlling for Company-Broker pairwise fixed effects.

Hypothesis 3: There is no difference in bias or inaccuracy between the sponsored and traditional sell-side EPS estimates belonging to companies covered by sponsored and traditional research at different periods and/or at the same time over the sample period.

4.2.4 Regression model 4 (Paired sample; Inaccuracy and Bias with switching variable)

In regression model 4, we use the same subsample as in regression model 3, but include a new dummy variable, "Spons_to_trad", in the regressions, which is 1 for estimates belonging to companies that have seen their coverage changed from sponsored to traditional sell-side and 0 in the opposite case. This is to see if there is an inherent and significant difference in bias and inaccuracy between companies that go from sponsored coverage to traditional sell-side coverage and vice versa. We also estimate regressions with an interaction term between the “Sponsored” variable and the “Spons_to_trad” variable to

see whether companies that go from sponsored to traditional experience a drop or increase in the inaccuracy and bias of their estimates.

Hypothesis 4: There is no difference in bias or inaccuracy between EPS estimates for companies that have gone from being covered by sponsored research to traditional sell-side research and EPS estimates for companies where the opposite is the case.

4.2.5 Regression model 5 (Nordea and DNB sample; Inaccuracy and Bias)

In regression model 5 we estimate regressions on a subsample of the dataset that only includes estimates by Nordea and DNB. As shown in section 3.2.4, only DNB and Nordea have sponsored and traditional estimates in IBES for all the years in our dataset. To test if having complete panel data over the entire period gives different results than when using the entire dataset, we run regressions using only estimates made by these two brokers. We estimate regressions for inaccuracy and bias, both before and after entropy balancing, resulting in a total of four regressions using this model.

Hypothesis 5: There is no difference in bias or inaccuracy between the sponsored and traditional sell-side EPS estimates made by Nordea and DNB.

5 Results

This section presents the results from running the five regression models outlined in our research design. Each subsection presents the regression output of one of the models, and each model includes several regressions. Note that the number of observations in the following regression outputs differs slightly from the number of observations in the datasets due to singleton observations being dropped in the multiple fixed-effects models (Correia, 2015).

5.1 Regression model 1 (Full sample; Inaccuracy)

Regression model 1: Inaccuracy as the dependent variable and the whole dataset as the sample.

	(1) Unbalanced	(2) Unbalanced	(3) Balanced	(4) Balanced
Sponsored	-.0098*	-.03***	-.0059	-.0196
	(-1.77)	(-3.09)	(-0.83)	(-1.64)
ln_ForecastHorizon	.0041***	.0041***	.0073***	.0076***
	(7.79)	(11.31)	(3.71)	(3.93)
Price_Book	-.0005	-.0007	.0028	.0031
	(-0.50)	(-0.97)	(1.47)	(1.47)
ROA	-.001*	-.0011***	-.0018	-.0018
	(-1.65)	(-2.59)	(-1.54)	(-1.59)
Leverage	.0001	.0001	-.0003	-.0003
	(0.49)	(0.69)	(-0.83)	(-0.75)
Inst_share	-.0038***	-.004***	-.0034	-.0046**
	(-3.98)	(-7.20)	(-1.47)	(-2.04)
Return_6M	-.0002***	-.0002***	-.0003***	-.0003***
	(-5.04)	(-6.25)	(-3.77)	(-3.79)
Price_Vol	.0001	.0001	.0009**	.001**
	(0.29)	(0.57)	(2.27)	(2.57)
ln_Firm_age	.0179***	.0173***	.0367	.0214
	(3.28)	(5.03)	(1.15)	(0.73)
ln_market_cap	-.0084	-.0082*	-.0203**	-.0208**
	(-1.23)	(-1.84)	(-2.23)	(-2.10)
Num_estimates	.0005	.0006*	.006	.0057
	(1.09)	(1.89)	(1.55)	(1.42)
_cons	.1668***	.1775***	.1056	.1775
	(2.60)	(4.41)	(0.87)	(1.41)
Observations	17039	17006	17039	17006
R-squared	.6341	.6615	.7894	.8009
Adj R^2	.623	.6377	.783	.7869
Year FE	Yes	Yes	Yes	Yes
Company FE	Yes	No	Yes	No
Broker FE	Yes	No	Yes	No
Company-Broker FE	No	Yes	No	Yes

T-statistics are in parentheses
**** p<.01, ** p<.05, * p<.1*

Our first regression model estimates differences in inaccuracy between sponsored and traditional sell-side research on our entire sample. Regressions 3 and 4 are estimated after entropy balancing the sample, while 1 and 2 are unbalanced. Regressions 1 and 3 control for Company and Broker fixed effects separately, while 2 and 4 control for Company-Broker pairwise fixed effects.

We observe that in both the unbalanced regressions, the inaccuracy of sponsored research is found to be significantly lower than the inaccuracy of traditional sell-side research. The significance is starkest when controlling for Company-Broker pairwise fixed effects. However, when entropy balancing the control variables in the sample by mean, variance, and skewness, the significance disappears. This could indicate that the differences in characteristics between the sponsored and traditional sell-side samples, e.g., with regards to sample size and variance, could be the reason for the significance in regression 1 and 2 rather than an actual difference in inaccuracy. So based on regression model 1, we cannot reject the null hypothesis that the difference in inaccuracy between sponsored and traditional sell-side research is equal to zero.

5.2 Regression model 2 (Full sample; Bias)

Regression model 2: Bias as the dependent variable and the whole dataset as the sample.

	(1) Unbalanced	(2) Unbalanced	(3) Balanced	(4) Balanced
Sponsored	-.0058	-.0217*	.0044	-.0083
	(-0.63)	(-1.76)	(0.32)	(-0.56)
ln_ForecastHorizon	.004***	.0041***	.0069**	.0074***
	(6.51)	(9.20)	(2.50)	(3.04)
Price_Book	-.0025	-.0029**	.0011	.0014
	(-1.41)	(-2.49)	(0.58)	(0.60)
ROA	-.0009	-.0009*	-.0011	-.0013
	(-1.15)	(-1.80)	(-0.81)	(-0.99)
Leverage	.0004	.0005	-.0003	-.0004
	(0.92)	(1.57)	(-0.87)	(-0.88)
Inst_share	-.0024	-.003**	-.0005	-.0014
	(-1.39)	(-2.31)	(-0.18)	(-0.44)
Return_6M	-.0001	-.0001	-.0001	-.0002
	(-1.26)	(-1.45)	(-1.09)	(-1.36)
Price_Vol	-.0001	0	.0011**	.0013**
	(-0.21)	(-0.09)	(2.10)	(2.40)
ln_Firm_age	.0036	.0023	.0829**	.0723*
	(0.50)	(0.46)	(2.02)	(1.74)
ln_market_cap	.0152	.0178***	.0003	-.0076
	(1.42)	(2.62)	(0.02)	(-0.46)
Num_estimates	.0005	.0004	.0073	.0076*
	(0.80)	(0.76)	(1.58)	(1.84)
_cons	-.0567	-.0492	-.2128	-.1278
	(-0.53)	(-0.72)	(-1.31)	(-0.71)
Observations	17039	17006	17039	17006
R-squared	.3715	.4438	.6573	.6979
Adj R^2	.3525	.4046	.6469	.6766
Year FE	Yes	Yes	Yes	Yes
Company FE	Yes	No	Yes	No
Broker FE	Yes	No	Yes	No
Company-Broker FE	No	Yes	No	Yes

T-statistics are in parentheses
*** p<.01, ** p<.05, * p<.1*

Regression model 2 estimates the same regressions as in model 1, only this time with forecast bias as the dependent variable rather than inaccuracy. Here we only find weak significance in the unbalanced regression 2 controlling for Company-Broker FEs. The results from this regression indicates that sponsored research is significantly less positively biased than traditional sell-side research. However, the other three regressions show no significant difference in bias. Overall, we cannot, based on regression model 2, reject the null hypothesis of no significant difference in bias between sponsored and traditional research.

5.3 Regression model 3 (Paired sample; Inaccuracy and Bias)

Regression model 3: Only companies covered by both types of research included in the sample.

	(1) Inaccuracy	(2) Bias
Sponsored	-.0462*	-.0409*
	(-2.00)	(-1.71)
ln_ForecastHorizon	.0115**	.0118*
	(2.08)	(1.76)
Price_Book	.021	.0244
	(1.08)	(1.27)
ROA	-.0023	-.0018
	(-1.09)	(-0.89)
Leverage	-.0005	-.0012
	(-0.28)	(-0.56)
Return_6M	-.0007**	-.0006*
	(-2.40)	(-1.80)
Price_Vol	.0007	.0006
	(0.68)	(0.57)
ln_Firm_age	.0317	.1032
	(0.19)	(0.55)
ln_market_cap	-.0659	-.0682
	(-1.62)	(-1.65)
Num_estimates	.0281***	.0249**
	(3.51)	(2.39)
_cons	.2011	.0687
	(0.64)	(0.19)
Observations	288	288
R-squared	.7631	.7218
Adj R^2	.7258	.6781
Time FE	Yes	Yes
Company-Broker FE	Yes	Yes

T-statistics are in parentheses
**** p<.01, ** p<.05, * p<.1*

Regression model 3 estimates differences in inaccuracy and bias between sponsored and traditional research only for companies that are or have been covered by both types of research. We find weak evidence for sponsored research being both less inaccurate and less positively biased than traditional sell-side research in this subsample. However, the coefficients are only significant on a 10% level, and the sample only contains 288 observations. Still, regression model 3 contains weak evidence against the null hypothesis of equal inaccuracy and bias among the two research types, indicating that sponsored research is of higher quality. Note that the institutional share variable was dropped in this

regression due to issues of heteroskedasticity with the small sample, which is the reason why the number of observations has dropped to 288.

5.4 Regression model 4 (Paired sample; Inaccuracy and Bias with switching variable)

Regression model 4: Adding "Spons_to_trad" dummy variable to regression model 3.

	(1) Inaccuracy	(2) Bias	(3) Inaccuracy	(4) Bias
Sponsored			.0032	.0009
			(0.16)	(0.04)
Spons_to_trad	.1658**	.1649**	.253***	.2401***
	(2.55)	(2.40)	(4.18)	(3.61)
Sponsored#Spons_to_trad			-.1192	-.1032
			(-1.59)	(-1.36)
ln_ForecastHorizon	.0127**	.0131*	.0138**	.014**
	(2.39)	(1.99)	(2.66)	(2.16)
Price_Book	-.0129**	-.0111*	-.0119**	-.0103
	(-2.42)	(-1.95)	(-2.08)	(-1.69)
ROA	.0017	.0015	.0017	.0015
	(1.68)	(1.39)	(1.60)	(1.34)
Leverage	-.0003	-.0002	-.0004	-.0003
	(-0.57)	(-0.39)	(-0.57)	(-0.41)
Inst_share	-.0004	-.0002	-.0002	0
	(-0.52)	(-0.24)	(-0.27)	(-0.03)
Return_6M	-.0009***	-.001***	-.0011***	-.0011***
	(-3.88)	(-3.74)	(-4.22)	(-3.95)
Price_Vol	.003***	.0028***	.003***	.0029***
	(3.22)	(2.83)	(3.25)	(2.85)
ln_Firm_age	-.0069	-.0056	.0022	.0024
	(-0.24)	(-0.19)	(0.08)	(0.08)
ln_market_cap	-.0533***	-.0562***	-.0547***	-.0574***
	(-3.78)	(-3.81)	(-3.75)	(-3.75)
Num_estimates	.0138	.0132	.0112	.0108
	(1.44)	(1.17)	(1.19)	(0.96)
_cons	.1846	.1787	.1624	.1607
	(1.42)	(1.47)	(1.21)	(1.28)
Observations	289	289	289	289
R-squared	.5014	.4647	.5173	.4764
Adj R2	.4721	.4332	.4851	.4415
Time FE	Yes	Yes	Yes	Yes
Broker FE	Yes	Yes	Yes	Yes

T-statistics are in parentheses
*** p<.01, ** p<.05, * p<.1*

Regression model 4 uses the same subsample as model 3 but includes a "Spons_to_trad" variable, as described in 4.2.4, and an interaction term with the Sponsored variable. Regressions 1 and 2 exclude the Sponsored variable and the interaction term, while 3 and 4

include them. In all four regressions, the "Spons_to_trad" variable is significantly positive, indicating that companies that go from sponsored to traditional sell-side coverage overall experience estimates with higher inaccuracy and higher positive bias than companies going the other way. The interaction term tests if there is a significant drop in inaccuracy or bias when a company goes from being covered by sponsored research to being covered by traditional sell-side research. No such significance was found, indicating that a company's estimates neither suffer nor gain from a change in research type.

5.5 Regression model 5 (Nordea and DNB sample; Inaccuracy and Bias)

Regression model 5: Only Nordea and DNB estimates included in the sample.

	(1) Inaccuracy (Unbalanced sample)	(2) Bias (Unbalanced sample)	(3) Inaccuracy (Balanced sample)	(4) Bias (Balanced sample)
Sponsored	-.0375**	-.0141	-.0239	.0894
	(-2.07)	(-0.38)	(-0.87)	(1.36)
ln_ForecastHorizon	.0044***	.0046***	.0092	.0098
	(5.66)	(5.12)	(1.59)	(1.24)
Price_Book	-.0007	-.0039*	-.0002	-.0053
	(-0.55)	(-1.71)	(-0.05)	(-1.22)
ROA	-.0016**	-.0012	-.0032	-.0076**
	(-2.00)	(-1.38)	(-1.46)	(-2.01)
Leverage	.0003	.0006	-.0002	-.0002
	(0.77)	(1.03)	(-0.28)	(-0.13)
Inst_share	-.0042***	-.0019	-.0023	.0097
	(-3.64)	(-1.13)	(-0.58)	(1.25)
Return_6M	-.0002***	-.0001	-.0004***	0
	(-4.56)	(-1.07)	(-3.61)	(-0.27)
Price_Vol	.0001	0	.0013*	.0013
	(0.37)	(-0.04)	(1.81)	(1.38)
ln_Firm_age	.0195***	-.0008	.0309	.2381**
	(3.10)	(-0.10)	(0.56)	(2.57)
ln_market_cap	-.0083	.0248**	-.0072	.0113
	(-1.08)	(2.05)	(-0.45)	(0.47)
Num_estimates	.0006	.0004	.0138*	.0269*
	(1.00)	(0.53)	(1.75)	(1.87)
_cons	.174**	-.1452	-.0087	-.9442**
	(2.43)	(-1.31)	(-0.04)	(-2.51)
Observations	9752	9752	9752	9752
R-squared	.6479	.3947	.8492	.7539
Adj R2	.6335	.3699	.843	.7438
Year FE	Yes	Yes	Yes	Yes
Company FE	Yes	Yes	Yes	Yes

T-statistics are in parentheses
**** p<.01, ** p<.05, * p<.1*

The last regression model only includes data from Nordea and DNB as these are the only researchers providing sponsored and traditional sell-side estimates in IBES for all the years of our study period. Regression 3 and 4 are done on an entropy balanced sample, while 1 and 2 are unbalanced. Before entropy balancing, we find in regression 1 that the Sponsored variable is significantly negative at a 5% level. The coefficient provides further indications that sponsored research is less inaccurate than traditional sell-side research. However, no significant difference is found with regards to bias nor after entropy balancing the sample. As such, model 5 does not provide sufficient evidence to reject the null hypothesis of equal inaccuracy and bias between the sponsored and traditional sell-side samples.

5.6 Conclusion of analysis

Overall, we fail to find sufficient evidence to reject the null hypothesis that the average inaccuracy and bias in the sponsored research sample is equal to the average inaccuracy and bias in the traditional sell-side research sample. There is some indication that, if anything, sponsored research is more accurate and less positively biased than traditional sell-side research, mainly in the regressions that are not entropy balanced. However, given the substantial differences in sample sizes and the conflicting results in the balanced and unbalanced analyses, it is likely that differences in size between the sponsored and traditional sell-side samples are the reason for the observed effect in the unbalanced regressions. Consequently, the findings should not uncritically be interpreted as causal relationships. Followingly, we conclude that sponsored and traditional sell-side equity research appears to be of similar quality based on our analysis.

6 Discussion

In this section, we discuss the findings presented in section 5 and our analysis in general. Section 6.1 outlines possible implications and explanations of our findings. Section 6.2 looks at opportunities for further research on the subject, while 6.3 discusses some important limitations to our analysis.

6.1 Implications and explanations of findings

In the end, we find no clear significant difference in inaccuracy and bias between sponsored and traditional sell-side equity research post-MiFID II. Our findings indicate then that the EPS forecasts of the two types of research are of equal quality, which is in line with the findings in Billings et al. (2014). From the investor's point of view, this means that the information value of the sponsored estimates is comparable to that of the traditional sell-side estimates and can be included in decision-making without sacrificing confidence in the forecasts. From the perspective of the companies who purchase sponsored research, our findings support the idea that sponsored research represents a viable opportunity for exposure to investors if other types of equity coverage are less available. Without sacrificing the quality of estimates, the research comes with documented positive effects for the companies, including increased institutional ownership, stock liquidity, trading volume and increased sell-side coverage (Billings et al., 2014) (Norberg and Eriksson, 2020). However, transparency in the equity research process is essential to ensure investors' continued trust in the estimates.

For the sell side, sponsored research is emerging in the Nordics as a material alternative revenue stream in a market where revenues are decreasing overall. According to our findings, utilizing this new revenue stream should not be accompanied by reduced credibility and trust in estimates and the analysts making them. Communicating this to investors and ensuring transparency in affiliations and work processes will be essential to maintaining trust. From a policy perspective, prior research has already documented the overall positive effects of MiFID II on research quality (Guo and Mota, 2019) (Fang et al., 2020) (Lang et al., 2019). Our results indicate that the paid-for research that Nordic investment banks have begun offering as a direct result of the regulation does not appear to replace

one type of bias with a stronger type of bias as feared. While commenting on the overall success of the regulation is outside the scope of this paper, we thereby find no evidence indicating that the emergence of sponsored research is a negative side-effect of MiFID II to the overall information environment.

There is some indication in our analysis that, if anything, sponsored research is more accurate and less positively biased than traditional sell-side research. While the evidence for this is weak and less robust than the evidence for no significant difference, there are some reasonable explanations for why this could be the case. For one, getting paid for the research directly might incentivize analysts to put extra effort into their analysis and do a more thorough and well-researched assessment of a company's future earnings. One might also expect that such a paid-for arrangement allows the analyst greater access to information from the company itself, which could help make more accurate forecasts. John Olaisen, Head of Global Research at ABG, highlights both of these points when arguing for sponsored research being of higher quality than ABG's traditional sell-side research (Bøhren, 2021b). It could also be that analysts are aware that paid-for research will be under increased scrutiny, and thus they make an extra effort to avoid any apparent signs of bias in their estimates.

6.2 Opportunities for further research

Beyond our analysis, some interesting and valuable opportunities for further research remain. While we find no significant difference between sponsored and traditional sell-side EPS estimates, the most substantial part of the bias in equity research is historically found in stock recommendations rather than in earnings estimates (See section 2.1). This follows from EPS forecasts being more directed towards sophisticated institutional investors, making them subject to more in-depth scrutiny (Mikhail et al., 2007) (Malmendier and Shanthikumar, 2007). Further, Buslepp (2009) found in his analysis of American companies and researchers that sponsored research companies issue more favorable stock recommendations than analysts at traditional brokerage firms. One might then have to examine other metrics in addition to EPS forecasts to determine the full bias of sponsored research. While the brokers in our sample generally do not issue stock recommendations in their sponsored research, many reports include a target price range for a company's

stock. Further research on the subject could examine whether there is some bias in these price ranges that exceed the bias of target prices in traditional sell-side research. It could also be worth looking further into whether there is a significant difference in how quickly target prices and EPS estimates are upgraded and downgraded between the two types of research beyond our descriptive statistics.

6.3 Limitations

While we believe our main findings are solid and robust, there are several limitations to our analysis that should be considered when interpreting our results. Firstly, while the tendency to do so is growing fast, issuing sponsored research is still a relatively new and rare practice among the Nordic investment banks in our sample. Thus, the sample of sponsored research in our dataset is much smaller than the sample of traditional sell-side research and has a lower variance in the variables. While we attempt to control for this by entropy balancing the samples, it is not a perfect substitute for having more equally sized samples. Hopefully, the study can be repeated in a few years when the sample of sponsored estimates has grown to have a more robust comparison with traditional sell-side estimates.

Further, as elaborated upon in section 3.2.4, we lack sponsored and traditional sell-side estimates for all brokers in all the years in the data gathered from IBES, thus leaving us with imperfect panel data on which to perform our analysis. For Danske Bank there are almost exclusively sponsored estimates in IBES for 2020, while for SEB the same is the case in 2019 and 2020. Based on our assumptions and methodologies used, we find no traditional sell-side estimates from ABG in the IBES database for any of the four years. We attempt to control for this in regression model 5 by only including data from DNB and Nordea, but this leaves us with an even smaller sponsored sample, mostly containing Nordea estimates. We are thus careful in generalizing these findings to the sponsored research market in the Nordics as a whole. Another related limitation in our study is that ABG's estimates constitute around 50% of our sample of sponsored research. Thus, trends and dynamics inherent in ABG's equity research have the possibility of driving and dominating our findings. We attempt to control for this by including Broker and Company-Broker fixed effects in our regressions.

Lastly, we have constructed the sponsored variable based on data available on company websites, equity research reports, IBES, and Eikon. Although our cross-referencing methods have been comprehensive, the labeling of the sponsored variable is still subject to measurement error. As such, the chance remains that either the sponsored or the traditional research has been labeled incorrectly. However, we estimate this margin of error to be low.

7 Conclusion

Following the introduction of MiFID II and the unbundling of equity research from other investment banking services, several Nordic investment banks have begun offering sponsored research to companies willing to pay for coverage. As the market for sponsored research in the Nordics has grown significantly in the last few years, concerns have been raised regarding bias and conflicts of interest resulting from the investment bank being paid directly by the covered company. In this paper, we have examined whether there is a significant difference in bias and inaccuracy between the sponsored and the traditional sell-side equity research offered by DNB Markets, Nordea Markets, Danske Markets, ABG and SEB. We do this through a quantitative analysis comparing the forecast error of EPS estimates scaled by share price in sponsored research with the scaled forecast error in traditional sell-side research.

We find no strong evidence indicating a significant difference in either bias or inaccuracy of EPS estimates between sponsored research and traditional sell-side research. If anything, we find some weak evidence for the estimates in sponsored research being more accurate and less biased than the traditional sell-side estimates. Overall, we find no support for the concerns of sponsored research being biased as a result of being paid for by the covered companies, and our results indicate that these estimates should hold the same value for investors as estimates made in traditional sell-side reports. Further research on the topic could examine whether there exists such a bias in the target stock price range in sponsored research or whether there is some bias inherent in the timing of upgrades and downgrades of price ranges or estimates.

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Appendix

Figure 11: Global equities and investment banking revenues.

This image is from Exhibit 1 of McKinsey Working Papers on Corporate & Investment Banking No. 13. Image downloaded from https://ecrresearch.com/sites/default/files/public/article/McKinsey_CIB_WP13_Reinventing%20Equity%20Research_2017.pdf.

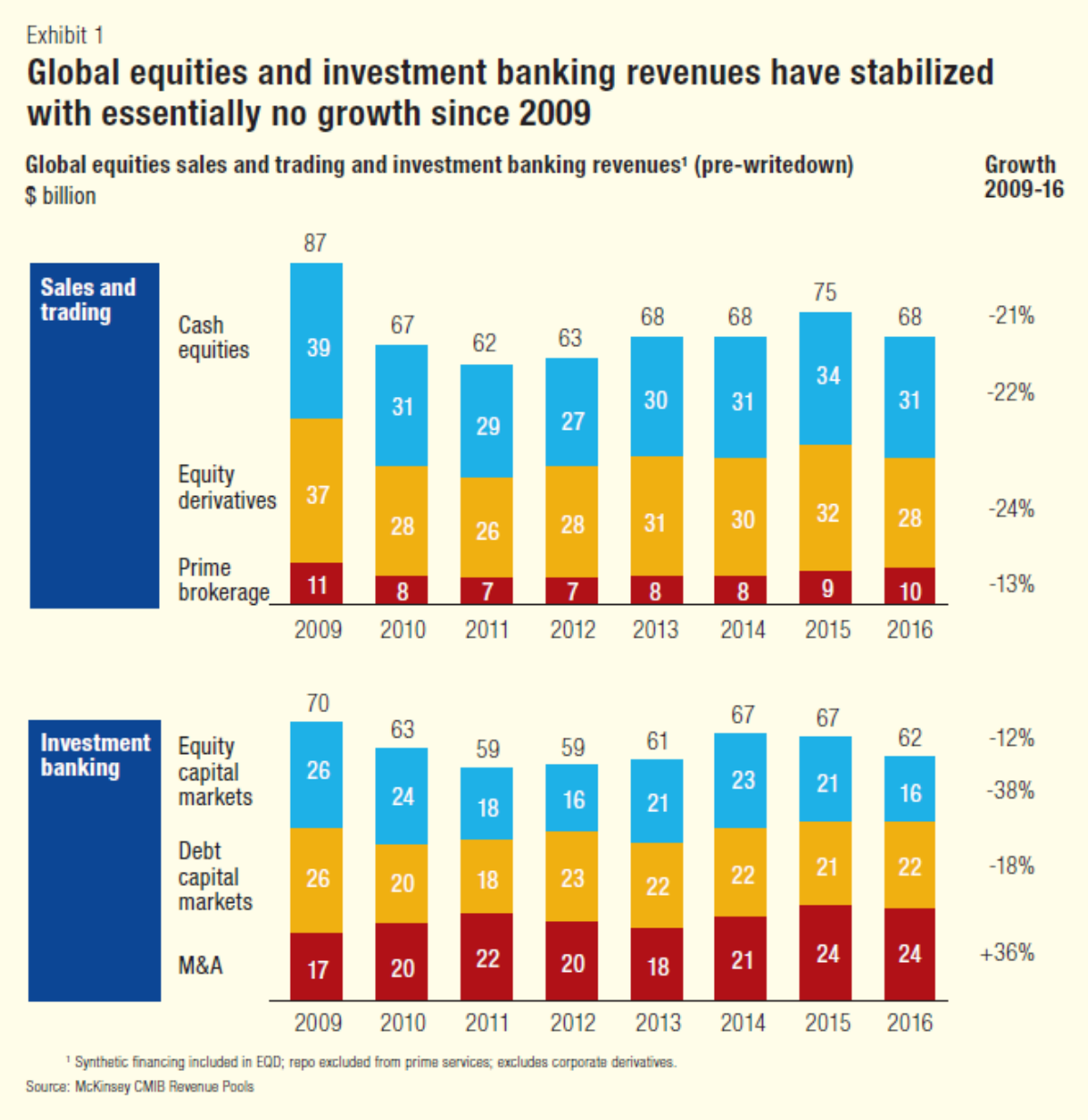

Figure 12: Development of research FTEs.

This image is from Exhibit 2 of McKinsey Working Papers on Corporate & Investment Banking No. 13. Image downloaded from https://ecrresearch.com/sites/default/files/public/article/McKinsey_CIB_WP13_Reinventing%20Equity%20Research_2017.pdf.

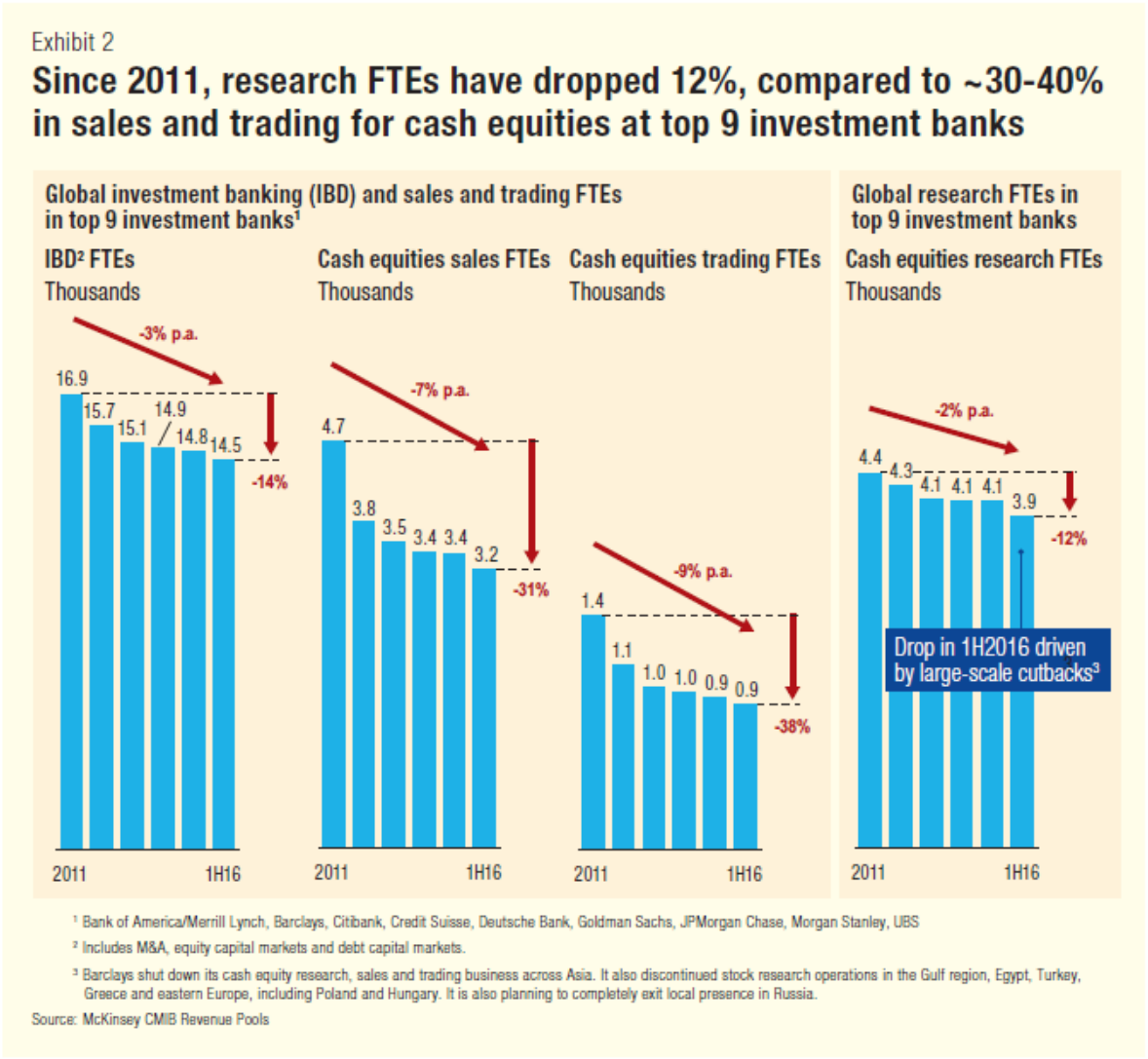

Figure 13: Research commission pool scenarios.

This image is from Exhibit 3 of McKinsey Working Papers on Corporate & Investment Banking No. 13. Image downloaded from https://ecrresearch.com/sites/default/files/public/article/McKinsey_CIB_WP13_Reinventing%20Equity%20Research_2017.pdf.

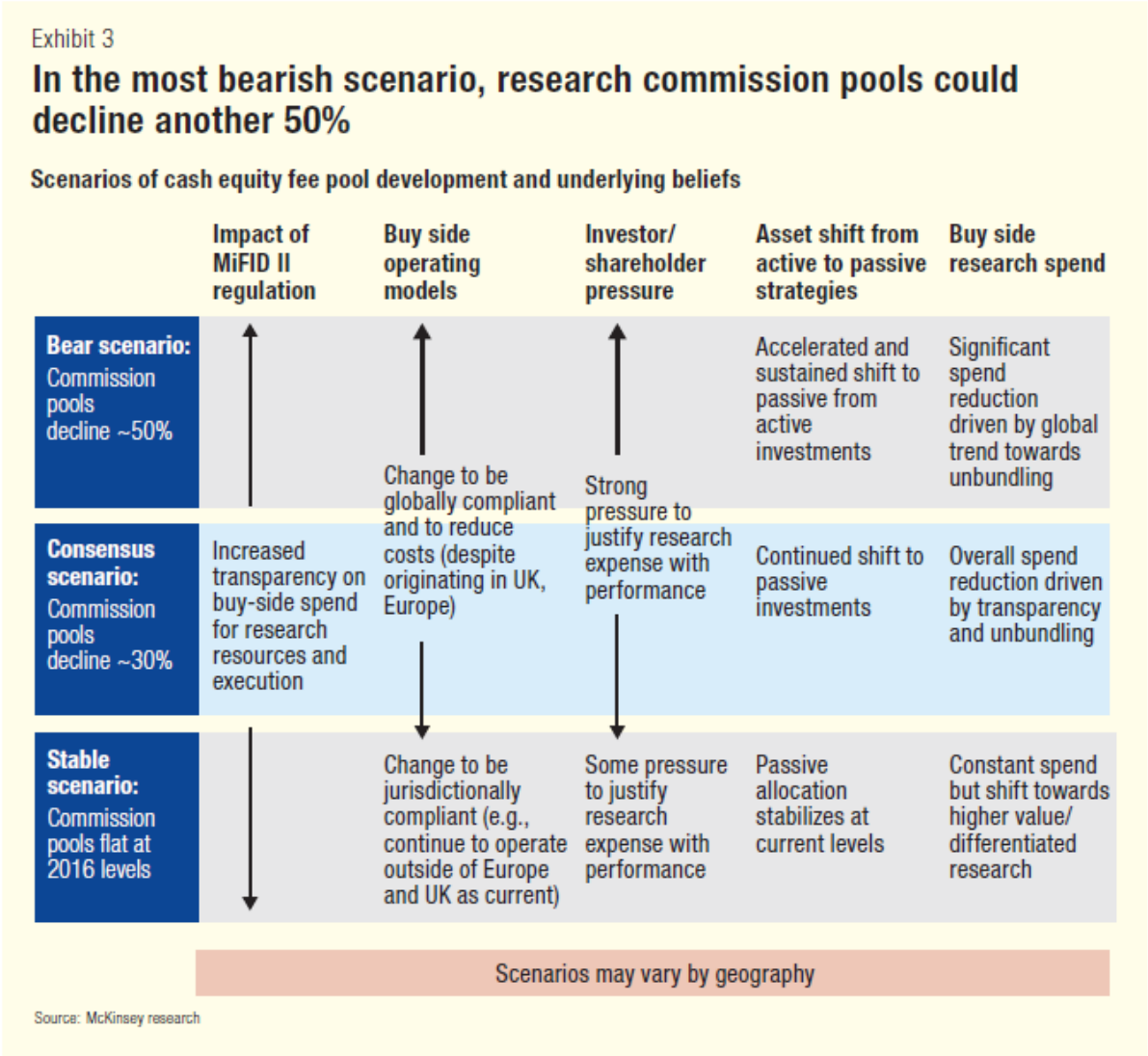

Table 17: Firm-level variables

Firm-level variables		
Variable Name	**Description**	**Source**
ln_market_cap	The USD denominated market cap of the company as of the last date in the year prior to the announcement year	CapitalIQ
ln_Firm_age	Years between the first pricing date and the last date in the year prior to the announcement year	CapitalIQ
Price_Book	The price book ratio as of the last date in the year prior to the announcement year	CapitalIQ
ROA	The Return on Assets, defined as EBIT(1-0.375)/Total Assets, as of the last date in the year prior to the announcement year	CapitalIQ
Leverage	Total Liabilities/Total Assets as of the last date in the year prior to the announcement year	CapitalIQ
Inst_share	Institutional shareholder base as a share of the total shareholder base. In cases where the CapitalIQ identifier belongs to a security trading as of the retrieval date (17.01.2021), the share is as of the retrieval date. In cases where the CapitalIQ identifier belongs to a security delisted prior to the retrieval date, the share is as of the last possible date prior to delistment	CapitalIQ
Return_6M	6-month buy and hold returns achieved as of 2 days prior to the announcement date	CapitalIQ
Price_Vol	1 year share price volatility as of 2 days prior to the announcement date	CapitalIQ
Num_estimates	The max of 1 and the max of the number of analysts with annual EBIT, EPS, and EBITDA estimates, as of the last date in the year prior to the announcement year	CapitalIQ
ln_ForecastHorizon	Natural logarithm of the number of days between the announcement date of the EPS estimate and the announcement date of the EPS actual.	Capital IQ

Table 18: 2020 Prospera sponsored research ranking

	2020 Commissioned Research - Swedish Ranking	
Research Provider	**Rank**	**Score**
SEB	1	4.08
ABG / Introduce	2	3.94
Redeye	3	4.85
Erik Penser / Access	4	3.81
Analysguiden / Aktiespararna	5	3.59

Source: Prospera

Table 19: 2019 Prospera sponsored research ranking

	2019 Commissioned Research - Swedish Ranking	
Research Provider	**Rank**	**Score**
SEB	1	4.06
ABG / Introduce	2	3.95
Redeye	3	3.93
Nordea	4	3.88
Erik Penser / Access	5	3.64

Source: Prospera

Table 20: Top 10 SIC Industries in sponsored sample

SIC Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Business Services	7%	19%
Entertainment	4%	10%
Pharmaceutical Products	4%	9%
Healthcare	5%	9%
Wholesale	3%	7%
Real Estate	4%	5%
Retail	7%	4%
Petroleum and Natural Gas	10%	4%
Electronic Equipment	2%	4%
Electrical Equipment	4%	3%

Table 21: Rank-ordered prevalence of top 10 traditional sell-side SIC industries

SIC Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Petroleum and Natural Gas	1	8
Machinery	2	12
Business Services	3	1
Retail	4	7
Food Products	5	14
Healthcare	6	4
Transportation	7	n.a.
Pharmaceutical Products	8	3
Construction	9	18
Real Estate	10	6

Table 22: Rank-ordered prevalence of top 10 sponsored SIC industries

SIC Industry	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Business Services	3	1
Entertainment	11	2
Pharmaceutical Products	8	3
Healthcare	6	4
Wholesale	18	5
Real Estate	10	6
Retail	4	7
Petroleum and Natural Gas	1	8
Electronic Equipment	21	9
Electrical Equipment	12	10

Table 23: SIC Industry shares - Traditional and Sponsored

SIC Industry shares - Traditional and Sponsored		
SIC Industry (N = 39)	**Traditional (N = 16,382)**	**Sponsored (N = 700)**
Agriculture	0%	n.a.
Apparel	1%	n.a.
Automobile and Trucks	1%	n.a.
Automobiles and Trucks	0%	n.a.
Banking	1%	1%
Beer & Liquor	1%	n.a.
Business Services	7%	19%
Business Supplies	3%	1%
Chemicals	3%	1%
Communication	3%	0%
Construction	4%	2%
Construction Materials	3%	2%
Consumer Goods	1%	2%
Defense	1%	3%
Electrical Equipment	4%	3%
Electronic Equipment	2%	4%
Entertainment	4%	10%
Fabricated Products	0%	2%
Food Products	6%	2%
Healthcare	5%	9%
Insurance	3%	n.a.
Machinery	8%	3%
Non-Metallic and Industrial Metal Mining	2%	0%
Personal Services	0%	0%
Petroleum and Natural Gas	10%	4%
Pharmaceutical Products	4%	9%
Precious Metals	0%	n.a.
Printing and Publishing	1%	1%
Real Estate	4%	5%
Recreation	0%	n.a.
Restaurants, Hotels, Motels	1%	1%
Retail	7%	4%
Steel Works Etc	1%	n.a.
Textiles	n.a.	1%
Tobacco Products	0%	n.a.
Trading	1%	2%
Transportation	5%	n.a.
Utilities	2%	1%
Wholesale	3%	7%
Total	100%	100%

Table 24: Number of companies in the sponsored sample per year and researcher

Research Provider	**2017**	**2018**	**2019**	**2020**	**Total**
Nordea	5	24	36	8	**73**
DNB	-	5	7	1	**13**
Danske Bank	-	3	7	2	**12**
SEB	-	11	15	8	**34**
ABG	-	-	71	27	**98**
Total	**5**	**43**	**136**	**46**	**230**

Table 25: Number of observations in the sponsored sample per year and researcher

Research Provider	2017	2018	2019	2020	Total
Nordea	11	72	145	9	**237**
DNB	-	13	22	1	**36**
Danske Bank	-	9	24	2	**35**
SEB	-	28	81	9	**118**
ABG	-	-	240	34	**274**
Total	**11**	**122**	**512**	**55**	**700**

Table 26: Number of companies in the traditional sell-side sample per year and researcher

Research Provider	2017	2018	2019	2020	Total
Nordea	249	242	259	160	**910**
DNB	154	165	193	105	**617**
Danske Bank	206	215	216	-	**637**
SEB	238	229	4	-	**471**
ABG	-	-	11	-	**11**
Total	**847**	**851**	**683**	**265**	**2,646**

Table 27: Number of observations in the traditional sell-side sample per year and researcher

Research Provider	2017	2018	2019	2020	Total
Nordea	1,847	1,895	1,898	204	**5,844**
DNB	1,029	1,158	1,337	127	**3,651**
Danske Bank	1,352	1,417	1,259	-	**4,028**
SEB	1,604	1,224	5	-	**2,833**
ABG	-	-	26	-	**26**
Total	**5,832**	**5,694**	**4,525**	**331**	**16,382**

Figure 14: Distribution of 6-month return and price volatility

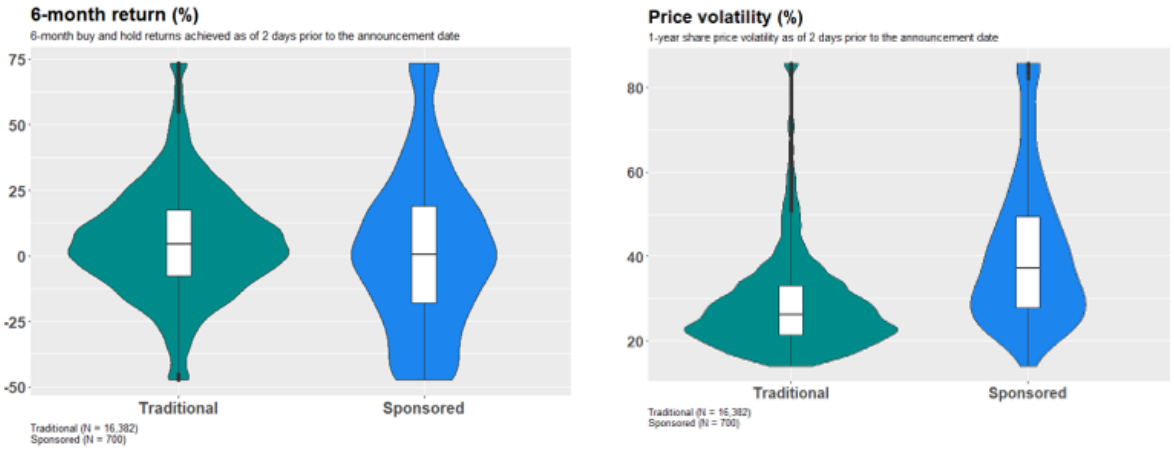

Figure 15: Distribution of forecast horizon and leverage

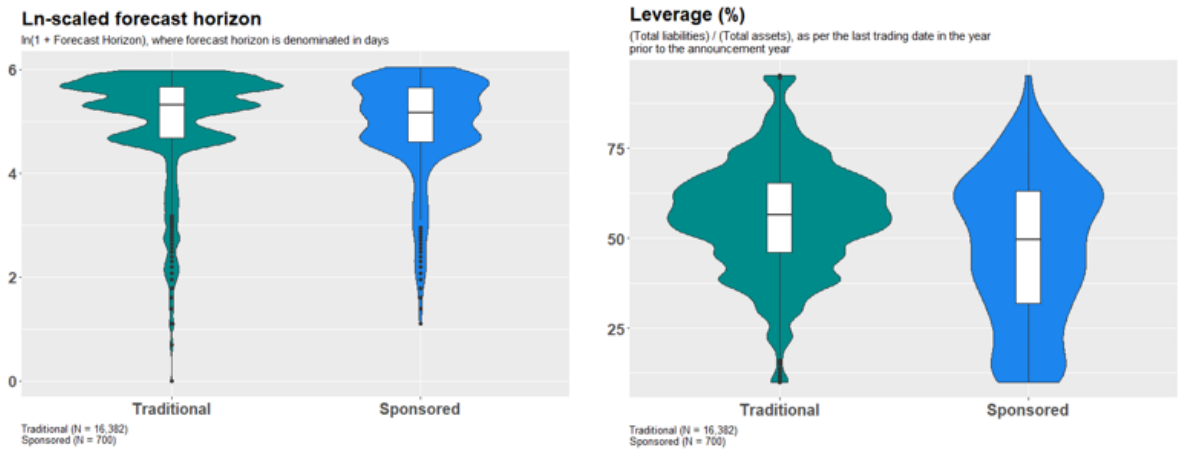

Figure 16: Distribution of firm age and market cap

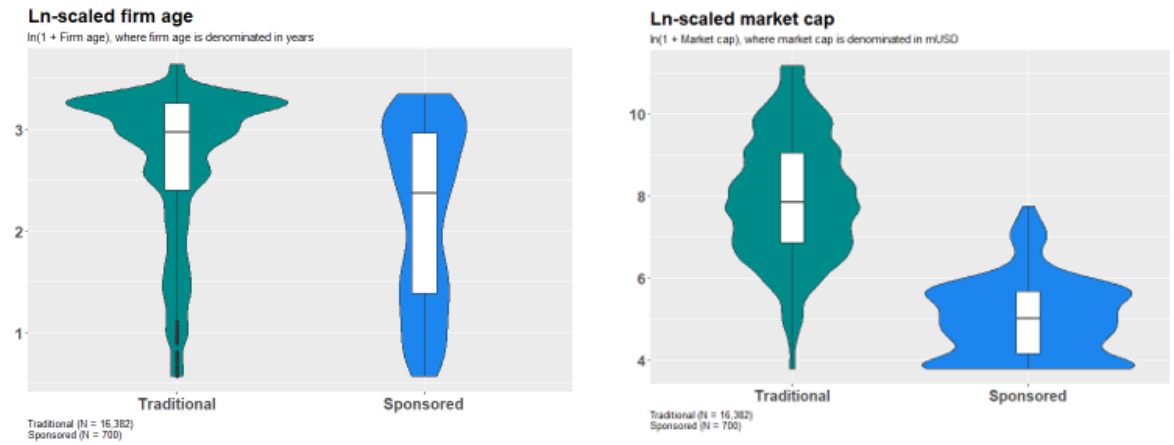

Figure 17: Distribution of institutional share and number of analysts

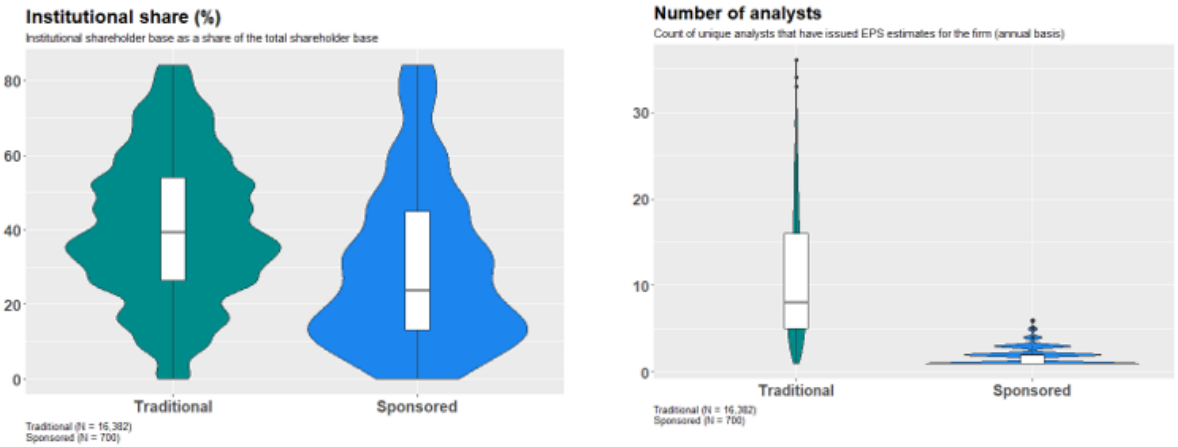

Figure 18: Distribution of price book and ROA

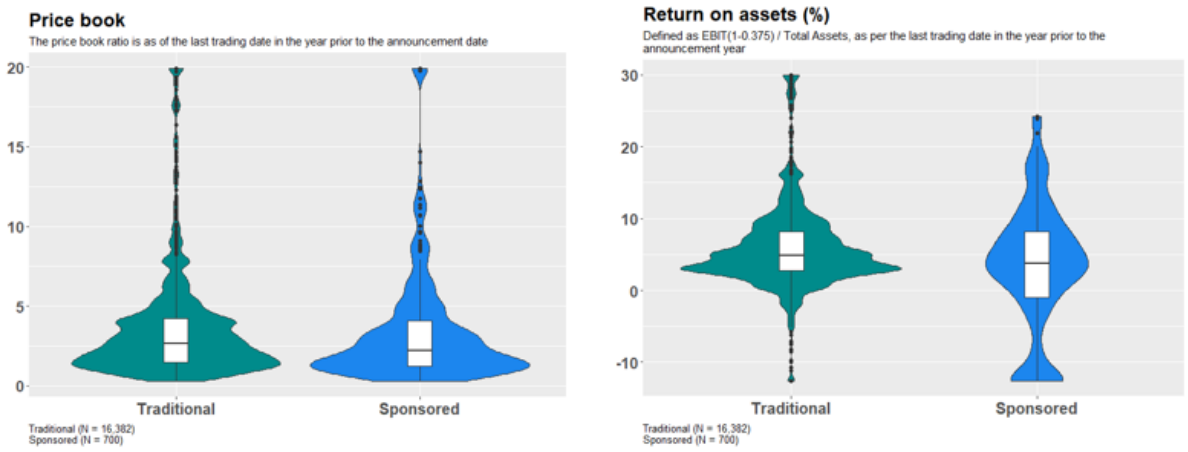

Figure 19: Distribution of bias and forecast horizon