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Anchoring among German Financial Analysts: An Empirical and Background Analysis

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Abstract: The paper investigates whether financial analysts in Germany were subject to cognitive and emotional constraints. The focus was on the heuristic of anchoring. An evaluation based on 224 individual forecasts for seven DAX-listed companies for the period from 2011 to 2018 with respect to the earnings per share of the current business year was done. Three issues were analysed in particular: Whether anchoring was found at all, to what extent anchoring has led to a deterioration of the forecast quality and if the effect of anchoring was still measurable shortly before the incurred earnings had been announced. For the assessment of the data, descriptive statistical measures, and tests such as the non-parametric Wilcoxon rank-sum test or the parametric t-test were used. For the German capital market there are currently very few empirical behavioural studies dealing with the forecast quality of financial analysts. This study is aiming to close this gap by investigating to what extent behavioural aspects have led to a significant deterioration in the forecast quality of financial analysts for the German stock market. The quality and reliability of analysts' forecasts is of high relevance to the capital market, since the assessments of financial analysts are used as a basis for investment decisions by private and institutional investors and are thus essential for a high degree of efficiency in the allocation of capital in a financial system.

Keywords: *Behavioural Finance, Financial analysts, Forecasting, Anchoring, Herd behaviour.*

1. Introduction

Financial analysts for stocks act as information intermediaries between companies, shareholders and other stakeholders. The quality and reliability of analysts' forecasts is of high relevance to the capital market, since the assessments of financial analysts are used as a basis for investment decisions by private and institutional investors and are thus essential for a high degree of efficiency in the allocation of capital in a financial system (Hollie et al., 2017, Wichels, 2001). One would expect that these professionals do their assessments and forecasts in a highly rational manner on the basis of quantitative models and the processing of qualitative information, which is carried out at great expense. In fact, however, a number of earlier studies show that this is not always the case and that also financial analysts deviate from the principle of rationality, and are subject to cognitive and emotional limitations (Hirshleifer et al., 2018, Daxhammer & Facsar, 2017). They also use heuristics to simplify their information and decision-making process, and to reduce their personal professional risk. This non-rational behaviour of financial analysts can lead to systematic distortions and misjudgements in their analyses and reduce the quality of their work. The most important indicator estimated by financial analysts to determine the value of shares is the future earnings per share.

A number of empirical studies have shown in the past that forecasts of earnings per share in particular are systematically distorted on average. An important cause of these distortions can be the anchoring heuristic (Cen et al., 2013, Campbell & Sharpe, 2009). There are very few empirical studies for the German capital market dealing with the influence of behavioural aspects on the forecast quality of financial analysts. Therefore, this study aims to investigate to what extent behavioural aspects have led to a significant deterioration in the forecasting quality of financial analysts for the German stock market. For this purpose, the forecast of 224 analysts for seven DAX stocks were statistically evaluated for the period from 2011 to 2018. A special focus was placed on the anchoring heuristic as the cause of systematic distortions in financial analyses. This study is structured as follows: The second chapter is devoted to the function of financial analysts as information intermediaries, their analysis processes and conflicts of interest, as well as the behavioural anomalies to be assumed in their work. The third chapter is devoted to the empirical analysis, consisting of a description of the data and methodology used and a presentation of the results found.

2. Financial Analysts and their Forecasts: A Theoretical Consideration

The Importance of Financial Analysts for the Financial System: Financial analysts are highly relevant for the capital market as a link between companies and other capital market participants. They procure, review, process and interpret the information published by the company, as well as publicly available information, and thus play a central role in information processing (Göres, 2008). Both potential and existing investors need continuous corporate information in order to be able to make decisions on the efficient allocation of their capital. However, since both the scope and complexity of the available information is extremely high and the expertise of investors is often insufficient to correctly evaluate and interpret this information, financial analysts play an important role. The results of financial analysts are used by private and institutional investors such as asset managers of funds, client advisors and portfolio managers of banks.

Financial analysts have the task of transforming the complex information about financial markets into a usable and comprehensible form supported by analytical methods (Whitehouse, 2017). Financial analysts can be differentiated into sell-side analysts, buy-side analysts and independent analysts. Buy-side analysts are usually employed by institutional investors such as corporations, insurance companies and investment and pension funds. Sell-side analysts work primarily for universal and investment banks as well as brokerage houses. Their analyses, assessments and investment recommendations are addressed to a broad external circle, consisting of private and institutional investors as well as business journalists and information service providers. Sell-side analysts therefore maintain a large number of relationships with a wide variety of capital market players and thus have a strong multiplier effect, since their studies are also available to the general public (Hobbs, 2015). The focus of this paper will be on sell-side analysts.

The Analysis Process of Financial Analysts: The analytical process of financial analysts can be divided into three main areas: information collection, processing and distribution. In gathering information, the focus is on receiving appropriate information about the company to be analysed, the respective industry and the overall economic environment. The subsequent information processing comprises the preparation and processing of the information by means of sound methods and ultimately leads to analytical results which are distributed to interested groups within the scope of information distribution. In order to obtain valuation-relevant information on the respective companies, financial analysts have various sources of information at their disposal. The primary sources include all information published either directly by the company or by special institutions such as the European Central Bank, economic research institutes, ministries or the governmental statistical offices (Whitehouse, 2017). Secondary sources are also used, which include all information that is publicly available or has been published by independent institutions.

Primary sources include quarterly, half-yearly and annual reports, ad hoc announcements, discussions with management and analysts' conferences, while secondary sources include journalistic publications, publications by management consultants or institutions and studies by industry associations as well as other financial analysts. Numerous empirical studies indicate that personal discussions with management, information from external accounting departments and analysts' conferences are the most important sources of information for financial analysts, while secondary sources are attributed less importance. However, the assessments of other analysts represent an important secondary source for financial analysts. A survey study by Kajüter (2009) showed that the forecast reporting of companies is considered to be very relevant, as the information requirements of financial analysts with regard to future-oriented assessments are very high. The uncertainty of financial analysts can be significantly reduced by the business reports of companies. These reports contain management assessments on future net assets, profits, and also statements on the overall economic and company-specific development (Amir et al., 2003).

Furthermore, quarterly reports in particular are used by analysts to continuously review their assessments in the course of a business year and to adjust them to internal and external developments (Paarz, 2011). On this basis, relevant performance indicators such as future earnings per share are forecasted and the value of a company is determined. According to Palepu and Healy (2012), information processing can be divided into three steps. First, a strategic analysis of the company is carried out with a view to determine the success factors and risks of a company, named the business strategy analysis. On the basis of studies of the industry-specific and competitive environment, possible future profit potentials for the company are to be estimated.

In the second step, the actual economic situation of the company is analysed with accounting methods on the basis of published company reports (Fried & Givoly, 1982). Subsequently, in the third step of the process, an analysis of the cash flows, as well as the fundamental key company figures is carried out.

To assess the company's past performance, current assets, and financial and earnings situation. This is the main part of the financial analysis (Ballwieser, 2011). Finally, in the prospective analysis, which is based on the previous process steps, the analysts forecast key earnings and risk figures to determine the fair value of the company (Fried, 1982). The information processing concludes with the comparison of the calculated fair value with the market value of the company, so that financial analysts can make a buy or sell recommendation for investors.

Conflicts of Interest in the Working Environment of Financial Analysts: Financial analysts act as information intermediaries in an environment of complex relationships, so that conflicts of interest may arise, which are characterised by corresponding obligations and incentives. The companies to be analysed, the employer and potential investors are important counterparts for the financial analyst and may cause conflicts of interest. These conflicts of interest can lead to a change in the behaviour of analysts and systematic distortions of forecasts and recommendations (O'Brien et al., 2005, Mehran & Stulz, 2007, Brunnberg, 2018). The management of a company can influence the assessment of an analyst in its favour because the analyst depends on it as a significant source of information. Financial analysts therefore often try to establish a personal and positive relationship with management representatives in order to obtain information as early as possible and to ensure a continuous exchange of information. In return, the management of the company to be analysed expects a fair and, in case of doubt, rather optimistic and market value-enhancing assessment from the analysts. This results in a cheaper and enhanced access to the capital market and higher remuneration for managers. It has already been demonstrated that financial analysts with a personal relationship.

To the management are more likely to give assessments that are positively biased on average (Hodgkinson, 2001, Lim, 2001, Darrough & Russell, 2002). Although the management of an analysed company expects financial analysts to give optimistic assessments in return for providing information, the management must at the same time ensure that the expectations of the capital market are not too high. Otherwise, the company could have difficulties in meeting expectations with negative price reactions as a consequence (Cotter et al., 2006). The management has a clear incentive to influence analysts' expectations by selectively providing information (Richardson et al., 2004). This is known as expectations management. The management compares the analysts' estimates with its own forecasts so that there is a continuous interaction between the management and financial analysts, named "earnings game" (Collingwood, 2001). The analysts' forecasts are initially optimistic in order to ensure that the management provides the relevant information. Over the course of the fiscal year, the optimistic forecasts are adjusted step by step, supported by the regular reporting of the management so that the forecasts become more accurate. Shortly before the publication of the actual results the forecasts of the financial analysts usually show a slight pessimism.

Which is deliberately aimed for by the company, so that in the end the capital market expectations can be met or even exceeded in the hope of a positive reaction of the share price? It could be shown that analysts' forecasts were lowered by an average of 12% in the course of the fiscal year after a rather optimistic forecast at the beginning and then becoming slightly pessimistic at the end of the year. In this way, the companies were often able to meet or exceed the expectations of the market (Bartov & Cohen, 2009). The expectation management of the companies is also advantageous for the analysts because it allows them to reduce their forecast error by adjusting their estimates in a way that they do not deviate by too much from the performance of the company. In this way they secure their reputation (Cotter et al., 2006). As mentioned, sell-side analysts work mainly for universal and investment banks or brokerage houses that provide further consulting and banking services for the company under analysis. These business relationships may distort the objective research of the financial analysts due to pressures from employers. This pressure is reinforced by the fact that financial analysts make their results available free of charge so that they do not directly generate their own income. Their task is to contribute indirectly to the profits of their employer (Dugar & Nathan, 1995). It was found in other research that the forecasts of financial analysts had a significantly positive bias if the company to be analysed had a close business relationship with the employee (Chan et al., 2007).

Anomalies in the Conduct of Financial Analysts: The quality of analysts' forecasts was also influenced by behavioural aspects (Kent Baker et al., 2017). Particularly in complex situations humans tend to rely on heuristics to promote easy and rapid decision-making (Kahneman & Tversky, 1974). Financial analysts are faced with the challenge of filtering out the information relevant to valuation from an extremely large quantity of information and evaluating it under time constraints. Therefore, despite their high level of expertise, they are likely too subject to cognitive and emotional limitations. This includes anchoring (Amir & Ganzach, 1998). Numerous research findings show that when making estimates, people tend to start out from an initial or reference value, a so-called anchor, and only adjust over time if at all (Kahneman & Tversky, 1974). This adjustment happens too slowly and too limited in terms of size which gives the initial value too much weight in the forecast. A systematic distortion of information processing and assessments may be the consequence. For financial analysts, anchor values are often those values that were last observed as market prices or profits. However, numerical values do not necessarily have to be used as anchors. The opinions and attitudes of other market participants or experts can also serve as anchors (Cen et al., 2013). Moreover, by focusing on the status quo, the bandwidths of forecasts are set too narrowly, which means that the probability of extreme deviations is underestimated (Ricciardi, 2008).

Some empirical studies have examined the anchoring heuristic for the US market. While Cen et al. (2013) found that financial analysts tend to base their forecasts on the median of EPS estimates for companies in an industry, Campbell and Sharpe (2009) showed that analysts are too strongly oriented towards historical values. In their work, they defined the existence of an anchoring as a prediction that is too close to a starting value. In addition, the authors found evidence that the consensus earnings forecasts of analysts anchor to the most recent earnings figures. Another potential cognitive heuristic of financial analysts could be selective perception of information. They tend to prefer information for their analysis that is consistent with their own ideas and expectations. At the same time, information that does not reflect their opinion is faded out or underweighted (Hirshleifer & Hong Teoh, 2003). In doing so, they concentrate on information that is in line with previously made forecasts in order to avoid cognitive dissonance and to avoid having to change their statements too often, which could jeopardise their reputation.

The heuristic of herd behaviour was also observed among financial analysts. Herd behaviour occurs when individual analysts base their forecasts on the forecasts of other analysts with a good reputation. This can result in an increase in the forecast error (DeBondt & Forbes, 1999). Herd behaviour also leads to a reduction in the dispersion of forecasts, as analysts adjust their forecasts in the direction of the consensus. In addition, the mean value of the distribution rises as analysts tend to adjust their forecasts to the consensus. This is particularly true for those who had a below-average forecast. This can be again explained by the fact that rather optimistic assessments lead to better relations with the management of the company. In addition, with positive assessments higher trading turnover can be achieved which is positive for the employer of the analyst. Another strong incentive for herding behaviour among analysts is that it can help to protect their personal reputation in the case of a major misjudgement, so that the analyst avoids being alone with the forecast error (Hirshleifer & Hong Teoh, 2003).

Other Factors Influencing Forecast Quality: In addition to the factors already described, the quality of analysts' assessments can be influenced by the analyst`s working environment, as well as company-specific and institutional factors. The more companies and sectors a financial analyst has to work on, the less accurate the estimates of the financial analysts become (Malloy, 2005). The size of the analyst`s employer plays a negative role as well (Clement, 1999). Company-specific factors such as earnings volatility, capital structure, the industry and market environment of the company, as well as the shareholder group and the current situation of a company, play a role in the forecast quality (Zhang et al., 2019). The more these factors increase the uncertainty for the analyst, the more likely the analyst is to use the heuristics outlined above, in particular anchoring and herd behaviour, in order not to jeopardise his reputation. In addition, disclosure requirements, accounting standards and legal and tax systems can influence the forecasting errors of financial analysts, which will not be discussed in detail here. Instead, reference is made to Baldwin (1984) or Elliot and Philbrick (1990).

3. Empirical Investigation of the Impact of Behavioural Biases on Analysts' Forecasts

As explained in the theoretical part of this paper, both the working environment of financial analysts and behavioural aspects can be supportive for anchoring earnings estimates and negatively affect the quality of analyst forecasts. Therefore, it will be empirically investigated whether financial analysts base their estimates on anchored EPS values of the previous business year and whether the use of these anchor values results in a higher forecast error and thus a deterioration of the quality of analysts' forecasts. Since analysts continually update their forecasts during the year and adjust them to new information, the analysts' forecasts at the beginning of the fiscal year show the highest degree of uncertainty.

Thus, the influence of behavioural aspects should be most pronounced at this point. The consideration of new information that analysts receive during the year in quarterly and other business reports reduces this uncertainty accordingly. Analysts' forecasts could be expected to become more accurate shortly before the end of the fiscal year. Therefore it is interesting to see whether the anchoring effect is still measurable at the end of a fiscal year. The anchor value, however, may have changed in the meantime. Instead of the results of the past business year the new anchor values are likely to be derived from recent quarterly business reports or management statements. The bias of the forecasting error tends to be negative in this case because the expectation management of companies aims to direct the forecast of analysts somewhat too negatively to be able to surprise the market to the positive at the date of the earnings announcement. The following hypotheses were formulated and tested on this basis:
H1: A systematic anchoring to the most recent past value of corporate earnings per share by financial analysts can be observed.
H2: The anchoring of the forecasts at the previous year's EPS leads to a higher forecast error by analysts.
H3: The anchoring effect is persistent over the entire forecasting period although analysts have the chance to adjust their forecasts in the meantime and the anchor value does change. The bias of the forecasting error tends to be negative.

Data and Methodology: This empirical study requires a homogeneous group of companies with a high analyst coverage rate as the forecast quality is higher for companies with a higher analyst coverage than for companies with a lower one (Lehmann, 2014, Hope, 2003). The seven companies selected for this study were all listed on the DAX and had to meet extensive reporting requirements. For the period under review from 2011 to 2018 at least 29 active analysts reviewed each company. In total, 224 individual forecasts were used in this study. The analysed data set consisted of the previous year's earnings per share, the analysts' forecasts for EPS in the current fiscal year and the actual EPS for the same fiscal year. The period of investigation excluded the financial and economic crisis of 2008/2009 as the forecast quality was significantly weaker during this period than usual (Ruhwedel et al., 2009). The companies investigated were Adidas (37), BMW (32), Beiersdorf (33), Lufthansa (29), Daimler (32), BASF (31) and Bayer (30). The number in brackets is indicating the number of financial analysts who reported on the respective company. The companies were selected to represent different industries to avoid any kind of industry bias. All the data was taken from Bloomberg and then further processed with respect to the purposes of this paper. This is true for all the tables and statistics to follow. In order to test hypothesis 1, the differences between the anchor values and forecasts.

As well as between forecasts and incurred EPS were first determined for all companies. Then the standard deviation of the two groups of data was calculated and compared with each other. It was assumed that the forecasts were anchored if the standard deviation of the differences between anchor values and forecasts was smaller than the one of the differences between forecasts and incurred EPS. The second hypothesis is tested by dividing the analysts' forecasts into two groups, depending on whether the analysts' forecasts have anchored more or less strongly to the previous year's EPS. In order to be able to make this distinction, it was assumed that a stronger anchor was present if the difference between the anchor value - the last year's EPS, and the forecast value was systematically smaller than the difference between the forecast value and the incurred EPS. This, of course, also meant a significantly higher forecast error of the group which tended more towards anchoring. Subsequently, the non-parametric Wilcoxon rank-sum test was used to check whether the mean values of the two groups differ significantly from each other to assess whether the group distinction was justified. To test for the third hypothesis, it was analysed whether the estimated earnings forecasts

differed significantly from the incurred earnings shortly before their announcements. In addition to a simple statistically descriptive procedure a parametric t-test was applied to verify the findings.

4. Empirical Results

The test results for Hypothesis 1 showed that the standard deviation of 0.3744 from the differences between the anchor values and forecasts for all companies in the years 2011 to 2018, was smaller than the standard deviation of 0.6017 from the differences between forecasts and incurred EPS. The hypothesis that financial analysts anchor their EPS forecasts for the coming business year to the EPS of the previous business year was confirmed.

Table 1: Proof for the Anchoring Effect Based on Different Standard Deviations between Past and Forecasted Values and Forecasted and True Values

Company	Year	Anchor	Difference Anchor and Forecast	Difference Forecast and True Value
Adidas	FY 18	6,624	1,479	0,338
Adidas	FY 17	4,995	0,813	0,816
Adidas	FY 16	3,269	0,726	1,000
Adidas	FY 15	3,382	0,002	0,111
Adidas	FY 14	4,010	0,308	0,936
Adidas	FY 13	3,790	0,485	0,265
Adidas	FY 12	3,200	0,504	0,086
Adidas	FY 11	2,710	0,434	0,056
BASF	FY 18	6,440	0,146	0,716
BASF	FY 17	4,830	0,299	1,311
BASF	FY 16	5,000	0,753	0,583
BASF	FY 15	5,431	0,034	0,465
BASF	FY 14	5,365	0,544	0,478
BASF	FY 13	5,712	0,265	0,612
BASF	FY 12	6,259	0,488	0,059
BASF	FY 11	5,701	0,293	0,265
Bayer	FY 18	6,633	0,144	0,549
Bayer	FY 17	7,204	0,452	1,023
Bayer	FY 16	6,800	0,517	0,113
Bayer	FY 15	5,925	0,886	0,011
Bayer	FY 14	5,526	0,267	0,132
Bayer	FY 13	5,267	0,531	0,272
Bayer	FY 12	4,756	0,118	0,393
Bayer	FY 11	4,123	0,271	0,362
Beiersdorf	FY 18	2,969	0,452	0,251
Beiersdorf	FY 17	3,214	0,086	0,331
Beiersdorf	FY 16	2,910	0,139	0,165
Beiersdorf	FY 15	2,547	0,201	0,162
Beiersdorf	FY 14	2,354	0,226	0,033
Beiersdorf	FY 13	2,070	0,329	0,045
Beiersdorf	FY 12	1,913	0,074	0,083
Beiersdorf	FY 11	1,782	0,039	0,170
BMW	FY 18	11,652	1,017	0,185
BMW	FY 17	10,450	0,331	1,533
BMW	FY 16	9,700	0,105	0,855
BMW	FY 15	8,873	0,610	0,217
BMW	FY 14	8,102	0,632	0,139
BMW	FY 13	7,629	0,147	0,326
BMW	FY 12	7,450	0,018	0,161
BMW	FY 11	4,910	0,789	1,751

Lufthansa	FY 18	4,397	0,009	0,012
Lufthansa	FY 17	2,976	0,731	3,050
Lufthansa	FY 16	2,766	0,051	0,261
Lufthansa	FY 15	1,021	0,754	0,991
Lufthansa	FY 14	1,386	0,481	0,846
Lufthansa	FY 13	2,074	0,778	0,090
Lufthansa	FY 12	0,594	0,128	1,608
Lufthansa	FY 11	1,529	0,043	0,892
Daimler	FY 18	9,779	0,426	1,967
Daimler	FY 17	8,934	0,590	1,435
Daimler	FY 16	8,279	0,372	0,283
Daimler	FY 15	6,083	1,031	1,165
Daimler	FY 14	4,139	1,836	0,108
Daimler	FY 13	5,369	0,722	0,508
Daimler	FY 12	5,320	0,025	0,024
Daimler	FY 11	5,280	0,985	0,055
Standard Deviation			**0,374**	**0,602**

To test for the second hypothesis all forecasts that were identified as rather anchored were assigned a, dummy variable of 1 and all forecasts that were identified as not so much anchored a dummy variable of 0. The distinction was made according to the method described in chapter 3.1. In order to check which prerequisites exist for the use of the possible significance test procedures, the data was first examined for variance homogeneity using the Levene test modified by Brown and Forsythe. The presence of a normal distribution of the samples was then tested using the Shapiro-Wilk test. The data was homogeneous in terms of variance, but did not show a normal distribution, so the nonparametric Wilcoxon rank-sum test was used (appendix 1). To be able to make a statement about whether the difference between the mean values of the two groups was significant, the significance level was set at 0.05.

Table 2: Wilcoxon Rank-Sum Test for the Impact of Anchoring on the Forecast Quality at the Beginning of a New Business Year

Dummy	Observation	Rank Sum	Expected Value
0	25	421	712.5
1	31	1175	883.5
Combined Results	56	1596	1596

Unadjusted variance: 3681.25 / Adjustment for ties: 0.00 / Adjusted variance: 3681.25.
H0: (Dummy 1 = 0) versus (Dummy1 = 1), z = -4.804 / Prob > I z I = 0.0000.

The results show that the forecasting error is significantly larger for rather anchored forecasts than for less anchored ones shortly after the release of last business year´s earnings (p-value: 0.0000 < 0.05). Therefore, the null hypothesis that anchoring did not negatively affect the quality of the forecast was rejected. The empirical results for testing hypothesis 3 show that 62% of the forecasts were too pessimistic shortly before the end of the business year and 37.5 % of the forecasts were too optimistic. The median of the forecasts was -5% compared to the EPS that actually occurred. Therefore the statistical findings seem to support hypothesis 3. To underline the validity of these findings, their statistical significance was analysed by using the parametric t-test. The existence of a normal distribution was supported by the Shapiro-Wilk test (appendix 2). The results show that the forecasting error is significantly larger for rather anchored forecasts than for less anchored ones shortly after the release of last business year´s earnings (p-value: 0.0000 < 0.05). Therefore, the null hypothesis that anchoring did not negatively affect the quality of the forecast was rejected.

Table 3: The Parametric T-Test for the Impact of Anchoring and the Negative Forecast Bias Shortly Before the Announcement of the Current Business Year Results

Variable	Observations	Mean	Std. Error	Std. Dev.	95% Con. Interval Lower & Upper Value	
Est. Mean-Y	56	5.274608	0.3427596	2.564978	4.587702	5.961513
Comp. EPS	56	5.397661	0.347562	2.600916	4.701131	6.094191
Difference	0	-0.123053	0.0537478	0.402212	-0.113429	-0.153399

Mean (difference) = mean (EstMean_Y – Comp_EPS) t = -2.2895

Ha: mean (difference) < 0 Ha: mean (difference) = 0 Ha: mean (difference) > 0

Pr(T<t) = 0.0130 Pr(ITI > ItI) = 0.0259 Pr(T>t) = 0.9870

Here, the persistence of the anchoring heuristic until the end of the current business year was proved by the t-statistic of t = -2.2895. This is clearly significant although analysts had access to a lot of additional relevant information from the quarterly reports at that time. The anchor value had changed as the forecasted earnings switched to a negative bias (Pr(T<t) = 0.0130 < 0.05 for mean(difference) < 0). Thus, shortly before the publication of the annual report for the past fiscal year, an on average pessimistic distortion of the analysts' forecasts compared to the realised EPS was demonstrated - driven by the expectation management of the companies. A lack of adjustment of anchor values to available information could have been caused as well by selective perception or herd behaviour as described in chapter 2.4.

Comparison of Empirical Findings with Existing Literature: The first empirical finding of this paper was that analyst forecast values had a standard deviation with past values that were almost half as high as the values that really occurred. This was a significant proof that anchoring was taking place. This result was backed by the study of Ricciardi (2008) which showed that analysts were focusing too much on the status quo and thereby setting the bandwidths of forecasts too narrowly. In addition, there was a high accordance with the study of Campbell and Sharpe (2009) who concluded that analysts are too strongly oriented towards historical values and due to the existence of anchoring their predictions were too close at the starting values. Specifically the authors found evidence that consensus earnings forecasts of analysts anchor to the most recent earnings figures which match exactly the results of this paper. The second empirical finding of the paper was that highly anchored values had a significantly higher forecast error than less anchored values. Kent Baker (2017) also came to the conclusion that the quality of analysts' forecasts was influenced by behavioural aspects.

Closely related to that is the outcome of the study by Hirshleifer & Hong Teoh (2003) that analysts tend to prefer information that is consistent with their own ideas and expectations and do not sufficiently reflect information that is contradicting their opinion. In doing so, they concentrate on information that is in line with previously made forecast values in order to avoid cognitive dissonance. Finally it was found that analysts were systematically too optimistic at the beginning of a business year and anchoring on the values of the past business year. Furthermore, they tended to be slightly too pessimistic at the end of a business year by anchoring their expectation on the recent guidance of the companies which have an incentive to surprise the market on the positive side. This pattern was also observed by Cotter et al. (2006) and Bartov and Cohen (2009). The intention of corporations to take advantage of the management of analysts` expectations was well documented by the studies of Richardson et al. (2004) and Collingwood (2001). Overall, the findings of this paper were well backed by existing literature. Analysts do not come up with pure rational results. They are affected by psychological traits such as anchoring and herding behaviour. This issue is constraining the efficiency of financial markets and the whole financial system as analysts have an important intermediary function with respect to the provision of information between investors and corporations.

5. Conclusion and Recommendations

Financial analysts are of high relevance to capital markets because their work can contribute significantly to a reduction of information asymmetries and the associated agency costs as well as to an increase in the information efficiency of financial markets. Therefore, this study aimed to investigate whether financial analysts were subject to cognitive and emotional constraints. The focus was on the heuristic of anchoring. The empirical study was based on 224 individual forecasts for seven DAX-listed companies for the period from

2011 to 2018. It was empirically found that the analysts' forecast values had a standard deviation with past values that were almost half as high as the values that really occurred. This was a clear proof that anchoring was taking place. In a second step it was shown that highly anchored values had a significantly higher forecast error than less anchored values. Finally it was found that both shortly after the publication of the previous year's annual report, and also at a later stage, just before the actual business year of companies ended and the true EPS figures were released, that the predictions for the remaining short period were still affected by the anchoring of analysts whereas the anchor values had changed.

This was surprising since the analysts had a great deal of information from the quarterly reports available to them at that point of time. In both cases, the forecasting errors increased due to the anchoring effect. However it should also be noted that in addition to anchoring, other behavioural factors such as herd behaviour or selective perceptions also seemed to have had a negative impact on the quality of analysts' forecasts, which had been not the primary focus of this study. A few recommendations can be derived from this paper: it is important that investors know the psychological biases of analysts described in this paper to incorporate them into their assessment about the outlook for expected earnings and risks. This could help to improve the information efficiency of financial markets and was one of the reasons to write this paper. In addition, the results of this paper suggest that the independency of analysts should be strengthened versus the brokerage or investment banking business of the firms they work for. Finally one could think of compensation schemes for analysts that reward independent forecasts and that are forgiving in case that an assessment was wrong. This could be supportive to reduce the biases of anchoring and herd behaviour among analysts. It would be useful if more research was done in this direction.

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Appendixes: **Appendix 1**

Table 4: Levene-Test According to Brown and Forsythe for Variance Homogeneity with Respect to Hypothesis 2

Dummy 1	Mean	Standard Deviation	Frequency
0	0,0388	0,0342	25
1	0,3081	0,6386	31
Total	0,1878	0,4911	56

W_0 = 6,767	df(1, 54)	Pr > F = 0,0119
W_{50} = 2,933	df(1, 54)	Pr > F = 0,0925
W_{10} = 3,244	df(1, 54)	Pr > F = 0,0773

Levene's robust test statistic W_0 tests the equality of the variances between the two groups (anchored and non-anchored) and the two statistics proposed by Brown and Forsythe, which replace the mean in Levene's formula with alternative location estimators. The first alternative W_{50} replaces the mean by the median. The second alternative replaces the mean with the mean reduced by 10% (W_{10}). The alternative W_{50} is usually used as the relevant threshold level in such tests. The Levene test statistic for the comparison of the medians of both groups was above the significance value of 0.05 for W_{50} and can therefore be considered as fulfilled.

Table 5: Shapiro-Wilk w Test for the Normal Distribution of the Data with Respect to Hypothesis 2

Variable	Observations	w	v	z	Prob. > z
Drel1a_0	25	0,8489	4,198	2,933	0,00168
Drel1a_1	31	0,4252	18,724	6,070	0,00000

Drel1a_0 stands for the average relative absolute forecast error of the non-anchored EPS forecasts. Drel1a_1 stands for the average relative absolute forecast error of the anchored EPS forecasts.

Appendix 2

Table 6: Levene-Test According to Brown and Forsythe and Shapiro-Wilk-Test with Respect to Hypothesis 3

Dummy 2	Mean	Standard Deviation	Frequency
0	5,2746	**2**,565	56
1	5,3977	2,601	56
Total	5,3661	2,572	112

W_0 = 0,0031	df(1, 110)	Pr > F = 0,9557
W_{50} = 0,0029	df(1, 110)	Pr > F = 0,9575
W_{10} = 0,0026	df(1, 110)	Pr > F = 0,9595

The Levene test statistic for the comparison of the medians of both groups was again above the significance value of 0.05 for W50 and can therefore be considered as fulfilled.

Table 7: Shapiro-Wilk W Test for Normal Distribution of the Data with Respect to Hypothesis 3

Variable	Observations	W	v	z	Prob. > z
Est.Mean C_Y	56	0,8489	4,198	2,933	0,00168
Comp_EPS	56	0,4252	18,724	6,070	0,00000

EstMeanC_Y stands for the financial analysts' consensus forecast for the EPS of the current fiscal year. Comp_EPS stands for the actual EPS for the past fiscal year.