Target Price Accuracy

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Abstract
This study analyzes the accuracy of forecasted target prices within analysts' reports. We compute a measure for target price forecast accuracy that evaluates the ability of analysts to exactly forecast the ex-ante (unknown) 12-month stock price. Furthermore, we determine factors that explain this accuracy. Target price accuracy is negatively related to analyst-specific optimism and stock-specific risk (measured by volatility and price-to-book ratio). However, target price accuracy is positively related to the level of detail of each report, company size and the reputation of the investment bank. The potential conflicts of interests between an analyst and a covered company do not bias forecast accuracy.

1 Introduction

Analysts' reports play a decisive role in capital markets. Along with company releases, reports issued by financial analysts provide information for all kinds of different market participants such as fund managers, pension managers, or high-wealth investors. Consequently, economic research has focused on analyzing whether capital markets react to analysts' reports. Various studies have found that market participants appreciate the information derived by analysts. However, traditional studies (e.g., Abdel-Khalik and Ajinkya 1982, Elton, Gruber, and Grossmann 1986, Lys and Sohn 1990, Stickel 1991, Stickel 1995, Womack 1996, Mikhail, Walther, and Willis 1997) have focused exclusively on the market impact of recommendations (e.g., levels like buy, hold and sell recommendations or their revisions) and earnings forecasts which analysts disclose in their reports.

The literature only recently shifted its focus towards a third quantitative measure: target prices. This is due to the fact that major databases like *First Call* from *Thomson Financial* initiated coverage of target prices only at the end of 1996. Hence, 1997 is the first complete year where standard data providers

delivered data concerning this measure. This information is taken from Brav and Lehavy (2003). Other studies from Asquith, Mikhail, and Au (2005), Gleason, Johnson, and Li (2008), and Bradshaw and Brown (2006) similarly showed that target price availability started in 1997. Nevertheless, via target prices (in relation to current stock prices) analysts can disclose more detailed information concerning their view of the covered company, compared to simply disclosing recommendation levels. Current US literature documents that target prices are paid significant attention by the market. Brav and Lehavy (2003), for example, analyzed the market reaction to the publication of target prices. Within their analysis, they form portfolios based on the revision of the target price scaled by the pre-announced stock price. Whereas the average buy-and-hold abnormal return for the least favourable revisions is -3.96%, it increases to +3.21% for the most favourable revisions. Similarly, Asquith, Mikhail, and Au (2005) set up a model which includes target price changes in addition to recommendation and earnings forecast changes. They find that the market reacts more to target price forecast revisions than to earnings forecast revisions. For the German market, Kerl and Walter (2008) found similar evi-

dence concerning the importance of target prices for capital markets. Within reports from the *Investext* database, they found that an upgraded recommendation is associated with a target price revision of +10.5%, whereas analysts' reports which downgrade a recommendation also downgrade the target price forecast by −8.9%. Based on their regression model, they found that target prices add information in excess of the general "summary measures" as, e.g., recommendation and earnings forecast revisions. However, the authors showed that in particular target price revisions of highly reputable investment banks contain value-relevant information. Following these papers, target price estimates are not merely a function of earnings estimates, but contain value-relevant information for capital markets.

Since earnings forecasts, recommendation levels and target prices have proven value-relevance, researchers focused on analyzing forecast accuracy. Brown (2000) provided a review of studies analyzing the question of whether the analysts' forecasts (mainly on earnings and stock recommendations) are accurate and whether investors could earn abnormal returns by following these recommendations. With respect to the accuracy of earnings forecasts, Loh and Mian (2006) and Ertimur, Sunder, and Sunder (2007) found that analysts who issue more accurate earnings forecasts also issue more profitable stock recommendations. Loh and Mian (2006), for instance, described a strategy that is long in the favourable stocks and short in the unfavourable stocks that are issued by the most accurate analysts (in terms of earnings forecast accuracy). Such a strategy leads to a statistically significant average monthly return of 0.737% (the four-factor alpha which uses risk premium, company size, book-to-market and momentum as factors, Carhart 1997). However, recommendations from analysts, who belong to the lowest accuracy quintile, lead to a monthly average return of statistically significant -0.529%. Overall, the recommendations of highly accurate analysts outperform recommendations of those analysts, who belong to the least accurate quintile by 1.27% per month. Their results show that investors who have access to information issued by competent, highly accurate analysts are rewarded.

With respect to the accuracy of target price forecasts, Asquith, Mikhail, and Au (2005) analyzed whether the current stock price reaches or exceeds the target price within the 12-month period. The authors concluded that price forecasts are achieved in 54.28% of all cases. If the target price is achieved, the company's maximum (minimum) stock price overshoots the target price by 37.27% during the 12 months, whereas otherwise the company's maximum (minimum) stock price undershoots the target by 15.62%. Bradshaw and Brown (2006) found that expected returns, which they derive from the ratio of the target price compared to the actual stock price, exceed actual returns by 35%. Only 24% of target price forecasts are met at the end of the 12-month period. The authors explained the low performance of their analysts' forecasts (in comparison to Asquith, Mikhail, and Au 2005) with generally lower skills of those analysts who are not highly ranked and a focus on both bull and bear markets. Additionally, Bradshaw and Brown (2006) concluded that superior earnings forecasting abilities do not lead to superior target price forecasting abilities. Contrarily, Gleason, Johnson, and Li (2008) found a positive association between earnings forecast accuracy and the profitability of target prices. The authors explained this finding by considering the effect of valuation model use on target price accuracy. Bonini, Zanetti, Bianchini, and Salvi (2010) developed inaccuracy measures and compared them to the actual returns realized by each stock. They found that forecasting accuracy is very limited with prediction errors up to 46%.

This paper analyzes the accuracy of analysts' target price forecasts. This topic is currently discussed in the literature and has, to the best of our knowledge, not been analyzed before for the German market. Our main contribution is to analyze potential factors that might be relevant for explaining target price accuracy. For the first time, we take the text-based informational depth of each analyst report into account to evaluate whether those analysts who provide additional information also issue more accurate target prices. Furthermore, we evaluate the target price accuracy in light of the reputation of the issuing bank and with respect to potential conflicts of interest which might impact the issued reports – two topics which are currently heavily discussed in the literature.

Results based on the accuracy measure show that the target price accuracy level for the total sample amounts to 73.64% after 12 months. Splitting the sample according to the type of recommendation shows an accuracy level for buy recommendations of 75.69%, whereas it decreases for sell recommen-

dations to 59.43%. For the total sample, the company's maximum (minimum) stock price within the 12-month period overshoots the target price forecasts, on average, by 17.72%. However, only 56.53% of the forecasts are met within the 12-month period. In these cases, maximum (minimum) stock prices overshoot target prices by 41.96%. For the remaining reports, where the target prices are not reached within the 12-month period, the stock price within the 12-month period reaches 86.20% of the forecasted price. Overall, it takes a median of 72 days to reach the target price for those stocks that succeed in doing so. Whereas hold and sell recommendations reach their target prices (if they do so) in about 50 days, it takes buy recommendations twice as long.

Our main focus is to distinguish between potentially relevant factors that explain target price accuracy. Results show that the stock price potential estimated by an analyst is negatively related to the level of forecast accuracy. Within this analysis, the estimated potential is defined as the absolute value of the target price divided by the current stock price minus one, subtracted by the one-year market-model return. Hence, target prices that highly deviate from the current stock price are, after 12 months, not as likely to be exactly reached compared to target prices that only marginally deviate from the current stock price. Furthermore, the text-based informational depth seems to be a proxy for thorough research by analysts. Results show that target price forecasts issued by analysts who also provide a detailed rationale in their report are marginally more accurate compared to less thoroughly researched reports. This result, however, is mainly true for the sample of positive recommendations. Additionally, results show that analysts' forecasts for stocks with a large market capitalization are more accurate. On the other hand, target price estimates for highly volatile stocks are less accurate compared to stocks with low volatility. One might argue that it is harder to make a precise forecast for stocks with higher stock volatility. Within further analyses, we scale each forecast and forecast error by its (one-year) stock volatility to put both measures on a level playing field. Results with respect to the relevant factors explaining target price accuracy are basically identical after scaling by volatility and are discussed in Section 4.3. With respect to reputation, results reveal that highly reputable banks issue target prices which are more accurate (at least for all positive

recommendations). Finally, results show that target price accuracy does not depend on potentially existing conflicts of interest.

The remainder of the paper is structured as follows. Section 2 describes the sample selection process along with descriptive statistics. Section 3 introduces the measures employed to compute target price accuracy and discusses its potential determinants. Section 4 displays results before Section 5 concludes.

2 Database

2.1 Database and sample selection

To analyze target price forecasts that are disclosed within analysts' reports issued for German stocks, we focus on the period from 2002 to 2004. We make use of the *Investext* database from *Thomson Financial* which provides analysts' financial reports in their original form. *Investext* claims to provide reports of over 450 different banks and independent research firms that cover more than 30,000 reports worldwide. For the German market, the database comprises 31,423 reports in the years from 2002 to 2004. Due to our research questions, we are required to read each of the reports in its entirety, a procedure which takes about 30 minutes per report. Therefore, we restrict the sample based on two rules: First, we exclusively focus on reports from banks that appear in the *Institutional Investor's* ranking in at least one year during the investigation period. Banks only show up in this ranking if they employ analysts who are part of the *Institutional Investor* All-European Research Team. The magazine *Institutional Investor* conducts an annual survey among a large number of buy-side managers who are asked to rank sell-side analysts along the dimensions stock-picking ability, earnings forecast accuracy, quality of written reports and overall services. Once an analyst is recognized as a top analyst in a given industry in the survey, he becomes a member of the *Institutional Investor's* All-European Research Team. US research commonly refers to the *Institutional Investor's* rankings as a selection criterion to distinguish valuable financial research (e.g., Stickel 1992, Previts, Bricker, Robinson, and Young 1994, Stickel 1995, Womack 1996, Asquith, Mikhail, and Au 2005, Fang and Yasuda 2010). However, Bradshaw and Brown (2006) considered that analysts might have no incentive to provide accurate

target prices since the membership of the *Institutional Investor* All-American Research Team is not based on target price accuracy but on factors including earnings forecast accuracy and quality of stock recommendations. This procedure results in 13 investment banks (such as BNP Paribas, Credit Suisse First Boston, Deutsche Bank, JP Morgan, and UBS) for which *Investext* provides reports. Second, we focus on reports featuring a length in the range between three and twenty pages. This results in 10,364 reports that match the search criteria. Since we have to read each report in its entirety, we draw a random sample of 1,000 reports that represent approximately 10% of the whole population.

2.2 Descriptive statistics on the covered companies

Table 1 shows the 10 most heavily covered stocks. As can be gleaned from the table, the list is headed by Siemens covered by 40 reports within the selected time period and closely followed by SAP and Volkswagen. However, as shown in the second column, coverage is quite widely disbursed in our sample. Although heading the list, analyst reports covering Siemens represent only 4% of the total sample. In total, 131 different companies are covered by the research industry. Table 1 gives details on a randomly selected report for each of the specific companies. A report on Linde, for example, was

Table 1: Top 10 most heavily covered companies within database

# Reports in sample	Relative share	Company	Broker	Report date	Recommendation	Earnings per share forecast	Target price	Current stock price
40	4.0%	Siemens	Deutsche Bank	12.04.2002	Buy	3.9	90	68.4
36	3.6%	SAP	ING Financial Markets	24.01.2002	Buy	4.24	180	157.82
34	3.4%	Volkswagen	BNP Paribas	27.10.2003	Sell	5.05	26	41.99
33	3.3%	Deutsche Telekom	Sanford C. Bernstein & Co.	25.02.2002	Buy	0.06	19	15.43
29	2.9%	Infineon Technologies	UBS Warburg	22.01.2002	Buy	-1.17	30	23.53
28	2.8%	Bayer	Credit Suisse First Boston	19.04.2004	Hold	1.69	20.5	21.54
27	2.7%	Metro	ING Financial Markets	13.02.2002	Hold	1.97	41	38
24	2.4%	BASF	Schroder Salomon Smith Barney	04.02.2002	Sell	1.56	33	44.95
21	2.1%	Linde	UBS Warburg	12.05.2003	Buy	3.18	40	31.5
21	2.1%	Altana	Schroder Salomon Smith Barney	01.08.2002	Hold	2.45	65	51.5

This table lists the 10 most heavily covered companies. The first two columns display the absolute number and relative share of the specific company within the database. The remaining columns show details of one randomly selected report covering the respective company. Each time, the broker name, the report date, the recommendation type itself (buy/hold/sell), the earning for share forecast for the upcoming financial year, the target price and the current stock price is displayed.

published by UBS Warburg. The company was recommended as a "BUY", the EPS forecast for the next financial year was 3.18 €, the target price 40 € (compared to a current stock price of 31.5 €).

Table 2 presents descriptive statistics on the covered firms. Panel A displays a mean (median) market capitalization of the covered firms of € 12.22 bn (€ 4.65 bn), with a maximum of € 72.60 bn and a minimum of € 0.03 bn. The mean (median) price-to-book value amounts to 2.29 (1.71). The mean one-year stock-specific return prior to the publication date t is -0.03 whereas the mean one-year market-model return (computed by the one-year CDAX return adjusted by the estimated OLS parameters) is -0.11. The fact that historic returns are negative is due to the selected time period of this analysis from 2002 to 2004. Taking one-year historic returns results in an exclusive focus on a bear market phase. The mean one-year volatility based on daily return data for a one-year period prior to the publication date t is displayed as 0.03 with a minimum of 0.01 and a maximum of 0.1. Panel B shows the sector allocation of the covered firms. Although a major focus of the covered companies lies in "industry" (22%) and "consumer goods" (19%), the sample seems to provide a healthy mixture of different sec-

tors. Only 11% of companies are classified as "financial service".

2.3 Summary statistics on analysts' reports

Since we aim to focus on the information published within analysts' reports, Table 3 presents special summary statistics apart from company statistics. The information for the 1,000 randomly selected reports is organized according to the three recommendation levels (buy, hold, and sell recommendations) and, additionally, for the total sample. At the beginning of 2002, Lehman Brothers and other banks switched from a five-category rating scheme to a three-category rating scheme (Bradley, Jordan, and Ritter 2003).Since we only find a negligible number of 15 strong buy recommendations and no strong sell recommendations, we join these strong buy recommendations with the 440 buy recommendations to obtain a three-category rating scheme. Such a procedure is also applied in Ertimur, Sunder, and Sunder (2007).

Since analyzing the target price accuracy requires each report to contain a target price, our final sample contains 950 reports. The reduction of 50

Table 2: Descriptive statistics on covered firms

Panel A: Firm characteristics	mean	median	min	max	1st percentile	99th percentile	standard deviation
Market capitalization (in billion €)	12.22	4.65	0.03	72.60	0.07	65.44	16.20
price-to-book ratio	2.29	1.71	0.21	21.43	0.43	9.37	2.07
1-year historic stock return	-0.03	-0.14	-0.91	9.60	-0.82	2.01	0.64
Market-model 1-year historic stock return	-0.11	-0.11	-1.39	2.14	-0.93	0.88	0.34
Volatility (1-year daily standard deviation)	0.03	0.03	0.01	0.10	0.01	0.06	0.01
Panel B: Sector allocation	**n**	**%**					
Consumer goods	183	0.19					
Service	99	0.10					
Communication	45	0.05					
Technology	108	0.11					
Industry	212	0.22					
Health care	88	0.09					
Financial service	110	0.11					
Basic materials	119	0.12					

This table presents descriptive statistics on the information collected from 1,000 randomly drawn analysts' reports on German stocks. Panel A discloses information on market capitalization, price-to-book ratios (both measured for each company at the publication date t of the stock's report), the one-year stock-specific return, the one-year market-model return which is based on the CDAX return, adjusted by the estimated OLS parameters, and the one-year stock-specific volatility prior to the publication date t. Panel B presents absolute and relative figures for the sector allocation of the covered stocks.

Table 3: Descriptive statistics on analysts' reports

Panel A: Target prices	Buy	Hold	Sell	Total
Number of reports	455	422	123	1000
Number of reports with target prices	443	400	107	950
Mean current stock price (P_t) in €	42.61	37.57	31.59	39.25
Mean target price (TP_t) in €	53.43	39.18	27.51	44.51
Mean implicit return [in %]	35.42	7.16	-12.96	18.07
Implicit return > 0 [% of sample]	98.87	65.75	19.63	76.00
Panel B: Information categories	**Buy**	**Hold**	**Sell**	**Total**
Expectations on revenues/sales [in %]	44.24	43.75	40.19	43.58
Expectations earnings/profits [in %]	50.56	48.25	44.86	48.95
Outlook revenues/sales [in %]	39.50	34.75	36.45	37.16
Outlook earnings/profits [in %]	48.98	39.00	51.40	45.05
Product introduction [in %]	11.51	7.00	1.87	8.53
New project [in %]	2.93	2.25	1.87	2.53
Cost efficiency [in %]	23.48	21.00	18.69	21.89
M&A activity [in %]	10.38	9.50	5.61	9.47
Stock repurchase [in %]	2.03	1.50	0.93	1.68
Industry climate [in %]	10.38	18.50	27.10	15.68
Quality of management [in %]	9.26	5.50	8.41	7.58
International operations [in %]	16.70	10.50	3.74	12.63
Competition [in %]	18.28	14.25	18.69	16.63
Risk [in %]	22.35	29.75	35.51	26.95
Future business perspective [in %]	25.51	17.00	25.23	21.89
Panel C: Conflicts of interest / investment banks	**Buy**	**Hold**	**Sell**	**Total**
Availability of conflicts of interest information [in %]	64.33	75.00	66.36	69.05
Holding/Ownership relation [in % of conflicts of interest sample]	43.86	45.67	33.80	43.60
Underwriting relation [in % of conflicts of interest sample]	37.89	47.00	50.70	43.45
Top 3 banks [in %]	44.24	55.75	42.06	48.84

This table presents descriptive statistics on the information collected from 1,000 randomly drawn analysts' reports on German stocks. The table is organized by the recommendation levels, i.e., buy recommendations (Buy), hold recommendations (Hold) and sell recommendations (Sell), and, additionally, a column for all reports (Total). In Panel A, we disclose the total number of reports, the number of reports that contain target price information, the mean actual stock price and the mean target price in €, and the mean implicit return, computed by the target price TP_t over the current stock price P_t minus one. Last, we report the percentage of the sample for which this implicit return is positive. In Panel B, we disclose information on each of the 15 categories in which analysts commonly give justifications for their recommendations. For each of the 15 categories, the table displays the percentage of how often, within each category, information is disclosed. Panel C displays to what percentage reports contain information on conflicts of interests. Furthermore, for these reports it is disclosed to what percentage a holding (underwriting) relationship occurs. Finally, Top 3 banks represents the ratio of reports written by those three banks that employ the largest number of highly ranked analysts following the Institutional Investor All-European rankings.

reports is only partly based on missing target prices within the reports. Additionally, we discard those reports with extreme values in terms of the accuracy measure (the 1st and 99th percentile). This is done to reduce possible outlier effects.

The final sample contains considerably more buy (443) and hold recommendations (400) than sell recommendations (107). Such a finding is not surprising, since analysts are reluctant to issue negative information regarding covered companies, and is in

line with the literature (e.g., Barber, Lehavy, McNichols, and Trueman 2001, Brav and Lehavy 2003). With respect to the forecasted stock price, we compute the implicit return that analysts assign to each stock as the ratio of the target price relative to its current stock price minus one (Panel A in Table 3). Usually, analysts issue price target forecasts for the following 12-month period. Whereas buy recommendations are expected to increase by 35.42%, hold recommendations display an implicit return of only 7.16%, and sell recommendations are expected to decrease by -12.96%. Altogether, analysts have a positive perception of the future and assign an implicit return of 18.07%. A solid level of optimism is also documented by Brav and Lehavy (2003) who found that, on average, target prices are 28% higher than current stock prices.

As mentioned before, we aim to contribute to the literature by analyzing the impact of the informational depth of each report on the accuracy of target prices. In order to identify the relevant topics that are commonly addressed by analysts, we analyzed around 100 (out-of-sample) reports. This process led us to identify 15 categories that constituted the core topics. For example, analysts frequently report on the outlook concerning earnings or profits. Our results mainly support the findings by Asquith, Mikhail, and Au (2005). The identified categories are: expectations on revenues/sales, expectations on earnings/profits, outlook on revenues/sales, outlook on earnings/profits, product introduction, new project, cost (in)efficiencies, M&A activity, stock repurchase, industry climate, quality of management, international operations, competition, risk, and future business perspective. To control for the informational depth of each report, we simply read each report in order to check if any of the above mentioned categories was addressed within the text. No further valuation of the content was performed. As a double-check, a substantial number of the reports were read by a second person. The process of proofreading by a second person closely supported the findings of the first round. Within this process, we populated a dummy variable with a one for each category if it was addressed and with zero if it was not addressed at all. Panel B in Table 3 displays the results. For example, in about every second report (48.95%), analysts address their expectations on earnings and profits. Other categories quite often concerned are: expectations on revenues/sales (43.58%), outlook on earnings/profits (45.05%),

and the outlook on revenues/sales (37.16%). However, the information on stock repurchases is, among these 15 categories, the most rarely addressed information. Interestingly, in the majority of categories, more information is disclosed for buy recommendations compared to sell recommendations.

Another topic of interest is the ongoing discussion on potential conflicts of interest which might bias the analysts' view. We therefore aim to control for these influences by taking advantage of the disclosure of business ties within the reports. However, such a disclosure can only be found in 69.05% of the final sample reports (Panel C in Table 3). To measure conflicts of interest, we focus on two important issues: (1) the fact that the bank has current holdings in the company and (2) the fact that the bank serves or has served as an underwriter for stocks of the covered company. Both types of potentially conflicting relations occur at the same frequency – in about 43% of the sample.

The final analysis includes 950 reports with disclosed target prices. In this sample, 722 reports (76% of the sample) are associated with a positive implicit return (with a target price above the current stock price). For this subsample, analysts correctly anticipate the direction of stock price movements if the firm's stock price achieves or exceeds the forecasted target price at some time within the 12-month period (see upper part of Figure 1 for an illustration of target price under- and overachievement). For the remaining 225 reports that are associated with a negative implicit return (a forecasted decline in the stock price), analysts correctly anticipate the direction of stock price movements if the stock price falls below the target price (see lower part of Figure 1). Combined with three reports that have an implicit return of zero this adds up to 950 reports.

2.4 Target price achievement

The percentage of stocks that achieve their target price forecast is presented in Panel A of Table 4. For the full sample, 56.53% of all target prices are achieved within the 12-month period. Sorting along the type of category, target prices of hold recommendations are most often achieved (69.50%) compared to buy recommendations (45.60%) and sell recommendations (53.27%). A similar result can be obtained when focusing only on the first three months after publication. These results could have

Figure 1: Graphical illustration of target price under- and overachievement
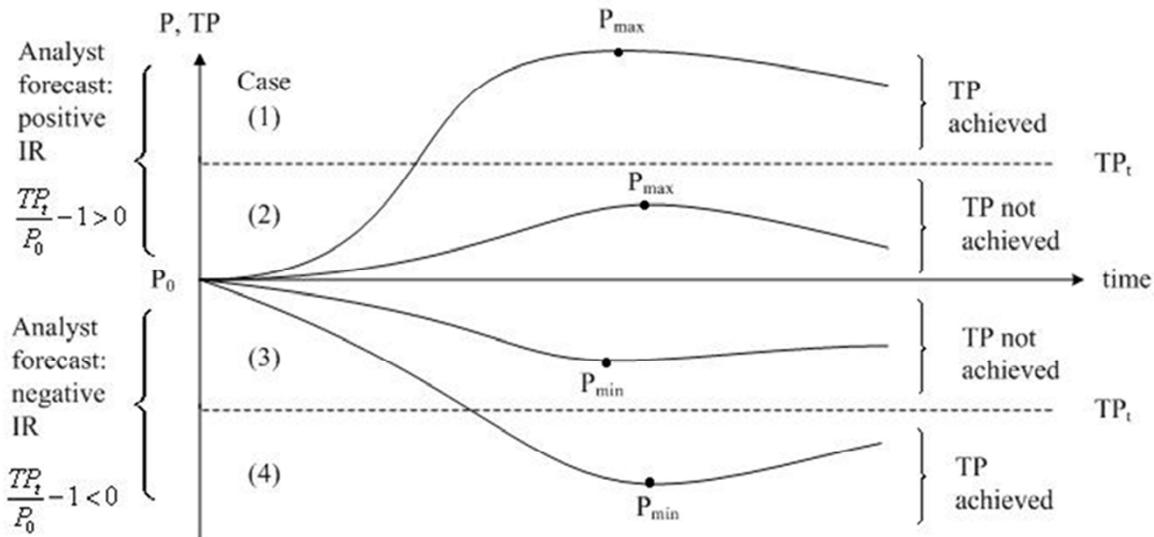
This figure illustrates four cases in which target price forecasts are overachieved (case (1) and (4)) or underachieved (case (2) and (3)). Within the upper part of the figure (case (1) and (2)), analysts have forecasted a positive development of the stock (positive implicit return). If the maximum stock price (P_{max}) within the 12-month period achieves or exceeds the forecasted target price (see upper dashed line), the forecast is achieved (case (1)), otherwise, it is not achieved (case (2)). Within the lower part of the figure (case (3) and (4)), analysts have forecasted a negative development of the stock (negative implicit return). If the minimum stock price (P_{min}) within the 12-month period falls below the forecasted target price (see lower dashed line), the forecast is achieved (case (4)), otherwise, the forecast is not achieved (case (3)).

been anticipated, since the deviation of the target price compared to the current stock price is the lowest for hold recommendations compared to buy (sell) recommendations. Asquith, Mikhail, and Au (2005) reported that the probability of achieving a particular target is highly dependent on the level of optimism. They disclosed that price targets that forecast a change of 0-10% are achieved in 74.4% of the cases, whereas price targets that forecast a change of 70% or more are realized in fewer than 25% of the cases. Unreported results show that for those stocks that reach the target price forecast, achieving the target price forecast takes an average of 72 days. Sorting along the three categories, it takes stock prices of buy recommendations to reach their target prices an average of 109 days, whereas for hold (sell) recommendations it only takes 48 (55) days.

Column 1 of Panel B in Table 4 shows that for those stocks that do not reach the forecasted target price, the maximum (minimum) stock price within the 12-month period is 86.20% of the forecasted price. Column 3 of Panel B in Table 4 shows that for those stocks that have reached the forecasted target price within the 12 months, the maximum (minimum) stock price within this period overshoots the target price by 41.96%. When focusing on the full sample, the forecasted target of all buy recommendations is on average overshot by 1.99%, whereas for the sample of all sell recommendations, targets are overshot by remarkable 34.87% within the 12-month period. These findings are in line with results from Asquith, Mikhail, and Au (2005) who reported for all recommendations an overshooting of 13.09%. Whereas target prices of strong buy recommendations are overshot by 3.86%, target prices of sell recommendations are overshot by 31.63%. However, one has to keep in mind that investors can hardly manage to earn such returns since they might not be able to time their investment decisions perfectly. In the following section, we therefore introduce a measure that evaluates target price accuracy after the usual time horizon of target prices, namely 12 months.

Table 4: Target price achievement within the 12-month forecast period

Panel A: Percentage of reports achieving 12-month target price (somewhere in the 12 months)

	Target price achieved in:					
	target price achieved	1-3 months	4-6 months	7-9 months	10-12 months	N
All Recommendations	56.53%	33.47%	10.95%	6.53%	5.58%	950
Buy	45.60%	17.38%	11.51%	7.22%	9.48%	443
Hold	69.50%	50.75%	10.50%	5.50%	2.75%	400
Sell	53.27%	35.51%	10.28%	7.48%	0.00%	107

Panel B: 12-month price maximums (minimums) / predicted price targets

	If target price missed	N	If target price achieved	N	Full Sample	N
All Recommendations	86.20%	413	141.96%	537	117.72%	950
Buy	83.42%	241	124.14%	202	101.99%	443
Hold	91.41%	122	147.73%	278	130.55%	400
Sell	86.90%	50	176.95%	57	134.87%	107

In Panel A of this table we present the percentage of reports that achieve the price target within the 12-month forecast period. Results are displayed for all recommendations and sorted by recommendation level. Additionally, the fraction of reports that achieve the price target within months 1 to 3, 4 to 6, 7 to 9 and 10 to 12 are displayed. In Panel B, we compute for the group of stocks that achieve (does not achieve) its target price within the 12-month period the level of overachieving (partly fulfilling) the target price (see also Figure 1). Similar results are also displayed for the full sample. We compute the ratio as the maximum price P_{max} achieved within 12 months divided by the target price TP_t if the target price is above the current stock price P_t. In cases of the target price TP_t below the current stock price P_t, the ratio equals the price target divided by the minimum price P_{min} achieved within 12 months.

3 Methodology

3.1 Accuracy measure

Studies have shown that capital markets react to published target prices (e.g., Brav and Lehavy 2003, Asquith, Mikhail, and Au 2005). Hence, based on the assumptions of the efficient market hypothesis, the disclosure of target prices seems to contain new and relevant information for financial markets. However, such a finding does not imply that target price forecasts are accurate from an ex-post perspective. Analysts might have limited incentives for primarily focusing on target price accuracy since bonuses depend on a whole set of performance variables – not necessarily on target price accuracy. Hong and Kubik (2003) stated that analysts heavily focus on the annual polls of money managers conducted by the magazine *Institutional Investor*, since they are highly rewarded in the case of success. Bradshaw and Brown (2006) quoted the career information page www.thevault.com: "Once a research analyst finds himself listed as an *II*-ranked analyst, the first stop is into his boss's office to renegotiate his annual package." However, within *Institutional Investor's* rankings, analysts are evaluated

along the four dimensions stock-picking ability, earnings forecasts accuracy, quality of written reports, and overall services. Target price accuracy is not part of this set. Cooper, Day, and Lewis (2001) and Bernhardt, Campello, and Kutsoati (2004) showed that published compensation schedules by banks include earnings forecast accuracy but not target price accuracy as a factor for setting analysts' salaries. Bonini, Zanetti, Bianchini, and Salvi (2010) additionally argued that target prices might be subject to biases since there is no explicit control of the forecast quality. Hence, analysts might use target prices strategically, e.g., in order to increase the sales hype of a stock (e.g., Asquith, Mikhail, and Au 2005). Empirical evidence on over-optimism, although not for target prices, stems from analysts issuing earnings forecasts. Stickel (1990), Abarbanell (1991), Dreman and Berry (1995), and Chopra (1998) showed that earnings forecasts are optimistically biased. Similarly, analysts tend to issue target prices that strongly deviate from current stock prices in order to attract the attention of institutional investors. Such effects have been observed, e.g., for private investors by Barber and Odean (2008). However, missing the target price after 12

months could also have a negative impact on the analyst's reputation. Therefore, analysts always face a trade-off when setting the target price potential for attracting institutional investors. A high target price potential, since it might never be reached, could increase the likelihood of disappointing investors and risking the analyst's own reputation. However, while setting it too low, institutional investors might not be attracted to the investment. Taking this into account, an ex-post analysis of target price accuracy seems useful for both investors and investment banks which employ analysts.

With respect to analyzing target price achievement, both Asquith, Mikhail, and Au (2005) and Bradshaw and Brown (2006) computed binary variables for meeting (not meeting) the target prices within and/or at the end of the 12-month period. The study of Bonini, Zanetti, Bianchini, and Salvi (2010) extends such metrics via computing the amount of under-/overachievement of target prices. Within their investor-oriented perspective, any overachievement of a target price counts as highly accurate, even in cases when the 12-month stock price strongly deviates from the forecasted target. Assume, for example, that the current stock price is € 30 and an analyst forecasts a target of € 50. In the case of a 12-month stock price of € 45, the forecast error amounts to 11.11%, a result that is fairly inaccurate. In the case of a 12-month stock price of € 55, the forecast error is -9.09%. Since the analyst overachieves his self-selected target, this outcome turns out to be fairly accurate.

However, one has to keep in mind that Bonini's measure represents the investors' perspective. If one judged the quality of analysts' forecasts based on this metric, it would be rational for analysts to mainly forecast low target prices that will easily be overachieved – and thus lead to enormous accuracy ratios. Once interested in the forecasting quality of an analyst, such an analysis might be more properly achieved by an accuracy measure that acknowledges exact and precise achievement of the forecasted target price after 12 months. This measure would penalize any deviation from the target price, irrespective of the direction of the deviation. From this perspective analysts are measured in terms of the absolute fit of their forecasts. If, for example, an analyst forecasts an increase in the stock price up to € 50, a 12-month stock price of € 49 is more precise (although it does not reach the forecasted price) compared to an overachievement of the price target

resulting in a stock price of € 60 after 12 months. (Following Bonini's measure, it would be the other way round.)

Since any deviation from the forecast reduces accuracy, we use absolute values in order to not distinguish between over- and underachieving the target price. To the best of our knowledge, this measure has not been used in this context so far:

$$(1) \quad AM = 1 - \overbrace{\left[\left(\left| \frac{P_{End}}{TP_t} - 1 \right| \right) | TP_t > P_t ; \left(\left| 1 - \frac{P_{End}}{TP_t} \right| \right) | TP_t < P_t \right]}^{12\text{-}month\,deviation\,between\,TP\,and\,stock\,price}$$

$$= 1 - \left[\left(\left| \frac{P_{End}}{TP_t} - 1 \right| \right) \right]$$

where TP_t is the target price forecast at the publication date t of the report, P_t is the current stock price at the publication date t of the report, and P_{End} is the stock price at the end of the 12-month period. The part of the equation within the brackets represents the computation of the forecast error. From this, the accuracy measure itself can be easily computed.

Based on the mentioned example where a stock price increase has been forecasted, either a stock price (at the end of the 12-month period) of € 45 or € 55 leads to a (symmetric) 10% deviation from the € 50 target price. Hence, any deviation from the price forecast will consequently lead to a reduction of accuracy. The same applies when a stock price decrease has been forecasted. Within the mentioned example, this results in a target price accuracy of 90% based on the introduced accuracy measure. Only in the case of a perfect match of the forecast and the 12-month stock price, the deviation would be 0% leading to a target price accuracy of 100%.

Since it might be harder for analysts to forecast target prices for highly volatile stocks, it could be advisable to adjust the introduced measure of target price accuracy by the stock-specific volatility in order to make stock forecasts comparable. In Section 4.3 we therefore use a volatility scaled version of the target price accuracy measure.

$$(2) \quad AM\_adj = 1 - \left[\frac{\left(\left| \frac{P_{End}}{TP} - 1 \right| \right)}{Volatility} \right]$$

3.2 Determinants for target price accuracy

Within the remainder of the text, we focus on the degree of accuracy measured by AM and, additionally, try to find explanations for the different levels of target price accuracy (see Section 4). For such an analysis, we initially discuss important determinants that could explain target price accuracy. These potentially relevant determinants can be divided into two groups: (1) analyst-specific determinants and (2) firm-specific determinants. Further variables are introduced to evaluate whether conflicts of interests and reputation play an important role in terms of target price accuracy. Finally, we discuss the second specification of the accuracy measure that directly acknowledges different levels of stock volatility.

Analyst-specific determinants

First, we focus on analyst-specific determinants. Since it has been shown that on average analysts publish highly optimistic forecasts, it is important to control for this optimism in analysts' forecasts. We therefore compute the implicit return which is the target price forecast at the publication date *t* of the report divided by the current stock price at the publication date *t* minus one. However, while forecasting the one-year stock price, one cannot assume the expected stock return to be zero which is often done for shorter time periods such as the one-day stock return. For the 12-month target price one usually assumes a positive risk-free rate and an equity risk premium. This drift means that stock returns will be non-zero on average even without any fundamental news. Stocks associated with higher implicit returns do not necessarily mean that analysts were on average more optimistic. Thus, it might help to adjust the implicit return by the average stock-specific return in order to get the additional return that analysts forecast. To compute this expected return, we use simple one-year historic returns for each stock and, additionally, the market-model return based on the one-year CDAX return adjusted by the estimated OLS parameters. As a robustness check, we also compute historic returns for two to four years and the two-year market-model return for the purpose of adjusting the implicit return. Results are virtually identical. Table 2 shows that both historic and market-model returns are substantially different across stocks. We therefore introduce a variable called POTENTIAL computed as the absolute value

of the implicit return, subtracted by the (market-model) one-year stock-specific return. We hypothesize this variable to be negatively related to the accuracy measure AM, since a higher stock-specific potential will lead, on average, to target prices being achieved less often. Based on the results of Table 4, it is clear that stock prices of hold recommendations achieve the forecasted prices more frequently and, on average, much faster.

Furthermore, we hypothesize that increased information disclosure within the analysts' reports, also called informational depth, plays a significant role in target price accuracy. The informational depth of a report might be a proxy for the prudence an analyst applies when performing the task of analyzing a company. Hence, there is more informational disclosure in cases of a more accurate and detailed work by an analyst. We expect this to lead to a higher accuracy of the issued target prices in the long run. We therefore model a variable called INFO-MEASURE which aggregates the number of information categories addressed in each report. Hence, this variable is theoretically distributed among [0, 15], i.e., zero for the case that none of the 15 information categories is addressed by the analyst in the body of the text, whereas 15 means that all of the 15 categories are addressed. For the sample, the mean of the INFOMEASURE variable is 3.20, its minimum 0, its maximum 10 and its standard deviation 1.78. We hypothesize this variable to be positively related to the accuracy measure AM, i.e., a higher information disclosure in the body of the text will increase the forecast accuracy, since analysts have likely expended more effort in analyzing the company. To the best of our knowledge, no other study has so far focused on explaining the accuracy of target price forecasts (or recommendations) by coding the informational content of the reports to proxy the level of detail an analyst applies.

Firm-specific determinants

Apart from analyst-specific variables, we concentrate on firm-specific variables to explain target price accuracy. As respective research concerning target price accuracy is absent, we have to borrow from the literature on earnings estimates to hypothesize the role of firm-specific factors. Schipper (1991) and Brown (1993) documented that earnings accuracy is conditional on the size of the firm. We therefore focus on the specific firm size (measured for each company in a log form of market capitaliza-

tion, i.e., Log MARKET VALUE, at the publication date t of the stock's report). We expect this variable to be positively related to the level of forecast accuracy. This could be due to the fact that for big stocks more information and more analyst coverage is publicly disclosed which reduces uncertainty. Similar results, although for the case of earnings forecast accuracy, were found by Sinha, Brown, and Das (1997) and Capstaff, Paudyal, and Rees (1999). They reported that analysts' forecast errors are smaller for companies with large market capitalizations and for companies that are followed by a large number of analysts. Beckers, Steliaros, and Thomson (2004) supported these findings with respect to the number of analysts. Apart from size which has proven its importance (e.g., Banz 1981, Stickel 1995), the price-to-book value (PRICE-TO-BOOK) is another firm characteristic that mirrors the information environment of each firm. We measure this value for each company at the publication date t of the stock's report. One might hypothesize this variable to be negatively related to the accuracy measure since stock price patterns of growth stocks (i.e. stocks with high price-to-book values such as high-tech, biotech or internet stocks) are much more volatile and, hence, not as likely to reach the forecasted target exactly compared to so-called value stocks.

A different strand of literature reports that earnings forecast accuracy decreases with increased earnings volatility (e.g., Huberts and Fuller 1995, De Bondt and Forbes 1999, Beckers, Steliaros, and Thomson 2004). The authors explain this finding by assuming that earnings volatility is inversely related to earnings predictability. Beckers, Steliaros, and Thomson (2004) proxy earnings volatility by using historical annualized daily stock return volatility during the one-year period preceding the earnings forecast. Following their line of arguments, a large proportion of the stock-specific risk results from the volatility of earnings. Analogously to earnings volatility being useful for explaining earnings forecasts, stock price volatility serves in explaining stock price forecasts. We therefore include historic volatility of daily stock returns in the model. The variable VOLATILITY is measured as the standard deviation of the stocks' daily return for the year prior to the publication of a report. Apart from computing VOLATILITY for the year prior to the publication of the report, we additionally performed all analyses with VOLATILITY measures based on the nine-month period, the six-month period and the three-month period

prior to publication. Results are robust across the different definitions of volatility. We hypothesize this variable to be negatively related to the accuracy measure, since higher volatility might be a proxy for higher risk, which makes it more difficult for analysts to accurately forecast the 12-month price. Contrary to the expected negative relation when explaining the forecast accuracy exactly *after* 12 months by volatility, the logic for explaining the amount of target price achievement *within* the 12-month period (see target price achievement by maximum/minimum prices within the 12-month period, Panel B of Table 4) would be the other way round. High-volatility stocks would be more likely to reach the forecasted target price at least once within the 12-month period compared to low-volatility stocks.

Bank reputation and conflicts of interest

The reputation of the bank could play a significant role with respect to forecast accuracy. Clement (1999) and Jacob, Lys, and Neale (1999) documented that analysts who work for the largest and most prestigious banks issue more precise earnings forecasts. Assuming that there are differences between the banks themselves with respect to the quality of their analysts' reports, one might think that the most accurate reports might be published by distinguished, well-known banks. Following the *Institutional Investor's* All-European rankings, we compute for each bank the average number of employed top analysts (in terms of their listing in the *Institutional Investor's* All-European Research Team rankings) for the years 2002 to 2004. Hence, a dummy variable called TOP3BANK is introduced which is equal to one if the bank is one of the three banks with the highest average number of top analysts, and zero otherwise. As a cross-check, analyses have additionally been performed while restricting the selection to only the most prestigious investment bank that employs the highest number of highly ranked analysts. Additionally, one might argue that apart from the bank-specific reputation it is also the analyst-specific reputation that is relevant for capital markets. However, most reports are written by analyst teams where it seems impossible to distinguish the effect of each analyst's individual reputation on capital markets. Panel C of Table 2 displays that these highly ranked banks wrote about every second report of our final sample (48.84%). We hypothesize that highly reputable banks issue

more accurate target price forecasts. Thus we expect the coefficient on TOP3BANK to be positive.

With respect to potential conflicts of interest, a relationship between the bank and the covered company itself could bias the accuracy of target prices. In order to control for potentially conflicting relations, we introduce a dummy variable called RELATIONSHIP which takes the value of one if the bank has either current holdings in the company or serves/has served as an underwriter for stocks of the covered company, and zero otherwise. In order to test for robustness, we model a second variable called UNDERWRITING_HOLDING which takes the value of one if the bank has either current holdings in the company or serves/has served as an underwriter for stocks of the covered company, which takes the value of two if the bank has both current holdings in the company and serves/has served as an underwriter for stocks of the covered company, and which is equal to zero otherwise. If existing relations between bank and covered firm lead to biased forecasts, we can expect these variables to be negatively related to the accuracy measure. The rationale behind this is that forecasts from analysts who suffer from conflicts of interests might be less accurate.

4 Results

4.1 Overall target price accuracy

Table 5 discloses detailed information on the accuracy measure AM. Within Panel A, the median accuracy level is shown to be 73.64%. Within Panel B, we split up the sample according to the recommendation levels. Whereas buy recommendations have a median accuracy level of 75.69%, sell recommendations are less accurate with a median level of accuracy of 59.43%. The median difference of both groups of 16.26% is statistically significant. Similar results can be drawn from Panel C where the sample is split according to the implicit return. One can infer from this evidence that analysts are not equally successful in forecasting optimistic and pessimistic future outcomes. The results show that they do significantly better with respect to positive forecasts. Within the literature for earnings forecast accuracy such a phenomenon has been shown by Ali, Klein, and Rosenfeld (1992) and Butler and Saraoglu (1999). They found that a bias between earnings forecasts and realized earnings predominantly exists in cases of

negative earnings development. In the case of rising earnings, analysts deliver satisfactory forecasts.

Multivariate regression results

The main objective within this paper is to analyze the driving factors that might help explaining target price accuracy. Results could be interesting for both institutional investors and investment banks at the same time. For the analysis we run standard OLS regressions with robust standard errors as proposed by White (1980). For an additional control of heteroskedasticity, we use bootstrapped standard errors where we draw 1,000 replications of the original sample. Furthermore, we run a maximum likelihood estimation and an iterative reweighted least square estimation within a generalized linear model framework. Since all models yield (almost) identical results, the discussion of results is based on the standard OLS results. Since Table 5 has shown significant differences between forecast accuracy of stocks based on recommendation levels we add dummy variables for buy and sell recommendations when analyzing the total sample. Alternatively, we use a dummy variable for reports which disclose an implicit return below zero. Results show that target price forecasts of negatively classified reports are much less accurate compared to the remainder of the sample (Table 6). Based on this finding, we split up the sample and perform separate regressions for the sub-groups.

First, we hypothesized that the POTENTIAL of a stock might play an important role. This rationale can be supported by our results, as the coefficient of the variable is significantly negative, as predicted, for all regressions. Asquith, Mikhail, and Au (2005) also found that the probability of achieving a price target is particularly dependent on the deviation or, as they put it, optimism exhibited by the analyst. Bradshaw and Brown (2006) stated that analyst target price performance is worse the higher the forecasted price relative to the current stock price. Similar evidence based on earnings forecasts is given by La Porta (1996). Whereas earnings for stocks with low earnings growth forecasts are very close to their expected value, earnings for stocks with high earnings growth forecasts highly deviate from their forecasts.

The second analyst-specific variable is the informational depth of each report. The variable INFO-MEASURE is added to each of the regressions as a

Table 5: Accuracy of target prices

Panel A: Accuracy measure for all recommendations

	Median	Mean	sd	N
All	73.64%	67.35%	0.26	950

Panel B: Accuracy measure based on recommendation levels

	Median	Mean	sd	N
Buy recommendation	75.69%	69.71%	0.24	443
Hold recommendation	76.12%	69.01%	0.25	400
Sell recommendation	59.43%	51.37%	0.33	107
Difference (Buy - Sell)	16.26%***	18.34%***		
p-value	0.0000	0.0000		

Panel C: Accuracy measure based on implicit return

	Median	Mean	sd	N
Implicit return > 0	77.15%	70.18%	0.24	722
Implicit return < 0	64.62%	58.10%	0.31	225
Difference (Implicit return > 0 - Implicit return < 0)	12.54%***	12.08%***		
p-value	0.0000	0.0000		

This table presents results for the accuracy measure. In Panel A, we report results (median, mean, standard deviation, and number of observations) for all recommendations. In Panel B, we split up the sample according to the recommendation level (buy, hold or sell recommendation). In Panel C, the sample is split according to the implicit return being above or below zero. Panel B and Panel C additionally report differences of the mean and median of (i) buy versus sell recommendations and (ii) reports with a positive versus negative implicit return. To control for statistical significance of these differences, the t-test is used to test the equality of mean and the non-parametric Wilcoxon/Mann-Whitney test is used to test the equality of median.

proxy to evaluate whether carefully prepared reports lead to higher accuracy of price forecasts. Results confirm our hypothesis especially for those reports that are positively classified (as a buy recommendation or, alternatively, as a recommendation associated with a positive implicit return), where the variable INFOMEASURE turns out to be significant at the 5% significance level. Within the literature, results are supported by Breton and Taffler (2001) who documented that text-based information, e.g., about the firm's management, strategy and its trading environment, is important for arriving at investment recommendations. Yet, one mystery lingers on: Why does the amount of information-disclosure seem to be important only within the positively classified cases? The literature on earnings forecast accuracy (e.g., Ali, Klein, and Rosenfeld 1992, Butler and Saraoglu 1999) reported that a bias between earnings forecasts and realized earnings predominantly exists in cases of a negative earnings development. Since analysts only reluctantly issue negative information, each forecast of a

decreasing stock price is a strong sign for an overvalued company. As visible in the tables, when stock prices are forecasted to depreciate significantly, target price accuracy does not depend on soft information such as the amount of information disclosure. The recommendation itself predominates. On the contrary, in cases of positive recommendations, which are quite commonly issued by analysts, further disclosure of soft information is relevant, since the recommendation level itself does not provide such strong information. These findings are supported by the results presented in Table 5. Target price accuracy is much lower for companies with a negative forecast.

Apart from the analyst-specific variables, we added a set of firm-specific variables (Log MARKET VALUE, PRICE-TO-BOOK, VOLATILITY) to analyze whether the information environment of the firm has a significant impact on target price accuracy. Differences in target price accuracy might not only be traceable to analyst-specific features and differences but also to indirect effects based on

Table 6: Determinants explaining the accuracy of target prices

Coeff.:	ALL	ALL	BUY	HOLD	SELL	Implicit return > 0	Implicit return < 0
POTENTIAL	-0.1001***	-0.1024***	-0.0869***	-0.0865**	-0.3678***	-0.0713***	-0.3959***
	(-5.43)	(-5.96)	(-4.10)	(-2.32)	(-4.09)	(-4.13)	(-6.72)
INFOMEASURE	0.0073*	0.0075*	0.0126**	0.0043	-0.0085	0.0086**	-0.0018
	(1.74)	(1.83)	(2.20)	(0.69)	(-0.49)	(1.97)	(-0.17)
Log MARKET VALUE	0.0264***	0.0271***	0.0162**	0.0391***	0.0200	0.0228***	0.0480***
	(5.48)	(5.62)	(2.09)	(6.01)	(1.17)	(4.15)	(4.68)
PRICE-TO-BOOK	-0.0102***	-0.0086***	-0.0168***	-0.0024	0.0095	-0.0135***	0.0120*
	(-3.44)	(-2.74)	(-4.21)	(-0.51)	(0.75)	(-4.25)	(1.91)
VOLATILITY	-0.0348***	-0.0341***	-0.0378***	-0.0304**	-0.0264	-0.0368***	-0.0010
	(-4.08)	(-4.02)	(-2.66)	(-2.47)	(-1.18)	(-3.65)	(-0.06)
BUY	0.0380**						
	(2.20)						
SELL	-0.1380***						
	(-4.40)						
IMPLICIT RE-TURN < 0		-0.1219***					
		(-5.80)					
Intercept	0.5837***	0.6028***	0.7044***	0.4523***	0.5633***	0.6413***	0.2576**
	(10.43)	(10.92)	(8.12)	(5.83)	(2.91)	(10.29)	(2.11)
adj. R²	16.82%	16.78%	11.42%	14.40%	16.87%	12.27%	26.60%
N	928	928	432	391	105	706	219
Prob(F-test)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*This table reports robust regression results for multivariate model specifications on the accuracy measure AM. The regressions are performed for buy, hold, and sell recommendations, and, furthermore, for stocks that are associated with a positive and negative implicit return by analysts. POTENTIAL is computed as the absolute value of the target price forecast TP_t at the publication date t of the report divided by the current stock price P_t at the publication date t of the report minus one, subtracted by the one-year market-model return which is based on the CDAX return, adjusted by the estimated OLS parameters. The model variable INFOMEASURE aggregates the number of information categories (altogether 15: expectations on revenues/sales, expectations on earnings/profits, outlook on revenues/sales, outlook on earnings/profits, product introduction, new project, cost (in)efficiencies, M&A activity, stock repurchase, industry climate, quality of management, international operations, competition, risk, and future business perspective) which are addressed in each report. It is therefore theoretically distributed on the interval [0,15]. Log MARKET VALUE is the natural logarithm of the market capitalization of each stock, measured at the publication date t of the stock's report. PRICE-TO-BOOK is the price-to-book ratio of each stock, measured at the publication date t of the stock's report. VOLATILITY is the standard deviation of the stock's daily return for the one-year period prior to the publication date t. For each value, t-statistics are given in parentheses. ***, **, * indicate statistical significance at the 1%-, 5%-, 10%-level (two-tailed test) based on robust standard errors as proposed by White (1980).*

differences in the information environment of a firm (e.g., Stickel 1995), e.g., a generally higher information-level for big companies that are followed by multiple analysts. In line with the literature (e.g., Sinha, Brown, and Das 1997, Capstaff, Paudyal, and Rees 1999) the coefficient of the Log MARKET VALUE is significant for almost all regressions. Results support the hypothesis that 12-month target prices of bigger firms with higher informational

disclosure are easier to forecast. A higher informational disclosure based on a higher level of analyst coverage reduces forecast uncertainty. With respect to the price-to-book value, the coefficients are significantly negative for the total sample and for positively classified reports. As predicted, stocks with a higher price-to-book value, i.e., glamour stocks like biotech and internet stocks, are shown to be associated with lower forecast accuracy. Last, results pro-

vide strong evidence that VOLATILITY plays an important role in explaining target price forecast accuracy. All regressions throughout the positively classified sub-groups display significantly negative coefficients. Results on VOLATILITY are also virtually identical for other volatility computations based on a nine-month, six-month and three-month period prior to publication of the report. As hypothesized, exactly forecasting the price of a stock with a higher volatility is not as easy as for stocks with lower volatility.

4.2 The effect of bank reputation and conflicts of interest

Market participants indirectly finance the research provided by investment banks. Schipper (1991) stated that analysts' research reports and recommendations are often part of a group of bundled investment banking services. Hence, investors should be interested in evaluating the analysts' role as financial intermediaries. Having an adequate knowledge about the most successful analysts (for example, in terms of target price accuracy), would allow investors to focus more on their valuable advice. However, recent studies have concentrated mainly on analyzing earnings forecast accuracy. Furthermore, the forecasts by All-American analysts also trigger a more significant market reaction. Clement (1999) reported forecast accuracy to be positively associated with analysts' experience and their employers' size. Jacob, Lys, and Neale (1999) also examined the contribution of experience and brokerage house variables on analysts' earnings forecast accuracy. They find that the employer size and the brokerage house's degree of industry specialization are positively related to the earnings forecast accuracy. Unlike Clement (1999), they did not find that earnings forecast accuracy improves with larger experience. However, bank reputation has only been analyzed with respect to earnings forecasts accuracy, not with respect to target price forecast accuracy. Therefore, we extend the literature on this issue.

Table 7 displays results when adding the variable TOP3BANK to the regressions. The coefficients on all basic model variables (POTENTIAL, INFO-MEASURE, Log MARKET VALUE, PRICE-TO-BOOK and VOLATILITY) are basically in accordance with the results in Table 6. The coefficient of the dummy variable TOP3BANK is positive and statistically significant for the sub-groups of positive

recommendations. Within unreported analyses, we further restricted the selection and focused purely on the most prestigious bank that employs the highest number of analysts. Results remain basically identical.

Hence, it seems as in cases of a positive forecast, highly reputable banks issue price target forecasts that are more accurate after 12 months.

Furthermore, economic research is currently interested in analyzing biasing relationships between the bank and the covered companies. Due to the investment banks' general motivation to secure future investment banking deals, analysts are assumed to be influenced by conflicts of interest when tracking and analyzing stocks. On the one hand, it is a fact that the overall number of stocks which are recommended for purchase heavily outweighs the number of stocks recommended for sale – a sign that analysts aim to please the covered companies or to attract investors. A number of studies found that conflicts of interests bias analysts' work (e.g., studies like Lin and McNichols 1998, Michaely and Womack 1999, Dechow, Hutton, and Sloan 2000). In particular, the studies document that affiliated analysts issue more favourable reports compared to their non-affiliated colleagues. This evidence is supported by Dugar and Nathan (1995) who found that financial analysts of brokerage houses that provide investment banking services for a company are more optimistic with respect to recommendations and earnings forecasts compared to those analysts that do not provide any service. Evidence that analysts tend to manipulate their investment recommendations in response to pressure from investment banking is documented by Bradshaw, Richardson, and Sloan (2003). On the other hand, another strand of literature finds quite the reverse concerning conflicts of interest and, thus, exculpates analysts. Iskoz (2003) and Agrawal and Chen (2008), for instance, provided evidence that affiliated analysts do not seem to issue more biased reports than analysts from independent research firms. Cowen, Groysberg, and Healy (2006) even found that analysts employed by banks which fund research through underwriting and trading activities issued less optimistic forecasts and recommendations as opposed to banks which do not perform M&A services at all.

Within Panel A of Table 8, we proxy the relationship between the bank and the covered company by including the variable RELATIONSHIP (UNDER-

Table 7: Determinants explaining the accuracy of target prices including reputation of issuing bank

Coeff.:	BUY	HOLD	SELL	Implicit return > 0	Implicit return < 0
POTENTIAL	-0.0817***	-0.0863**	-0.3678***	-0.0677***	-0.3966***
	(-3.85)	(-2.32)	(-4.03)	(-3.95)	(-6.70)
INFOMEASURE	0.0102*	0.0044	- 0.0085	0.0073	-0.0020
	(1.72)	(0.69)	(- 0.49)	(1.63)	(-0.19)
Log MARKET VALUE	0.0186**	0.0390***	0.0200	0.0249***	0.0481***
	(2.39)	(5.84)	(1.11)	(4.48)	(4.67)
PRICE-TO-BOOK	-0.0171***	-0.0023	0.0095	-0.0138***	0.0120*
	(-4.25)	(-0.50)	(0.75)	(-4.32)	(1.90)
VOLATILITY	-0.0369**	-0.0305**	- 0.0264	-0.0364***	-0.0008
	(-2.54)	(-2.46)	(- 1.17)	(-3.64)	(-0.04)
TOP3BANK	0.0483**	-0.0031	0.0004	0.0403**	0.0082
	(2.16)	(-0.13)	(0.01)	(2.32)	(0.23)
Intercept	0.6679***	0.4550***	0.5628***	0.6073***	0.2518**
	(7.56)	(5.57)	(2.60)	(9.42)	(2.00)
adj. R^2	11.93%	13.94%	15.06%	12.69%	25.90%
N	432	391	105	706	219
Prob(F-test)	0.0000	0.0000	0.0000	0.0000	0.0000

This table reports robust regression results for multivariate model specifications on the accuracy measure AM. The regressions are performed for buy, hold, and sell recommendations, and, furthermore, for stocks that are associated with a positive and negative implicit return by analysts. POTENTIAL is computed as the absolute value of the target price forecast TP_t at the publication date t of the report divided by the current stock price P_t at the publication date t of the report minus one, subtracted by the one-year market-model return which is based on the CDAX return, adjusted by the estimated OLS parameters. The model variable INFOMEASURE aggregates the number of information categories which are addressed in each report. It is therefore theoretically distributed on the interval [0,15]. Log MARKET VALUE is the natural logarithm of the market capitalization of each stock, measured at the publication date t of the stock's report. PRICE-TO-BOOK is the price-to-book ratio of each stock, measured at the publication date t of the stock's report. VOLA-TILITY is the standard deviation of the stocks' daily return for the one-year period prior to the publication date t. TOP3BANK is equal to one if the bank is one of the three banks with the highest average number of top analysts (following the Institutional Investor's All-European rankings for the years 2002 to 2004), and zero otherwise. For each value, t-statistics are given in parentheses. ***, **, * indicate statistical significance at the 1%-, 5%-, 10%-level (two-tailed test) based on robust standard errors as proposed by White (1980).

WRITING_HOLDING). Results show that coefficients for both variables are insignificant across the different regressions. Hence, results show that the type of relationship between the investment bank and the covered company does not seem to have a bearing on the level of the accuracy of price targets. Such results are important for investors since they might have feared that conflicted analysts issue price forecasts that are not as accurate as independent research would be.

4.3 Volatility-adjusted target price accuracy

Since it might be harder to make a precise forecast for a stock with a higher volatility, it might come as no surprise that the target price accuracy is higher for stocks with lower volatility compared to stocks with higher volatility (see Table 6). However, within the descriptive statistic of Table 2, results show that the level of volatility is substantially different across stocks, with a minimum of 0.01 and a maximum of 0.1. In order to compare different levels of accuracy on a level playing field, we introduce a volatility-adjusted target price measure (AM_adj). At the same time, we scale the variable POTENTIAL by the

Table 8: Determinants explaining the accuracy of target prices including conflicts of interests

Panel A: Conflict of interest – relation at all

Coeff.:	BUY	HOLD	SELL	Implicit return > 0	Implicit return < 0
POTENTIAL	-0.0680***	-0.0860**	- 0.4355***	-0.0556***	-0.3718***
	(-2.98)	(-2.10)	(- 3.49)	(-2.91)	(-5.26)
INFOMEASURE	0.0064	0.0009	- 0.0007	0.0061	0.0010
	(1.04)	(0.13)	(- 0.03)	(1.27)	(0.08)
Log MARKET VALUE	0.0303***	0.0373***	0.0354	0.0309***	0.0480***
	(3.62)	(5.37)	(1.44)	(5.24)	(4.10)
PRICE-TO-BOOK	-0.0120**	-0.0007	0.0076	-0.0070	0.0145*
	(-2.09)	(-0.12)	(0.22)	(-1.61)	(1.83)
VOLATILITY	-0.0187	-0.0330**	- 0.0052	-0.0240**	- 0.0107
	(-1.30)	(-2.21)	(- 0.13)	(-2.14)	(-0.50)
RELATIONSHIP	-0.0080	0.0248	- 0.0618	-0.0037	0.0068
	(-0.35)	(0.87)	(- 0.69)	(-0.20)	(0.15)
Intercept	0.6052***	0.4801***	0.3948	0.5750***	0.2629**
	(6.03)	(5.85)	(1.44)	(8.07)	(2.00)
adj. R^2	11.85%	13.96%	1 2.64%	11.90%	25.10%
N	275	292	70	470	164
Prob(F-test)	0.0000	0.0000	0.0008	0.0000	0.0000

Panel B: Conflict of interest – underwriting/holding relation

Coeff.:	BUY	HOLD	SELL	Implicit return > 0	Implicit return < 0
POTENTIAL	-0.0692***	-0.0860**	- 0.4477***	-0.0563***	-0.3745***
	(-3.02)	(-2.09)	(- 3.72)	(-2.94)	(-5.37)
INFOMEASURE	0.0066	0.0010	- 0.0003	0.0061	0.0010
	(1.06)	(0.14)	(- 0.01)	(1.28)	(0.08)
Log MARKET VALUE	0.0304***	0.0376***	0.0340	0.0310***	0.0492***
	(3.63)	(5.43)	(1.41)	(5.25)	(4.27)
PRICE-TO-BOOK	-0.0121**	-0.0010	0.0054	-0.0070	0.0135*
	(-2.09)	(-0.19)	(0.16)	(-1.62)	(1.78)
VOLATILITY	-0.0185	-0.0331**	0.0009	-0.0237**	-0.0099
	(-1.28)	(-2.20)	(0.02)	(-2.11)	(-0.46)
UNDERWRITING_HOLDING	-0.0101	0.0113	- 0.0546	-0.0048	-0.0093
	(-0.71)	(0.76)	(- 1.09)	(-0.43)	(-0.38)
Intercept	0.6085***	0.4827***	0.4053	0.5762***	0.2654**
	(6.05)	(5.92)	(1.47)	(8.12)	(2.01)
adj. R^2	12.00%	13.87%	1 3.63%	11.93%	25.15%
N	275	292	70	470	164
Prob(F-test)	0.0000	0.0000	0.0004	0.0000	0.0000

Table 8 continued: Legend

This table reports robust regression results for multivariate model specifications on the accuracy measure AM. The regressions are performed for buy, hold, and sell recommendations, and, furthermore, for stocks that are associated with a positive and negative implicit return by analysts. POTENTIAL is computed as the absolute value of the target price forecast TP_t at the publication date t of the report divided by the current stock price P_t at the publication date t of the report minus one, subtracted by the one-year market-model return which is based on the CDAX return, adjusted by the estimated OLS parameters. The model variable INFOMEASURE aggregates the number of information categories which are addressed in each report. It is therefore theoretically distributed on the interval [0,15]. Log MARKET VALUE is the natural logarithm of the market capitalization of each stock, measured at the publication date t of the stock's report. PRICE-TO-BOOK is the price-to-book ratio of each stock, measured at the publication date t of the stock's report. VOLA-TILITY is the standard deviation of the stocks' daily return for the one-year period prior to the publication date t. RELATIONSHIP takes the value of one if the bank has either current holdings in the company or serves/has served as an underwriter for stocks of the covered company, and is otherwise zero. UNDERWRITING_HOLDING takes the value of one if the bank has either current holdings in the company or serves/has served as an underwriter for stocks of the covered company, which takes the value of two if the bank has both current holdings in the company and serves/has served as an underwriter for stocks of the covered company, and which is equal to zero otherwise. For each value, t-statistics are given in parentheses. ***, **, * indicate statistical significance at the 1%-, 5%-, 10%-level (two-tailed test) based on robust standard errors as proposed by White (1980).

stock-specific volatility since the analyst-specific return forecast might also be dependent on different levels of stock volatility. Table 9 therefore displays results of a model where volatility is no longer used as an independent variable but for scaling the accuracy measure and the stock-specific POTENTIAL.

As visible within the table, all results still support the hypotheses with respect to the variables PO-TENTIAL_adj, INFOMEASURE, Log MARKET VALUE and PRICE-TO-BOOK. Hence, even after taking into account that it might be much harder to forecast the target price of highly volatile stocks, stocks that are negatively classified and stocks whose target price highly deviate from the current stock price display lower levels of target price accuracy. At the same time, the size of the company and the level of information disclosure are positively related to the accuracy measure. Thus, we can conclude that the presented effects of the results section are not driven by different levels of volatility but remain relevant after controlling directly for stock-specific volatility.

5 Discussion and concluding remarks

Sell-side analysts perform an important task within financial markets since they act as intermediaries that interpret financial information such as accounting data for investors. As part of their job, they make recommendations about stocks and issue earnings and target price forecasts. Apart from all further details which are disclosed within their reports, financial research has shown that these 'summary measures' contain new and relevant information for investors and financial markets (e.g., Stickel 1995, Francis and Soffer 1997, Brav and Lehavy 2003,

Asquith, Mikhail, and Au 2005). However, analysts seem to be subject to various biases when performing their task of covering companies in order to write financial reports. A huge part of the literature addresses the phenomenon of overly optimistic analysts. Some authors argued that analysts might issue biased recommendations since they aim to enhance the existing investment banking relations between their bank and the covered company (e.g., Lin and McNichols 1998, Francis and Philbrick 1993). Others stated that analysts aim to generate further underwriting business and trading commissions via their firm-specific disclosures (e.g., Hayes 1998, Hong and Kubik 2003). Referring to the disclosure of target prices, Asquith, Mikhail, and Au (2005) wondered whether target prices are meant to increase the sales hype of a stock or to compensate for overly optimistic reports.

Since investment banks heavily invest in their research departments, they are interested in measuring and evaluating the performance of their analysts. A whole strand of literature has evolved that analyzes the accuracy of earnings forecasts. Loh and Mian (2006) and Ertimur, Sunder, and Sunder (2007), for instance, found that analysts who issue more accurate earnings forecasts also issue more profitable recommendations. At the same time, earnings forecast accuracy seems to be relevant with respect to the determination of analysts' bonuses. This is due to the fact that an important aspect of analysts' compensations is their performance in the well-known yearly ranking of All-American analysts issued by *Institutional Investor*. This ranking explicitly takes earnings forecast accuracy into account. However, since data on target prices has only recently been included in standard databases, target

Table 9: Determinants explaining the accuracy of target prices – based on volatility-adjusted accuracy measure

Coeff.:	ALL	ALL	BUY	HOLD	SELL	Implicit return > 0	Implicit return < 0
POTENTIAL_adj	- 0.0605***	- 0.0651***	- 0.0435*	- 0.0833**	- 0.1663**	- 0.0466***	- 0.2244***
	(-3.33)	(-3.82)	(-1.84)	(-2.53)	(-2.05)	(-2.65)	(-4.00)
INFOMEASURE	0.0029*	0.0029*	0.0059**	0.0008	- 0.0024	0.0031*	0.0016
	(1.69)	(1.70)	(2.45)	(0.31)	(-0.36)	(1.68)	(0.36)
Log MARKET VALUE	0.0059***	0.0060***	0.0018	0.0114***	0.0036	0.0044**	0.0115***
	(3.23)	(3.35)	(0.61)	(4.54)	(0.62)	(2.10)	(3.24)
PRICE-TO-BOOK	- 0.0009	- 0.0004	- 0.0039***	0.0029*	0.0050	- 0.0025**	0.0080***
	(-0.88)	(-0.40)	(-2.70)	(1.72)	(1.14)	(-2.23)	(3.48)
BUY	0.0080						
	(1.13)						
SELL	- 0.0403***						
	(-3.62)						
IMPLICIT RETURN < 0		- 0.0346***					
		(-4.43)					
Intercept	0.8274***	0.8329***	0.8633***	0.7797***	0.8211***	0.8480***	0.7490***
	(44.30)	(45.76)	(29.71)	(29.52)	(14.09)	(40.49)	(20.33)
adj. R²	3.27%	3.53%	0.61%	4.69%	- 3.48%	0.82%	8.74%
N	914	914	426	386	102	695	216
Prob(F-test)	0.0000	0.0000	0.0022	0.0000	0.1979	0.0002	0.0000

This table is based on Table 6. The variable POTENTIAL has been adjusted by the standard deviation of the stocks' daily return for the one-year period prior to the publication date t (VOLATILITY). Similarly, the accuracy measure itself (the dependent variable) has also been adjusted by the standard deviation of the stocks' daily return for the one-year period prior to the publication date t (VOLATILITY). All other variables are defined as in Table 6.

prices, their impact on financial markets, and their accuracy have not been analyzed with similar thoroughness. Two seminal papers (Brav and Lehavy 2003, Asquith, Mikhail, and Au 2005) have shown that target prices contain relevant information for capital markets, even conditionally on other information that is issued in the form of, for example, earnings price forecasts. With respect to the question of target price accuracy, evidence is still evolving with a number of (working) papers (e.g., Bonini, Zanetti, Bianchini, and Salvi 2010, Bradshaw and Brown 2006, Gleason, Johnson, and Li 2008). We contribute to the literature by analyzing target price accuracy in the German capital market. Contrary to Bonini, Zanetti, Bianchini, and Salvi (2010), who take an investor-oriented perspective where any overachievement of forecasts is positively acknowledged by their model since investors will benefit, we define target price accuracy in terms of

exactly matching a forecasted price. Such a measure evaluates the forecasting ability of analysts. Results show that, generally, the target price accuracy level after 12 months amounts to 73.64%. Splitting the sample according to the recommendation levels shows that for buy recommendations it is 75.69%, whereas it decreases for sell recommendations to 59.43%. However, the main focus of this study is to distinguish the driving forces of price target accuracy. First, we focus on analyst-specific variables such as implicit return, adjusted by the expected stock-specific return, and the amount of informational disclosure within the text. In line with the literature (e.g., Asquith, Mikhail, and Au 2005, Bonini, Zanetti, Bianchini, and Salvi 2010, Bradshaw and Brown 2006), forecasts that largely deviate from the current stock price are likely to be not as accurate as forecasts which are (almost) spot-on. With respect to the disclosure of text-based information, this

study provides weak evidence that the level of target price accuracy can be explained by the amount of information that is disclosed within reports. This text-based informational disclosure is assumed to proxy the prudence that an analyst applies when performing the task of covering a company within his reports. Our results show that within the sub-groups of stocks that are recommended for purchase, a higher level of disclosed information increases the level of forecast accuracy. Hence, the amount of text-based information seems to proxy the detail that analysts apply for their task. Although such information has not been employed before to explain target prices accuracy, economic research has realized that text-based non-financial information seems to add explanatory power in various contexts. Bradshaw (2002) examined the frequency with which analysts supplement their recommendations or target prices with non-financial information such as recent accounting irregularities, court decisions, new contracts, or general macroeconomic conditions. They find that such information is often used when the stock recommendation itself is less favourable. Amir and Lev (1996) analyzed the relevance of financial and non-financial information for explaining stock market reactions within the telecommunication sector and find that non-financial text-based information such as growth proxies and market penetration measures are highly value-relevant. Similarly, Asquith, Mikhail, and Au (2005) and Kerl and Walter (2008) reported that markets react to the disclosure of non-financial text-based information. Barker (1999) analyzed different valuation models and states that these models are only a "point of departure" beyond which analysts explore subjective company-specific information (such as the quality of management) to arrive at their conclusions. Breton and Taffler (2001) determined that text-based information, e.g., information on the firm's management, strategy, and its trading environment, is important for drawing investment recommendations.

When it comes to the analysis of firm-specific variables to explain target price accuracy, we find, very much in line with the literature on earnings forecast accuracy (e.g., Brown 1993, Sinha, Brown, and Das 1997, Capstaff, Paudyal, and Rees 1999), that target price forecast accuracy is higher for bigger firms (in terms of market capitalization). For these firms, informational disclosure is higher since a higher number of analysts regularly cover these companies,

thus reducing forecast uncertainty. A second important result stems from including volatility in our model to explain target price accuracy. Results show that stocks which are highly volatile are much harder to forecast accurately compared to low volatile stocks. The economic literature reports similar results with respect to earnings forecast accuracy, which decreases with increasing earnings volatility (e.g., Huberts and Fuller 1995, De Bondt and Forbes 1999, Beckers, Steliaros, and Thomson 2004). Beckers, Steliaros, and Thomson (2004) explicitly proxy earnings volatility by historical stock return volatility. Further analyses have shown that the main results of the model remain identical when adjusting the accuracy measure directly by different levels of volatility.

Finally, we apply the ongoing discussion regarding analysts' reputation and conflicts of interest to our basic analysis of target price accuracy. With respect to the reputation of analysts, results reveal that, in line with studies focusing on earnings forecast accuracy (e.g., Brown and Chen 1990, Stickel 1992), highly reputable banks issue target prices that are more accurate. Similar to the results of the text-based information disclosure, this result only holds for all positive recommendations. Studies like Ali, Klein, and Rosenfeld (1992) and Butler and Saraoglu (1999) reported that a bias between earnings forecasts and realized earnings predominantly exists in cases of a negative earnings development. Hence, neither highly reputable analysts nor analysts that disclose a huge amount of text-based information can do better compared to the average analyst when negative forecasts are issued. Future research could connect these findings to Easterwood and Nutt (1999) who found that analysts underreact to negative information but overreact to positive information. Finally, results show that the level of accuracy does not depend on potentially existing conflicts of interest between the investment bank and the covered company. Within the literature, there is mixed evidence on the question of whether affiliated analysts are more biased compared to non-affiliated analysts. Therefore we add an important result since, irrespective of a potential bias, analysts' performance while issuing target price forecasts seems to be unbiased by such influences as conflicts of interests.

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Biography

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