Framing Effects in Stock Market Forecasts: The Difference Between Asking for Prices and Asking for Returns

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Abstract

Studies analyzing return expectations of financial market participants like fund managers, CFOs or individual investors are highly influential in academia and practice. Examples of such surveys in the U.S. are the Livingston Survey of the Federal Reserve Bank of Philadelphia, the Surveys of Consumers of the University of Michigan, the UBS/Gallup survey, and the Duke/CFO Business Outlook survey. An example from Germany is the ZEW Bankprognosen survey. We argue and show that the results in the surveys above are easily influenced by the elicitation mode of return expectations. Surveys that ask for future stock price levels (like the Livingston Survey) are more likely to produce mean reverting expectations than surveys that directly ask for future returns (like the Michigan Surveys of Consumers or the Duke/CFO Business Outlook survey). Furthermore, we conduct a questionnaire study that explicitly analyzes whether the specific elicitation mode affects return expectations in the above direction. In our study, subjects (students in business administration at two large German universities) were asked to state mean forecasts for seven time series. Using a between subject design, one half of the subjects was asked to state future price levels, the other group was directly asked for returns. We observe a highly significant framing effect. For upward sloping time series, the return forecasts stated by investors in the return forecast mode are significantly higher than those derived for investors in the price forecast mode. For downward sloping time series, the return forecasts given by investors in the return forecast mode are significantly lower than those derived for investors in the price forecast mode. We argue that this finding is consistent with behavioral theories of investor expectation formation that are based on the representativeness heuristic.

Keywords: Return forecast, volatility forecast, confidence interval, individual investor, overconfidence, expertise, financial education, financial literacy, framing effect, investor surveys.

JEL classification: C9, G1.

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1. Introduction

Studies analyzing return expectations of financial market participants like fund managers, CFOs, or individual investors are highly influential in practice. Examples of such surveys in the U.S. are the Livingston Survey of the Federal Reserve Bank of Philadelphia <http://www.phil.frb.org/econ/liv>, the Surveys of Consumers of the University of Michigan <http://www.sca.isr.umich.edu/>, the UBS/Gallup survey <http://www.ropercenter.uconn.edu/ubs.html>, and the Duke/CFO Business Outlook survey <http://www.cfosurvey.org/duke>. An example from Germany is the ZEW Bankprognosen survey <http://www.zew.de/de/publikationen/bankprognosen/index.php>.

Results of these regular surveys are often mentioned in the popular press and influence economic policy debates (see, for example, Dominitz and Manski (2004) or the above web pages, e.g. <http://faculty.fuqua.duke.edu/cfosurvey/media.htm>). The main and simple focus in practice is, whether expectations are going up or down or, in other words, whether optimism about the economic outlook has increased or decreased. These survey results are also used to predict whether general economic conditions will improve or deteriorate. More generally, survey data is becoming more and more important in all areas of economics (see, for example, Manski (2004)).

In our paper, we argue and show that the results of the surveys above are easily influenced by the elicitation mode of return expectations. Surveys that ask for future stock price levels (like the Livingston Survey) are more likely to produce mean reverting expectations than surveys that directly ask for future returns (like the Michigan Surveys of Consumers or the Duke/CFO Business Outlook survey).

Our line of reasoning is twofold:

1. We carefully analyze existing studies on return expectations that usually ask for *either* future price levels *or* future returns. We find that studies which ask for future price levels document mean reverting expectations whereas studies asking for future returns document a belief in trend continuation (see the next section). We argue that this finding is consistent with behavioral theories of investor expectation formation that are based on the representativeness heuristic. We thus show that there is much more information in the literature on investor expectations that remains hidden when the elicitation mode is overlooked. Thus, we are able to explain the variance in findings across studies of market expectations in terms of how the questions are framed.
2. We conduct a questionnaire study that explicitly analyzes whether the specific elicitation mode affects return expectations in the above direction. In our study, subjects (students in business administration at two large German universities) were asked to state mean forecasts for seven time series. Using a between-subject design, one half of the subjects was asked to state future price levels (we will call this response mode “price forecast mode” in the following), the other

group was directly asked for returns (called “return forecast mode” in the following). We observe a highly significant framing effect. For upward sloping time series, the return forecasts stated by investors in the return forecast mode are significantly higher than those derived for investors in the price forecast mode. For downward sloping time series, the return forecasts given by investors in the return forecast mode are significantly lower than those derived for investors in the price forecast mode.

The above mentioned surveys are highly influential both in academia and practice. The fact that the elicitation mode might influence results is overlooked in the interpretation and might even result in wrong corporate or economic policy decisions. More generally, studies show that framing effects can influence trading behavior and prices in experimental asset markets (see, for example, Andreassen (1988), Kirchler et al. (2005), Weber et al. (2000)). Another recent example that individual biases affect market prices is Coval and Shumway (2005) who study biases of Chicago Board of Trade traders (see also Fehr and Tyran (2005) for a recent survey of the effects of individual biases on market outcomes). Moreover, it is important to note that not only non-professionals are subject to biases as we will show in the next section. Deaves et al. (2005) analyze the ZEW Bankprognosen survey and find that professional stock market analysts are biased in the way that underestimate the volatility of stock returns. Practitioners such as the CFOs surveyed in the Duke/CFO Business Outlook survey are also subject to biases. Even more important, these biases of CFOs are correlated with suboptimal corporate financial policies or corporate investment decisions (Ben-David et al. (2006)). Several other studies also show that psychological biases affect economic behavior outside the laboratory. This is true for individual investors as well as professional investors or CFOs (see, for example, Dorn and Huberman (2005), Fenton-O'Creevy et al. (2003), Glaser and Weber (2004), Graham et al. (2006), or Malmendier and Tate (2005)). Our results can also explain, why studies analyzing the correlation between different investor sentiment indicators usually document inconclusive findings (see, e.g. Qiu and Welch (2006) or Shiller (2000)).

The rest of the paper is organized as follows. In Section 2 we develop our main hypothesis and present the literature review. Section 3 contains the design of our study and descriptive statistics. Section 4 presents the results and the last section concludes.

2 Derivation of Our Main Hypothesis and Literature Review

Why should it matter whether investors state prices or returns to predict stock price development? Andreassen (1987, 1988) argues that the regressiveness of predictions depends (among other things) on the way investors think about past realizations of the time series. Do they think in terms of price levels or price changes (i.e., returns)? He argues that the most representative price of the time series “35, 37, 39, 41, 43, 45” is lower than the final price. Thus, making a forecast while thinking in terms

of price levels leads to mean reverting expectations. In contrast, the most representative change of the time series "+2, +2, +2, +2, +2" is "+2". Thus, thinking in terms of changes leads to a belief in trend continuation. The underlying mechanism was named representativeness heuristic by Tversky and Kahneman (1982). We hypothesize that a similar mechanism might be at work for different ways of eliciting stock price forecasts.[1]

Hypothesis 1 (Forecast Framing Effect): In comparison to direct return forecasts, price forecasts are distorted in the direction of mean reverting expectations.

In other words, for upward sloping time series, the return forecasts given by investors in the return forecast mode will be higher than those stated by investors in the price forecast mode. For downward sloping time series, the return forecasts given by investors in the return forecast mode will be lower than those derived for investors in the price forecast mode.

Note that we just make relative predictions in this hypothesis and do not expect to find a general pattern of beliefs in mean reversion in the price forecast mode and beliefs in trend continuation in the return forecast mode.[2]

Before we formally test Hypothesis 1 with our questionnaire study described in the next section, we explore whether the existing literature is consistent with this hypothesis. In our literature review, we include all studies which ask for either future price levels or future returns to forecast (real) stock prices or artificially generated charts in experimental studies. We do not only include academic studies analyzing the questionnaire data provided by the surveys mentioned in the introduction but also other questionnaire or experimental studies that generate new data sets. However, we exclude studies

- that do not clearly state whether people were asked to state returns or prices.
- that do not analyze whether respondents have extrapolative or mean reverting expectations.
- that purely analyze directional predictions or elicit probabilistic forecasts.
- that only analyze interval forecasts.
- that analyze extremely short term expectations (i.e. with a forecast horizon of less than one week) or extremely long run expectations (i.e. with a forecast horizon of more than three years) as expectations in these cases might be mixed with market microstructure issues (in the first case) or macroeconomic issues (in the second case).

[1] In the experimental studies of Andreassen (1987, 1988), expectations of participants can be inferred by their stock trading behavior. Andreassen (1987, 1988) shows how various framing manipulations influences whether, for example, participants buy stocks when prices fall or rise. However, he does not ask for expectations and does not analyze whether expectations are influenced by the elicitation mode.

[2] In fact, due to the general tendency of stocks to increase in the long run, we rather expect in both forecast modes to find a belief in mean reversion for downward sloping trends and a belief in trend continuation for upward sloping trends.

- analyzing exchange rate predictions due to different time series properties of exchange rates.

The remaining studies we identified are shown in Table 1.[3]

	Studies that document a belief in mean reversion (reversal, anchoring)			Studies that document a belief in trend continuation (extrapolation, persistence)		
	Authors	Data source	Participants/ respondents	Authors	Data source	Participants/ respondents
Studies asking for returns/ changes				Andreassen/Kraus (1990), study 1	Experiment	Students
				Czaczkes/Ganzach (1996), study 1	Experiment	Students
				Amromin/Sharpe (2006)	Michigan survey of consumers	Consumers/investors
				Dominitz/Manski (2005)	Michigan survey of consumers	Consumers/investors
				Fisher/Statman (2002a)	Gallup/PaineWebber	Individual investors
				Fisher/Statman (2002b)	Gallup/PaineWebber	Individual investors
				Graham/Harvey (2003)	Duke/CFO Magazine	CFOs
				Shiller (2000)	Questionnaire	Institutional investors
				Törngren/Montgomery (2004)	Experiment	Students, professionals
				Vissing-Jorgensen (2003)	UBS/Gallup	Individual investors
Studies asking for prices/ levels	Andreassen/Kraus (1990), study 1	Experiment	Students	[De Bondt (1993), study 1]	Questionnaire	Students
	Czaczkes/Ganzach (1996), study 1	Experiment	Students			
	De Bondt (1991)	Livingston survey	Economists			
	[De Bondt (1993), study 1]	Questionnaire	Students			
	Glaser/Weber (2005a)	Internet questionnaire	Individual investors			
	Lawrence/Makridakis (1989)	Experiment	Students			
	Lawrence/O'Connor (1992)	Experiment	Students			
	Mussweiler/Schneller (2003)	Experiment	Students			
	O'Connor/Remus/Griggs (1997)	Experiment	Students			
	Siebenmorgen/Weber (2004)	Experiment/questionnaire	Students			
	Theissen (2006)	Internet questionnaire	Individual investors			

Table 1: Studies analyzing return expectations of financial market participants or experimental subjects.

Table 1 groups existing papers in studies documenting a belief in mean reversion (left part) and a belief in trend continuation (right part). A belief in mean reversion is sometimes also called a belief in reversals or just anchoring whereas common synonyms of a belief in trend continuation are extrapolative expectations or a belief in persistence. Furthermore, the table states the data source and the participants in the respective study. For both groups of studies, we show on the left side of Table 1, whether the respective study asked for prices (levels) or returns (changes). The resulting picture is surprisingly clear: Studies asking for prices document a belief in mean reversion whereas studies asking for returns document a belief in trend continuation. The table also shows that it does not matter whether the judge is a professional or an individual investor or just a student in an artificial experiment.[4]

There are some other interesting points that emerge from Table 1. The study by De Bondt (1993) appears on both sides of the table although participants where only asked for future price levels. It is the only study we are aware of that asks for prices and documents a belief in trend continuation. However, the study does not only ask for the most likely value of the price of stocks in the future but also for upper and lower bounds of an interval that contains the future price with 80 percent probability. De Bondt (1993) shows that confidence intervals stated by students are not symmetric. Although subjects expect upward moving charts to continue to rise they are aware of a great downside potential which is communicated by the lower bound of their interval. In other words, focusing on the mid point of the interval would result in mean reverting expectations. This is why it is hard to classify

[3] See Lawrence et al. (2006), MacDonald (2000), or Webby and O'Connor (1996) for extensive surveys of the remaining studies.

[4] Studies analyzing expectations of professionals usually find that they are also biased. See, for example, Ben-David (2004), Deaves et al. (2005), Glaser et al. (2005), or Menkhoff et al. (2006) and the references cited therein.

this study. De Bondt (1993) calls this the hedging theory of confidence intervals. As a theoretical background of this hedging theory, he explicitly mentions the above described theory of Andreassen (1987, 1988) which is based on the representativeness heuristic by Tversky and Kahneman (1982).[5]

Two other studies (Czaczkes and Ganzach (1996), study 1, and Andreassen/Kraus (1990), study 1) are close to our study. In Czaczkes and Ganzach (1996), study 1, experimental subjects had to predict the impact of a series of changes in stock earnings on prices of the stock. 45 students had to predict the price change over the next period, 44 students were asked to state the next price. People in the price group received the true price as feedback, subjects in the price change group received the true price change from period to period. They find that predictions in the price change group were more extreme than predictions in the price condition. These findings are consistent with our hypothesis stated above. However, Czaczkes and Ganzach (1996) are not able to disentangle whether the elicitation mode or the specific form of feedback drives their results. Czaczkes and Ganzach (1996) explain their results in the following way: Several heuristics which people use in making numerical predictions compete for the determination of prediction output. Some of them (e.g. representativeness) lead to excessively extreme predictions while others (e.g. anchoring and adjustment) lead to regressive (and even over-regressive) predictions. In their view, the results indicate that factors which facilitate reliance on representativeness (focus on changes) indeed lead to an increase in extremity, while factors that facilitate reliance on anchoring and adjustment (focus on prices) lead to a decrease in extremity.

In Andreassen/Kraus (1990), study 1, 77 experimental subjects had to predict the future development of exponential time series (e.g. the number of viruses in t which increases exponentially in t). One half of the subjects received the first five values and were asked to predict the next value. The other half received the first five values plus the four changes and were asked to predict the next price change. Consistent with our hypothesis, they find that the degree of extrapolative expectations is higher in the change condition. However, the authors are not able to disentangle the effect of different information and the specific elicitation mode on their results, a fact that they themselves acknowledge (Andreassen and Kraus (1990), p. 356). Furthermore, real financial time series usually do not exhibit time series properties that resemble those of exponential time series.

Further evidence that is consistent with Hypothesis 1 is provided by Amromin and Sharpe (2006). Table 1 shows that they analyze data from the Michigan survey of consumers and document a belief in trend continuation. In one figure in their paper, they analyze results from a question in the Michigan survey of consumers that was part of the survey until January 2003 and that asked for future prices. While usually only few investors state negative expected returns, between 10 and 20 percent of investors in each survey month predict that price levels will go down. They therefore also conjecture, that the framing of questions influences the result obtained by this kind of surveys.

[5] See De Bondt (1993), pp. 357-358.

Although the above picture looks unambiguous, it is no precise test of Hypothesis 1. The studies usually look at the mean or median answer across the respective subject pool. This way of analyzing the data overlooks the large heterogeneity across people. Studies focusing on determinants of the cross-section of expectations are, for example, Dominitz and Manski (2004). Furthermore, several other factors apart from the subject pool are different, such as the information presented, the forecast horizon, the time period or the time series to be forecasted, to mention just a few. Thus, it is difficult to refute the argument that the above results are driven by factors other than the elicitation mode. This is why we formally test Hypothesis 1 with a new questionnaire study that we will present in the following.

3. Design of the Study and Descriptive Statistics

3.1. Design of the Study

To explicitly test Hypothesis 1, we designed different versions of a questionnaire that was filled out by students of two classes at the University of Mannheim and the University of Münster. The questionnaire took about 15 minutes to be completed. All completely filled out questionnaires entered a drawing of 25 cash prizes of 20 Euros each to provide an incentive for complete answers.[6]

The pretested questionnaire consisted of three parts plus a cover sheet, six pages in total (see the Appendix).

In Part I, subjects saw price charts of three DAX 30 listed stocks – BASF, Deutsche Telekom, and Henkel preferred stock – as well as the DAX 30 performance index. Each chart displayed the price development over the last six months. Part II of the questionnaire was designed in the same way with the only difference that price charts of three undisclosed stocks were displayed, labeled Stock A, Stock B, and Stock C. The price charts exactly depicted the movement of three other DAX stocks: Schering, SAP, and Infineon. For each of the seven assets, participants were asked to provide forecasts for two time horizons, one and six months. Each forecast consisted of three values: the median plus upper and lower bound of a 90 percent confidence interval. A detailed definition of what was meant by these values was given on the cover sheet. We choose this design as the vast majority of the surveys mentioned above use this way of measuring expectations (see the web links mentioned above or Graham and Harvey (2003, 2005) or Welch (2000)) Using this design, each participant made six forecasts for seven price charts, resulting in 42 forecasts per subject in total.

[6] The investor surveys mentioned above usually provide no financial incentive. This is also true for relevant experimental studies. For example, no monetary reward or class credit was given for participation in the experiment in Lawrence and O'Connor (1992), p. 19. Furthermore, Remus et al. (1998) conducted an experiment to assess the effects of financial incentives on time series forecasting accuracy. There was no evidence that financial incentives impacted forecasting accuracy in stable time series.

The price charts were presented in the same order to all participants due to organizational aspects. Although no order effects have been reported in similar studies, the fact should be kept in mind when interpreting the results.

Part III of the questionnaire was used to collect demographic data plus other information that might be of interest. The collected data includes age, gender, course of study, and semester. Furthermore, we asked for self-assessments of knowledge of statistics, interest in financial markets, and knowledge of financial markets on ordinal scales. Two further control questions elicited the general belief in a future stock market movement conditioned on the fact that the market has fallen respectively risen by 10 percent. Finally, participants were asked to state for each asset that was used in the experiment with name disclosed whether they know it and whether they hold it in their own portfolio.[7]

We selected the stocks that are part of DAX 30 index based on the historic price movement over the last six months. To be able to test the hypotheses, upward, flat, and downward trends were selected. In Part I as well as in Part II of the questionnaire participants were confronted with all three trend types. In addition, subjects were asked to forecast the DAX 30, which can be classified as a flat trend. BASF and Stock A (Schering) can be classified as an upward, Henkel preferred stock and Stock C (Infineon) as a downward, and Deutsche Telekom and Stock B (SAP) as flat trend.[8]

It should be mentioned that the selection of stocks was conducted according to an intuitive classification by the authors, i.e. not the past returns but the graphical trend was used as a decision basis. This procedure is widely used in the literature (see, for example, De Bondt (1993) or Shefrin (2000)). However, later in the paper, we also analyze the effect or past returns more formally in a regression analysis.

The construction of the graphical charts was conducted with special care to minimize distorting effects. For the six stocks and the DAX 30 performance index, 132 daily closing prices from Thomson Financial Datastream between April 22, 2004 and October 22, 2004 were used. The time series were displayed in coordinate systems that looked all alike with the exception that the scaling on the ordinate had to be adjusted to the specific price range. The scaling can influence forecasts in a sense that the price chart might appear highly volatile with small scaling. A rather large scaling will have the opposite effect. A standardization procedure was applied to mitigate these effects. First, the upper and lower bounds were standardized. Second, the number of horizontal lines was picked not to vary excessively.[9] Both elements influence forecasts.[10] The limits for the upper and lower bounds were chosen according to Lawrence and O'Connor (1992). They were designed in a way that the data

[7] In the case of the DAX stock index, the respective question used „DAX mutual funds / DAX index funds".
[8] Relative changes are for BASF +9.87 percent, for Stock A (Schering) +24.97 percent, for Henkel –18.69 percent, for Stock C (Infineon) –27.45 percent, for Deutsche Telekom +1.72 percent, for Stock B (SAP) +1.23 percent und for the DAX Index –3.06 percent over the displayed six months.
[9] The number used varied between three and five.
[10] See Lawrence and O'Connor (1992), p. 449.

rectangle, defined by the minimum and maximum along the vertical and horizontal axis, fills three eights of the vertical dimension of the graph. The rationale behind this procedure is to lower the risk that the bounds of the diagram serve as "natural boundaries" for the forecast.

Due to implementation aspects, a time lag of three trading days in Mannheim and four trading days in Münster occurred between the last price displayed and the date on which the survey was conducted.[11]

For the empirical tests, an experimental design with random allocation to the experimental groups was used. The complete group was randomly split into three subgroups by distributing the questionnaires – which were printed in a fixed ratio – randomly to the participants. The three experimental groups were defined in the following way. In the first version of the questionnaire, participants were asked to state *price* estimates (see Appendix A), in the second version *returns* forecasts (see Appendix B). Both experimental groups received exactly the same information in exactly the same format, i.e. the price charts over the last six months. The only difference was the response mode. A third version was created with a slight change in the information provided. In addition to the price charts over the last six months the last six one-month-returns were displayed on top of the chart. Figure 1 shows an example.

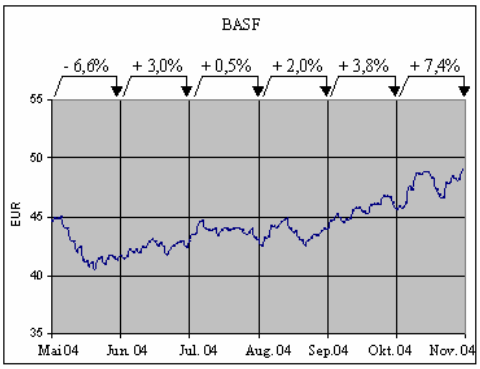

Figure 1: Chart with return information (figure from original German questionnaire)

The additional information was provided to support participants in their task of completing the questionnaire. The treatment was added as a fall-back for the case that the task to estimate returns (as asked for in the second version) would be perceived as too difficult. However, our whole analysis will not distinguish between the two information conditions, i.e. we merge the two subgroups 2 and 3 into one main "return forecast" group. In fact, the additional information shown in Figure 1 has almost no influence on the results. Details are available from the authors on request.

The three versions have been distributed in a way that half of the participants received the price version and a quarter of the participants one of the two return versions. Thus we used a classical between-subject-design. Table 2 summarizes the differences in the questionnaires between the three experimental groups.

[11] There were no big price movements over this period. All time series decreased. The maximum change was about -2%.

Experimental group	Values asked for	Information presented
Price version (see Appendix A)	Prices	Price chart
Returns without monthly returns (see Appendix B)	Returns	Price chart
Returns with monthly returns (see Appendix B with charts as shown in Figure 1)	Returns	Price chart, additionally: one-month-returns (see Figure 1 for an example)

Table 2: Design-related differences of experimental groups

In Mannheim, 120 questionnaires were distributed in an advanced class in decision theory. In Münster, 152 questionnaires were handed out to students attending an advanced behavioral finance class. In total, 249 completely filled out questionnaires were returned. Reasons for deviations are listed in Table 3.

	Price forecast mode	Return forecast mode	Total
Completed	128	121	249
Not returned	5	5	10
Returned incompletely	4	3	7
Price estimates given instead of returns	-	6	6
Total	**137**	**135**	**272**

Table 3: Returned questionnaires by experimental groups

The table shows that in six cases subjects in the second experimental group had problems with the task of estimating returns which they "solved" by estimating prices instead. All these subjects did not receive the additional return information.

A higher degree of difficulty of the "return forecast mode" can also be seen when we compare inconsistent answers among the experimental groups. During the cleaning of the data, 69 individual estimates have been eliminated for the returns versions, but only 35 for the price version.[12] This finding of more severe problems in dealing with returns is in line with other literature.[13] A data cleaning process was applied to remove inconsistencies from the data. For each estimate, we require the upper limit to be greater than the median and the median to be greater than the lower limit.[14] If that is not the case, the three values of the estimate are omitted, but not the complete questionnaire.[15] All price forecasts are converted into returns based on the value at the end of the six month period presented in the charts[16] (see also De Bondt (1998) and Glaser and Weber (2005a)).[17]

[12] See below for reasons for the data cleaning.

[13] Other research also indicates that people seem to have problems dealing with returns. Andreassen (1988) finds in an experiment that errors recalling price changes were significantly larger than those made in recalling prices. Furthermore, investors recall the returns of their own portfolios rather poor (see Glaser and Weber (2005b)). In general, one can say that people find it easier to deal with prices than returns.

[14] In theory, a distribution can be constructed where the 5 or the 95 percentile equals the median. Though possible, it is extremely unlikely for continuous distributions of stock prices or returns. Therefore, we consider such estimates as nonsense and omit them from the data set.

[15] All the following results are similar when we exclude the whole questionnaire. Furthermore, variables like gender etc. are not correlated with missing or inconsistent observations.

[16] There were no big price movements between the end of the chart period and the day the questionnaire was filled out. The results are thus similar when we use the value of the day the questionnaire was filled out in our analysis.

[17] Dividends cannot explain potential differences between the return forecasts calculated this way and the returns directly stated by subjects. The DAX index is a performance index anyway. All 1-month forecasts are not influenced as dividends

In line with the above literature, means have not been surveyed directly, but can be approximated via the median and upper and lower limits for continuous random variables (see Keefer and Bodily (1983)).[18]

For each of the seven time series i, $i \in \{1;2;3;4;5;6;7\}$ and each subject k, $k \in \{1;...;249\}$, the mean is approximated using the following formula[19]:

$$\text{mean}_i^k = 0.63x(0.50)_i^k + 0.185\left[x(0.05)_i^k + x(0.95)_i^k\right]$$

$x(p)_i^k$ is the p percentile of the distribution with $p \in \{0.05;0.50;0.95\}$.

3.2 Descriptive Statistics

In this subsection, we present descriptive statistics of our subject pool. Table 4 compares descriptive statistics of the students surveyed in Mannheim and Münster. We chose a decision analysis class in Mannheim and a finance class in Münster to be able to analyze the effect of financial education on our results. Table 4 indeed shows that the Münster group has a higher affinity with financial markets, as expected. Self-reported stock market interest and stock market knowledge are significantly higher in Münster (p-value <0.0001). Typical is the higher percentage of men in the finance class.

		Mannheim Decision analysis class	**Münster** Finance class	**p-value**
Gender	Women	43.00%	19.46%	
	Men	57.00%	80.54%	
Age	Mean	24.23	24.32	0.0245**
	Median	23	24	
Semester	Mean	6.68	6.83	0.7460
	Median	7	6	
Statistics knowledge	Mean	2.58	2.78	0.0109**
(school grades: 1=very good; 6=very bad)	Median	2	3	
Stock market interest	Mean	2.52	1.99	<0.0001***
(1=very interested; 4=not interested at all)	Median	2.50	2	
Stock market knowledge	Mean	3.83	3.09	<0.0001***
(school grades: 1=very good; 6=very bad)	Median	4	3	

Table 4: Descriptive statistics by location. P-values of Mann-Whitney test. ** indicates significance at the 5 percent level, * indicates significance at the 1 percent level.**

The results seem plausible as the class in Mannheim is a mandatory general business class whereas the class in Münster is part of the specialization area "Finance". In total, the students from Mannheim have a lower affinity with financial topics. Considering this, the variable "location" can be interpreted as a "finance" dummy or "expertise" dummy variable. The comparison of the two locations is

are paid out afterwards. Even most of the 6-month forecasts cannot be influenced. BASF, Deutsche Telekom, and SAP paid out dividends after our 6-month forecast horizon. Infineon does not pay a dividend at all. Only the results for the Henkel stock (dividend payment date April 19, 2005) and the Schering stock (dividend payment date April 15, 2005) could potentially be influenced. We show later, that this is not the case. In contrast, the potential effect of dividends makes our result even stronger.

[18] All results are similar when we analyze the median or the midpoint of the interval directly. Thus, the results are not affected by the above formula for the mean. See also Subsection 4.3.2.

[19] See Keefer and Bodily (1983), p. 597.

interesting in a sense that – if the same results are found for both – a higher external validity can be assumed. Furthermore, we can analyze the effect of financial education on our results.

Furthermore, Table 5 shows that the differences in the most relevant descriptive statistics between the "price forecast mode" and the "return forecast mode" are small. Therefore, biases due to the assignment of questionnaire, can be ruled out.

		Price forecast mode	Return forecast mode
Gender	Women	25.00%	33.06%
	Men	75.00%	66.94%
Age	Mean	24.79	23.75
	Median	24	24
Semester	Mean	7.02	6.50
	Median	7	6
Statistics knowledge	Mean	2.78	2.61
(school grades: 1=very good; 6=very bad)	Median	3	3
Stock market interest	Mean	2.21	2.19
(1=very interested; 4=not interested at all)	Median	2	2
Stock market knowledge	Mean	3.38	3.40
(school grades: 1=very good; 6=very bad)	Median	3	3

Table 5: Descriptive statistics by forecast mode.

Another interesting comparison can be made by using the two qualitative questions regarding the development of the DAX index conditioned on different past returns (see Part III in the questionnaires in the Appendix). Its purpose was to uncover a general belief in trend continuation or mean reversion. We find that subjects in the different experimental groups do not per se believe in trend continuation or mean reversion. For the rising DAX, the majority of participants in all groups expect trend continuation or a consolidation at about the same level. For a falling DAX, the majority of participants in all groups expect a reversal.

4. Results

4.1 Test of Our Main Hypothesis (Forecast Framing Hypothesis)

Figures 2 and 3 as well as Table 6 show the results of the test of Hypothesis 1. The table presents means and medians across subjects of 1-month as well as 6-month forecasts for each time series and for the two groups ("price forecast mode" and "return forecast mode"). Furthermore, the table contains the difference of mean and median returns between the two groups as well as the p-value of a Mann-Whitney test. Null hypothesis is equality of populations. The main message of Figures 2 and 3 as well as Table 6 is as follows. We document a highly significant framing effect.[20] The returns stated

[20] Unreported results show that this framing effect is even slightly stronger when we only compare participants that did not receive additional return information, i.e. all participants in the "price forecast mode" and one subgroup in the "return forecast mode".

in the “return forecast mode” are significantly higher for upward sloping trends (BASF and Stock A) and significantly lower for downward sloping trends (Henkel and Stock C). Thus, we confirm Hypothesis 1. Furthermore, the results are not only highly significant, the difference in the returns stated by subjects in the two groups is even economically large. For example, for the BASF stock, the difference in the mean returns stated is larger than 4 percentage points for 1-month forecasts.

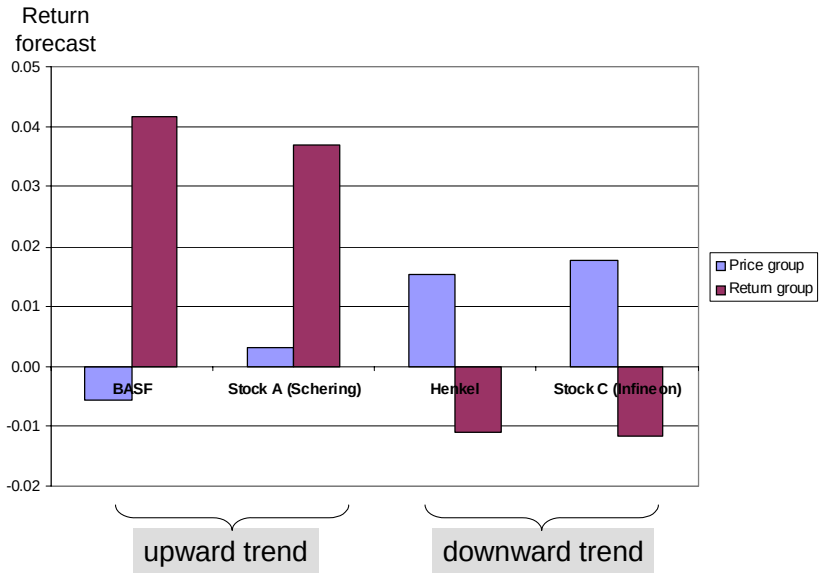

Figure 2: Return forecasts over a 1 month horizon

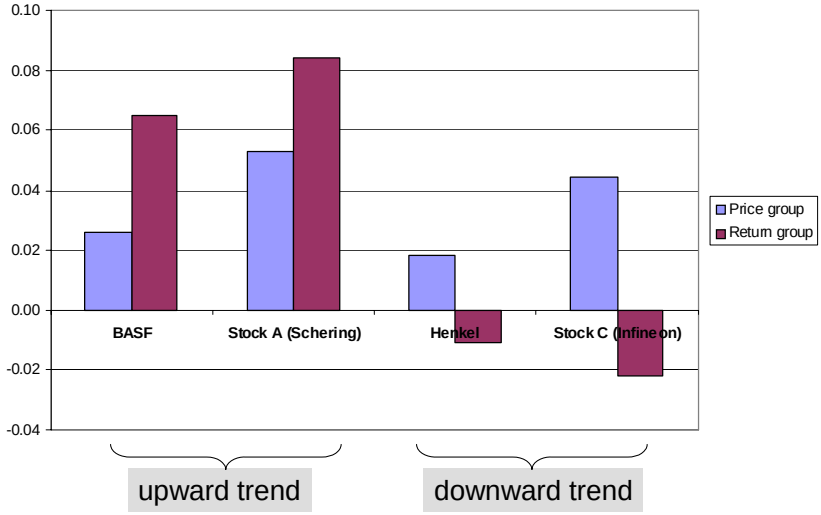

Figure 3: Return forecasts over a 6 month horizon

All in all, the results stated by subjects are quite plausible. For example, in most of the cases, 6 month returns are higher than 1 month returns which is consistent with the belief that stocks, on average, have a positive expected return in a given month. Furthermore, Table 6 shows that our results are not driven by a dividend effect (see also Footnote 17). The only forecasts that could potentially be affected by the fact that people in the “price forecast mode” state implicit returns without dividends whereas subjects in the “return forecast mode” include the effect of dividends in their return forecasts are the 6-month forecasts of the Henkel and the Schering stock. The name of the Schering stock was

not known to the subjects. Thus the only forecast remaining that could potentially be influenced by the dividend effect described above is the Henkel stock.[21] However, returns in the "price forecast mode" derived from the given price forecasts are even *higher* than the returns stated by subjects in the "return forecast mode". Thus, different effects of dividends on the returns stated in the two groups cannot explain our results.

Stock	Trend		Price forecast mode	Return forecast mode	Difference Return-Price	p-value (Mann-Whitney)
BASF	up	Mean (1 month)	-0.0055	0.0417	0.0472	<0.0001***
		Median (1 month)	0.0004	0.0400	0.0396	
		N	125	119		
		Mean (6 months)	0.0257	0.0650	0.0393	<0.0001***
		Median (6 months)	0.0208	0.0562	0.0354	
		N	126	116		
Stock A (Schering)	up	Mean (1 month)	0.0033	0.0369	0.0336	<0.0001***
		Median (1 month)	0.0114	0.0336	0.0222	
		N	124	116		
		Mean (6 months)	0.0529	0.0842	0.0313	<0.0001***
		Median (6 months)	0.0560	0.0714	0.0154	
		N	128	116		
Henkel	down	Mean (1 month)	0.0153	-0.0109	-0.0263	0.0006***
		Median (1 month)	0.0098	-0.0063	-0.0161	
		N	124	111		
		Mean (6 months)	0.0184	-0.0108	-0.0292	0.0011***
		Median (6 months)	0.0288	-0.0017	-0.0305	
		N	127	116		
Stock C (Infineon)	down	Mean (1 month)	0.0178	-0.0116	-0.0293	0.0008***
		Median (1 month)	0.0196	0.0000	-0.0196	
		N	125	115		
		Mean (6 months)	0.0445	-0.0218	-0.0663	<0.0001***
		Median (6 months)	0.0768	-0.0112	-0.0879	
		N	128	116		
DAX index	flat	Mean (1 month)	0.0074	0.0114	0.0041	0.6224
		Median (1 month)	0.0082	0.0063	-0.0019	
		N	126	117		
		Mean (6 months)	0.0225	0.0220	-0.0005	0.8282
		Median (6 months)	0.0204	0.0139	-0.0065	
		N	127	117		
Deutsche Telekom	flat	Mean (1 month)	-0.0126	0.0065	0.0191	0.0008***
		Median (1 month)	-0.0019	0.0019	0.0038	
		N	119	116		
		Mean (6 months)	0.0168	0.0183	0.0015	0.3308
		Median (6 months)	0.0149	0.0126	-0.0023	
		N	125	117		
Stock B (SAP)	flat	Mean (1 month)	-0.0091	0.0101	0.0191	<0.0001***
		Median (1 month)	-0.0106	0.0073	0.0179	
		N	126	116		
		Mean (6 months)	-0.0051	0.0151	0.0201	<0.0001***
		Median (6 months)	-0.0116	0.0100	0.0216	
		N	127	117		

Table 6: Mean forecasts. *indicates significance at the 10 percent level, ** indicates significance at the 5 percent level, * indicates significance at the 1 percent level.**

Similar results are obtained when we focus on the number of participants that expect an upward (both the one month forecast and the six months forecast are positive) or a downward movement (both the one month forecast and the six months forecast are negative), as Table 7 shows. First of all, we observe that the degree of mean reverting expectations is always higher in the "price forecast mode".

[21] The dividend yield of Schering was less than 2 percent. Thus, even if subjects recognized the Schering chart, the difference in mean returns stated (3.13 %) cannot be explained by the fact that subjects in the return group include dividends whereas returns calculated by the price forecasts given by subjects do not include dividends.

Furthermore, Table 7 shows that the degree of mean reverting expectations in both the price as well as in the return group is always stronger for the two downward sloping time series (Henkel and Stock B). This is consistent with O'Connor et al. (1997).[22] Consider for example, the BASF stock and the Henkel stock. About 66 % of all forecasts of the BASF stock, an upward sloping time series, can be classified as "upward movement" and about 8 % can be classified as "downward movement". Thus, when we pool subjects in both the price and the return group, the subjects as a group expect trend continuation. For the two downward sloping series, we observe a different picture. Slightly more subjects expect a reversal of the two downward sloping time series. Thus, more subjects expect that downward sloping trends will reverse when compared to upward sloping trends. Table 7 also shows that when we divide all "upward movement" and "downward movement" forecasts into the "price forecast mode" and the "return forecast mode", the degree of mean reverting expectations is always stronger for the "price forecast mode". For example, for the two downward sloping time series, the majority of subjects in the "return forecast mode" expects that the two stocks will fall even further.

			BASF	Stock A (Schering)	Henkel	Stock B (SAP)
	Trend		**Up**	**Up**	**Down**	**Down**
All	**Upward movement**	**N**	165	161	84	85
		%	66.27%	64.66%	33.73%	34.14%
	Downward movement	**N**	21	27	62	54
		%	8.43%	10.84%	24.90%	21.69%
	Inconclusive	**N**	63	61	103	110
		%	25.30%	24.50%	41.37%	44.18%
Price forecast mode	**Upward movement**	**N**	60	61	53	57
		%	46.88%	47.66%	41.41%	44.53%
	Downward movement	**N**	19	25	26	22
		%	14.84%	19.53%	20.31%	17.19%
	Inconclusive	**N**	49	42	49	49
		%	38.28%	32.81%	38.28%	38.28%
Return forecast mode	**Upward movement**	**N**	105	100	31	28
		%	86.78%	82.64%	25.62%	23.14%
	Downward movement	**N**	2	2	36	32
		%	1.65%	1.65%	29.75%	26.45%
	Inconclusive	**N**	14	19	54	61
		%	11.57%	15.70%	44.63%	50.41%

Table 7: Number of participants that expect an upward (both 1 month and 6 month forecast are positive) or a downward movement (both 1 month and 6 month forecast are negative).

However, Table 7 also shows that there is large cross-sectional heterogeneity in our subject pool. A minority of people always has expectations in the opposite direction. This is consistent with the study by Dominitz and Manski (2005) who describe a population of investors as a mixture of expectation types. Dominitz and Manski (2004) further stress the importance of determinants of such cross-

[22] More generally, many phenomena in financial markets are substantially different in upward-moving and downward-moving markets. Examples are investors' trading activity (see Glaser and Weber (2005b) and Statman, Thorley, and Vorkink (2006)), correlations between stocks (Ang and Chen (2002)), and the momentum effect (Cooper et al. (2004)).

sectional heterogeneity such as demographic variables that we do not observe in our study such as income or wealth.

For the flat trends, Table 6 shows that the difference in return forecasts in the two groups are low and in most cases insignificant, as expected. But why do we observe significant differences in 3 out of 6 cases that resemble those of the two upward sloping trends? When we look at the charts of Deutsche Telekom and Stock B (see the questionnaires in the Appendix) we observe that both charts are upward sloping over the last 3 months. It might be possible that not the whole charts (i.e. the returns over 6 months) influence forecasts, but the development over a shorter horizon. We explore this more formally in a regression analysis. We regress the mean forecasts of investors for each price group and each forecast horizon on several explanatory variables and past return variables. In regressions (1) to (4), we include the return over the past six months before the forecast was made. In regressions (5) to (8), we split this return into two return variables. One variable measures the return over the last three months before the forecast was made, the other return variable (Return [month -6 to month -4]) measures the return in the 3-month period before this period, i.e. from month -6 to month -4. The results are presented in Table 8.

The table once again confirms the results of Table 6 and thus Hypothesis 1. Past returns have a negative influence on return forecasts in the "price forecast mode" indicating a belief in mean reversion. In contrast, this effect is positive for subjects in the "return forecast mode", indicating a belief in trend continuation. In regression (3), the past 6-month return variable is not significant. However, regression (7) shows that the past 3-month return has a significant influence in the expected direction. To summarize, regressions (5) to (8) show, that the returns over the last 3 months have a highly significant influence on forecasts in the predicted direction. The results are similar when we include all 6 month-to-month returns as separate explanatory variables. Furthermore, the R-squared values are higher in the return forecast mode. This is no surprise as we expect these subjects to look at past returns to a higher degree than people in the price forecast mode. We further explore this issue by running the regressions only for subjects in the return forecast mode who received additional return information. We find that the R-squared values in these regressions are about 0.30, i.e. higher than the R-squared values in Table 8. This result is also intuitive. We can explain more variance in the forecasts as subjects directly observe the returns that are the basis for their forecasts.

Group	Price forecast mode	Return forecast mode	Price forecast mode	Return forecast mode	Price forecast mode	Return forecast mode	Price forecast mode	Return forecast mode
Forecast horizon	1 month	1 month	6 months	6 months	1 month	1 month	6 months	6 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gender	0.002	-0.002	0.011	0.001	0.002	-0.002	0.012	0.001
	(0.66)	(0.59)	(1.47)	(0.23)	(0.65)	(0.60)	(1.55)	(0.20)
Age	0.000	0.002	0.000	0.001	0.000	0.002	0.000	0.001
	(0.36)	(2.85)***	(0.56)	(1.33)	(0.48)	(2.85)***	(0.56)	(1.31)
Statistics knowledge	0.001	0.001	-0.005	0.001	0.001	0.001	-0.005	0.001
	(0.85)	(0.72)	(1.60)	(0.60)	(0.86)	(0.73)	(1.62)	(0.60)
Stock market interest	-0.004	0.005	-0.011	0.004	-0.004	0.005	-0.011	0.004
	(1.67)*	(2.14)**	(2.32)**	(1.01)	(1.69)*	(2.12)**	(2.27)**	(1.01)
Stock market knowledge	0.001	0.000	-0.004	-0.001	0.001	0.000	-0.004	-0.001
	(0.34)	(0.14)	(1.12)	(0.36)	(0.38)	(0.15)	(1.08)	(0.38)
Knowledge of time series/asset	-0.005	0.004	-0.010	0.002	0.007	0.003	0.012	0.009
	(1.67)*	(1.66)*	(1.67)*	(0.37)	(1.64)	(0.80)	(1.41)	(1.49)
Stock in portfolio	-0.013	-0.004	0.018	0.003	-0.011	-0.005	0.022	0.003
	(1.56)	(0.74)	(1.15)	(0.24)	(1.38)	(0.79)	(1.44)	(0.22)
Return [month -6 to month -1]	-0.039	0.110	0.016	0.211				
	(4.08)***	(14.44)***	(0.86)	(15.95)***				
Return [month -6 to month -4]					0.072	0.104	0.229	0.294
					(2.63)***	(4.65)***	(4.12)***	(7.51)***
Return [month -3 to month -1]					-0.169	0.109	-0.240	0.099
					(5.36)***	(4.22)***	(3.77)***	(2.19)**
Constant	0.001	-0.041	0.053	-0.018	0.004	-0.040	0.061	-0.011
	(0.06)	(2.37)**	(2.09)**	(0.60)	(0.32)	(2.32)**	(2.39)**	(0.38)
N	848	787	868	791	848	787	868	791
Adjusted R-squared	0.02	0.23	0.03	0.24	0.04	0.22	0.04	0.24

Table 8: Regression Results: Regressions of mean forecasts on explanatory variables and past returns. *indicates significance at the 10 percent level, ** indicates significance at the 5 percent level, * indicates significance at the 1 percent level.**

Furthermore, forecasts are not driven by other explanatory variables (gender, age, statistics knowledge, stock market interest, stock market knowledge, knowledge of time series/asset, or whether the respective asset is in the own portfolio). Forecasts are not influenced by the fact that subjects know or own a particular stock. Thus, subjects that have a particular stock in their portfolio are not more optimistic when compared to the other investors who do not own the respective stock. Unreported regression results show that the results are similar when we run the regressions for each time series and each investment horizon separately.

Unreported results show that the fact whether we present monthly return information in addition to the chart does not have a strong influence on forecasts (apart from the above discussed effect on the R-squared values in the regressions). Returns stated by people observing the additional information are, on average, less extreme.

Our main results in this subsection can be summarized as follows. We document a highly significant framing effect. For upward sloping time series, the return forecasts given by investors who are asked directly for returns are significantly higher than those stated by investors who are asked for prices. For downward sloping time series, the return forecasts given by investors who are asked directly for returns are significantly lower than those stated by investors who are asked for prices.

4.3 Further Results

In this subsection we verbally discuss several other results and robustness checks. The complete results are available from the authors on request or can be found in the online version of our paper.[23]

4.3.1 Analysis of Forecast Errors

The above results show that the elicitation mode of investor expectations affects the results. But which frame is better? Which frame produces better, i.e. more accurate results? To answer this question we empirically analyze the forecast error in the two elicitation modes. The forecast error is defined as the absolute difference between the actual, realized value and the predicted value. Our results show that the forecast error does not differ in the two groups. However, we note that this finding could be a result of chance. An irrational forecast ex ante can be true ex post just by chance. Future research should focus especially on this issue by analyzing panel data sets of investor expectations. Deaves et al. (2005) is an example of this kind of research, but without the focus on the elicitation mode so far.

4.3.2 Upper and Lower Bound and Skewness of Intervals

In this subsection, we analyze the upper and lower bound and the skewness of the intervals provided. This finding is motivated by the De Bondt (1993) hedging theory of confidence intervals which was discussed before. Maybe, the intervals of subjects are highly skewed (in the opposite direction in both elicitation modes) so that, in the extreme case, upper and lower bound as well as mid point of intervals are exactly equal although the median provided by the subjects are significantly different in both elicitation modes.

However, our data clearly rejects the hedging theory of confidence intervals. The skewness of the intervals provided by students is not significantly different in both groups.[24] In line with that, we also find that the mid point of the intervals as well as upper and lower bounds are also highly significantly different in both groups.

4.3.3 Volatility Estimates

We also analyzed the volatility estimates of investors by studying the width of the intervals provided. To do this, we follow the methodology of Graham and Harvey (2003, 2005). The main and highly significant finding is that volatility estimates are lower when subjects are asked for returns compared to price forecasts. We also find that even subjects in the price group underestimate the volatility of stock returns. In line with the literature, we use historical volatilities, chart volatilities, and implied

[23] See SFB 504 discussion paper 05-40 <http://www.sfb504.uni-mannheim.de/wp/abstract.php3?id=526>.

[24] We find that the mean skewness across investors is always negative for all time series and forecast horizons in both elicitation modes. O'Connor et al. (2001) find exactly the same result, irrespective of the trend of the time series: The lower limit is farther away from the forecast than the upper limit.

volatilities as an objective volatility benchmark or an estimate for the future volatility (see, e.g. Graham and Harvey (2003)). The finding that intervals are too tight is usually called overconfidence (see, for example, Lichtenstein et al. (1982), Klayman et al. (1999), Soll and Klayman (2004), Glaser et al. (2004), Griffin and Brenner (2004), Hilton (2001) or Graham and Harvey (2003)).

One explanation for the tighter intervals in the return group is that subjects are less likely to state negative returns in the return group. Only 396 mean forecasts (i.e. about 25 % of all forecasts) are negative in the return group whereas 699 mean forecasts (i.e. about 40 % of all forecasts) are negative in the price group. The same picture emerges when we analyze the lower bounds provided by people. For all time series and both time horizons, more people in the price group realize that there is also downside potential. In other words, people are more likely to realize downward potential when they are asked to state prices. This is consistent with Amromin and Sharpe (2006), see above. They analyze data from the Michigan survey of consumers and document a belief in trend continuation. In one figure, they analyze results from a question in the Michigan survey of consumers that was part of the survey until January 2003 and that asked for future price levels. While usually only few investors state negative expected returns, between 10 and 20 percent of investors in each survey month predict that price levels will go down. Subjects seem to be reluctant to state negative numbers.

4.3.4 The Role of Expertise

In this subsection, we analyze the role of expertise. Remember from Subsection 3.2 that students from Mannheim have a lower affinity with financial topics compared to the Münster group so that the variable “location” can be interpreted as a “finance” dummy or “expertise” dummy variable.

We find that the framing effect documented before is highly significant in both groups, but stronger in the Mannheim group. The difference in return estimates between the “price forecast mode” and the “return forecast mode” is lower in Münster.

We also find that in both groups, volatility estimates are lower in the return groups. We thus confirm the framing effect documented above for students at both universities. Furthermore, confidence intervals of the Münster group are wider. Students in Münster are closer to the objective volatility benchmark. Thus, the overconfidence bias is weaker in Münster, but it is still highly significant.

To summarize, financial education seems to improve answers of subjects which is intuitive. The documented framing effects (differences between “price forecast mode” and “return forecast mode”) and overconfidence are lower for subjects with higher financial education.

These findings on the role of expertise in financial judgement should be put into perspective to the many other studies that analyze the biases and performance of professional financial market participants. These studies ususally find that expert judgment is biased, too. Regarding the question how the strength of their bias compares to that of non-professionals the evidence is mixed (see, for

example, Andersson et al. (2005), Ericsson et al. (2005), Glaser et al. (2005), Haigh and List (2005), Koehler et al. (2002), Önkal et al. (2003)). The results presented in this paper suggest the following interpretation. Practical expertise can be detrimental as it makes practitioners overconfident or makes them behave as if they were overconfident due to institutional reasons. Conflicting results in the literature might be a result of different levels of academic or financial education which is often not controlled for in the studies mentioned above. On the other hand, financial education and financial knowledge (also called "financial literacy") might help improve behavior and reduce biases. Some recent studies suggest that this might actually be the case (see Agnew and Szykman (2005) and Elliot et al. (2005)). More generally, our study suggests that financial education on the one hand and experience of practitioners on the other are different concepts.

5 Discussion and Conclusion

In this study, we analyzed existing studies on return expectations that usually ask for either future price levels or future returns. We find that studies which ask for future price levels document mean reverting expectations whereas studies asking for future returns document a belief in trend continuation. The above surveys are highly influential both in academia and practice. The fact that the elicitation mode might influence results is overlooked in the interpretation.

Furthermore, we conducted a questionnaire study that explicitly analyzes whether the specific elicitation mode affects return expectations in the above direction. We document a highly significant framing effect. For upward sloping time series, the return forecasts given by investors who are asked directly for returns are significantly higher than those stated by investors who are asked for prices. For downward sloping time series, the return forecasts given by investors who are asked directly for returns are significantly lower than those stated by investors who are asked for prices. We are thus able to confirm our explanation for the heterogeneity of findings in the literature discussed above. Our results can also explain, why studies analyzing the correlation between different investor sentiment indicators usually document inconclusive findings.

But how should we ask investors to elicit their return expectations? In our view, we should prefer the price forecast mode and we should always ask for intervals. First, people have more problems dealing with returns. Second, the confidence intervals in the price forecast mode are wider and thus closer to an objective benchmark. This is partly driven by the fact that people realize to a greater extent that there is also a downward potential in stock prices. Engelberg, Manski, and Williams (2006) also suggest to elicit return expectations by interval rather than point forecasts as the latter forecasts do reveal nothing about the uncertainty that forecasters feel.

Furthermore, we show that past returns influence stock return expectations. However, it is still unclear, how long investors look back when they form expectations or make stock trading decisions.

Future research should analyze this issue in greater detail. Related studies that analyze the link between past returns and trading activity are Glaser and Weber (2005b), Statman et al. (2006), and Griffin et al. (2006).

In our view, the most important suggestion that can be given based on our study is to educate people. We show that financial education improves answers in our study. Future research should further analyze the effects of financial literacy on behavior and performance in financial markets.

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Appendix A: Price Level Version Questionnaire

Dear participant,

thank you for participating in this study! Its goal is to gain further insights into investors' forecasts of the future development of stocks. The questionnaire will take about 15 minutes to be completed.
As an incentive, we will randomly select 10 out of all completed questionnaires. Participants who filled out the selected questionnaires will win 20 Euros. Exclusively for this purpose, you will be asked to provide your e-mail address. However, the complete data analysis will be conducted without this information, i.e. anonymously.

In Part I of the questionnaire, you will see index level or price charts for the *DAX index* and *3 other DAX stocks* over the last 6 months. In Part II, you will see price charts for *3 unidentified stocks* over the last 6 months.

In both Part I and Part II, you are asked to provide the following 3 values for each presented time series for a **1 month horizon** and a **6 month horizon**:

1. an **upper bound** for the price/index level
2. an **estimate** of the price/index level
3. a **lower bound** for the price/index level

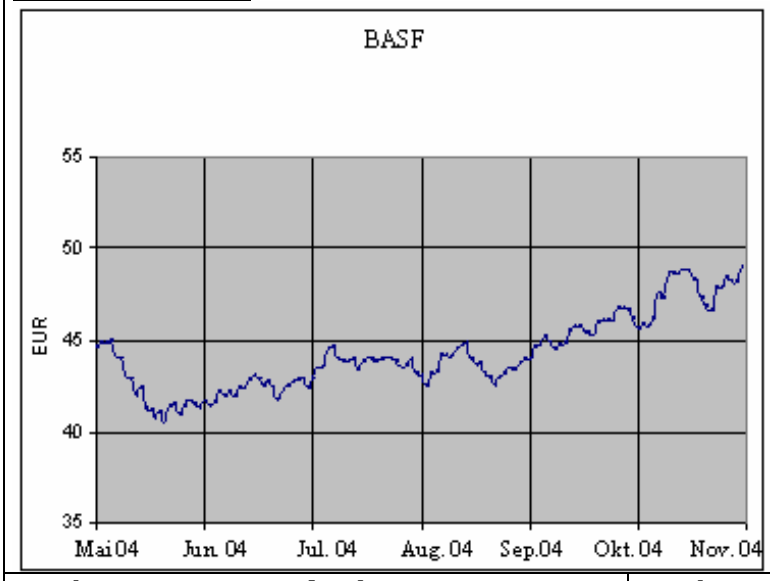
The true, realized value (i.e. the price of the stock in 1 month respectively 6 months) should …

... exceed the **upper bound** only with a low probability (5 %).
... with the same probability be below respectively above the **estimate**.
... fall short of the **lower bound** only with a low probability (5 %).

In Part III, the questionnaire ends with some questions regarding your general opinion about stock markets and with some questions about yourself.

Part I: Forecasts of DAX Stocks and the DAX Index

Forecast 1: BASF



On the left hand side, the price chart of the BASF stock over the last 6 months is shown.
For the price in 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a price estimate.

… a lower bound. The true value should fall short of the lower bound only with a 5% probability.

For the price in **1 month**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

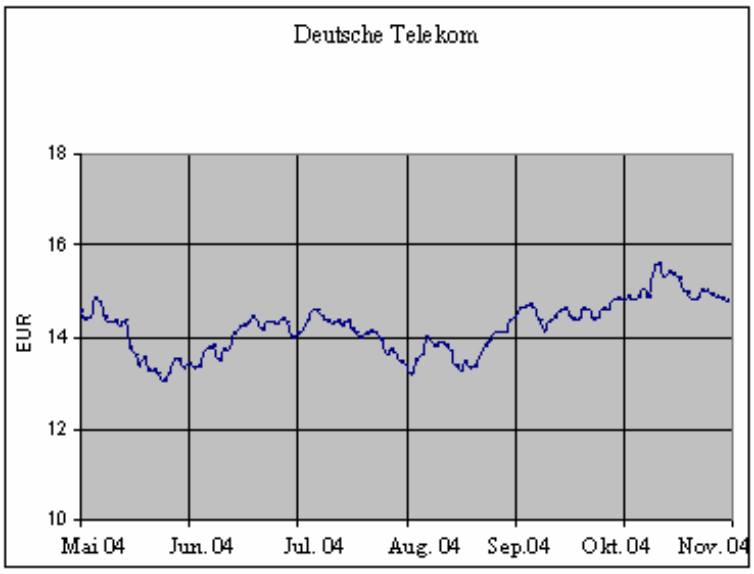
For the price in **6 months**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

Forecast 2: Deutsche Telekom



On the left hand side, the price chart of the Deutsche Telekom stock over the last 6 months is shown.
For the price in 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a price estimate.

… a lower bound. The true value should fall short of the lower bound only with a 5% probability.

For the price in **1 month**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

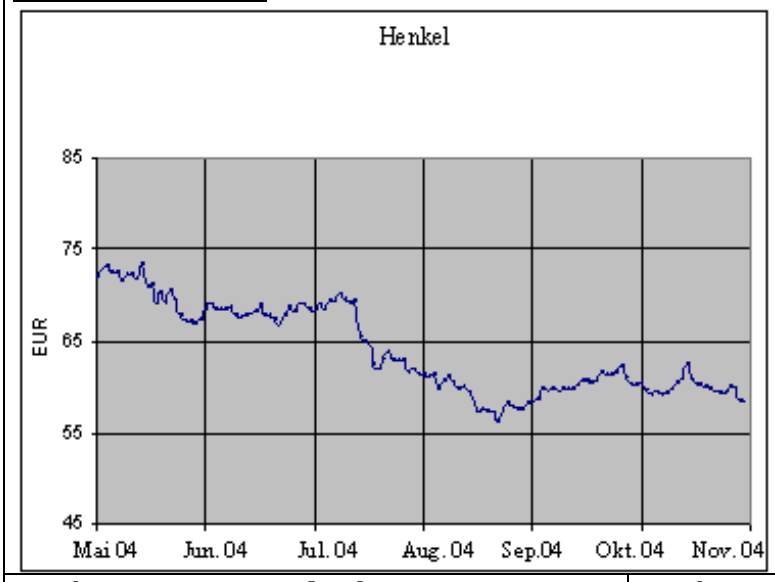
For the price in **6 months**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

Forecast 3: Henkel



On the left hand side, the price chart of the Henkel stock over the last 6 months is shown.
For the price in 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a price estimate.

… a lower bound. The true value should fall short of the lower bound only with a 5% probability.

For the price in **1 month**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

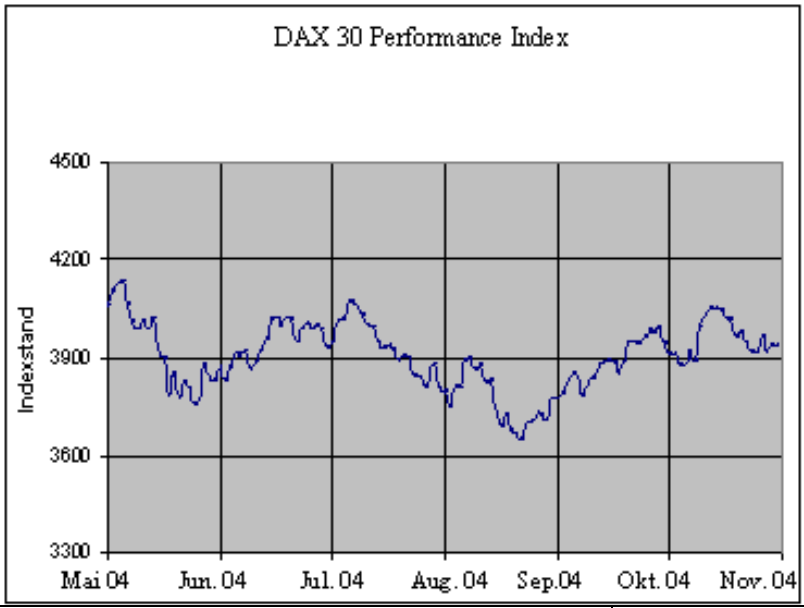
For the price in **6 months**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

Forecast 4: DAX 30 Performance Index



On the left hand side, the chart of the DAX 30 Performance Index over the last 6 months is shown.
For the value in 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… an estimate.

… a lower bound. The true value should fall short of the lower bound only with a 5% probability.

For the value in **1 month**, please state ...

… an upper bound:

… an estimate:

… a lower bound:

For the value in **6 months**, please state ...

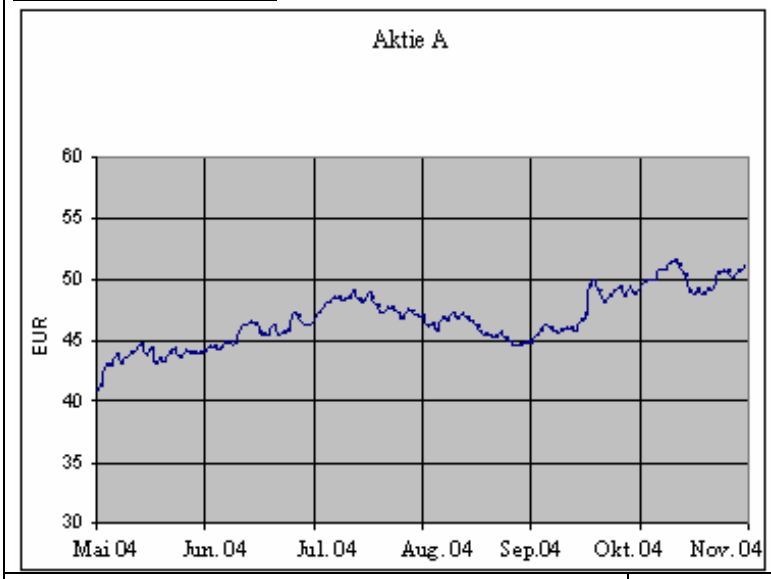
… an upper bound:

… an estimate:

… a lower bound:

Part II: Forecasts of Unidentified Stocks

Forecast 5: Stock A



On the left hand side, the price chart of Stock A over the last 6 months is shown.
For the price in 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a price estimate.

… a lower bound. The true value should fall short of the lower bound only with a 5% probability.

For the price in **1 month**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

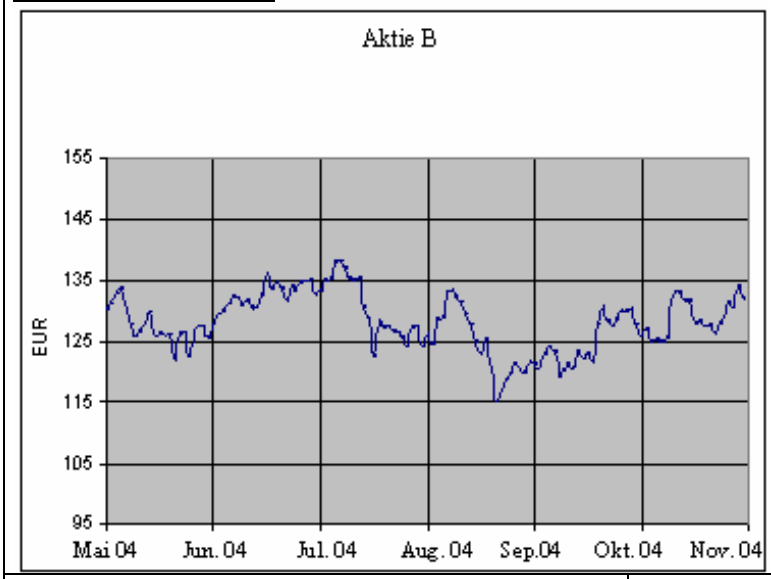
For the price in **6 months**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

Forecast 6: Stock B



On the left hand side, the price chart of Stock B over the last 6 months is shown.
For the price in 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a price estimate.

… a lower bound. The true value should fall short of the lower bound only with a 5% probability.

For the price in **1 month**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

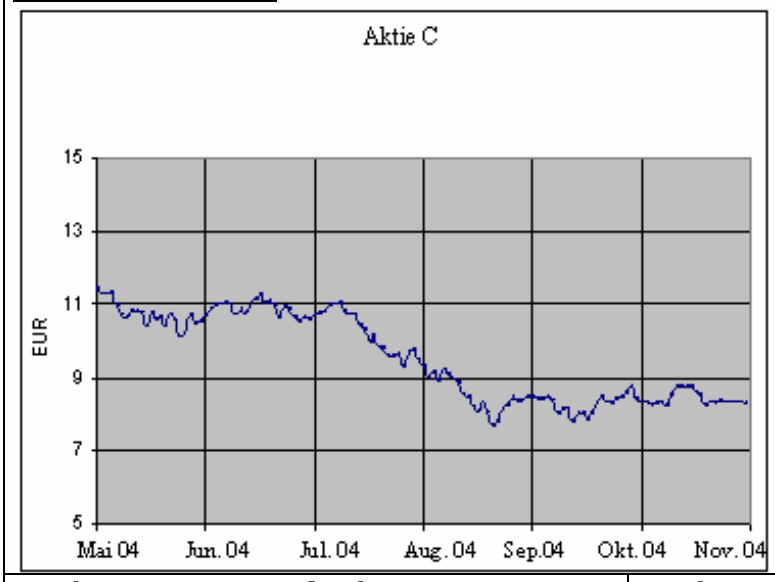
For the price in **6 months**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

Forecast 7: Stock C



On the left hand side, the price chart of Stock C over the last 6 months is shown.
For the price in 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a price estimate.

… a lower bound. The true value should fall short of the lower bound only with a 5% probability.

For the price in **1 month**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

For the price in **6 months**, please state ...

… an upper bound: €

… an estimate: €

… a lower bound: €

Part III: Stock Markets and Demographic Data

Please answer the following questions regarding stock markets in general and about yourself.

Age: _____

Gender: O female O male

Field of study: _____

Semester: _____

How do you rate your statistics knowledge in school grades?

O 1 O 2 O 3 O 4 O 5 O 6

Please specify your general interest in stock and financial markets. I'm…

O very interested O interested O not very interested O not interested at all

How do you rate your knowledge about stock and financial markets in school grades?

O 1 O 2 O 3 O 4 O 5 O 6

Suppose the DAX index would have dropped by 10% over half a year. What development would you expect for the following 6 months?

O The DAX index continues to fall.
O The DAX index stays at about the same level.
O The DAX index rises again.

Suppose the DAX index would have risen by 10% over half a year. What development would you expect for the following 6 months?

O The DAX index falls again.
O The DAX index stays at about the same level.
O The DAX index continues to rise.

Please tick all companies/financial products which you *know*.

O BASF
O Deutsche Telekom
O Henkel
O DAX mutual funds/DAX index funds

Please tick all companies/financial products which you *have in your own brokerage account/portfolio*.

O I do not have any brokerage account/portfolio.
O BASF
O Deutsche Telekom
O Henkel
O DAX mutual funds/DAX index funds
O I do not have any of those stocks in my brokerage account/portfolio.

Your e-mail address: (necessary to participate in the drawing of cash prizes)

_____

Thank you very much for your participation!

Appendix B: Return Version Questionnaire

Dear participant,

thank you for participating in this study! Its goal is to gain further insights into investors' forecasts of the future development of stocks. The questionnaire will take about 15 minutes to be completed.
As an incentive, we will randomly select 10 out of all completed questionnaires. Participants who filled out the selected questionnaires will win 20 Euros. Exclusively for this purpose, you will be asked to provide your e-mail address. However, the complete data analysis will be conducted without this information, i.e. anonymously.

In Part I of the questionnaire, you will see index level or price charts for the *DAX index* and *3 other DAX stocks* over the last 6 months. In Part II, you will see price charts for *3 unidentified stocks* over the last 6 months.

In both Part I and Part II, you are asked to provide the following 3 values for each presented time series for a **1 month horizon** and a **6 month horizon**:

1. an **upper bound** for the return
2. an **estimate** of the return
3. a **lower bound** for the return

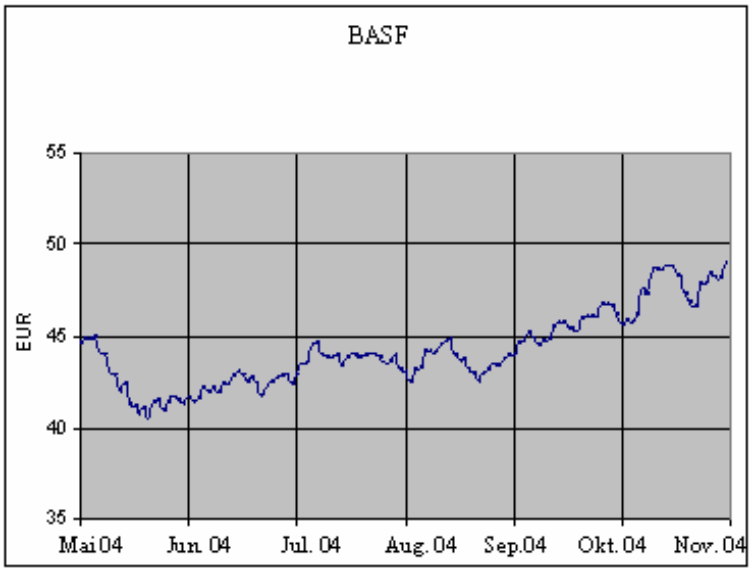
The true, realized return (i.e. the return of the stock over a 1 month respectively a 6 months horizon) should …

... exceed the **upper bound** only with a low probability (5 %).
... with the same probability be below respectively above the **estimate**.
... fall short of the **lower bound** only with a low probability (5 %).

In Part III, the questionnaire ends with some questions regarding your general opinion about stock markets and with some questions about yourself.

Part I: Return Forecasts for DAX Stocks and the DAX Index

Forecast 1: BASF



On the left hand side, the price chart of the BASF stock over the last 6 months is shown.
For the return over 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a return estimate.

… a lower bound. The true, realized return should fall short of the lower bound only with a 5% probability.

For the return over **1 month**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

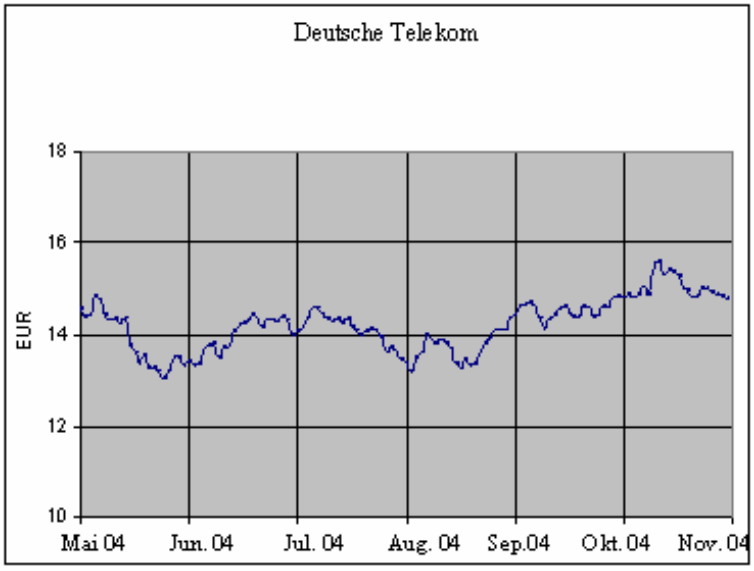
For the return over **6 months**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

Forecast 2: Deutsche Telekom



On the left hand side, the price chart of the Deutsche Telekom stock over the last 6 months is shown.
For the return over 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a return estimate.

… a lower bound. The true, realized return should fall short of the lower bound only with a 5% probability.

For the return over **1 month**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

For the return over **6 months**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

Forecast 3: Henkel

On the left hand side, the price chart of the Henkel stock over the last 6 months is shown.
For the return over 1 respectively 6 months, please state …

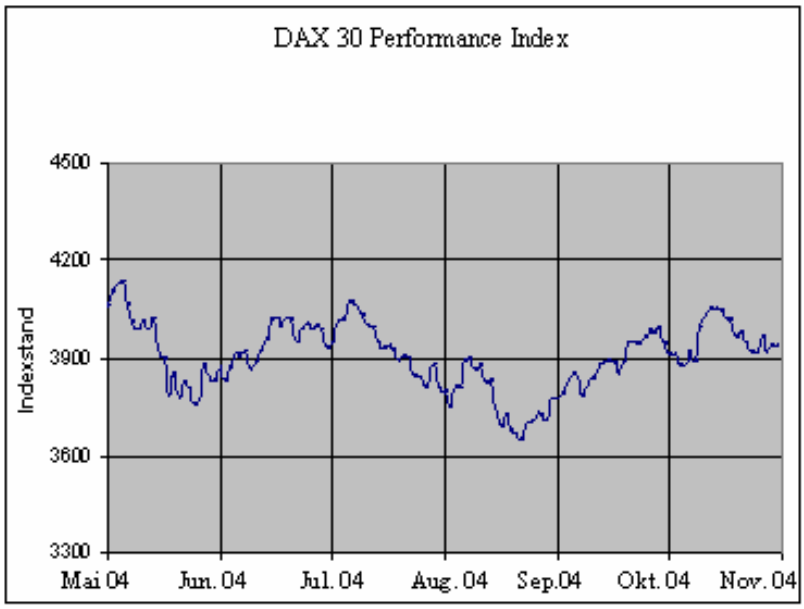
… an upper bound that will be exceeded only with a 5% probability.

… a return estimate.

… a lower bound. The true, realized return should fall short of the lower bound only with a 5% probability.

For the return over **1 month**, please state ...		For the return over **6 months**, please state ...	
… an upper bound:	%	… an upper bound:	%
… an estimate:	%	… an estimate:	%
… a lower bound:	%	… a lower bound:	%

Forecast 4: DAX 30 Performance Index



On the left hand side, the chart of the DAX 30 Performance Index over the last 6 months is shown.
For the return over 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a return estimate.

… a lower bound. The true, realized return should fall short of the lower bound only with a 5% probability.

For the return over **1 month**, please state ...		For the return over **6 months**, please state ...	
… an upper bound:	%	… an upper bound:	%
… an estimate:	%	… an estimate:	%
… a lower bound:	%	… a lower bound:	%

Part II: Return Forecasts for Unidentified stocks

Forecast 5: Stock A

On the left hand side, the price chart of Stock A over the last 6 months is shown.
For the return over 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a return estimate.

… a lower bound. The true, realized return should fall short of the lower bound only with a 5% probability.

For the return over **1 month**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

For the return over **6 months**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

Forecast 6: Stock B

On the left hand side, the price chart of Stock B over the last 6 months is shown.
For the return over 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a return estimate.

… a lower bound. The true, realized return should fall short of the lower bound only with a 5% probability.

For the return over **1 month**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

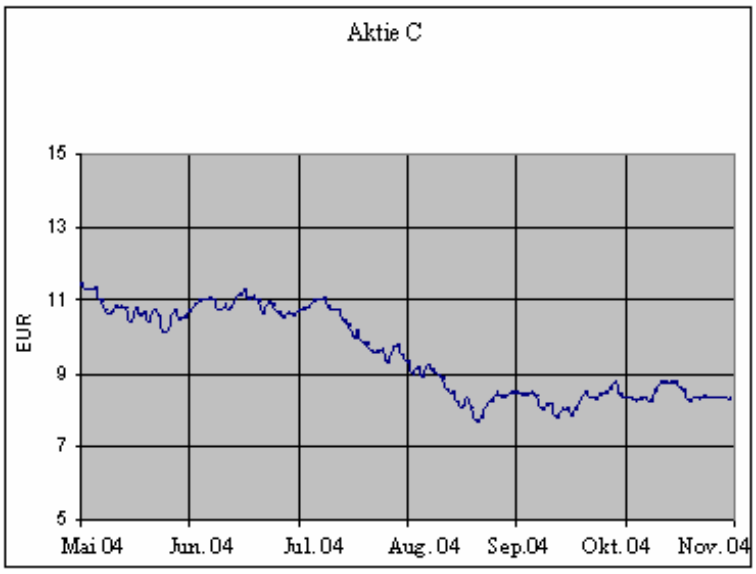
For the return over **6 months**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

Forecast 7: Stock C



On the left hand side, the price chart of Stock C over the last 6 months is shown.
For the return over 1 respectively 6 months, please state …

… an upper bound that will be exceeded only with a 5% probability.

… a return estimate.

… a lower bound. The true, realized return should fall short of the lower bound only with a 5% probability.

For the return over **1 month**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

For the return over **6 months**, please state ...

… an upper bound: ____ %

… an estimate: ____ %

… a lower bound: ____ %

Part III: Stock Markets and Demographic Data

Please answer the following questions regarding stock markets in general and about yourself.

Age: _____

Gender: O female O male

Field of study: _____

Semester: _____

How do you rate your statistics knowledge in school grades?

O 1 O 2 O 3 O 4 O 5 O 6

Please specify your general interest in stock and financial markets. I'm…

O very interested O interested O not very interested O not interested at all

How do you rate your knowledge about stock and financial markets in school grades?

O 1 O 2 O 3 O 4 O 5 O 6

Suppose the DAX index would have dropped by 10% over half a year. What development would you expect for the following 6 months?

O The DAX index continues to fall.
O The DAX index stays at about the same level.
O The DAX index rises again.

Suppose the DAX index would have risen by 10% over half a year. What development would you expect for the following 6 months?

O The DAX index falls again.
O The DAX index stays at about the same level.
O The DAX index continues to rise.

Please tick all companies/financial products which you *know*.

O BASF
O Deutsche Telekom
O Henkel
O DAX mutual funds/DAX index funds

Please tick all companies/financial products which you *have in your own brokerage account/portfolio*.

O I do not have any brokerage account/portfolio.
O BASF
O Deutsche Telekom
O Henkel
O DAX mutual funds/DAX index funds
O I do not have any of those stocks in my brokerage account/portfolio.

Your e-mail address: (necessary to participate in the drawing of cash prizes)

_____

Thank you very much for your participation!