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by Lukas Menkhoff, Maik Schmeling, and Ulrich Schmidt

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Keywords: Market behavior, overconfidence, experience, professionalism

JEL classification: G1, D81, F30

Lukas Menkhoff
Institut für Geld und Internationale Finanzwirtschaft
Leibniz Universität Hannover
Königsworther Platz 1
30167 Hannover, Germany
Telephone: +49 511 762-4551
E-mail: menkhoff@gif.uni-hannover.de

Maik Schmeling
Institut für Geld und Internationale Finanzwirtschaft
Leibniz Universität Hannover
Königsworther Platz 1
30167 Hannover, Germany
Telephone: +49 511 762-8213
E-mail: schmeling@gif.uni-hannover.de

Ulrich Schmidt
Kiel Institute for the World Economy
24100 Kiel, Germany
Telephone: +49 431 8814-337
E-mail: uschmidt@bwl.uni-kiel.de

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Overconfidence, Experience, and Professionalism: An Experimental Study

Lukas Menkhoff [a], Maik Schmeling[a], and Ulrich Schmidt[*, b, c]

[a] Leibniz Universität Hannover, Germany

[b] Christian-Albrechts Universität zu Kiel, Germany

[c] Kiel Institute for the World Economy, Germany

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* Corresponding author: Prof. Dr. Ulrich Schmidt, Lehrstuhl für Finanzwissenschaft, Sozialpolitik und Gesundheitsökonomik, Christian-Albrechts-Universität zu Kiel, Olshausenstr. 40, D-24098 Kiel, Germany, Phone: (+49) (431) 880-1400, Fax: (+49) (431) 880-4621, e-mail: uschmidt@bwl.uni-kiel.de.

1 Introduction

An important issue in the behavioral economics literature is the question whether observed behavioral biases and market anomalies are persistent or whether they tend to wash out with increasing experience of subjects. To analyze this question, many studies run repeated experiments and compare behavior in later rounds with that in earlier rounds (e.g. Dufwenberg et al., 2005, Plott and Zeiler, 2005). Another approach is to compare behavior of students or other lay men with that of professionals who are assumed to be more experienced (e.g. List and Heigh, 2005, Glaser et al., 2005). Our experiment on overconfidence in financial markets takes the second approach but introduces two innovations compared to earlier studies: First, we compare behavior of professionals and lay men while controlling for experience at the same time. This allows us to detect differences between the groups which cannot be attributed to experience. Second, we consider two different groups of professionals, institutional investors and investment advisors.

Overconfidence is a robust phenomenon in the psychology of judgment which has received increasing attention in the behavioral economics literature. Although the phenomenon is rather general, substantial differences depending on the type of questions (Lichtenstein and Fischhoff, 1977, Klayman et al., 1999, Soll, 1996) and respondents (Yates et al., 1997, 1998) have been observed. In the context of financial markets overconfident investors tend to overestimate their abilities or the precision of their knowledge. As a consequence, they usually hold riskier portfolios and trade more than maximizing expected utility would suggest (e.g. Odean, 1998). There exist numerous theoretical and empirical studies analyzing the impact of overconfidence on investment decisions and financial market outcomes (e.g. Barber and Odean, 2001, Biais et al., 2005). Some of these studies are, as our experiment, devoted to the relation between overconfidence and experience.[1] The model of Gervais and Odean (2001) predicts that after an initial period overconfidence should decrease with experience. Evidence supporting this result has been reported by Locke and Mann (2001) and Christoffersen and Sarkissian (2002). However, several studies in the psychological literature show that experts are more likely to be overconfident than relatively inexperienced subjects

[1] One motivation for analyzing this relation is the observation of Chevalier and Ellison (1999), Liang (1999), and Edwards and Caglayan (2001) that inexperienced fund managers have significantly higher returns than their more experienced colleagues. If inexperienced managers are more overconfident, this observation could be explained without contradicting market efficiency since a higher degree of overconfidence corresponds to higher risk taking.

(see e.g. Heath and Tversky, 1991, and Frascara, 1999). Similar results have been obtained by Kirchler and Maciejovsky (2002); in their experimental asset markets the degree of overconfidence increases during the experiment. Also in the experiments of Glaser et al. (2005, 2007) professional traders usually have a higher degree of overconfidence than students. Altogether the relation between overconfidence, experience and professionalism remains unclear. Our experiment tries to analyze whether this ambiguity is caused by the fact that the mentioned studies only analyze the effect of experience or professionalism isolated while we take both factors into account simultaneously. Moreover, some studies take the age of respondents as proxy for their experience. However, also the relation between age and overconfidence seems to be unclear as some studies found that overconfidence is increasing with age (Job, 1990, Crawford and Stankov, 1996, Hansson et al., 2008) while others came to opposite results (Pliske and Mutter, 1996, Touron and Hertzog, 2004).

In our online-experiment subjects have to state confidence intervals as well as point estimates for two major stock indices and to evaluate their own performance and information in relation to other investors. Altogether 496 subjects participated in the experiment, all of them being registered users of a large online platform for market sentiment data. Due to this registration, we can distinguish individual investors and professionals and infer that 74 of our subjects are institutional investors and 78 are investment advisors. Moreover, several socioeconomic characteristics of subjects are available as control variables, in particular age and investment experience. Our results show that there are systematic differences in the overconfidence between professionals and individual investors even if we control for experience. However, the group of professionals cannot be considered as a homogenous group since investment advisors turn out to be substantially more overconfident than institutional investors.[2] Age and experience have a significant impact in nearly all of the tasks of our experiment, the direction of their impact is, however, opposite and depends on the specific task. The latter point indicates that different facets of overconfidence should be clearly distinguished (see also Glaser et al., 2005, Menkhoff et al., 2006).

Altogether, our study has several major implications for the behavioral finance literature and also for other fields of behavioral economics where it has become an important question whether behavioral biases and market anomalies tend to wash out with market experience

[2] There is further evidence that a somewhat higher degree of information – indicating professionalism – does not need to improve outcome monotonously (see Huber et al., 2008).

(e.g. Shogren et al., 2001, Loomes et al., 2003). First, there exist systematic differences between professionals and lay men even if we control for experience. Therefore, the impact of experience should not be identified by simply comparing the behavior of the two groups as done in many studies in different fields of behavioral economics (e.g. Fox et al, 1996). Second, even if the behavior of professionals and lay men is compared one should take some care in choosing the right group of professionals. Third, experience and age may have contrary effects on behavior although they are usually correlated (see Feng and Seasholes, 2005, for tentative positive correlation). Therefore, studies assessing the impact of experience by comparing younger and older subjects should be taken with some caution.

The paper is organized as follows. The next section provides a more detailed discussion of the concept of overconfidence, presents the experimental design, and contains information on the online platform which was used for the experiment. Section 3 provides our results. We present some descriptive statistics and run several regression analyses in order to assess the influence of the control variables. Finally, section 4 contains some concluding observations.

2 Overconfidence and Experimental Design

Overconfidence is a rather robust phenomenon in the psychology of judgment (see Odean, 1998, Klayman et al., 1999, and, more recently, Glaser et al., 2004 for a broad overview over the relevant literature). In the finance literature, overconfidence is usually regarded as a systematic overestimation of the precision of own knowledge and implies an underestimation of the variance of random variables. This type of overconfidence is often referred to as miscalibration (Lichtenstein et al., 1982). Experimental research usually analyzes miscalibration by asking for confidence intervals of random variables or for knowledge questions, e.g. subjects should state an upper and a lower bound of the length of the river Nile such that they are 90% sure that the true value will fall inside this range (see Lichtenstein et al., 1982, Russo and Schoemaker, 1992, and Klayman et al., 1999). An additional concept of overconfidence is given by unrealistically positive self-evaluations (Greenwald, 1980). A popular example is the study of Svenson (1981) who asked a sample of students to assess their own driving safety: 82% of the students judged themselves to be in the top 30% of the group. A third stream of literature regards overconfidence as illusion of control (Langer, 1975) and unrealistic optimism which means that people overestimate personal success probabilities. In our experiment we try to address all three facets of overconfidence.

The experiment was run in cooperation with sentix® (see www.sentix.de) which is the leading online platform assessing market sentiment data for European capital markets. Sentiment data are derived from weekly surveys with more than 2600 participants, many of them being professional investors. This weekly survey allowed us to approach the subjects of this study via a link to our online-experiment which was active for one week. Altogether 496 subjects participated in the experiment, 344 individual investors, 74 institutional investors and 78 investment advisors. Due to registration of participants we were able to adjust the tasks (v) and (vi), see below, to the single investor types. Also socioeconomic data like gender, age, and experience are available. As in most other experimental studies of overconfidence, we do not provide monetary incentives for truthful responses. As far as we know, there does not exist an incentive-compatible method for the elicitation of e.g. confidence intervals. As a reward, our participants received 50 activation points which are necessary for downloading sentiment data from sentix®.

In the experiment subjects had to perform six different tasks:

(i) Give a point estimate of the quote of the DAX 30 (i.e. the most prominent German stock index) in precisely one month.
(ii) Give a range consisting of an upper and a lower bound such that the quote of the DAX 30 in one month will be inside this range with a probability of 90%.
(iii) Give a point estimate of the quote of DJIA (Dow Jones Industrial Average) in precisely one month.
(iv) Give a range consisting of an upper and a lower bound such that the quote of the DJIA in one month will be inside this range with a probability of 90%.
(v) How good is your investment performance compared to other investors? Answer could be given out of seven categories (0-6) from much worse to much better.
(vi) How good is your information compared to other investors? Answer could be given out of seven categories (0-6) from much worse to much better.

Tasks (ii) and (iv) assess overconfidence as miscalibration (larger intervals correspond to less overconfidence), task (v) concerns unrealistically positive self-evaluation, and tasks (i), (iii), and (vi) are related to unrealistic optimism and the illusion of control. Note that in tasks (v) and (vi) each investor should compare herself only with other investors belonging to the same

group. So on average one should expect that in the absence of overconfidence investors evaluate their performance and information as equally good.

The choice of our tasks is motivated by two goals of our study; first, we want to analyze overconfidence in the context of investment decisions and not for general knowledge questions;[3] second, we do not want to measure precisely the degree of overconfidence of our subjects which would require much more questions. Since our goal is simply to compare overconfidence between the single groups of investors while controlling for experience and age, we decided to restrict our study to a limited number of tasks in order to increase the number of participants. The results presented in the next section show that the number of tasks is sufficient for such comparisons.

3 Results

3.1 Descriptive statistics

We first show some descriptive statistics and simple tests for mean equality between groups in Table 1. The first two rows of this table show means (and medians in brackets) for the DAX and DJIA confidence intervals. It turns out that institutional investors provide the largest confidence intervals, whereas individuals and investment advisors provide strictly narrower interval forecasts. The difference between institutional investors and the other two investor groups is most pronounced for their German home market, the DAX. Here, the null that all three groups provide the same intervals can be significantly rejected. Furthermore, there is a significant difference between institutionals and individuals, whereas the difference between advisors and individuals is insignificant. Therefore, advisors seem to be as miscalibrated as individuals, despite their higher degree of professionalism.

INSERT TABLE 1 ABOUT HERE

The third and fourth row of Table 1 show mean values for the DAX and DJIA point forecasts. All three groups of investors expect decreasing stock markets on average, and this negative return expectation is significant for all six items except for the institutional DAX return forecast which is not significantly different from zero. In contrast to these expectations, both

[3] Note, however, that measures of overconfidence in both domains are positively correlated, see Glaser et al. (2004).

the DAX and the DJIA realize positive returns over the month following the forecast of participants in the online-experiment. Therefore, all three groups were wrong on average but investment advisors show the worst results compared to individuals and institutional investors.

The next two rows present results for the self-assessment of one's own investment performance („superior performance") and one's own information („superior information") compared to other peer-group market participants. Higher values of these two self-assessments indicate higher levels of confidence in one's own abilities. Looking at the results, it is striking that advisors provide the most favorable self-assessments among all three groups for both items. Institutional investors are less overconfident whereas individuals show the lowest values. However, to put the answers into perspective, mean answers in all six cases exceed the number of three which would be the value of a completely average investor within each group. Therefore, investment advisors and institutional investors seem to be overconfident, whereas the outcome for individual investors indicates overconfidence with respect to information only.

Finally, the last two rows show results for portfolio turnover and investment experience, two key variables thought to be related to overconfidence and risk taking. It turns out that trading volume is similar for advisors and individuals whereas their investment experience differs significantly in the sense that advisors are much more experienced than individuals. Therefore, high trading volume does not seem to be eliminated by investment experience. The latter finding does not hold for institutional investors which show a lower turnover combined with high experience.

3.2 Correlations of overconfidence, experience, and turnover

This section investigates relations between our measures of overconfidence, experience, and turnover in order to gain a better understanding of how these investor attributes are related. Results are shown in Table 2 which provides Spearman rank correlation coefficients and p-values (in parentheses) for the null of no correlation.

Looking at four measures of overconfidence (the two confidence intervals and the two self-assessments), one finds that these measures are positively but far from being perfectly correlated. This result seems interesting since it implies that overconfidence cannot be

measured by one single item but seems to have different facets (see Glaser et al., 2005, 2007). More specifically, while the two confidence intervals and the two self-assessments show high correlations of 0.52 and 0.43, respectively, the correlation between self-assessments and miscalibration in the two markets are considerably lower and in the range of 0.03 to 0.11. Even the largest correlation of 0.52 (between the two confidence intervals) seems relatively low, given that the task is identical but only for two different markets. We think that this is an interesting finding and we will further investigate this in the context of regression analyses in the next section.

INSERT TABLE 2 ABOUT HERE

Regarding the correlations of our overconfidence measures with turnover, it seems interesting to note that turnover is positively related to the DAX confidence interval which would indicate that turnover decreases with overconfidence. However, looking at the DJIA confidence interval and the two self-assessments, the usual positive relation between overconfidence and trading volume can be found. This again underscores the above finding that all overconfidence measures are not alike.

There is a tentatively positive correlation between higher (and thus better in our case) DAX and DJIA return forecasts and confidence intervals. This indicates that less miscalibration is related to superior forecasting ability. Similar in spirit, better return forecasts are accompanied by less overconfident self-assessments of subjects. These results suggest that overconfidence goes hand in hand with inferior investment behavior which is not limited to higher trading volume (e.g. Odean, 1998).

Similar results can be found for investment experience and age. While more experienced and younger investors tend to provide larger confidence intervals (i.e. are less overconfident) the opposite is true for the self-assessment exercises. Younger and more experienced investors tend to believe more strongly in being above average, i.e. they are more overconfident. Again, the difference between overconfidence measures is obvious and the results also show that (a) age and experience are significantly related to overconfidence and that (b) the two variables have opposing effects. The latter finding seems interesting since intuition would suggest that age is a good proxy for experience. Our results strongly reject this intuition.

3.3 Regression analyses

This section provides additional insight into the relation of overconfidence, experience, and professionalism by regressing our measures of overconfidence on variables reflecting professionalism and experience while simultaneously controlling for other socio-demographic factors possibly affecting overconfidence.

In addition to the socio-economic factors considered so far, we also include here the degree of education and wealth. These variables have been found of potentially positive impact on investment behavior as shown for example by Vissing-Jørgensen (2003) and Karlsson and Nordén (2007). Education is measured as a bivariate variable of holding a university degree or not. Wealth is approximated by the value of portfolio volume, being ordered in five categories, ranging from up to ten thousand Euro with less than 15 percent share of all respondents until more than one million Euro with less than 8 percent share. So, about one third of responses fall into the categories of 10 to 50 and 50 to 250 thousand Euro each. We document the following results with the inclusion of these controls, however, results are qualitatively similar without them.

Regression results are reported in Table 3. The first two columns refer to regressions with the DAX and DJIA confidence interval as dependent variable and several explanatory variables on the right-hand side.[4] Estimation is carried out via GMM with heteroscedasticity robust standard errors. As can be seen from the results, institutional investors provide larger confidence intervals than individuals while investment advisors provide smaller intervals. This result holds despite controlling for other factors such as age, experience, whether participants hold a university's degree and their wealth. Therefore, professionalism has an additional impact on miscalibration, but this effect depends on the type of professional considered. In a sense, one cannot say that all professionals really behave professionally. At least some of them, advisors, do not. This may explain partly, why earlier studies found conflicting evidence on the role of professionalism on investment behavior.[5] Furthermore, both age and experience have a significant impact on the two interval forecasts. Interestingly, they enter with opposite signs as already noted in the correlation analysis discussed above.

[4] Here, as in our earlier analyses concerning the confidence intervals, we have excluded obvious outliers such as a DAX confidence interval of 100,000 points. Results reported in the following are pretty robust to in- or exclusion of some more or less extreme values.

[5] Some studies find a positive influence of professionalism, such as Locke and Mann (2005) or Alevy et al. (2007), whereas others find a rather negative influence, such as Dennis and Strickland (2002) or Haigh and List (2005).

Therefore, older investors are more miscalibrated than younger investors, whereas increasing experience alleviates miscalibration.

INSERT TABLE 3 ABOUT HERE

Regarding the next two columns, which show results for DAX and DJIA return forecasts, one can infer that return expectations on behalf of investors are mostly not significantly related to variables we consider. There is a mildly significant effect of being an institutional investor towards a better DAX forecast and it seems that older investors tend to be more realistic in the case here but the strength of these two effects is rather questionable. However, it seems interesting that neither professionalism nor experience have consistently significant effects on the forecasting ability of investors.

Finally, the last two columns provide regression results for the two self-assessments, performance and information, which again yield some striking results.[6] First, we find that both institutional investors and investment advisors have significantly higher levels of overconfidence when assessing their own performance and when assessing their degree of information relative to other investors in their peer-group. This result corroborates our findings above but it is reassuring that this higher level of overconfidence holds when controlling for other important determinants, such as age or investment experience. Regarding these latter two key determinants, we find significant but opposing effects on the two self-assessments. Older investors tend to view their own performance and degree of information as being lower whereas more experienced investors show significantly higher levels of overconfidence. As with the miscalibration results, age and experience are clearly different and should not be taken as the same thing in experimental or empirical research. As a last important determinant, we find that more wealth is related to higher self-assessments. This finding corroborates earlier evidence by Grinblatt and Keloharju (2006) who find that wealthier individuals trade significantly more and further underscores the necessity to control for different factors when investigating overconfidence since different determinants of overconfidence may coexist and there is no mutual exclusiveness of the different possible driving forces.

[6] We employ ordered logit regressions here, since participants of our online-experiment could rank themselves according to seven categories. Due to this reason, it is more appropriate to accommodate this categorical data with regression models that account for the ordered and discrete nature of the data (see Greene, 2003).

4 Conclusions

This study analyzes whether the degree of overconfidence depends on experience and professionalism. The consideration of experienced financial professionals makes it difficult to conduct a conventional laboratory experiment. Moreover, as List (2006) has argued in detail, the framing and environment of an academic laboratory may distort behavior so that we prefer to conduct an online-experiment which has characteristics of a “framed field experiment” (Harrison and List, 2004).

Altogether 496 subjects participated in this online-experiment allowing to compare lay men, i.e. individual investors, with two groups of professionals, i.e. investment advisors and institutional investors. We find systematic differences in overconfidence between groups in that investment advisors are most overconfident with respect to the tasks required, whereas institutional investors tend to be least overconfident (although not consistently). Moreover, we find that experience has an influence on overconfidence which is not well captured by professionalism. Interestingly, the relation of experience to overconfidence is contrary to the relation of age. Finally, the examination of overconfidence as either miscalibration, unrealistically positive self-evaluation or illusion of control provides different results.

These findings suggest some complexity in the analysis of overconfidence in that groups of professionals should be carefully identified, in that experience cannot be well approximated by either professionalism or age and in that all three facets of overconfidence should be clearly distinguished.

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Table 1. Overconfidence measures of different investor groups

	Investment Advisors	Institutional Investors	Individual Investors	H_0: No difference between groups	H_0: No difference between Advisors and Individuals	H_0: No difference between Institutionals and Individuals
DAX confidence interval	461 [400]	561 [470]	448 [400]	5.95 ***(0.00)	-0.80 (0.43)	-3.38 ***(0.00)
DJIA confidence interval	930 [750]	1106 [900]	1003 [800]	0.69 (0.50)	1.03 (0.30)	-0.26 (0.80)
DAX return forecast	-0.88 **(0.04)	-0.25 (0.63)	-0.84 ***(0.00)	0.46 (0.63)	0.00 (0.97)	-2.21 **(0.05)
DJIA return forecast	-2.23 ***(0.00)	-1.39 ***(0.00)	-1.31 ***(0.00)	1.35 (0.26)	-3.64 *(0.06)	0.11 (0.79)
Superior performance	4.28	4.14	3.55	13.77 ***(0.00)	4.34 ***(0.00)	3.39 ***(0.00)
Superior information	5.26	5.23	4.38	30.57 ***(0.00)	6.14 ***(0.00)	5.60 ***(0.00)
Annual portfolio turnover	3.04	2.79	3.09	2.01 (0.14)	0.28 (0.80)	2.01 **(0.04)
Investment experience	4.57	4.49	3.76	10.68 ***(0.00)	-3.74 ***(0.00)	-3.28 ***(0.00)

Notes: This table shows mean answers for three groups of investors in the first three columns (numbers in squared brackets are median answers). The numbers in parentheses below the average DAX and DJIA return forecasts are p-values for the test that return forecasts are equal to zero. Columns four to six show results for tests for significant differences between groups (Wilcoxon signed-rank tests). Numbers in parentheses are p-values and stars refer the level of significance: ***: 0.01, **: 0.05, *: 0.10.

Table 2. Correlations of overconfidence measures, experience, and turnover

	DAX confidence interval	DJIA confidence interval	DAX return forecast	DJIA return forecast	Superior performance	Superior information	Annual portfolio turnover	Investment experience
DJIA confidence interval	0.52 (0.00)							
DAX return forecast	0.23 (0.00)	0.14 **(0.00)						
DJIA return forecast	0.12 (0.02)	0.23 **(0.00)	0.74 **(0.00)					
Superior performance	0.11 (0.03)	0.04 (0.38)	-0.03 (0.59)	-0.11 **(0.02)				
Superior information	0.10 **(0.04)	0.03 (0.56)	0.01 (0.89)	-0.10 **(0.04)	0.43 ***(0.00)			
Annual portfolio turnover	0.08 *(0.10)	-0.02 (0.73)	0.00 (0.92)	-0.06 (0.22)	0.20 ***(0.00)	0.08 *(0.09)		
Investment experience	0.10 **(0.03)	0.08 *(0.08)	0.01 (0.75)	0.02 (0.64)	0.18 ***(0.00)	0.25 ***(0.00)	-0.21 ***(0.00)	
Age	-0.17 ***(0.00)	-0.10 **(0.04)	0.03 (0.47)	0.11 **(0.02)	-0.09 **(0.05)	-0.08 (0.11)	-0.21 ***(0.00)	0.37 ***(0.00)

Notes: This table shows Spearman rank-correlations between different measures of overconfidence. Numbers in parentheses are p-values and stars refer the level of significance: ***: 0.01, **: 0.05, *: 0.10.

Table 3. Regression results

	DAX confidence interval	DJIA confidence interval	DAX return forecast	DJIA return forecast	Superior performance	Superior information
Institutional	75.31	51.78	0.97	0.30	0.56	1.31
Investors	**(0.04)	(0.26)	*(0.07)	(0.64)	**(0.01)	***(0.00)
Investment	-24.99	-49.40	-0.31	-0.62	0.71	1.23
Advisors	(0.47)	(0.22)	(0.65)	(0.29)	***(0.00)	***(0.00)
Age	-53.39	-51.12	0.31	0.48	-0.30	-0.14
	***(0.00)	***(0.00)	(0.19)	**(0.03)	***(0.00)	(0.13)
Investment	31.30	32.46	-0.19	-0.10	0.27	0.23
experience	***(0.00)	***(0.01)	(0.26)	(0.47)	***(0.00)	***(0.00)
University	28.91	5.65	-1.23	-0.61	-0.24	-0.45
degree	(0.65)	(0.93)	(0.42)	(0.63)	(0.53)	(0.48)
Wealth	-12.52	-16.93	-0.03	-0.09	0.22	0.16
	*(0.08)	*(0.08)	(0.84)	(0.64)	***(0.00)	**(0.02)
Constant	465.91	573.80	-1.26	-2.68		
	***(0.00)	***(0.00)	(0.18)	***(0.00)		
Cut 1					-3.74	-4.69
Cut 2					-2.63	-3.45
Cut 3					-1.74	-2.84
Cut 4					0.37	-0.32
Cut 5					1.59	0.63
Cut 6					2.67	2.03
Adj. R^2	0.18	0.13	0.01	0.02	0.10	0.12

Notes: This table shows results from regressions of overconfidence measures on group dummies (i.e. being an institutional investor or investment advisor) and further explanatory evidence. The first four columns give results for GMM regressions with heteroscedasticity robust standard errors. The last two columns show results for ordered logit regressions since the self-assessment of superior performance and information is coded as a discrete variable from 0 - 6. Numbers in parentheses are p-values based on robust standard errors and stars refer the level of significance: ***: 0.01, **: 0.05, *: 0.10.