How does Mutual Fund Manager Overconfidence Impact Mutual Fund Investment Performance?*

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Abstract:

The purpose of this paper is to investigate to what extent mutual fund managers are prone to behavioural biases and whether or not they differ from less sophisticated investors in their potential susceptibilities. The extent to which overconfidence and related behavioural traits such as hubris may have any bearing on fund performance is investigated. The answer to these questions can be considerably informative to the fund manager skill versus luck debate as well as the debate on performance persistence. The results suggest that excess fund manager overconfidence does diminish mutual fund returns following the publication of the annual report, *ceteris paribus*. This effect is robust across different investment styles, although it is found to be stronger among growth-oriented funds.

Keywords: mutual fund performance, investor psychology, professional investors, overconfidence

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1. Introduction

The overall purpose of this paper is to explore the extent to which mutual fund managers are prone to behavioural biases and whether or not this affects their investment performance in any significant way. In particular, how overconfidence and its associated behavioural attributes e.g. overoptimism and self-serving attribution bias may have any bearing on fund performance is of interest. The answer to these questions can be considerably informative to the fund manager skill versus luck debate as well as the debate on performance persistence. My underlying research questions are motivated by three large areas of research, i.e. studies of mutual fund performance and persistence, studies of financial accounting narratives and business communication, and studies of professional investor psychology.

This paper seeks to investigate the dynamic relationship between fund-manager expressed overconfidence and the investment performance of the mutual fund. The areas of focus in this paper are the extent to which (1) past investment performance affects fund manager's overconfidence, (2) fund manager's overconfidence impacts the fund's future investment performance and (3) the dynamics of this complex relation across fund type, investment style, fund manager duration and the proxies used to measure overconfidence. I specifically test the following null hypotheses:

> **$H1_0$:** There is no significant difference in the future investment performance of mutual funds whose managers exhibit varying degrees of *overoptimism*, ceteris paribus.
>
> **$H2_0$:** There is no significant difference in the future investment performance of mutual funds whose managers exhibit varying degrees of *certainty*, ceteris paribus.
>
> **$H3_0$:** There is no significant difference in the future investment performance of mutual funds whose managers exhibit varying degrees of *self-reference*, ceteris paribus.
>
> **$H4_0$:** There is no significant difference in the future investment performance of mutual funds whose managers exhibit varying degrees of *hubris*, ceteris paribus.

The paper is organised as follows: Section 2 discusses the core constructs and variables used throughout the paper. Section 3 briefly explains the methods commonly used in prior

literature as well as in this study to measure overconfidence. Section 4 describes the data and reports summary statistics. Section 5 focuses on how overconfidence is correlated with the prior performance of a mutual fund. Section 6 explores how fund manager expressed overconfidence may impact future investment performance. Section 7 summarises and concludes the paper.

2. Core Constructs and Variables

The terms "confidence", "trust" and "full belief" are usually considered synonyms. In fact, "confidence" is derived from the Latin *fido* meaning "I trust". The credit crisis we have just witnessed may be also known as a confidence crisis and it is interesting to observe that "credit" is similarly derived from the Latin *credo* meaning "I believe". The level of collective trust and confidence among investors can demonstrably have significant impacts on financial markets. Particularly interesting is the dynamic between one individual's level of trust and another's. Akerlof and Shiller (2009) propose *confidence multipliers* based on the idea of Keynsian multipliers that model how marginal propensity to consume spreads in a population of investors in response to, for instance, a government stimulus. They argue that a marginal change in person A's level of confidence in the financial market affects person B's level of confidence to a similar extent multiplied by the associated confidence multiplier. In this way, they propose a simple mathematical framework to model how confidence or lack of it quickly spreads among investors and other financial agents.

As for the mutual fund industry, dramatic changes have occurred in the seven decades following the Investment Company Act of 1940 coming into force. Bogle (2005) explains that the industry transformed tremendously from being organized, operated, and managed in the interests of fund shareholders to one that mostly serves the interests of managers and distributors. He describes this as a transition from stewardship to salesmanship, with asset-gathering becoming the industry's driving force. As fund managers incrementally assumed a more pronounced role in the mutual fund industry, a new strand of mutual fund literature increasingly focussed on their characteristics and their potential influence on performance.

In such settings, it is reasonable to investigate to what extent mutual fund managers are prone to behavioural biases and whether or not they differ from investors in their susceptibilities. In my research, the extent to which overconfidence and related behavioural traits e.g. over-optimism, narcissism, self-serving attribution, etc. may have any bearing on fund

performance is of interest. In addition, the answer to these questions can be considerably informative to the fund manager skill versus luck debate as well as the debate on persistence.

Humans constantly learn about themselves and their abilities by observing the consequences of their actions; and in doing so, most people overestimate the degree to which they play a role in their own successes.[1] A number of constructs need to be clearly differentiated in this discussion. Van den Steen (2002) provides a comprehensive categorization for this purpose: *Self-serving attribution* bias refers to the fact that people attribute success to their own dispositions and skills, while they attribute failure to external forces or bad luck; ego-centric or *self-centric* bias refers to the fact that individuals taking part in a joint endeavour relatively over-estimate their contribution to a good outcome; *overconfidence* relates to the fact that people over-estimate the accuracy of their estimates and predictions; *overoptimism* refers to the fact that individuals tend to be overoptimistic about future events and the consequences of their actions; and finally, *illusion of control* relates to the fact that people think they have more influence than they actually do over the outcome of a random or partially random event.

Overoptimism is closely related to the *valence effect* of prediction, i.e. the tendency for people to simply overestimate the likelihood of good things happening rather than bad things. Valence refers to the positive or negative emotional charge something has. The outcome of valence effects may be called wishful thinking. However, in certain situations, the positive outcome bias may actually alter the event in some way so that it indeed results in a positive outcome.

Prior psychology literature has produced two different types of explanations for these effects. Mostly, these phenomena have been interpreted in the framework of motivational biases, the argument being that individuals are motivated to hold unrealistically positive self-perceptions in order to increase their own happiness and well-being. The core assumption is, of course, that people seek to maximize their happiness in a utilitarian way. On the other hand, a challenging view has been put forward by cognitive psychologists. They claim that people generally expect to succeed, and they generally accept responsibility for their expected outcomes. Hence, in combination of the two effects, people tend be prone to self-serving attribution bias.

[1] This effect has been extensively studied in the psychology literature. A number of key papers in this relation are cited in Gervais, Simon, and Terrance Odean, 2001, Learning to be Overconfident, The Review of Financial Studies 14, 1-27.

Self-serving attribution bias can, in turn, engender overconfidence. Gervais and Odean (2001) explain that investors may falsely attribute superior past performance to their own skill, and inferior past performance to chance, which produces overconfidence. Overestimation of one's investment skill can, in this manner, result in excessive trading, as documented by Odean (1999). Despite the extensive literature examining attribution and overconfidence among ordinary individuals, corporate executives, traders, and retail investors, there are few studies that can claim to have examined the role of such biases in subsequent fund manager performance. In particular, due to the fact that the bulk of investment in financial markets is made by institutions rather than retail investors, any link between a professional asset manager's performance and her potential overconfidence or susceptibility to attribution bias can be of considerable importance, both to the academic literature and the investment industry.

3. Methodology

3.1. Methods used in prior literature to measure overconfidence

The overconfidence effect, in general terms, can be measured in a number of different ways. Hoffrage (2004) lists some of the most common approaches: (1) the subjects can be requested to evaluate their own confidence in a statement, and then all the statements with a given level of confidence can be grouped together and be compared that to the actual frequency of being correct; (2) subjects can be tested with multiple-choice questions and then their level of confidence in their answer can be elicited on a scale from chance to total certainty by comparing this to the true accuracy of their answers; (3) subjects can be asked to choose confidence intervals in response to questions with numerical answers; and (4) subjects can be given the opportunity to bet on the correctness of their answers with chances that are favourable, if their judgements of accuracy are correct, which means that they lose money if they are overconfident.[2]

However, fewer approaches are robust when it comes to gauging investor overconfidence. For example, trading activity is a commonly used proxy of overconfidence (Barber and

[2] Assuming that the human confidence has perfect calibration, judgements with 100% confidence should be correct 100% of the time, 80% confidence correct 80% of the time, etc. By contrast, research findings suggest that confidence exceeds accuracy so long as individuals are answering hard questions about unfamiliar topics. For example, subjects were correct about 80% of the time when they were "100% certain" about their performance in a spelling task. Adams, P. A., and J. K. Adames, 1960, Confidence in the recognition and reproduction of words difficult to spell, *American Journal of Psychology* 73, 544-552.

Odean (2000)) which clearly works for retail investors, but it cannot be as easily used for fund managers. Fund managers do not always engage in excessive trading due to overconfidence, rather they may have to increase their turnover after a rise in fund inflows, which usually follows good past performance. Putz and Ruenzi (2009) control for this effect in their examination of the turnover of US equity mutual funds over the period 1994-2004. The authors conclude that fund managers indeed trade more after good past performance, and their higher trading is driven by individual portfolio performance. This is consistent with superior past performance producing task-specific overconfidence. In a similar way, Chow, Lin, Lin and Weng (2009) examine a sample of equity mutual funds, and show that fund managers behave overconfidently conditional on prior performance. They also demonstrate that such behaviour deteriorates subsequent performance. However, one should note that other potential confounding factors may affect managerial trades, such as incentive for window-dressing, tax-management issues, preference for liquidity and changing investment styles to attract fund flows, thus reducing the robustness of trading activity as a proxy for overconfidence.

Another proxy used in the literature for measuring overconfidence is *Active Share*. Active Share refers to the share of portfolio holdings that differ from benchmark index holdings, and is introduced as a new measure of active portfolio management by Cremers and Petajisto (2009). Using this measure, Choi and Lou (2008) are able to show that mutual fund managers are typically susceptible to the self-serving attribution bias.

However, neither turnover nor Active Share is a "clean" measure of overconfidence. A more straightforward way of measuring overconfidence may be to examine the actual estimates and predictions of fund managers about their subsequent performance. Willis (2001), for examples, investigates annual earnings forecasts that are publicly released in conjunction with mutual fund manager stock recommendations, thereby finding evidence of excess optimism. Gort, Wang and Siegrist (2008) examine overconfidence using a similar method, and conclude that the pension fund managers in their sample provide too narrow confidence intervals when asked to forecast future returns or estimate past returns of various assets. However, since their approach requires questionnaire-type surveys attempting to measure fund manager confidence intervals, it cannot be readily used for a large sample of respondents and is subject to the usual robustness concerns associated with this type of secondary data collection.

3.2. Measurement of overconfidence in this study

I use three proxies to measure overconfidence using the considerable body of textual data available. These proxies are (excessive levels of) optimism, certainty and self-reference. The Diction software is used to extract the first two variables. Diction is a well-known content analysis software that is widely used in the field of finance and accounting, among other fields, to produce consistent narrative-based scores for any given text. Diction has been used extensively to analyze the speeches of policymakers, political speeches, earning announcements and corporate annual reports. The algorithm uses a series of thirty-three dictionaries (word-lists) to search text passages for different semantic features such as, e.g., praise, satisfaction, or denial. In this study, I predominantly use the optimism and certainty master variables used in Diction.

In Diction, optimism is defined as, "language endorsing some person, group, concept or event or highlighting their positive entailments." The formula used for calculating "net optimism" is: [praise + satisfaction + inspiration] - [blame + hardship + denial]; in other words, "optimism" minus "pessimism". Further details about these master variables are included in Appendix 1.

Diction defines certainty as "language indicating resoluteness, inflexibility, and completeness and a tendency to speak ex cathedra." The Diction formula for certainty is: [tenacity + leveling + collectives + insistence] - [numerical terms + ambivalence + self reference + variety]. I use the adjustment proposed in Demers and Vega (2010) to include numerical terms as adding to rather than subtracting from the certainty score. Appendix 1 includes more detailed definitions.

The third proxy used in this paper for overconfidence is self-reference which is defined as the frequency of first-person singular and plural pronouns in each narrative (I, me, my, mine, we, us, our, ours), which can be derived from Diction with a simple calculation.

In a similar way, I also measure hubris, not as a proxy for overconfidence, but as a related variable which can potentially impact fund manager decision making in a similar way to overconfidence. I use Amernic, Craig and Tourish (2010)'s method for calculating hubris by combining scores for praise (representing a propensity for 'affirmations'), accomplishment (reflecting a 'can-do' mentality'), and tenacity (reflecting confidence); i.e. hubris = [praise + accomplishment + tenacity]. Detailed definitions of these variables are listed in Appendix 1.

In the empirical analysis that will follow, I have also explored the possibility of constructing a meta-variable comprising some or all of the overconfidence proxies as well as the hubris measure. Since the face validity of these variables is an issue that can be discussed in detail, the usefulness of such overconfidence meta-variable will be evaluated on an empirical basis.

4. Data

I use mutual fund annual reports filed in SEC Edgar database since 2003 which was the starting year for such mandatory disclosures. There are roughly 3000 mutual fund annual reports filed in each year. The body of annual reports filed in SEC Edgar typically consist of several sections including the following:

- President's (or Chairman's) letter
- Individual fund commentaries (Fund manager report)
- Schedule of portfolio investments
- Financial statements
- Financial highlights
- Notes to financial statements
- Report of independent public accounting firm
- Schedule of shareholder expenses

Among these, only the *president's letter* and *fund commentaries* by individual fund managers contain mostly non-quantitative information including managerial insights and explanations. By comparison, the fund manager reports provide more leverage in understanding any likely relation between fund manager psychology and past or future investment performance. Although the president's letter can provide investors with a useful big picture, it is often too broad and too generic for our study purposes.

The fund/portfolio manager report is an information-rich section of the annual report which helps explain the past performance of the fund and portray its likely short-term and long-term future performance. The following recurring sections and themes are commonly present in the fund manager report:

- Strategy review
- Transitory glance at market environment
- Discussion of overall past performance
- Sector by sector analysis
- Fund outlook

It must be noted that in our analysis of fund manager reports, the optimism scores calculated are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative. The reason for dividing up each annual report in this way is to increase accuracy. The fund outlook section, by definition, is where the fund manager writes about his views on the fund's possible performance in the future, and therefore, this section of the narrative lends itself to an optimistic, pessimistic, or realistic tone of voice. Similarly, the discussion on past performance is an appropriate place to look for occasions of self-reference.

As for mutual fund returns, I use the data provided by the CRSP Survivorship-bias Free Mutual Fund database. In order to link the CRSP database to the Edgar database, the two corresponding identifiers (Cusip and CIK) need to be matched. For this purpose, a customised cross-referencing table provided by S&P is used.

Table 1 provides basic descriptive statistics on the proxies used for fund manager overconfidence. The scores reported in Table 1 are not normalised. Since the normal range of the Diction optimism score of a typical narrative based on the Corporate Financial Reports dictionary is between 48.21 and 52.50, the relatively low standard deviations are no cause for concern and should be interpreted within this range. The same observation holds for the certainty and self-reference measures.

Table 1: Descriptive statistics of fund manager expressed indicators of overconfidence

This table reports the distribution of selected overconfidence proxies based on the content analysis of fund manager narratives. Optimism and certainty are computed by Diction, and certainty is adjusted according to Demers and Vega (2008). Self-reference is the frequency of first-person singular and plural pronouns in each narrative (I, me, my, mine, we, us, our, ours), derived from Diction with some manipulation. The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

Year	No. of funds	Optimism		Certainty		Self-reference	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
2003	2870	51.318	1.968	47.129	1.161	1.167	0.169
2004	2911	52.293	2.125	46.993	1.198	1.079	0.209
2005	2894	52.312	2.183	47.794	1.125	1.118	0.104
2006	2955	51.260	1.984	48.142	1.504	1.365	0.196
2007	3108	52.775	1.419	46.959	1.146	1.299	0.188
2008	2939	52.471	2.117	47.217	1.182	1.016	0.207
2009	3072	53.010	2.204	46.851	1.336	1.198	0.245

Cross-correlations:

	Optimism	Certainty	Self-reference
Optimism	1.00		
Certainty	0.416	1.00	
Self-reference	0.755	0.488	1.00

5. How does overconfidence relate to past performance?

Gervais and Odean (2001) extending their earlier work in Odean (1999) develop a model explaining the process through which traders become overconfident by learning about their own ability and past performance. They argue that initially, the traders do not recognize their ability, but in the course of time and with accumulating more experience, they attribute successful outcomes to their superior judgements, and failure to external factors. Hence, traders "learn" to become overconfident through time.

It is reasonable to expect a similar pattern among mutual fund managers such that their overconfidence level should vary subject to prior investment performance. To measure the degree of this variation, I have formed top and bottom deciles by sorting the funds in each year on prior-year Carhart alphas and combining all the extreme deciles across 2003-2009. The three proxies I have used for overconfidence are optimism, certainty and self-reference.

The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative. Table 2A demonstrates the mean and standard deviation of extreme deciles for each of the three overconfidence proxies.

The t-test with unequal variance is used to measure the difference between the two extreme deciles. It can be inferred from this table that prior performance, when positive, does indeed generate surplus optimism as well as certainty. The difference between the two deciles in terms of self-reference is also significant, albeit slightly weaker. This finding conforms to the representative anecdotal examples of manual content analysis performed by the researcher which do suggest that high-performing fund managers tend to refer to themselves more often than poor-performing ones.

Table 2A: Variation of mutual fund manager overconfidence in extreme decile portfolios sorted on prior year alphas

This table compares the top and bottom deciles formed by sorting the funds in each year on prior-year Carhart alphas and combining all the extreme deciles across 2003-2009. Optimism and certainty are computed by Diction, and certainty is adjusted according to Demers and Vega (2008). Self-reference is the frequency of first-person singular and plural pronouns in each narrative (I, me, my, mine, we, us, our, ours), derived from Diction with some manipulation. The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

	Top Decile (n = 2087)		Bottom Decile (n = 2087)		
Variables	Mean	S.D.	Mean	S.D.	T-test with unequal var
Optimism	55.931	2.097	49.737	1.955	2.544**
Certainty	51.013	2.255	45.634	2.210	2.339**
Self-reference	1.944	0.249	1.095	0.251	1.895*

This relation can be investigated using a parallel method starting from fund-managed expressed attributes. First, the funds are sorted in each year on fund manager-expressed optimism, certainty, and self-reference, and then all the extreme deciles across 2003-2009 are combined. Then, the average prior-year Carhart alphas of top and bottom deciles are compared using the same t-test. Results are shown in Table 2B.

Table 2B: Variation of average Carhart alphas in extreme decile portfolios sorted on mutual fund manager overconfidence

This table compares the average prior-year Carhart alphas of top and bottom deciles formed by sorting the funds in each year on fund manager-expressed optimism, certainty, and self-reference, and then combining all the extreme deciles across 2003-2009. Optimism and certainty are computed by Diction, and certainty is adjusted according to Demers and Vega (2008). Self-reference is the frequency of first-person singular and plural pronouns in each narrative (I, me, my, mine, we, us, our, ours), derived from Diction with some manipulation. The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

Variables	Top Decile (n = 2087)		Bottom Decile (n = 2087)		T-test with unequal variance
	Mean	S.D.	Mean	S.D.	
Average alpha of Optimism-sorted decile portfolio	0.0097	0.0055	0.0041	0.0049	1.877*
Average alpha of Certainty-sorted decile portfolio	0.0076	0.0049	0.0030	0.0027	1.660*
Average alpha of Self-reference sorted portfolio	0.0072	0.0053	0.0036	0.0044	1.912*

The above results indicate that fund managers who use a more optimistic, certain and self-reliant tone in their reports to shareholders have, on average, experienced higher previous-year alphas compared to others. This, of course, is consistent with the observation in Table 2A and suggests that the role of prior performance has to be accounted for before interpreting any cross-sectional variance observed in fund returns that may be marginally explained by differences in fund manager characteristics.

According to Gervais and Odean (2001), through the self-serving attribution mechanism, investors may falsely attribute superior past performance to their own skill, and inferior past performance to chance. This mechanism, which has a net positive impact on overconfidence, can be coupled with the weakening or distortion of information signals triggered by anxiety,

as explained in Freud (1936). The resulting dynamic relationship can be illustrated in Figure 1 below:

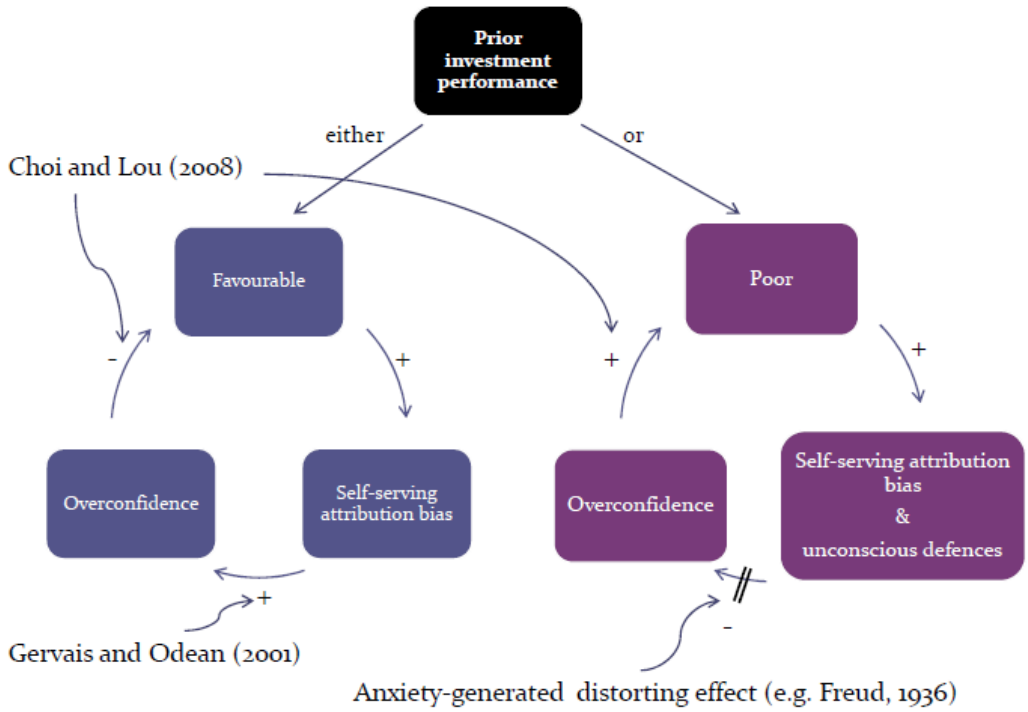

Figure 1 - The dynamic interaction between self-serving attribution bias and overconfidence

Hence, it can be hypothesized that in an alternating round of good and bad prior performance, the average fund manager's level of inherent overconfidence should increase, *ceteris paribus*.

Table 3 shows the results of an attempt to test this hypothesis by tracing the expressed overconfidence indicators of all the fund managers in 2003 and following this same cohort for the subsequent six years until 2009. It can be observed that optimism and self-reference both tend to rise over the years of managing the same fund (Fig. 2 and Fig. 3).

Table 3: Does fund-manager expressed overconfidence increase by fund manager duration?

This table reports the mean normalized optimism/certainty/self-reference scores for a given cohort of fund managers starting in 2003 and finishing in 2009 or earlier if the fund manager leaves the fund or the fund terminates.

Year	n.	Optimism	Certainty	Self-reference
2003	2870	51.318	47.129	1.167
2004	2679	52.213	47.118	1.197
2005	2551	52.916	47.292	1.281
2006	2317	53.610	48.324	1.256
2007	2019	54.227	46.395	1.319
2008	1720	54.971	47.286	1.367
2009	1436	55.259	47.124	1.375

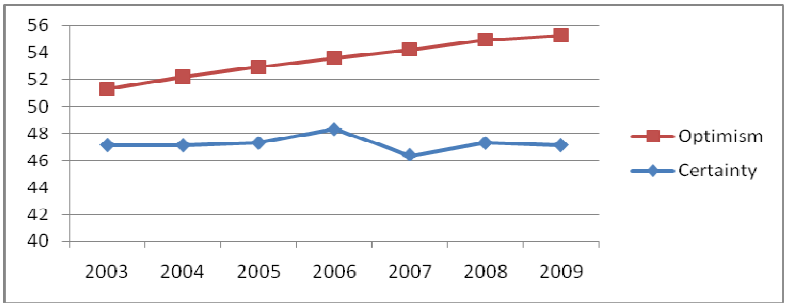

Figure 2 - Variation of optimism and certainty by fund manager duration

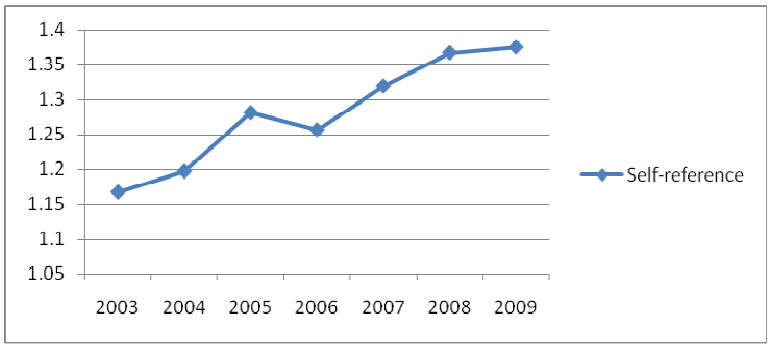

Figure 3 - Variation of self-reference by fund manager duration

This simple observation is, of course, not robust to survivorship bias. The cohort of fund managers who survive through the years may in fact have been mostly delivering positive performance in absolute terms, and therefore it may not be surprising that they exhibit signs of increased overconfidence. However, it is possible that the growing overconfidence accumulated in this way may, on average, drive fund managers to make sub-optimal investment decisions leading to adverse performance, as Choi and Lou (2008) demonstrate in their paper.

6. How does overconfidence impact future investment performance of mutual funds?

The objective of this section is to test the hypothesis that excessive levels of overconfidence interfere with sound investment decision-making and thereby harm future performance. In other words, we expect that a fund manager with higher levels of net overconfidence (after considering the effect of prior performance) may experience lower future returns, everything else held constant. Therefore, the general null hypothesis can be formed as follows:

> **H_0:** There is no significant difference in the future investment performance of mutual funds whose managers exhibit varying degrees of overconfidence/hubris, *ceteris paribus*.

In order to test this hypothesis, the Carhart model is used as the base regression model. The Carhart (1997) model builds on the Fama-French three-factor model by adding prior-year momentum which, for the purpose of this research, adequately captures the effect of previous performance. Therefore, the general approach would be to add the overconfidence measure as independent variable to the Carhart model, and then to regress the average monthly returns subsequent to the publication of the annual reports accordingly.

$$E(R_{it}) - R_{ft} = \beta_0 + \beta_{1i}[E(R_{mt}) - R_{ft}] + \beta_{2i}E(\mathrm{SMB}_t) + \beta_{3i}E(\mathrm{HML}_t) + \beta_{4i}E(\mathrm{MOM}_t) \quad (1)$$

Hence, $\beta_{5i}E(OC_t)$ is added to the RHS of the above model. Table 4 shows the results of regressing average monthly fund returns during the 12 months following the publication of the 2003-09 annual report on the four Carhart factors (market excess return, SMB, HML, MOM) as well as fund-manager expressed optimism, certainty and self-reference dummy variables. The dummy variables indicate that the fund belongs to the top decile in each category e.g. top 10% overoptimistic, etc. In obtaining the results reported in Table 4, measurements of optimism, certainty, and self-reference are made universally without dividing up the fund manager reports into relevant sections. The insignificant coefficients further prompted us to divide up the reports into separate sections (past performance discussion and fund outlook) before performing the analysis.

Table 4: Does fund-manager abnormal overconfidence impact subsequent mutual fund performance? (Reports analysed universally)

This table displays the results of regressing average monthly fund returns during the 12 months following the publication of the 2003-08 annual report on the four Carhart risk factors (market excess return, SMB, HML, MOM) as well as fund-manager expressed optimism, certainty and self-reference dummy variables. The dummy variables indicate that the fund belongs to the top decile in each category (e.g. top 10% overoptimistic, etc.)

Variable	Optimism	Certainty	Self-reference
Intercept	0.0065***	0.0059***	0.0062***
$R_M - R_F$	0.9452***	0.9447 ***	0.9473 ***
SMB	0.4236***	0.4242***	0.4239***
HML	0.4550 ***	0.4554***	0.4547 ***
MOM	-0.2092 ***	-0.2089 ***	-0.2085 ***
Optimism	-0.1728 (-1.31)		
Certainty		0.0134 (1.06)	
Self-reference			-0.0759 (-1.27)

Table 5A reiterates the same analysis with reports categorized by section. The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

Table 5A: Does fund-manager abnormal overconfidence impact subsequent mutual fund performance? (Reports analysed by section)

This table displays the results of regressing average monthly fund returns during the 12 months following the publication of the **2003-09** annual report on the four Carhart factors (market excess return, SMB, HML, MOM) as well as fund-manager expressed optimism, certainty and self-reference dummy variables. The dummy variables indicate that the fund belongs to the top **decile** in each category (e.g. top 10% overoptimistic, etc.) The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

	Optimism	Certainty	Self-reference
Intercept	0.0061***	0.0191***	0.0094***
$R_M - R_F$	0.9442***	0.9729 ***	0.9417 ***
SMB	0.4263***	0.4388***	0.4112***
HML	0.4408 ***	0.4571***	0.4590 ***
MOM	-0.2015 ***	-0.2154 ***	-0.2110 ***
Optimism	-0.5285** (-2.01)		
Certainty		0.1026* (1.65)	
Self-reference			-0.2742* (-1.82)

It can be inferred from the results in Table 5A that higher levels of net overconfidence (as proxied by optimism and self-reference) predict lower future monthly returns based on the Carhart model. Furthermore, optimism seems to be a more robust proxy for overconfidence based on the reported significance levels. The very low regression coefficient associated with certainty, however, bears a positive sign, contrary to our expectation, which may be due to the fact that fund managers commonly use a firm and resolute tone of voice in their reports to investors.

In Table 5B, I have included the average fund manager overconfidence over the previous three years in forming the OC dummy variable. Since SEC started filing mutual fund annual reports online in the Edgar database as of 2003, we will have to start from 2005 to compute the average overconfidence scores. Another approach, not pursued here, is to take the average on both annual and semi-annual reports, thereby increasing data points. The results reported in Table 5B still indicate a negative relationship between excess net overconfidence and future returns. However, they are relatively weaker compared to Table 5A, which may be due to the potentially transient nature of overconfidence.

Table 5B: Does fund-manager abnormal overconfidence impact subsequent mutual fund performance? (Reports analysed by section)

This table displays the results of regressing average monthly fund returns during the 12 months following the publication of the **2005-09** annual report on the four Carhart factors (market excess return, SMB, HML, MOM) as well as average previous 3-year fund-manager expressed optimism, certainty and self-reference dummy variables. The dummy variables indicate that the fund belongs to the top **decile** in each category (e.g. top 10% overoptimistic, etc.) The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

	Optimism	Certainty	Self-reference
Intercept	0.0139***	0.0204***	0.0128***
$R_M - R_F$	0.7417***	0.7383 ***	0.7721 ***
SMB	0.5394***	0.5966***	0.5172***
HML	0.4033***	0.4129***	0.4304 ***
MOM	-0.3515 ***	-0.3752***	-0.3398 ***
Optimism	-0.7144* (-1.92)		
Certainty		0.2250 (1.57)	
Self-reference			-0.3268* (-1.77)

Table 6 reports the results of the same regressions as in Table 5, with the difference that the dummy variables indicate belonging to the top quintile of the overconfidence proxy. The results are weaker (as expected), nevertheless still significant and suggestive of the inverse impact of net overconfidence of subsequent-year returns.

Table 6: Does fund-manager abnormal overconfidence impact subsequent mutual fund performance? (Reports analysed by section)

This table displays the results of regressing average monthly fund returns during the 12 months following the publication of the 2003-09 annual report on the four Carhart factors (market excess return, SMB, HML, MOM) as well as fund-manager expressed optimism, certainty and self-reference dummy variables. The dummy variables indicate that the fund belongs to the top **quintile** in each category (e.g. top 20% overoptimistic, etc.) The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

	Optimism	Certainty	Self-reference
Intercept	0.0119***	0.0145***	0.0247***
$R_M - R_F$	0.8044***	0.9031***	0.8987 ***
SMB	0.3962***	0.4285***	0.4019***
HML	0.4804 ***	0.4116***	0.4622 ***
MOM	-0.3266 ***	-0.3005 ***	-0.3790***
Optimism	-0.6515** (-1.97)		
Certainty		0.2730 (1.60)	
Self-reference			-0.4076* (-1.69)

An obvious question that follows is the extent to which the observed negative impact of overconfidence on fund returns varies in the months following the publication of the annual report. If we regard the level of fund-manager expressed overconfidence as a snapshot taken at the time of producing the annual report, it is reasonable to expect that the impact of such overconfidence would be stronger in the nearer months than the more distant future. I have investigated the 3-, 6-, and 9-month windows following the publication date of the annual report, and the regression results reported in Table 7, seem to suggest that indeed the impact of net overconfidence on future returns fades away, albeit slightly, as time goes on.

Table 7: How does fund-manager abnormal overconfidence and hubris impact subsequent mutual fund performance in the short term?

This table displays the results of regressing average monthly fund returns during the 3, 6, and 9 months following the publication of the annual report on the four Carhart factors (market excess return, SMB, HML, MOM) as well as fund-manager expressed optimism, certainty and self-reference dummy variables. The dummy variables indicate that the fund belongs to the top decile in each category (e.g. top 10% overoptimistic, etc.) The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

	9M	6M	3M
Optimism	-0.5348**	-0.5412**	-0.5661**
	(-2.05)	(-2.09)	(-2.14)
Certainty	0.1054*	0.1021*	0.1106*
	(1.67)	(1.71)	(1.78)
Self-reference	-0.2756*	-0.2812*	-0.3017**
	(-1.79)	(-1.88)	(-1.98)
Hubris	-0.7895**	-0.7857**	-0.7922**
	(-1.99)	(-2.10)	(-2.24)

Table 8 reports the results of the regressions in the model with buy-and-hold returns instead of average monthly returns during the specified periods. The results are quite similar.

Table 8: Does fund-manager abnormal overconfidence and hubris impact subsequent mutual fund performance? (Inclusion of year dummies)

This table displays the results of regressing buy-and-hold fund returns during the 12 months following the publication of the 2003-09 annual report on the four Carhart factors (market excess return, SMB, HML, MOM) as well as fund-manager expressed optimism, certainty and self-reference dummy variables. The dummy variables indicate that the fund belongs to the top decile in each category (e.g. top 10% overoptimistic, etc.) The optimism scores are based on the fund outlook section, the self-reference scores are based on the past-performance discussion section and certainty scores are based on the whole narrative.

	Without year dummies	With year dummies
Optimism	-0.5194** (-1.98)	-0.5323* (-1.85)
Certainty	0.1125* (1.67)	0.1374 (1.41)
Self-reference	-0.2717* (-1.79)	-0.2919* (-1.70)
Hubris	-0.7838** (-1.96)	-0.7942* (-1.90)

Table 8 also reports the results of including year dummies in the regressions. Year dummies can control for potential time-specific conditions that may have affected the funds' performance, such as boom and bust periods. However, the results are comparable, as can be seen in Table 8, and still suggest that abnormal levels of overconfidence can be detrimental to the fund's future investment performance.

The relationship between the performance of mutual funds and their investment styles is widely researched. To obtain a general perspective on the role of fund managers' overconfidence and hubris in this regard, I look at two broad categories of investment styles, namely, growth and value. This information is extracted from the funds' S&P objective codes as reported in the CRSP database. Table 9 reports the regression coefficients for optimism, self-reference and hubris associated with each subgroup. The results suggest that highly

overconfident and hubristic growth-oriented fund managers are more negatively disadvantaged by this attribute compared to their value-oriented peers.

Table 9: Does the impact of fund-manager abnormal overconfidence and hubris on subsequent performance vary with investment style?

This table displays the results of regressing average monthly fund returns during the 3 months following the publication of the annual report on the four Carhart factors (market excess return, SMB, HML, MOM) as well as fund-manager expressed optimism. The optimism dummy variable indicates that the fund belongs to the top decile in its category (i.e. top 10% overoptimistic). The funds are categorized by investment style (S&P objective code) and the optimism scores are based on the fund outlook section of the annual report.

	Optimism Coefficient	Self-reference Coefficient	Hubris Coefficient
Growth	-0.614** (-2.47)	-0.3304* (-1.80)	-0.8031** (-2.11)
Value	-0.429* (-1.89)	-0.2025* (-1.69)	-0.7815* (-1.93)

This finding is potentially interesting as it may suggest that growth-oriented fund managers have more incentive and opportunity to become overconfident by virtue of having to "believe" in and relate to the growth stories associated with their investments. However, a more detailed breakdown of fund investment styles and the associated impact of excess net optimism on future returns is required. One may expect to find a similar general pattern as in Table 9, suggesting that the effect of overconfidence on the future performance of a mutual fund depends, among other factors, on where the fund is located along the value-growth investment style continuum.

A question that may arise here is the link between this finding and the evidence of skill among growth-oriented fund managers. Chen, Jegadeesh and Wermers (2000) and Kosowski, Timmermann, Wermers and White (2006) have shown that growth-oriented funds possess better stock-selection skills than income-oriented funds. Can it be similarly posited that growth-oriented funds exhibit similar evidence of negative skill on the other side of the

distribution, which may be due their susceptibility to certain behavioural biases such as overconfidence and hubris?

7. Summary and conclusion

In this paper, I set out to investigate the dynamic relationship between fund manager overconfidence and the performance of the mutual fund. The cross-sectional variations demonstrated that good past performance boosts overconfidence as measured by all proxies used in this paper. A similar pattern is observed with hubris measures which are related to overconfidence. This is, of course, in line with theoretical expectations and prior literature.

Subsequently, I ran Carhart four-factor regressions with overconfidence and year dummy variables with results suggesting that excess overconfidence does indeed diminish monthly returns following the publication of the annual report, assuming everything else is held constant. This effect is robust across different investment styles, although it is stronger among growth-oriented funds. Incorporating average scores for fund manager overconfidence over the previous three years results in similar regression coefficients, although relatively weaker.

It was also observed that overoptimism and self-reference are more representative indicators of overconfidence than certainty, possibly due to the fact that professional writers are resolute by normal practice. Finally, fund manager duration appears to correlate with fund manager expressed overconfidence and hubris in the long run. For the same cohort of fund managers studied throughout the range of the sample data, the measured overconfidence tends to rise steadily and in agreement with theoretical expectations.

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Appendix I

Definitions of Diction Variables used in constructing Optimism, Certainty and Hubris scores in this chapter (Source: Diction 5.0 User's Manual)

TENACITY: All uses of the verb to be (*is, am, will, shall*), three definitive verb forms (*has, must, do*) and their variants, as well as all associated contraction's (*he'll, they've, ain't*). These verbs connote confidence and totality.

LEVELING: Words used to ignore individual differences and to build a sense of completeness and assurance. Included are totalizing terms (*everybody, anyone, each, fully*), adverbs of permanence (*always, completely, inevitably, consistently*), and resolute adjectives (*unconditional, consummate, absolute, open-and-shut*).

COLLECTIVES: Singular nouns connoting plurality that function to decrease specificity. These words reflect a dependence on categorical modes of thought. Included are social groupings (*crowd, choir, team, humanity*), task groups (*army, congress, legislature, staff*) and geographical entities (*county, world, kingdom, re public).*

INSISTENCE: This is a measure of code-restriction and semantic contentedness. The assumption is that repetition of key terms indicates a preference for a limited, ordered world. In calculating the measure, all words occurring three or more times that function as nouns or noun-derived adjectives are identified (either cybernetically or with the user's assistance) and the following calculation performed: [Number of Eligible Words **x** Sum of their Occurrences] ÷ 10. (For small input files, high frequency terms used two or more times are used in the calculation).

NUMERICAL TERMS: Any sum, date, or product specifying the facts in a given case. This dictionary treats each isolated integer as a single word and each separate group of integers as a single word. In addition, the dictionary contains common numbers in lexical format (*one, tenfold, hundred, zero)* as well as terms indicating numerical operations (*subtract, divide, multiply, percentage*) and quantitative topics (*digitize, tally, mathematics).* The presumption is that Numerical Terms hyper -specify a claim, thus detracting from its universality.

AMBIVALENCE: Words expressing hesitation or uncertainty, implying a speaker's inability or unwillingness to commit to the verbalization being made. Included are hedges (*allegedly*, *perhaps, might*), statements of inexactness (*almost, approximate, vague, somewhere*) and confusion (*baffled, puzzling, hesitate).* Also included are words of restrained possibility (*could, would, he'd*) and mystery (*dilemma, guess, suppose, seems).*

SELF-REFERENCE: All first-person references, including *I, I'd, I'll, I'm, I've, me, mine, my, myself.* Self-references are treated as acts of indexing whereby the locus of action appears to reside in the speaker and not in the world at large (thereby implicitly acknowledging the speaker s limited vision).

VARIETY: This measure conforms to Wendell Johnson's (1946) Type-Token Ratio which divides the number of different words in a passage by the passage's total words. A high score indicates a speaker's avoidance of overstatement and a preference for precise, molecular statements.

PRAISE: Affirmations of some person, group, or abstract entity. Included are terms isolating important social qualities (*dear, delightful, witty),* physical qualities (*mighty, handsome, beautiful),* intellectual qualities (*shrewd, bright, vigilant, reasonable),* entrepreneurial qualities (*successful, conscientious, renowned*), and moral qualities (*faithful, good, noble*). All terms in this dictionary are adjectives.

SATISFACTION: Term s associated with positive affective states (*cheerful, passionate, happiness*), with moments of undiminished joy (*thanks, smile, welcome*)and pleasurable diversion (*excited, fun, lucky),* or with moments of triumph(*celebrating, pride, auspicious).* Also included are words of nurturance: *healing, encourage, secure, relieved.*

INSPIRATION: Abstract virtues deserving of universal respect. Most of the terms in this dictionary are nouns isolating desirable moral qualities (*faith, honesty, self-sacrifice, virtue*) as well as attractive personal qualities (*courage, dedication, wisdom, mercy).* Social and political ideals are also included: *patriotism, success, education, justice*.

BLAME: Terms designating social inappropriateness (*mean, naive, sloppy, stupid*) as well as downright evil (*fascist, blood-thirsty, repugnant, malicious*) compose this dictionary. In addition, adjectives describing unfortunate circumstances (*bankrupt, rash, morbid, embarrassing*) or unplanned vicissitudes (*weary, nervous, painful, detrimental)* are included. The dictionary also contains outright denigrations: *cruel, illegitimate, offensive, miserly.*

HARDSHIP: This dictionary contains natural disasters (*earthquake, starvation, tornado, pollution),* hostile actions (*killers, bankruptcy, enemies, vices*) and censurable human behaviour (*infidelity, despots, betrayal*). It also includes unsavoury political outcomes (*injustice*, *slavery, exploitation, rebellion*) as well as normal human fears (*grief, unemployment, died, apprehension*) and in capacities (*error*, *cop-outs, weakness*).

DENIAL: A dictionary consisting of standard negative contractions (*aren't, shouldn't, don't*), negative functions words (*nor, not, nay*), and term s designating null sets (*nothing, nobody, none*).

ACCOMPLISHMENT: Words expressing task-completion (*establish, finish, influence, proceed)* and organized human behaviour (*motivated, influence, leader, manage)*. Includes capitalistic terms (*buy, produce, employees, sell),* modes of expansion (*grow, increase, generate, construction*) and general functionality (*handling, strengthen, succeed, outputs).* Also included is programmatic language: *agenda, enacted, working, leadership*.