Sensation Seeking, Sports Cars, and Hedge Funds*

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Abstract

We find that hedge fund managers who own powerful sports cars take on more investment risk. Conversely, managers who own practical but unexciting cars take on less investment risk. The incremental risk taking by performance car buyers does not translate to higher returns. Consequently, they deliver lower Sharpe ratios than do car buyers who eschew performance. In addition, performance car owners are more likely to terminate their funds, engage in fraudulent behavior, load up on non-index stocks, exhibit lower *R*-squareds with respect to systematic factors, and succumb to overconfidence. We consider several alternative explanations and conclude that manager revealed preference in the automobile market captures the personality trait of sensation seeking, which in turn drives manager behavior in the investment arena.

Keywords: Sensation seeking, Hedge funds, Risk, Fraud, Overconfidence

JEL Classification: G11; G12; G14; G23

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1. Introduction

"The emerging manager who goes out and buys a fancy sports car right off the bat is someone you probably want to avoid."

–Business Insider (Singapore), February 2016[1]

Sensation seeking is a personality trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience and has been linked to the propensity to engage in risky driving, extreme sports, substance abuse, and crime (Zuckerman, 1994; 2007). Does sensation seeking affect the behavior of important financial market participants such as professional fund managers? The emerging academic literature on the role of sensation seeking in finance finds that sensation seeking chief executive officers (henceforth CEOs) take on more business risk (Cain and McKeon, 2016) and generate better innovation outcomes (Sunder, Sunder, and Zhang, 2016), while sensation seeking U.S. households (Bochkay et al., 2016) and Finnish retail investors (Grinblatt and Keloharju, 2009) exhibit riskier economic behavior in the housing loan market and trade more often, respectively. Yet little is known about the impact of sensation seeking on the trading behavior of professional investors. This paper fills this void by employing data on hedge fund managers' automobile ownership to gauge their proclivity for sensation seeking and analyzing their investment behavior.

[1] See "Here are the biggest 'red flags' that keep people away from giving a new hedge fund manager money," Business Insider (Singapore), 18 February 2016. The article further describes this as the classic "red Ferrari syndrome."

The hedge fund industry is an interesting laboratory for exploring the impact of sensation seeking on finance. The complex, dynamic, and relatively unconstrained strategies that hedge fund managers employ, which often involve short sales, leverage, and derivatives, may attract sensation seekers by satisfying their desire for varied, novel, complex, and intense experiences. Indeed, professional traders often describe trading as addictive given the adrenaline rush they derive from placing big wagers.[2] Neuroscientists have found that in the human brain, monetary gain stimulates the same reward circuitry as cocaine (Breiter et al., 2001).[3] Sensation seekers may also be drawn to the industry's low levels of transparency and regulation, which offer opportunities for criminal activities and fraud. Unsurprisingly, some hedge fund managers routinely engage in extreme sports such as kickboxing, alpine skiing, triathlons, ultra marathons, and automobile racing.[4] Seemingly wary of the impact of sensation seeking on trading behavior, some hedge fund allocators argue that the purchase of a performance sports car or the pursuit of risky leisure activities by a hedge fund manager raises red flags about her fund.

Prior research has used data on piloting licenses (Cain and McKeon, 2016; Sunder, Sunder, and Zhang, 2016), extramarital affairs (Bochkay et al., 2016), and speeding tickets (Grinblatt and Keloharju, 2009) to identify sensation seekers. By using the characteristics of vehicles purchased, such as body style, maximum horsepower, maximum torque, passenger volume, and safety ratings, as opposed to speeding tickets, we are able to leverage on a

[2] See, for example, "A disgraced trader's bid for redemption – Alexis Stenfors got fired for lying about losses; moving on has been hard," Wall Street Journal, 30 April 2016.

[3] Lo (2013) provides an excellent discussion of the insights from cognitive neuroscience on the behavior of financial market participants.

[4] Portfolio managers who participate in extreme sports include Pierre Andurand from Andurand Capital Management (kickboxing), Philippe Jabre of Jabre Capital Partners (alpine skiing), Daniel Loeb of Third Point (triathlons), Kah Shin Leow of Quantedge (ultra marathons), and Christian Zuhel of Zais Group (automobile racing). See "Kickboxing oil trader pursues knockout at new hedge fund," Bloomberg News, 15 May 2013, "An unbeaten risk-taker," Financial Times, 3 March 2006, "Biggest chapter yet for a poison pen," Wall Street Journal, 31 July 2012, "Former Bermuda hedge fund manager enjoys success in new Singapore venture," The Royal Gazette, 10 January 2011, and "Best 100 hedge funds," Barrons, 19 May 2012.

multiplicity and continuum of signals that increase the power of our tests. Moreover, we sidestep concerns about how travel mileage, traffic enforcement activity, situational awareness behind the wheel, as well as the use of radar-detecting and laser-jamming devices can affect the probability of getting a traffic citation conditional on speeding. We argue that the purchase of a powerful sports car, more often than not, conveys the intent to drive in a spirited fashion and therefore signals an inclination for sensation seeking.[5] Conversely, we contend that the acquisition of a practical but unexciting minivan reflects an aversion to sensation seeking. Articles in the popular press that describe minivans as dowdy, stodgy, and uncool, lend support to this view.[6]

The empirical results are striking. We find that hedge fund managers who purchase performance cars take on more investment risk than do fund managers who eschew performance cars. Specifically, sports car drivers deliver returns that are 1.80 percentage points per annum more volatile than do non-sports car drivers. This represents a 16.61 percent increase in volatility over that of drivers who shun sports cars. Similarly, drivers of high horsepower and high torque automobiles exhibit 1.14 and 1.25 percentage points per annum more volatility, respectively, in the funds that they manage than do drivers of low horsepower and low torque automobiles. The increased risk taking by performance car enthusiasts cannot be attributed to the usual factors that shape hedge fund investment behavior such as fund age (Agaarwal and Jorion, 2010), size (Berk and Green, 2004), incentives (Agarwal, Daniel, and Naik, 2009), and share restrictions (Aragon, 2007). After controlling for these factors in multivariate regressions, we still find that the cross-sectional risk differences between performance and non-performance car owners are

[5] Indeed, evidence suggests that, after adjusting for mileage, the most likely cars to get ticketed are powerful sports cars. According to "Cars most likely to get a ticket," Forbes, 13 October 2010, the car most likely to get ticketed is the Mercedes Benz SL, while SUVs and minivans are least likely to get ticketed. Other powerful or sporty cars on the top ten list for speeding citations include the Volkswagen GTI, the Mercedes Benz CLK 63 AMG, the Mercedes Benz CLS 63 AMG, the Scion tC, and the Acura Integra.

[6] See, for example, "Operation: minivan," Wall Street Journal, 1 August 2003.

economically and statistically significant. Differences in systematic risk do not explain our results since our findings prevail after we adjust for co-variation with the Fung and Hsieh (2004) seven factors and examine idiosyncratic risk. Our findings are also not driven by other factors such as backfill bias (Liang, 2000; Fung and Hsieh, 2009; Bhardwaj, Gorton, and Rouwenhorst, 2014), serial correlation in fund returns (Getmansky, Lo, and Makarov, 2004), and manager manipulation of fund returns (Bollen and Pool, 2008, 2009; Aragon and Nanda, 2016), that could cloud inferences made from reported returns. These results suggest that managers who procure cars with attributes that signal a preference for sensation seeking deliver more volatile returns.

Is the inverse also true? Do hedge fund managers who purchase cars with attributes that suggest an aversion to sensation seeking deliver more stable returns? We find that managers who acquire practical but unexciting cars take on lower investment risk relative to managers who shun these cars. In particular, minivan owners generate returns that are 1.28 percentage points per annum less volatile than do other owners. This represents an 11.74 percent reduction in risk relative to managers who eschew minivans. Moreover, managers who purchase cars with high passenger volumes and excellent safety ratings also deliver returns that are on an annualized basis 1.59 and 0.97 percentage points less volatile, respectively, than do managers who purchase cars with low passenger volumes and poor safety ratings. These results remain economically and statistically meaningful after we control for the myriad of factors that may drive fund manager investment behavior or taint inferences derived from reported returns. To the extent that the anti-sensation vehicle attributes (i.e., minivan, passenger volume, and safety rating) signal a penchant for sensation avoidance, these results complement those based on the pro-sensation vehicle attributes (i.e., sports car, horsepower, and torque). We carefully consider several alternative explanations for our findings, including reverse causality, social status or wealth (Piff et al.,

2012), marital status (Love, 2010; Roussanov and Savor, 2014), and manager age (Barber and Odean, 2001), but find that they are unlikely to drive the bulk of our results.

Does the incremental risk-taking by sensation seekers translate into higher returns? We find that despite taking more investment risk, fund managers who purchase performance cars do not harvest greater returns than do fund managers who eschew those cars. Consequently, buyers of cars with pro-sensation attributes deliver lower Sharpe ratios than do buyers of cars with anti-sensation attributes. For example, a one standard deviation increase in vehicle maximum horsepower is associated with a decrease in fund annualized Sharpe ratio of 0.18. This represents a 21.43 percent reduction relative to the Sharpe ratio of the average fund in our sample. In contrast, a one standard deviation increase in vehicle passenger volume is associated with a 0.18 increase in fund annualized Sharpe ratio. Anecdotal evidence suggests that institutional investors emphasize performance metrics like the Sharpe ratio when evaluating fund managers. These empirical results broadly validate the advice given by hedge fund allocators to avoid managers who purchase fancy sports cars.

The sensation seeking story further predicts that the incremental risk taking by sensation seekers extends beyond financial markets. In line with this view, we find that managers who acquire cars with pro-sensation attributes exhibit heightened operational risk while managers who acquire cars with anti-sensation attributes exhibit lower operational risk. Specifically, controlling for a variety of factors that may affect fund behavior, performance car drivers are more likely to terminate their funds and report regulatory, civil, and criminal violations on their Form ADVs. Conversely, drivers of practical but unexciting cars are less likely to shut down their funds and report violations on their Form ADVs. Dimmock and Gerken (2012) document a strong relation between Form ADV violations and hedge fund fraud. In light of their findings,

these results suggest that the sensation seeking behavior that led hedge fund managers to purchase performance cars might also predispose them to fraud.

Does the desire for varied and novel experiences drive trading behavior amongst sensation seekers? We show that not only do sensation seeking hedge fund managers trade more frequently (Grinblatt and Keloharju, 2009), but they also trade more actively and engage in more unconventional strategies. In particular, relative to other car owners, owners of cars with pro-sensation attributes turnover their stock portfolios more often, load up more on non-index stocks, increase their Active Share (Cremers and Petajisto, 2009) vis-à-vis the S&P 500, and exhibit lower R-squareds with respect to the Fung and Hsieh (2004) risk factors. The opposite holds for owners of cars with anti-sensation attributes. The heightened trading activity of sensation seekers hurts performance. Performance car owners reduce their net returns through trading more than do non-performance car owners, which suggests in the spirit of Barber and Odean (2000, 2001) that sensation seekers may be more overconfident than non-sensation seekers.

The results suggest that hedge fund managers' preference for sensation seeking drives the financial and operational risks of the funds that they manage. By doing so we contribute to the literature on hedge fund financial risks, which has concentrated on extrinsic and pecuniary reasons for bearing risk. For example, Agarwal and Naik (2004) and Fung and Hsieh (2004) show that hedge fund returns can be explained by a variety of systematic risk factors including the option-based factors alluded to by Mitchell and Pulvino (2001), Fung and Hsieh (2001), and others. Sadka (2010) and Teo (2011) find that hedge funds often take on liquidity risk so as to earn the liquidity risk premium (Pástor and Stambaugh, 2003), while Kosowski, Buraschi, and Trojani (2014) and Bali, Brown, and Caglayan (2014) argue that correlation risk and macroeconomic risks, respectively, explain the cross-section of hedge fund returns. Yet others

such as Aragon and Nanda (2012) and Buraschi, Kosowski, and Sritrakul (2014) contend that extrinsic factors such as past performance and fund incentives shape pecuniary risk taking. Unlike them, we explore an intrinsic and non-pecuniary driver of financial risk-taking amongst hedge fund managers, namely, the innate preference for sensation seeking.

This paper enriches our understanding of the sources of hedge fund operational risk. Work in this area has focused on assessing operational risk and its impact (Brown et al., 2008; 2009; 2012) or predicting hedge fund fraud (Bollen and Pool, 2012; Dimmock and Gerken, 2012). We show that innate personality traits such as sensation seeking can engender operational risk. Moreover, by uncovering a common driver for both operational and financial risk, we help rationalize Brown et al.'s (2009) finding of a significant and positive interaction between the two types of risk.

Our work also resonates with research in corporate finance on the influence of CEO personal characteristics such as military experience (Benmelech and Frydman, 2015), early life experience (Malmendier, Tate, and Yan, 2011; Bernile, Bhagwat, and Rau, 2016), and marital status (Love, 2010; Roussanov and Savor, 2014) on corporate outcomes. For example, Benmelech and Frydman (2015) find that military CEOs are associated with conservative corporate policies and ethical behavior while Bernile, Bhagwat, and Rau (2016) show that CEOs who experience fatal natural disasters in their childhood without extremely negative consequences lead firms that behave more aggressively. Like them, we show that manager personal characteristics drive risk-taking behavior in their professional lives.

The remainder of this paper is organized as follows: Section 2 provides a description of the data and methodology. Section 3 reports the results from the empirical analysis. Section 4 presents robustness tests while Section 5 concludes.

2. Data and methodology

We evaluate the impact of hedge funds using monthly net-of-fee returns and assets under management data of live and dead hedge funds reported in the Lipper TASS, Morningstar, Hedge Fund Research (henceforth HFR), and BarclayHedge data sets from January 1990 to December 2012.[7] Because Lipper TASS, Morningstar, HFR, and BarclayHedge started distributing their data in 1994, the data sets do not contain information on funds that died before December 1993. This gives rise to survivorship bias. We mitigate this bias by focusing on data from January 1994 onward.

In our fund universe, we have a total of 58,069 hedge funds, of which 33,680 are live funds and 24,389 are dead funds. However, due to concerns that funds with multiple share classes could cloud the analysis, we exclude duplicate share classes from the sample.[8] This leaves a total of 48,778 hedge funds, of which 28,290 are live funds and 20,488 are dead funds. The funds are roughly evenly split between Lipper TASS, Morningstar, HFR, and BarclayHedge. While 10,750 funds appear in multiple databases, many funds belong to only one database. Specifically, there are 11,408, 7,225, 10,648, and 8,747 funds unique to the Lipper TASS, Morningstar, HFR, and BarclayHedge databases, respectively. This highlights the advantage of

[7] The results are robust to using pre-fee returns. To derive pre-fee returns it is important to match each capital outflow to the relevant capital inflow when calculating the high-water mark and the performance fee. In our pre-fee return calculation, we assume as per Appendix A of Agarwal, Daniel, and Naik (2009) that capital leaves the fund on a first-in, first-out basis. To side step this issue, we prefer to work with the cleaner, reported net-of-fee returns in the paper.

[8] Inferences do not change when we include multiple share classes of the same fund in the analysis.

obtaining data from more than one source.[9] In addition to monthly return and size information, our sample also captures data on fund characteristics such as management fee, performance fee, redemption period, lock-up period, investment style, leverage indicator, high-water mark indicator, fund age, and fund location.

We hand-collect hedge fund manager vehicle purchase records and details from various websites. The website VIN place (vin.place) provides free access to vehicle purchase records. The data on VIN place are culled from dealerships and auto insurance companies, and captures the vast majority of new vehicle purchases in the United States.[10] We search for manager car purchases on VIN place using a name search, which we further refine by matching the city and state of the car buyer address with the location of the hedge fund management company.[11] From VIN place we obtain basic vehicle information including make, model, year, and vehicle identification number (henceforth VIN). Vehicle make denotes the automaker, e.g., Chevrolet, Ford, and Toyota, while vehicle model denotes the specific car model that is produced by the automaker, e.g., Corvette, Focus, and Camry.

To obtain additional information on the car purchased by the manager, we search on Autocheck (www.autocheck.com) for the VINs obtained from vin.place. Autocheck provides additional car details such as trim levels and body style. Vehicle trim levels specify the exact

[9] For funds in multiple databases, we follow a priority rule and only keep the observations from the highest priority database. We adopt the following priority rule for our fund data: Lipper TASS > Morningstar > HFR > BarclayHedge. We are motivated by the observation in Joenväärä, Kosowski, and Tolonen (2014) that Lipper TASS was the most widely used database by hedge fund researchers. They base their observation on 76 papers published in five frequently cited finance journals. We redo our baseline multivariate regression results using three alternative priority rules: (i) Morningstar > HFR > BarclayHedge > Lipper TASS, (ii) HFR > BarclayHedge > Lipper TASS > Morningstar, and (iii) BarclayHedge > Lipper TASS > Morningstar > HFR, and find virtually identical results.

[10] There are roughly 90 million records in the VIN place dataset from 2006 to 2012. This lines up with the roughly 90 million of total new car sales during that period reported by Autodata. See "US car sales set record in 2015," Wall Street Journal, 5 January 2016. However we do note that VIN place has an opt out policy and as such any individual can request that their car purchase records be removed. Thus, it is possible that our search will miss some managers who have opted out from the dataset.

[11] In the event we get mutiple matching car buyers based on a name, city and state match, we drop that observation from the sample.

variant within each car model. For example, trim levels for the Porsche 911 include Carrera S Coupe, GT3, Turbo, etc. Vehicle body style provides a brief description of physical structure of the vehicle, e.g., hatchback two-door, coupe two-door, sports van, etc. Autocheck also provides the full transaction history of the car, accident records, and maintenance records.

Finally using all available information from VIN place and Autocheck, we obtain car details such as maximum horsepower, maximum torque, passenger volume, Insurance Institute for Highway Safety (henceforth IIHS) average safety rating, and price (Manufacturer Suggested Retail Price or MSRP during year of sale) from websites such as cars.com (www.cars.com), cars-data (www.cars-data.com), and the IIHS (www.iihs.org).[12] In our analysis, to avoid look-ahead bias, we will focus on relating car purchases to hedge fund manager investment behavior after the purchase date where purchase date data are obtained from Autocheck.[13]

We categorize the cars in our sample into sports cars, minivans, and other cars based on body style. According to the Merriam-Webster dictionary, a sports car is a "low small usually two-passenger automobile designed for quick response, easy maneuverability, and high-speed driving" while a minivan is a "small passenger van". Therefore, we classify all vehicles with the "coupe two-door", "convertible two-door", or "hatchback two-door" body style as sports cars and classify all vehicles with the "passenger van", "sports van", or "extended sports van" body

[12] The IIHS is an independent, nonprofit, scientific, and educational organization dedicated to reducing losses – deaths, injuries, and property damage – from crashes on the nation's roads. They evaluate a car's crashworthiness based on five dimensions, namely, (i) small front overlap, (ii) moderate front overlap, (iii) side, (iv) roof strength, and (v) head restraints and seats. Along each dimension, the crashworthiness of the car is rated either as good, acceptable, marginal, or poor. To compute the IIHS average safety rating, we quantify the crashworthiness score using the rubric poor = 1, marginal = 2, acceptable = 3, and good = 4, and take the average across the five dimensions. See http://www.iihs.org/iihs.

[13] While the model year provides a rough guide for when the new car was purchased, Autocheck supplies both the year and month for when the car was first purchased. Most car models are first sold in the later part of the calendar year that precedes the model year. For example, new 2016 model year cars are generally sold beginning in the fall of 2015. In the event that the model year differs from the purchase year in Autocheck by more than one year, we drop that observation from the sample.

style as minivans.[14] We define as pro-sensation vehicle attributes: sports car, maximum horsepower, and maximum torque. Conversely, we define as anti-sensation vehicle attributes: minivan, passenger volume, and IIHS average safety rating. By including maximum horsepower and maximum torque in our list of pro-sensation car attributes, we help address concerns that some of the vehicles that we classify as sports cars based on body style are too underpowered to be considered bona fide sports cars.[15] We include passenger volume and safety rating in our list of anti-sensation car attributes based on the view that spacious and safe cars are often perceived as dull cars. In total, we are able to match 1,774 vehicles to 1,144 hedge fund managers in our sample of which 163 are sports cars and 101 are minivans.[16] Table 1 provides summary statistics of the vehicles that have been matched to the hedge fund managers in our sample. It indicates that there is significant cross-sectional heterogeneity in the body styles, horsepower levels, torque levels, passenger volumes, safety ratings, and prices of the vehicles bought by hedge fund managers.

[Insert Table 1 here]

Following Agarwal, Daniel, and Naik (2009), we classify funds into four broad investment styles: Security Selection, Multi-process, Directional Trader, and Relative Value. Security Selection funds take long and short positions in undervalued and overvalued securities, respectively, and reduce systematic risks in the process. Usually, they take positions in equity markets. Multi-process funds employ multiple strategies that take advantage of opportunities created by significant transactional events, such as spin-offs, mergers and acquisitions,

[14] In our sample, examples of sports cars include the Ferrari 458 Italia (coupe two-door), Aston Martin DBS (coupe two-door), Nissan GTR (coupe two-door), Lotus Elise (convertible two-door), and Volkswagen GTI (hatchback two-door) while examples of minivans include the Toyota Sienna (sports van), Honda Odyssey (sports van), and Chrysler Town and Country (sports van), Volkswagen Routan (passenger van), and Chevrolet Uplander (extended sports van).

[15] Examples of such cars may include the Hyundai Veloster (coupe two-door), Volkswagen EOS (convertible two-door), and the Mini Cooper (hatchback two-door).

[16] Inferences do not change when we confine the sample to fund managers who only purchase one car.

bankruptcy reorganizations, recapitalizations, and share buybacks. Directional Trader funds bet on the direction of market prices of currencies, commodities, equities, and bonds in the futures and cash markets. Relative Value funds take positions on spread relations between prices of financial assets and aim to minimize market exposure.

Hedge fund data are susceptible to many biases (Fung and Hsieh, 2000, 2009). These biases stem from the fact that, due to the lack of regulation of hedge funds, inclusion in hedge fund databases is voluntary. As a result, there is a self-selection bias. For instance, funds often undergo an incubation period in which they rely on internal funding before seeking capital from outside investors. Incubated funds with successful track records then go on to list in various hedge fund databases while the unsuccessful funds do not, resulting in an incubation bias. Separate from this, when a fund is listed on a database, it often includes data prior to the listing date. Again, because successful funds have a strong incentive to list and attract capital inflows, these backfilled returns tend to be higher than the non-backfilled returns. To concerns about backfill bias raised by Bhardwaj, Gorton, and Rouwenhorst (2014) and others, we also redo the tests after removing all return observations that have been backfilled prior to fund listing date, which necessitates that we confine the fund sample to databases with data on fund listing date, namely TASS and HFR.

Throughout this paper, we model the risks of hedge funds using the Fung and Hsieh (2004) seven-factor model. The Fung and Hsieh factors are the excess return on the Standard and Poor's (S&P) 500 index (*SNPMRF*); a small minus big factor (*SCMLC*) constructed as the difference between the Wilshire small and large capitalization stock indexes; the yield spread of the US ten-year Treasury bond over the three-month Treasury bill, adjusted for duration of the ten-year bond (*BD10RET*); the change in the credit spread of Moody's BAA bond over the ten-

year Treasury bond, also appropriately adjusted for duration (*BAAMTSY*); and the excess returns on portfolios of lookback straddle options on currencies (*PTFSFX*), commodities (*PTFSCOM*), and bonds (*PTFSBD*), which are constructed to replicate the maximum possible return from trend-following strategies (see Fung and Hsieh, 2001) on their respective underlying assets.[17] These seven factors have been shown by Fung and Hsieh (2004) to have considerable explanatory power on hedge fund returns.

3. Empirical results

3.1. Cross-sectional analysis

To explore the impact of sensation seeking on fund risk-taking behavior, we first group our sample of hedge funds by each of the automobile attributes that relate to sensation seeking. Specifically, we sort funds based on whether the manager purchased (i) a sports car or a non-sports car, (ii) a high horsepower or a low horsepower car, and (iii) a high torque or a low torque car. We classify an automobile as a high horsepower car if its maximum horsepower lies at or above the median horsepower of the cars in our sample. Similarly, we categorize an automobile as a high torque car if its maximum torque lies at or above the median torque of the cars in our sample. Table 2 reports the average fund risk and idiosyncratic risk evaluated over the 24-month period post automobile purchase for each group of funds.[18] Fund idiosyncratic risk is the standard deviation of fund residuals from the Fung and Hsieh (2004) seven-factor model estimated over 24 months. For each fund group, Table 2 also reports the average hedge fund

[17] David Hsieh kindly supplied these risk factors. The trend-following factors can be downloaded from http://faculty.fuqua.duke.edu/~dah7/DataLibrary/TF-Fac.xls.

[18] Inferences do not change when we estimate risk and idiosyncratic risk over 36 months as opposed to over 24 months.

monthly returns, alpha, and flow, as well as fund attributes such as management fees, performance fees, lock-up period, redemption period, and assets under management (henceforth AUM).

[Insert Table 2 here]

The risk measures reported in Table 2 indicate that hedge fund managers who purchase sports cars, high horsepower cars, and high torque cars tend to take on more risk than do other hedge fund managers. On an annualized basis, sports car drivers take on 1.80 percentage points more risk than do non-sports car drivers, high horsepower car owners deliver returns that are 1.14 percentage points more volatile than do low horsepower car owners, and the returns of managers who purchase high torque cars are 1.25 percentage points more volatile than those of managers who purchase low torque cars. These results are economically significant. The 1.80 percentage point spread in risk between sports car and non-sports car drivers represents a 16.61 percent increase in volatility over that of non-sports car drivers. Moreover, for each car attribute sort, the spread in risk between the two groups of fund managers is statistically significant at the one percent level. These results are broadly consistent with the sensation seeking view. Inferences do not change when we analyze idiosyncratic risk suggesting that co-variation with the Fung and Hsieh (2004) seven factors cannot explain the spread in risk.

The other fund attributes, with the exception of fund AUM, do not appear to exhibit statistically reliable variation across groups. We find that fund managers who purchase sporty, high horsepower, and high torque cars tend to manage fewer assets than do fund managers who purchase non-sporty, low horsepower, and low torque cars. The difference in AUM is statistically different from zero at the five percent level for the horsepower and torque sorts.

Therefore, one concern with the above sort analysis is that if managers who run smaller funds also have greater risk appetites than do managers who run larger funds, the relationship between performance car ownership and fund size may mechanically explain why we find that performance car owners also tend to take on more investment risk in their professional lives.

To address such concerns, we estimate the following multivariate regression on fund risk:

$$RISK_{im+23,m} =$$
$$\propto +\beta_1 PROSENSATION_{im-1} + \beta_2 RISK_{m-1,m-24} + \beta_3 MGTFEE_i$$
$$+ \beta_4 PERFFEE_i + \beta_5 HWM_i + \beta_6 LOCKUP_i + \beta_7 LEVERAGE_i + \beta_8 AGE_{im-1}$$
$$+ \beta_9 REDEMPTION_i + \beta_{10} \log(FUNDSIZE_{im-1})$$
$$+ \beta_{11} STRATEGYDUM_i + \beta_{12} YEARDUM_{m-1} + \varepsilon_{im},$$

where *RISK* is the standard deviation of fund returns estimated over 24 months, *PROSENSATION* is a placeholder for fund manager pro-sensation seeking variables derived from the automobile ownership data, *MGTFEE* is fund management fee, *PERFFEE* is fund performance fee, *HWM* is fund high-water mark indicator, *LOCKUP* is fund lock-up period, *LEVERAGE* is fund leverage indicator, *AGE* is fund age since inception, *REDEMPTION* is fund redemption period, log(*FUNDSIZE*) is the natural logarithm of fund assets under management, *STRATEGYDUM* is the fund strategy dummy, and *YEARDUM* is the year dummy. We estimate three sets of regressions that correspond to the three pro-sensation seeking variables that we employ: (i) *SPORT*, an indicator variable that takes a value of one when the manager purchased a sports car and a value of zero otherwise, (ii) *POWER*, the maximum horsepower of the car purchased by the manager, and (iii) *TORQUE*, the maximum torque of the car purchased by the

manager. We also estimate regressions on fund idiosyncratic risk or the standard deviation of fund residuals from the Fung and Hsieh (2004) seven-factor model estimated over 24 months.[19]

[Insert Table 3 here]

Table 3 reports the coefficient estimates from the cross-sectional regressions on fund risk. The coefficient estimates on *SPORT*, *POWER*, and *TORQUE* indicate that after controlling for other variables that may explain fund risk-taking, hedge fund managers who purchase sporty, high horsepower, or high torque cars take on more risk than do other fund managers. Specifically, after controlling for other variables, managers who embrace sports cars deliver returns that are on an annualized basis 2.57 percentage points more volatile than do managers who eschew sports cars. Similarly, one standard deviation increases in maximum horsepower and maximum torque are associated with increases in annualized fund risk of 1.26 percentage points and 1.12 percentage points, respectively. These results are qualitatively unchanged when we adjust for co-variation with the Fung and Hsieh (2004) seven factors and evaluate idiosyncratic risk instead of total risk. The coefficient estimates on the other fund variables are largely statistically indistinguishable from zero. However we do find that funds that charge higher management fees tend to take on greater idiosyncratic risk. In addition, it is not surprising that funds that embrace leverage also tend to take on more risk, although the effects are again statistically reliable only for idiosyncratic risk.

Next, to investigate the relationship between the preference for sensation avoidance in the automobile market and investment risk, we first sort funds into groups based on the various anti-sensation vehicle attributes. We find in Table 2 that managers who acquire practical but

[19] Inferences remain unchanged when we evaluate risk and idiosyncratic risk over 36 months as opposed to over 24 months.

unexciting cars take on lower investment risk relative to other managers. For example, minivan owners generate returns that are 1.28 percentage points per annum less volatile than do other owners. This represents an economically meaningful 11.74 percent reduction in risk relative to managers who eschew minivans.[20]

Next, we estimate the following analogous multivariate regression on risk:

$$RISK_{im+23,m} =$$
$$\propto +\beta_1 ANTISENSATION_{im-1} + \beta_2 RISK_{m-1,m-24} + \beta_3 MGTFEE_i$$
$$+ \beta_4 PERFFEE_i + \beta_5 HWM_i + \beta_6 LOCKUP_i + \beta_7 LEVERAGE_i + \beta_8 AGE_{im-1}$$
$$+ \beta_9 REDEMPTION_i + \beta_{10} \log(FUNDSIZE_{im-1})$$
$$+ \beta_{11} STRATEGYDUM_i + \beta_{12} YEARDUM_{m-1} + \varepsilon_{im},$$

where *ANTISENSATION* is a placeholder for fund manager sensation avoidance variables derived from the automobile ownership data, and the other variables are as per previously defined. We estimate three sets of regressions that correspond to the three anti-sensation seeking variables that we employ: (i) *MINIVAN*, an indicator variable that takes a value of one when the manager purchased a minivan and a value of zero otherwise, (ii) *SPACE*, the passenger volume of the car purchased by the manager, and (iii) *SAFETY*, the IIHS average safety rating for the car purchased by the manager. For completeness, we also estimate regressions on fund idiosyncratic risk.

[Insert Table 4 here]

[20] While this spread is only statistically significant at the ten percent level, the corresponding spreads for the sorts on passenger volume and safaty rating are statistically significant at the one percent level.

The results reported in Table 4 indicate that, after controlling for other factors, hedge fund managers who eschew sensation seeking tend to take on less risk in the investment arena. In particular, minivan drivers deliver returns that are 2.21 percentage points per annum less volatile than do other drivers. Likewise, a one standard deviation increase in passenger volume translates to a 0.59 percentage points per annum reduction in risk while a one unit improvement in the average IIHS safety rating engenders a 0.75 percentage points per annum reduction in risk.

The results from the simple sort reported in Table 2 suggest that the incremental risk taking by performance car buyers does not translate to higher investment returns. Does the heightened risk tolerance of performance car buyers therefore result in lower Sharpe ratios for their funds? Anecdotal evidence indicates that investors rely on performance attributes such as the Sharpe ratio when evaluating hedge fund managers. To investigate, we estimate the following multivariate regression on fund Sharpe ratio:

$$SHARPE_{im+23,m} =$$

$$\propto +\beta_1 PROSENSATION_{im-1} + \beta_2 MGTFEE_i + \beta_3 PERFFEE_i + \beta_4 HWM_i$$
$$+ \beta_5 LOCKUP_i + \beta_6 LEVERAGE_i + \beta_7 AGE_{im-1} + \beta_8 REDEMPTION_i$$
$$+ \beta_9 \log(FUNDSIZE_{im-1}) + \beta_{10} STRATEGYDUM_i + \beta_{11} YEARDUM_{m-1} + \varepsilon_{im},$$

where *SHARPE* is average fund returns over and above the risk-free rate divided by the standard deviation of fund returns estimated over 24 months, and the rest of the variables are as per previously defined. We also estimate analogous regressions with the anti-sensation variables in place of the pro-sensation variables.

[Insert Table 5 here]

Table 5 reports the coefficient estimates from the regressions on fund Sharpe ratio. While the coefficient estimate on *SPORT* is unreliably different from zero, those on *POWER* and *TORQUE* are statistically significant at the five and one percent levels, respectively. We find that a one standard deviation increase in car maximum horsepower and torque precipitates a 0.177 and 0.184 decrease in fund annualized Sharpe ratio, respectively. These results are economically meaningful, given that the annualized Sharpe ratio of average fund in our sample is 0.84 with a standard deviation of 1.15. The coefficient estimates on the anti-sensation variables are also economically relevant and statistically reliable. They indicate that owners of practical but unexciting cars deliver higher Sharpe ratios than do other car owners. Specifically, minivan drivers generate annualized Sharpe ratios that are 0.34 higher than do non-minivan drivers. Taken together, our empirical results broadly validate the advice given out by hedge fund allocators to avoid fund managers who purchase fancy performance cars.

3.2. Operational risk

The results in the previous section indicate that performance car buyers take on more investment risk. If sensation seeking truly drives this relationship, and since the increased tolerance for risk by sensation seekers need not be confined to the financial markets, we should observe that performance car buyers also take on more operational risk. In this section, we explore differences between the operational risk of managers who purchase performance cars and that of managers who eschew performance cars by analyzing the cross-sectional determinants of fund termination and fraud.

Our analysis of fund termination is motivated by Brown et al. (2009) who find that operational risk is more significant than financial risk in explaining fund failure. Moreover, fund

termination is particularly relevant in the context of sensation seeking because sensation seekers' desire to pursue novel ideas and experiences (Zuckerman, 2007) may induce them to terminate their funds early so as to partake in new life experiences. To explore the relationship between performance car ownership and fund termination, we estimate logit regressions on an indicator variable for fund termination with the set of independent variables used in the Table 3 baseline regressions augmented with fund returns, risk, and flows calculated over the past 24 months. The indicator variable, *TERMINATION*, takes a value of one when a fund stops reporting returns for that month *and* states that it has liquidiated, and takes a value of zero otherwise. We limit the analysis to TASS and HFR funds since only TASS and HFR provide the reason for why a fund stopped reporting returns.[21] As per the baseline analysis, our main focus is on the dependent variables *SPORT*, *POWER*, and *TORQUE* which proxy for sensation seeking behavior by hedge fund managers in the automobile market.

[Insert Table 6 here]

The results reported in Table 6 indicate that, controlling for other factors that can explain fund termination, performance car buyers are more likely to terminate their funds than buyers who shun performance cars. The marginal effects from the logit regressions suggest that sports car drivers are 4.70 percent more likely to terminate their funds in any given year than are non-sports car drivers. Similarly, one standard deviation increases in maximum horsepower and torque are associated with a 1.96 percent and a 2.04 percent increase in the probability of fund termination in any given year, respectively. These results are economically meaningful given that the unconditional probability of fund termination in any given year is 6.04 percent. The

[21] Inferences do not change when we use the entire sample of funds and define *TERMINATION* as an indicator variable that takes a value of one when a fund stops reporting returns for that month and takes a value of zero otherwise.

coefficient estimates on *SPORT*, *POWER*, and *TORQUE* are all statistically significant at the one percent level. Table 6 also reports the results from analogous regressions on fund termination with the anti-sensation variables. It indicates that fund managers who own practical but unexciting cars are less likely to terminate their funds. The coefficient estimates on *MINIVAN*, *SPACE*, and *SAFETY* are all negative and statistically significant at the one percent level.

We note that seasoning appears to affect fund termination. The longer a hedge fund has been in existence, the more likely it is to survive. This is reminiscent of Chevalier and Ellison (1999) and Brown, Goetzmann, and Park (2001) who show that seasoned mutual fund managers and hedge fund managers, respectively, are less likely to be terminated. In the presence of seasoning, Lunde, Timmermann, and Blake (1999) argue that a semiparametric Cox hazard rate regression approach is more appropriate. Therefore, we also report in Table 6 coefficient estimates from a Cox Proportional Hazard model for fund termination. Inferences do not change when we adopt the Cox hazard rate regression approach. This confirms that our results are robust to the way we model fund survival.

An analysis of hedge fund fraud is pertinent in the context of sensation seeking given the connection between sensation seeking, crime, and delinquency (Zuckerman, 2007). Sensation seeking has been linked to delinquency by school attending adolescents (Romero, Luengo, and Sobral, 2001), criminal behavior by college students (Horvath and Zuckerman, 1993; Fischer and Smith, 2004), as well as escape attempts, disobedience, and violence by incarcerated delinquents (Farley and Farley, 1972; Farley, 1973). To explore the relationship between performance car ownership and the probability of hedge fund fraud, we estimate multivariate logit regressions on an indicator variable for Form ADV violations. The indicator variable *VIOLATION* takes a value

of one after a fund manager reports on her Form ADV file that she has been associated with a regulatory, civil, or criminal violation, and a value of zero otherwise.

Form ADV has to be filed by all investment advisors with at least US$100 million in AUM and may be voluntarily filed by investment advisors managing between US$25 million and US$100 million in AUM. It includes disclosure on all regulatory, civil, and criminal violations linked to the investment advisor over the past ten years. Our use of Form ADV information follows Brown et al. (2008) who employ Form ADV disclosures in their assessment of hedge fund operational risk, and Dimmock and Gerken (2012) who find that Form ADV disclosures have significant power to predict hedge fund fraud.

[Insert Table 7 here]

Table 7 reports the coefficient estimates and marginal effects from the logit regressions on *VIOLATION*. The set of control variables that we employ is analogous to that used in the baseline Table 3 regressions. Our focus is, as usual, on the pro-sensation dependent variables *SPORT*, *POWER*, and *TORQUE*. We find that consistent with the sensation seeking view, hedge fund managers who purchase performance cars are also more likely to report on their Form ADVs that they have been associated with past regulatory, civil, and criminal violations. The coefficient estimates on the *SPORT*, *POWER*, and *TORQUE* are all positive and statistically significant at the five or one percent level. The marginal effects indicate that owners of sports cars are 17.3 percentage points more likely to report a violation on their Form ADVs than are owners of other cars. In light of the findings of Dimmock and Gerken (2012), these results suggest that the behavior that led fund managers to purchase performance cars might also predispose hedge fund managers to fraud.

To investigate the impact of sensation avoidance on the probability hedge fund fraud, we estimate analogous regressions on *VIOLATION* with the anti-sensation variables. The results reported in Table 7 indicate that managers who own practical but unexciting vehicles are less likely to report a violation on their Form ADVs. The coefficient estimates on *MINIVAN*, *SPACE*, and *SAFETY* are all negative and statistically significant at the five percent level. The marginal effects reveal that minivan owners are 44.6 percent less likely to report a violation on their Form ADVs than are other car owners.

3.3. Trading behavior

Sensation seekers are driven by their desire for novel and varied experiences. To the extent that the performance car ownership reveals a propensity for sensation seeking, we should observe that performance car buyers trade more often, purchase more unusual stocks, and engage in more unconventional strategies. Conversely, to the extent that the ownership of a practical but unexciting minivan reflects a propensity for sensation avoidance, we should observe that minivan buyers trade less often, purchase more commonly held stocks, and engage in more conventional strategies.

To investigate, we construct four trading behavior metrics from fund manager long-only quarterly stock holdings to measure how active a fund manager is: *TURNOVER*, *NRSQUARED*, *NONSPRATIO*, and *ACTIVESHARE*. The metric *TURNOVER* is the annualized turnover of a hedge fund manager's stock portfolio. *NRSQUARED* is one minus the *R*-squared from the regression of fund excess returns against the Fung and Hsieh (2004) seven factors. *NONSPRATIO*, derived from quarterly stock holdings, is the ratio of the number of non-S&P 500 index stocks bought in a quarter to the total number of new positions in the quarter.

ACTIVESHARE is Active Share as defined in Cremers and Petajisto (2009) relative to the S&P 500. The trading behavior metrics are defined such that an increase in any of them represents a more active or unconventional portfolio. We compute the trading behavior metrics for hedge funds sorted by the pro- and anti-sensation attributes and compute the spread between different groups of funds.

[Insert Table 8 here]

The results reported in Table 8 indicate that consistent with the sensation seeking view, owners of cars with pro-sensation qualities trade more often, purchase more non-index stocks, exhibit lower R-squareds relative to the Fung and Hsieh (2004) seven-factor model, and increase their Active Share vis-à-vis the S&P 500. The reverse holds for owners of cars with anti-sensation qualities. We argue that the preference amongst performance car owners for non-index stocks and for unconventional strategies that deliver low R-squareds reflects their desire for novel and varied experiences. These results add to the findings of Grinblatt and Keloharju (2009) who document that amongst Finnish individual investors, sensation seekers trade more frequently than do non-sensation seekers. We show that amongst U.S. hedge fund managers, not only do sensation seekers trade more often, but they also trade more actively and partake in more unconventional strategies than do non-sensation seekers.

3.4. Overconfidence

Are sensation seekers also more overconfident? Grinblatt and Keloharju (2009) provide prima facie evidence that sensation seeking may be related to overconfidence. They show that just like overconfident individual investors, sensation seeking individual investors also trade more frequently. Therefore, since men are more likely to engage in sensation seeking activities

than are women (Zuckerman, 1994), they argue that sensation seeking may explain the finding by Barber and Odean (2001) that men trade more than women. However, to establish the link between overconfidence and sensation seeking, it is not sufficient to investigate trading frequency or turnover. It is also important to test for the performance implications of trading.

In that effort, we test for differences in own-benchmark adjusted returns (Barber and Odean, 2000; 2001) between groups of fund managers sorted by the pro- and anti-sensation vehicle attributes. We define *OVERCONFIDENCE* as the difference between the return of the fund portfolio held at the end of the prior year and the returns of the actual portfolio of stocks held by a hedge fund. This is simply the negative of the own-benchmark adjusted return used in Barber and Odean (2000; 2001) and is defined so that it increases in overconfidence. The results reported in Table 8 indicate that sensation seekers are more likely to succumb to overconfidence, at least based on the metrics employed by Barber and Odean (2000; 2001).[22]

3.5. Alternative explanations

An alternative explanation for our baseline results is that the act of buying or driving a car instead of telegraphing a manager's preference for sensation seeking actually begins to change her tolerance for risk. Hedge fund managers may become more risk loving after driving performance cars or become more risk averse after driving minivans. To distinguish from this reverse causality story, we estimate multivariate regressions analogous to our baseline tests on risk estimated over the 24-month period *prior* to car purchase, and report the results in Panel A of Table 9. The coefficient estimates on the vehicle attributes are still economically meaningful

[22] We note that this does not necessarily imply that sensation seekers underperform non-sensation seekers. Indeed, Barber and Odean (2001) show that even though men trade more than women and lose more from trading than do women, their returns are not statistically different from those of women.

and statistically significant at the five percent level suggesting that reverse causality cannot drive the bulk of our results.

[Insert Table 9 here]

Yet another explanation is that the car variables we study may proxy for manager social status or wealth as opposed to sensation seeking. Casual empiricism suggests that performance cars typically cost more than minivans. Indeed, in our sample, price or MSRP is positively correlated to maximum horsepower ($\rho = 0.759$) and maximum torque ($\rho = 0.661$), but negatively correlated to the indicator variable for minivan ($\rho = -0.069$). According to Piff et al. (2012), higher social class predicts increased unethical behavior. They find that drivers in higher status cars (based on vehicle make, age, and appearance) are more likely to cut off other vehicles at busy four-way intersection with stop signs on all sides and are also more likely to not stop for pedestrians at a crosswalk. They argue that the unethical tendencies of upper class individuals are driven in part by their more favorable attitudes toward greed. One view therefore is that greed amongst high status drivers may in turn drive them to take on more investment risk.

To investigate the social status view, we control for vehicle price in the baseline regressions. The coefficient estimates on the sensation variables reported in Panel B of Table 9 indicate that even after accounting for the explanatory power of price, risk is still positively related to the pro-sensation variables, and negatively related to the anti-sensation variables. We find mixed support for the social status view. In the presence of the *PROSENSATION* variables, the coefficient estimates on price in the risk regressions are positive and statistically significant at the five or one percent level. However, in the presence of the *ANTISENSATION* variables, the coefficient estimates on price often turn negative and are no longer statistically different from

zero. To further control for the impact of social status, we cull data on fund manager home prices. The value of a fund manager's home provides a good proxy for her wealth and social status.[23] Next, we redo the baseline risk regressions with home value as an additional independent variable. The results reported in Panel C of Table 9 indicate that inferences remain unchanged after controlling for social status in this fashion.

Marital status may explain our results. Some hedge fund managers may purchase practical, spacious, and safe cars such as minivans for their partners who have to ferry children to and from school, enrichment classes, or sports practices. Consequently, the indicator variables *SPORT* and *MINIVAN* may proxy for marital status as opposed to sensation avoidance. In light of the finding by Love (2010) and Roussanov and Savor (2014) that single men tend to take on more risk than married men, our baseline results may be driven more by marital status than by sensation seeking. To test this alternative hypothesis, we first merge our data with marriage and divorce data that are publicly available for 13 states in the U.S.[24] We are able to obtain the marital records for 68 out of the 273 funds that operate in the 13 states.[25] We find, after including an indicator variable for married i.e., *MARRIED*, at the time of car purchase in our baseline regressions, that the coefficient estimates on the pro-sensation and anti-sensation variables are still statistically significant at the five percent level, suggesting that our results are not simply a by-product of marital status. We report these findings in Panel D of Table 9.

[23] We believe that, manager homes are superior to say manager yachts for assessing social status because managers are less likely to purchase a home for sensation seeking reasons. Conversely, some luxury yachts have performance features that may appeal to sensation seekers. See, for example, www.pershing-yacht.com.

[24] The 13 states that publicly disclose marital records are Arizona, California, Colorado, Connecticut, Florida, Georgia, Kentucky, Nevada, North Carolina, Ohio, Pennsylvania, Texas, and Virginia. See Lu, Ray, and Teo (2016) for more information on this data.

[25] We assume that the fund managers who operate in the 13 states and who do not have marriage or divorce records are not married.

Manager age may also account for our results. Barber and Odean (2001) show that younger retail investors take more risk than do older retail investors.[26] The younger car buyer may gravitate towards sports cars given their youthful and vibrant designs. Conversely, the older car buyer may eschew the tighter confines and harsher suspensions of sports cars, and prefer the space and softer suspensions of minivans. Consequently, the coefficient estimates on *SPORT* and *MINIVAN* from the baseline regressions on fund risk may capture the effects of manager age instead. While we have controlled for fund age, that in itself may not adequately proxy for manager age. To account for manager age, we cull data on fund manager date of birth from the Peoplewise website (www.peoplewise.com). We are able to obtain date of birth information for about 25 percent of the fund managers in our sample. Next, we redo the baseline regressions for this subsample of fund managers after including an additional independent variable for manager age. The results reported in Panel E of Table 9 indicate that inferences remain unchanged with the adjustment for manager age.[27]

4. Robustness tests

4.1. Serial correlation in fund returns

Serial correlation in fund returns could arise from linear interpolation of prices for illiquid and infrequently traded securities or the use of smoothed broker dealer quotes. If managers who eschew performance cars hold more illiquid securities that are infrequently traded, this could explain why we find that their reported returns are less volatile than those of managers who purchase performance cars. To allay such concerns, we re-estimate the baseline

[26] See their Table III.

[27] While statistical significance falls with the reduction in sample size, the coefficient estimates on the pro-sensation and anti-sensation variables are of the same order of magnitude and sign as those from the baseline regressions. Moreover, half of the coefficient estimates remain statistically significant at the five percent level.

regressions after unsmoothing fund returns using the algorithm of Getmansky, Lo, and Makarov (2004). The results presented in Panel F of Table 9 indicate that our findings are robust to illiquidity induced serial correlation in fund returns.

4.2. Backfill bias

To cater to investors who typically prefer low risk hedge funds, fund management companies may be more inclined to list a hedge fund with steady returns than one with volatile returns, ceteris paribus. Therefore, backfilled returns (Liang, 2000; Fung and Hsieh, 2009; Bhardwaj, Gorton, Rouwenhorst, 2014) may be less volatile than non-backfilled returns. If hedge funds run by managers who eschew performance cars backfill their returns more than do hedge funds run by managers who purchase performance cars, this may explain why we find that the latter deliver more volatile returns. To address concerns stemming from backfill bias, we redo the baseline regressions on risk computed after fund listing. This necessitates that we confine the fund sample to TASS and HFR since only these databases provide data on fund listing date. The results reported in Panel G of Table 9 indicate that our findings are not driven by backfill bias.

4.3. Fund fees

The imputation of fund fees may cloud the estimation of risk. Therefore, it is helpful if we also analyze risk estimated from pre-fee returns. To derive pre-fee returns, it is important to match each capital outflow to the relevant capital inflow when calculating the high-water mark and the performance fee. In our pre-fee return calculation, we assume as per Appendix A of Agarwal, Daniel, and Naik (2009) that capital leaves the fund on a first-in, first-out basis. The results on risk derived from pre-fee returns are reported in Panel H of Table 9 and indicate that our findings are robust to the imputation of fees.

4.4. Automaker effect

Yet another concern is that our results may be driven by an automaker effect. Suppose some automakers, such as BMW, are more likely to produce performance cars while other automakers, such as Volvo and Toyota, are more likely to produce safe and practical cars. Moreover, for reasons not associated with sensation seeking, owners of BMWs take on more investment risk than do owners of Volvos or Toyotas. Then we could potentially observe the results reported in Tables 3 and 4 even in the absence of sensation seeking. To cater for such concerns, we include vehicle make fixed effects in our baseline multivariate regressions. The results reported in Panel I of Table 9 indicate that our inferences do not change when we account for the automaker effect.

4.5. Managers who own multiple vehicles

There are concerns that managers who own multiple vehicles may have purchased their second or third cars for their children, spouses, or significant others. This practice may cloud inferences made from the vehicles that they purchase. To sidestep such concerns, we confine the sample to hedge fund managers who according to the VIN place database purchase only one car during our sample period, and redo the baseline regressions. This reduces the number of hedge fund managers in the sample from 1,144 to 701. We find from the results reported in Panel J of Table 9 that inferences do not change when we confine the sample to fund managers who only purchase one car.

5. Conclusion

Sensation seeking has important implications for finance. It can explain why some CEOs take more business risk or why some CEOs generate better innovation outcomes. It can also account for why certain retail investors trade more frequently or why certain households take on riskier home loans. Yet despite the prevalence of sensation seeking behavior amongst investment management professionals, evidence that relates sensation seeking to the investment behavior of professional fund managers has remained elusive.

Using a novel dataset on automobile purchases by hedge fund managers, this paper exploits cross-sectional variation in vehicle attributes to investigate the effects of sensation seeking on investment behavior. We argue that the purchase of a powerful sports car signals the intent to drive in a spirited fashion and therefore conveys a propensity for sensation seeking. To our knowledge, this is the first empirical study that analyzes the implications of personal lifestyle choices on investment behavior.

Our results empirically validate the advice given by some hedge fund allocators to avoid managers who drive fancy sports cars. We find that hedge fund managers who own high performance cars take on more investment risk than do other fund managers. They do so without being compensated with higher returns. Therefore, performance car owners deliver lower Sharpe ratios than do non-performance car owners. The incremental risk-taking by sports car enthusiasts extends beyond financial markets to the fund operations arena as well. Sensation seekers are more likely to terminate their funds and report violations on their Form ADVs. The latter has been shown to be a reliable harbinger of hedge fund fraud. Sensation seeking also impacts fund manager trading behavior. Hedge funds managers who embrace powerful sports cars trade more frequently, actively, and unconventionally than do managers who eschew such cars. Trading

hurts the performance of sensation seekers more than it hurts the performance of non-sensation seekers. This suggests that sensation seekers may be more prone to overconfidence. Neither reverse causality nor manager attributes, such as age, social status, or marital status, can explain our findings.

This paper therefore provides a useful starting point for understanding the implications of personal lifestyle choices on investment management. The findings indicate that fund manager vehicle ownership data offer rich insights into their intrinsic and non-pecuniary motivations for taking financial and operational risk. Given that vehicle ownership information is readily available and our results are untainted by look-ahead bias, they also have significant practical relevance for hedge fund investors such as pension funds, endowments, and family offices, as well as hedge fund recruiters, consultants, and allocators.

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Table 1

Summary statistics

This table reports summary statistics on the vehicles that have been matched to the hedge fund managers in our sample. Vehicle purchase records are obtained from VIN place (vin.place) which culls data from dealerships and auto insurance companies and captures the vast majority of new vehicle purchases in the United States. VIN place supplies vehicle make, model, year, and vehicle identification number (henceforth VIN). Additional information on car details such as body trim and style are derived from Autocheck (www.autocheck.com). Other vehicle attribute data are obtained from websites such as cars.com (www.cars.com), cars-data (www.cars-data.com) and the Insurance Institute for Highway Safety (www.iihs.org). Sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. Minivans are vehicles with any of the following body styles: sports van, passenger van, and extended passenger van. IIHS average safety rating is the safety rating for the vehicle from the Insurance Institute for Highway Safety reported on a five point scale and averaged across five different dimensions, namely, (i) small front overlap, (ii) moderate front overlap, (iii) side, (iv) roof strength, and (v) head restraints and seats. Price is Manufacturer Suggested Retail Price or MSRP for the vehicle during year of sale. The sample period is from January 1994 to December 2015.

Vehicle attribute	Number of observations	Mean	Standard deviation	Minimum	Maximum
Sports car (indicator variable)	1,774	0.09	0.29	0.00	1.00
Maximum horsepower (bhp)	1,759	266.21	82.27	70.00	620.00
Maximum torque (pound-feet)	1,756	267.32	85.68	68.00	663.00
Minivan (indicator variable)	1,774	0.06	0.23	0.00	1.00
Passenger volume (cubic feet)	1,386	113.36	28.08	45.00	211.00
IIHS average safety rating	1,171	3.44	0.58	1.50	4.00
Price (US$)	1,761	39,621.47	25,650.53	9,990.00	386,500.00

Table 2

Sorts on hedge fund manager automobile attributes

This table reports performance, flows, risk, and characteristics for funds sorted on pro-sensation and anti-sensation vehicle attributes. The pro-sensation attributes are sports car, maximum horsepower, and maximum torque, while the anti-sensation attributes are minivan, passenger volume, and safety rating. Sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. Minivans are vehicles with any of the following body styles: sports van, passenger van, and extended passenger van. Safety rating is the average Insurance Institute for Highway Safety (IIHS) safety rating for the vehicle. There are 1,774 cars with matches to the hedge fund managers in our sample. For each of the following vehicle attributes: maximum horsepower, maximum torque, passenger volume, and IIHS average safety rating, we sort the vehicles into two groups based on the median value of that attribute in our sample. For example, high horsepower vehicles are vehicles whose maximum horsepower equals or exceeds the median horsepower of the cars in our sample. The other cars are classified as low horsepower cars. To minimize look ahead bias, all hedge fund performance, flow, risk, and characteristics are computed after the purchase date of the vehicle. Returns is fund monthly returns. Alpha is Fung and Hsieh (2004) seven-factor monthly alpha where factor loadings are estimated over the last 24 months. Flow is fund monthly flow. Total risk is the standard deviation of monthly returns, while idiosyncratic risk is the standard deviation of the monthly residuals from the Fung and Hsieh (2004) seven-factor regressions. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Panel A: Pro-sensation vehicle attribute	Sports car	Non-sports car	Spread	High horsepower	Low horsepower	Spread	High torque	Low torque	Spread
Number of funds	163	1,611		981	793		901	873	
Returns (%)	0.50	0.50	0.00	0.50	0.51	-0.01	0.51	0.49	0.02
Alpha (%)	0.20	0.20	0.00	0.19	0.20	-0.01	0.20	0.19	0.01
Flow (%)	0.54	0.50	0.04	0.39	0.64	-0.25	0.43	0.57	-0.14
Total risk (%)	3.65	3.13	0.52**	3.32	2.99	0.33**	3.35	2.99	0.36**
Idiosyncratic risk (%)	2.39	2.04	0.35**	2.16	1.99	0.17**	2.19	1.96	0.23**
Management fee (%)	1.38	1.42	-0.04	1.41	1.43	-0.02	1.40	1.43	-0.03
Performance fee (%)	16.64	17.08	-0.44	17.10	16.97	0.13	17.11	16.98	0.13
High-water mark (dummy)	0.79	0.84	-0.05	0.84	0.84	0.00	0.84	0.84	0.00
Fraction of funds with lock-ups	0.44	0.51	-0.06	0.49	0.52	-0.03	0.49	0.51	-0.02
Lock-up period (days)	275.03	244.85	30.18	244.13	250.95	-6.82	247.21	247.38	-0.17
Redemption period (days)	88.22	84.25	3.97	86.61	82.15	4.46	86.50	82.67	3.83
Leveraged (dummy)	0.68	0.64	0.04	0.63	0.67	-0.04*	0.63	0.67	-0.04
Assets under management (US$m)	515.24	818.37	-303.13	388.15	1,289.13	-900.98**	360.48	1,235.01	-874.53*
Panel B: Anti-sensation vehicle attribute	Minivan	Non-minivan	Spread	High passenger volume	Low passenger volume	Spread	High safety rating	Low safety rating	Spread
Number of funds	101	1673		1,105	669		676	495	
Returns (%)	0.56	0.50	0.06	0.51	0.48	0.03	0.46	0.51	-0.05
Alpha (%)	0.37	0.17	0.20**	0.19	0.17	0.02	0.16	0.24	-0.08
Flow (%)	0.98	0.47	0.51	0.41	0.65	-0.24	0.45	0.75	-0.30
Total risk (%)	2.78	3.15	-0.37	2.87	3.33	-0.46**	2.81	3.09	-0.28**
Idiosyncratic risk (%)	1.8	2.07	-0.27	1.88	2.20	-0.32**	1.88	2.09	-0.21**
Management fee (%)	1.55	1.41	0.14*	1.44	1.38	0.06	1.42	1.42	0.00
Performance fee (%)	17.2	17.03	0.17	17.11	16.93	0.18	17.02	17.70	-0.68
High-water mark (dummy)	0.86	0.84	0.02	0.85	0.82	0.03	0.85	0.84	0.01
Fraction of funds with lock-ups	0.42	0.51	-0.09	0.48	0.53	-0.05	0.49	0.52	-0.02
Lock-up period (days)	232.02	248.05	-16.03	248.15	246.01	2.14	229.10	256.31	-27.21
Redemption period (days)	61.29	86.03	-24.74**	84.90	84.16	0.74	83.26	81.97	1.29
Leveraged (dummy)	0.67	0.65	0.02	0.65	0.64	0.01	0.64	0.66	-0.02
Assets under management (US$m)	1,945.31	720.97	1,224.34	643.44	1,029.58	-386.14	502.82	1,564.75	-1,061.93

Table 3

Multivariate regressions on hedge fund risk with pro-sensation variables

This table reports coefficient estimates from multivariate regressions on hedge fund risk. The dependent variables are RISK and IDIORISK. RISK is standard deviation of monthly hedge fund returns. IDIORISK is the standard deviation of monthly hedge fund residuals from the Fung and Hsieh (2004) seven-factor residuals. RISK and IDIORISK are estimated over each non-overlapping 24-month period after the vehicle purchase month. The independent variables include pro-sensation vehicle attributes such as SPORT, POWER, and TORQUE. SPORT is an indicator variable that takes a value of one for sports cars, where sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. POWER is maximum horsepower in units of 100 bhp. TORQUE is maximum torque in units of 100 pound-feet. The other independent variables include fund characteristics such as management fee (MGTFEE), performance fee (PERFFEE), high-water mark indicator (HWM), lock-up period in years (LOCKUP), leverage indicator (LEVERAGE), fund age in years (AGE), redemption period in months (REDEMPTION), and log of fund size (log(FUNDSIZE)). We estimate AGE and FUNDSIZE as the average age and size of the fund, respectively, in each non-overlapping period. Controls are also included for past RISK and IDIORISK estimated over the 24-month period prior to vehicle purchase, as well as strategy and year fixed effects. The t-statistics, derived from standard errors clustered by fund, are in parentheses. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

	Dependent variable					
Independent variables	RISK	IDIORISK	RISK	IDIORISK	RISK	IDIORISK
SPORT	0.742**	0.384**				
	(4.95)	(3.80)				
POWER			0.441**	0.277**		
			(8.72)	(7.43)		
TORQUE					0.377**	0.244**
					(8.02)	(6.99)
$RISK_{m-1,m-24}$	0.631**		0.636**		0.635**	
	(17.44)		(17.55)		(17.66)	
$IDIORISK_{m-1,m-24}$		0.518**		0.521**		0.521**
		(17.28)		(17.61)		(17.72)
MGTFEE	0.106	0.149*	0.109	0.151*	0.100	0.144*
	(1.12)	(2.16)	(1.16)	(2.21)	(1.10)	(2.18)
PERFFEE	0.004	0.007	0.001	0.005	0.002	0.006
	(0.42)	(0.72)	(0.12)	(0.54)	(0.19)	(0.58)
HWM	-0.123	0.026	-0.176	-0.002	-0.158	0.010
	(-0.56)	(0.15)	(-0.81)	(-0.01)	(-0.73)	(0.06)
LOCKUP	0.021	0.069	0.071	0.101	0.055	0.091
	(0.19)	(0.88)	(0.67)	(1.30)	(0.52)	(1.18)
LEVERAGE	0.088	0.159	0.148	0.196*	0.118	0.177*
	(0.76)	(1.93)	(1.36)	(2.49)	(1.07)	(2.24)
AGE	-0.009	-0.010	-0.008	-0.009	-0.009	-0.010
	(-1.00)	(-1.41)	(-0.87)	(-1.28)	(-0.97)	(-1.34)
REDEMPTION	0.028	0.004	0.023	0.001	0.021	-0.001
	(1.33)	(0.24)	(1.15)	(0.04)	(1.06)	(-0.04)
log(FUNDSIZE)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.99)	(-1.40)	(-0.86)	(-1.27)	(-0.95)	(-1.33)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.469	0.470	0.486	0.486	0.482	0.485
N	2802	2796	2780	2774	2771	2765

Table 4

Multivariate regressions on hedge fund risk with anti-sensation variables

This table reports coefficient estimates from multivariate regression analysis of hedge fund risk. The dependent variables are RISK and IDIORISK. RISK is standard deviation of monthly hedge fund returns. IDIORISK is the standard deviation of monthly hedge fund residuals from the Fung and Hsieh (2004) seven-factor residuals. RISK and IDIORISK are estimated over each non-overlapping 24-month period after the vehicle purchase month. The independent variables include anti-sensation vehicle attributes such as MINIVAN, SPACE, and SAFETY. MINIVAN is an indicator variable that takes a value of one for minivans, where minivans are vehicles with any of the following body styles: sports van, passenger van, extended passenger van. SPACE is passenger volume in cubic feet. SAFETY is Insurance Institute for Highway Safety (IIHS) average safety rating. The other independent variables include fund characteristics such as management fee (MGTFEE), performance fee (PERFFEE), high-water mark indicator (HWM), lock-up period in years (LOCKUP), leverage indicator (LEVERAGE), fund age in years (AGE), redemption period in months (REDEMPTION), and log of fund size (log(FUNDSIZE)). We estimate AGE and FUNDSIZE as the average age and size of the fund, respectively, in each non-overlapping period. Controls are also included for past RISK and IDIORISK estimated over the 24-month period prior to vehicle purchase, as well as strategy and year fixed effects. The t-statistics, derived from standard errors clustered by fund, are in parentheses. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

	Dependent variable					
Independent variables	RISK	IDIORISK	RISK	IDIORISK	RISK	IDIORISK
MINIVAN	-0.637**	-0.475**				
	(-6.80)	(-5.45)				
SPACE			-0.611**	-0.365**		
			(-5.64)	(-4.12)		
SAFETY					-0.217**	-0.125*
					(-3.00)	(-2.25)
$RISK_{m-1,m-24}$	0.623**		0.618**		0.595**	
	(17.07)		(16.20)		(15.27)	
$IDIORISK_{m-1,m-24}$		0.516**		0.516**		0.488**
		(17.56)		(17.12)		(16.44)
MGTFEE	0.090	0.148*	0.082	0.131	0.100	0.172*
	(0.94)	(2.12)	(0.82)	(1.82)	(0.98)	(2.07)
PERFFEE	-0.002	0.003	-0.002	0.004	-0.002	-0.001
	(-0.22)	(0.27)	(-0.24)	(0.41)	(-0.15)	(-0.08)
HWM	-0.138	0.029	-0.140	0.054	-0.151	0.081
	(-0.67)	(0.17)	(-0.67)	(0.31)	(-0.71)	(0.46)
LOCKUP	0.062	0.093	0.104	0.118	0.110	0.136
	(0.62)	(1.25)	(1.02)	(1.50)	(1.03)	(1.63)
LEVERAGE	0.174	0.212**	0.190	0.230**	0.219	0.274**
	(1.68)	(2.75)	(1.75)	(2.94)	(1.88)	(3.23)
AGE	-0.006	-0.007	-0.001	-0.001	-0.004	-0.004
	(-0.63)	(-0.92)	(-0.10)	(-0.13)	(-0.42)	(-0.51)
REDEMPTION	0.023	0.002	0.013	0.000	0.042	0.020
	(1.08)	(0.11)	(0.61)	(0.01)	(1.85)	(1.07)
log(FUNDSIZE)	-0.032	-0.050*	-0.021	-0.057*	-0.036	-0.061*
	(-1.15)	(-2.24)	(-0.71)	(-2.48)	(-1.12)	(-2.42)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.498	0.497	0.505	0.503	0.504	0.500
N	2802	2796	2229	2224	1854	1850

Table 5
Multivariate regressions on hedge fund Sharpe ratio

This table reports coefficient estimates on multivariate regression analysis of hedge fund Sharpe ratio. The dependent variable is SHARPE which is fund Sharpe ratio, i.e., average monthly fund excess returns divided by standard deviation of monthly fund returns, estimated over each non-overlapping 24-month period after the vehicle purchase month. The independent variables include pro-sensation vehicles such as SPORT, POWER, and TORQUE, as well as anti-sensation vehicle attributes such as MINIVAN, SPACE, and SAFETY. SPORT is an indicator variable that takes a value of one for sports cars, where sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. POWER is maximum horsepower in units of 100 bhp. TORQUE is maximum torque in units of 100 pound-feet. MINIVAN is an indicator variable that takes a value of one for minivans, where minivans are vehicles with any of the following body styles: sports van, passenger van, extended passenger van. SPACE is passenger volume in cubic feet. SAFETY is Insurance Institute for Highway Safety (IIHS) average safety rating. The other independent variables include fund characteristics such as management fee (MGTFEE), performance fee (PERFFEE), high-water mark indicator (HWM), lock-up period in years (LOCKUP), leverage indicator (LEVERAGE), fund age in years (AGE), redemption period in months (REDEMPTION), and log of fund size (log(FUNDSIZE)). We estimate AGE and FUNDSIZE as the average age and size of the fund, respectively, in each non-overlapping period. Controls are also included for strategy and year fixed effects. The t-statistics, derived from standard errors clustered by fund, are in parentheses. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Independent variables	Dependent variable = SHARPE					
SPORT	-0.002					
	(-0.05)					
POWER		-0.062*				
		(-2.46)				
TORQUE			-0.062**			
			(-2.62)			
MINIVAN				0.099*		
				(2.55)		
SPACE					0.191**	
					(2.90)	
SAFETY						0.053*
						(2.38)
MGTFEE	-0.003	-0.005	-0.004	-0.001	0.001	0.001
	(-0.16)	(-0.24)	(-0.21)	(-0.06)	(0.05)	(0.09)
PERFFEE	0.008*	0.008*	0.008*	0.005*	0.005*	0.006*
	(2.10)	(2.14)	(2.16)	(2.30)	(2.22)	(2.04)
HWM	-0.004	-0.003	-0.003	-0.002	-0.007	-0.023
	(-0.08)	(-0.06)	(-0.07)	(-0.05)	(-0.15)	(-0.40)
LOCKUP	0.008	0.001	-0.000	0.001	0.005	-0.013
	(0.22)	(0.02)	(-0.01)	(0.02)	(0.15)	(-0.53)
LEVERAGE	-0.042	-0.050	-0.048	-0.036	-0.038	-0.013
	(-0.70)	(-0.81)	(-0.77)	(-0.92)	(-0.78)	(-0.34)
AGE	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003
	(-0.56)	(-0.53)	(-0.46)	(-0.84)	(-1.35)	(-1.08)
REDEMPTION	-0.008	-0.007	-0.007	-0.003	-0.003	-0.001
	(-1.08)	(-1.03)	(-1.02)	(-0.59)	(-0.58)	(-0.25)
log(FUNDSIZE)	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.56)	(-0.53)	(-0.46)	(-0.84)	(-1.35)	(-1.08)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.041	0.044	0.045	0.042	0.039	0.060
N	3,197	3,171	3,162	3,197	2,556	2,128

Table 6

Logit and Cox regressions on fund termination

This table reports coefficient estimates from multivariate logit and cox regressions on hedge fund termination. The dependent variable is TERMINATION which is takes a value of one after a hedge fund stops reporting and states that it has liquidated to the commercial databases and takes a value of zero otherwise. The independent variables include pro-sensation variables such as SPORT, POWER, and TORQUE, as well as anti-sensation vehicle attributes such as MINIVAN, SPACE, and SAFETY. SPORT is an indicator variable that takes a value of one for sports cars, where sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. POWER is maximum horsepower in units of 100 bhp. TORQUE is maximum torque in units of 100 pound-feet. MINIVAN is an indicator variable that takes a value of one for minivans, where minivans are vehicles with any of the following body styles: sports van, passenger van, extended passenger van. SPACE is passenger volume in cubic feet. SAFETY is Insurance Institute for Highway Safety (IIHS) average safety rating. The other independent variables include fund characteristics such as management fee (MGTFEE), performance fee (PERFFEE), high-water mark indicator (HWM), lock-up period in years (LOCKUP), leverage indicator (LEVERAGE), fund age in years (AGE), redemption period in months (REDEMPTION), and log of fund size (log(FUNDSIZE)). We estimate AGE and FUNDSIZE as the average age and size of the fund, respectively, in each non-overlapping period. Controls are also included for past RISK, RETURN, and FLOW estimated over the 24-month period prior to vehicle purchase, as well as strategy and year fixed effects. RISK is standard deviation of monthly hedge fund returns, RETURN is monthly fund return, and FLOW is monthly fund flow. The t-statistics, derived from standard errors clustered by fund, are in parentheses. The marginal effects for the logit regression are in brackets. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

	Dependent variable = TERMINATION											
Independent variables	Logit regressions						Cox regressions					
SPORT	0.748**						3.136**					
	(3.08)						(3.58)					
	[0.004]											
POWER		0.414**						1.721**				
		(5.89)						(4.97)				
		[0.002]										
TORQUE			0.329**						1.470**			
			(4.33)						(4.73)			
			[0.001]									
MINIVAN				-1.314**						0.243		
				(-3.10)						(-1.79)		
				[-0.004]								
SPACE					-0.601**						0.583*	
					(-3.02)						(-2.15)	
					[-0.003]							
SAFETY						-0.560**						0.446**
						(-3.82)						(-4.06)
						[-0.013]						
MGTFEE	0.278*	0.251*	0.229*	0.245*	0.243	0.288*	1.016	1.110	1.019	1.024	1.110	0.975
	(2.48)	(2.12)	(2.00)	(2.22)	(1.85)	(2.25)	(0.11)	(0.78)	(0.14)	(0.20)	(0.83)	(-0.15)
PERFFEE	0.008	0.000	0.004	0.012	0.010	0.013	1.034*	1.012	1.014	1.022*	1.020	1.023
	(0.69)	(0.02)	(0.36)	(1.30)	(0.77)	(0.95)	(2.42)	(0.84)	(1.03)	(2.09)	(1.33)	(1.42)
HWM	-0.620**	-0.642**	-0.565*	-0.710**	-0.609**	-0.724**	0.788	0.957	0.934	0.952	0.873	1.100
	(-2.73)	(-2.88)	(-2.45)	(-3.71)	(-2.75)	(-2.79)	(-0.91)	(-0.15)	(-0.24)	(-0.18)	(-0.54)	(0.27)
LOCKUP	-0.485**	-0.392**	-0.421**	-0.277*	-0.425**	-0.327**	0.847	0.857	0.869	0.857	0.770**	0.915
	(-4.10)	(-3.14)	(-3.42)	(-2.47)	(-3.40)	(-2.91)	(-1.47)	(-1.41)	(-1.21)	(-1.73)	(-2.71)	(-0.91)
LEVERAGE	0.051	-0.061	-0.149	-0.015	0.010	0.081	1.480**	1.177	1.024	1.189	1.347*	1.231
	(0.40)	(-0.48)	(-1.13)	(-0.13)	(0.08)	(0.59)	(2.80)	(1.25)	(0.18)	(1.29)	(2.30)	(1.36)
AGE	0.017	0.010	0.010	0.011	0.004	0.014	1.017	1.021	1.016	1.035**	1.009	1.002
	(1.73)	(1.02)	(1.01)	(1.13)	(0.40)	(1.30)	(1.59)	(1.68)	(1.33)	(2.95)	(0.73)	(0.11)
REDEMPTION	-0.007	-0.009	-0.007	-0.028	-0.001	-0.017	1.011	1.028	1.030	1.024	0.995	0.982
	(-0.32)	(-0.43)	(-0.31)	(-1.12)	(-0.08)	(-0.96)	(0.54)	(1.48)	(1.59)	(1.54)	(-0.26)	(-0.96)
log(FUNDSIZE)	-0.124**	-0.107**	-0.110**	-0.086**	-0.111**	-0.107**	0.848**	0.884**	0.875**	0.888**	0.912*	0.913*
	(-3.58)	(-3.09)	(-3.13)	(-2.58)	(-2.93)	(-2.81)	(-4.26)	(-3.20)	(-3.59)	(-2.77)	(-2.37)	(-2.23)
$RISK_{m-1,m-24}$	3.418	4.196	4.544	4.947	1.871	4.453	1.069	0.970	0.960	0.978	1.019	1.016
	(0.80)	(0.97)	(1.10)	(1.55)	(0.48)	(1.12)	(1.00)	(-0.39)	(-0.55)	(-0.25)	(0.24)	(0.20)
$RETURN_{m-1,m-24}$	-26.599**	-24.294**	-26.004**	-22.570**	-33.081**	-26.755**	0.577**	0.776*	0.715**	0.611**	0.587**	0.688**
	(-4.70)	(-4.55)	(-4.96)	(-4.78)	(-6.34)	(-5.30)	(-4.36)	(-2.18)	(-2.93)	(-3.28)	(-3.97)	(-3.08)
$FLOW_{m-1,m-24}$	-1.635	-0.812	-0.672	-0.457	-1.118	-1.911	1.047	1.014	1.011	1.038	1.013	0.931
	(-0.95)	(-0.56)	(-0.47)	(-0.36)	(-0.74)	(-1.11)	(1.23)	(0.31)	(0.29)	(1.46)	(0.32)	(-1.77)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.137	0.128	0.133	0.143	0.136	0.141	0.109	0.104	0.104	0.122	0.113	0.123
N	51511	41264	41008	30364	30815	26727	10288	8967	9142	5700	7416	5835

Table 7

Performance car ownership and Form ADV violations

This table reports coefficient estimates from multivariate logit regressions on an indicator variable for hedge fund FORM ADV violations. The dependent variable is VIOLATION which takes a value of one when the hedge fund manager reports on her Form ADV that she has been associated with a regulatory, civil, or criminal violation, and takes a value of zero otherwise. The independent variables include pro-sensation variables such as SPORT, POWER, and TORQUE, as well as anti-sensation vehicle attributes such as MINIVAN, SPACE, and SAFETY. SPORT is an indicator variable that takes a value of one for sports cars, where sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. POWER is maximum horsepower in units of 100 bhp. TORQUE is maximum torque in units of 100 pound-feet. MINIVAN is an indicator variable that takes a value of one for minivans, where minivans are vehicles with any of the following body styles: sports van, passenger van, extended passenger van. SPACE is passenger volume in cubic feet. SAFETY is Insurance Institute for Highway Safety (IIHS) average safety rating. The other independent variables include fund characteristics such as management fee (MGTFEE), performance fee (PERFFEE), high-water mark indicator (HWM), lock-up period in years (LOCKUP), leverage indicator (LEVERAGE), fund age in years (AGE), redemption period in months (REDEMPTION), and log of fund size (log(FUNDSIZE)). We estimate AGE and FUNDSIZE as the average age and size of the fund, respectively, in each non-overlapping period. Controls are also included for year fixed effects.The t-statistics, derived from standard errors clustered by fund, are in parentheses. The marginal effects are in brackets. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Independent variables	Dependent variable = VIOLATION					
SPORT	0.778**					
	(2.61)					
	[0.173]					
POWER		0.656**				
		(5.18)				
		[0.130]				
TORQUE			0.486**			
			(4.20)			
			[0.097]			
MINIVAN				-1.961**		
				(-4.50)		
				[-0.446]		
SPACE					-0.360	
					(-0.95)	
					[-0.065]	
SAFETY						0.024
						(0.12)
						[0.005]
MGTFEE	-0.374	-0.364	-0.379	4.325**	3.750**	4.030**
	(-1.06)	(-1.01)	(-1.07)	(12.25)	(10.89)	(9.71)
PERFFEE	-0.014	-0.012	-0.011	0.097**	0.100**	0.064**
	(-0.49)	(-0.43)	(-0.38)	(5.44)	(5.11)	(3.01)
HWM	-0.632	-0.788	-0.725	-0.872**	-1.487**	-0.727
	(-1.34)	(-1.62)	(-1.51)	(-2.58)	(-3.72)	(-1.78)
LOCKUP	-0.019	0.078	0.027	-0.585**	-0.492*	-0.352
	(-0.06)	(0.24)	(0.08)	(-3.38)	(-2.51)	(-1.67)
LEVERAGE	0.311	0.389	0.340	0.470*	0.534*	0.327
	(1.01)	(1.21)	(1.08)	(2.26)	(2.33)	(1.31)
AGE	0.012	0.009	0.007	-0.031	-0.028	-0.010
	(0.53)	(0.40)	(0.29)	(-1.86)	(-1.52)	(-0.52)
REDEMPTION	0.004	-0.007	-0.005	-0.003	0.013	-0.020
	(0.07)	(-0.10)	(-0.08)	(-0.06)	(0.26)	(-0.37)
log(FUNDSIZE)	0.186*	0.171*	0.168*	0.300**	0.348**	0.270**
	(2.50)	(2.28)	(2.22)	(4.88)	(4.93)	(3.64)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.062	0.099	0.079	0.409	0.371	0.352
N	624	618	615	826	645	530

Table 8
Trading behavior analysis

This table reports trading behavior metrics for funds sorted on pro-sensation and anti-sensation vehicle attributes. The pro-sensation attributes are sports car, maximum horsepower, and maximum torque, while the anti-sensation attributes are minivan, passenger volume, and safety rating. Sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. Minivans are vehicles with any of the following body styles: sports van, passenger van, and extended passenger van. Safety rating is the average Insurance Institute for Highway Safety (IIHS) safety rating for the vehicle. There are 1,774 cars with matches to the hedge fund managers in our sample. For each of the following vehicle attributes: maximum horsepower, maximum torque, passenger volume, and IIHS average safety rating, we sort the vehicles into two groups based on the median value of that attribute in our sample. For example, high horsepower vehicles are vehicles with maximum horsepower that equals or exceeds the median horsepower of the cars in our sample. The other cars are classified as low horsepower cars. The trading behavior metrics include TURNOVER, NRSQUARED, NONSPRATIO, and ACTIVESHARE. TURNOVER is the annualized turnover of a hedge fund managers long-only stock portfolio. NRSQUARED is one minus the R-squared from the regression of fund excess returns against the Fung and Hsieh (2004) seven factors. NONSPRATIO is the ratio of the number of non-S&P 500 index stocks bought in a quarter to the total number of new positions in the quarter. ACTIVESHARE is Active Share (Cremers and Petajisto, 2009) relative to the S&P 500. OVERCONFIDENCE, computed from fund long-only stock holdings, is the return of the fund had it not traded since the start of the year in excess of its actual return (Barber and Odean, 2000; 2001). The trading behavior metrics NRSQUARED, NONSPRATIO, and ACTIVESHARE are defined such that an increase in any one of them represents a more active or unconventional portfolio. To minimize look-ahead bias, all trading behavior metrics are computed after the purchase date of the vehicle. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Panel A: Pro-sensation car attributes	Sport	Non-sport	Spread	High horsepower	Low horsepower	Spread	High torque	Low torque	Spread
TURNOVER	0.232	0.171	0.061*	0.242	0.173	0.069*	0.233	0.180	0.053
NRSQUARED	0.682	0.617	0.065**	0.650	0.597	0.053**	0.637	0.607	0.030**
NONSPRATIO	0.716	0.672	0.044*	0.741	0.662	0.079**	0.724	0.678	0.046**
ACTIVESHARE	0.588	0.538	0.050**	0.596	0.540	0.056**	0.589	0.545	0.044**
OVERCONFIDENCE	0.069	0.044	0.025*	0.059	0.035	0.024**	0.048	0.046	0.002
Panel B: Anti-sensation car attributes	Minivan	Non-minivan	Spread	High passenger volume	Low passenger volume	Spread	High safety rating	Low safety rating	Spread
TURNOVER	0.085	0.212	-0.127**	0.151	0.191	-0.040*	0.177	0.175	0.002
NRSQUARED	0.586	0.653	-0.067**	0.625	0.676	-0.051*	0.649	0.659	-0.010
NONSPRATIO	0.612	0.705	-0.093**	0.643	0.705	-0.062**	0.679	0.682	-0.003
ACTIVESHARE	0.421	0.551	-0.130**	0.460	0.568	-0.108**	0.506	0.537	-0.031**
OVERCONFIDENCE	0.045	0.066	-0.022	0.053	0.077	-0.024**	0.061	0.072	-0.011

Table 9

Alternative explanations and robustness tests

This table reports coefficient estimates from multivariate regressions on hedge fund risk. The dependent variables are RISK and IDIORISK. RISK is standard deviation of monthly hedge fund returns. IDIORISK is the standard deviation of monthly hedge fund residuals from the Fung and Hsieh (2004) seven-factor residuals. RISK and IDIORISK are estimated over each non-overlapping 24-month period after the vehicle purchase month. The independent variables include pro-sensation vehicle attributes such as SPORT, POWER, and TORQUE, as well as anti-sensation vehicle attributes such as MINIVAN, SPACE, and SAFETY. SPORT is an indicator variable that takes a value of one for sports cars, where sports cars are vehicles with any of the following body styles: two-door coupe, two-door convertible, and two-door hatchback. POWER is maximum horsepower in units of 100 bhp. TORQUE is maximum torque in units of 100 pound-feet. MINIVAN is an indicator variable that takes a value of one for minivans, where minivans are vehicles with any of the following body styles: sports van, passenger van, extended passenger van. SPACE is passenger volume in cubic feet. SAFETY is Insurance Institute for Highway Safety (IIHS) average safety rating. The other independent variables include fund characteristics such as management fee (MGTFEE), performance fee (PERFFEE), high-water mark indicator (HWM), lock-up period in years (LOCKUP), leverage indicator (LEVERAGE), fund age in years (AGE), redemption period in months (REDEMPTION), and log of fund size (log(FUNDSIZE)). We estimate AGE and FUNDSIZE as the average age and size of the fund, respectively, in each non-overlapping period. Controls are also included for past RISK and IDIORISK estimated over the 24-month period prior to vehicle purchase, as well as strategy and year fixed effects. The coefficient estimates on the independent variables that not based on vehicle attributes are omitted for brevity. The t-statistics, derived from standard errors clustered by fund, are in parentheses. The sample period is from January 1994 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Dependent variable = RISK						Dependent variable = IDIORISK					
SPORT	POWER	TORQUE	MINIVAN	SPACE	SAFETY	SPORT	POWER	TORQUE	MINIVAN	SPACE	SAFETY
Panel A: Dependent variables evaluated over the two-year period prior to car purchase											
0.436**	0.182**	0.153**	-0.531**	-0.423**	-0.275**	0.272*	0.176**	0.152**	-0.478**	-0.409**	-0.164*
(2.93)	(3.59)	(3.26)	(-3.44)	(-2.60)	(-2.79)	(2.47)	(4.22)	(3.82)	(-2.89)	(-2.79)	(-2.01)
Panel B: Controlling for vehicle price											
0.445**	0.208*	0.159*	-0.641**	-0.618**	-0.207**	0.207*	0.138*	0.118*	-0.483**	-0.362**	-0.111
(2.85)	(2.27)	(2.15)	(-6.63)	(-5.76)	(-2.82)	(1.97)	(2.56)	(2.44)	(-5.43)	(-4.13)	(-1.96)
Panel C: Controlling for the purchase price of the manager's house											
1.633*	0.326*	0.238	-1.043**	-0.754*	-0.684*	0.709	0.183*	0.139	-0.653*	-0.312	-0.324
(2.37)	(2.33)	(1.84)	(-2.95)	(-2.36)	(-2.08)	(1.95)	(2.14)	(1.91)	(-2.44)	(-1.52)	(-1.41)
Panel D: Controlling for marital status											
0.762**	0.429**	0.378**	-0.649**	-0.760**	-0.224*	0.334*	0.282**	0.266**	-0.594**	-0.474**	-0.246**
(2.83)	(5.39)	(4.31)	(-4.03)	(-3.89)	(-2.04)	(2.03)	(4.89)	(4.19)	(-4.58)	(-2.98)	(-3.26)
Panel E: Controlling for manager age											
0.781	0.272*	0.200	-1.617**	-0.813	-0.513**	0.484*	0.161*	0.131	-0.546	-0.446	-0.418**
(1.66)	(2.15)	(1.87)	(-3.37)	(-1.90)	(-2.96)	(2.10)	(1.99)	(1.78)	(-1.17)	(-1.34)	(-2.89)
Panel F: Adjusted for serial correlation in fund returns											
0.416*	0.234*	0.173*	-0.689**	-0.713**	-0.248**	0.355	0.159*	0.167**	-0.685**	-0.464**	-0.026
(2.39)	(2.25)	(2.11)	(-6.54)	(-5.80)	(-3.35)	(1.55)	(2.46)	(3.03)	(-6.59)	(-3.52)	(-0.30)
Panel G: Adjusted for backfill bias											
0.465*	0.346**	0.211*	-0.751**	-0.822**	-0.230*	0.161	0.209**	0.136*	-0.551**	-0.519**	-0.104
(2.04)	(3.33)	(2.38)	(-6.76)	(-6.55)	(-2.50)	(1.19)	(3.35)	(2.54)	(-6.33)	(-5.35)	(-1.59)
Panel H: Prefee returns											
0.506**	0.228*	0.153	-0.746**	-0.749**	-0.218*	0.215*	0.129*	0.096*	-0.556**	-0.467**	-0.127*
(2.75)	(2.10)	(1.86)	(-6.43)	(-5.78)	(-2.57)	(1.99)	(2.13)	(1.99)	(-5.93)	(-5.00)	(-2.23)
Panel I: Includes vehicle make fixed effect											
0.418*	0.338**	0.324**	-0.572**	-0.691**	-0.182*	0.218	0.248**	0.247**	-0.488**	-0.371**	-0.108
(2.31)	(2.94)	(3.22)	(-4.82)	(-4.83)	(-2.23)	(1.74)	(3.06)	(3.28)	(-4.76)	(-3.16)	(-1.66)
Panel J: Fund managers who purchase only one car											
0.694**	0.410**	0.287**	-0.447**	-0.503**	-0.300**	0.393*	0.242**	0.190**	-0.238*	-0.196	-0.169
(2.88)	(5.63)	(4.11)	(-3.40)	(-2.92)	(-2.66)	(2.52)	(4.43)	(3.60)	(-1.97)	(-1.33)	(-1.84)