Sensation-Seeking Hedge Funds

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Abstract

Using a novel data set of hedge fund manager automobile purchases, we show that, motivated by sensation seeking, hedge fund managers often take risk for personal and non-pecuniary reasons. In line with the sensation seeking view, managers who own powerful sports cars take on more investment risk but do not deliver higher returns, resulting in lower Sharpe ratios. Moreover, funds managed by performance car owners exhibit higher operational risk and are more likely to fail. Performance car owners demonstrate other attributes associated with sensation seeking, such as a preference for lottery-like stocks, unconventional strategies, and active trading.

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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, February 2016[1]

Professional fund managers are supposed to take risks to enhance returns. In this paper, we show that, motivated by sensation seeking, fund managers often take substantial financial and operational risks for non-pecuniary reasons unrelated to performance. 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 experiences. It has been linked to the propensity to engage in risky driving, extreme sports, substance abuse, and crime (Zuckerman, 1994; 2007).[2] The emerging academic literature on the role of sensation seeking in finance finds that sensation-seeking Finnish retail investors (Grinblatt and Keloharju, 2009) and U.S. households (Bochkay et al., 2017) trade more often and exhibit riskier economic behavior in the housing loan market, respectively, while sensation-seeking chief executive officers (henceforth CEOs) generate better innovation outcomes (Sunder, Sunder, and Zhang, 2017) and take on more business risk (Cain and McKeon, 2016). Yet little is known about the impact of sensation seeking on the trading behavior of professional investors. This paper fills this void by gauging their proclivity for sensation seeking via automobile ownership data and analyzing their investment behavior.

The hedge fund industry is an important and interesting laboratory for exploring the

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

[2]While sensation seeking may imply greater risk taking, the taking of risk does not necessarily imply sensation seeking. The elevated risk taking of sensation seekers is simply a by-product of their preference for varied, novel, complex, and intense experiences. Zuckerman (2007) notes "...sensation seekers do not seek risk for its own sake. It is not the riskiness of their activities that make them rewarding. In fact, many or most experiences sought by sensation seekers are not at all risky. Listening to rock music; partying with interesting, stimulating people; and looking at intensely erotic or violent movies or television involve no risk. However, other types of activities such as driving very fast, engaging in extreme sports, getting drunk or high on drugs, and having unprotected sex with a variety of partners, do involve risk."

impact of sensation seeking on finance. Hedge funds collectively managed over US$3 trillion in assets in 2016.[3] 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.[4] Neuroscientists have found that in the human brain, monetary gain stimulates the same reward circuitry as cocaine (Breiter et al., 2001). Sensation seekers may also be drawn to the industry's limited transparency and regulatory oversight, which imply fewer constraints on trading behavior. Consistent with this view, some hedge fund managers routinely engage in extreme sports.[5] 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 manager raises red flags about her fund (Strachman, 2008).

Prior research has used data on speeding tickets (Grinblatt and Keloharju, 2009), pilot licenses (Cain and McKeon, 2016; Sunder, Sunder, and Zhang, 2017), and extramarital affairs (Bochkay et al., 2017) 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 or pilot licenses, we are able to leverage on a multiplicity and continuum of signals that increase the power of our tests.[6] We argue that the purchase of a powerful sports car, more often than not, conveys the intent to drive

[3]See https://www.barclayhedge.com/research/indices/ghs/mum/HF_Money_Under_Management.html.

[4]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.

[5]Portfolio managers who participate in extreme sports include Pierre Andurand from Andurand Capital Management (kickboxing), Philippe Jabre of Jabre Capital Partners (alpine skiing), Kah Shin Leow of Quantedge (ultra-marathons), and Christian Zugel 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, "Former Bermuda hedge fund manager enjoys success in new Singapore venture," The Royal Gazette, 10 January 2011, and "Hedge funder who loves racing and investing," Hedge Fund News, 6 June 2012.

[6]Moreover, this allows us to sidestep concerns about how travel mileage, traffic enforcement activity, situational awareness behind the wheel, and access to a good lawyer, as well as the use of radar-detecting and laser-jamming devices can affect the probability of receiving a traffic citation conditional on speeding.

in a spirited fashion and therefore signals an inclination for sensation seeking.[7] Jonah (1997) reviews the link between sensation seeking and risky driving. Conversely, we contend that the acquisition of a practical but unexciting vehicle such as a minivan reflects an aversion to sensation seeking.[8]

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, even after controlling for past fund investment risk. Specifically, sports car drivers deliver returns that are 1.80 percentage points per annum or 16.61 percent more volatile than do non-sports car drivers. Similarly, funds managed by drivers of high horsepower and high torque automobiles exhibit more volatile returns. Conversely, we find that managers who acquire practical but unexciting cars take on less investment risk relative to managers who shun these cars. Minivan owners, for example, generate returns that are 1.28 percentage points per annum or 11.74 percent less volatile than do other owners. Moreover, managers who purchase cars with high passenger volumes and excellent safety ratings also produce more stable returns. Importantly, the incremental risk-taking by sensation seekers does not benefit their clients. 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 such cars. Consequently, buyers of cars with pro-sensation attributes (sports car ownership, horsepower, and torque) deliver lower Sharpe ratios than do buyers of cars with anti-sensation attributes (minivan ownership, passenger volume, and safety rating). For example, sports car owners generate annualized Sharpe ratios that are on average 0.34 lower than those generated by other car owners. This represents a 40 percent reduction relative to the Sharpe ratio of the average fund in our sample.

The disinhibition and boredom susceptibility of sensation seekers imply that they may

[7] In an ideal world, we would assess hedge fund managers by using the battery of tests developed in the psychology literature to gauge sensation seeking (see Zuckerman (2007)). However as Brown et al. (2012) have shown, hedge fund managers may not always tell the truth.

[8] Articles in the popular press that describe minivans as dowdy, stodgy, and uncool, lend support to this view. See, for example, "Operation: minivan," Wall Street Journal, 1 August 2003.

cut corners on compliance and other record-keeping functions, leading to higher operational risk, which hurts their clients. In line with this view, we find that performance car drivers are more likely to terminate their funds, even after controlling for their elevated financial risk. They are also more likely to disclose regulatory actions as well as civil and criminal violations on their Form ADVs. Moreover, performance car owners exhibit higher ω-Scores, a univariate measure of operational risk exposure (Brown et al., 2009). These results suggest that sensation-seeking hedge fund managers may be more predisposed to fraud (Dimmock and Gerken, 2012).

We show that the desire for varied, novel, complex, and intense experiences drives trading behavior amongst those hedge fund managers we identify as sensation seekers. Relative to other car owners, owners of cars with pro-sensation attributes turn over their stock portfolios more often, load up more on non-index stocks, increase their Active Share vis-à-vis the S&P 500 (Cremers and Petajisto, 2009), exhibit lower R-squareds with respect to the Fung and Hsieh (2004) risk factors, engage in more distinctive strategies (Sun, Wang, and Zheng, 2012), and prefer lottery-like stocks with high past daily returns (Bali, Cakici, and Whitelaw, 2011). The opposite holds for owners of cars with anti-sensation attributes. Moreover, we find that the preference for active trading, unconventional strategies, and lottery-like stocks explains the elevated financial risk of performance car owners.

Why do investors continue to subscribe to hedge funds managed by sensation seekers given their lower Sharpe ratios and higher operational risks?[9] We find that sensation-seeking funds of hedge funds (henceforth FoFs) tend to take on more non-pecuniary risk and load-up more on sensation-seeking hedge funds. Conversely, sensation-avoiding FoFs tend to take on less non-pecuniary risk and load-up less on sensation-seeking hedge funds. These results suggest that sensation seeking may drive investor preference for sensation-seeking fund managers.

Our results cannot be attributed to the usual factors that shape hedge fund investment behavior such as fund share restrictions (Aragon, 2007), incentives (Agarwal, Daniel, and

[9]Conversations with asset managers reveal that many fund investors ask for information about car ownership as part of their fund manager due diligence review.

Naik, 2009), age (Aggarwal and Jorion, 2010), size (Berk and Green, 2004), and systematic risk (Fung and Hsieh, 2004). Our findings are also not driven by other factors such as backfill bias (Fung and Hsieh, 2009; Bhardwaj, Gorton, and Rouwenhorst, 2014) and serial correlation in fund returns (Getmansky, Lo, and Makarov, 2004) that could cloud inferences made from reported returns. We carefully consider several alternative explanations, including reverse causality, sample selection, endogeneity, gender, social status (Piff et al., 2012), peer effects, marital status (Love, 2010; Roussanov and Savor, 2014), and manager age, but find that they are unlikely to drive our findings.

The results suggest that sensation-seeking fund managers do not always take risk to enhance returns. By doing so, we contribute to the literature on hedge fund financial risks, which has hitherto concentrated on extrinsic and pecuniary reasons for bearing risk. For example, Mitchell and Pulvino (2001), Agarwal and Naik (2004), and Fung and Hsieh (2001; 2004) show that hedge fund returns can be explained by a variety of systematic risk factors including option-based factors. Sadka (2010) finds that hedge funds often take on liquidity risk so as to earn the liquidity risk premium, 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–specifically, 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 preference for sensation seeking.

This paper deepens 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, one instance of operational risk (Dimmock and Gerken, 2012; Bollen and Pool, 2012). We show that innate personality traits such as sensation seeking can have operational risk implications. 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 personal leverage (Cronqvist, Makhija, and Yonker, 2012), marital status (Roussanov and Savor, 2014), military experience (Benmelech and Frydman, 2015), frugality (Davidson, Dey, and Smith, 2015), and early life experience (Malmendier, Tate, and Yan, 2011; Bernile, Bhagwat, and Rau, 2017) on corporate outcomes. While those studies show that manager personal characteristics drive risk-taking behavior in their professional lives, our hedge fund analysis allows us to gain further insights into the types of risk that are taken and the consequences of sensation-seeking behavior.

Lastly, the results enrich the behavioral finance literature. We complement work by Grinblatt and Keloharju (2009) who analyze the impact of sensation seeking on the trading frequency of Finnish retail investors but do not investigate risk. Unlike them, we focus on the non-pecuniary financial and operational risks of professional hedge fund managers. Non-pecuniary risk taking benefits sensation-seeking fund managers at the expense of their underlying investors. Therefore, in the context of sensation seeking, an analysis of risk is arguably even more important for investment managers than for individual investors, whose risk taking activities do not impose negative externalities on others. Unlike Grinblatt and Keloharju (2009), we also show that sensation seekers trade more actively and unconventionally, have a stronger preference for lottery-like stocks, and lose more from trading per se than do non-sensation seekers. Indeed, the last finding bolsters the view expounded by Grinblatt and Keloharju (2009) that the overconfidence findings of Barber and Odean (2000; 2001) may be ascribed to sensation seeking. In general, we contribute to the nascent literature on sensation seeking in finance by (i) showing that the incremental risk taking of sensation seekers extends beyond financial risk into the operational risk arena, (ii) linking sensation seeking to the preference for active trading, unconventional strategies, and lottery-like stocks, and (iii) documenting a novel sensation avoidance effect via the anti-sensation

vehicle attributes that we analyze.[10]

The remainder of this paper is organized as follows. Section 2 describes the data and methodology. Section 3 reports the empirical results. Section 4 presents robustness tests while Section 5 concludes.

2 Data and methodology

We hand-collect hedge fund manager vehicle purchase records and details from various websites. VIN place (vin.place) provides free access to new vehicle purchase records from 2006 to 2012. The data are culled from dealerships and auto insurance companies, and capture the vast majority of new vehicle purchases in the United States.[11] 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 with the location of the hedge fund management company.[12] 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, while vehicle model denotes the specific model produced, e.g., Corvette.

To obtain additional information, we search on Autocheck (www.autocheck.com) with the VINs obtained from vin.place. Autocheck provides car details such as trim levels and body style. Vehicle trim levels specify the exact variant within each car model. For example,

[10]Grinblatt and Keloharju (2009) principally use a discrete variable–the number of speeding tickets–to proxy for sensation seeking while Cain and McKeon (2016) and Sunder, Sunder, and Zhang (2017) use a binary variable–whether a CEO has a pilot's license–as a proxy. In contrast, we use multiple, and often continuous, vehicle attributes to proxy for sensation seeking. We note that in an untabulated robustness test (pp. 575), Grinblatt and Keloharju (2009) also use an indicator variable–sports car ownership–to gauge sensation seeking. They define sports cars as vehicles with power-to-weight ratios in excess of 125 kW per metric ton (based on our conversations with Matti Keloharju). We define sports cars as two-door coupes, two-door convertibles or two-door hatchbacks, and use sports car ownership as one of our three pro-sensation variables. However, we also analyze the continuous variable–vehicle horsepower-to-weight ratio–as an alternative proxy for sensation seeking and obtain very similar results.

[11]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 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.

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

trim levels for the Porsche 911 include Carrera S Coupe, GT3, Turbo, etc. Vehicle body style provides a brief description of the body style of the vehicle, e.g., hatchback two-door, coupe two-door, sports van, etc. Finally, 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).[13] To avoid look-ahead bias, we relate car purchases to manager investment behavior after the purchase date where purchase date data are obtained from Autocheck.

We categorize the cars in our sample into sports cars, minivans, and other cars based on body style. According to Merriam-Webster, 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 style as minivans.[14] We define as pro-sensation vehicle attributes: the indicator variable for sports car, maximum horsepower, and maximum torque. Conversely, we define as anti-sensation vehicle attributes: the indicator variable for minivan, passenger volume, and IIHS average safety rating.[15] Maximum horsepower and torque are included as pro-

[13]IIHS evaluates a car's crashworthiness based on five dimensions: (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.

[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), Chrysler Town and Country (sports van), Volkswagen Routan (passenger van), and Chevrolet Uplander (extended sports van).

[15]Our baseline findings are robust to using alternative pro-sensation variables such as 0-60 mph time, 0-60 mph quintile rank, or horsepower-to-weight ratio, and alternative anti-sensation variables such as miles per gallon (city), miles per gallon (highway), or cargo volume. They are also robust to demeaning the vehicle attributes by model year. We do so in response to concerns that advances in manufacturing technology have led to improvements in vehicle attributes such as horsepower, torque, and safety ratings over time.

sensation attributes to address concerns that some of the vehicles classified as sports cars based on body style are too underpowered to be considered bona-fide sports cars. Passenger volume and safety rating are included as anti-sensation attributes since spacious and safe cars are often perceived as dull.

We evaluate the impact of sensation seeking on hedge funds using monthly net-of-fee returns and assets under management (henceforth AUM) 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 2015. Since VIN place only includes information on vehicles purchased from 2006 to 2012, we focus on the sample period from January 2004 to December 2015, which allows us to examine the risk-seeking behavior of hedge fund managers post-vehicle purchase while controlling for fund risk prior to the purchase date.

In our fund universe, we have a total of 49,672 hedge funds, of which 28,810 are live funds and 20,862 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.[16] This leaves a total of 43,195 hedge funds, of which 25,461 are live funds and 17,734 are dead funds. The funds are roughly evenly split between Lipper TASS, Morningstar, HFR, and BarclayHedge. While 9,675 funds appear in multiple databases, many funds belong to only one database. Specifically, there are 10,267, 6,141, 9,264, and 7,848 funds unique to the Lipper TASS, Morningstar, HFR, and BarclayHedge databases, respectively. This highlights the advantage of obtaining data from more than one source.[17]

During the period that corresponds to the VIN place purchase data, i.e., 2006 to 2012,

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

[17]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 by Joenväärä, Kosowski, and Tolonen (2017) that Lipper TASS is 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.

there are 5,479 hedge fund managers in our sample, of which 4,505 are based in the U.S. In total, we are able to match 1,774 vehicles to 1,144 of these U.S.-based hedge fund managers, of which 163 are sports cars and 101 are minivans.[18] Table 1 provides summary statistics of the matched vehicles. It indicates that there is significant heterogeneity in the body styles, horsepower, torque, passenger volumes, safety ratings, and prices of the vehicles bought by 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. Usually, they take positions in equity markets. Multi-process funds employ multiple strategies that take advantage of opportunities created by significant events, such as spin-offs, mergers and acquisitions, 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, 2009). These biases stem from the fact that inclusion in hedge fund databases is voluntary. As a result, there is a self-selection bias. For instance, when a fund is listed on a database, it often includes data prior to the listing date. Because successful funds have a strong incentive to list and attract capital, these backfilled returns tend to be higher than the non-backfilled returns. To alleviate concerns about backfill bias raised by Bhardwaj, Gorton, and Rouwenhorst (2014), and others, we redo the tests after removing all return observations that have been backfilled prior to fund listing date.

[18] We treat multiple cars purchased by the same manager as independent observations. Inferences do not change when we confine the sample to fund managers who only purchase one car.

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 U.S. 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 on their respective underlying assets.[19] Fung and Hsieh (2004) show that these seven factors 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 hedge funds by the pro-sensation automobile attributes. Specifically, we sort funds based on whether the manager purchased (i) a sports car or a non-sports car, (ii) a high or low horsepower car, and (iii) a high or low torque car. We classify an automobile as a high horsepower car if its maximum horsepower lies at or above the median. Similarly, we categorize an automobile as a high torque car if its maximum torque lies at or above the median. Table 2 reports the average fund risk and idiosyncratic risk post-automobile purchase for each group of funds. Fund risk is the standard deviation of fund returns while idiosyncratic risk is the standard deviation of fund residuals from the Fung and Hsieh (2004) seven-factor

[19]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.

model. Risk and idiosyncratic risk are estimated over each non-overlapping 24-month period post-vehicle purchase. We analyze idiosyncratic risk, as opposed to systematic risk, as we are principally interested in exploring non-pecuniary risk taking. For each group, Table 2 also reports the average monthly fund returns, alpha, and flow, as well as fund attributes such as management fee, performance fee, lock-up period, redemption period, and AUM.

The risk measures reported in Table 2 indicate that hedge fund managers who purchase performance cars 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 with high torque cars are 1.25 percentage points more volatile than those of managers with low torque cars. These results are economically significant. The 1.80 percentage point spread in risk between sports and non-sports car drivers represents a 16.61 percent increase in volatility over that of non-sports car drivers. Moreover, for each sort, the spread in risk is statistically significant at the one percent level. These results are broadly consistent with the sensation seeking view. Inferences remain qualitatively unchanged when we analyze idiosyncratic risk. Inferences also do not change when we perform quintile sorts on horsepower and torque, and examine the spread in risk between the extreme quintiles.

[Insert Tables 2 and 3 here]

The other fund attributes do not appear to exhibit statistically reliable variation across groups, with the exception of fund AUM. Fund managers who purchase performance cars tend to manage smaller funds. Therefore, if managers who run smaller funds also have greater risk appetites, fund size may explain why we find that performance car owners take on more risk. To address such concerns, we estimate the following multivariate regression

on fund risk:

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

where *RISK* is the standard deviation of fund returns estimated over 24 months, *PROSENSATION* is a placeholder for the pro-sensation variables derived from automobile ownership data, *MGTFEE* is management fee, *PERFFEE* is performance fee, *HWM* is high-water mark indicator, *LOCKUP* is lock-up period, *LEVERAGE* is leverage indicator, *AGE* is fund age since inception, *REDEMPTION* is redemption period, log(*FUNDSIZE*) is the natural logarithm of fund AUM, *STRATEGYDUM* is the fund strategy dummy, and *YEARDUM* is the year dummy. We estimate three sets of regressions that correspond to the pro-sensation variables: (i) *SPORT*, an indicator variable that takes a value of one for sports cars and a value of zero otherwise, (ii) *POWER*, the maximum horsepower of the car purchased, and (iii) *TORQUE*, the maximum torque of the car purchased. We also estimate regressions on fund idiosyncratic risk.[20] The regressions are estimated for fund risk evaluated over all non-overlapping periods post vehicle purchase.[21]

Table 3 reports the coefficient estimates from the 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 performance cars take on more risk than do other fund managers. Specifically, managers who embrace

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

[21]We do so because sensation seeking is a durable personality trait (Zuckerman, 2007). We obtain similar inferences when we limit the regression analysis to the first 24 months post vehicle purchase or when we limit the regression analysis to the vehicle ownership period, using Autocheck vehicle ownership data. Since Autocheck vehicle ownership data are not available for all funds, the latter analysis requires that we reduce the sample size by 28.7 percent.

sports cars deliver returns that are 2.33 percentage points per annum 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 1.28 percentage points and 1.12 percentage points, respectively. These results are qualitatively unchanged when we evaluate idiosyncratic 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, unsurprisingly, smaller funds and funds that embrace leverage also take on more risk.

To investigate the relationship between sensation avoidance and investment risk, we first sort funds based on the anti-sensation vehicle attributes. We find in Table 2 that managers who acquire practical but unexciting cars take on lower investment risk. 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. Inferences do not change when we perform quintile sorts on passenger volume and safety rating, and examine the spread in risk between the extreme quintiles.

Next, we estimate multivariate regressions on risk that are analogous to Eq. (1) but with *ANTISENSATION* in place of *PROSENSATION*, where *ANTISENSATION* is a placeholder for the anti-sensation variables derived from automobile ownership data. We estimate three sets of regressions that correspond to the anti-sensation variables: (i) *MINIVAN*, an indicator variable that takes a value of one for minivans and a value of zero otherwise, (ii) *SPACE*, the passenger volume of the car purchased, and (iii) *SAFETY*, the IIHS average safety rating for the car purchased. We also estimate regressions on idiosyncratic risk.

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 particular, minivan drivers deliver returns that are 2.20 percentage points per annum less volatile than do other drivers. Likewise, a one-standard deviation increase in passenger volume translates to a 0.61 percentage point per annum reduction in risk, while a one-unit improvement in the average

IIHS safety rating engenders a 0.85 percentage point per annum reduction in risk. The results for *MINIVAN* are not driven by the presence of sports cars amongst non-minivans. Inferences do not change when we include *SPORT* and *MINIVAN* in the same risk regression.

[Insert Tables 4 and 5 here]

The results from Table 2 suggest that the incremental risk taking by performance car buyers does not translate to higher returns. Does the heightened risk tolerance of performance car buyers therefore result in lower Sharpe ratios? 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:

$$\begin{aligned} SHARPE_{im+23,m} &= \alpha + \beta_1 PROSENSATION_{im-1} + \beta_2 MGTFEE_i + \beta_3 PERFFEE_i \\ &+ \beta_4 HWM_i + \beta_5 LOCKUP_i + \beta_6 LEVERAGE_i + \beta_7 AGE_{im-1} + \beta_8 REDEMPTION_i \\ &+ \beta_9 log(FUNDSIZE_{im-1}) + \beta_{10} STRATEGYDUM_i + \beta_{11} YEARDUM_{im} + \epsilon_{im}, \quad (2) \end{aligned}$$

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.[22] We also estimate analogous regressions with the anti-sensation variables.

Table 5 reports the coefficient estimates from the regressions on fund Sharpe ratio. The coefficient estimates on *SPORT*, *POWER*, and *TORQUE* are all negative and statistically significant at the one percent level. We find that sports car owners deliver annualized Sharpe ratios that are on average 0.34 lower than those delivered by other car owners. Moreover, one-standard deviation increases in horsepower and torque are associated with decreases in fund annualized Sharpe ratio of 0.15 and 0.13, respectively. These results are economically

[22]Outliers driven by return standard deviations that are close to zero may cloud inferences made from Sharpe ratios. To ameliorate the impact of outliers, we winsorize *SHARPE* at the 0.5 and 99.5 percentiles. Inferences do not change when we estimate regressions on raw Sharpe ratios.

meaningful, given that the annualized Sharpe ratio of the average fund in our sample is 0.84 with a standard deviation of 1.15. The coefficient estimates on the anti-sensation variables indicate that owners of practical but unexciting cars deliver higher Sharpe ratios. Specifically, minivan drivers generate annualized Sharpe ratios that are on average 0.43 higher than do other drivers. Inferences do not change when we estimate analogous regressions on fund information ratio, i.e., fund alpha divided by the standard deviation of fund residuals from the Fung and Hsieh (2004) model. Taken together, our empirical results broadly validate the advice by hedge fund allocators to avoid managers who purchase fancy performance cars.

3.2 Operational risk

If sensation seeking drives the relationship between performance car ownership and risk, we should expect that the disinhibition and non-pecuniary risk-taking extend beyond hedge fund strategies to the management of the fund itself. As a consequence, we should find that performance car buyers are affiliated with funds that show evidence of direct or indirect loss resulting from inadequate or failed internal processes, people, or systems–evidence usually associated with operational risk exposure.[23] In extreme cases, this operational risk exposure can lead to fund termination. In this section, we explore differences between the operational risk attributes of managers who purchase performance cars and those of managers who eschew performance cars by analyzing the cross-sectional determinants of fund termination and other operational risk metrics, controlling for financial risk.

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. 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 Eq. (1) regressions, augmented with fund returns and flows calculated over the past 24 months. Because we are interested in measuring operational risk exposure, we

[23]This definition corresponds to that of Basel (2001) where this measure of risk is understood to be distinct from market and credit risk exposure.

also control for financial risk measured over the same time frame. The indicator variable, *TERMINATION*, takes a value of one when a fund stops reporting returns for that month and states that it has liquidated, 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.

[Insert Table 6 here]

The results reported in Table 6 indicate that, controlling for other factors that can explain fund termination including financial risk exposure, performance car buyers are more likely to terminate their funds. 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 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.

Sensation seeking may lead to deviations from expected standards of business conduct that could precipitate regulatory action and lawsuits, as well as civil and even criminal violations. These events must be reported as Item 11 disclosures on Form ADV.[24] To explore the relationship between sensation seeking and violations of expected standards of business

[24]For a brief period in 2006, all hedge funds domiciled in the United States and meeting certain minimal conditions had to register as financial advisors and file the necessary Form ADV that provides basic information about the operational characteristics of the fund. This requirement was dropped in June 2006, but since that date most hedge funds continue to voluntarily file this form and since the passage of the Dodd Frank Act all hedge funds with over $100M assets under management are required to file this form.

conduct, we estimate multivariate logit regressions on an indicator variable for Form ADV violations.[25] The indicator variable *VIOLATION* takes a value of one after a fund manager reports on her Form ADV file in the 24-month period post vehicle purchase that she has been associated with an Item 11 Form ADV disclosure, and a value of zero otherwise. To minimize look-ahead bias, we focus on the set of funds that did not report a Form ADV disclosure prior to vehicle purchase. Form ADV includes disclosure on all regulatory actions taken against the fund and lawsuits as well as civil and criminal violations linked to the investment advisor over the past ten years.

Table 7 reports the coefficient estimates and marginal effects from the logit regressions on *VIOLATION*. The set of independent variables that we employ is analogous to that used in the baseline Eq. (1) regressions. Consistent with the sensation seeking view, we find that 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 one percent level. The marginal effects indicate that owners of sports cars are 18.9 percentage points more likely to report a violation on their Form ADVs than are owners of other cars. We also estimate analogous regressions on *VIOLATION* with the anti-sensation variables. The results reported in Table 7 indicate that managers who own minivans are 18.5 percentage points less likely to report a violation on their Form ADVs.

[Insert Tables 7 and 8 here]

To further investigate the relationship between sensation seeking and operational risk, we compute fund ω-Score, an operational risk instrument derived from fund performance, volatility, age, size, and fee structure that Brown et al. (2009) show is useful for predicting

[25]This analysis follows Brown et al. (2008) who argue that problem funds from an operational risk perspective may be identified by those funds that make an Item 11 disclosure. As Brown et al. (2009) observe, some of the legal and regulatory problems identified in the ADV forms may not be related to operational issues while on the other hand there may be funds with operational issues that have not yet attracted the attention of legal or regulatory authorities and for which no Item 11 disclosure is required. However, Dimmock and Gerken (2012) show that these disclosures, along with other fund characteristics reported in Form ADV, significantly predict hedge fund fraud events, one instance of operational risk exposure.

hedge fund failures. As per Brown et al. (2009) we only compute the ω-Scores for funds from the TASS database. Next, we estimate regressions on *OMEGA* or fund ω-Score with the pro- and anti-sensation vehicle attributes as independent variables. The set of control variables that we employ is analogous to that used in the baseline Eq. (1) regressions. The regressions are estimated for *OMEGA* evaluated over all non-overlapping 24-month periods post vehicle purchase. The results reported in Table 8 support the view that sensation seekers exhibit greater operational risk. The coefficient estimates for the pro-sensation (anti-sensation) variables are positive (negative) and statistically significant at the five percent level. In particular, the coefficient estimate on *SPORT* reveals that sports car drivers deliver ω-Scores that are on average 0.089 higher than do drivers who shun sports cars. Conversely, the coefficient estimate on *MINIVAN* suggests that minivan owners exhibit ω-Scores that are on average 0.197 lower than do owners who eschew minivans. These results are economically meaningful given that the standard deviation for *OMEGA* is 1.22.

3.3 Trading behavior

Sensation seekers are driven by their desire for varied, novel, complex, and intense experiences. Therefore, to the extent that 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. To investigate, we construct five trading behavior metrics from hedge fund 13-F long-only quarterly stock holdings and reported returns: *TURNOVER*, *NONSPRATIO*, *ACTIVESHARE*, *NRSQUARED*, and *DISTINCTIVENESS*.[26] The metric *TURNOVER* is the annualized turnover of a hedge fund manager's stock portfolio. *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 as defined in Cremers and Petajisto (2009) relative to the S&P 500. *NRSQUARED* is one minus the R-squared from the regression of fund excess returns

[26] Brunnermeier and Nagel (2004) also use Thomson Financial 13-F filings to investigate hedge fund trading behavior.

against the Fung and Hsieh (2004) seven factors. *DISTINCTIVENESS* is the Sun, Wang, and Zheng (2012) strategy distinctiveness index measure. The trading behavior metrics are defined such that an increase in any of them represents a more active (*NONSPRATIO* and *ACTIVESHARE*) or unconventional (*NRSQUARED* and *DISTINCTIVENESS*) portfolio. We compute the trading behavior metrics for funds sorted by the pro- and anti-sensation attributes and evaluate the spreads between different groups of funds.

[Insert Table 9 here]

The results reported in Table 9 indicate that consistent with the sensation seeking view, owners of cars with pro-sensation qualities trade more often, purchase more non-index stocks, increase their Active Share vis-à-vis the S&P 500, exhibit lower R-squareds relative to the Fung and Hsieh (2004) seven-factor model, and engage in more distinctive strategies. The reverse holds for owners of cars with anti-sensation qualities. In results available upon request, we find that the preference for active trading and unconventional strategies amongst sensation seekers, partly explains their elevated financial risk.

3.4 Overconfidence

Are sensation seekers also more overconfident (Barber and Odean, 2000; 2001)? To link sensation seeking to overconfidence, while it is helpful to investigate turnover as in Grinblatt and Keloharju (2009), 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 current year return of the fund portfolio held at the end of the prior year and the return of the actual portfolio of stocks held by the fund. This is simply the negative of the own-benchmark adjusted return from Barber and Odean (2000; 2001) and is defined so that it increases in overconfidence. The results reported in Table 9 indicate that sensation seekers are also more

likely to succumb to overconfidence.[27]

3.5 Preference for lotteries

Do sensation seekers prefer lottery-like stocks? Kumar (2009) describes lottery-like stocks as low-priced stocks with high idiosyncratic volatility and high idiosyncratic skewness. Bali, Cakici, and Whitelaw (2011) argue that stocks with high maximum daily return over the past month (henceforth MAX) capture investor preference for lottery-like stocks. The extreme positive daily returns of lottery-like stocks may satisfy sensation seekers' preference for intense experiences. To investigate, we define $LOTTERY$ as the maximum daily stock return over the past month (or MAX) averaged across stocks held by the fund, and test for differences in $LOTTERY$ between groups of fund managers sorted by the pro- and anti-sensation vehicle attributes. The results reported in Table 9 reveal that sensation seekers are drawn to lottery-like stocks. Inferences remain unchanged when we use the Kumar (2009) definition for lottery-like stocks instead (see his Table II). In results available upon request, we show that lottery-like stocks are more volatile than are other stocks, and that the preference for lottery-like stocks amongst the sensation seekers in our sample partly explains their elevated risk-taking.

3.6 Hedge fund investor preferences

Why do investors subscribe to hedge funds managed by sensation-seeking managers given their lower Sharpe ratios and higher operational risks? Information on investor holdings of hedge funds is rarely available in practice.[28] To circumvent the data availability issue, we exploit return data on FoFs. First, we re-estimate our baseline cross-sectional risk regressions on our sample of FoF managers. We find that controlling for other factors, FoFs managed

[27] 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 often and lose more from trading than do women, their returns are not statistically different from those of women.

[28] An exception is Aiken, Clifford, and Ellis (2015) who examine the hedge fund holdings of registered FoFs. However they are only able to examine 79 FoFs due to the small number of registered FoFs.

by performance car owners, tend to take on more risk and idiosyncratic risk than do other FoFs. Conversely, FoFs, managed by owners of practical but unexciting cars tend to take on less risk and idiosyncratic risk than do other FoFs. Next, we construct portfolios of hedge funds and FoFs based on vehicle ownership. The sensation-seeking hedge fund portfolio is the average return of all hedge fund managers that previously bought a sports car. The sensation-avoiding hedge fund portfolio is the average return of all hedge fund managers that previously bought a minivan. The sensation-neutral hedge fund portfolio is the average return of all hedge fund managers that previously purchased vehicles that were neither sports cars nor minivans. The sensation-seeking, -avoiding, and -neutral FoF portfolios are defined analogously. We estimate time-series regressions on the FoF portfolio returns with the returns of the three hedge fund portfolios as independent variables. The coefficient estimates indicate that sensation-seeking FoFs load more on sensation-seeking hedge funds while sensation-avoiding FoFs load less on sensation-seeking hedge funds. These results are available upon request and suggest that sensation seeking by investors drives their preference for sensation-seeking hedge funds.

3.7 Alternative explanations

An alternative explanation for our baseline results is that the act of buying or driving a performance car, instead of telegraphing a manager's innate preference for sensation seeking, actually begins to increase her tolerance for risk. 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. The coefficient estimates reported in Panel A of Table 10 suggest that reverse causality does not drive our results.[29]

[Insert Table 10 here]

[29]In unreported results, we estimate analogous regressions on fund risk for sports car buyers with an indicator variable that takes a value of one during the 24-month period post-purchase and a value of zero otherwise as an independent variable. The results indicate that hedge fund managers do not increase their risk taking after purchasing sports cars.

Gender may explain our findings. Barber and Odean (2001) show that female investors take on less risk than do male investors (see their Table III). If males prefer sports cars while females prefer minivans, then gender could account for our risk results. To account for gender, we include a gender dummy in our risk regressions.[30] The estimates reported in Panel B of Table 10 indicate that gender does not drive our results.

Another concern is that social status or wealth may drive our results. According to Piff et al. (2012), upper-class individuals, driven in part by greed, exhibit greater unethical tendencies. Greed amongst high-status drivers may motivate them to take on more investment risk. To investigate, we control for vehicle price (or MSRP) in the baseline regressions. The coefficient estimates reported in Panel C of Table 10 indicate that inferences remain unchanged after accounting for price. To further control for social status, we cull data on fund manager home prices and redo the baseline risk regressions with home value as an additional independent variable.[31] The results reported in Panel D of Table 10 indicate that inferences remain unchanged after controlling for social status in this fashion. Related to the wealth story is the view that non-frugal managers take on greater risk (Davidson, Dey, and Smith, 2015). To address the frugality concern, we redo our tests with an alternative pro-sensation attribute: horsepower per dollar, which may appeal to frugal, cost-conscious sensation seekers. We find that managers who purchase higher horsepower per dollar cars deliver more volatile returns and exhibit greater operational risk, suggesting that frugality does not drive our results.

A related story is that some managers purchase expensive sports cars to mimic their more successful peers in the industry and attract investors. This is reminiscent of the peer effects story documented by Pool, Stoffman, and Yonker (2015) for mutual funds. However,

[30]We use the Genderize Python Application Programming Interface (https://genderize.io/) to determine gender using manager first name. For managers whose first names, according to Genderize, are not unambiguously male or female, we perform a Google search for a picture of the manager or for a biography of the manager with a gender reference. In line with Aggarwal and Boyson (2016), we find that the vast majority, i.e., 91.26 percent, of the managers in our sample are males.

[31]We thank Jeremy Stein for this suggestion. Home value data are obtained from the LexisNexis KnowX platform.

the evidence on flows in Table 2 suggests that such behavior is not rational. Performance car owners do not attract greater flows. Indeed, owners of high horsepower and torque cars harvest flows that are 3.00 percent and 1.68 percent per annum lower than do owners of low horsepower and torque cars, respectively. While sports car drivers attract greater flows than do other drivers, the difference at 48 basis points per annum is economically modest and statistically insignificant at the ten percent level. Moreover, the peer effect channel can neither explain why our results prevail after controlling for price nor explain why performance car owners take on more risk for non-pecuniary reasons. In univariate tests, for managers who purchase multiple cars, we find that the vehicle attributes are persistent over time. This suggests that car purchase behavior is driven more by a stable personality trait than by time-varying peer effects.

Some fund managers may purchase practical cars such as minivans for their partners to ferry children. Consequently, *SPORT* and *MINIVAN* may proxy for marital status, which in turn may explain risk (Love, 2010; Roussanov and Savor, 2014). To control for marital status, we first merge our data with marriage and divorce data that are publicly available for 13 states in the U.S.[32] We are able to obtain marital records for 68 out of the 273 funds that operate in the 13 states. We use those records to construct an indicator variable for whether a manager is married or single. We assume that managers who operate in those states but do not have marital records are single. The results reported in Panel E of Table 10 indicate that inferences remain unchanged after controlling for marital status.

Manager age may also account for our results. Barber and Odean (2001) show that younger investors take more risk than do older investors. If younger managers gravitate toward sports cars while older managers gravitate toward minivans, the coefficient estimates on *SPORT* and *MINIVAN* from the baseline risk regressions may capture the effects of manager age instead. While we have controlled for fund age, that in itself may not adequately proxy

[32]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 the data.

for manager age. To account for manager age, we cull data on fund manager date of birth from Peoplewise (www.peoplewise.com). We are able to obtain date of birth information for about 85 percent of the managers in our sample. Next, we redo the baseline regressions for this subsample after including an additional independent variable for manager age. The results reported in Panel F of Table 10 indicate that inferences remain unchanged with the adjustment for manager age.

Sample selection may cloud inferences from our results. Hedge fund managers who choose to purchase new cars may have taken greater risks and have been more successful at parlaying risk into returns. Therefore, the ability to purchase a new car may be related to the propensity to take risks in the future as well. The coefficients in Tables 3 and 4 that supposedly explain the variation in fund risk could be contaminated by correlation between the residuals in these cross-sectional regressions and the unobserved factors that shape fund managers' propensity to purchase new cars. To address these issues, we employ the Heckman (1979) two-stage procedure to correct for possible sample selection bias. To apply this procedure, we first estimate a probit regression on the entire universe of U.S. based hedge funds to determine the factors underlying selection. The inverse Mills ratio is then computed from this first stage probit and incorporated into the regression on fund risk to correct for selection bias.

To implement the Heckman correction, a critical identifying assumption is that some variables explain selection but not risk. If there is no such exclusion restriction, the model is identified by only distributional assumptions about the residuals, which could lead to problems in estimating the parameters of the model. The exclusion restriction that we employ is fund flow estimated over the past 24 months. Managers of funds with higher past flows may find it easier to purchase new cars given the resulting increased fee revenues. At the same time, it is unlikely that, controlling for other fund attributes such as size, past fund flows significantly explain future fund risk. Other variables that could determine selection include past fund return and risk. Therefore, to correct for sample selection, we

first estimate a probit regression on the probability of purchasing a new car with past fund flow, risk, returns, as well as the other control variables used in the Eq. (1) regressions as independent variables. None of the coefficient estimates on past risk and performance in the selection equations are statistically significant at conventional levels. In line with our intuition, the coefficient estimates on fund flow in the selection equations are positive and statistically significant at the one percent level. In the Heckman model, the coefficient estimate on the inverse Mills ratio takes the sign of the correlation between the residuals in the regression that explain selection and hedge fund risk. In all the risk regressions, the coefficients on the inverse Mills ratio are negative, albeit statistically indistinguishable from zero. The sign suggests that, contrary to the sample selection story, managers who purchase new cars subsequently take on less risk. The estimates from the second stage regressions reported in Panel G of Table 10 indicate that our findings are robust to sample selection.

A related endogeneity story is that, conditional on purchasing a new car, managers who purchase sports cars may have taken greater risks and have been more successful at parlaying risk into returns. To investigate, we estimate a probit regression on the probability of a sports car purchase with past two-year fund flow, risk, return, as well as the other control variables used in the Eq. (1) regressions as independent variables. In unreported results, we find that none of the coefficient estimates on past risk and performance are statistically significant at conventional levels. Only the estimate on past fund flow is statistically distinguishable from zero at the five percent level. Inferences do not change when we estimate the probit with fund idiosyncratic risk and alpha in place of fund risk and return. These findings cast doubt on the endogeneity view. To further investigate the endogeneity story, we redo the baseline risk regressions with past two-year fund returns and flows as additional independent variables. Inferences remain unchanged with this alternative specification. The coefficient estimates on past returns are all negative and statistically indistinguishable from zero, which further undermines the endogeneity view.

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. To allay such concerns, we re-estimate the baseline regressions after unsmoothing fund returns using the algorithm of Getmansky, Lo, and Makarov (2004). The results presented in Panel H of Table 10 indicate that our findings are robust to adjusting for serial correlation in fund returns.

4.2 Backfill bias

For marketing reasons, 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 may be less volatile than non-backfilled returns. If hedge funds managed by performance car owners are less likely to backfill their returns, this could explain why we find that they deliver more volatile returns. To address backfill bias concerns, we redo the baseline regressions after dropping returns reported prior to 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 I of Table 10 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, 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 reported in Panel J of Table 10 indicate that our findings are robust to the imputation of fees.

4.4 Automaker effect

Another concern is that our results may be driven by an automaker effect. Suppose some automakers, such as BMW, produce performance cars while other automakers, such as Volvo, produce safe and practical cars. If for reasons not associated with sensation seeking, BMW owners take on more investment risk than do Volvo owners, then we could potentially observe the baseline results even in the absence of sensation seeking. To account for such concerns, we include vehicle make fixed effects in our baseline regressions. The results reported in Panel K of Table 10 indicate that inferences remain unchanged after accounting for the automaker effect.

4.5 Managers who own multiple vehicles

Managers who own multiple vehicles may have purchased their second or third cars for their children, spouses, or significant others. To sidestep such concerns, we confine the sample to managers who purchased only one car during our sample period, and redo the baseline regressions. This reduces the number of managers in the sample from 1,144 to 701. The results reported in Panel L of Table 10 indicate that inferences do not change when we confine the sample to these managers.

5 Conclusion

Sensation seeking has important implications for finance. It can explain why certain retail investors trade more frequently or why certain households take on riskier home loans. It can also account for why some CEOs take more business risk or generate better inno-

vation outcomes. Yet despite the importance of sensation seeking as a potential driver of non-pecuniary risk and the prevalence of sensation-seeking amongst investment managers, evidence that relates sensation seeking to the investment behavior of professional fund managers has remained elusive. Using a novel dataset of 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.

Our results empirically validate the advice given by some hedge fund allocators to avoid managers who drive fancy sports cars. We find that managers who own performance cars take on more investment risk than do other managers, 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. Sensation seekers are more likely to terminate their funds, disclose violations on their Form ADVs, and exhibit greater operational risk. Sensation seeking also impacts trading behavior. Managers who embrace powerful sports cars trade more frequently, actively, and unconventionally than do managers who eschew such cars. They also gravitate toward lottery-like stocks. Trading hurts the performance of sensation seekers more than it hurts the performance of sensation avoiders, suggesting that sensation seekers may be prone to overconfidence. Reverse causality, sample selection, endogeneity, age, gender, wealth, peer effects, and marital status cannot explain the bulk of 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 hedge fund manager vehicle ownership data offer rich insights into their intrinsic and non-pecuniary motivations for taking financial and operational risks. Given that sensation seeking is unlikely to be germane only to hedge funds, future work that explores the impact of sensation

seeking on the wider asset management community, including mutual funds, private equity funds, venture capital funds, and other institutional investors, may prove fruitful.

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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 2004 to December 2015.

Vehicle attribute	Number of observations	Mean	Median	Standard deviation	Minimum	Maximum
Sports car (indicator variable)	1,774	0.09	0.00	0.29	0.00	1.00
Maximum horsepower (bhp)	1,759	266.21	264.50	82.27	70.00	620.00
Maximum torque (pound-feet)	1,756	267.32	254.00	85.68	68.00	663.00
Minivan (indicator variable)	1,774	0.06	0.00	0.23	0.00	1.00
Passenger volume (cubic feet)	1,386	113.36	102.00	28.08	45.00	211.00
IIHS average safety rating	1,171	3.44	3.50	0.58	1.50	4.00
Price (US$)	1,761	39,621.47	33,300.00	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. Return is fund monthly return. 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 model. The sample period is from January 2004 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	
Return (%)	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$m)	515.24	818.37	-303.13	388.15	1,289.13	-900.98**	360.48	1,235.01	-874.53*
Panel B: Anti-sensation vehicle attribute	Minivan	Non-minivan	Spread	High passenger volume	Low passenger volume	Spread	High safety rating	Low safety rating	Spread
Number of funds	101	1673		1,105	669		676	495	
Return (%)	0.56	0.50	0.06	0.51	0.48	0.03	0.46	0.51	-0.05
Alpha (%)	0.37	0.17	0.20**	0.19	0.17	0.02	0.16	0.24	-0.08
Flow (%)	0.98	0.47	0.51	0.41	0.65	-0.24	0.45	0.75	-0.30
Total risk (%)	2.78	3.15	-0.37	2.87	3.33	-0.46**	2.81	3.09	-0.28**
Idiosyncratic risk (%)	1.8	2.07	-0.27	1.88	2.20	-0.32**	1.88	2.09	-0.21**
Management fee (%)	1.55	1.41	0.14*	1.44	1.38	0.06	1.42	1.42	0.00
Performance fee (%)	17.2	17.03	0.17	17.11	16.93	0.18	17.02	17.70	-0.68
High-water mark (dummy)	0.86	0.84	0.02	0.85	0.82	0.03	0.85	0.84	0.01
Fraction of funds with lock-ups	0.42	0.51	-0.09	0.48	0.53	-0.05	0.49	0.52	-0.02
Lock-up period (days)	232.02	248.05	-16.03	248.15	246.01	2.14	229.10	256.31	-27.21
Redemption period (days)	61.29	86.03	-24.74**	84.90	84.16	0.74	83.26	81.97	1.29
Leveraged (dummy)	0.67	0.65	0.02	0.65	0.64	0.01	0.64	0.66	-0.02
Assets under management (US$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 model. 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)). Controls are also included for past RISK and IDIORISK estimated over the prior 24-month period, 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 2004 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

	Dependent variable					
Independent variables	RISK	IDIORISK	RISK	IDIORISK	RISK	IDIORISK
SPORT	0.672**	0.341**				
	(4.37)	(3.34)				
POWER			0.448**	0.281**		
			(9.05)	(7.65)		
TORQUE					0.379**	0.244**
					(8.20)	(7.10)
$RISK_{m-1,m-24}$	0.631**		0.633**		0.633**	
	(17.42)		(17.56)		(17.66)	
$IDIORISK_{m-1,m-24}$		0.518**		0.519**		0.520**
		(17.29)		(17.58)		(17.69)
MGTFEE	0.105	0.149*	0.114	0.154*	0.103	0.147*
	(1.11)	(2.16)	(1.24)	(2.28)	(1.16)	(2.24)
PERFFEE	0.004	0.007	0.001	0.005	0.002	0.005
	(0.45)	(0.74)	(0.09)	(0.51)	(0.17)	(0.57)
HWM	-0.128	0.023	-0.183	-0.006	-0.164	0.007
	(-0.58)	(0.13)	(-0.85)	(-0.03)	(-0.76)	(0.04)
LOCKUP	0.023	0.070	0.075	0.103	0.058	0.092
	(0.21)	(0.89)	(0.72)	(1.32)	(0.55)	(1.19)
LEVERAGE	0.088	0.159	0.148	0.196*	0.118	0.178*
	(0.76)	(1.93)	(1.37)	(2.49)	(1.08)	(2.25)
AGE	-0.009	-0.010	-0.009	-0.010	-0.009	-0.010
	(-1.02)	(-1.42)	(-0.91)	(-1.31)	(-1.00)	(-1.36)
REDEMPTION	0.028	0.004	0.023	0.001	0.022	-0.001
	(1.32)	(0.24)	(1.19)	(0.07)	(1.11)	(-0.01)
log(FUNDSIZE)	-0.003	-0.034	-0.021	-0.046*	-0.020	-0.046*
	(-0.11)	(-1.46)	(-0.73)	(-1.99)	(-0.69)	(-1.99)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.466	0.469	0.486	0.487	0.482	0.485
N	2,802	2,796	2,780	2,774	2,771	2,765

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 model. 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 100 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)). Controls are also included for past RISK and IDIORISK estimated over the prior 24-month period, 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 2004 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

	Dependent variable					
Independent variables	RISK	IDIORISK	RISK	IDIORISK	RISK	IDIORISK
MINIVAN	-0.634**	-0.502**				
	(-6.70)	(-5.83)				
SPACE			-0.622**	-0.378**		
			(-5.70)	(-4.25)		
SAFETY					-0.246**	-0.137*
					(-3.53)	(-2.54)
$RISK_{m-1,m-24}$	0.622**		0.619**		0.595**	
	(17.00)		(16.10)		(15.28)	
$IDIORISK_{m-1,m-24}$		0.516**		0.517**		0.489**
		(17.58)		(17.00)		(16.43)
MGTFEE	0.091	0.149*	0.086	0.133	0.095	0.169*
	(0.94)	(2.13)	(0.85)	(1.84)	(0.93)	(2.05)
PERFFEE	-0.002	0.003	-0.002	0.004	-0.001	-0.001
	(-0.22)	(0.26)	(-0.22)	(0.42)	(-0.13)	(-0.05)
HWM	-0.138	0.032	-0.148	0.051	-0.147	0.080
	(-0.67)	(0.19)	(-0.70)	(0.29)	(-0.68)	(0.46)
LOCKUP	0.062	0.093	0.096	0.115	0.106	0.135
	(0.63)	(1.25)	(0.94)	(1.45)	(1.00)	(1.62)
LEVERAGE	0.179	0.215**	0.196	0.234**	0.226	0.277**
	(1.73)	(2.79)	(1.79)	(2.99)	(1.95)	(3.26)
AGE	-0.006	-0.007	-0.001	-0.001	-0.005	-0.005
	(-0.62)	(-0.91)	(-0.11)	(-0.15)	(-0.47)	(-0.56)
REDEMPTION	0.023	0.002	0.015	0.001	0.043	0.020
	(1.09)	(0.11)	(0.69)	(0.08)	(1.93)	(1.11)
log(FUNDSIZE)	-0.032	-0.051*	-0.019	-0.056*	-0.035	-0.060*
	(-1.15)	(-2.25)	(-0.66)	(-2.44)	(-1.09)	(-2.40)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.498	0.498	0.504	0.503	0.505	0.501
N	2,802	2,796	2,228	2,223	1,857	1,853

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 100 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)). 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 2004 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Independent variables	Dependent variable = SHARPE					
SPORT	-0.097**					
	(-3.69)					
POWER		-0.052**				
		(-3.51)				
TORQUE			-0.044**			
			(-3.23)			
MINIVAN				0.124**		
				(3.48)		
SPACE					0.171**	
					(5.73)	
SAFETY						0.066**
						(4.45)
MGTFEE	-0.017	-0.019	-0.018	-0.008	-0.007	-0.005
	(-0.89)	(-0.95)	(-0.91)	(-0.71)	(-0.62)	(-0.40)
PERFFEE	0.006	0.006	0.006	0.004	0.003	0.004
	(1.88)	(1.87)	(1.87)	(1.95)	(1.72)	(1.81)
HWM	-0.024	-0.018	-0.019	-0.012	-0.018	-0.019
	(-0.54)	(-0.41)	(-0.43)	(-0.45)	(-0.57)	(-0.49)
LOCKUP	0.015	0.015	0.016	0.010	0.017	0.003
	(0.53)	(0.52)	(0.54)	(0.60)	(0.93)	(0.16)
LEVERAGE	-0.009	-0.007	-0.005	-0.006	0.005	0.013
	(-0.27)	(-0.21)	(-0.13)	(-0.28)	(0.23)	(0.51)
AGE	-0.002	-0.002	-0.002	-0.001	-0.002	-0.003
	(-0.75)	(-0.78)	(-0.74)	(-0.79)	(-1.29)	(-1.31)
REDEMPTION	-0.004	-0.006	-0.006	-0.002	-0.003	-0.002
	(-0.84)	(-1.13)	(-1.14)	(-0.73)	(-1.01)	(-0.56)
log(FUNDSIZE)	0.004	0.005	0.005	0.001	-0.001	0.003
	(0.44)	(0.57)	(0.59)	(0.19)	(-0.22)	(0.43)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.121	0.118	0.117	0.117	0.128	0.102
N	3,197	3,171	3,162	3,197	2,554	2,132

Table 6
Multivariate logit regressions on hedge fund termination

This table reports coefficient estimates from multivariate logit 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, 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 100 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)). Controls are also included for past RISK, RETURN, and FLOW estimated over the prior 24-month period, 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 are in brackets. The sample period is from January 2004 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Independent variables	Dependent variable = TERMINATION					
SPORT	0.748**					
	(3.08)					
	[0.004]					
POWER		0.414**				
		(5.89)				
		[0.002]				
TORQUE			0.329**			
			(4.33)			
			[0.001]			
MINIVAN				-1.314**		
				(-3.10)		
				[-0.004]		
SPACE					-0.601**	
					(-3.02)	
					[-0.003]	
SAFETY						-0.560**
						(-3.82)
						[-0.013]
MGTFEE	0.278*	0.251*	0.229*	0.245*	0.243	0.288*
	(2.48)	(2.12)	(2.00)	(2.22)	(1.85)	(2.25)
PERFFEE	0.008	0.000	0.004	0.012	0.010	0.013
	(0.69)	(0.02)	(0.36)	(1.30)	(0.77)	(0.95)
HWM	-0.620**	-0.642**	-0.565*	-0.710**	-0.609**	-0.724**
	(-2.73)	(-2.88)	(-2.45)	(-3.71)	(-2.75)	(-2.79)
LOCKUP	-0.485**	-0.392**	-0.421**	-0.277*	-0.425**	-0.327**
	(-4.10)	(-3.14)	(-3.42)	(-2.47)	(-3.40)	(-2.91)
LEVERAGE	0.051	-0.061	-0.149	-0.015	0.010	0.081
	(0.40)	(-0.48)	(-1.13)	(-0.13)	(0.08)	(0.59)
AGE	0.017	0.010	0.010	0.011	0.004	0.014
	(1.73)	(1.02)	(1.01)	(1.13)	(0.40)	(1.30)
REDEMPTION	-0.007	-0.009	-0.007	-0.028	-0.001	-0.017
	(-0.32)	(-0.43)	(-0.31)	(-1.12)	(-0.08)	(-0.96)
log(FUNDSIZE)	-0.124**	-0.107**	-0.110**	-0.086**	-0.111**	-0.107**
	(-3.58)	(-3.09)	(-3.13)	(-2.58)	(-2.93)	(-2.81)
$RISK_{m-1,m-24}$	3.418	4.196	4.544	4.947	1.871	4.453
	(0.80)	(0.97)	(1.10)	(1.55)	(0.48)	(1.12)
$RETURN_{m-1,m-24}$	-26.599**	-24.294**	-26.004**	-22.570**	-33.081**	-26.755**
	(-4.70)	(-4.55)	(-4.96)	(-4.78)	(-6.34)	(-5.30)
$FLOW_{m-1,m-24}$	-1.635	-0.812	-0.672	-0.457	-1.118	-1.911
	(-0.95)	(-0.56)	(-0.47)	(-0.36)	(-0.74)	(-1.11)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.137	0.128	0.133	0.143	0.136	0.141
N	51,511	41,264	41,008	30,364	30,815	26,727

Table 7
Multivariate logit regressions on hedge fund 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 100 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)). Controls are also included for strategy 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 2004 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Independent variables	Dependent variable = VIOLATION					
SPORT	0.844**					
	(2.94)					
	[0.189]					
POWER		0.654**				
		(5.05)				
		[0.128]				
TORQUE			0.494**			
			(4.18)			
			[0.098]			
MINIVAN				-1.415**		
				(-2.86)		
				[-0.185]		
SPACE					-0.357	
					(-0.86)	
					[-0.062]	
SAFETY						0.042
						(0.20)
						[0.007]
MGTFEE	-0.412	-0.419	-0.419	-0.639	-1.012**	-1.117*
	(-1.21)	(-1.19)	(-1.23)	(-1.91)	(-2.78)	(-2.18)
PERFFEE	-0.011	-0.008	-0.006	-0.018	-0.010	-0.025
	(-0.40)	(-0.27)	(-0.23)	(-0.61)	(-0.31)	(-0.68)
HWM	-0.636	-0.760	-0.718	-0.459	-0.533	-0.902
	(-1.33)	(-1.54)	(-1.48)	(-0.89)	(-0.92)	(-1.45)
LOCKUP	-0.004	0.075	0.031	-0.110	0.028	0.094
	(-0.01)	(0.22)	(0.09)	(-0.34)	(0.08)	(0.24)
LEVERAGE	0.377	0.430	0.395	0.321	0.404	0.345
	(1.20)	(1.33)	(1.24)	(1.00)	(1.14)	(0.82)
AGE	0.014	0.009	0.009	0.009	0.017	0.019
	(0.64)	(0.40)	(0.39)	(0.39)	(0.74)	(0.72)
REDEMPTION	0.005	-0.005	-0.006	0.011	-0.010	-0.091
	(0.08)	(-0.07)	(-0.09)	(0.15)	(-0.14)	(-1.04)
log(FUNDSIZE)	0.142	0.135	0.128	0.187*	0.203*	0.230*
	(1.90)	(1.75)	(1.68)	(2.52)	(2.24)	(2.35)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.065	0.098	0.079	0.086	0.096	0.089
N	620	614	611	620	493	386

Table 8

Multivariate regressions on hedge fund ω-Scores

This table reports coefficient estimates from multivariate logit regressions on fund ω-Scores. The dependent variable is OMEGA or fund ω-Score which is an operational risk instrument derived from fund performance, volatility, age, size, and fee structure as per Brown et al. (2009). OMEGA is estimated over each non-overlapping 24-month period after the vehicle purchase month. 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 100 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)). 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 2004 to December 2015. * Significant at the 5% level; ** Significant at the 1% level.

Independent variables	Dependent variable = OMEGA					
SPORT	0.089*					
	(2.31)					
POWER		0.058**				
		(5.23)				
TORQUE			0.042**			
			(4.25)			
MINIVAN				-0.197**		
				(-4.34)		
SPACE					-0.138**	
					(-2.85)	
SAFETY						-0.069**
						(-3.01)
MGTFEE	-0.001	0.000	-0.002	-0.001	-0.001	-0.008
	(-0.04)	(0.02)	(-0.08)	(-0.03)	(-0.05)	(-0.38)
PERFFEE	-0.091**	-0.090**	-0.090**	-0.091**	-0.091**	-0.088*
	(-32.08)	(-31.93)	(-31.57)	(-31.53)	(-28.97)	(-21.76)
HWM	0.061	0.050	0.053	0.061	0.009	0.067
	(1.35)	(1.17)	(1.26)	(1.34)	(0.21)	(1.04)
LOCKUP	-0.535	-0.601	-0.450	-0.543	-0.203	-1.049
	(-0.65)	(-0.72)	(-0.53)	(-0.66)	(-0.22)	(-1.01)
LEVERAGE	-0.123**	-0.113**	-0.122**	-0.123**	-0.140**	-0.091
	(-3.14)	(-2.86)	(-3.10)	(-3.13)	(-3.29)	(-1.90)
AGE	-0.175**	-0.176**	-0.176**	-0.175**	-0.176**	-0.175**
	(-70.67)	(-70.05)	(-68.88)	(-70.76)	(-64.61)	(-55.05)
REDEMPTION	-0.002	0.001	0.000	-0.002	0.005	0.002
	(-0.29)	(0.07)	(0.03)	(-0.30)	(0.48)	(0.28)
log(FUNDSIZE)	0.021**	0.021**	0.020**	0.021**	0.014	0.019*
	(2.92)	(2.87)	(2.72)	(2.97)	(1.73)	(2.35)
Strategy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.982	0.982	0.981	0.982	0.977	0.982
N	477	476	474	477	363	301

Table 9

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, NONSPRATIO, ACTIVESHARE, NRSQUARED, and DISTINCTIVENESS. TURNOVER is the annualized turnover of a hedge fund manager's long-only stock portfolio. 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. NRSQUARED is one minus the R-squared from the regression of fund excess returns against the Fung and Hsieh (2004) seven factors. DISTINCTIVENESS is the Sun, Wang, and Zheng (2012) strategy distinctiveness index measure. 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). LOTTERY is the maximum daily stock return over the past one month averaged across stocks held by the fund. The trading behavior metrics NONSPRATIO, ACTIVESHARE, NRSQUARED, and DISTINCTIVENESS 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 2004 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
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**
NRSQUARED	0.682	0.617	0.065**	0.650	0.597	0.053**	0.637	0.607	0.030**
DISTINCTIVENESS	0.715	0.703	0.012	0.726	0.683	0.043**	0.716	0.692	0.024*
OVERCONFIDENCE	0.069	0.044	0.025*	0.059	0.035	0.024**	0.048	0.046	0.002
LOTTERY	0.073	0.049	0.024**	0.082	0.052	0.030**	0.078	0.055	0.023**
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
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**
NRSQUARED	0.586	0.653	-0.067**	0.625	0.676	-0.051*	0.649	0.659	-0.010
DISTINCTIVENESS	0.685	0.723	-0.038*	0.722	0.727	-0.005	0.715	0.735	-0.020*
OVERCONFIDENCE	0.045	0.066	-0.022	0.053	0.077	-0.024**	0.061	0.072	-0.011
LOTTERY	0.036	0.068	-0.032**	0.045	0.068	-0.023**	0.052	0.062	-0.010**

Table 10

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 model. 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 100 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)). Controls are also included for past RISK and IDIORISK estimated over the prior 24-month period, 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 2004 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 gender											
0.742**	0.444**	0.380**	-0.633**	-0.590**	-0.217**	0.384**	0.280**	0.247**	-0.470**	-0.345**	-0.126*
(4.94)	(8.71)	(7.79)	(-6.76)	(-5.25)	(-3.01)	(3.79)	(7.48)	(6.80)	(-5.41)	(-3.79)	(-2.28)
Panel C: 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 D: 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 E: 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 F: Controlling for manager age											
0.621**	0.439**	0.372**	-0.653**	-0.609**	-0.237**	0.352**	0.292**	0.253**	-0.514**	-0.390**	-0.118*
(3.63)	(7.68)	(6.93)	(-6.62)	(-5.25)	(-3.04)	(3.03)	(6.79)	(6.29)	(-5.58)	(-4.20)	(-1.97)
Panel G: Controlling for sample selection using the Heckman model											
0.695**	0.432**	0.364**	-0.649**	-0.632**	-0.211*	0.351**	0.273**	0.236**	-0.497**	-0.374**	-0.121*
(4.81)	(8.64)	(7.93)	(-6.87)	(-5.84)	(-2.93)	(3.65)	(7.49)	(6.97)	(-5.85)	(-4.26)	(-2.20)
Panel H: 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 I: 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 J: 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 K: 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 L: 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)