The Valuation of Hedge Funds' Equity Positions ✧

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ABSTRACT

We provide evidence on the valuation of equity positions by hedge fund advisors. Reported valuations deviate from standard valuations based on closing prices from CRSP for roughly seven percent of the positions. These deviations are economically significant for about 25 percent of the hedge fund advisors. Advisors with more pronounced valuation deviations show a stronger discontinuity in their reported returns around zero, manage a higher fraction of potentially fraudulent funds, show smoother reported returns, self-report to commercial databases, and are domiciled in offshore locations. Additional tests suggest that the documented equity valuation deviations respond to past performance.

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The recent cases of hedge fund fraud in the United States have made irregularities in the asset valuation practices of hedge fund advisors a point of concern for regulators, investors, and legislators. A key concern is that manipulation of asset valuations by hedge funds can result in direct wealth losses for hedge fund investors; wealth transfers across current, new, and redeeming hedge fund investors; and sub-optimal investment decisions made by investors in response to distorted hedge fund risk-return profiles.[1]

The fundamental cause for these concerns is that, unlike mutual funds, hedge funds are exempt from the set of regulations comprising the Investment Company Act of 1940 (ICA).[2] As such, hedge funds do not have to follow the detailed valuation guidelines and rules provided by SEC under the framework of ICA.[3] Thus, hedge fund advisors operate in an ambiguous legal environment where the boundaries of what might be considered a legal or illegal valuation practice are not well defined.

Previous research has sought to shed light on the valuation practices of hedge funds, but, due to limited availability of position valuations data, the resulting analysis has produced only indirect evidence based on self-reported hedge fund returns. This paper provides direct evidence on the valuation of security positions for reporting purposes by hedge funds. Our direct evidence comes from analyzing a new dataset of individual stock position valuations reported by hedge fund advisors in 13F reports filed with the SEC. These positions represent

[1] Under heightened pressure to take a more active role in detecting and combating hedge fund fraud, SEC recently launched the *Aberrational Performance Inquiry* initiative, under which SEC staff use proprietary models to detect abnormal performance that is indicative of hedge fund fraud (see U. S. Securities and Exchange Commission (2011)).

[2] Sections 3(C)(1) and 3(C)(7) of ICA exempt hedge fund advisors from the general regulatory requirements of ICA as long as they have a certain number of investors that are classified, respectively, as accredited investors or qualified purchasers.

[3] For example, Accounting Series Release No. 113 and No. 118 provide very specific valuations guidelines for different securities and valuation scenarios as applied to the computation of mutual fund net asset values. In addition, mutual funds are required to disclose general information that describes their valuation processes to investors in annual prospectuses.

the only detailed portfolio positions of hedge fund advisors that are publically available. A key advantage of using this dataset is that valuation of equity securities is highly transparent, which makes detection of pricing irregularities among their corresponding positions fairly straightforward.

We document that about seven percent of all equity positions, corresponding to roughly 150 thousand positions, are valued by hedge fund advisors using prices that differ from closing prices as reported in CRSP. Using closing prices to value positions is not only a standard and widely-used practice among asset management companies that are subject to ICA[4], but is also explicitly requested by the SEC when advisors file their 13F reports.[5] The reported valuations for these 150 thousand positions deviate from CRSP-based valuations by roughly 2.5 percent in absolute terms. Such level of valuation deviations is not trivial in an economic sense. Cross-sectional patterns suggest that economically significant valuation deviations exist for only about 25 percent of the sample advisors, with the majority of hedge fund advisors showing little or no valuation deviations. In light of this evidence, we pose a simple question: What causes certain advisors to value their equity positions at prices that differ from the closing prices in CRSP?

One possible explanation is that the positions with the documented valuation deviations correspond to illiquid securities that advisors valued by applying valuation discretion. Exploring this possibility, we stratify positions by the liquidity of the underlying stocks and

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[4] With regard to the valuation of individual positions, Accounting Series Release No. 113, which regulates the valuation practices of mutual funds, but not of hedge fund advisors, states that "If a security was traded on an exchange, the last quoted sale price is generally used."

[5] Filing instructions request that "In determining fair market value, [the advisor has to] use the value at the close of trading on the last trading day of the calendar year or quarter, as appropriate." (see Special Instruction 9 at http://www.sec.gov/about/forms/form13f.pdf).

document valuation deviations even among positions corresponding to the most liquid stocks. By doing so, we are able to rule out illiquidity-related issues as the source of these deviations.

We raise the possibility that the valuation deviations we observe could perhaps be caused by institutional arrangements that we cannot observe. For example, advisors could either directly or indirectly — especially when they use external pricing services — rely on pricing feeds that tend to offer prices that differ from CRSP prices due to data collection and dissemination procedures that are specific to a particular vendor. This and other arrangements that we discuss later could cause advisors to use prices for position valuations that are recorded at different points in time, giving rise to larger valuation deviations when intraday price volatility is higher for the underlying stocks. Thus, it is possible that the positions with valuation deviations that we observe correspond to stocks with high intraday price volatility at the end of the quarter. This possibility is, however, ruled out when positions are stratified by intraday price volatility of the underlying stocks because valuation deviations persist even among the positions with the least intraday price volatility.

Since the valuation practices of hedge fund advisors exist in a lax legal environment characterized by a high degree of ambiguity, we hypothesize that the documented equity valuation deviations reflect certain advisors strategically managing their equity position valuations to impress upon their potential or existing clients (*Strategic Valuation Hypothesis*). The resulting empirical prediction is that hedge fund advisors with stronger equity valuation deviations should exhibit stronger irregularities in their reported returns and stronger incentives for engaging in such behavior.

Our results are consistent with the *Strategic Valuation* hypothesis, suggesting that the equity valuation deviations are not random. This conclusion is supported by three sets of results. First, equity valuation deviations are related to suspicious irregularities in reported returns identified in previous research. Specifically, hedge fund advisors with more pronounced equity valuation deviations show a stronger discontinuity in their reported returns around zero—whereby the number of small positive returns outweighs the numbers of small negative returns—and exhibit smoother reported returns.

Second, the documented equity valuation deviations are more prevalent among advisors with characteristics suggesting a stronger presence of incentives to engage in pricing irregularities. In particular, hedge fund advisors that self-report to commercial databases show more pronounced equity valuation deviations. This is consistent with advisors using valuation as a tool in trying to impress potential investors that are exposed to advisors' self-reported returns. In addition, we show that hedge fund advisors domiciled offshore also show stronger equity valuation deviations. This evidence is consistent with offshore domiciles affording advisors greater opportunities to use valuation to their advantage since they face a lax legal environment.

Lastly, we document a direct link between equity valuation deviations and past performance. More specifically, we show that when hedge funds show weak performance over the last twelve months, advisors respond by marking up their positions. Conversely, when hedge funds show strong past performance, advisors respond by marking down their positions relative to standard valuations based on closing prices from CRSP. This evidence suggests that a component of the valuation behavior of hedge fund advisors is directly driven by incentives related to performance considerations.

Our paper contributes to a growing literature that studies irregularities in self-reported hedge fund returns. The findings from this literature suggest that hedge funds report: (1)

smoothed returns (see, e.g., Bollen and Pool (2008) and Getmansky, Lo, and Makarov (2004)), (2) disproportionally more small positive than small negative returns in the pooled distribution of returns around zero (see, e.g., Jylha (2011) and Bollen and Pool (2009)), (3) higher returns in December (see Agarwal, Daniel, and Naik (2011)), and (4) returns that have been restated in later data vintages (see Patton, Ramadorai, and Streatfield (2011) and Aragon and Nanda (2011)).

Our research is also related to studies that analyze the operational risks of hedge funds (see, e.g., Brown, Goetzmann, Liang, and Schwarz (2008); Brown, Goetzmann, Liang, and Schwarz (2011); Cassar and Gerakos (2011); and Liang (2003)). For example, Brown, Goetzmann, Liang, and Schwarz (2011) show that hedge funds that have experienced legal problems are less likely to use independent pricing agents, which affords them greater pricing discretion, and they are more likely to have switched their pricing agent in the last year. Cassar and Gerakos (2011) show that hedge funds with less verifiable pricing sources and greater pricing discretion for their managers report smoother returns.

The remainder of the paper is organized as follows. In Section I we discuss data and sample summary statistics. Section II provides an overview of valuation deviations at the position level. Section III analyzes a first set of possible explanations for the documented valuation deviations. Section IV investigates the influence of valuation deviations on reported returns. Sections V, VI, and VII relate valuation deviations to hedge fund advisors' incentives, and Section VIII concludes.

I. Data

A. Data Sources and Identification of Hedge Fund Advisors

Our hedge fund 13F position valuations data came from Wharton Research Data Services (WRDS), which downloaded and parsed all electronic 13F filings available on the SEC EDGAR website. According to the Securities Exchange Act of 1934, all institutions with investment discretion over $100 million in certain pre-specified securities must report quarterly holdings to the SEC as part of their 13F filing requirement.[6] The securities for which institutions have to report their positions include equities, convertible bonds, options, and warrants; their names are periodically listed on the SEC website.[7] Our sample period begins in the first quarter of 1999 – the earliest period for which 13F reports are available in electronic format from EDGAR – and ends in the last quarter of 2008. Important for our study, WRDS' dataset differs from the 13F dataset provided by Thomson-Reuters, a 13F data source popular with academics, in one important way: Unlike Thomson-Reuters, WRDS provides valuations reported by each institution for each position.

To identify hedge fund advisors among all the 13F filing institutions, we relied on a proprietary list of hedge fund advisors provided by Thomson-Reuters. The list, which contained identification numbers (CIKs), assigned uniquely to each 13F filing institution by the SEC, was checked against various sources to make sure that the listed institutions were indeed hedge fund management companies. We checked the list against names of hedge fund management companies listed in the Center for International Securities and Derivatives Markets (CISDM), Lipper TASS, and Morningstar hedge fund databases and against advisor

[6] More information about the requirements of Form 13F pursuant to Section 13(f) of the Securities Exchange Act of 1934 can be found at: http://www.sec.gov/divisions/investment/13ffaq.htm.

[7] The official list of Section 13F securities can be found on the following SEC webpage: http://www.sec.gov/divisions/investment/13flists.htm.

names that were registered as investment advisors managing hedge funds on Form ADV filed with the SEC. The advisors' names were also checked using Lexis-Nexis searches and inspection of advisors' websites to ensure that they were involved in hedge fund management. Besides the intended checks, this procedure also generated additional hedge fund advisor names that we added to the original list. The resulting list of 978 hedge fund advisors that filed at least one 13F report during the 1999-2008 period was subjected to additional filters described below.

We employed the CISDM, Lipper TASS, and Morningstar hedge fund databases to obtain information on monthly returns, assets under management, and domicile for hedge funds that were managed by our sample advisors.

Our last dataset is the CRSP Monthly and Daily Stock Data Series. We used this dataset to supplement our holdings and position valuations data with historical prices, volume, and other information for individual stocks. This last dataset was linked with the rest of our data using stock CUSIPs.

B. Data Steps and Valuation Deviation Measure

Since we focus only on the valuation of equity positions, we excluded all positions corresponding to non-equity securities.[8] Key to our analysis is the valuation of each stock position reported by each hedge fund advisor along with the number of stock shares held in that position. Advisors are required to report position valuations in their 13F reports that are consistent with fair value principles. In accordance with this principle, the 13F filing

[8] Additional details on the procedure we used to clean our dataset from non-equities and data errors are provided in the appendix.

instructions request that *"In determining fair market value, [the advisor has to] use the value at the close of trading on the last trading day of the calendar year or quarter, as appropriate*."[9]

To assess the extent to which advisors conform with these valuation principles, we construct a valuation benchmark for each reported position that employs the stock prices reported in the CRSP daily stock files. CRSP files report for each stock on each date the last trading price from the exchange on which the stock last traded. For stocks that did not trade on a particular day, the price is reported as the average of ask and bid quotes at the close of the trading. We calculated how much the reported valuation of each stock position differs from a valuation that is based on stock prices reported in the CRSP database. We refer to this measure as *stock position valuation deviation* (*VD*) and compute it as follows:

$$VD_{i,j,t} = \frac{reported\ valuation_{i,j,t} - CRSP\ valuation_{i,j,t}}{CRSP\ valuation_{i,j,t}} \quad (1)$$

where $reported\ valuation_{i,j,t}$ is the value reported by advisor *i* for a position of stock *j* in quarter *t*, and $CRSP\ valuation_{i,j,t}$ is the respective value based on the CRSP price. More specifically, $CRSP\ valuation_{i,j,t}$ is computed as

$$CRSP\ valuation_{i,j,t} = reported\ shares_{i,j,t} \times CRSP\ price_{j,t} \quad (2)$$

where $reported\ shares_{i,j,t}$ is the number of reported shares by advisor *i* for stock *j* in quarter *t* and $CRSP\ price_{j,t}$ is the stock price of stock *j* from the CRSP stock database as of the portfolio report day.

[9] See Special Instruction 9 at http://www.sec.gov/about/forms/form13f.pdf.

To ensure that valuation deviations did not arise due to unintentional data entry errors or text-parsing errors, we performed corrections to address scaling issues due to displaced decimal points or interchanged columns. Furthermore, we excluded all stocks that had a stock split in the last five days prior to the valuation date to eliminate the possibility of a non-zero *VD* caused by an accidental use of prices prior to the stock split.

As an additional screen, we included only 13F reports that were filed within forty-five days of the end of the calendar quarter, the legally required window within which the reports have to be filed. Furthermore, we excluded all advisors that filed less than four 13F reports. Finally, to eliminate remaining outliers (caused perhaps by filing errors or parsing errors) we excluded the most extreme 5% of the deviations.[10]

C. Sample Description

Our final sample consists of 864 hedge fund advisors and 15,198 quarterly reports. Sample summary statistics are reported in Table I. The number of hedge fund advisors that filed 13F reports increases from 194 in 1999 to 682 in 2008. Consistent with an increasing number of 13F filing advisors, the number of filed reports more than quadruples from 534 reports in 1999 to 2,360 reports in 2008. Table I also shows the portfolio value and the number of distinct stocks in the portfolios of fund advisors. The mean portfolio size varies around the total sample mean of about 1.8 billion USD.[11] Only in the years following the dot-com bubble (2002, 2003) and the subprime crisis (2008) the mean portfolio size is

[10] We applied alternative filters related to the size of position valuation deviation that excluded positions deviating by more than 50%, 40%, 30%, 20%, or 10%, respectively. The results of the paper were qualitatively similar when these alternative filters were used.

[11] The 13F portfolio size is calculated based on CRSP prices and the reported number of shares.

considerably smaller. On average, a hedge fund advisor's portfolio covers 125 distinct stocks, whereas the median number of stocks is 48. Both numbers declined between 1999 and 2008.

II. Frequency and Magnitude of Valuation Deviations

A. Valuation Deviations over Time

We start by examining positions with reported valuations that differ from CRSP valuations, i.e., positions with $|VD|>0$. Since advisors are required to round reported valuations to the nearest one thousand dollars (as per Form 13F instructions), the valuation deviation of a position by less than $1,000 could be simply caused by rounding. Thus, to avoid deviations that arise due to rounding, for such positions we set *VD* equal to zero.

Panel A of Table II reports the frequency of positions with nonzero valuation deviations. The first column shows that, on average, about 7% of all positions, which translates into about 150 thousand out of roughly 2.3 million total positions, were valued at prices that deviated from CRSP prices. The fraction of positions with valuation deviations is higher in the first half than in the second half of the sample period. The largest value is reached in 2003 (11.56%) and the lowest in 2006 (4.50%). The fraction of positions that deviate from the CRSP valuation by at least five percent is much smaller, but still accounts for about one percent of all positions. The fraction of positions deviating by at least 10 percent makes up only 0.5 percent of all positions.

To get a sense for the economic magnitude of the valuation deviations, the fourth column reports the average of $|VD|$, computed across all positions with valuation deviations. The average deviation among these positions is 2.49%, which, although not extreme, is economically significant.

B. Valuation Deviations across Advisors

Next, we examine how widespread valuation deviations are across hedge fund advisors. Cassar and Gerakos (2011) document that the majority of hedge fund advisors rely on independent pricing committees or external parties to compute their NAVs, and for this reason, these advisors exhibit fewer pricing irregularities. Applied to our setting, the Cassar and Gerakos (2011) evidence would suggest that the equity valuation deviations we document should be confined to a small subset of advisors.

In Panel B of Table II, the fraction of positions with valuation deviations and the magnitude of the deviations among positions with nonzero deviations are first computed for each hedge fund advisor separately over the entire sample period and then cross-sectional statistics are calculated.

Consistent with the majority of advisors using independent parties for NAV pricing, most advisors show little or no valuation discrepancy. However, a non-trivial fraction of advisors, show a substantial degree of valuation discrepancy. For example, 25 percent of the hedge fund advisors have more than 6% of their positions valued at prices that differ from CRSP prices. The magnitude of valuation deviations tells a similar story, as 25 percent of advisors show valuation deviations ranging from 4.8% to 26%. In sum, valuation deviations are confined to a sizable subset of hedge fund advisors, the majority of hedge fund advisors display little or no valuation discrepancies, and the differences in valuation discrepancy between the former and latter group are of a severe magnitude.

III. A First Pass at Possible Explanations

A. Is Illiquidity Responsible for the Valuation Deviations?

It is possible that the observed deviations are confined to stocks that did not trade on the report date. If an exchange-determined price for a given stock did not exist because the stock did not trade that day, advisors are allowed to use their discretion to come up with a "fair value" estimate. In doing so, hedge fund advisors can use prices provided by pricing services, quotes obtained from dealers, in-house valuation methodologies, or a combination of these approaches. Thus, we would expect position valuations for non-trading stocks to differ from CRSP valuations, which in such cases are based on the average of the bid and ask closing quotes.

Panel A of Table III reports results stratified by whether a stock traded or not during the report date. Consistent with hedge fund advisors using discretion to value non-traded stocks, the majority of positions among non-traded stocks (about 70%) are valued at prices that deviated from CRSP prices. Nevertheless, the positions with valuation deviations continue to make up a non-trivial fraction of roughly 7% among the positions of traded stocks, and continue to display an economically significant magnitude of about 2.49%. This evidence, combined with the fact that the number of positions corresponding to stocks that did not trade is very small (only 5,657 positions out of roughly 2.3 million positions) suggests that discretion applied to the valuation of non-traded stocks is not responsible for the vast majority of observed valuation deviations.

Another possibility is that the positions with valuation deviations correspond to thinly-traded stocks trading at prices that do not reflect a fair value based on the most recent market conditions. For example, for stocks that traded early in the day but did not trade for the rest of the day, the advisor could choose to ignore the last trade price as a stale price and use discretion to come up with an alternative “fair value” estimate that reflects more recent developments.[12] Such a practice would lead to a deviation from the CRSP valuation, which is based on the last trading price for the day.

Panel B excludes non-traded stocks and reports similar statistics as in Panel A for the remaining positions stratified into deciles by the underlying stock’s illiquidity. As a measure of a stock’s illiquidity we use the Amihud's ratio, defined as the ratio of a given stock's absolute return to its dollar volume.[13] For each stock and quarter, this ratio is averaged across all trading days of the quarter to come up with a quarterly measure. Stocks are ranked on illiquidity and sorted into deciles every quarter.

Results from Panel B show that deviations from CRSP valuations are observed across all deciles regardless of the level of illiquidity. The fraction of positions with valuation deviations ranges from 5.57% to 9.99% across the different deciles. Importantly, a significant fraction of deviations exists even among the highly liquid positions of Decile 1. The positions with valuation deviations represent 6.94% of all positions in Decile 1 with an average deviation of 2.34%, suggesting that illiquidity alone cannot explain the observed valuation discrepancies among hedge fund advisors. That illiquidity plays a minor role is further supported by the fact that, despite the larger deviations observed in Decile 10, or even Decile 9, the number of deviations from these deciles is dwarfed by the number of deviations from the rest of the deciles. Thus, these findings suggest that discretion that is available when

[12] According to regulation SFAS 157, as applied to Alternative Asset Management Companies, an advisor could make a case that a thinly traded stock represents a Level 2 asset, for which valuation discretion can be applied, rather than a Level 1 asset, for which valuation should be based on market prices only.
[13] See Amihud (2002).

valuing thinly-traded stocks is not responsible for the vast majority of observed position valuation deviations. In sum, the combined evidence from Panels A and B rules out illiquidity as the main driver for the observed valuation differences.

B. Are Institutional Arrangements Responsible for the Valuation Deviations?

The observed valuation deviations could be the outcome of processes caused by institutional arrangements, of which we are not aware. For example, advisors or their external pricing services could rely on pricing feeds offering prices that differ from CRSP prices due to data collection and dissemination procedures that are specific to a particular data vendor. Besides relying on different data feeds, advisors could use different procedures for handling closing prices that are affected by cancelled trades or trades that happen outside of the best bid and ask quotes at the close of the trading day. In addition, advisors could choose to use closing quotes rather closing trading prices or could choose to use closing prices from different exchanges. The pre-determined choices that advisors have made to deal with these issues could vary from one hedge fund complex to another and naturally give rise to deviations from the CRSP prices.

The multiple choices available to advisors in dealing with such arrangements could lead to use of prices or quotes recorded at different points in time, resulting in larger valuation deviations when intraday price volatility is higher for the underlying stocks. Thus, it is likely that the positions with nonzero valuation deviations correspond to stocks that experienced high intraday price volatility, where deviations were more likely to be the product of pre-specified institutional arrangements to deal with the above issues.

Panel C of Table III excludes non-traded stocks and reports similar statistics as in Panels A and B for the remaining positions stratified into deciles by the underlying stocks' intraday price volatility. A stock's intraday volatility is measured as the spread between the highest and lowest trading price during the report day, divided by the average of highest and lowest trading price.

Results from Panel C show that deviations from CRSP valuations are observed across all deciles regardless of the level of intraday volatility. The fraction of positions with valuation deviations ranges from 5.82% to 7.44% across the different deciles. Importantly, a significant fraction of deviations exists even among the least volatile positions of Decile 1. The positions with valuation deviations represent 5.85% of all positions in Decile 1 with an average deviation of 2.29%, suggesting that intraday volatility alone, as related to certain institutional arrangements, cannot fully explain the observed valuation discrepancies among hedge fund advisors.

IV. Valuation Deviations and Suspicious Return Patterns

The previous section ruled out illiquidity of the underlying stocks and institutional arrangements that could come into play through intraday price volatility as explanations for the observed equity valuation deviations. In this section we explore an additional explanation. The hypothesis, which we refer to as the *Strategic Valuation Hypothesis*, postulates that equity valuation deviations are caused by hedge fund advisors, who, in pursuit of their self-interest, take advantage of lax regulation by strategically fudging equity position valuations to impress upon potential or existing clients. One of the resulting testable predictions of this hypothesis is that hedge fund advisors with stronger equity valuation deviations should display stronger irregularities in their reported returns.[14]

To explore this relation, we focus on two return patterns that are documented in the literature to be consistent with strategic return management: (i) a discontinuous distribution of hedge fund returns around zero, and (ii) smoothing of hedge fund reported returns.

A. Discontinuity around Zero and Valuation Deviations

Bollen and Pool (2009) document a discontinuity in the distribution of pooled hedge fund reported returns whereby the number of small positive returns far outweighs the number of small negative returns. Such a pattern is consistent with hedge fund advisors trying to avoid reporting small negative returns by strategically marking up positions just enough to avoid negative returns. In a later extension, Bollen and Pool (2010) show that a particular discontinuity measure, which they refer to as the Kink measure, is the most significant measure for predicting hedge fund fraud. In what follows, we explore whether advisors that show more equity valuation deviations exhibit a stronger distribution discontinuity in their reported returns and manage a higher fraction of funds that are flagged as potentially fraudulent by the Kink measure.

A.1 Discontinuity Measure Based on Fixed Return Intervals

A.1.1. Methodology

[14] One possibility is that, since 13F reports are publically available, a hedge fund advisor might use prices to value his 13F positions that are more accurate than the prices used to prepare his NAV valuations, which are not publically available. However, because the reported returns are based on NAV valuations, this would work against us finding a relation between the 13F-based valuation deviations and irregularities in reported returns.

We run regressions of our discontinuity metric on dummy variables reflecting the level of equity valuation deviations by advisors. To construct our first discontinuity metric, we follow a two-step procedure. We first assign the reported returns of all hedge funds to each respective advisor. Next, for each advisor, the discontinuity metric is computed as the difference of the fraction of positive returns and the fraction of negative returns within tight intervals around zero.

The key independent variables are constructed by dividing advisors into three equal-sized groups according to their equity valuation deviations. Advisors with the lowest valuation deviations are in the benchmark group. We then define two dummy variables: *Medium Deviation* equals one for advisors that belong to the group with medium equity valuation deviations and zero otherwise. *High Deviation* equals one for advisors that belong to the group with the highest valuation deviations.[15] If advisors in the medium and high deviations groups (compared against the low deviation group) mark strategically to avoid reporting small negative returns, the coefficients on the dummy variables ought to be positive.

To construct the indicator variables specified above, we use two metrics that measure the valuation deviations at the advisor level. The first one, *ABS_PD,* is measured as the absolute value of an advisor's quarterly *Portfolio Valuation Deviation* (*PD*), which in turn is measured as the signed net dollar value of a stock portfolio's total valuation deviation at the end of a given quarter *t*, divided by the portfolio value determined by CRSP prices:

[15] This categorization is roughly based on cross-sectional patterns in valuation deviations documented in Table II, where we observe advisors with extreme and moderate valuation deviations along with advisors that show very little or no valuation deviations at all.

$$PD_{i,t} = \frac{\sum_j \left(reported\ valuation_{i,j,t} - CRSP\ valuation_{i,j,t} \right)}{\sum_j CRSP\ valuation_{i,j,t}}, \tag{3}$$

The second valuation deviation measure, *FRAC*, captures the fraction of positions with nonzero valuation deviations for each advisor in each quarter. Both measures are averaged across all quarterly observations of a given advisor to come up with one aggregated measure per advisor.

As control variables we include the advisor's stock portfolio illiquidity, *SPI_AVG*, and the advisor's total portfolio illiquidity, *TPI_AVG*. The first control variable, *SPI_AVG,* is included to control for any effects that are related to valuation of thinly traded stocks for which the manager has more valuation discretion. It is calculated as the average across the advisor's quarterly observations, where for each quarter and each advisor *SPI* is measured as the value-weighted mean of Amihud's ratio of all the stocks in the portfolio. Since the return patterns of a hedge fund depend not only on the stocks held but also on other assets in the portfolio, we use *TPI_AVG* to additionally control for any illiquidity-induced pricing issues related to assets other than equity securities, which we do not observe in our 13F portfolio data. *TPI_AVG* is measured as the beta exposure to Pástor and Stambaugh (2003)'s innovations in aggregate liquidity, aggregated at the advisor level by taking a value-weighted average across all funds managed by each advisor.

A.1.2. Results

Table IV reports results. We employ different specifications whereby the dependent variable, the fraction of positive minus fraction of negative reported returns, is constructed based on returns that fall within three intervals, i.e., +/-100, +/-200, and +/-300bps around zero.

Results show that the differential fraction of positive and negative reported returns is higher for advisors with the highest equity valuation deviations relative to advisors with the lowest equity valuation deviations. The coefficient on *High Deviation* is both economically and statistically significant across all specifications. The coefficient on *Medium Deviation* is also positive in all specifications, but significant at conventional levels in only five out of the six specifications. These results are consistent with advisors with the highest equity valuation deviations trying to avoid reporting small losses, giving rise to a discontinuity in their reported returns around zero.

A.2 Discontinuity Measure Based on the Kink Indicator

A.2.1 Methodology

We next examine whether the observed equity valuation deviations are related to the Kink fraud indicator suggested by Bollen and Pool (2010). This measure is also based on the distribution of fund returns around zero. However, an advantage of this measure is that the size of the return interval is not set exogenously, but is determined optimally for each fund based on its return distribution. Moreover, Bollen and Pool (2010, p. 26) show that the Kink fraud indicator is the most significant measure for detecting fraudulent behavior among hedge funds.

To calculate this measure, for each fund, we create a histogram of reported returns with the optimal bin size computed according to Silverman (1986).[16] Next, we count the number of return observations that fall in three adjacent bins, two to the left of zero and one to the right. If a fund shows no discontinuity and thus a smooth distribution, the number of observations in the middle bin should equal the average number of observations in the two surrounding bins. Thus, we test whether the number of observations in the middle bin is significantly lower than the average from the two adjacent bins. According to Bollen and Pool (2010), a fund is categorized as "Kink" fund when the number of observations in the middle bin is significantly less than expected at a 10% significance level. Next, for each advisor, the dependent variable is computed as the fraction of funds that are categorized as Kink funds. The independent variables are the same as in the previous section.

A.2.2 Results

The regression results in Table V show that advisors who exhibit more equity valuation deviations manage a larger fraction of funds that are categorized as "Kink" funds, i.e., potentially fraudulent funds. These results are also consistent with advisors that show more equity valuation deviations showing a stronger discontinuity in their reported returns around zero relative to advisors in the benchmark group. Thus, evidence from Table V is consistent with the evidence presented in Table IV.

B. Smoothed Returns and Valuation Deviations

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[16] The optimal bin size for each fund is calculated as $\alpha \times 1.364 \times \sigma \times n^{-1/5}$, where σ is the monthly return standard deviation, n is the number of observations, and α is set equal to 0.776, corresponding to a normal distribution.

Previous studies document that hedge funds report remarkably smooth returns (see, e.g., Bollen and Pool (2008) and Getmansky, Lo, and Makarov (2004)). Return smoothing alters hedge fund reported returns and helps generate more attractive performance statistics. The main idea is that when a hedge fund's assets exhibit weak performance, the advisor could mark positions up to boost reported returns. Conversely, when the hedge fund's assets exhibit strong performance, the advisor could mark positions down to hold back on the reported returns.[17] Return smoothing thus causes information to not be fully incorporated into reported returns, giving rise to a less than one-for-one relation between the underlying assets' true economic returns and reported returns. We examine whether equity valuation deviations are related to this specific pattern of reported returns.

B.1. Methodology

To measure return smoothing parameters, we use an approach that is similar to the approach used in Getmansky, Lo, and Makarov (2004). Hedge fund reported returns are modeled as a function of the underlying unobservable true economic returns. In the model, $R_{j,t}^{rep}$ represents the reported return of fund j for period t and $R_{j,t}$ stands for the unobserved economic return of fund j over the same period. The model specification includes concurrent and two lags of economic returns:

$$R_{j,t}^{rep} = a + \theta_{j,0} \cdot R_{j,t} + \theta_{j,1} \cdot R_{j,t-1} + \theta_{j,2} \cdot R_{j,t-2} + \varepsilon_{j,t}, \quad (4)$$

[17] This form of manipulation consists of underreporting both gains and losses and is consistent with the notion of returns management discussed in Agarwal, Daniel, and Naik (2011): Fund managers might overvalue their portfolio to avoid reporting negative returns and undervalue their portfolio to create reserves which can be added to future returns if they happen to be negative ("saving for the rainy day").

with constraints on coefficients such that $\theta_{j,k} \in [0,1]$, $k = 0,1,2$, and $1 = \theta_{j,0} + \theta_{j,1} + \theta_{j,2}$. The key coefficient, θ_0, shows how much of the true economic return is reflected in the reported return. A θ_0 value equal to one means that, on average, fund *j* fully reported the true economic return. Return smoothing will lead to a less than one-for-one relation between reported returns and true economic returns, i.e., a θ_0 less than one, since reported returns do not fully incorporate all the available economic information.

As the economic return is unobservable, we proxy for it with the predicted returns from a regression of reported excess fund returns on a subset of ten factors that are used to proxy for hedge fund trading strategies. The factors are: the three Fama and French (1993) factors, five trend-following factors of Fung and Hsieh (2004), the change in the yield of a 10-year Treasury note, and the change in the credit spread.[18] We select the subset of factors by maximizing the adjusted R^2.

Our first smoothing measure is the smoothing coefficient θ_0. The second smoothing measure is the Herfindahl Index (ξ) suggested by Getmansky, Lo, and Makarov (2004) as a way to measure concentration of theta weights. This measure is constructed as the sum of the squared theta coefficients for each fund. Lower values for this measure are indicative of return smoothing. The last return smoothing measure is the first order serial correlation coefficient of reported returns (ρ), which will be higher in the presence of return smoothing. Unlike the first two measures, this third measure is simply computed from reported returns and is thus not dependent on a particular method used to model reported or economic returns.

[18] In robustness examinations we also use a subset of hedge fund strategy indices as factors to predict returns (see, e.g., Agarwal and Naik (2004)). Our results (not reported) remain the same.

Each measure is first computed for each hedge fund and then value-weighted across all funds managed by each advisor, resulting in one observation per advisor. We thus employ regressions at the advisor level where the dependent variable is one of three smoothing measures. The independent variables are the same as in the previous section.

B.2. Results

Table VI reports regression results. We restrict the subset of included risk factors in calculating θ_0 to a maximum of three factors. Results using an unrestricted model are similar and not reported here in the interest of brevity.

The coefficient values for *High Deviation* range from -0.0324 to -0.0337 when the θ_0 measure is the dependent variable. These values are significant both in an economic and statistical sense, proving that advisors with the highest equity valuation deviations report smoother reported returns than advisors with the least equity valuation deviation. This conclusion is further supported by the sign and significance of coefficients on *High Deviation* when specifications with the other two dependent variables are used. As expected, advisors with high equity valuation deviations show a lower Herfindahl Index and higher serial correlation.

Taken together, results from Tables IV, V and VI suggest that advisors with high equity valuation deviations show stronger irregularities in their reported returns, consistent with the *Strategic Valuation* hypothesis. These results are also consistent with the view that advisors with high valuation deviations employ weaker internal pricing controls that are associated with the use of less verifiable pricing sources, a greater degree of managers' valuation discretion, and less reliance on external independent pricing parties. Weaker pricing controls can then afford advisors greater opportunities to strategically manage the valuations of their positions.

V. Valuation Deviations and Advertising

Previous research that examines biases in self-reported hedge fund returns suggests an advertising rationale intended to generate more visibility behind the decision of some hedge funds to self-report to commercial databases.[19] We hypothesize that, taking advantage of the generated visibility, a fraction of the self-reporting advisors potentially use valuation as a tool to generate attractive returns that they can advertise to potential investors.[20] This suggests that pricing irregularities and in particular equity valuation deviations ought to be more prevalent among advisors that report than among advisors that do not report to commercial databases. Along the same vein, the prevalence of equity valuation deviations ought to increase after advisors join a commercial database. In what follows, we explore these two empirical predictions.

A. Reporting to a Database and Valuation Deviations

To examine whether advisors that report to commercial databases exhibit more equity valuation deviations, we regress each of our equity valuation deviations measures on *Database Reporting*, a dummy variable indicating whether an advisor reports to at least one

[19] See, for example, Ackermann, McEnally, and Ravenscraft (1999), Agarwal, Fos, and Jiang (2010), and Aiken, Clifford, and Ellis (2011) .

[20] The restriction imposed by SEC rule 502(c), which prohibits hedge fund advisors from engaging in any form of general advertising, actually makes reporting to commercial databases the best remaining advertising option for advisors.

of the three commercial databases, CISDM, Lipper TASS, and Morningstar, in a given quarter.[21]

The equity valuation deviation measures used for this analysis, *ABS_PD* and *FRAC*, are the same measures that were introduced in the previous section, with the only difference being that they are constructed for each given advisor in each given quarter. Again, to account for the illiquidity of thinly traded stocks, as a control variable in all specifications we include stock portfolio's illiquidity, *SPI*, measured as the value-weighted mean of Amihud's ratio of all the stocks in the portfolio in a given quarter.[22]

All analysis is done at the advisor and quarter level. Table VII shows results using two different specifications. The first specification is a pooled regression. The second specification includes time-fixed effects to control for any unobservable time effects that could equally affect the marking behavior of all advisors. Thus, the second specification is better suited for analyzing the explanatory power of the cross-section. In both specifications, standard errors are clustered by advisor.

There are 462 advisors out of the 864 advisors in our sample that report to at least one of the commercial databases. Results show that, regardless of the specification or the valuation deviation measure used, the coefficient on *Database Reporting* is positive and statistically significant. Said in a different way, advisors that report to commercial databases exhibit stronger equity valuation deviations. This result is consistent with the notion that, aspiring to impress potential investors, these hedge fund advisors use position valuations as a tool for

[21] Some of the advisors that we classify as non-reporting could be reporting to some other databases. This, however, would work against us finding a difference in the valuation deviations between advisors we classify as reporting and those that we classify as non-reporting.
[22] The Pastor and Stambaugh (2003) liquidity beta is not applicable and therefore not included as a control here since this analysis is not based on reported returns.

generating impressive performance metrics.[23] The control variable *SPI* has no significant impact on valuation deviations.

B. Valuation Deviations Before and After Joining a Database

If reporting to commercial databases is a way for hedge fund advisors to advertise returns that have been affected by the valuation choices of advisors, we would expect hedge fund advisors to change their marking behavior after joining the database. We next explore this possibility.

Focusing on advisors with at least one holdings report before and after the first date of appearance in a commercial database generates a list of 38 advisors. We use two approaches to compare the marking behavior before and after the first date of database reporting. The first one is in effect a difference in differences approach, whereby the valuation deviation measure (*ABS_PD* and *FRAC*) for each advisor in each quarter is first benchmarked against the average valuation deviation measure of other advisors that never chose to report to a commercial database. Next, an average of the benchmarked measure is computed for each advisor before and after the first date of database reporting, and a paired t-test is used for the after-before comparison. As a robustness check, we introduce a second approach, which compares the average advisors' rank based on their equity valuation deviation measure before and after, where ranks are normalized to be between 0 and 1.

Table VIII shows that advisors who choose to report to commercial databases show stronger equity valuation deviations after they start reporting to commercial databases. This

[23] One could argue that returns reported to a commercial hedge fund database could potentially help investors figure out that an advisor is manipulating its valuations. However, the fact that Bernard Madoff reported grossly fabricated returns to one of the hedge fund databases for 11 years and got away with it for such a long time illustrates that investors have no ability to detect fraud simply based on reported returns.

result is statistically significant for all four differences computed and is consistent with advisors changing their marking behavior after joining a commercial database. In sum, the combined evidence from Tables VII and VIII makes a contribution by providing new evidence that questions the accuracy of self-reported returns for measuring hedge fund performance.

VI. Offshore Domiciles and Valuation Deviations

Cumming and Dai (2010) document a higher incidence of misreported returns among offshore funds. Presumably being domiciled in offshore locations that are subject to laxer regulation affords hedge fund advisors greater opportunities to use valuation to their advantage.[24] This suggests that pricing irregularities and in particular equity valuation deviations ought to be more prevalent among advisors that are domiciled in offshore locations.

We examine the relation between equity valuation deviations and advisors' domicile. We include two specifications. In Panel A of Table IX, the key independent variable, *One Fund Offshore,* indicates whether an advisor has at least one hedge fund that is domiciled in the Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Curacao, or Virgin Islands, and zero otherwise. In Panel B, we introduce two new independent variables, *Offshore All* and *Offshore Not All*. The former variable equals one for each advisor managing only hedge

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[24] Hedge funds that operate in offshore locations often get to use the services of local fund administrators, accounting firms, and auditing firms, which, also as offshore entities, operate under a different and perhaps more relaxed set of rules and regulations.

funds that are domiciled offshore. The latter variable equals one for each advisor managing at least one, but not all, funds that are domiciled offshore.

Results from Panel A of Table IX show that advisors managing at least one fund that is domiciled offshore show more equity valuation deviations. Results from Panel B tell a similar story, but they appear to emphasize that this effect is confined primarily to advisors that manage only funds that are domiciled in offshore locations. These results are consistent with the view that advisors that face lax regulatory requirements are more likely to subject themselves to weaker pricing controls and/or deviate from standard equity valuations. The coefficient on the control variable *SPI* remains insignificant.

VII. Past Performance and Directional Valuation Deviations

One presumed goal of introducing pricing irregularities in valuation of positions is artificial enhancement of performance measures to maintain the current base of investors and attract additional investment flows. Return smoothing is one of the ways through which hedge funds can reduce volatility of their portfolio returns and enhance performance statistics such as the Sharpe Ratio. If valuation is used by hedge fund advisors to smooth returns, the valuation patterns of hedge fund advisors ought to display directional patterns that are a function of past performance. Specifically, we would expect hedge fund advisors to strategically mark up their positions following low portfolio returns and to strategically mark them down following high portfolio returns. This section explores the direct relation between the marking behavior of hedge fund advisors, as characterized by their equity valuation deviations, and their past performance.

A. Methodology

To examine the relation between the marking behavior of advisors and performance of the hedge funds that they manage, we relate directional equity valuation deviation measures at the advisor's portfolio level to past portfolio returns using a regression approach. The dependent variable, *Portfolio Valuation Deviation* (*PD*), is constructed for each advisor in each quarter as shown in Section IV. Specifically, *PD* is measured as the signed net dollar value of a portfolio's total equity valuation deviations at the end of a given quarter, divided by the portfolio value as determined by CRSP prices. In addition, we use an alternative measure of directional equity valuation deviations, *FRACDIF*. For each advisor in each quarter, *FRACDIF* is computed as the difference of the fraction of positions with positive equity valuation deviations and the fraction of positions with negative valuation deviations. Although, both measures are highly correlated, they capture somewhat different patterns of equity valuation deviations at the portfolio level. The *PD* measure is more sensitive to severe equity valuation deviations that could be limited to a small number of large positions. On the other hand, the *FRACDIF* measure is better positioned to capture relatively small equity valuation deviations spread across a large number of the portfolio positions.

The key independent variables in our regression are two return measures, which reflect the advisor's past performance over the last twelve months. For each advisor, the first return measure is calculated as the holdings-based return of a portfolio that mimics the holdings of the advisor's 13F portfolio. This holdings-based return is calculated by employing CRSP returns for the underlying portfolio stocks. The idea behind using this measure is that an advisor looks at the real returns of the underlying assets in his portfolio at the end of quarter *t* and then strategically affects valuations. Ideally we would have used real returns of the total portfolio, but such returns are not available because only a fraction of the portfolio is reported in 13F reports. Thus, to capture the total performance of the advisor, we use an additional performance measure, which is the value-weighted average of the reported returns of all hedge funds managed by the advisor.

B. Results

Estimation results and corresponding p-values are given in Table X. Standard errors are clustered by advisor. *PD* and *FRACDIF* are the dependent variables, respectively, in Panels A and B. Results from Panel A show a negative coefficient on the past performance variables for all four specifications, suggesting an inverse relationship between past portfolio returns and end-of-quarter net portfolio equity valuation deviation.[25] Thus, lower returns lead to an increase in the portfolio's net portfolio equity valuation deviations and vice versa. Statistical significance of the result holds for three out the four specifications. Although the sign of the coefficient is as expected, it is not significant when the *PD* measure is used in the specification with time fixed effects. Our control variable, *SPI,* is insignificant in each regression. This is sensible since illiquidity by itself should not predict the direction of valuation deviations.

Panel B of Table X confirms the results from Panel A. Following a low (high) portfolio return, an advisor tends to increase (decrease) the difference between the fraction of positions with positive valuation deviations and the fraction of positions with negative valuation

[25] In unreported results we show that this finding qualitatively holds even when we use shorter intervals (defined over the last three, six months or from the beginning of the calendar year until the end of current quarter) to measure past performance.

deviations in her portfolio. The respective coefficients are negative and statistically significant in all four specifications. Our control variable remains insignificant.

VIII. Conclusion

Hedge funds have enjoyed substantial leeway in how they value their assets for reporting and transaction purposes. However, recent egregious cases of manipulation by certain advisors have brought about increased criticism and scrutiny of hedge fund valuation practices. The recent developments and the growing size of the hedge fund industry have also given rise to calls for greater transparency and structure in the asset valuation process and more monitoring and enforcement efforts by regulators. As a step in this direction, the Statement of Financial Accounting Standards No. 157 (SFAS 157), also applicable to hedge fund advisory firms, was introduced to provide guidance on how to measure and report fair value of assets.[26]

Our research suggests that the calls for greater transparency and structure were well-justified. Using data from 1999 till 2008, a period roughly before SFAS 157 came into full effect, we documented that the valuations of equity positions for 25 percent of hedge fund advisors showed significant deviations from standard valuations based on closing prices even though advisors were explicitly asked to use closing prices.

One important aspect of our findings is that these discrepancies took place even for valuations that advisors reported to SEC in mandated 13F reports. This evidence is consistent

[26] Effective after November 15, 2007, SFAS 157 has introduced more structure in the valuation process. For example, when valuing positions, advisors are required to classify assets into three levels based on their liquidity. The most liquid assets from Level 1 should be valued using market prices and quotes. To value the least liquid assets from Level 3, advisors are required to come up with estimated fair values. Furthermore, careful documentation and justification is required as advisors decide to move a particular asset from one category to another.

with Brown, Goetzmann, Liang, and Schwarz (2011) who show that hedge fund managers misrepresent material information even when such information is likely to be verified. Specifically, Brown, Goetzmann, Liang, and Schwarz (2011) show that over 15 percent of their sample hedge funds misstated material facts to due diligence firms even when they knew that these firms were hired to verify that reported information.[27]

An important caveat, however, applies to the interpretation of our results. Since hedge funds' valuation practices exist in an ambiguous legal environment, the equity valuation deviations we document are not necessarily illegal. Besides the ambiguity in the legal environment, the SEC enforcement practices could also explain why such valuation deviations exist. SEC generally takes action against hedge funds' valuation misstatements primarily under the legal framework of the anti-fraud provisions of ICA. Legal action is taken by the SEC against such misrepresentations, as long as it can be clearly established that any reported violations are material (i.e., materiality test) and intentional (i.e., intent test). While most of the previous cases brought against hedge fund advisors have been for extreme, hard-to-justify cases of manipulation, the valuation deviations we document in this paper are not that extreme, which would undermine the materiality test. Establishing a link between equity valuation deviations and intent is also difficult given the unavailability of data due to hedge fund advisors' exemption from the reporting requirement of ICA.

Our findings are also important in light of the recent review of the Section 13(f) reporting requirements prepared by the SEC's Office of Inspector General. Our findings support the recommendations raised in this review both for a greater involvement by the SEC

[27] In an illustrative example, Brown, Goetzmann, Liang, and Schwarz (2011) point to a hedge fund manager who verbally reported assets under management over $300 million higher than the actual figure.

in the implementation of Section 13(f) and for changes to Section 13(f) that would increase oversight over its implementation (see U. S. Securities and Exchange Commission (2010)).[28]

The documented equity valuation deviations are not random and are not driven by difficulties associated with valuing illiquid securities or by other institutional arrangements. Our results suggest that the equity valuation deviations are the product of strategic pricing deviations. Specifically, a comparison of advisors that exhibit the strongest equity valuation deviations to those that exhibit the weakest equity valuation deviations shows that the former group of advisors exhibits smoother reported returns and a greater discontinuity in their hedge funds' return distribution around zero. In an effort to perhaps impress potential investors, advisors that self-report to a commercial databases exhibit stronger equity valuation deviations. Consistent with taking advantage of a laxer regulatory environment, advisors that are domiciled in offshore locations show a higher incidence of equity valuation deviations. Also, consistent with advisors trying to enhance their performance, we show that hedge funds mark their common stock positions up following a period of poor returns and mark them down following a period of good returns.

[28] One key finding of the report was that "There is no periodic monitoring of the Section 13(f) reporting process, including no review of the Form 13F filing for accuracy and completeness."

Table I
Sample Characteristics

This table presents summary statistics for our sample of hedge fund advisors during the 1999-2008 sample period. Statistics include: number of hedge fund advisors that filed 13F reports with the SEC, number of 13F reports filed by our sample advisors, the mean and median portfolio size as well as the mean and median number of distinct stocks in the 13F portfolios.

			13F portfolio size (in million $)		Number of stocks in 13F portfolio	
Year	13F Advisors	13F Reports	Mean	Median	Mean	Median
1999	194	534	2,250	429	140	66
2000	241	699	1,967	405	126	63
2001	288	895	1,820	331	140	56
2002	329	1,054	1,444	215	128	55
2003	420	1,254	1,427	265	124	52
2004	526	1,593	1,849	333	133	54
2005	635	2,027	1,919	338	127	50
2006	726	2,308	1,966	333	124	45
2007	724	2,474	2,169	386	123	43
2008	682	2,360	1,605	254	110	35
Total sample	864	15,198	1,845	323	125	48

Table II
Stock Position Valuation Deviations

This table reports descriptive statistics on the valuation deviations of the stock positions from 13F reports. We calculate how much the reported valuation of each stock position differs from a valuation that is based on prices from CRSP. We refer to this measure as *stock position valuation deviation (VD)* and compute it as follows:

$$VD_{i,j,t} = \frac{reported\ valuation_{i,j,t} - CRSP\ valuation_{i,j,t}}{CRSP\ valuation_{i,j,t}}$$

where $reported\ valuation_{i,j,t}$ is the value reported by advisor i for a position of stock j in quarter t, and $CRSP\ valuation_{i,j,t}$ is the respective value based on the CRSP price. More specifically, $CRSP\ valuation_{i,j,t}$ is computed as

$$CRSP\ valuation_{i,j,t} = reported\ shares_{i,j,t} \times CRSP\ price_{j,t}$$

where $reported\ shares_{i,j,t}$ is the number of reported shares by advisor i for stock j in quarter t and $CRSP\ price_{j,t}$ is the stock price of stock j from the CRSP stock database as of the portfolio report day. *VD* is set to zero if a position's reported value deviates from its CRSP valuation by less than $1,000. Panel A reports the fraction of positions with |*VD*|>0 and the fraction of positions deviating by at least 5% and 10%, respectively. The next column reports the mean absolute valuation deviation, i.e., average of |*VD*|, computed conditionally only across the positions with valuation deviations for each year as well as over the whole sample period. The last column reports the number of observations. Panel B reports statistics on the cross-sectional distribution of stock position valuation deviations. First, fraction of deviating positions and conditional mean of |*VD*| are computed for each hedge fund advisor over the entire sample period. If a hedge fund advisor does not report deviating positions, her conditional mean |*VD*| is set to zero. Next, the measures calculated at the advisor level are used to compute cross-sectional statistics.

Panel A: Stock position valuation deviations by year

Year	% |*VD*|>0	% |*VD*| ≥ 5%	% |*VD*| ≥ 10%	Conditional mean |*VD*|	Observations
1999	7.95%	0.95%	0.54%	2.08%	95,709
2000	9.06%	0.79%	0.48%	1.82%	108,352
2001	9.89%	2.05%	1.12%	3.50%	154,940
2002	8.59%	0.93%	0.49%	2.10%	163,430
2003	11.56%	1.04%	0.60%	1.92%	183,634
2004	6.68%	0.74%	0.42%	2.18%	257,298
2005	5.60%	0.91%	0.48%	2.64%	315,599
2006	4.50%	0.66%	0.31%	2.53%	330,240
2007	6.02%	0.98%	0.49%	2.85%	344,894
2008	4.76%	0.76%	0.37%	2.95%	295,623
Total sample	6.78%	0.93%	0.49%	2.49%	2,249,719

Table II -- continued

Panel B: Cross-sectional distribution of valuation deviations				
Cross-sectional statistics	% |*VD*| > 0	%|*VD*| ≥ 5%	%|*VD*| ≥ 10%	Conditional mean |*VD*|
Mean	5.65%	1.18%	0.65%	3.25%
Max	100.00%	42.57%	21.56%	25.57%
p90	13.96%	3.17%	1.69%	8.19%
p75	6.00%	0.96%	0.51%	4.80%
Median	1.88%	0.17%	0.04%	1.81%
p25	0.54%	0.00%	0.00%	0.57%
p10	0.00%	0.00%	0.00%	0.00%
Min	0.00%	0.00%	0.00%	0.00%

Table III
Illiquidity, Intraday Volatility, and Stock Position Valuation Deviations

This table reports descriptive statistics on the valuation deviation of the stock positions, stratified by illiquidity and intraday volatility measures. Panel A shows position valuation deviations, stratified by whether a stock traded or not during the report day. Reported statistics are the same as in Table II. Panel B reports position valuation deviations stratified by stock illiquidity, excluding the non-traded stocks. Positions are sorted into illiquidity deciles following a two-step approach: First, for each stock, illiquidity is measured by Amihud's ratio, defined as the ratio of a given stock's absolute return to its dollar volume. For each stock and quarter, this ratio is averaged across all trading days of the quarter to come up with a quarterly measure. The stock-quarter observations are ranked on illiquidity and sorted into deciles where the most liquid stocks are placed in Decile 1 and the most illiquid stocks are placed in Decile 10. Second, each position-quarter observation is sorted into the underlying stock's illiquidity decile. Reported statistics are the same as in Panel A. Panel C reports position valuation deviations stratified by a stock's intraday volatility, also excluding the non-traded stocks. Positions are sorted into volatility deciles following the two step approach in Panel B. A stock's intraday volatility is measured as the spread between the highest and lowest trading price during the report day, divided by the average of highest and lowest trading price.

Panel A: Stock position valuation deviations stratified by whether a stock traded or not

Trading Group	% $\|VD\|>0$	% $\|VD\| \geq 5\%$	% $\|VD\| \geq 10\%$	Conditional mean $\|VD\|$	Observations
Traded	6.62%	0.91%	0.49%	2.49%	2,244,062
Not traded	70.04%	7.19%	2.26%	2.34%	5,657

Panel B: Stock position valuation deviations stratified by stock illiquidity

Illiquidity Decile	% $\|VD\|>0$	% $\|VD\| \geq 5\%$	% $\|VD\| \geq 10\%$	Conditional mean $\|VD\|$	Observations
1 (most liquid)	6.94%	0.92%	0.47%	2.34%	788,475
2	5.57%	0.83%	0.45%	2.61%	401,606
3	5.67%	0.85%	0.47%	2.63%	272,297
4	6.13%	0.78%	0.42%	2.30%	202,530
5	6.32%	0.79%	0.45%	2.38%	160,500
6	6.73%	0.93%	0.52%	2.55%	130,846
7	7.46%	0.95%	0.52%	2.43%	103,516
8	8.54%	1.07%	0.62%	2.53%	80,574
9	9.50%	1.31%	0.68%	2.77%	61,691
10 (most illiquid)	9.99%	2.15%	0.98%	3.80%	42,027

Table III -- continued

Panel C: Stock position valuation deviations stratified by stock's intraday volatility					
Intraday Volatility Decile	% |*VD*|>0	% |*VD*| ≥ 5%	% |*VD*| ≥ 10%	Conditional mean |*VD*|	Observations
1 (least volatile)	5.85%	0.75%	0.38%	2.29%	159,319
2	5.82%	0.81%	0.41%	2.40%	301,352
3	6.11%	0.84%	0.43%	2.34%	320,863
4	6.43%	0.85%	0.45%	2.33%	301,059
5	6.67%	0.82%	0.48%	2.35%	276,325
6	6.99%	0.80%	0.46%	2.24%	246,238
7	7.30%	0.89%	0.52%	2.44%	208,965
8	7.44%	1.03%	0.55%	2.66%	180,002
9	7.43%	1.26%	0.57%	2.89%	149,120
10 (most volatile)	7.34%	1.79%	0.94%	3.96%	100,819

Table IV
Equity Valuation Deviations and the Distribution of Reported Returns around Zero

This table relates the distribution of reported returns around zero with equity valuation deviations. The dependent variable is the advisor's difference of the fractions of positive and negative reported returns within tight intervals around zero. To create this measure, we first assign hedge fund returns reported to commercial databases to its respective advisor. Next, for each advisor, we subtract the fraction of negative returns from the fraction of positive returns. We use subsets of reported returns that are within three intervals, i.e., +/-100, +/-200, and +/-300bps around zero, respectively. Results for each subset are reported in the respective columns. The key independent variables are constructed by dividing advisors into three equal-sized groups according to their equity valuation deviations. Advisors with the lowest valuation deviations are in the benchmark group. We then define two dummy variables: *Medium Deviation* equals one for advisors that belong to the group with medium equity valuation deviations and zero otherwise. *High Deviation* equals one for advisors that belong to the group with the highest valuation deviations. To construct the indicator variables specified above, we use two metrics that measure the valuation deviations at the advisor level. The first one, *ABS_PD,* is measured as the absolute value of an advisor's quarterly *Portfolio Valuation Deviation* (*PD*), which in turn is measured as the signed net dollar value of a stock portfolio's total valuation deviation at the end of a given quarter *t*, divided by the portfolio value determined by CRSP prices:

$$PD_{i,t} = \frac{\sum_j \left(reported\ valuation_{i,j,t} - CRSP\ valuation_{i,j,t} \right)}{\sum_j CRSP\ valuation_{i,j,t}}$$

The second valuation deviation measure, *FRAC*, captures the fraction of positions with nonzero valuation deviations for each advisor in each quarter. Both measures are averaged across all quarterly observations of a given advisor to come up with one aggregated measure per advisor. As control variables we include the advisor's stock portfolio illiquidity, *SPI_AVG*, and the advisor's total portfolio illiquidity, *TPI_AVG*. The first control variable, *SPI_AVG,* is calculated as the average across the advisor's quarterly *SPI* observations, where for each quarter and each advisor *SPI* is measured as the value-weighted mean of Amihud's ratio of all the stocks in the portfolio. Amihud's ratio is computed as the ratio of a given stock's absolute return to its dollar volume. For each stock and quarter, this ratio is averaged across all trading days of the quarter to come up with a quarterly measure. *TPI_AVG* is measured as the beta exposure to Pástor and Stambaugh (2003)'s innovations in aggregate liquidity, aggregated at the advisor level by taking a value-weighted average across all funds managed by each advisor. Each advisor represents a unit of observation in all the regressions. Robust p-values, presented in parentheses, are based on White (1980) standard errors. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

Table IV-- continued

Dependent variable: Fraction of positive minus fraction of negative reported returns						
Interval around zero:	*100bps*		*200bps*		*300bps*	
Deviation based on:	*ABS_PD*	*FRAC*	*ABS_PD*	*FRAC*	*ABS_PD*	*FRAC*
Intercept	0.0574***	0.0597***	0.1299***	0.1356***	0.1693***	0.1763***
	<(0.001)	<(0.001)	<(0.001)	<(0.001)	<(0.001)	<(0.001)
Medium Deviation	0.0343***	0.0185*	0.0583***	0.0236	0.0821***	0.0443**
	(0.005)	(0.092)	(0.002)	(0.186)	<(0.001)	(0.031)
High Deviation	0.0462***	0.0549***	0.0699***	0.0873***	0.0886***	0.1053***
	<(0.001)	<(0.001)	<(0.001)	<(0.001)	<(0.001)	<(0.001)
SPI_AVG	-0.0004	-0.0003	-0.0014**	-0.0012***	-0.0011	-0.0009
	(0.488)	(0.571)	(0.029)	(0.004)	(0.478)	(0.474)
TPI_AVG	-0.0319	-0.0338	0.0038	0.0017	0.0327	0.0287
	(0.367)	(0.317)	(0.948)	(0.975)	(0.642)	(0.669)
Observations	432	432	432	432	432	432
R^2	2.98%	4.05%	2.87%	4.24%	4.01%	4.66%

Table V
Equity Valuation Deviations and Fraction of Kink Funds

This table presents results from regressions that relate equity valuation deviations with the discontinuity around zero in hedge fund's return distribution. To identify a discontinuity in the distribution of hedge fund returns, we follow the approach of Bollen and Pool (2010). For each fund, we create a histogram of reported returns with the optimal bin size computed according to Silverman (1986). The optimal bin size is calculated as $\alpha \times 1.364 \times \sigma \times n^{-1/5}$, where σ is the monthly return standard deviation, n is the number of observations, and α is set equal to 0.776, corresponding to a normal distribution. Then, we count the number of return observations that fall in three adjacent bins, two to the left of zero and one to the right. If a fund shows no discontinuity and thus a smooth distribution, the number of observations in the middle bin should approximately equal the average number of observations in the two surrounding bins. Thus, we test whether the number of observations in the middle bin is significantly lower than the average from the two adjacent bins and divide the difference between the numbers of observations by its standard deviation. The test statistic is computed as:

$$t = \frac{X_2 - \frac{1}{2}\left(X_1 + X_3\right)}{\left[n(p_2 - p_2^2) + \frac{1}{4}n(p_1 - p_1^2 + p_3 - p_3^2) + np_2(p_1 + p_3) - \frac{1}{2}np_1 p_3\right]^{1/2}}$$

where X_k denotes the total number of observations that fall in bin k, n is the number of observations, and p_k is the probability that an observation falls in bin k. According to Bollen and Pool (2010), a fund is categorized as "Kink" fund when the number of observations in the middle bin is significantly less than expected at a 10% significance level. For each advisor, the dependent variable is computed as the fraction of funds that are categorized as Kink funds. The independent variables are defined in Table IV. Robust p-values, presented in parentheses, are based on White (1980) standard errors. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

Dependent variable: Frequency of Kink funds per advisor		
Deviation based on:	*ABS_PD*	*FRAC*
Intercept	0.1211***	0.1269***
	<(0.001)	<(0.001)
Medium Deviation	0.0821**	0.0450
	(0.022)	(0.190)
High Deviation	0.0891**	0.1086***
	(0.012)	(0.004)
SPI_AVG	0.0020	0.0021
	(0.709)	(0.669)
TPI_AVG	0.0824	0.0922*
	(0.144)	(0.098)
Observations	426	426
R^2	1.94%	2.29%

Table VI
Equity Valuation Deviations and Return Smoothing

This table presents results from advisor-level regressions that relate return smoothing with equity valuation deviations. We quantify return smoothing using three different ways: First, we use the θ_0 from the model of Getmansky, Lo, and Makarov (2004). For each fund *j* in our sample we regress its reported return on its economic return using:

$$R_{j,t}^{rep} = a + \theta_{j,0} \cdot R_{j,t} + \theta_{j,1} \cdot R_{j,t-1} + \theta_{j,2} \cdot R_{j,t-2} + \varepsilon_{j,t}$$

with constraints on coefficients such that $\theta_{j,k} \in [0,1]$, $k = 0,1,2$ and $1 = \theta_{j,0} + \theta_{j,1} + \theta_{j,2}$. In this equation, $R_{j,t}^{rep}$ represents the reported return of fund *j* at date *t* and $R_{j,t}$ stands for the fund's economic return. As the economic return is unobservable, we proxy for it by using predicted returns from a regression of excess fund returns on a subset of factors that are used to proxy for hedge fund trading strategies. The factors we use include: the three Fama and French (1993) factors, five trend-following factors used by Fung and Hsieh (2004), the change in the yield of a 10-year Treasury note, and the change in the credit spread. We select the subset of factors by maximizing the adjusted R^2 and restrict the subset to a maximum of three factors. The first smoothing measure we use as dependent variable in our regressions is the smoothing coefficient θ_0. As the second smoothing measure, we use the Herfindahl Index which is constructed as the sum of the squared theta coefficients for each fund $\xi = \theta_0^2 + \theta_1^2 + \theta_2^2$. The last return smoothing measure we employ is the first order serial correlation coefficient of reported returns, ρ. Each measure is first computed for each hedge fund and then averaged across all funds managed by each advisor, with weights determined by each funds' average assets under management. The key independent variables, *Medium Deviation* and *High Deviation,* and our control variables, the stock portfolio's illiquidity, *SPI_AVG,* and the total portfolio's illiquidity, *TPI_AVG,* are defined in Table IV. Each advisor represents a unit of observation in all the regressions. Robust p-values, presented in parentheses, are based on White (1980) standard errors. P-values are computed with respect to the null hypothesis that the coefficient is zero, except for the intercept in the θ_0 and ξ regressions for which the null hypothesis *Intercept=1* is used. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

Table VI -- continued

Deviation based on:	*ABS_PD*			*FRAC*		
Dependent variable:	θ_0	ξ	ρ	θ_0	ξ	ρ
Intercept	0.9013***	0.8391***	0.1553***	0.9001***	0.8372***	0.1576***
	<(0.001)	<(0.001)	<(0.001)	<(0.001)	<(0.001)	<(0.001)
Medium Deviation	-0.0157	-0.0235	0.0384*	-0.0107	-0.0137	0.0293
	(0.158)	(0.128)	(0.060)	(0.351)	(0.369)	(0.144)
High Deviation	-0.0324**	-0.0362**	0.0586***	-0.0337***	-0.0402**	0.0603***
	(0.012)	(0.023)	(0.006)	(0.007)	(0.012)	(0.005)
SPI_AVG	-0.0016	-0.0018	0.0018**	-0.0018	-0.0019	0.0020**
	(0.412)	(0.369)	(0.014)	(0.343)	(0.302)	(0.011)
TPI_AVG	-0.0516	-0.0692	0.1081	-0.0553	-0.0733	0.1129
	(0.214)	(0.228)	(0.169)	(0.159)	(0.184)	(0.141)
Observations	421	421	421	421	421	421
R^2	2.61%	2.06%	2.72%	2.82%	2.37%	2.78%

Table VII
Reporting to a Database and Equity Valuation Deviations

This table compares the equity valuation deviation measures of advisors that report to those that do not report to at least one of the three commercial databases, CISDM, Lipper TASS, and Morningstar. Results are from regressions of advisor-quarter-level valuation deviation measures on *Database Reporting*, a dummy variable indicating whether an advisor reports to at least one of the three databases in the respective quarter. Each advisor's quarterly report is a unit of observation in the following regressions. Separate regressions are run for each of the two valuation deviation measures that are used as dependent variables: *ABS_PD* and *FRAC*. *ABS_PD* and *FRAC* are the same measures that were introduced in Table IV, with the only difference being that they are constructed for each given advisor in each given quarter. All regressions are run using two different specifications. The first specification, *OLS*, is a pooled regression. The second specification, *TIME_FE*, includes time-fixed effects to control for any unobservable time effects that could equally affect the valuation deviations of all advisors. Our key control variable in all specifications is the quarterly stock portfolio's illiquidity measure, *SPI*, as defined in Table IV. Robust p-values, presented in parentheses, are based on Rogers (1993) standard errors clustered by advisor. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

Dependent variable:	*ABS_PD*		*FRAC*	
Regression method:	*OLS*	*TIME_FE*	*OLS*	*TIME_FE*
Intercept	0.0013***	0.0015***	0.0489***	0.1112***
	<(0.001)	(0.007)	<(0.001)	<(0.001)
Database Reporting	0.0008***	0.0007***	0.0118**	0.0108*
	(0.004)	(0.006)	(0.041)	(0.066)
SPI	0.0001	0.0001	0.0011	0.0010
	(0.320)	(0.340)	(0.260)	(0.260)
Observations	15,198	15,198	15,198	15,198
Clusters	864	864	864	864
R^2	0.20%	0.55%	0.18%	1.53%

Table VIII
Equity Valuation Deviations Before and After Joining a Database

This table compares the equity valuation deviations of advisors before and after they join a commercial database. The reported results are from a subsample of 38 advisors with at least one holdings report before and after the first date of appearance in a commercial database. Within this subsample, we use two ways to compare the valuation deviations before and after the first date of database reporting. The first one (*DIFF-IN-DIFFS*) is in effect a difference in differences approach, whereby the valuation deviation measure (*ABS_PD* and *FRAC,* both as defined in Table IV) for each advisor in each quarter is first benchmarked against the average valuation deviation measure of other advisors that never chose to report to a commercial database. Next, an average of the benchmarked deviation measure is computed for each advisor before and after the first date of database reporting and a paired t-test is used for the comparison. The second approach (*RANK*) compares the average advisors' rank based on their deviation variables before and after, where ranks are normalized to be between 0 and 1. P-values are presented in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

Deviation based on:	*ABS_PD*		*FRAC*	
Approach:	*DIFF-IN-DIFFS*	*RANK*	*DIFF-IN-DIFFS*	*RANK*
Before	-0.0008	0.6075	0.0241	0.6153
After	0.0021	0.7066	0.0899	0.7058
After-Before	0.0029**	0.0990***	0.0658*	0.0905***
	(0.017)	<(0.001)	(0.050)	(0.002)

Table IX
Offshore Domicile and Equity Valuation Deviations

This table compares the equity valuation deviation measures of advisors that manage offshore funds to those that do not manage offshore funds. Each advisor's quarterly report is a unit of observation in the following regressions. The dependent variables are the deviation measures introduced in Table IV. In Panel A, the key independent variable, *One Fund Offshore,* equals one for each advisor with at least one hedge fund that is domiciled in the Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Curacao, or Virgin Islands and zero otherwise. In Panel B, *Offshore Not All* equals one or each advisor managing at least one, but not all, funds that are domiciled offshore in a given quarter. *Offshore All* equals one for each advisor-quarter for which all funds are domiciled offshore. All regressions are run using two different specifications, *OLS* and *TIME*_FE as defined in Table VII. Our key control variable in all specifications is the stock portfolio's illiquidity measure, *SPI*, as defined in Table IV. Robust p-values, presented in parentheses, are based on Rogers (1993) standard errors clustered by advisor. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

Panel A: Influence of offshore domicile on valuation deviations

Dependent variable:	*ABS_PD*		*FRAC*	
Regression method:	*OLS*	*TIME_FE*	*OLS*	*TIME_FE*
Intercept	0.0015***	0.0009	0.0492***	0.0851***
	<(0.001)	(0.158)	<(0.001)	<(0.001)
One Fund Offshore	0.0008**	0.0009**	0.0177*	0.0187**
	(0.040)	(0.033)	(0.056)	(0.046)
SPI	0.0000	-0.0000	0.0003	0.0002
	(0.485)	(0.836)	(0.511)	(0.539)
Observations	6,151	6,151	6,151	6,151
Clusters	427	427	427	427
R^2	0.10%	0.80%	0.30%	1.40%

Panel B: Influence of fraction of funds with offshore domicile on valuation deviations

Dependent variable:	*ABS_PD*		*FRAC*	
Regression method:	*OLS*	*TIME_FE*	*OLS*	*TIME_FE*
Intercept	0.0015***	0.0009	0.0492***	0.0857***
	<(0.001)	(0.153)	<(0.001)	<(0.001)
Offshore Not All	0.0007	0.0007	0.0116	0.0125
	(0.133)	(0.108)	(0.214)	(0.185)
Offshore All	0.0014*	0.0014*	0.0376**	0.0387**
	(0.055)	(0.053)	(0.035)	(0.030)
SPI	0.0000	-0.0000	0.0003	0.0002
	(0.481)	(0.833)	(0.504)	(0.526)
Observations	6,151	6,151	6,151	6,151
Clusters	427	427	427	427
R^2	0.10%	0.80%	0.60%	1.70%

Table X
Past Returns and Equity Valuation Deviations

This table presents results from advisor-quarter-level regressions of equity valuation deviation measures on past returns. In Panel A, the dependent variable is *Portfolio Valuation Deviation* (*PD*) as defined in Table IV. In Panel B, *FRACDIF* is the dependent variable. For each advisor in each quarter, *FRACDIF* is computed as the difference of the fraction of positions with positive valuation deviations and the fraction of positions with negative valuation deviations. In both panels, the key independent variable is *Return*, which reflects the advisor's performance over the last twelve months. *Return* is measured in two ways: For each advisor, the first return measure is calculated as the holdings-based return of a portfolio that mimics the holdings of the advisor's 13F portfolio. This holdings-based return is calculated by employing CRSP returns for the underlying portfolio stocks. The second measure for *Return* is the value-weighted average of the reported returns of all hedge funds managed by each advisor. Both regressions are run using two different specifications, *OLS* and *TIME*_FE as defined in Table VII. Our key control variable in both specifications is the stock portfolio's illiquidity measure, *SPI*, as defined in Table IV. Robust p-values, presented in parentheses, are based on Rogers (1993) standard errors clustered by advisor. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

Panel A: Past returns and portfolio valuation deviation (PD)				
Dependent variable:	*PD*			
Return based on:	*Holdings Return*		*Reported Return*	
Regression method:	*OLS*	*TIME_FE*	*OLS*	*TIME_FE*
Intercept	-0.0004***	-0.0005	-0.0007***	-0.0015*
	<(0.001)	(0.408)	<(0.001)	(0.055)
Return	-0.0021***	-0.0028***	-0.0017**	-0.0014
	<(0.001)	(0.002)	(0.047)	(0.155)
SPI	0.0001	0.0001	-0.0000	-0.0000
	(0.542)	(0.498)	(0.175)	(0.787)
Observations	13,066	13,066	5,590	5,590
Clusters	861	861	392	392
R^2	0.40%	0.70%	0.10%	1.20%

Table X -- continued

Panel B: Past returns and fractional difference between overstated and understated positions (FRACDIF)				
Dependent variable:	*FRACDIF*			
Return based on:	*Holdings Return*		*Reported Return*	
Regression method:	*OLS*	*TIME_FE*	*OLS*	*TIME_FE*
Intercept	-0.0078***	-0.0380***	-0.0102***	-0.0494***
	<(0.001)	<(0.001)	<(0.001)	(0.005)
Return	-0.0064**	-0.0096*	-0.0211**	-0.0203**
	(0.041)	(0.091)	(0.011)	(0.049)
SPI	0.0001	0.0002	-0.0003	-0.0003
	(0.839)	(0.761)	(0.244)	(0.382)
Observations	13,066	13,066	5,590	5,590
Clusters	861	861	392	392
R^2	0.00%	0.80%	0.20%	1.20%

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APPENDIX: Data Cleaning Procedure

This appendix describes the methodology we used to clean our dataset from securities other than common stocks and unintentional data errors. The data cleaning steps are presented below in sequential order.

Removing other types of securities

1. We drop each position for which we were not able to match the position's CUSIP to a stock from the CRSP monthly stock database.
2. We drop each position the name of which indicates that the respective security is not a common stock. Specifically, we drop those positions with names containing strings such as, e.g., 'BOND', 'CALL', 'CONVERTIBLE', 'DEBT', 'FRNT', 'PFD STOCK', 'PUT', 'WARRANT', et cetera. We also use several variations and abbreviations of these words to identify non-equities.
3. Furthermore, for each holding, we check Column 5 of Form 13F if that holding is identified as an option position. All option holdings identified in this manner are excluded. As some filings use different identifiers for options rather than the 'PUT' or 'CALL' designation, such as 'P' or 'C', we also make sure to identify and exclude such cases.
4. We conduct an additional check to identify options positions that were labeled as stock positions perhaps due to a filing error. We map the holdings positions to the Option Metrics database, which contains historical price data for the US equity options markets. We calculate the implied price for each holdings position as the reported value divided by the number of shares and compare this price to the prices of the options belonging to the respective security. If the implied price is between the option's best bid and best offer but the CRSP price is not, we drop the observation from the sample.

5. We exclude those observations for which the position size is given in terms of a principal amount instead of a number of shares, as denoted in Column 5 of Form 13F. The principal amount is only given in the case of convertible debt securities and therefore this designation indicates that the respective position is not an equity security.

Removing unintentional errors when filling out the report

6. We correct our dataset for scaling issues, e.g., due to a possibly displaced decimal point or due to reported position values that are not given in thousands of dollars as requested by Form 13F. In many cases such scaling issues apply to all the positions in a given report. Thus, we exclude the whole report from our sample if it contains at least one position for which its reported value divided by the CRSP value is close to 0.0001, 0.001, 0.01, 0.1, 10, 100, 1000, or 10000.
7. We exclude reports with position values and number of shares reported in interchanged columns. To identify these reports, we calculate the reciprocal of the implied price of each position by dividing the positions' reported number of shares by the reported value. If the reported number for a position's value is by mistake reported in the column designated for reporting the number of shares (and vice versa), the reciprocal of the implied price should equal the CRSP price.
8. We exclude all stocks that had a stock split within the last five days prior to the valuation date to eliminate the possibility of a non-zero valuation deviation caused by an accidental use of prices prior to the stock split.
9. Finally, to eliminate remaining outliers (caused perhaps by filing errors) we exclude the most extreme 5% of the deviating positions, measured by the absolute deviation from the CRSP price.