

Trust and Delegation

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Due to imperfect transparency and costly auditing, trust is an essential component of financial intermediation. In this paper we study a comprehensive sample of due diligence reports from a major hedge fund due diligence firm. A routine feature of due diligence is an assessment of integrity. We find that misrepresentation about past legal and regulatory problems is frequent (21%), as is incorrect or unverifiable representations about other topics (28%). Misrepresentation, the failure to use a major auditing firm and the use of internal pricing are significantly related to legal and regulatory problems, indices of operational risk. Due diligence (DD) reports are costly and are only performed when a fund is seriously considered for investment. It is important to control for this conditioning which would otherwise bias cross-sectional analysis. We find that DD reports are typically issued on high return funds three months after the historical performance has peaked. DD reports are also issued at the point of highest cash flow into the fund. This pattern is consistent with return chasing behavior by institutional hedge fund investors.

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“The positive proposition that increasing the integrity of a firm will contribute to increasing its value is no different in kind from the positive proposition that the net present value investment rule will lead to value creation.”-Michael Jensen²

In the modern era of fund-based asset management, most investment decisions are delegated to agents whose behavior and character are imperfectly observed and known. Trust is thus an essential feature of the principal-agent relationship in the investment industry and integrity is an important factor in delegated fund management. A variety of institutions have developed to mediate the trust relationship, including regulators, independent auditors and service providers, third-party due diligence firms and informal word-of-mouth networks. Each time a manager “touches” one of these institutions, verifiable information is generated. The consistent or contradictory nature of this information has the potential to enhance or reduce the perceived trustworthiness of the manager.

The issue of trust is particularly important in the hedge fund industry. Hedge funds have only voluntary U.S. registration requirements, and because they are constrained from marketing to non-qualified investors, the amount of publicly available information available about their performance, strategies, organization, third-party relationships and personnel is limited to investors who review the fund offering memoranda. Hedge funds, particularly those that use proprietary trading models to generate returns, typically offer less information about their investment process than do other kinds of investment managers such as mutual funds. Although independent data

² Jensen (2009)

services such as TASS, HFR, and CISDM report such things as fund styles, leverage and fees, historical performance, and related advisor entities, they ultimately rely on the funds themselves to voluntarily provide this information.

In part because the SEC does not allow hedge funds to engage in general solicitation, they have historically relied on trusted referrals as a prime distribution channel. This reliance on referrals, and the limited transparency with respect to performance and operations, are potential reasons why the Madoff scheme could last so long. Relatively few third party entities had access to performance statistics, information about firm auditors, pricing policies, self-administration and custody. In an environment lacking multiple, comparable sources of information about an agent's credibility, trust is even more important, as are mechanisms to verify trustworthiness.

In this paper we analyze a comprehensive database of due diligence reports on hedge funds provided by a major investigation firm. Due diligence (DD) firms specialize in gathering and verifying information potentially relevant to operational risk assessment. They are typically retained by clients who are considering an investment in a hedge fund, and who wish to gather more information beyond what is provided by the fund prospectus and by regulatory filings.³ While the academic literature has widely studied the roles of regulators, auditors and informal reputation within financial markets, research on third-party investigation is comparatively recent. For example, using essentially the same database, Cassar and Gerakos (2008) document correlation between hedge fund internal controls and manager fees, arguing that the extent of operational risk controls is endogenous.

³ Typical clients are funds of hedge funds, investment banks, and wealthy individuals.

The novel feature of the DD reports for our purpose is that they document factual misrepresentations and inconsistencies in statements and materials provided by hedge fund managers. The due diligence database employed in the current study allows us to address some basic questions about trust and credibility in the investment industry.

First, how frequently do managers misreport to investigators about operational risk factors? Although, as we shall discuss, the sample of firms subject to due diligence is endogenously determined by such issues as scale, past performance and risk concerns, the basic evidence in the DD records about the rates and nature of informational conflicts is sufficient to give investors serious cause for concern. We focus in particular on misrepresentations related to past regulatory and legal problems, and upon misrepresentations or verification problems relating to performance. The former is pertinent to the potential for future operational events, the latter is important because it is relevant to the trustworthiness of investor returns. We find that both types of misrepresentation are common in the data.

The second question we investigate is whether informational contradictions matter to performance and risk. In particular, we ask whether variables related to honesty explain past and future reported returns, and also whether they explain the probability of fund failure. This question is complicated by the obvious problem that if managers lie about performance, then their reported returns may not be a trustworthy basis for assessing their *ex post* or *ex ante* performance. Considering the empirical results at face value, it would appear that informational conflicts on the DD forms are associated with higher future returns. Furthermore we find that verification problems increase the probability of fund failure.

Finally, we ask how the DD process relates to other institutional filters on operational risk. The most striking result we find is that the failure to use a Big 4 accounting firm is a consistent indicator of factors associated with operational risk, including self-pricing of securities.

To address these questions, we control for a major conditioning variable: the selection of the fund for DD investigation. Because investors commission the DD reports, several factors are endogenous, including past performance and past legal or regulatory problems. For example a hedge fund with a stellar historical record might also have a history of regulatory problems which would motivate a fiduciary to more thoroughly vet the manager. In controlling for sample selection we estimate a model that explains the decision to undertake the DD process. This allows us to draw unbiased inferences about performance differentials between problem and non-problem funds. Additionally, the selection model is interesting in its own right, as it provides additional insight into the determinants of hedge funds flows.

An event study shows that the DD reports are typically issued on high return funds three months after the historical performance has peaked. The DD reports are also issued at the point of highest investor flow into the fund. This pattern is consistent with return chasing behavior by institutional hedge fund investors. Brown *et al.* (2008) found no evidence that knowledge of operational risk in any way mediated the fund flow performance relation. In this paper, we find some limited evidence that transparency of operations enhances fund flow, where transparency is measured by the extent to which management voluntarily discloses all prior problems and correctly respond to questions that are raised in the due diligence process.

The remainder of the paper is organized as follows. In the next section we describe the data. In section III we report the determinants of funds selected for due diligence and address the selection bias issue. Section IV presents our main results on operational risk analysis, manager integrity, fund performance, and investor flows. Section V concludes.

II. Data

Our sample consists of 444 due diligence reports compiled by HedgeFundDueDiligence.com, a third party hedge fund due diligence service provider⁴. These funds are managed by 403 different advisors over the period 2003 to 2008. The DD report information is gathered by the company through several channels: the offering document and marketing materials provided by the manager, on site interviews with the manager, and forms filled out by the manager. They augment this by verifying operational controls, assets under management, and performance with the administrator. Finally, they attempt to verify the authenticity of the audit with the auditor and perform a background check on the management company and its key staff.

A typical DD report spans between 100 to 200 pages with both quantitative and qualitative sections prepared for the clients. Conventional databases such as TASS, HFR, or CISDM usually provide fund level information such as strategy, performance, assets, fees, and leverage, but they do not document the investment and operational process. In contrast, the DD reports reveal how portfolio values are determined, where day-to-day accounting is done, how the DD firm verifies the accuracy of the data provided, and how

⁴The company's website is <http://www.hedgefundduediligence.com/>

the governance and control processes are conducted. As a result, DD reports provide a natural platform for us to study operational risk – a major factor in hedge fund failures.⁵ By hand collecting data from the DD reports, we create 50 variables for our analysis, although not all data is available for all funds.⁶ Data definitions for these variables are reported in Appendix A.

We supplement the information collected by the DD company with data from a combined TASS/CISDM dataset. These two datasets are matched via names and other characteristics. If a fund exists in both CISDM and TASS, we default to the characteristic and return data provided in TASS. As of March 2009, TASS has a total of 12,656 funds and CISDM has 13,171 funds, both live and defunct funds. We are able to match 5,879 TASS funds and CISDM funds, which leaves us a combined hedge fund database of 19,948 funds. Our analyses focus on fields that overlap between both datasets. We use the style definitions utilized by Agarwal, Daniel and Naik (2008) for our combined dataset. Using this matched dataset, we then match the DD funds via fund names. If we are able to match a DD fund to our TASS/CISDM merged dataset, we rely on the performance information in the TASS/CISDM database for our performance and flow analyses.

In addition to the specific funds that investors requested the DD company to investigate, some advisors also manage other hedge funds besides those in the DD dataset. These funds are listed in the same DD report, along with information indicating if they are offshore, onshore equivalents or part of the master feeder structure of the fund being investigated. In the cases where the “other” funds listed on the DD report are

⁵ See Capco (2003). Brown *et al.* (2009) find that a measure of operational risk is more predictive of fund failure than is financial risk.

⁶ For example, most onshore hedge funds are limited partnerships, which do not have boards of directors.

distinct, we also add these funds to our sample when investigating performance or investor flows. Since these funds are being operated by the same managers they are arguably exposed to the same operational risks.⁷ On the other hand, in our analysis of fund flows, they may provide a less accurate measure of investor flow response to performance.

We present summary statistics for the DD funds in Table I.

<Insert Table I about here>

Of particular interest are variables related to operational issues that were previously unavailable from other hedge fund data sources. One set of variables of interest is the method of pricing securities by the fund. Hedge funds that invest in infrequently traded or illiquid securities cannot rely solely on observed market prices for establishing the portfolio value of the fund. In these cases, managers may supply their own estimates of the hard-to-value security price. This method has obvious potential for operational risk or downright fraud, if employed by an untrustworthy manager. If securities in the fund are priced either entirely or partially by the manager we set the “pricing” variable equal to 0; if priced completely externally it is equal to 1. Another variable related to pricing is the *NavRestate* variable. This variable indicates whether the net asset value has been restated in the fund’s history and is a related indicator of the reliability of the pricing mechanism.

⁷ These “other” funds may have some operational qualities that do not match the DD fund. We run all performance and flow analyses on the DD funds only and came to similar concludes to those presented in the text.

Another group of four variables evaluates the signature controls of the fund. Two variables indicate the number of signatures required to move money from a bank or the prime broker. Generally, the more signatures required to move money from one location to another, the lower the operational risk. However, the number of signatures does not completely capture the security of cash accounts. A two signature requirement, while better than a single signature, may be of little value if both signatures are non-independent. To supplement these measures, the DD company also indicates whether money movements are restricted to certain locations. For example, money movements from the prime broker may be limited to only the fund's bank account. The final signature-related variable indicates whether the signature controls are of "institutional quality," meeting the best practice standard for the institutional investment industry. The DD company defines institutional quality as all money movements requiring an internal and independent third party signature.⁸

Two of the due diligence variables address personnel and governance: the number of staff departures from the fund and the number of fund board members who are independent. The first of these relates to the risk involved when a position is vacated and know-how is lost, or continuity in oversight is compromised. Higher personnel turnover taxes the attention of other members of the firm and is a common "red flag" for operational risk. The count of independent board members is a standard governance measure that equates independence with disincentive for fraud and lack of conflicts of interest. It has been shown to be a useful variable in studies of the mutual fund industry (see Cremers and Nair (2005)). In a practical sense, in the hedge fund universe, only

⁸ The DD company does note they do not use the term institutional quality to render an opinion about the signature controls, but rather to compare the fund's signature controls against a predefined standard.

funds organized offshore tend to have directors.⁹ For both employee turnover and independent board members, there is the additional possibility that leaving a fund, or an unwillingness of an independent director to serve on a board is an indication of potential problems.

The DD firm also reports whether the fund is audited by a Big 4 accounting firm. This variable is of particular interest because the fund “inherits” the positive reputation of the firm to the extent that the auditor issues an unqualified opinion with respect to the audited assets and valuation procedures. In the aftermath of the Enron case that brought down a major accounting firm, the risks to the auditor of taking on an untrustworthy client are clearly evident. Thus, this simple variable is expected to carry considerable weight in separating funds with and without significant risk of fraud.¹⁰ Because of this liability, the auditing firm typically pre-screens managers for the potential risk they pose the firm before taking them as a client. This risk analysis continues after the firm is accepted as a client.¹¹ Because of client confidentiality issue, audit firms are not a public source of information about manager operational risk.¹²

One key operational risk variable we use in our analysis is whether or not the fund has had a previous regulatory problem or has been involved in a lawsuit. For a brief

⁹ Only a hand full of onshore funds in our sample has boards of directors. Aragon, Liang, and Park (2009) indicate that most onshore funds are organized as partnership while most offshore funds are organized as open-end investment companies.

¹⁰ Liang (2003) indicates that hedge funds that employed Big 4 auditors tend to be large funds and have less reporting discrepancies.

¹¹ From one of the DD reports: “... also stated that *OneBig4Auditor* performs extensive Due Diligence prior to accepting a new client.”

¹² Auditors were unresponsive to all DD company questions except for the most basic requests for information. Most auditors, especially the ‘Big 4’ would not discuss any aspect of their audits with the DD company, even going as far in some cases as not to confirm the fund was a client of the company. This was regardless of whether or not the fund gave the auditor permission. In some circumstances, the DD company was able to obtain audits from either the administrator or the fund itself to help verify performance and asset information. However, without auditor verification, the DD company would be unable to verify the authenticity of the audit.

period in 2006 most U.S. based hedge funds were required to register with the SEC as investment advisors and file a Form ADV disclosure that provided operational details of the funds, including ownership details, evidence of external and internal conflicts of interest and legal and regulatory problems, along with other information.¹³ Brown *et al.* (2008) found that, among other things, problem funds had significantly more conflicts of interest compared to non-problem funds, suggesting that the potential for exploiting customers was associated with past adverse events. Table I shows that that 41% of the funds in our sample have some form of legal or regulatory problem, more than twice the frequency of problems reported in the 2006 Form ADV filings (Brown *et al.* 2008). Of this number, 32% of the funds have been involved in legal disputes as defendants and 15% of funds in the database have past regulatory problems. Firms with problems of this nature would be less inclined to reveal them publicly through registration. Unscrupulous managers might even misrepresent the extent of past problems to customers. Fee-based due diligence service providers seek to capture this kind of misrepresentation through background research and direct interviews with managers.

We use the DD forms to indicate whether managers indeed misrepresent past problems, or their past experiences. The DD firm compared the manager's statement about past legal and regulatory events to third-party records and noted whether the manager's account squared with the independent evidence. A manager who lied about his or her background also falls into this category. We further break this indicator down into misrepresentation about lawsuits vs. regulatory problems. We also have an indicator for whether the DD company could not verify other information provided by the manager,

¹³ The filing deadline was February 1, 2006, but on June 23, 2006, the U.S. Court of Appeals for the District of Columbia Circuit vacated the rule changes that had required many newly-registered hedge fund managers to register as investment advisers under the Investment Advisers Act.

for example discrepancies relating to operational issues such as the signatures required for fund transfer. The manager may report that the fund uses one procedure and the bank or broker may report that the fund uses another. The category *Noted Verification Problem* indicates that 42% of the funds in our sample had either a misrepresentation or an inconsistency problem. To further investigate the trustworthiness of these funds, we break these variables down further in Table Ia. *Signature Disagreement* indicates that in 16% of the cases, the fund's version of the signature process did not match the version explained by the administrator, while *Pricing Disagreement* indicates that 3.6% of the funds disagreed with the administrator on the process used to price the portfolio. *Bad Recall* indicates that in 21% of the cases, the manager verbally stated incorrect information to the DD company when check against written documentation. *Asset Disagree* and *Performance Disagree* indicate that 10% of the asset and 4.5% of the performance data disagreed between the fund and either the administrator or the auditor. *Switched Vendor* indicates that 11% of the funds switched a major data vendor in the last 3 years, while *Refused DD Question* means that 14% of the funds or the administrator refused to answer DD company questions. Finally, *Can't Verify Assets* and *Can't Verify Performance* indicate that the DD company is unable to verify the fund's assets for 8% of the funds or performance information for 9% of the funds, respectively.

<Insert Table Ia about here>

In the wake of the Madoff scandal, verifying performance and existence of assets has taken on greater importance. Surprisingly, nearly 19% of funds' asset information

either could not be verified independently (*Assets Disagree*) or the DD firm found a disagreement between the fund's reported assets and evidence from an alternative source (*Can't Verify Assets*). Similar discrepancies (*Performance Disagree*) or verification problems (*Can't Verify Performance*) with respect to reported performance were noted for 14% of DD investigations. The DD firm also found that 20% of managers (*Bad Recall*) interviewed had poor recollection about basic levels of assets and performance. For example, one manager's verbal assets under management figure were over \$300 million higher than the actual number.

We found it useful to rank managers on how forthcoming they were concerning past problems. We considered three cases. In the first case, managers voluntarily disclosed a past problem; however, after further investigation, the DD company found additional legal or regulatory items that should have been disclosed. This occurred in 6% of the cases. We label these managers "strategic liars" in table Ia. In the second case, managers disclosed no past problems, but the DD company found they had past legal or regulatory problems. This occurred 9% of the time. We simply label this group of managers "liars." Finally, if a fund disclosed past problems and the DD company found these were all of the problems with no additional misrepresentations concerning their backgrounds, we labeled these managers "truth-tellers" (23%). A final category is the group of managers who had no past legal or regulatory problems to disclose. It is remarkable that 15% of funds intentionally or unintentionally told some category of lies to the DD company even when they knew that the company was hired to verify this information.

To investigate the relationship between funds' operational properties and past problems, we separate out the problem funds (i.e. those that have experienced legal and regulatory problems) and report univariate means and differences in Table II.

<Insert Table II about here>

We find little difference in the performance of the two groups. Problem funds tend to be larger than non-problem funds, which may be a function of larger funds having more opportunities for lawsuits. This is consistent with Brown *et al.* (2008). We do find non-problem funds have some better operating controls. Non-problem funds more frequently use independent pricing procedures than do problem funds, although problem funds are also more illiquid (measured by longer lockup and redemption periods) and therefore may have to rely on internal pricing. Non-problem funds also have Big 4 auditors more often as well as lower levels of noted verification problems. However, there are few differences in the signature setups between the two groups. The Big 4 auditor variable is particularly interesting in light of the practice of auditors "pre-screening" clients through their own due diligence process. Finally, the problem funds are more likely to switch data vendors, perhaps because irregularities may have been discovered by the previous vendor.

III. Determinants of Fund Selection

Our univariate results indicate that problem funds are more likely to have poorer operational controls while problem funds have similar performance to non-problem

funds. However, one confounding aspect in any empirical analysis is the potential for selection bias. Unlike the TASS/CISDM database which comprises thousands of hedge funds, the DD company surveyed only approximately 450 hedge funds at the specific request of a potential or current investor in each fund. Previous research has found investors are more likely to invest in hedge funds that have certain characteristics such as higher historical performance.¹⁴ Investors may also be more likely to request a DD report when they do not trust self-reported measures of historical performance. For these reasons, funds in our DD sample may not represent a random sample of funds from the entire hedge fund universe.

We examine this selection issue in the following manner. Using our combined TASS/CISDM database, we create a list of hedge funds available to be selected each year based on characteristic and performance data ending the previous calendar year. For example, in 2003, any hedge fund alive during the second half of 2002 with the relevant characteristic and performance data is included in our sample. We then label funds selected for a DD report in the following year with a “1” while funds not selected are labeled with a “0”. We create a data panel extending from 2003 to 2008, which we then use to run a logistic regression predicting which funds are selected based on their characteristics.

We include prior performance (*Return Mean*), prior risk (*Return Standard Deviation*), return autocorrelation (*Ret Autocorrelation*) size (*Log Assets*), fees and share restriction measures. We also include a dummy variable indicating whether the fund has a Big 4 auditor as indicated in TASS/CISDM. While we do not have background checks on all funds in TASS/CISDM, we utilize the Big 4 auditor flag to proxy for a lack of past

¹⁴ For example, see Ding, Getmansky, Liang and Wermers (2008).

problems, due to indications that the Big 4 auditors screen potential clients. We fit for the case of funds selected for a DD report so positive coefficients indicate a fund with those characteristics is more likely to be chosen for a DD report. We run two models. One model only examines the selection of the DD funds where we were able to match that DD fund with our combined TASS/CISDM. The other model includes funds that we were unable to match. We used data from the DD reports to populate the necessarily fields for these funds to be included in the selection model. While these funds could not have been selected solely from TASS/CISDM due to their lack of inclusion in those datasets, these funds had to be known by the individuals requesting the DD reports and therefore it seems reasonable to include them in the analysis. We include style and year dummies as well as clustered standard errors by fund. The results are reported in Table III

<Insert Table III about here>

As one would expect, larger funds with better prior performance are more likely to be selected. Larger funds have more clients and higher visibility, which increases the likelihood one would select the fund for a report. As Ding *et al.* (2008) find, funds with superior past performance are more likely to receive attention from potential investors. We also find that funds with Big 4 auditors are less likely to be selected. If it is perceived that problem funds are less likely to have Big 4 auditors, this fact alone may be a sufficient “red flag” to require the services of a DD company before investing in such a fund. An alternative interpretation is that investors are more comfortable if a fund has a well-known auditor due to their reliance on the auditor’s opinion with respect to

operational risk. Major fraud cases, such as Bayou and Madoff, involved smaller, unknown auditors. Funds with higher incentive fees and those with a high water mark provision are more likely to be selected, as these variables are likely to reflect manager quality.¹⁵ The selection model results are consistent whether or not we include the unmatched DD funds. Consistent with prior findings¹⁶, these selection results suggest investors chase past returns.

We also examine performance and flows to the DD funds around the DD report date. Each month we compute monthly flow for all funds, which is the difference between this month's assets and last month's assets adjusted for this month's performance divided by the prior month's assets. We then compute the median of all funds' monthly flows by the number of months that flow occurred from the report date. We do the same for monthly returns. We report median values from two years prior to the report date to two years after the report date with zero being the report month. Figure 1 displays results for monthly returns while Figure 2 displays results for monthly flows.

<Insert Figures 1 and 2 about here>

Both flows and returns peak slightly before the funds had a DD report. If one were to include a lag from the time that the fund was selected by the investor for a DD report and the report date, investors are selecting funds, on average, exactly at the peak of their performance and investor flows. The two graphs also nicely show how flows lag

¹⁵ See Brown *et al.* (2008).

¹⁶ See Agarwal *et al.* (2006), Brown *et al.* (2008) and Ding *et al.* (2008).

performance by approximately 6 to 8 months, consistent with the evidence that investors chase past performance

In addition to the selection bias concerning which funds get selected for the DD reports from the entire hedge fund universe, the DD funds that choose to list in major databases may be significantly different from funds that choose to not report. We compare the DD funds listed in CISDM/TASS and funds that were not listed. Results are presented in Table IV.

<Insert Table IV about here>

Interestingly, there are almost no differences between the two groups. The only significant difference lies in the autocorrelation of returns. All other performance, operating and truthfulness variables are not significantly different. These results, however, are conditional on funds being selected for analysis.¹⁷

IV. Results on Operational Risk

A. Relationship between Operational Risk and Problems and Misrepresentations

Potential hedge fund investors must decide whether to trust managers with their money. An important question for investors is whether the operational controls of the fund compensate for any potential historical breaches of trust. For example, if managers have a history of legal or regulatory problems then strong operational controls, such as a Big 4 auditor or external pricing, may alleviate investors' concerns. In addition, if a relationship between problems and operational controls exists, then simply having

¹⁷ Cassar and Gerakos (2008) perform a similar comparison and find similar results.

information about the background history of the managers may provide investors with some comfort regarding the funds' operational controls.

To test these propositions, we examine the relationship between past regulatory or legal problems and operational controls using a logistic model. We control for selection bias by performing the analysis using the two-stage Heckman (1979) model. The *lambda* term represents the selection control variable from the first stage regression. The second stage logistic model utilizes advisor information to cluster standard errors and also includes style dummies. We fit for the one case; thus, positive coefficients indicate a higher likelihood of problems. Results are reported in Table V.

<Insert Table V about here>

We find that funds with legal and regulatory problems have poor operational controls. Problem funds are less likely to have independent pricing. We also find problem funds are more likely to have switched vendors in the last 3 years. While changing vendors to upgrade the quality of pricing or trade execution is positive for investors, changing vendors may also be a red flag as the fund may have been dropped by the vendor. Finally, problem funds are less likely to have a Big 4 auditor; although this result is consistent with Big 4 auditors avoiding funds with legal or regulatory issues. This evidence is consistent with Brown *et al.* (2008) who find that operational risk (measured by the probability of having problems) is positively associated with conflict of interest and concentrated ownership problems. We would expect that having a Big 4 auditor and independent pricing would be negatively associated with conflicts of interest.

One potential drawback of using background information on managers is the reliability of this information, especially if it is self-reported. Indeed, we find approximately 20% of funds have managers who misrepresented past problems or their background information. 10% of funds would have been classified as non-problem funds based on the information disclosed voluntarily to the DD company and through any precompiled due diligence questionnaires, but were found to be problem funds after background checks by the DD company. An important question is whether any indications exist that would flag investors about potential misrepresentations.

We perform an analysis of misrepresentations similar to the prior analysis performed on problems. We run a logistic regression on the misrepresentation variable, where 1 indicates a fund misrepresented itself. We fit for the one case; hence positive coefficients indicate a higher likelihood the fund misrepresented something to the DD firm. We include the same independent variables as in Table V and conduct the econometric analysis in the same manner. Results for two different specifications are presented in Table VI.

<Insert Table VI about here>

While strong relationships between problems and operational controls exist, identifying misrepresentations without a professional third party evaluation is much more challenging. The only indication that a fund may be misrepresenting itself is the lack of a Big 4 auditor. This relationship may again be due to the Big 4 auditor's prescreening clients. Liars are less likely to have Big 4 auditors.

B. Relationship between Operational Controls and Performance

Results in the prior section find a relationship between operational risk and problems, which is similar to previous results found by Brown *et al.* (2008, 2009) on hedge fund operational risk. While those studies examined the relationship between operational risk and potential conflicts of interest, the collected due diligence data provides the opportunity to examine other potential operational risks for investors. In light of Ponzi scheme scandals in the hedge fund area, one issue of great interest is whether reported returns fairly represent investor performance. Prior research on hedge fund performance has identified evidence that some hedge fund managers may game their performance.¹⁸

We first examine the performance reported by the hedge funds in our due diligence sample prior to the DD report date. For each fund in our sample, we compute the appraisal ratio using the Fung and Hsieh (2004) seven factor model.¹⁹ We regress this performance measure on several independent variables, focusing on the relationship between two sets of variables. The first set is comprised of variables that indicate the truthfulness of fund management during the DD process. As previously defined, managers who voluntarily disclosed some but not all of their past problems are defined as “strategic liars.” Managers who disclosed none of their past problems are labeled “liars.” Finally, managers who disclose all (if any) of their past problems are labeled “truth-

¹⁸ For example, Bollen and Pool (2009) find a discontinuity in the distribution of hedge fund returns. Getmansky *et al.* (2004) find significant autocorrelation of hedge fund returns while Agarwal *et al.* (2008) find hedge funds’ December returns appear artificially high.

¹⁹ We thank David Hsieh for making this data available at his website. See <http://faculty.fuqua.duke.edu/~dah7/HFDData.htm>.

tellers.” The second set of variables of interest is the operational controls, including the pricing mechanism, Big 4 auditor indicator, verification problems and so forth.

We regress fund appraisal ratios against these variables as well as other control variables relevant to performance, such as fund size, age and style dummies. As before, we use a two-stage Heckman model to control for the selection bias found previously.²⁰ We also compute standard errors and *t*-statistics using clustered standard errors by advisor since we have overlap across advisors. We include both the DD funds and the other funds listed on the DD reports, perform the analysis using three different sets of independent variables, and report results in Table VII.

<Insert Table VII about here>

While we find no relationship between risk-adjusted performance and measures of truthfulness, we do find funds with a Big 4 auditor have lower appraisal ratios than funds with non-Big 4 auditors even after controlling for style, size and age. While funds without Big 4 auditors may indeed be better performers, an alternative explanation for these findings is that the returns reported by firms without Big 4 auditors may not be trustworthy. Small and young funds perform better due to managers’ desire to establish their track records while the positive coefficient on “notice period” may indicate a liquidity premium.²¹

²⁰ In our previous results, we found performance prior to the DD report was a factor in the selection of funds. Including performance as a factor in the first stage regression and then examining performance in the second stage model causes a large spurious loading on the lambda variable. Thus, we omit performance related variables from the first stage regression for the examination of prior performance only. Our results therefore may be confounded by the selection bias, even when using the Heckman procedure.

²¹ See Chevalier and Ellison (1998) and Aragon (2007), respectively.

We next examine the performance of funds after their DD report date. Again, for each fund we compute their appraisal ratio using the Fung and Hsieh (2004) seven factor model. The empirical setup is identical to the prior results on prior performance, except for the inclusive of performance related variables in the first stage of the Heckman procedure. We also use the same three sets of independent variables and report results in Table VIII.

<Insert Table VIII about here>

Funds that strategically lie on their DD reports have higher performance than other funds after the DD report. As with the auditor result in the prior analysis, perhaps these funds are better funds. However, since these managers appear to only strategically lie to the DD company, they may also choose to “game” the return data reported to investors, which causes these funds to appear superior to their peers.²² We also find funds that have external pricing have lower performance than funds that price their own portfolios. Non-independent pricing allows the opportunity to inflate performance through “cherry picking” of model prices or outright fraud.²³ Overall, these results raise the question of whether performance reported by some hedge funds may not reflect the truth.

C. Relationship between Fund Termination and Operational Risk

²² Given that hedge funds may not engage in general solicitation, performance data reported to hedge fund databases is one of the few ways funds can make themselves known to investors. Reported returns may differ from the actual returns to fund investors. For example, according to the Wall Street Journal, NIR Group was investigated for telling investors the performance of the fund was high, while then telling investors their shares were “worthless” when trying to redeem. See <http://online.wsj.com/article/SB124840478374278275.html>.

²³ Alternatively, internal pricing may be related to hard-to-price illiquid securities, as indicated by the positive coefficient on Notice period, which can serve as an indicator for liquidity premium.

Thus far, we have established a relationship between operational risk and past regulatory and legal problems and have found relationships between operational risk variables and fund performance. While managers with low quality operational procedures may be able to smooth performance, ultimately this behavior may have little long-term effect on the performance outcome for investors. However, if a manager is committing a serious breach of fiduciary duty which causes fund closure, this could lead to substantial loss or inconvenience. In addition, artificially high performance could attract more flows from other investors, allowing such things as performance smoothing or allowing fraudulent Ponzi schemes to continue over long periods.

In Table IX, we examine the relationship between fund “death” and operational risk variables and other fund characteristics to determine whether operational risk affects the probability of fund death. For our purpose, fund death is defined as the cessation of the fund reporting to the database. We run a Cox proportional hazards model controlling for right-censoring. As with the other models, we include the Heckman *lambda* to control for selection bias.

<Insert Table IX about here>

Our results indicate that funds where performance or asset data could not be verified along with a misrepresentation are more likely to fail. Brown *et al.* (2009) argue that operational risk is more predictive of fund failure than is financial risk. Indeed, in our sample return standard deviation is *inversely* related to fund failure. This is consistent with the view that firms which engage in return smoothing behavior are most likely to

fail. While the coefficient on the signature institutional quality variable is opposite of what would be expected, not all hedge funds stop reporting to databases due to poor performance. Hence, funds with high quality signature processes are most likely larger and may stop voluntarily reporting instead of actually terminating.

D. Relationship between Future Flows and Operational Risk

While our analysis has found information about truthfulness and operational risk relevant, whether investors utilize this information to its fullest is unknown. Some individuals refused to invest with Madoff due to operational concerns. However, others continued to provide money even when they understood his operational deficiencies.²⁴ Prior research has shown no relationship between investor flows and operational risk disclosed by hedge funds during the brief period of mandatory disclosure by the SEC.²⁵ However, it was unclear whether investors did not know about the operational risk characteristics of the funds they invested in, or whether they had full information but simply chose to ignore operational risk concerns. While the DD reports are only prepared for one investor, the information will clearly be known to one party either interested in investing or already invested in the fund.²⁶ In addition, the information from the DD report may also filter through third-party channels and become “public” information to the investment community.

²⁴ For example, the \$17Billion fund (according to the Madoff SEC Form ADV filing) was audited not by a Big 4 firm but rather by David Friehling, a strip mall accountant who has since pleaded guilty to charges stemming from his role in the affair.

²⁵ See Brown *et al.* (2008).

²⁶ One investor can represent a large portion of a fund’s overall assets. The DD reports give information on funds’ largest investors, who on average represent 21% of funds’ assets.

We examine investor reaction to the DD reports by examining investor flows for the twelve months immediately after the DD report dates. Flows are computed as in Sirri and Tufano (1998). Models include style dummies as well as the *lambda* term from the Heckman procedure. Errors are clustered on the advisor variable and our independent variables are the same variables used in prior analyses. We report results for three models in Table X on our DD fund sample combined with the other funds listed on the DD report.

<Insert Table X about here>

Consistent with the results reported in Brown *et al.* (2008) we find little relationship between operational risk or the truthfulness of DD companies and investor flows. Only the *Bad Recall* variable, which represents verbal inconsistencies from the management, is significantly negative. However, one confounding issue is that we are including both the DD funds and the other funds listed on the DD report in this analysis. While we know an investor is interested in the DD fund itself and thus we may be able to observe a reaction in the flow variable, the same does not hold for the other funds listed on the DD report. Thus, we run the same analysis but only on DD funds themselves. Results are reported in Table XI.

<Insert Table XI about here>

Unlike the previous results, we now find some limited evidence that transparency can lead to higher fund flow. Funds that voluntarily disclosed all of their prior problems have higher flows, and funds for which it was difficult to reconcile manager statements with other information experience lower flows. This is consistent with a view that investors are more likely to invest with a manager who is truthful. Of course, successful managers have less incentive to misrepresent their record, and so it is not clear whether the fund flow is reacting to truthfulness or to the general perception that the manager is successful.

As a final exercise on investor reaction to the DD reports, we investigate the level of flows directed toward the DD funds after the DD reports versus funds with similar size, age and performance in the same style prior to the DD report date. On the one hand, we know investors are interested in these funds; thus the DD funds should have higher levels of flows. However, all DD reports find some level of red flags. These red flags, even if minor especially if the DD reports are being performed on funds that investors are particularly concerned about, may deter investment. We report results comparing flows of the DD funds to the matched funds in Table XII.

<Insert Table XII about here>

We find that the DD funds do have higher investor flows after the DD reports. Thus, most investors must still feel comfortable enough to invest in these funds, even after reading about funds' operational deficiencies. Investors may use the DD report as one of the screening criteria, together with their own information and connections.

V. Conclusion

Using hand-collected proprietary hedge fund due diligence (DD) data, we study operational risk, manager integrity, hedge fund performance and investor flows. Despite the fundamental importance of integrity in the delegated asset management business, we find that incomplete and inaccurate disclosure of important information is not uncommon among a sample of funds selected for research by clients of a major due diligence firm. The sample selection issues with respect to the database are themselves revealing. The DD reports are commissioned for funds with high past performance, and this performance peaks around the time of the report, consistent with a reversion towards the mean. The same is true for investor flows, albeit with a lag. Focusing on funds of interest to investors, we find some evidence that truth-telling is rewarded by investor flows. This is consistent with the unsurprising hypothesis that investors value managerial integrity. It is also consistent with the view that successful managers who are able to attract funds find little incentive to misrepresent their past history. In prior work, we had hypothesized an important role for private-sector information providers in the hedge fund industry. The current study allows us to study the private-sector mechanism in depth using a key subsample for which information gathering was extremely costly, and was evidently of some value to the investor.

Some of our results were to be expected. We find that funds with legal or regulatory problems are less trustworthy. We also found that the relationship with a major auditing firm was a sufficient statistic for the tendency to tell the truth. This is particularly important as we find that misrepresentation of pertinent facts is a leading

indicator of future fund failure. This strongly suggests that the role of the auditing firm is an important one in the market for investment services, especially hedge funds and other service providers that are lightly regulated.

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Table I: Basic Statistics

Data is from a due diligence company. There are 444 funds. All data are hand-collected. Data definitions are reported in Appendix A.

| Performance | N | Mean | Std dev | Min | Max |
|--------------------------------|-----|--------|---------|-------|---------|
| Avg. Returns | 419 | 1.67 | 1.18 | -1.97 | 9.73 |
| Return Std. Dev. | 417 | 2.37 | 1.82 | 0.01 | 12.40 |
| Autocorrelation | 393 | 0.15 | 0.23 | -0.55 | 0.78 |
| Appraisal Ratio | 336 | 1.05 | 2.33 | -0.61 | 37.49 |
| Fund Properties | | | | | |
| Management fee (%) | 441 | 1.54 | 0.48 | 0.00 | 3.5 |
| Incentive fee (%) | 440 | 19.13 | 4.50 | 0.00 | 50.00 |
| High Water Mark | 439 | 0.97 | 0.18 | 0.00 | 1.00 |
| Redemption period | 441 | 72.25 | 74.97 | 1.00 | 730.00 |
| Lockup period | 441 | 97.01 | 199.15 | 0.00 | 2000.00 |
| Notice period | 442 | 50.36 | 35.84 | 1.00 | 365.00 |
| Time to get cash | 421 | 20.26 | 16.09 | 0.00 | 120.00 |
| Holding Period | 396 | 0.75 | 0.79 | 0.00 | 5.50 |
| AUM (Millions of \$) | 441 | 380.62 | 861.55 | 0.00 | 8000.00 |
| Manager Characteristics | | | | | |
| Manager age | 379 | 44.18 | 8.98 | 27.00 | 79.00 |
| Manager experience | 375 | 18.79 | 7.97 | 1.00 | 50.00 |
| Manager degree | 379 | 0.65 | 0.65 | 0.00 | 2.00 |
| Manager property | 260 | 1.67 | 3.33 | 0.00 | 32.00 |
| Operations | | | | | |
| Pricing | 443 | 0.65 | 0.48 | 0.00 | 1.00 |
| Signature: bank | 404 | 1.70 | 0.71 | 0.00 | 4.00 |
| Signature: prime broker | 391 | 1.74 | 0.73 | 0.00 | 5.00 |
| Signature: IQ | 438 | 0.25 | 0.44 | 0.00 | 1.00 |
| Big4Auditor | 443 | 0.63 | 0.48 | 0.00 | 1.00 |
| Money Restrictions | 384 | 0.38 | 0.48 | 0.00 | 1.00 |
| Transparency | 442 | 1.43 | 0.69 | 0.00 | 2.00 |
| NAV restate | 442 | 0.10 | 0.30 | 0.00 | 1.00 |
| Staff departure | 437 | 0.49 | 0.95 | 0.00 | 7.00 |
| % of board Ind. | 338 | 0.45 | 0.32 | 0.00 | 1.00 |
| Background Issues | | | | | |
| Problem | 443 | 0.41 | 0.49 | 0.00 | 1.00 |
| Lawsuit | 443 | 0.32 | 0.47 | 0.00 | 1.00 |
| Regulatory | 443 | 0.15 | 0.36 | 0.00 | 1.00 |
| Misrepresentation | 443 | 0.21 | 0.41 | 0.00 | 1.00 |
| Inconsistency | 443 | 0.28 | 0.45 | 0.00 | 1.00 |
| Noted Ver Problem | 443 | 0.42 | 0.49 | 0.00 | 1.00 |

Table Ia: Univariate Information on Verification Problems

Data is from a due diligence company. There are 444 funds. All data are hand-collected. Data definitions are reported in Appendix A.

| Verification Problems | N | Mean | Std dev | Min | Max |
|--------------------------|-----|--------|---------|-----|-----|
| Signature Disagreement | 443 | 16.03% | 36.73% | 0 | 1 |
| Pricing Disagreement | 443 | 3.60% | 18.68% | 0 | 1 |
| Bad Recall | 443 | 20.99% | 40.77% | 0 | 1 |
| Assets Disagree | 443 | 10.38% | 30.54% | 0 | 1 |
| Performance Disagree | 442 | 4.52% | 20.81% | 0 | 1 |
| Switched Vendor | 443 | 11.51% | 31.95% | 0 | 1 |
| Refused DD question | 443 | 14.00% | 34.73% | 0 | 1 |
| Can't Verify Assets | 443 | 8.13% | 27.35% | 0 | 1 |
| Can't Verify Performance | 443 | 9.03% | 28.69% | 0 | 1 |
| Lying Information | N | Mean | Std dev | Min | Max |
| Strategic Liar | 443 | 6.32% | 24.36% | 0 | 1 |
| Liar | 443 | 9.26% | 29.01% | 0 | 1 |
| Truth teller | 443 | 23.48% | 42.43% | 0 | 1 |
| Regulatory Lie | 443 | 6.32% | 24.36% | 0 | 1 |
| Lawsuit Lie | 443 | 17.38% | 37.94% | 0 | 1 |
| Legal Lie | 443 | 2.26% | 14.87% | 0 | 1 |
| Background Lie | 443 | 5.87% | 23.53% | 0 | 1 |

Table II: Problem and Non-problem Funds Compared

Data is from a due diligence company. There are 444 funds. All data are hand-collected. Data definitions are reported in Appendix A. Problem funds are those funds that have either a regulatory issue or a lawsuit discussed on the DD report. The difference is the non-problem mean minus the problem mean. The significance of the difference is assessed using a t-test.

| Performance | Non-Problem | | Problem | | Diff |
|--------------------------|-------------|--------|---------|--------|----------|
| | N | Mean | N | Mean | |
| Avg. Returns | 242 | 1.65 | 177 | 1.70 | -0.05 |
| Return Std. Dev. | 240 | 2.29 | 177 | 2.47 | -0.18 |
| Autocorrelation | 227 | 0.14 | 166 | 0.15 | -0.01 |
| Appraisal Ratio | 198 | 0.95 | 138 | 1.20 | -0.25 |
| Fund Properties | | | | | |
| Management fee (%) | 258 | 1.57 | 183 | 1.50 | 0.07 |
| Incentive fee (%) | 259 | 19.19 | 182 | 19.05 | 0.14 |
| High Water Mark | 256 | 0.98 | 183 | 0.96 | 0.02 |
| Redemption period (days) | 260 | 64.41 | 181 | 83.51 | -19.10* |
| Lockup period (days) | 260 | 76.77 | 181 | 126.08 | -49.31* |
| Notice period (days) | 260 | 47.65 | 182 | 54.23 | -6.58 |
| Time to get cash (days) | 246 | 19.40 | 175 | 21.47 | -2.07 |
| Holding Period (years) | 230 | 0.68 | 166 | 0.84 | -0.16 |
| AUM (Millions of \$) | 260 | 282.12 | 181 | 522.11 | -239.99* |
| Operations | | | | | |
| Pricing | 260 | 0.72 | 183 | 0.54 | 0.28** |
| Signature: bank | 242 | 1.65 | 162 | 1.78 | -0.13 |
| Signature: prime broker | 230 | 1.70 | 162 | 1.79 | -0.09 |
| Signature: IQ | 256 | 0.26 | 182 | 0.25 | 0.01 |
| Big4Auditor | 260 | 0.70 | 183 | 0.52 | 0.18** |
| Money Restrictions | 221 | 0.40 | 163 | 0.34 | 0.06 |
| Transparency | 259 | 1.42 | 183 | 1.43 | -0.01 |
| NAV restate | 259 | 0.10 | 183 | 0.10 | 0.00 |
| Staff departure | 258 | 0.42 | 179 | 0.58 | -0.16 |
| % of board Ind. | 214 | 0.47 | 124 | 0.43 | 0.04 |
| Background Issues | | | | | |
| Misrepresentation | 260 | 0.10 | 183 | 0.38 | -0.28** |
| Inconsistency | 260 | 0.27 | 183 | 0.30 | -0.03 |
| Noted Ver Problem | 260 | 0.34 | 183 | 0.54 | -0.20** |
| Signature Disagreement | 260 | 0.17 | 183 | 0.15 | 0.02 |
| Pricing Disagreement | 260 | 0.04 | 183 | 0.03 | 0.01 |
| Bad Recall | 260 | 0.20 | 183 | 0.22 | -0.02 |
| Assets Disagree | 260 | 0.08 | 183 | 0.14 | -0.06 |
| Performance Disagree | 260 | 0.04 | 182 | 0.05 | -0.01 |
| Switched Vendor | 260 | 0.07 | 183 | 0.18 | -0.11** |
| Refused DD question | 260 | 0.13 | 183 | 0.15 | -0.02 |
| Can't Verify Assets | 260 | 0.09 | 183 | 0.07 | 0.02 |

| | | | | | |
|--------------------------|-----|------|-----|------|--------|
| Can't Verify Performance | 260 | 0.09 | 183 | 0.09 | 0.00 |
| Independent Admin | 259 | 0.93 | 183 | 0.83 | 0.10** |

**Significant at the 1% level; *Significant at the 5% level

Table III: Logistic Analysis of Fund Selection

Presented below are results from logistic models analyzing the selection of funds for a DD report. *Log Assets* is the log of the last assets reported by the fund. *Management Fee* and *Incentive Fee* are the funds' management fee and incentive fee, respectfully. *High Water Mark* and *Leveraged* are one if the fund has a high water mark or uses leverage, respectfully. *Red Notice Period* and *Lockup Period* is the length of notice (in days) needed to request money and the length of time (in months) money is locked into the fund. *Return Mean*, *Return Std. Dev.* and *Ret Autocorrelation* is the average monthly return, monthly return standard deviation and autocorrelation of monthly returns respectfully. *Big 4 Auditor* is one if the fund has a big 4 auditor. Standard errors are clustered by fund.

| | Database Matches | | All Funds | |
|---------------------|------------------|----------|-------------|----------|
| | Coefficient | Chi Sq | Coefficient | Chi Sq |
| Log Assets | 0.391 | 108.07** | 0.384 | 87.86** |
| Management Fee | 0.285 | 6.97** | 0.416 | 18.82** |
| Incentive Fee | 0.047 | 14.48** | 0.054 | 21.18** |
| High Water Mark | 0.658 | 13.15** | 0.817 | 22.14** |
| Leveraged | 0.048 | 0.13 | 0.001 | 0.00 |
| Red Notice Period | 0.007 | 10.07** | 0.009 | 23.07** |
| Lockup Period | -0.037 | 12.67** | -0.043 | 19.14** |
| Return Mean | 0.841 | 144.55** | 0.841 | 147.40** |
| Return Std. Dev. | -0.472 | 93.46** | -0.492 | 106.87** |
| Ret Autocorrelation | 0.300 | 1.13 | -0.075 | 0.09 |
| Big 4 Auditor | -0.475 | 13.62** | -1.041 | 80.53** |
| Year Dummies | Y | | Y | |
| Style Dummies | Y | | Y | |
| Clustered by Fund | Y | | Y | |
| Fund Year | 26,112 | | 26,203 | |
| Observations | | | | |
| Number of Funds | 8,999 | | 9,090 | |
| R-Squared | 0.26 | | 0.27 | |

**Significant at the 1% level

*Significant at the 5% level

Table IV: TASS/CISDM funds vs. Non-Database Funds

DD data is based on 444 due diligence reports from a due diligence company. All data are hand-collected. TASS data is from Tremont TASS, Inc. and CISDM is from the Center of ... Both datasets are from 2009. *In TASS/CISDM* represents funds found in either the CISDM or TASS database while *Not in TASS/CISDM* as those not found.

| | In TASS/CISDM | | | | | Not in TASS/CISDM | | | | Diff | p-value |
|----------------|---------------|--------|--------|--------|--|-------------------|--------|--------|--------|--------|---------|
| | N | Mean | Median | Stdev | | N | Mean | Median | Stdev | | |
| Ret. Mean | 313 | 1.71 | 1.42 | 1.23 | | 106 | 1.57 | 1.42 | 1.03 | 0.14 | 0.24 |
| Ret. Stdev | 313 | 2.46 | 2.05 | 1.81 | | 104 | 2.11 | 1.54 | 1.81 | 0.35 | 0.10 |
| Ret. Autocorr | 298 | 0.17 | 0.17 | 0.22 | | 95 | 0.09 | 0.10 | 0.24 | 0.08 | 0.01 ** |
| Assets | 314 | 374.87 | 119.50 | 827.36 | | 127 | 394.83 | 105.00 | 944.12 | -19.96 | 0.84 |
| Lawsuit | 315 | 0.32 | 0.00 | 0.47 | | 128 | 0.31 | 0.00 | 0.47 | 0.01 | 0.92 |
| Regulatory | 315 | 0.16 | 0.00 | 0.37 | | 128 | 0.14 | 0.00 | 0.35 | 0.02 | 0.63 |
| V. Problem | 315 | 0.43 | 0.00 | 0.50 | | 128 | 0.41 | 0.00 | 0.49 | 0.02 | 0.67 |
| SignaturePB | 279 | 1.72 | 2.00 | 0.75 | | 113 | 1.77 | 2.00 | 0.68 | -0.05 | 0.56 |
| SignatureB | 286 | 1.71 | 2.00 | 0.71 | | 118 | 1.69 | 2.00 | 0.71 | 0.02 | 0.88 |
| SignIQ | 310 | 0.23 | 0.00 | 0.42 | | 128 | 0.31 | 0.00 | 0.47 | -0.08 | 0.08 |
| Pricing | 315 | 0.64 | 1.00 | 0.48 | | 128 | 0.66 | 1.00 | 0.48 | -0.02 | 0.77 |
| Big 4 Auditor | 315 | 0.64 | 1.00 | 0.48 | | 128 | 0.59 | 1.00 | 0.49 | 0.05 | 0.26 |
| Strategic Liar | 315 | 0.06 | 0.00 | 0.24 | | 128 | 0.06 | 0.00 | 0.24 | 0.00 | 0.97 |
| Liar | 315 | 0.09 | 0.00 | 0.28 | | 128 | 0.11 | 0.00 | 0.31 | -0.02 | 0.46 |
| Truthteller | 315 | 0.23 | 0.00 | 0.42 | | 128 | 0.23 | 0.00 | 0.43 | 0.00 | 0.99 |

**Significant at the 1% level.

**Significant at the 5% level.

Table V: Relationship between Problems and Operational Risk Variables

This table reports results of a probit model investigating the relationship between operational risk variables and problems defined as lawsuits and regulatory issues. Models are run with style dummies to control for style effects. Models are run in connection with a two-stage Heckman model, where *Lambda* is the control term. Variables definitions are in Appendix A.

| | Model 1 | | Model 2 | |
|------------------|-------------|---------|-------------|---------|
| | coefficient | Chi-sq | coefficient | Chi-sq |
| Return mean | 0.193 | 0.99 | 0.041 | 0.03 |
| Return Std. Dev. | 0.033 | 0.08 | 0.083 | 0.40 |
| Return Autocorr | 0.032 | 0.00 | -0.139 | 0.04 |
| Log(assets) | 0.093 | 1.03 | 0.162 | 2.05 |
| Fund age | 0.032 | 0.31 | 0.051 | 0.59 |
| Management fee | -0.469 | 2.66 | -0.277 | 0.61 |
| Incentive fee | -0.027 | 0.85 | -0.014 | 0.17 |
| Lockup period | 0.005 | 0.05 | 0.014 | 0.26 |
| Notice period | 0.002 | 0.41 | -0.002 | 0.13 |
| Background Lie | 0.027 | 0.00 | 0.257 | 0.15 |
| Signature IQ | -0.023 | 0.00 | -0.169 | 0.19 |
| Pricing | -0.699 | 6.82** | -0.904 | 6.91* |
| Big 4 auditor | -0.825 | 7.43** | -0.889 | 5.14* |
| Perf Ver Issue | -0.119 | 0.13 | 0.115 | 0.08 |
| Bad Recall | -0.066 | 0.05 | -0.480 | 1.36 |
| Oper Ver Issue | -0.003 | 0.00 | -0.397 | 1.02 |
| Vender Switch | 1.292 | 10.31** | 1.565 | 12.42** |
| Refused Question | 0.219 | 0.40 | 0.450 | 1.20 |
| # Ind Board | | | -0.522 | 1.11 |
| Lambda | 0.485 | 1.23 | 0.243 | 0.23 |
| Pseudo R-square | 0.21 | | 0.27 | |
| Num Obs. | 382 | | 290 | |

**Significant at the 1% level.

*Significant at the 5% level.

Table VI: Relationship between Misrepresentation and Operational Risk Variables

This table reports results of a probit model investigating the relationship between operational risk variables and misrepresentation. Models are run with style dummies to control for style effects. Models are run in connection with a two-stage Heckman model, where *Lambda* is the control term. Variables definitions are in Appendix A.

| | Model 1 | | Model 2 | |
|------------------|-------------|--------|-------------|--------|
| | coefficient | Chi-sq | coefficient | Chi-sq |
| Return mean | 0.266 | 1.48 | 0.304 | 1.49 |
| Return Std. Dev. | -0.186 | 1.86 | -0.181 | 1.28 |
| Return Autocorr | 0.165 | 0.06 | 0.056 | 0.00 |
| Log(assets) | -0.039 | 0.14 | 0.020 | 0.03 |
| Fund age | 0.010 | 0.03 | 0.031 | 0.23 |
| Management fee | 0.357 | 1.05 | 0.552 | 1.86 |
| Incentive fee | -0.011 | 0.12 | 0.010 | 0.09 |
| Lockup period | 0.007 | 0.07 | -0.016 | 0.19 |
| Notice period | 0.002 | 0.20 | -0.003 | 0.28 |
| Disclosed Issue | 0.440 | 2.02 | 0.222 | 0.31 |
| Signature IQ | 0.239 | 0.35 | 0.267 | 0.29 |
| Pricing | -0.474 | 2.09 | -0.371 | 0.74 |
| Big 4 auditor | -0.556 | 3.17 | -0.834 | 5.35* |
| Perf Ver Issue | -0.361 | 0.84 | -0.481 | 0.89 |
| Bad Recall | -0.441 | 1.56 | -0.760 | 2.11 |
| Oper Ver Issue | 0.201 | 0.28 | -0.284 | 0.33 |
| Vender Switch | 0.237 | 0.31 | 0.065 | 0.01 |
| Refused Question | 0.273 | 0.42 | 0.749 | 2.45 |
| # Ind Board | | | 0.267 | 0.23 |
| Lambda | 0.300 | 0.37 | 0.655 | 1.27 |
| Pseudo R-square | 0.11 | | 0.13 | |
| Num Obs. | 382 | | 290 | |

**Significant at the 1% level.

*Significant at the 5% level.

Table VII: Relationship between Prior Appraisal Ratio and Operational Risk Variables

This table reports results investigating the relationship between operational risk and performance prior to the DD report date. The fund's appraisal ratio is the dependent variable. Models are run with style dummies to control for style effects. Models are run in connection with a two-stage Heckman model, where *Lambda* is the control term. Variables definitions are in Appendix A.

| | Model 1 | | Model 2 | | Model 3 | |
|--------------------|---------|---------|---------|---------|---------|---------|
| | Coeff. | t-value | Coeff. | t-value | Coeff. | t-value |
| All Lies | -0.060 | -0.29 | | | -0.100 | -0.55 |
| Some Lies | -0.085 | -0.47 | | | -0.085 | -0.51 |
| No Lies | 0.030 | 0.15 | | | 0.000 | 0.00 |
| Log(assets) | -0.016 | -0.70 | -0.016 | -0.70 | -0.015 | -0.67 |
| Fund age | -0.093 | -4.94** | -0.093 | -5.03** | -0.100 | -5.19** |
| Autocorrelation | 0.722 | 1.61 | 0.729 | 1.61 | 0.761 | 1.66 |
| Management fee | -0.028 | -0.31 | -0.031 | -0.36 | -0.028 | -0.33 |
| Incentive fee | 0.010 | 1.57* | 0.011 | 1.66* | 0.012 | 1.95* |
| Lockup period | 0.008 | 1.08 | 0.008 | 1.05 | 0.010 | 1.25 |
| Notice period | 0.004 | 1.86 | 0.004 | 1.90 | 0.003 | 1.69 |
| Pricing | -0.087 | -0.62 | -0.087 | -0.68 | -0.098 | -0.69 |
| Signature IQ | 0.068 | 0.50 | 0.065 | 0.49 | 0.031 | 0.23 |
| Big 4 auditor | -0.363 | -2.26* | -0.360 | -2.34* | -0.355 | -2.22* |
| Perf Ver Issue | -0.252 | -1.93 | -0.234 | -2.12* | | |
| Perf Ver w/ MR | -0.410 | -1.43 | -0.461 | -1.73 | | |
| Bad Recall | 0.005 | 0.04 | 0.011 | 0.09 | | |
| Oper Ver Issue | 0.187 | 1.08 | 0.190 | 1.10 | | |
| Vender Switch | -0.155 | -1.24 | -0.163 | -1.33 | | |
| Refused Question | -0.049 | -0.25 | -0.054 | -0.30 | | |
| Lambda | 0.097 | 2.34* | 0.099 | 2.42* | 0.074 | 1.91 |
| Adjusted R-squared | 0.20 | | 0.19 | | 0.18 | |
| Num Obs. | 417 | | 417 | | 417 | |

**Significant at the 1% level; *Significant at the 5% level.

Table VIII: Relationship between Future Appraisal Ratio and Operational Risk Variables

This table reports results examining the relationship between fund performance after the DD report and operational risk. The fund's appraisal ratio is the dependent variable. Models are run with style dummies to control for style effects. Models are run in connection with a two-stage Heckman model, where Λ is the control term. Variables definitions are in Appendix A.

| | Model 1 | | Model 2 | | Model 3 | |
|------------------|---------|---------|---------|---------|---------|---------|
| | Coeff. | t-value | Coeff. | t-value | Coeff. | t-value |
| All Lies | -0.042 | -0.22 | | | 0.076 | 0.55 |
| Some Lies | 0.859 | 2.36* | | | 1.002 | 2.42* |
| No Lies | -0.149 | -1.13 | | | -0.142 | -1.28 |
| Log(assets) | -0.054 | -1.53 | -0.042 | -1.17 | -0.083 | -2.45* |
| Fund age | -0.028 | -1.63 | -0.023 | -1.46 | -0.029 | -1.97* |
| Autocorrelation | -0.172 | -0.56 | -0.171 | -0.53 | -0.231 | -0.81 |
| Management fee | -0.202 | -1.03 | -0.222 | -1.09 | -0.199 | -1.00 |
| Incentive fee | 0.016 | 0.64 | 0.018 | 0.72 | 0.014 | 0.56 |
| Lockup period | -0.001 | -0.19 | -0.003 | -0.33 | -0.003 | -0.34 |
| Notice period | 0.006 | 2.87** | 0.007 | 2.73** | 0.007 | 2.85** |
| Pricing | -0.226 | -1.75 | -0.225 | -1.81 | -0.280 | -2.04* |
| Signature IQ | -0.007 | -0.05 | 0.032 | 0.24 | | |
| Big 4 auditor | -0.208 | -1.45 | -0.221 | -1.59 | | |
| Perf Ver Issue | 0.796 | 0.90 | 1.150 | 1.16 | | |
| Perf Ver w/ MR | -0.023 | -0.16 | -0.105 | -0.83 | | |
| Bad Recall | -0.134 | -1.16 | -0.172 | -1.48 | | |
| Oper Ver Issue | 0.107 | 0.63 | 0.082 | 0.46 | | |
| Vender Switch | 0.197 | 0.64 | 0.165 | 0.56 | | |
| Refused Question | -0.186 | -1.25 | -0.223 | -1.52 | | |
| Lambda | 0.107 | 1.88 | 0.106 | 1.80 | 0.116 | 1.92 |
| R-squared | 0.20 | | 0.16 | | 0.17 | |
| Num Obs. | 345 | | 345 | | 352 | |

**Significant at the 1% level; *Significant at the 5% level.

Table IX: Relationship between Probability of Fund Death and Operational Risk Variables

This table reports results of a Cox proportional hazards model investigating the relationship between operational risk variables and the length of time to death after the DD report. Models are run with style dummies to control for style effects. Models are run in connection with a two-stage Heckman model, where *Lambda* is the control term. Variables definitions are in Appendix A.

| | Model 1 | | Model 2 | |
|------------------|-------------|---------|-------------|---------|
| | coefficient | Chi-sq | coefficient | Chi-sq |
| Return mean | 0.199 | 1.56 | 0.157 | 0.94 |
| Return Std. Dev. | -0.312 | 8.31** | -0.292 | 7.18* |
| Return Autocorr | 0.119 | 0.08 | 0.130 | 0.09 |
| Log(assets) | -0.047 | 0.29 | -0.087 | 0.88 |
| Fund age | 0.046 | 1.18 | 0.048 | 1.26 |
| Management fee | 0.456 | 3.91* | 0.446 | 3.73 |
| Incentive fee | -0.022 | 0.88 | -0.027 | 1.22 |
| Lockup period | -0.011 | 0.50 | -0.009 | 0.29 |
| Notice period | 0.004 | 0.88 | 0.003 | 0.64 |
| Signature IQ | 0.521 | 5.84* | 0.519 | 5.84* |
| Pricing | 0.194 | 0.84 | 0.257 | 1.44 |
| Big 4 auditor | -0.160 | 0.43 | -0.055 | 0.05 |
| Perf Ver Issue | 0.357 | 1.43 | 0.424 | 1.98 |
| Perf Ver w/ MR | 1.504 | 14.68** | 1.388 | 12.23** |
| Bad Recall | 0.245 | 1.05 | 0.221 | 0.85 |
| Oper Ver Issue | 0.012 | 0.00 | 0.061 | 0.05 |
| Vender Switch | -0.369 | 1.35 | -0.438 | 1.88 |
| Refused Question | -0.057 | 0.04 | -0.053 | 0.04 |
| Problem | | | 0.324 | 2.92 |
| Lambda | 0.442 | 1.34 | 0.304 | 0.60 |
| Pseudo R-square | 0.03 | | 0.03 | |
| Num Obs. | 282 | | 282 | |

**Significant at the 1% level.; *Significant at the 5% level.

Table X: Relationship between Future Flows and Operational Risk Variables

This table reports results with examining investor flows after the DD report. The fund's flow as a percentage of prior assets over the 12 months after their DD report is the dependent variable. Models are run with style dummies to control for style effects. Models are run in connection with a two-stage Heckman model, where *Lambda* is the control term. Variables definitions are in Appendix A.

| | All Funds | | All Funds | | All Funds | |
|------------------|-----------|---------|-----------|---------|-----------|---------|
| | Coeff. | t-value | Coeff. | t-value | Coeff. | t-value |
| All Lies | 1.363 | 1.36 | | | 1.528 | 1.56 |
| Some Lies | -0.086 | -0.16 | | | 0.025 | 0.05 |
| No Lies | 0.552 | 1.26 | | | 0.499 | 1.23 |
| Return Mean | 0.357 | 0.80 | 0.345 | 0.75 | 0.433 | 0.93 |
| Return Std. Dev. | -0.276 | -1.24 | -0.281 | -1.23 | -0.270 | -1.23 |
| Return Autocorr | -1.759 | -0.76 | -1.847 | -0.80 | -1.464 | -0.66 |
| Log(assets) | -0.742 | -3.36** | -0.677 | -3.06** | -0.758 | -3.29** |
| Fund age | -0.077 | -1.53 | -0.084 | -1.70 | -0.056 | -1.09 |
| Management fee | -0.110 | -0.30 | -0.006 | -0.02 | -0.178 | -0.47 |
| Incentive fee | 0.013 | 0.33 | 0.005 | 0.13 | 0.009 | 0.23 |
| Lockup period | -0.030 | -0.94 | -0.023 | -0.66 | -0.026 | -0.82 |
| Notice period | 0.015 | 1.64 | 0.013 | 1.40 | 0.013 | 1.53 |
| Pricing | -0.480 | -1.09 | -0.630 | -1.41 | -0.518 | -1.13 |
| Signature IQ | 0.689 | 1.08 | 0.742 | 1.07 | 0.696 | 1.08 |
| Big 4 auditor | 0.337 | 1.06 | 0.235 | 0.75 | 0.496 | 1.54 |
| Perf Ver Issue | -0.654 | -1.62 | -0.475 | -1.22 | | |
| Bad Recall | -0.860 | -2.13* | -0.941 | -2.39* | | |
| Oper Ver Issue | -0.479 | -1.12 | -0.595 | -1.42 | | |
| Vender Switch | -0.418 | -1.02 | -0.387 | -1.00 | | |
| Refused Question | 0.302 | 0.81 | 0.421 | 1.24 | | |
| Lambda | 0.232 | 0.87 | 0.196 | 0.78 | 0.175 | 0.65 |
| R-squared | 0.21 | | 0.20 | | 0.19 | |
| Num Obs. | 267 | | 267 | | 267 | |

**Significant at the 1% level.; *Significant at the 5% level.

**Table XI: Relationship between Future Flows and Operational Risk Variables
(DD Funds Only)**

This table reports results with examining investor flows after the DD report, but only includes funds selected for DD reports. The fund's flow as a percentage of prior assets over the 12 months after their DD report is the dependent variable. Models are run with style dummies to control for style effects. Models are run in connection with a two-stage Heckman model, where *Lambda* is the control term. Variables definitions are in Appendix A.

| | All Funds | | All Funds | | All Funds | |
|------------------|-----------|---------|-----------|---------|-----------|---------|
| | Coeff. | t-value | Coeff. | t-value | Coeff. | t-value |
| All Lies | 1.802 | 1.36 | | | 2.037 | 1.59 |
| Some Lies | 0.249 | 0.53 | | | 0.404 | 0.87 |
| No Lies | 0.935 | 1.98* | | | 0.949 | 1.98* |
| Return Mean | -0.489 | -1.08 | -0.497 | -1.03 | -0.556 | -1.18 |
| Return Std. Dev. | 0.107 | 0.48 | 0.125 | 0.53 | 0.155 | 0.69 |
| Return Autocorr | 0.662 | 0.78 | 0.473 | 0.48 | 0.933 | 1.07 |
| Log(assets) | -1.032 | -3.96** | -0.927 | -3.77** | -1.055 | -3.76** |
| Fund age | -0.106 | -1.39 | -0.128 | -1.62 | -0.084 | -1.20 |
| Management fee | -0.062 | -0.20 | 0.142 | 0.48 | -0.072 | -0.26 |
| Incentive fee | 0.026 | 0.51 | 0.016 | 0.32 | 0.019 | 0.42 |
| Lockup period | 0.013 | 0.36 | 0.018 | 0.48 | 0.021 | 0.57 |
| Notice period | 0.002 | 0.33 | -0.001 | -0.15 | 0.000 | 0.09 |
| Pricing | -0.226 | -0.60 | -0.535 | -1.22 | -0.132 | -0.36 |
| Signature IQ | 0.823 | 1.18 | 0.874 | 1.13 | 0.734 | 1.07 |
| Big 4 auditor | 0.581 | 1.64 | 0.394 | 1.19 | 0.697 | 1.85 |
| Perf Ver Issue | -0.384 | -0.91 | -0.140 | -0.35 | -0.925 | -1.55 |
| Bad Recall | -0.920 | -2.32* | -1.075 | -2.55* | | |
| Oper Ver Issue | -0.025 | -0.06 | -0.202 | -0.51 | | |
| Vender Switch | -0.392 | -0.93 | -0.465 | -1.18 | | |
| Refused Question | 0.599 | 1.30 | 0.728 | 1.80 | | |
| Lambda | -0.545 | -0.89 | -0.471 | -0.77 | 2.037 | 1.59 |
| R-squared | 0.31 | | 0.27 | | 0.29 | |
| Num Obs. | 197 | | 197 | | 197 | |

**Significant at the 1% level.; *Significant at the 5% level.

Table XII: Comparison of Flows and Appraisal Ratios after DD Report

This tables reports results comparing the flows and appraisal ratios of funds selected for DD reports and other matched funds from the TASS database. Funds for the appraisal ratio results were matched by age, size and prior appraisal ratio while match funds for the flow results were selected by age, assets and return performance over the prior period. Results for all DD funds, problem funds and non-problem funds are reported as well as p -values for the difference.

| | DD Funds | Non-DD Matched Funds | Difference | p -value |
|-----------------|----------|----------------------|------------|------------|
| Flows | 1.483 | 0.632 | 0.851 | 0.00 |
| Problem Flows | 1.675 | 0.736 | 0.939 | 0.00 |
| Non-Pro Flows | 1.277 | 0.521 | 0.756 | 0.00 |
| | | | | |
| Arratio | 0.212 | 0.137 | 0.074 | 0.31 |
| Problem Arratio | 0.244 | 0.183 | 0.060 | 0.64 |
| Non-Pro Arratio | 0.181 | 0.094 | 0.087 | 0.22 |

Figure 1: Median Returns

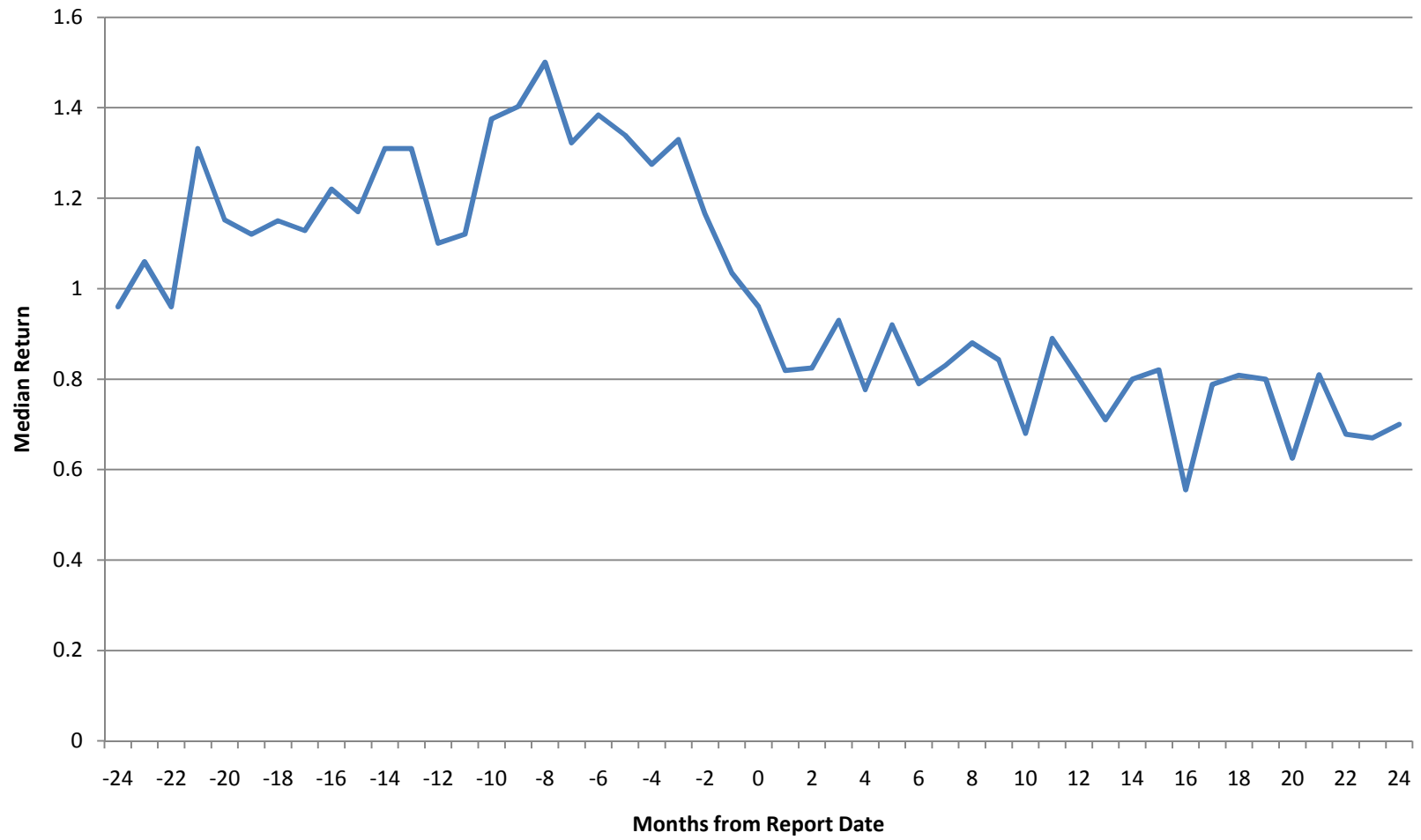
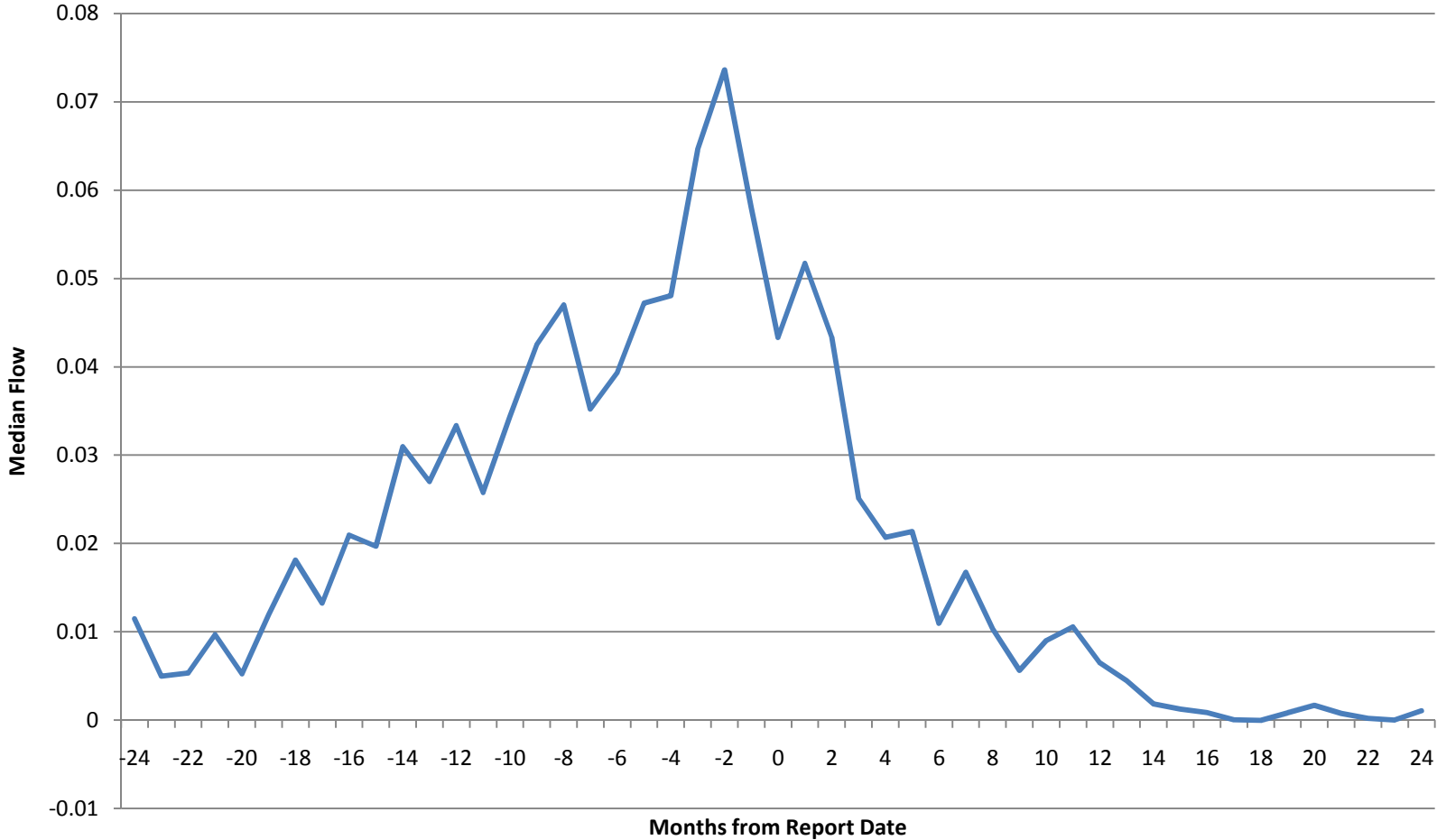


Figure 2: Median Flows



Appendix A: Data Definitions

Data is from a due diligence company. There are 445 funds. All data are hand-collected.

| | |
|-------------------------|---|
| Performance | |
| Avg. Returns | Average Monthly Return in percent |
| Return Std. Dev. | Avg, Return standard deviation |
| Autocorrelation | Avg, Return autocorrelation |
| Fund Properties | |
| Management fee (%) | Fund's management fee in percent |
| Incentive fee (%) | Fund's incentive fee in percent |
| High Water Mark | 1 if the fund has a high water mark and zero otherwise |
| Redemption period | Number of days between redemption opportunities |
| Lockup period | Number of days new money is locked into fund |
| Notice period | Number of days request for a redemption notice |
| Time to get cash | Number of days to get cash from fund after redemption |
| Holding Period | Average length of time a position is held, in years |
| AUM (Millions of \$) | Assets under management at DD report time |
| Log(assets) | Log of assets in US Dollars |
| Fund age | Age of fund in years |
| Manager Characteristics | |
| Manager age | Manager's age in years |
| Manager experience | Number of years experience in this area in years |
| Manager degree | Manager's education (0=Bachelors or lower, 1=masters/MBA, 2=Ph.D./MD/Advanced Law) |
| Manager property | Value of real estate property in millions of dollars |
| Operations | |
| Pricing | Priced completely externally = 1, mixed or internal = 0 |
| Signature: bank | # of signatures required to move money from bank |
| Signature: prime broker | # of signatures required to move money from prime broker |
| Signature: IQ | 1 if signature controls are institutional quality, zero otherwise |
| Big4Auditor | 1 if fund's auditor is a big 4 auditor, zero otherwise |
| Money Restrictions | 1 if restrictions on where money can be sent from Bank/PB |
| Transparency | no position transparency=0, partial=1, full=2 |
| NAV restate | 1 if fund has restated NAV in the past |
| Staff departure | # of persons that have departed the fund |
| % of board Ind. | % of board members that are independent |
| Background Issues | |
| Problem | 1 if fund has a lawsuit or regulatory problem, 0 otherwise |
| Lawsuit | 1 if fund has a lawsuit, 0 otherwise |
| Regulatory | 1 if fund has a regulatory issue, 0 otherwise |
| Misrepresentation | 1 if managers failed to disclose past regulatory or legal issue |
| Noted Ver Problem | 1 if DD company had a problem verifying information This includes significant differences between performance/assets and operational rules and failing to disclose prior problems |

| Lying Information | |
|--------------------------|---|
| Strategic Liar | Fund voluntarily discloses a problem, but does not disclose all problems. |
| Liar | Fund discloses no problems, but has problems. |
| Truth teller | Fund discloses all problems. |
| Regulatory Lie | Did not disclose all regulatory infractions |
| Lawsuit Lie | Did not disclose all lawsuits |
| Legal Lie | Did not disclose all legal problems |
| Background Lie | Misrepresented personal background information |
| Background Issues | |
| Signature Disagreement | Signature process to move money disagreed between fund and administrator |
| Pricing Disagreement | Process to price the portfolio disagreed between fund, administrator and/or auditor. |
| Bad Recall | Fund verbally said something incorrect during DD visit. |
| Assets Disagree | Asset information disagrees between fund, administrator and/or auditor |
| Performance Disagree | Performance information disagrees between fund, administrator and/or auditor |
| Switched Vendor | Fund switched the vendor of a major process in the last three years. |
| Refused DD Question | Fund and/or administrator refused to answer a DD question |
| Can't Verify Assets | DD company cannot independently verify asset information |
| Can't Verify Performance | DD company cannot independently verify performance information |
| Perf Ver Problem | 1 if Assets Disagree, Performance Disagree, Can't Verify Assets or Can't Verify Performance =1 and misrepresentation is 0 |
| Perf Ver Problem w/ MR | 1 if Assets Disagree, Performance Disagree, Can't Verify Assets or Can't Verify Performance =1 and misrepresentation is 1 |