The Dodd-Frank Act and Hedge Fund Operational Risk

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Abstract

We examine the impact of the post-Dodd-Frank change in 2011 on hedge fund disclosure. We find that new disclosure questions added to Form ADV improve the ability to forecast future adverse operational events compared to the information disclosed pre-Dodd-Frank. A byproduct of the analysis is a uni-dimensional operational risk score based on information from the SEC website. The measure is effective in predicting liquidation events, changes in leverage, and other performance metrics. It is also predictive of net fund flows, suggesting that investors take into account operational risk when making investment decisions.

JEL Classification: G32, G28, G23

Keywords: Operational Risk; Mandatory Disclosure; Hedge Funds; LASSO Regression; Information Asymmetry; Financial Regulation.

*'The importance and impact of conflicts of interest controls and the registration and reporting requirements are indisputable……**And by "operational risk," I generally mean risk from inadequate or failed internal processes and systems.**'*[1]

Mary Jo White (Former SEC Chair)

1. Introduction

With the broad adoption of alternative investment strategies over the past three decades, the global hedge fund market has become an important asset class for institutional and individual investors. According to an authoritative source on the industry, total hedge fund assets crossed the $4 trillion milestone at the beginning of 2022.[2] Based on the Wall Street Journal, "Light-touch regulation and low interest rates enabled private funds to grow larger over the past decade than the commercial bank sector, raking in hundreds of billions of dollars a year in fees, Gensler has said." [3] Hedge funds seek to generate risk-adjusted returns for their investors through active trading in securities markets.[4] However, due to the competitive nature of the active management industry, hedge funds typically maintain informational boundaries with respect to their security positions and proprietary strategies. This informational opacity can make it difficult for regulators and investors to independently assess and manage portfolio risk. Occasional large-scale fund failures such as the collapse of Bernard Madoff's fund in 2008 have alerted regulators to the importance of operational risk, i.e., "the risk of loss resulting from inadequate or failed internal processes, people, and systems" in the hedge fund industry.[5]

The Dodd–Frank Wall Street Reform and Consumer Protection Act was passed in 2010 in the wake of the global financial crisis. Its primary goal was the reduction of risk in the financial

[1] https://www.sec.gov/news/speech/2014-spch121114mjw

[2] Hedge Fund Research Inc., https://www.hfr.com/news/global- hedge-fund-capital-surpasses-historic-milestone-to-begin-2022.

[3] The *Wall Street Journal*, August 24, 2023. Private funds include both private equity and hedge funds.

[4] Cf. Cao, Liang, Lo, and Petrasek (2018), Cao, Chen, Goetzmann, and Liang (2018).

[5] Basel Committee on Banking Supervision (Basel Committee), International Convergence of Capital Measurement and Capital Standards (the revised Basel II framework), November 2005, Paragraph 644. www.bis.org/publ/bcbs118.htm.

system. Among other things, it imposed additional regulatory restrictions on hedge funds, including mandating the filing of Form ADV by all funds. As a result, in July 2011 the SEC significantly revised and enhanced the nature as well as the number of items in this key disclosure filing. According to former SEC Chair Mary L. Schapiro:

> *These rules will fill a key gap in the regulatory landscape… In particular, our proposal will give the Commission, and the public, insight into hedge fund and other private fund managers who previously conducted their work under the radar and outside the vision of regulators.*[6]

The hedge fund industry has been operating under the new regulatory regime since 2011. The ensuing 11 years provide an opportunity for assessing the effects of the Dodd-Frank mandated changes to hedge fund disclosure and can be a useful setting for exploring the materiality of disclosure about conflicts of interest more generally. In this paper, we test whether the information in the enhanced post-Dodd-Frank Form ADV predicted adverse outcomes like fund closure to investors. We find evidence that the SEC's enhancement of disclosure about conflicts in 2011 generated information that materially added to the ability to assess operational risk.

We compare the results to prior findings from the pre-Dodd-Frank regime. Brown, Goetzmann, Liang, and Schwarz (2008) [hereafter BGLS] find that operational risk variables predict future fund problems. They develop a metric, the ω-score, based on regulatory (ADV) and subscription-based private data (TASS) sources to predict adverse events such as fund closure. In this paper, we use machine-learning methods to construct an ω-score metric based solely on SEC-mandated disclosed data only. This is particularly useful because it relies on information subject to a common standard subject to regulatory enforcement. We find that this updated ω-score compares favorably to the earlier BGLS measure. We specifically test the added value of new disclosure items. Our findings suggest that the new disclosure regime adds materially to an important dimension of operational risk assessment.

[6] https://www.sec.gov/news/speech/2011/spch062211mls-items-1- 2.htm

Due to the large number of variables in post-2011 Form ADV, we use a regularization technique, LASSO, to select salient inputs.[7] We test the power of these variables to predict future adverse events and poor fund performance. We find that virtually all of the LASSO-selected operational risk indicators significantly predict regulatory-related problems. Furthermore, consistent with the findings in BGLS, these indicators are negatively correlated to leverage, suggesting that presumably sophisticated creditors to hedge funds were cognizant of and sensitive to operational risk.

In a post-Madoff industry white paper, Scharfman (2009) argued that hedge fund investors failed to adequately take operational risk into account in their investment decisions. Using data from 1994 to 2005, BGLS found little evidence of a relationship between operational risk and fund flows. They concluded that investors either lack this information or regard it as immaterial to their decision to invest.[8] In the current study, we test whether investor flow elasticity to operational risk increased in the post-Dodd-Frank period. We find that an ADV-based operational risk score derived solely from publicly disclosed and easily available information is significantly and negatively correlated with fund flows. This result is consistent with access to information improving investor decision-making.

The remainder of the paper is organized as follows. Section 2 presents our research questions and hypotheses. Section 3 summarizes previous literature. Section 4 describes the data. Sections 5 and 6 describe the methodology and display the results. Section 7 reports further robustness tests. Section 8 concludes.

2. Background

Hedge funds were historically regarded as private investment vehicles serving a restricted number of wealthy individuals and families. As such they were not subject to the same regulatory oversight as retail investment products such as mutual funds. In 1985 the SEC broadened the definition of hedge fund clientele to allow pooled assets – effectively

[7] Our selected seven indicators include 15 external relationship variables that describes the affiliation and 20 internal variables that covers the participation or interest in client transactions, custody, and control person information for hedge funds related advisory companies.

[8] Cf. Brown et al. (2009) for a TASS-based operational risk score, and Brown et al. (2012) for a due diligence [DD] operational risk score.

eliminating restrictions on the number of investors in a given fund. Among other events such as the collapse of Long-Term Capital Management in 1998, this alerted the SEC and other regulators to the potential of broader effects of hedge funds on investors and capital markets.[9]

In May 2003 motivated in part by "…a growing number of enforcement cases in which hedge fund advisers defrauded hedge fund investors," the SEC organized a Hedge Fund Roundtable to discuss hedge fund structure and operations, as well as the assessment of the current regulatory scheme relating to the industry.[10] In December 2004 the Commission adopted new rules that required all hedge funds to register with the SEC and to submit Form ADV annually. These rules were successfully challenged and in June 2006 mandatory disclosure of hedge fund companies was terminated.[11] However in 2009, less than a year after the arrest of Bernard Madoff for running a Ponzi scheme through a hedge fund, the SEC established the *Custody of Funds or Securities of Clients by Investment Adviser Rule*.[12] The new rule required all advisory companies to disclose custody information to the SEC.

Subsequently, in July 2011, in response to the Dodd-Frank Act, the SEC promulgated an expanded version of Form ADV. It changed both the submission standards for filing and the nature and extent of information disclosure. The SEC forms required most hedge funds to register as Registered Investment Advisors (RIA). A small category of funds was allowed lesser registration and reporting requirements. Exempt Reporting Advisors (ERA) need only file an abbreviated version of the new Form ADV with state authorities.[13] Later, in August 2016, RIAs participating in an Umbrella Registration (UR) are required to operate under a single compliance policy and a single code of ethics, each of which is administered by a single chief compliance officer.

The SEC also greatly enhanced the scope of questions related to operational risk. Item 7 for example pertains to *Financial Industry Affiliations and Private Fund Reporting*. It was

[9] *Registration Under the Advisers Act of Certain Hedge Fund Advisers* https://www.sec.gov/rules/final/ia-2333.htm#I

[10] *Registration Under the Advisers Act of Certain Hedge Fund Advisers* https://www.sec.gov/rules/final/ia-2333.htm#I

[11] *Registration Under the Advisers Act of Certain Hedge Fund Advisers* (sec.gov/rules/final/ia-2333.htm)

[12] Rule 206(4)-2 under the Investment Advisers Act of 1940.

[13] A detailed ERA and RIA classification can be found in Appendix A.3.

expanded to include 16 types of external conflicts of interest, compared to seven types in the pre-Dodd form (the structure of the amended Form ADV can be found in Figure 3 of Appendix A.4). The new form also expanded disclosure of internal conflicts of interest, increasing the number of questions in Item 8: *Participation or Interest in Client Transactions* and creating two new categories: Item 9 *Custody*, and Item 10 *Control Person* (a detailed evolution of the history of Form ADV and related amendment rules can be found in Figure 1 of Appendix A.2. Also, the definition of categorizing the ERA and RIA can be found in Figure 2 of Appendix A.1).

The amended Form ADV thus provides market participants and regulators with more information potentially material to the assessment of operational risk.[14] However, additional regulation requires a cost-benefit analysis. To test whether the expanded requirements have material benefits, it is necessary to address several questions. First, did the expansion of mandated information disclosure and the public provision of it improve the power to forecast future adverse operational events? Second, is there any evidence that market participants actually relied on the expanded information set to make investment decisions? Third, is there any evidence that the private market for information (like the TASS data) had not already met the needs of investors for data material to assess operational risk? We address each of these questions in the paper.

3. Literature Review

3.1 Hedge Funds and Operational Risk Research

Operational risk has long been an important issue for assessing risk for financial institutions – particularly banks (De Fontnouvelle et al., 2007; Chernobai et al., 2011). Zitzewitz (2012) provides a useful overview of forensic economics that includes a discussion of the importance of operational risk controls. As pointed out above, regulatory attention to hedge fund operational risk and academic research on hedge fund operational risk has evolved over the past two decades.

[14] According to Basel II Committee, operational risk is defined as "the risk of loss resulting from inadequate or failed internal processes, people, and systems or external events."

Broadly speaking, academic research on hedge fund operational risk has taken two approaches – a qualitative top-down approach that focuses on such variables as ownership, governance, procedures, and personnel, and a quantitative bottom-up approach that applies statistical analysis to fund returns to identify suspicious or incongruous patterns in self-reported performance data and due diligence reports (cf. Brown 2012). Examples of the top-down approach include BGLS (2008) which uses Form ADV filing data to study hedge fund operational risk, and Brown et al. (2009) who use TASS data (a vendor of hedge fund information) to construct an ω-score – a metric for operational risk.

Examples of the bottom-up approach include Liang (2003) who finds inconsistencies in hedge fund reported data, and Bollen and Pool (2009) who show that funds with a discontinuous return distribution at zero likely misrepresent performance. Getmansky et al. (2004) find that hedge fund performance metrics are artificially enhanced by return smoothing, and Getmansky et al. (2005) use style, performance, volatility, and illiquidity to assess the risk of hedge fund failure. Considerable other research has identified other performance flags indicative of potential misrepresentation.[15] Dimmock et al. (2018) show how the effectiveness of even a parsimonious set of data from Form ADV to detect misconduct and fraud by investment managers and argue for improved data accessibility.

Some papers have explicitly considered the effect of Dodd-Frank regulatory changes on hedge funds. For example, Charoenwong, Kwan, and Umar (2019) find that reduced regulator resources due to a shift in jurisdiction over midsized investment advisors increased client complaints. Restrepo (2022) addresses the cost-benefit tradeoff of Dodd-Frank hedge fund regulation, attributing erosion in post-Dodd performance in part to compliance costs and constraints.

Some papers have addressed the relevance of specific sub-sets of variables in ADV filings particularly those reporting affiliations and conflicts. Some affiliations can be positive. Franzoni and Gianneti (2016) show that hedge funds affiliated with financial conglomerates have more stable capital. Mullally (2022) finds that outside ownership of a fund company has positive effects on fund flows. On the other hand, Zheng and Yan (2021) report results consistent with pre-Dodd evidence in Brown et al. (2008) that funds with external

[15] cf. Bollen and Pool, 2008 and 2012; Straumann, 2008; Bollen and Whaley, 2009; Sun et al., 2012 among others.

relationships perform worse and have a higher probability of failure – likely due to agency costs and incentive misalignment. In related results, Sun and Teoh (2019) find evidence that agency costs may cause funds managed by listed firms to perform worse.

3.2 Hedge Fund Regulation and Disclosure

Several studies argue that mandated disclosure can enhance information efficiency (cf. Mahoney, 1995; Pinto, 2023) and improve market liquidity (Leuz and Wysock, 2016). In the context of the hedge fund industry, some scholars remain skeptical of increased hedge fund monitoring. Atkins (2006) for example, argues that wealthy investors are able to reasonably assess and manage operational risk and that Form ADV may perversely substitute for responsible due diligence. Other research regards disclosure as potentially valuable for investors and regulators. Provided with suitable information, monitoring can take the form of capital requirements and restrictions (Cumming and Dai, 2010) or disclosure requirements to enhance fraud detection by managers (Dimmock and Gerken, 2012) and to reduce misreporting (Honigsberg, 2019). To document this, Dimmock and Gerkin (2016) using a DiD approach show that improved SEC hedge fund oversight in 2004 decreased misreporting cases, but the rule revocation in 2006 reversed that trend due to exits from the regulatory framework.

Our contribution to this literature is to provide empirical evidence that the post-Dodd-Frank disclosure requirements significantly enhanced the potential ability of investors and regulators to predict adverse operational risk-related outcomes. Our findings suggest that the 2011 regulatory change reduced information asymmetry related to operational risk, both by requiring all qualified funds to report and by increasing the amount of information they are required to report. Based on these findings we develop an extension of the BGLS operational risk metric that relies on publicly disclosed information and demonstrates the potential of machine-learning methods to improve operational risk assessment.

4. Data

4.1 TASS and Form ADV Data

Our study relies on two data sources. The first data source is the TASS database. TASS is one of the principal vendors of hedge fund data. It provides detailed information on fund characteristics and performance. We retrieve the live fund data from 2012 to 2022 from TASS.[16] We also include defunct funds that were liquidated or became unresponsive in vendor attempts to contact them in the period 2013 to 2022. The performance and characteristics of the defunct fund sample are also included in our analysis.

The second data source is the SEC's Office of Freedom of Information Act (FOIA) service website which allows downloading of amended Form ADV filings for both Exempt Reporting Advisers [ERA] and Registered Investment Advisers [RIA] at a monthly frequency starting in July 2006.[17] We retrieve Part 1A filings from 2012 to 2022 for live funds and Part 1A filings for the year 2023 for liquidated or unable-to-contact funds.[18] Part 1A data has 12 Items and 3 Schedules.[19] Items 7 to 10 provide self-reported conflicts of interest. Item 7 documents advisory firms' external conflict of interest, and Items 8 and 10 document internal conflicts of interest.

These four items comprise 43 external and internal conflicts of interest variables, more than double the number available before 2011. In addition, Item 11 reports detailed information on the legal and disciplinary history of advisors and related persons. Following BGLS, we consider a fund to be a problem fund if the advisor answered 'yes' to any of the questions listed in Item 11. There is another difference between the original Form ADV and the Amended Form. The amended Form ADV does not require precisely the same annual updates as the pre-Dodd form. In particular, ownership information in Schedules A and B now need

[16] We begin the sample in 2012 for consistency across funds. Form ADV was amended in July 2011, and funds typically file in April. Thus pre-2012 filings are mostly the pre-Dodd. In addition, while the TASS data performance data are monthly, most of the characteristics are updated annually as of December.

[17] https://www.sec.gov/help/foiadocsinvafoiahtm.html. BGLS set the SEC investment adviser website (IAPD) as their Form ADV data source. Notice that the information provided by the SEC FOIA service website used in our study contains the same information on the IAPD website. The reason for 'switching' to the FOIA service website is that the Form ADV data on this website has a more accessible format.

[18] The ADV filing on the FOIA website is updated monthly, and records are aggregated annually. For consistency with the TASS sample period, we use the December filing. The SEC requires annual Form ADV to be submitted by the end of April.

[19] A detailed explanation of the structure of Form ADV can be found in Appendix A.4.

only to be filed for the initial application; thus, ownership information is not necessarily current.

In sum, the amended Form ADV expands the disclosure of fund characteristics potentially relevant to the assessment of operational risk and makes it readily accessible to investors in a timely manner. In the analysis below, we are thus able to use the data that were available in most cases to investors in real-time to conduct our tests.[20]

4.2 Descriptive Statistics

We identify 1,308 management companies in the SEC database out of 2,774 listed in TASS -- 47.15% of the TASS database. [21] These management companies represent 5,673 (46.71%) of the 12,146 live funds according to the 11-year TASS and amended Form ADV filing samples.[22] We identify 1,257 defunct funds liquidated or unable to be contacted within the prior 10-year period, representing 22.16% of the matched TASS-ADV dataset.

Table 1 reports descriptive statistics for the ADV and TASS-live funds. Panel A compares the RIA-matched fund sample, as well as the TASS live fund sample. RIA funds deliver higher returns than the larger TASS sample, they charge more fees, have more assets under management, live longer, and more frequently use margin and set up high watermark provisions; they also have longer redemption/subscription frequency and lockup periods. In Appendix A.9, we provide a comparison table for RIA and ERA. Note that ERA funds – those exempt from full filing -- have significantly lower returns/Sharpe ratios, assets under management, high watermarks, and lockups/redemption frequency. Therefore, registration is a signal for fund quality.

[20] Some required filings we use are available at a monthly frequency.

[21] We use a two-step procedure to match funds across the two databases. We first identify exact matches in the TASS 'Company Name' and the 'Legal Name' field for From ADV 1A. For the remainder, we use unique keywords in TASS fund name or parent company name fields to search. firms in Form ADV. We then use additional information such as domicile country, location address, and website address to confirm matches. We use the same matching process for defunct funds as described above for live funds on TASS.

[22] We remove the TASS funds that report quarterly (instead of monthly returns) or gross-of-fee returns and funds with less than $10 million assets under management. We winsorize the top and bottom 5% appraisal ratios, as well as top 1% for management fee and incentive fee. Furthermore, all the foreign domiciled fund assets under management and returns are converted to USD according to the annual exchange rate provided by OECD data (https://data.oecd.org/conversion/exchange-rates.htm).

[Insert Table 1]

Panel B of Table 1 distinguishes RIA funds further as those with and without Umbrella Registration (UR and non-UR).[23] UR funds had a higher average return, alpha, appraisal ratio, Sharpe ratio, management and incentive fees, high watermark provisions, more assets under management, longer subscription, and redemption periods, as well as having longer histories.[24] These differences caution against pooling UR funds with non-UR funds.

4.3 Problem Funds and Non-problem Funds

We further classify funds as having high vs. low operational risk. We follow BGLS and define a simple binary variable based on disciplinary action. We classify funds as a problem if they answered yes to any query in Item 11. These are "Reportable events include felonies and investment-related misdemeanors, regulatory disciplinary actions, court judgments related to violations of investment-related statutes and regulations by the investment advisor and its affiliated persons."[25] BGLS found that other Form ADV variables significantly predicted this problem measure.

[Insert Table 2]

Table 2 separates the entire RIA sample (live and defunct funds) into Problem Funds and Non-Problem Funds. The last two columns display the outcomes of our univariate analysis for RIA funds. Consistent with BGLS's findings for the earlier sample period, problem funds had significantly lower average returns/alphas, incentive fees, personal capital, leverage, high watermark provisions, and lockups/subscription/redemption frequencies. In unreported results, we find that both external and internal conflicts of interest were significant predictors of Problem status.

[23] Since 2011, a single Form ADV can be submitted by one filing advisor with one or more relying advisors who only advise for private funds.
(https://www.sec.gov/rules/proposed/2015/ia-4091-appendix-a.pdf).

[24] Comparing the results in Table 1, we can also observe that the UR funds outperform the entire TASS live fund sample in terms of average return, alpha, appraisal ratio, and Sharpe ratio.

[25] RIA Compliance Associates "Form ADV Drafting Tips (n.d.) https://www.ria-compliance-consultants.com/compliance_tips/form_adv_drafting_tips_for_investment_advisor_compliance/

5. Test of the Materiality of Amended Form ADV

In this section, we test whether the newly added items in the amended Form ADV materially improved the prediction of Problem vs. Non-Problem fund status. We estimate a panel logit regression in which the independent variables are either the full post-2011 set of variables or the subset of pre-2011 variables only. Using the errors from these two specifications we test the null hypothesis that the additional variables added no material information predictive of the Problem Fund indicator. Table 3 presents the effectiveness of the additional operational risk-related variables (Items 7, 8, 9, and 10) in the amended Form ADV in the post-Dodd (Post-2011) period improves the Problem Funds identification for RIA sample, comparing with the Form ADV used in pre-Dodd (Pre-2011) period. Both models (Post-2011 and Pre-2011) use the setting of the equation presented below:

$$Problem_{i,t} = \alpha_{i,t} + \boldsymbol{\beta_{ORV}} \boldsymbol{X_{ORV\ i,t}} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{10} \eta_q YearDummies_{qi} + \varepsilon_{i,t} \quad (1)$$

$Problem_{i,t}$ is a binary indicator that represents whether a fund i has answered 'Yes' to any of the questions on Item 11 of Form ADV in year t. $\boldsymbol{X_{ORV\ i,t}}$ is the set of the operational risk-related variables in the pre-2011 Form ADV or the amended Form ADV after 2011 for fund i in year t. Both models include the style and year dummies.

Table 3 displays the results of the *F*-test and LRT (Likelihood-ratio Test) for the ADV variables concerning the RIA funds. In Panel A, we present the *F*-test and LRT for the pre-Dodd and amended Form ADV filing variables. The independent variables for both tests are the Problem Funds indicator. As per Panel A, the model that incorporates post-2011 variables (amended Form ADV) provide greater statistical power for identifying problem funds.

[Insert Table 3]

Figure 1 displays the PCA outcomes for the amended Form ADV filing variables of RIA funds. Over 11 dimensions are necessary to explain over 80% of the variance. This suggests that not only does the amended Form ADV filing provide improved power for regulatory problem identification, but the variables in the post-Dodd version of Form ADV also offer less duplicated statistical information. Therefore, Table 3 and Figure 1 demonstrate that not only has the number of operational risk variables increased in the amended Form ADV filings, but

these newly added variables (along with the original variables) also provide better statistical information overall.

[Insert Figure 1]

6. Reduced Form Operational Risk Assessment and Estimation

6.1 Operational Risk Indicators Selection and ADV-based Ω-score Construction

The variables in Items 7, 8, 9, and 10, comprise 44 potential operational risk -related variables. As described above, we group those variables into external and internal relationships: variables in Item 7 are considered external relationship-related, while variables in Items 8, 9, and 10 are classified as internal relationship-related variables (the structure and number of the variables in related Items for our variable selection pool can be found in Figure 4 of Appendix A.5).[26]

Given the large number of variables in the amended Form ADV (44) we use LASSO regression (Tibshirani, 1996) to select a parsimonious set of operational risk indicators. [27] Following BGLS we classify funds as problem or non-problem funds. We then estimate a Logit regression with L1 (LASSO) regularization applied to the set of 44 variables.[28] Those with significant non-zero coefficients are taken as salient explanatory variables. The coefficients allow us to define a uni-dimensional score—ADV-based operational risk score as a linear combination of the selected variables.

Table 4 presents LASSO regression results for RIA funds. Among the 44 variables, 42 are selected as important for problem fund identification. This includes 16 external variables (out of 17 total external relationships) and 26 internal variables (out of 27 total internal relationships). Panel A also reports whether the variables are in the pre-Dodd Form ADV (only

[26] Variables in Item 7 can be classified as external relationship and variables in Item 8 as internal relationship-related. Regarding the operational risk-related items added in the Amended Form ADV variables in Items 9 and 10 are treated as internal relationship variables, since they pertain to internal operational processes rather than external factors.

[27] In this, we follow current literature (Chen and Tindall, 2013 and 2014; Wu et al., 2020).

[28] Specifically, we use the Logit regression with the L1 regularization for this LASSO process.

one variable), the variable importance, and the importance rank for the top 10 important variables (7 internal and 3 external; all new variables).

[Insert Table 4]

Furthermore, the variable coefficients in Panel A provide some useful insights. For the top-10 variables, *ReceiveCustodialControlReport*, *OtherControlCompany*, *FuturesCommissions*, *AnnualSurpriseExamination*, and *Pension* negatively correlate to Problem Fund records. The *OtherControlCompany* variable indicates that the fund has other unreported entities that directly or indirectly control fund management or policies.

Moreover, the importance of *OtherControlCompany* in identifying Problem Funds is also interesting. According to the ADV glossary provided by the SEC[29] and our examination within the sample, the funds with *OtherControlCompany* are funds whose related companies are further owned (or controlled) by another company. The *OtherControlCompany* variable suggests the presence of additional oversight motivated by ownership or interested management. Figure 2 presents the WordClouds (frequencies of the words in describing the detailed ownership and management information) for the two items under Item 10 – *OtherControlCompany* and *OtherControlPerson*. Figures 2A, 2B, and 2C present the WordCloud for *OtherControlCompany/Person* (combined set), *OtherControlCompany*, and *OtherControlPerson*, respectively.

[Insert Figure 2]

Compared with *OtherControlPerson*, *OtherControlCompany* provides more structural management roles, such as controlling the funds' related companies by owning stocks or as a parent company (such as words, 'stock', 'common', 'subsidiary'). On the other hand, *OtherControlPerson* reflects more personnel-related governance (such as the words 'president', 'director', 'chief', etc.). In the untabulated results, only *OtherControlCompany* in Item 10 is selected as an important variable. According to the previous description, the outperformance operational risk identification role of *OtherControlCompany* can be explained by the funds-related companies being able to receive more skillful operating and management knowledge, as well as extra risk monitoring supervision due to a relatively larger

[29] https://iard.com/sites/iard/files/glossary.pdf.

power for companies' strategy and governance decisions. Consequently, the *OtherControlCompany* variable suggests the presence of additional oversight motivated by ownership or interested management, and thus improved operational risk monitoring.

Additionally, *ReceiveCustodialControlReport* and *ReceiveAnnualSurpriseExamination* means that a fund's related company can receive internal control reports for its custodial services or annual earnings surprise examination prepared by an independent accountant. This may improve custody and financial risk monitoring during the business. Besides the mentioned internal relationships, *FuturesCommissions* and *Pension* are the two variables that also lead to lower operational risk performance. This means whether the fund's company has a related person who is a Future Commission Merchant (FCM) or pension consultant. Notice that FCMs have more possibility to gain derivative-based leverage but will not be affected by the decisions made by the CTA and CPO since FCMs mostly may not have the right to trade over the clients' accounts. Moreover, most pension funds tend to have low-risk tolerance (Stewart, 2007). Thus, funds engaged with an external affiliation with pension funds may face more risk management evaluation before conducting the affiliation relationship.

Besides, external or internal relationships such as *RelatedQualifiedCustodian, CustodySecuritiesService, DetermineClientsAcctSecurity,* and *CustodyCash/BankAcctService* are conflicts that may increase the custody risk. Furthermore, *SwapDealer* may increase operational risk by obscuring the pricing mechanism.

Panel B presents the number, importance rank, and percentage of the selected variables within different groups. Firstly, according to the comparison between Pre-Dodd versus Post-Dodd variables, among all the 42 selected variables, 66.67% of the post-Dodd variables are selected, and they have a higher median rank than the pre-Dodd ones. This aligns with our previous results in Table 3 that the amended Form ADV provides improved statistical information inclusion. Moreover, in an unreported result, for the top 21 important variables (about the top half of our selected variables), 80.95% of them are newly added.

Furthermore, the third and fourth rows present the selected variables' percentages for external and internal relationship groups. More than 60% of the selected variables belong to internal relationships. This may be explained by the limited governance/decision power from the external affiliations. Since external relationships are more focused on margin/leverage

supports or additional suggestions for financial monitoring (accountant) or law consulting. Most of the important operational risk management and assessment should be taken more account by internal governance, especially for conflict-of-interest issues.

Besides, we further dig into the external and internal groups to find out whether the variables that can mitigate or trigger higher operational risk have a relatively important role in Problem Fund identification. An external/internal relationship will be assigned as a good relationship if the related variables have a negative coefficient according to the LASSO problem fund identification regression results. Otherwise, the relationship will be assigned to a bad external/internal relationship. Specifically, variables with negative signs mean that with involvement in those relationships, funds' related company can better monitor or even decrease the operational risk (lower possibility to have disciplinary history), while positive variables indicate higher operational risk (higher possibility to be identified as Problem Funds) with their existence. Within the 42 selected variables, we get 8 good internal (GI), 18 bad internal (BI), 7 good external (GE), and 9 bad external (BE) variables.

According to the median ranks, BE relationships have higher median ranks than GE (22 versus 30), which means that they provide a higher possibility of becoming Problem Funds. In relation to the previously discussed role for external affiliated parties, good external relationships mainly contribute to increased leverage opportunities without adding much more operational risk (i.e., FCM), or providing extensive monitoring due to the nature of the affiliated company's business nature (i.e., Pension). However, bad relationships such as '*BrokerDealer*' and '*CommodBroker*' will obviously increase the operational risk exposures due to the increased obscure pricing scheme during the advisory process, thus leading to potential fraud and misconduct.

In addition, GI relationships have a lot higher median ranks than the GE variables (14.00 versus 22.50). This means, that even though the GI variables only consisted of 30.77% of the selected internal variables, funds will suffer less operational risk-averse outcomes. This may be because GI variables lead to more comprehensive and intensive risk management. For instance, the three chosen GI variables *ReceiveCustodialControlReport*, *ReceiveAnnualSurpriseExamination*, and *OtherControlCompany* represent three aspects of oversight — monitoring custodial risk, determining financial risk, and providing extra

governance supports. Those may help funds' related company suffer less from the operational risk exposure, due to a more rigorous and independent supervision practice (as stated in the variable explanation in Appendix A.1., *ReceiveCustodialControlReport* and *ReceiveAnnualSurpriseExamination* should all come from independent public accountants).

Moreover, Panel C presents the Kruskal-Wallis Test to find out whether the differences between the medians for different groups mentioned previously are significant. Consistent with previous results in Panel B, Post-Dodd, internal, BE, and GI have significantly higher median ranks in determining the Problem Funds than the others for different categorization definitions. Overall, the amendment rule for Form ADV in 2011 due to the Dodd-Fank Act provides more important variables that can better identify the operational risk. More importantly, internal relationships, especially good internal relationships, can reduce the fund companies' operational risk exposure.

6.2 Reduced Form Operational Risk Estimation

6.2.1 Operational Risk Indicators Predicting Future Adverse Events and Performance

We first test whether the selected operational risk indicators' power to forecast future adverse events, as well as predict future performance. In addition to employing individual-level variables for predictive purposes, we also assess the efficacy of the chosen operational risk indicators via the utilization of four relationship percentage variables – GE, BE, GI, and BI.[30] Specifically, Equations (2) and (3) present adverse events, performance, and leverage predictions by using the Cox-Proportional Hazard model, OLS, and Logit regression, respectively. $X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables in year $t-1$ that represent the percentage of the number of Good/Bad

[30] Previous literature mainly predicts hedge funds' performance by either using macro-based (systematic risk-based) factors (Amenc et al., 2003; Bali et al., 2007; Avramov et al., 2013; Bali et al., 2014; Ardia et al., 2022) or using the idiosyncratic risk-based variables (Liang, 1999; BGLS; Brown et al., 2008a, 2009, 2012). In this paper, we adopt BGLS's method to use fund-level performance and characteristic variables as our control variables for our empirical prediction process.

External/Internal relationships the funds are involved in according to the total number of the relationships in the relative groups. [31]

$$h_{i,t}(T) = h_{0i,t}(T) \times exp\,(\beta_{ExtGoodRelPerc}X_{ExtGoodRelPerc\,it-1} + \beta_{ExtBadRelPerc}X_{ExtBadRelPerc\,it-1} + \beta_{IntGoodRelPerc}X_{IntGoodRelPerc\,i,t-1} + \beta_{IntBadRelPerc}X_{IntBadRelPerc\,i,t-1} + C_{t-1}'\delta_C + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14}\gamma_j StyleDummies_{ji} + \sum_{q=1}^{9}\eta_q YearDummies_{qi}) \quad (2)$$

$$Appraisal\ ratio_{i,t}\ or\ Style-adjusted\ return_{i,t}\ or\ Leveraged_{i,t} = \alpha_{i,t} + \beta_{ExtGoodRelPerc}X_{ExtGoodRelPerc\,it-1} + \beta_{ExtBadRelPerc}X_{ExtBadRelPerc\,it-1} + \beta_{IntGoodRelPerc}X_{IntGoodRelPerc\,i,t-1} + \beta_{IntBadRelPerc}X_{IntBadRelPerc\,i,t-1} + C_{t-1}'\delta_C + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14}\gamma_j StyleDummies_{ji} + \sum_{q=1}^{9}\eta_q YearDummies_{qi} + \varepsilon_{i,t} \quad (3)$$

For adverse events in Equation (2), we adopt the definition proposed by Liang and Park (2010). Fund i is considered adversely impacted in year t with age T if it is liquidated or unable to be contacted according to TASS. Alternately we define the adverse event as a negative average return in the previous 6 months, as well as decreased AUM in the previous 12 months. Within Equation (3), $Appraisal\ ratio_{i,t}$ is the appraisal ratio of fund i in year t, $Style-adjusted\ return_{i,t}$ is fund i's average monthly return in year t adjusted by the average TASS-style monthly return and its standard deviation in the same year.[32] $Leveraged_{i,t}$ is one if fund i uses leverage in year t. $Umbrella_{i,t-1}$ in both equations is one if the fund's related firms under Umbrella Registration in the previous year. Besides the percentage variables according to the LASSO results, within both 2 sets of equations, we control various fund

[31] Again, good/bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results in Table 4.

[32] We calculate the annual appraisal ratio by regressing the 12-month excess return of fund i on the excess return of the fund's TASS-style index I within the same year (BGLS, 2008). Specifically, $r_{it} - R_{ft} = \alpha_i + \beta_i(r_{it} - R_{ft}) + \varepsilon_{it}$, and $i \in I$. Where R_{ft} is the 3-month US Treasury Bill return. Furthermore, the style-adjusted return is calculated by $\frac{\mu_{it}-\mu_{It}}{\sigma_{it}}$. μ_{it} is the average monthly return for fund i in year t and σ_{it} is the standard deviation of the average monthly return for fund i in year t. μ_{It} is the average monthly return for the fund i's relative TASS-style in year t.

performance and characteristic variables.[33] Year dummies and style dummies are also included.[34]

Table 5 presents the results for both individual-level and aggregate-level operational risk indicators for adverse outcomes prediction (a full version of regression results with detailed variable-level and aggregate-level percentage variables for adverse liquidation, performance, and leverage can be found in Table 2 of Appendix A.6, Table 3 of Appendix A.7, and Table 4 of Appendix A.8.). Panel A presents the performance and leveraged forecast results. Panel B presents the adverse liquidation events prediction results. According to Models 1, 2, 4, and 5, funds' related companies with a higher percentage of good internal relationships in the previous year will lead to increased style-adjusted return, appraisal ratio, and leverage accessibility. The negative effect brought by the high percentage involvement of bad internal relationships significantly harms the future style-adjusted return and leverage accessibility in Models 1, 2, and 5. Furthermore, according to Models 1, 2, and 3, large exposures to bad external relationships are more prone to predict decreased performance such as style-adjusted return and appraisal ratio. For good external relationships that lead to lower operational risk, a large proportion of these relationships will be 'rewarded' by an increased appraisal ratio in the future, as stated in Model 2.

[Insert Table 5]

Similarly, Models 1, 2, and 3 in Panel B show the significant power of the GI (Models 1 and 3) and BE (Model 2) relationship percentage in predicting the decreased/increased liquidation events in the following year. Moreover, when examining the *t*-statistics for the four percentage-level variables in Panels A and B, it becomes apparent that these findings align with Panels B and C in Table 4. This indicates that the internal percentage relationship

[33] Specifically, C_{t-1} represents a vector of variables, including average and standard deviation of monthly returns, leveraged or not indicator, onshore and high-water mark indicators, logarithm of assets, and fund management fee in year $t-1$. Furthermore, for performance prediction in Equation (3), average return in year $t-1$ will not be included. Similarly, for leveraged or not prediction, leveraged or not indicator in year $t-1$ will not be included as well.

[34] Moreover, all the prediction analysis tables started from this section report the regression results that with clustered standard errors for TASS-style, year, and funds' advisory companies (fund flow analysis) besides the controlled dummies (the clustered errors are only for the OLS models, for rest of the models, we only control the relative dummies). This method is aligned with the clustered error consideration used in the previous literature for hedge fund performance analysis (Brown, Gregoriou, and Pascalau, 2011; Bali, Brown, and Caglayan, 2014).

variables play a more crucial role in predicting adverse outcomes compared to the external percentage relationship variable.

Furthermore, within the two general groups, having more good internal variables leads to outperformance, increased leverage accessibility, and decreased liquidation events, while vice versa for the bad external relationship exposures.

6.2.2 ADV-based Ω-score Predicting Adverse Events and Performance

The last section shows that our selected operational risk-related external and internal variables have the power to predict future adverse events and performance. In this section, we test whether the ADV-based Ω-score, a more direct but comprehensive uni-dimensional score constructed from regression coefficients predicts performance, leverage, and adverse events. Equations (4) and (5) present those testing strategies with similar settings in the previous two equations.

$$h_{i,t}(T) = h_{0i,t}(T) \times exp\,(\beta_1 ADV - Based\ \Omega\ score_{i,t-1} + C_{t-1}{}'\delta_C + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14}\gamma_j StyleDummies_{ji} + \sum_{q=1}^{9}\eta_q YearDummies_{qi}) \quad (4)$$

$$Appraisal\ ratio_{i,t}\ or\ Style - adjusted\ return_{i,t}\ or\ Leverage_{i,t} = \alpha_{i,t} + \beta_1 ADV - Based\ \Omega\ score_{i,t-1} + C_{t-1}{}'\delta_C + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14}\gamma_j StyleDummies_{ji} + \sum_{q=1}^{9}\eta_q YearDummies_{qi} + \varepsilon_{i,t} \quad (5)$$

Table 6 presents the adverse outcomes prediction results by using the constructed ADV-based Ω-score. Models 1 and 2 indicate that an increase in the ADV-based Ω-score by one-unit results in a decrease of 1% in funds' future style-adjusted return and appraisal ratio. Furthermore, Models 3 and 4 suggest that funds with a higher ADV-based Ω-score are less likely to be leveraged and will be more likely to be liquidated in the future. Furthermore, funds under UR will experience increased leverage opportunities and enhanced performance in the future, as demonstrated in Models 1, 2, and 3. This observation is consistent with the summary statistics presented in Table 1, indicating that funds associated with companies under UR exhibit superior performance (including higher return, alpha, Sharpe ratio, and appraisal ratio), higher quality (reflected in higher management and incentive fees, with a

high water mark, and a longer lockup period), as well as a more extended operating history. This underscores how the SEC's revised registration categorization – Umbrella Registration – aids market participants in better discerning funds that outperform and enjoy greater trust from lenders.

[Insert Table 6]

Moreover, Appendix A.16 provides the median and mean values for the ADV-based Ω Score across various TASS styles. On average, fund of funds (FoFs) exhibits the lowest operational risk exposure, attributed to risk diversification within FoF strategies achieved by investing in different funds within the portfolio. Conversely, Fixed Income Arbitrage (FIA), Undefined, and Multi-strategy funds emerge as the top three fund types with the highest operational risk scores. The elevated risk associated with FIA stems from its typical reliance on a high leverage ratio, potentially necessitating managers to seek additional leverage through margin or derivative-based methods. In the case of Undefined and Multi-strategy funds, their heightened operational risk is more straightforward, given that the opacity and complexity inherent in these funds increase the likelihood of both internal and external conflicts of interest. In addition, we include the results of the ADV-based Ω-score using the Canonical Correlation Analysis (CCA) method developed by BGLS in Appendix A.17. Comparing the results in Table 14 with Appendix A.17, we find that our LASSO-constructed ADV-based Ω-score provides more significant prediction power than the CCA-constructed ADV-based Ω-score.[35] This can be partially attributed to the direct utilization of ADV data in the former, as opposed to the indirect use of private data such as TASS in the latter. Moreover, it demonstrates that public data like the ADV is effective in constructing meaningful operational risk measures.

[35] This may because of the larger amount of the variables included in the LASSO method. Since for the CCA-constructed ADV-based Ω Score, we find the weights for the variables according to the linear combination of the performance and characteristics information provided by TASS. However, the size for the TASS variables is limited (12 variables according to BGLS), so that to avoid the imbalance issue in the CCA process, we should select a parsimonious set of the operational risk variables instead of using all the key indicators. This may drive the outperformance of the LASSO-constructed ADV-based Ω Score.

6.3 Operational Risk and Future Fund Flows

According to our analysis so far, we have found evidence that our constructed ADV-based Ω-score, which directly utilizes the amended Form ADV, can negatively predict future performance and adverse events (survival and performance) for hedge funds. Our next objective is to investigate whether investors are aware of a hedge fund's operational risk exposure, in addition to the lenders.

Scharfman (2009) has previously suggested that investors are aware of the negative relationship between a fund's operational risk management skills and hedge fund failures. Despite BGLS's lack of evidence regarding investors' awareness of hedge funds' operational risk, we seek to determine whether investors react to funds with high operational risk exposure, particularly after the Dodd-Frank Act and the provision of a richer range of operational risk information via the amended Form ADV. To this end, we present fund flow predictions in Equation (6) utilizing the ADV-based Ω-score.[36]

$$Flow_{i,t} = \alpha_{i,t} + \beta_1\, ADV - Based\ \Omega\ score_{i,t-1} + \delta_1\, High\ rank_{i,t-1} + \delta_2 Mid\ rank_{i,t-1} + \delta_3 Low\ rank_{i,t-1} + \delta_4 Log\ assets_{i,t-1} + \delta_5 Stdev_{i,t-1} + \delta_6 Management\ fee_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t} \quad (6)$$

Table 7 presents the fund flow prediction results. Model 1 and Model 2 present the fund flow analysis for our full sample. Clustered standard errors are used for style, years, and funds' advisory companies in two models. Model 1 indicates that funds with high operational risk exposure in the past are viewed less favorably by investors. Specifically, a one-unit increase in the ADV-based Ω-score leads to a 2% decrease in future fund flows.

Moreover, Model 2 shows that the investors may be even more cautious about previous non-outperform funds (*Mid trank* and *Low trank*) that also have a higher operational risk. All the results in this section suggest that, unlike the findings in BGLS where investors either ignore operational risk or are unaware of it, in the post-Dodd-Frank era, investors are more aware

[36] $High\ rank$, $Mid\ rank$, and $Low\ rank$ are the fractional ranks for the previous year's return (adjusted by exchange rate) introduced by Getmansky et al. (2018).

of the quality of a hedge fund's operational risk management, thanks to the richer coverage of operational risk information provided by the amended Form ADV filings. Moreover, similar to Table 6, fund companies that are under UR will also get increased fund flows in the future.

[Insert Table 7]

6.4 Out-Of-Sample Operational Risk Predicting Adverse Outcomes and Fund Flows

In this section, we provide the Out-Of-Sample (OOS) prediction results for performance, leverage, adverse liquidation, and fund flow by using the yearly-constructed ADV-based Ω-score according to our LASSO-based measurement. Since the ADV-based Ω-score used in the previous results in Tables 5 and 6 are all based on the full panel sample constructed operational risk score according to the LASSO-based method. Thus, we conduct the LASSO process as described in Table 4 (Section 6.1) for each year from 2012-2021 to get 'dynamic' weights for the selected operational risk variables. By using the annual-constructed ADV-based Ω-score we would like to know whether our operational risk measurement is also effective in OOS predictions.

Table 8 presents the cross-sectional estimation for future performance (style-adjusted return and appraisal ratio), leverage accessibility, adverse liquidation probability, and fund flows by using the OOS ADV-based Ω-score from 2013-2022. According to Table 8, for each year's prediction of the 5 dependent variables, we provide the coefficient, *t*/*z*-statistics, and goodness of fit value for related OLS, Logit, and Cox-Hazard models. The results show that for all the adverse outcomes and fund flow forecasting, the constructed ADV-based Ω-score can significantly predict future underperformance, less accessibility of leverage, higher liquidation risk, as well as outflows for more than half of the 10 years.

[Insert Table 8]

Moreover, when looking at the trend for the coefficient and *t*/*z*-statistics for ADV-based Ω-score on an annual basis, we can find out that the power of the ADV-based Ω-score for predictions present increased magnitude and significant level with time. Specifically, investors (fund flows) and lenders (leverage) have started to be more and more cautious about investing/providing leverage for funds' related companies that have higher operational risk.

Also, increased operational risk exacerbates the loss of performance starting at year 2018. The liquidation risk is even more sensitive to the operational risk. Starting from 2015, fund companies that disclose more operational risk will suffer higher and increased significant risk of being adversely liquidated. In addition, as presented in the bottom part of Table 8, comparing with the first half period predictions (2013-2017), almost all the second half five-year predictions (2018-2022) have higher significant levels and magnitude for the coefficients of ADV-based Ω-score for different adverse outcomes and fund flows.

In summary, the findings presented in Table 8 not only demonstrate the robustness of our operational risk assessment but also offer proof that the utilization of publicly accessible mandatory disclosure for hedge funds can enhance market participants' awareness of operational risk management. This improvement has been observed from the time the amended Form ADV was introduced during the post-Dodd period.

7. Robustness

In this section, we provide further analysis for the previous analysis by using a broader sample that includes both RIA and ERA, to find out whether the enhanced disclosure of the amended Form ADV can still provide a more direct and robust operational risk assessment for both relatively big-size (RIA) and small-size (ERA) funds. Tables 7, 8, and 9 in Appendix A.11, A.12, and A.13 present the aggregate-level External/Internal Good/Bad percentage variables for predicting adverse outcomes for the entire sample. [37]

Similar to the results in Table 4 and Table 5, funds' related companies that have better internal operational risk management relationships will have increased appraisal ratio (Models 2 and 4 in Table 8 of Appendix A.12) and style-adjusted return (Model 5 in Table 8 of Appendix A.12), leverage accessibility (Models 2 and 4 in Table 9 of Appendix A.13), and less liquidation possibility (Models 2 and 4 in Table 7 of Appendix A.11) in the future. However, more involving in bad external relationships will bring a significant adverse impact on funds' future appraisal ratio (Model 3 in Table 8 of Appendix A.12) and style-adjusted return (Model 4 in Table 8 of

[37] Notice that for the variable selection and related weights for the ADV-based Ω-score in the future process, we re-run the LASSO problem fund identification process for both RIA and ERA funds within the 11-year panel sample.

Appendix A.12), leverage (Models 3 and 4 in Table 9 of Appendix A.13), and survival (Model 4 in Table 7 of Appendix A.11). Moreover, in accordance with the relative importance comparison for operational risk identification ranks, GI percentage have higher *t*/*z*- statistics than that of BE variables (again, according to Panel B and Panel C of Table 4, internal relationships are more important than external ones. GI and BE are more important than BI and GE, respectively).

Furthermore, consistent with Table 6, Table 10 in Appendix A.14 presents the predictions of the adverse outcome by using the ADV-based Ω-score. Consistent with Table 6, funds with higher operational risk will suffer decreased style-adjusted return, appraisal ratio, and confidence from lenders, as well as increased liquidation risk. Notice that both the magnitude and significant level for ADV-based Ω-score are relatively smaller than the RIA sample. This can be explained by the filing requirement variations between ERA and RIA funds' related companies. RIA companies need to file the full amended Form ADV while ERA does not need to answer the questions in Items 8 and 9. Those two items include most of the internal variables. As stated in Table 4, internal variables are relatively important in assessing the operational risk for the funds. Consequently, when combining the ERA and RIA for score construction, missing values may be present in the ERA samples and may 'decrease' the power of the ADV-based Ω-score.

Moreover, according to Model 3, funds-related companies that with UR remain to be important for increasing the trust of lenders. However, ERA funds will have a decreased appraisal ratio and leverage opportunity in the future, as presented in Models 2 and 3. This can be explained by the definition of RIA and ERA according to the SEC. Figure 2 in Appendix A.3 shows that the variation between those two categories mainly depends on the AUM for their related companies. Consequently, funds belonging to companies that are RIA will have more sufficient assets and also may lead to more outperformance possibilities since they can only get the assets for management if the investors appreciate the funds' performance.

Furthermore, we also want to know, besides the RIA funds, whether the investors for ERA funds have also been taking into account operational risk. As shown in Table 11 in Appendix A.15, consistent with our previous result in Table 7, our ADV-based Ω-score can negatively forecast future fund flows, and funds that are not outperformance previously (*low trank* and

mid trank) will suffer more outflows. Consequently, even within a larger sample that considers the variation of the registration under the SEC and state authorities, the selected operational risk variables, as well as the ADV-based Ω-score by using the LASSO-based method can still predict funds' future outflows. In a word, investors are also aware of the operational risk evaluation for both the SEC-registered funds (RIA) and state authorities-registered funds (ERA).

8. Conclusion

This study examines the effectiveness of the post-Dodd-Frank amended Form ADV by the SEC in providing investors with meaningful information regarding operational risk in hedge funds. The amended Form ADV introduces a wider array of operational risk-related data, including new variables that enhance our ability to identify funds involved in regulatory violations. We first investigate whether the additional information genuinely enhances the assessment of operational risk, and our findings confirm that it does.

Then, using LASSO regression, we construct a univariate operational risk measure known as the Ω-score, derived from the disclosure variables. This Ω-score is then employed to predict various adverse outcomes such as fund closures, leverage levels, and fund performance. These predictions are based on an analysis of a panel of fund disclosures following the enactment of Dodd-Frank.

Furthermore, our analysis of fund flows provides evidence that investors were less inclined to invest in funds with higher operational risk exposure after the introduction of the amended Form ADV in July 2011. This suggests that the amended Form ADV has had a positive impact. Notably, when compared to prior research that relied on private market information like TASS, our Form ADV-based Ω-score, utilizing publicly available information from the SEC website, exhibits greater predictive power in anticipating adverse fund events and capturing investors' attention in the post-Dodd-Frank era.

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Figure 1 PCA Explained Variance Plot for Amended Form ADV Filings Variables

This figure presents the explained variance for the 43 orthogonal dimensions according to the amended Form ADV Filings from January 2012 to December 2022 panel sample of RIA funds.

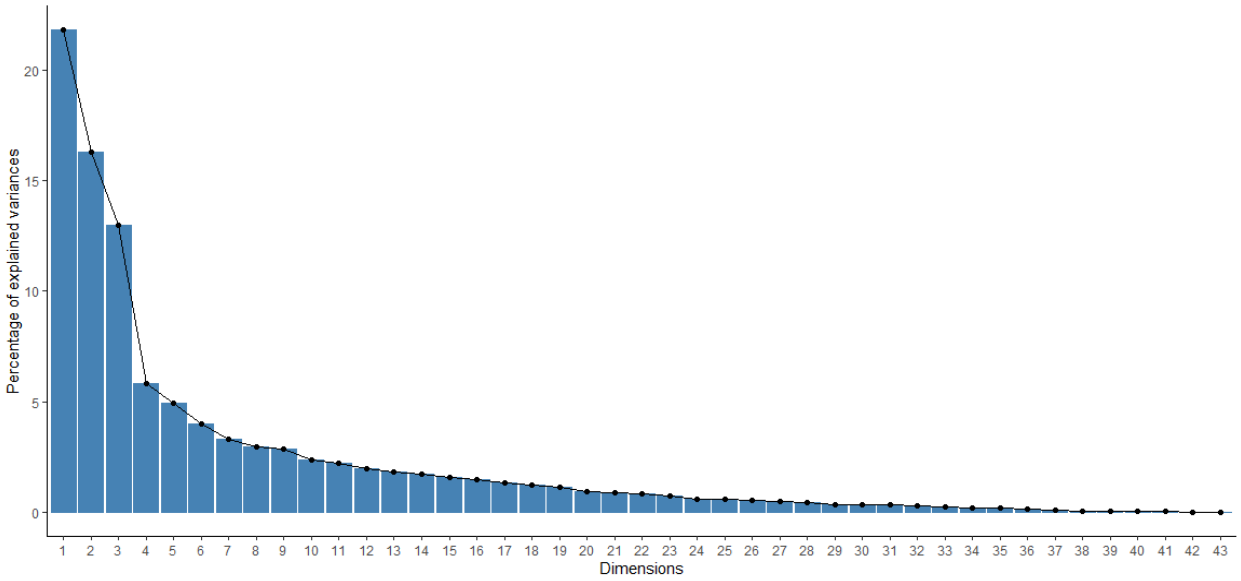

Figure 2 WordClouds for Other Control Person or Company Description

The three figures below present WordClouds for the words' frequency according to the description of Item 10 – OtherControlCompany/Person of RIA funds. For each of the plots, the bigger the word, the higher the frequency of the word. Black, blue, and green colors also provide relatively high, median, and low-frequency levels for words. Figure 2A presents WordCloud for a total of Item 10 descriptions. Figure 2B presents WordCloud for further control, interests, and ownerships that are brought by other companies. Figure 2C presents WordCloud for other controls, ownerships, and monitoring that are due to other persons.

Figure 2A WordCloud Plot for OtherControlPerson/Company

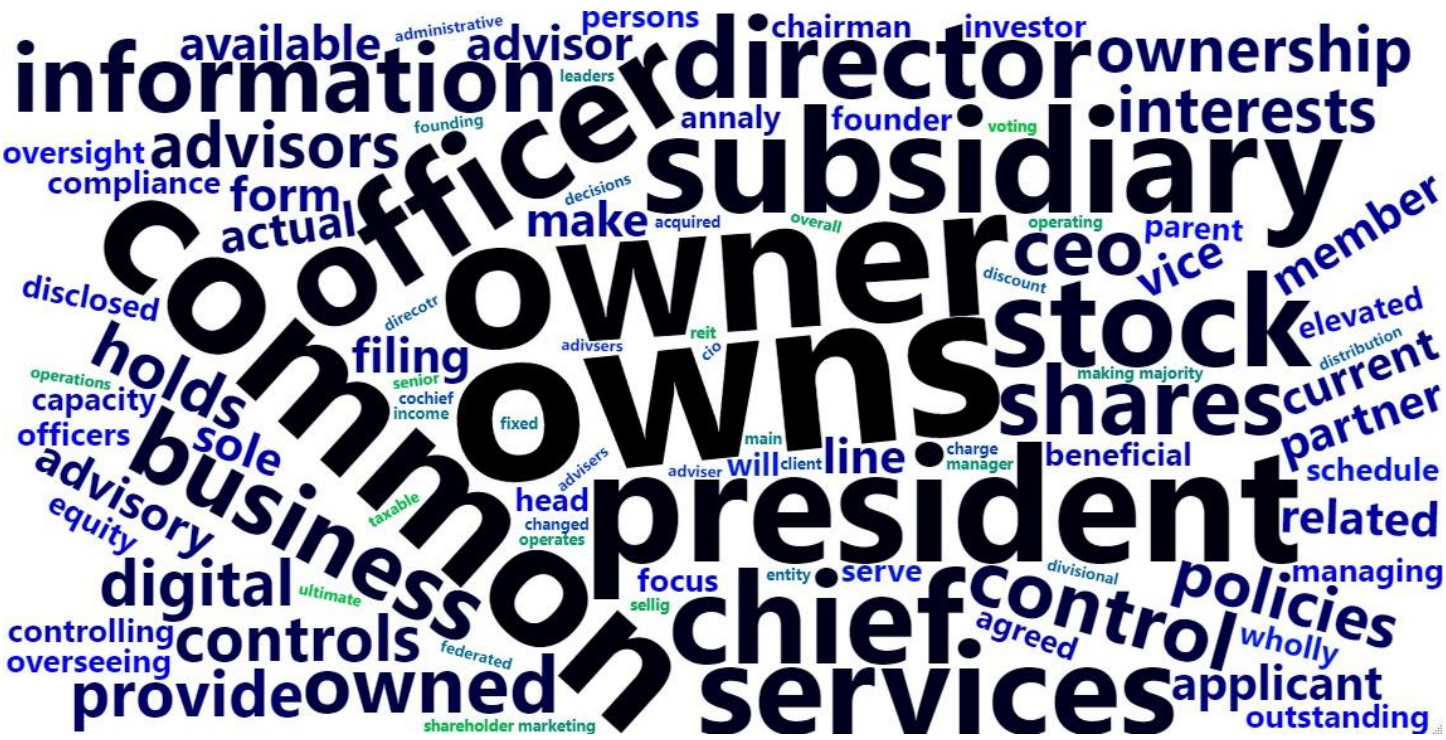

Figure 2B WordCloud Plot for OtherControlCompany

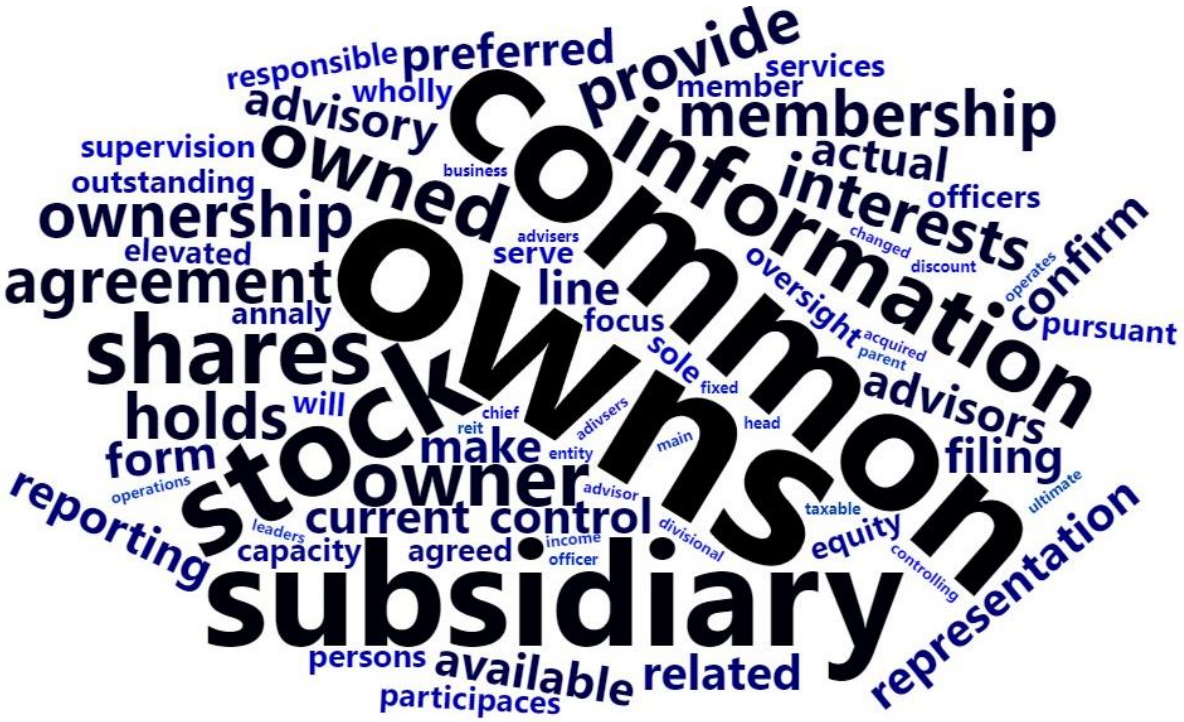

Figure 2C WordCloud Plot for OtherControlPerson

Table 1 Descriptive Statistics of TASS and Matched RIA Funds Panel Sample

Panel A reports descriptive statistics for RIA funds in the TASS database that have Form ADV filed by their advisory companies.[38] The TASS live funds are all those included in TASS that have at least a one-month rate of return record of a given year. The sample size differs because TASS includes funds not subject to SEC requirements to file Form ADV. The final two columns report a *t*-test for sample differences. Panel B breaks out the difference between RIA funds under Umbrella Registration (UR) and non-UR RIA funds. Some funds changed their UR status within the sample period. ***, **, * indicate statistical significance at the 1%, 5% and 10% level respectively.

Panel A: RIA Funds and All TASS Live Funds									
	Matched RIA Funds			All TASS Live Funds					
	N	Mean	Stdev.	N	Mean	Stdev.	Diff	*p*-value	
Return	4,431	0.30	0.80	12,146	0.28	1.81	0.03	0.05	**
Stdev.	4,430	2.10	1.59	12,191	2.12	1.67	-0.01	0.61	
Skewness	4,430	-0.11	0.49	12,191	-0.10	0.49	-0.01	0.31	
Kurtosis	4,430	-0.70	0.75	12,191	-0.65	0.74	-0.05	0.00	***
1st-order AC	4,430	-0.02	0.23	12,191	-0.05	0.20	0.03	0.00	***
Sharpe ratio	4,430	0.22	0.40	11,578	0.24	0.50	-0.02	0.23	
Appraisal ratio	4,431	0.12	0.49	11,584	0.22	0.59	-0.09	0.00	***
Alpha	4,431	0.03	0.83	11,584	0.04	1.95	-0.01	0.14	
Management fee	4,334	1.40	0.58	11,735	1.38	0.65	0.02	0.07	*
Incentive fee	4,027	13.24	8.27	10,302	12.27	8.62	0.97	0.00	***
Min. Invt. ($M)	4,392	2.50	75.83	12,072	2.31	66.18	0.20	0.88	
Asset ($M)	2,702	551.00	17,356.73	7,435	281.40	10,473.25	269.60	0.05	**
Fund age	4,431	8.85	5.26	12,226	8.62	5.23	0.22	0.02	**
Leveraged	4,431	0.46	0.49	12,226	0.44	0.48	0.01	0.17	
Margin	2,488	0.28	0.45	6,726	0.22	0.41	0.06	0.00	***
High water mark	4,405	0.55	0.50	12,083	0.48	0.50	0.06	0.00	***
Lockup period	4,431	2.15	5.43	12,226	1.72	5.96	0.43	0.00	***
Sub. Freq.	4,431	17.70	13.31	12,226	15.64	14.23	2.06	0.00	***
Red. Freq.	4,431	33.18	38.84	12,226	26.35	34.72	6.82	0.00	***

[38] For the TASS database, we remove the funds that reports quarterly (instead of monthly return) or gross-of-fee returns, and the funds with less than $10 million assets under management. Moreover, we winsorize the top and bottom 5% for the appraisal ratio, as well as top 1% for management fee and incentive fee. Furthermore, all the foreign domiciled funds' assets under management and returns are converted to US-dollar according to the annual exchange rate provided by OECD data (https://data.oecd.org/conversion/exchange-rates.htm).

Panel B: RIA UR and non-UR Funds									
	RIA Funds with UR			RIA Funds without UR			RIA UR and non-UR Funds		
	N	Mean	Median	N	Mean	Median	Diff	*p*-value	
Return	548	0.54	0.48	4,394	0.29	0.27	0.26	0.00	***
Stdev.	548	2.06	1.63	4,393	2.10	1.63	-0.04	0.52	
Skewness	548	0.00	0.03	4,393	-0.11	-0.12	0.11	0.00	***
Kurtosis	548	-0.50	-0.80	4,393	-0.71	-0.85	0.21	0.00	***
1st-order AC	548	-0.04	-0.03	4,393	-0.02	-0.03	-0.02	0.03	**
Sharpe ratio	548	0.37	0.30	4,393	0.22	0.20	0.15	0.00	***
Appraisal ratio	548	0.27	0.26	4,394	0.12	0.10	0.15	0.00	***
Alpha	548	0.19	0.20	4,394	0.01	0.08	0.18	0.00	***
Management fee	532	1.48	1.50	4,302	1.40	1.50	0.09	0.00	***
Incentive fee	463	17.91	20.00	4,004	13.23	20.00	4.68	0.00	***
Min. Invt. ($M)	525	1.63	0.50	4,354	2.51	0.15	-0.88	0.46	
Asset ($M)	360	2,920.58	125.88	2,668	218.16	62.43	2,702.42	0.28	
Fund age	548	12.42	11.00	4,394	8.76	8.00	3.66	0.00	***
Leverage	548	0.48	0.00	4,394	0.46	0.00	0.02	0.38	
Margin	369	0.29	0.00	2,436	0.28	0.00	0.01	0.73	
High water mark	548	0.67	1.00	4,363	0.55	1.00	0.12	0.00	***
Lockup period	548	3.44	0.00	4,394	2.14	0.00	1.31	0.00	***
Sub. Freq.	548	18.59	21.00	4,394	17.72	21.00	0.87	0.11	
Red. Freq.	548	43.45	21.00	4,394	32.96	21.00	10.49	0.00	***

Table 2 Univariate Analysis: Comparison of Problem and Nonproblem RIA Funds

This table reports fund-level performance, characteristics, and conflict of interest univariate analysis for Problem and Non-problem RIA funds. 'Problem Funds' are the funds' advisory companies that answered '*Yes*' at least once to any questions on Item 11 of Form ADV. Table 2 shows the performance and fund characteristics statistics for Problem and Nonproblem RIA funds according to the TASS. The last two columns present the *t*-test for Problem and Nonproblem funds. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

	Problem Funds			Nonproblem Funds					
	N	Mean	Stdev.	N	Mean	Stdev.	Diff	*p*-value	
Return	930	0.24	0.60	3,501	0.30	0.85	-0.06	0.01	**
Stdev.	930	1.81	1.29	3,500	2.18	1.65	-0.37	0.00	***
Skewness	930	-0.12	0.46	3,500	-0.10	0.50	-0.02	0.16	
Kurtosis	930	-0.71	0.69	3,500	-0.70	0.77	-0.01	0.75	
1st-order AC	930	0.02	0.23	3,500	-0.03	0.23	0.05	0.00	***
Sharpe ratio	930	0.22	0.38	3,500	0.22	0.41	0.00	0.83	
Appraisal ratio	930	0.14	0.48	3,501	0.12	0.49	0.01	0.51	
Alpha	930	-0.02	0.67	3,501	0.03	0.86	-0.05	0.07	*
Management fee	909	1.37	0.66	3,425	1.40	0.56	-0.03	0.18	
Incentive fee	809	13.02	8.22	3,218	14.15	8.39	-1.13	0.00	***
Min. Invt. ($M)	903	0.92	3.65	3,489	2.92	85.05	-2.00	0.17	
Asset ($M)	495	187.57	530.23	2,207	632.51	19,203.00	-444.94	0.28	
Personal capital ($M)	803	1.02	8.89	3,055	3.37	23.06	-2.35	0.00	***
Fund age	930	8.84	4.88	3,501	8.85	5.36	-0.01	0.97	
Leveraged	930	0.41	0.48	3,501	0.47	0.49	-0.06	0.00	***
Margin	448	0.31	0.46	2,040	0.27	0.44	0.04	0.12	
High water mark	922	0.50	0.50	3,483	0.56	0.49	-0.06	0.00	***
Lockup period	930	1.11	3.94	3,501	2.42	5.73	-1.31	0.00	***
Sub. Freq.	930	16.09	12.83	3,501	18.12	13.40	-2.04	0.00	***
Red. Freq.	930	27.60	32.49	3,501	34.66	40.24	-7.06	0.00	***

Table 3 Effectiveness of the Operational Risk-related Variables in the Amended Form ADV

This table presents the effectiveness of the additional operational risk-related variables (Items 7, 8, 9, and 10) in the amended Form ADV in the post-Dodd (Post-2011) period improves the Problem Funds identification for RIA sample, comparing with the Form ADV used in pre-Dodd (Pre-2011) period. Both models (Post-2011 and Pre-2011) use the setting of the equation presented below:

$$Problem_{i,t} = \alpha_{i,t} + \boldsymbol{\beta_{ORV}} \boldsymbol{X_{ORV\ i,t}} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{10} \eta_q YearDummies_{qi} + \varepsilon_{i,t}$$

$Problem_{i,t}$ is a binary indicator that represents whether a fund i has answered 'Yes' to any of the questions on Item 11 of Form ADV in year t. $\boldsymbol{X_{ORV\ i,t}}$ is the set of the operational risk-related variables in the pre-2011 Form ADV or the amended Form ADV after 2011 for fund i in year t. Both models include the style and year dummies. Specifically, Panel A presents the partial *F*-test,[39] and Panel B presents the likelihood-ratio test (LRT)[40] results. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

Panel A: *F*-test							
		F-test					
Model	Res. DF	SSR	DF	SSR Diff.	*F*	*p*-value	
Pre-2011 model	18,717	1,972.60					
Post-2011 model	18,687	1,738.50	30	234.05	83.86	0.00	***
Panel B: LRT							
Model	Res. DF	Res. Dev	DF	Deviance	*p*-value		
Pre-2011 model	18,717	11,638.60					
Post-2011 model	18,687	9,818.90	30	1,819.70	0.00	***	

[39] Partial F test: $\frac{\frac{SSR_R - SSR_F}{p}}{\frac{SSR_g}{n-k}}$, where SSR_R and SSR_F represent the sum of squared residuals for the reduced model (pre-2011) and the full model (post-2011), respectively. p is the number of the variables removed from the post-2011 model, n is the total observations in our panel sample, and k is the number of the coefficients (including the intercept) in the post-2011 model.

[40] Likelihood-ratio test (LRT): $-2log_e\left(\frac{\mathcal{L}_R(\hat{\theta})}{\mathcal{L}_F(\hat{\theta})}\right) = Deviance_R - Deviance_F$. Where R and F represent reduced (pre-2011) and the full model (post-2011), respectively.

Table 4 LASSO Regression and Relative Importance

This table presents our LASSO prediction result, as well as the relative importance of the selected external and internal relationships for RIA funds. The optimization formula used in our LASSO regression model (Tibshirani, 1996) is presented below:

$$\min_{\beta_j} \sum_{i=1}^{n} (Problem_{i,t} - \sum_{j=1}^{p} \boldsymbol{X_{ORV\ i,t,j}} \boldsymbol{\beta_{ORV\ i,t,j}})^2 + \lambda \sum_{j=1}^{p} |\beta_j|$$

Where n is the total number of the observation for RIA funds, $Problem_{i,t}$ represents whether fund i's related advisory company answers any '*Yes*' in Item 11 in Form ADV for year t. $\boldsymbol{X_{ORV\ i,t,j}}$ is the set of the 43 operational risk-related variables in the amended Form ADV filed by fund i's related advisory company in year t, plus one intercept term ($p = 43 + 1 = 44$), and λ is the tunning parameter.[41]

Panel A presents the LASSO regression result for the top 10 important variables. Columns report the LASSO coefficients, whether a variable belongs to external or internal (E/I) groups, whether the variable is newly added or originally (N/O) presented in the pre-Dodd Form ADV (BGLS, 2008), and the importance rank of each variable according to the absolute values of coefficients. Panel B presents summary statistics (total number, percentage, median, and sum rank) for the selected O/N and E/I operational risk variables. Panel C provides the Kruskal-Wallis Test[42] comparing the relative importance of LASSO-selected relationships.

Panel A: LASSO Regression Result for RIA Funds (Top-10 Important Variables)

Variable	Coef.	External vs Internal	Old vs New	Importance	Rank
RelatedQualifiedCustodian	12.42	I	N	12.42	1
ReceiveCustodialControlReport	-7.65	I	N	7.65	2
CustodySecuritiesService	5.68	I	N	5.68	3
FuturesCommission	-4.85	E	N	4.85	4
DetermineClientsSecurity	4.83	I	N	4.83	5
OtherControlCompany	-4.80	I	N	4.80	6
CustodyCash/BankAcctService	4.19	I	N	4.19	7
ReceiveAnnualSurpriseExamination	-3.96	I	N	3.96	8
SwapDealer	3.73	E	N	3.73	9
Pension	-3.54	E	N	3.54	10

[41] λ is the tunning parameter, which is optimally found by choosing the value that returns us the smallest MSE according to the 10-fold cross-validation for the LASSO regression.

[42] The *H* Statistic is calculated by $H = [\frac{12}{n(n+1)} \sum_{j=1}^{c} \frac{T_j^2}{n_j}] - 3(n+1)$. Where n is the total sample size for all groups, c is the number of the groups (in our case, it equals to 2), T_j is the sum of the ranks in the jth group, and n_j is the size of the jth group.

Table 4 Continued

Panel B: Summary Statistics for the LASSO-selected Operational Risk-related Variables					
		Num. of the Selected Variables	% of the Selected Variables	Median Rank	Sum Rank
Pre-2011 vs. Post 2011	Post-2011	28.00	66.67%	16.50	384.00
	Pre-2011	14.00	33.33%	30.50	519.00
External vs. Internal	External	16.00	38.10%	22.50	384.00
	Internal	26.00	61.90%	18.50	519.00
External Good vs. Bad	External Good	7.00	43.75%	30.00	180.00
	External Bad	9.00	56.25%	22.00	199.00
Internal Good vs. Bad	Internal Good	8.00	30.77%	14.00	134.00
	Internal Bad	18.00	69.23%	22.50	390.00

Panel C: Relative Importance Comparison Between External vs. Internal and Old vs. New Relationships--Kruskal-Wallis Test

	Pre-2011 vs. Post-2011	External vs. Internal	External Good vs. Bad	Internal Good vs. Bad
H	202,897.60	133,417.00	101,920.00	113,905.52
p-value	0.00	0.00	0.00	0.00
Variable groups that have relatively higher ranks	**Post-2011**	**Internal**	**External Bad**	**Internal Good**

Table 5 Operational Risk External and Internal Good or Bad Percentage Variables Predicting Adverse Outcomes

This table presents the performance, leverage, and adverse liquidation prediction results for RIA funds by using the LASSO-selected external and internal good or bad percentage variables. Models in Panel A use the equation below for the style-adjusted return & appraisal ratio (OLS),[43] as well as leveraged or not (Logit) predictions:

$$\begin{aligned} &Appraisal\ ratio_{i,t}\ or\ Style-adjusted\ return_{i,t}\ or\ Leveraged_{i,t} \\ &\quad = \alpha_{i,t} + \beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} \\ &\quad + \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} \\ &\quad + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t} \end{aligned}$$

Models in Panel B use the Cox Proportional-Hazards Model used in this analysis is presented below:[44]

$$\begin{aligned} h_{i,t}(T) = h_{0i,t}(T) \times exp\ (&\beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} \\ &+ \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Return_{i,t-1} \\ &+ \delta_6 Management\ fee_{i,t-1} + \delta_7 Leveraged_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi}) \end{aligned}$$

$X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables that represent the percentage of the number of Good or Bad[45] External or Internal relationships the funds are involved in according to the total number of the relationships in the relative groups.[46] 'External' and 'Internal' at the bottom of the table represent whether a model uses the selected variable-level external or internal relationships. All models control the TASS-style and year dummies for predictions. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.[47]

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[43] We calculate the annual appraisal ratio by regressing the 12-month excess return of fund i on the excess return of the fund's TASS-style index j within the same year (BGLS, 2008). Specifically, $r_{it} - R_{ft} = \alpha_i + \beta_i(r_{jt} - R_{ft}) + \varepsilon_{it}$, where R_{ft} is the 3-month US Treasury Bill return. Furthermore, the style-adjusted return is calculated by $\frac{Return_{it} - \mu_{jt}}{\sigma_{it}}$. $Return_{it}$ is the average monthly return for fund i in year t and σ_{it} is the standard deviation of the average monthly return for fund i in year t. μ_{jt} is the average monthly return for the fund i's relative TASS-style in year t.

[44] A fund i will be considered as adversely impacted at year t with age T if it is liquidated or unable to contact according to TASS, with a negative average return in the previous 6 months, as well as decreased AUM in the previous 12 months (Liang and Park, 2010).

[45] Good/Bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results.

[46] The total number of the 4 groups of variables are Good External -- 7, Bad External -- 9, Good Internal--9, Bad Internal: 17.
For instance, if fund A is involved in 4 Good External, 5 Bad External, 5 Good Internal, and 12 Bad Internal relationships, the relative values are ExtGoodRelPerc -- 4/7, ExtBadRelPerc -- 5/9, IntGoodRelPerc -- 5/9, IntBadRelPerc -- 12/17.

[47] A full version of regression results that with detailed variable-level and aggregate-level percentage variables for adverse liquidation, performance, and leverage can be found in Table 2 of Appendix A.6, Table 3 of Appendix A.7, and Table 4 of Appendix A.8.

Panel A: Percentage-level Relationship Variables Predicting Performance and Leverage																				
	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
	Style-adjusted Return						Appraisal Ratio						Leverage								
	Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ExtGoodRelPerc	0.05	1.55		0.12	2.67	***	0.00	-0.02					0.00	0.00		0.43	0.07				
ExtBadRelPerc	-0.08	-1.94	**	-0.16	-3.01	***	-0.28	-4.82	***				-0.02	-0.09		0.25	0.95				
IntGoodRelPerc	0.13	3.82	***	0.14	3.11	***				0.23	4.64	***	0.81	3.74	***				1.18	5.23	***
IntBadRelPerc	-0.09	-2.46	**	-0.02	-0.35					-0.10	-1.94	**	-0.63	-2.58	***				-0.97	-3.73	***
Return													-0.02	-0.62		0.00	-0.15		-0.02	-0.93	
Stdev.	0.00	-0.47		-0.07	-9.13	***	-0.07	-8.10	***	-0.07	-9.42	***	0.00	-0.30		0.00	-0.15		0.01	0.49	
Management fee	0.01	2.67	***	-0.01	-1.17		-0.01	-0.60		0.00	-0.32		0.28	5.81	***	0.31	6.04	***	0.33	6.58	***
Log(Asset)	0.02	6.40	***	0.03	6.00	***	0.03	6.44	***	0.03	6.27	***	-0.02	-0.86		0.02	1.19		0.02	0.96	
Leveraged?	-0.01	-0.72		0.05	3.79	***	0.04	2.72	***	0.03	2.24	**									
Onshore?	0.08	7.22	***	0.04	3.05	***	0.05	3.13	***	0.07	4.51	***	0.45	7.77	***	0.52	8.34	***	0.56	9.29	***
High water mark?	0.05	4.25	***	0.07	5.30	***	0.05	3.28	***	0.04	2.95	***	0.45	7.78	***	0.25	3.99		0.33	5.40	***
Umbrella	0.16	7.47	***	0.01	0.28		0.04	1.41		0.01	0.39		0.68	4.51	***	0.78	4.92	***	0.77	5.00	***
Num. of Obs.	11,332			11,487			11,487			11,487			11,487			9,609			11,487		
Adj. R^2	14.66%			14.66%			18.10%			17.72%											
Pseudo R^2													29.56%			30.80%			32.31%		
External	N			N			N			Y			N			N			Y		
Internal	N			N			Y			N			N			Y			N		
Style	Y			Y			Y			Y			Y			Y			Y		
Year	Y			Y			Y			Y			Y			Y			Y		

Table 5 Continued

Panel B: Percentage-level Relationship Variables Predicting Adverse Liquidation									
	Model 1			Model 2			Model 3		
	Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ExtGoodRelPerc	0.42	1.12		-0.03	-0.07				
ExtBadRelPerc	0.58	1.11		1.01	1.89	*			
IntGoodRelPerc	-1.19	-2.35	**				-1.14	-2.13	**
IntBadRelPerc	-0.58	-1.25					-0.29	-0.63	
Return	-0.24	-4.06	***	-0.22	-3.46	***	-0.25	-4.02	***
Stdev.	0.10	2.65	***	-0.06	-1.63		0.07	2.03	**
Management fee	-0.22	-1.98	**	-0.21	-1.98	**	-0.15	-1.39	
Log(Asset)	-0.33	-7.18	***	-0.27	-5.92	***	-0.29	-6.36	***
Leveraged	-0.36	-3.10	***	-0.28	-2.34	**	-0.07	-0.58	
Onshore	-0.40	-3.06	***	-0.32	-2.35	**	-0.31	-2.33	**
High water mark	-0.13	-1.03		-0.16	-1.23		-0.36	-2.78	***
Umbrella	-0.08	-0.24		-0.07	-0.23		-0.16	-0.53	
Num. of Obs.	11,487			11,487			11,487		
Concordance	80.20%			80.60%			77.40%		
External	N			N			Y		
Internal	N			y			N		
Style	Y			Y			Y		
Year	Y			Y			Y		

Table 6 ADV-based Ω-score and Future Adverse Outcomes

This table presents the fund performance and adverse liquidation events prediction by using the constructed LASSO-constructed ADV-based Ω-score for RIA funds. Models 1 to 3 present the style-adjusted return (winsorized at top and Bottom 1%) and appraisal ratio as well as the leveraged or not prediction (Logistic regression) according to the equation below:[48]

$$\begin{aligned} &Appraisal\ ratio_{i,t}\ or\ Style-adjusted\ return_{i,t}\ or\ Leverage_{i,t} \\ &\quad = \alpha_{i,t} + \beta_1 ADV-Based\ \Omega\ score_{i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} \\ &\quad + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} \\ &\quad + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t} \end{aligned}$$

Model 4 presents the liquidation events prediction by using the ADV-based Ω-score according to the equation below:[49]

$$\begin{aligned} h_{i,t}(T) = h_{0i,t}(T) \times exp\ (&\beta_1 ADV-Based\ \Omega\ score_{i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} \\ &+ \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Return_{i,t-1} + \delta_6 Management\ fee_{i,t-1} \\ &+ \delta_7 Leveraged_{i,t-1} + \delta_8 High\ water\ mark_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} \\ &+ \sum_{q=1}^{9} \eta_q YearDummies_{qi}) \end{aligned}$$

The style-adjusted return and appraisal ratio prediction results in Panel A are reported with the clustered standard error for TASS-style and year. All models in both Panels control the TASS-style and year dummies for predictions. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[48] We calculate the annual appraisal ratio by regressing the 12-month excess return of fund i on the excess return of the fund's TASS-style index j within the same year (BGLS, 2008). Specifically, $r_{it} - R_{ft} = \alpha_i + \beta_i(r_{jt} - R_{ft}) + \varepsilon_{it}$, where R_{ft} is the 3-month US Treasury Bill return. Furthermore, the style-adjusted return is calculated by $\frac{Return_{it}-\mu_{jt}}{\sigma_{it}}$. $Return_{it}$ is the average monthly return for fund i in year t and σ_{it} is the standard deviation of the average monthly return for fund i in year t. μ_{jt} is the average monthly return for the fund i's relative TASS-style in year t. $Leveraged_{i,t}$ is whether the fund i uses leverage or not for the predicted year t.

[49] A fund i will be considered as adversely impacted at year t with age T if it is liquidated or unable to contact according to TASS, with a negative average return in the previous 6 months, as well as decreased AUM in the previous 12 months (Liang and Park, 2010).

	Model 1			Model 2			Model 3			Model 4		
	Style-adjusted Return			Appraisal Ratio			Leveraged			Adverse Liquidation Events		
	Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ADV-based Ω Score	-0.01	-6.84	***	-0.01	-5.37	***	-0.05	-2.77	***	0.10	3.33	***
Return							0.22	5.28	***	0.11	1.20	
Stdev.	-0.01	-5.75	***	-0.04	-7.75	***	-0.08	-2.97	***	0.47	5.90	***
Management fee	0.03	7.30	***	0.00	0.05		0.69	6.09	***	-0.35	-1.65	*
Log(Asset)	0.02	3.65	***	0.04	6.98	***	0.27	7.13	***	-0.03	-0.41	
Leveraged	0.11	5.70	***	0.13	5.32	***				-0.95	-4.78	***
Onshore	0.09	4.74	***	0.19	7.36	***	0.91	8.50	***	0.11	0.54	
High water mark	0.10	5.63	***	0.12	5.26	***	0.70	7.01	***	0.30	1.39	
Umbrella	0.15	8.59	***	0.13	4.84	***	0.40	2.58	***	-0.44	-1.44	
Num. of Obs.	11,332			11,487			11,487			11,487		
Adj. R^2	12.92%			20.85%								
Pseudo R^2							54.64%					
Concordance										87.50%		

Table 7 ADV-based Ω-score Predicting Fund Flows

This table presents the fund flow[50] prediction by using the LASSO-constructed ADV-based Ω-score for RIA funds according to the empirical strategy (BGLS, 2008).

$$Flow_{i,t} = \alpha_{i,t} + \beta_1\, ADV - Based\ \Omega\ score_{i,t-1} + \delta_1\, High\ trank_{i,t-1} + \delta_2 Mid\ trank_{i,t-1} + \delta_3 Low\ trank_{i,t-1} + \delta_4 Log\ assets_{i,t-1} + \delta_5 Stdev_{i,t-1} + \delta_6 Management\ fee_{i,t-1} + \delta_U Umbrella_{i,t} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t}$$

Model 2 presents the fund flow prediction result with the interaction terms between the *ADV-based Ω-score* and three average monthly return ranks in the previous year (*High trank*, *Mid trank,* and *Low trank*).[51] *ADV-based Ω-score* represents the fund's previous year's operational risk score, *Stdev.*, *Log(Asset),* and *Umbrella* are the standard deviation for monthly return, log of the average monthly assets, and Umbrella Registration indicator of the funds in the previous year. *Management fee* is the management fee for funds. All the flows for offshore funds are adjusted according to the exchange rate for the relative currency and predicted year. All models control the TASS-style, year, and Firm dummies for predictions. All the results are reported with the clustered standard error for TASS-style, firm, and year. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

	Model 1			Model 2		
	Coef.	*t*-Value		Coef.	*t*-Value	
ADV-based Ω Score	-0.02	-7.70	***	-0.08	-10.31	***
ADV-based Ω Score*High trank				0.06	0.78	
ADV-based Ω Score*Mid trank				-0.21	-7.12	***
ADV-based Ω Score*Low trank				-0.11	-3.87	***
High trank	3.35	6.09	***	4.14	5.19	***
Mid trank	-1.46	-6.30	***	-3.49	-9.41	***
Low trank	-1.38	-8.92	***	-2.50	-7.22	***
Stdev.	-0.04	-5.29	***	-0.04	-5.70	***
Management fee	0.00	0.32		0.01	1.37	
Log(Asset)	0.00	0.13		0.01	0.86	
Umbrella	0.19	5.46	***	0.19	5.66	***
Num. of Obs.	11,487			11,487		
Adj. R^2	48.00%			50.36%		
Style	Y			Y		
Firm	Y			Y		
Year	Y			Y		

[50] Fund flow for fund i in year t is calculated by $Flow_{i,t} = \frac{Assets_{i,t} - Assets_{i,t-1} * (1 + Return_{i,t})}{Assets_{i,t-1}}$.

[51] Specifically, *High trank*, *Mid trank,* and *Low trank* are computed as $Min(\frac{1}{3}, Frank_{i,t-1})$, $Min(\frac{1}{3}, Frank_{i,t-1} - High\ trank_{i,t-1})$ and $Min(\frac{1}{3}, Frank_{i,t-1} - High\ trank_{i,t-1} - Mid\ trank_{i,t-1})$ respectively (Franzoni and Giannetti, 2017; Getmansky et al., 2018). Where $Frank_{i,t-1}$ is the fractional rank for RIA funds from 0 to 1, according to their average monthly return in the previous year.

Table 8 ADV-based Ω-score Predicting Performance, Leverage, Adverse Liquidation, and Fund Flows (OOS)

This table presents the appraisal ratio,[52], style-adjusted Return,[53], leveraged or not,[54], adverse liquidation events,[55] and fund flow[56] out-of-sample (OOS) prediction by using the LASSO-constructed ADV-based Ω-score[57] for RIA funds according to the equations below:

$$\begin{aligned} &Appraisal\ ratio_{i,t}\ or\ Style-adjusted\ return_{i,t}\ or\ Leverage_{i,t} \\ &= \alpha_{i,t} + \beta_1 ADV-Based\ \Omega\ score_{i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} \\ &+ \delta_4 Onshore_{i,t-1} + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} + \delta_U Umbrella_{i,t-1} \\ &+ \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} h_{i,t}(T) = h_{0i,t}(T) \times exp\ (&\beta_1 ADV-Based\ \Omega\ score_{i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} \\ &+ \delta_4 Onshore_{i,t-1} + \delta_5 Return_{i,t-1} + \delta_6 Management\ fee_{i,t-1} + \delta_7 Leveraged_{i,t-1} \\ &+ \delta_8 High\ water\ mark_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi}) \end{aligned}$$

$$\begin{aligned} Flow_{i,t} = \alpha_{i,t} &+ \beta_1\ ADV-Based\ \Omega\ score_{i,t-1} + \delta_1\ High\ trank_{i,t-1} + \delta_2 Mid\ trank_{i,t-1} + \delta_3 Low\ trank_{i,t-1} \\ &+ \delta_4 Log\ assets_{i,t-1} + \delta_5 Stdev_{i,t-1} + \delta_6 Management\ fee_{i,t-1} + \delta_U Umbrella_{i,t} \\ &+ \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t} \end{aligned}$$

The Coef. columns present the coefficients for the year-by-year LASSO-constructed ADV-based Ω-score for the relative years' cross-sectional predictions according to the equations above. For each of the independent variables, the *t* or *z*-statistics, as well as the goodness of fit values (Adj. R^2, Pseudo R^2, and Concordance) are also reported. The last column represents the number of the observations within the yearly sample.[58] Besides the single year adverse outcomes and fund flow predictions, at the bottom of the table we also report the half-split sample forecasting results.[59]

[52] We calculate the annual appraisal ratio by regressing the 12-month excess return of fund i on the excess return of the fund's TASS-style index j within the same year (BGLS, 2008). Specifically, $r_{it} - R_{ft} = \alpha_i + \beta_i(r_{jt} - R_{ft}) + \varepsilon_{it}$, where R_{ft} is the 3-month US Treasury Bill return.

[53] The style-adjusted return is calculated by $\frac{Return_{it}-\mu_{jt}}{\sigma_{it}}$. $Return_{it}$ is the average monthly return for fund i in year t and σ_{it} is the standard deviation of the average monthly return for fund i in year t. μ_{jt} is the average monthly return for the fund i's relative TASS-style in year t.

[54] $Leveraged_{i,t}$ is whether the fund i uses leverage or not for the predicted year t.

[55] A fund i will be considered as adversely impacted at year t with age T if it is liquidated or unable to contact according to TASS, with a negative average return in the previous 6 months, as well as decreased AUM in the previous 12 months (Liang and Park, 2010).

[56] Fund flow for fund i in year t is calculated by $Flow_{i,t} = \frac{Assets_{i,t}-Assets_{i,t-1}*(1+Return_{i,t})}{Assets_{i,t-1}}$.

[57] The ADV-based Ω-scores in this table are constructed by the year-by-year LASSO regression results (coefficients as weights for the selected variables). This means for each year we run separate LASSO regression and get the related weights.

[58] Notice that the Style-adjusted returns for each year's sample is winsorized by top and bottom 1%. Thus, the last column reports the number of the observations for style-adjusted return vs. other dependent variables' models (Style-adjusted return/Others).

[59] Since our sample do not have any adverse liquidation events for RIA funds in 2022, there is no results for cross-sectional liquidation prediction in that year.

Year	Fund Flows				Leveraged				Style-adjusted Return				Appraisal Ratio				Adverse Liquidation Events				Num. of Obs. (Style-adjusted Return/Others)
	Coef.	*t*-value		Adj. R^2	Coef.	*z*-value		Pseudo R^2	Coef.	*t*-value		Adj. R^2	Coef.	*t*-value		Adj. R^2	Coef.	*z*-value		Concor-dance	
2013	-0.01	-2.20	**	80.40%	0.09	0.05		14.93%	-0.01	-1.88	*	19.68%	0.00	-0.49		39.00%	0.08	1.40		88.80%	1,622/1,666
2014	0.00	0.02		72.15%	0.00	-0.07		18.13%	0.00	-0.87		19.21%	0.00	0.15		24.37%	-0.01	-0.32		82.80%	1,415/1,426
2015	0.00	0.31		73.52%	-0.04	-2.01	**	11.23%	0.00	1.25		7.18%	0.00	0.73		13.53%	0.11	2.50	**	76.90%	1,058/1,071
2016	-0.01	-1.37		78.02%	-0.01	-1.83	*	23.46%	0.00	-0.83		13.36%	0.00	-0.90		31.72%	0.13	2.63	***	82.20%	576/583
2017	-0.14	-1.83	*	85.44%	0.00	-0.01		46.79%	-0.02	-4.51	***	41.26%	-0.02	-2.93	***	34.43%	0.10	1.95	*	86.70%	1,150/1,161
2018	-0.01	-2.96	***	77.16%	-0.03	-3.21	***	47.98%	-0.02	-5.36	***	39.74%	-0.02	-5.29	***	29.17%	0.10	2.11	**	98.00%	1,055/1,064
2019	-0.07	-5.56	***	63.25%	-0.19	-4.88	***	53.93%	-0.01	-2.83	***	28.07%	-0.01	-5.39	***	17.57%	0.05	0.62		97.50%	1,695/1,713
2020	-0.02	-3.39	***	53.63%	-0.38	-5.93	***	40.15%	-0.01	-6.64	***	33.34%	-0.01	-3.06	***	44.22%	0.03	3.23	***	99.00%	1,217/1,218
2021	-0.01	-2.37	**	66.77%	-0.12	-3.57	***	42.14%	-0.19	-3.64	***	14.17%	-0.01	-3.51	***	36.28%	0.04	3.92	***	94.30%	1,082/1,123
2022	-0.01	-2.24	**	65.76%	-0.09	-2.22	***	45.11%	-0.04	-7.13	***	21.79%	-0.01	-2.21	**	21.79%	-	-	-	-	462/462
2013-2017	-0.01	-2.41	**	41.71%	0.03	1.03		18.54%	0.00	-3.12	***	7.30%	0.00	0.97		21.48%	0.03	1.57		74.80%	5,821/5,907
2018-2022	-0.01	-6.57	***	61.78%	-0.05	-3.67	**	37.40%	-0.01	-6.19	***	6.62%	-0.02	-2.66	***	6.62%	0.03	2.32	**	88.20%	5,511/5,580
Full Sample	-0.01	-5.51	**	50.80%	-0.03	-3.93	***	37.04%	0.00	-5.22	***	4.80%	-0.01	-5.97	***	11.77%	0.03	2.30	**	78.88%	11,332/11,487
Style	Y				Y				Y				Y				Y				
Controls	Y				Y				Y				Y				Y				
Firm	Y				Y				Y				Y				Y				

Appendix

A.1 Variable Explanation

This table provides a detailed explanation of the external and internal conflict relationship variables according to Form ADV Part 1A, as well as the variables used in our empirical analysis. Panel A presents the variables and relative explanations that belong to Item 7 (Financial Industry Affiliations and Private Fund Reporting). Panel B presents the variables and relative explanations that belong to Item 8 (Participation or Interest in Client Transactions), 9 (Custody), and 10 (Control Person). Panel C presents the fund performance, characteristics from TASS, and the constructed operational risk-related score according to the Form ADV filing.

Panel A: External Relationships (Item 7)	
Variables	Explanations
BrokerDealer	Whether a fund has a related person that is a broker/dealer, municipal securities dealer, or government securities broker or dealer.
InvestmentAdvisor	Whether a fund has a related person that is another investment adviser.
MunicipalAdvisor	Whether a fund has a related person that is a registered municipal advisor
SwapDealer	Whether a fund has a related person that is a registered security-based swap dealer.
SwapParticipant	Whether a fund has a related person that is a major security-based swap participant.
CommodBroker	Whether a fund has a related person that is a commodity pool operator or commodity trading advisor.
FuturesCommission	Whether a fund has a related person that is a futures commission merchant.
Banking	Whether a fund has a related person that is a banking or thrift institution.
Trust	Whether a fund has a related person that is in a trust company.
Accounting	Whether a fund has a related person that is an accountant or serves in an accounting firm.
Law	Whether a fund has a related person that is a lawyer or serves in a law firm.
Insurance	Whether a fund has a related person that is in an insurance company or agency.
Pension	Whether a fund has a related person that is a pension consultant.
RealEstate	Whether a fund has a related person that is a real estate broker or dealer.
LimitedPartnership	Whether a fund has a related person that is a sponsor or syndicator of limited partnerships (or equivalent), excluding pooled investment vehicles.
ManagingMember	Whether a fund has a related person that is a sponsor, general partner, or managing member (or equivalent) of pooled investment vehicles.
AdvisorPrivateFund	Whether a fund has a related person that advises any private fund.

Panel B: Internal Relationships	
Form ADV Variables	Explanations
	Item 8
BuySellYourOwnSecurity	Whether a fund has a related person that can buy securities for him/herself from advisory clients or sell securities he/she owns to advisory clients (principal transactions).
BuySellYourselfClientSecurity	Whether a fund has a related person that can buy or sell for him/herself securities (other than shares of mutual funds) that he/she also recommends to advisory clients.
RecommendSecurityYourOwn	Whether a fund has a related person that can recommend securities (or other investment products) to advisory clients in which any related person has some other proprietary (ownership) interest.
AgencyCrossTransaction	Whether a fund has a related person that is a broker-dealer or registered representative of a broker-dealer, execute securities trades for brokerage customers in which advisory client securities are sold to or bought from the brokerage customer.
RecommendUnderwriter	Whether a fund has a related person that can recommend to advisory clients or acts as a purchaser representative for advisory clients with respect to, the purchase of securities for which the related person serves as an underwriter or general or managing partner.
RecommendSalesInterest	Whether a fund has a related person that can recommend the purchase or sale of securities to advisory clients for which any related person has any other sales interest (other than the receipt of sales commissions as a broker or registered representative of a broker-dealer).
DetermineClientsSecurity	Whether a fund has a related person that has discretionary authority to determine the securities to be bought or sold for a client's account.
DetermineNumClientsSecurity	Whether a fund has a related person that has discretionary authority to determine the number of securities to be bought or sold for a client's account.
DetermineClientsAgent	Whether a fund has a related person that has discretionary authority to determine the broker or dealer to be used for a purchase or sale of securities for a client's account.
DetermineClientsComission	Whether a fund has a related person that has discretionary authority to determine the commission rates to be paid to a broker or dealer for a client's securities transactions.
RecommendBrokers	Whether a fund has a related person that can recommend brokers or dealers to clients.
OtherResearch	Whether a fund has a related person that receives research or other products or services other than execution from a broker-dealer or a third party ("soft dollar benefits") in connection with client securities transactions.

CompensateNonEmpClientsRef	Whether a fund has a related person that directly or indirectly, compensates any person that is not an employee for client referrals.
CompensatetEmpClientsRef	Whether a fund has a related person that directly or indirectly, provides any employee compensation that is specifically related to obtaining clients for the firm (cash or non-cash compensation in addition to the employee's regular salary).
ReceiveCompensateClientsRef	Whether a fund has a related person that directly or indirectly, receives compensation from any person (other than you or any related person) for client referrals.

Item 9

CustodyCash/BankAcct	Whether a fund has a related person that has custody of any advisory clients' cash or bank accounts.
CustodySecurities	Whether a fund has a related person that has custody of any advisory clients' securities.
CustodyCash/BankAcctService	Whether a fund has a related person that has custody of any advisory clients' cash or bank accounts (in connection with advisory services provide to clients).
CustodySecuritiesService	Whether a fund has a related person that has custody of any advisory clients' securities (in connection with advisory services provide to clients).
ReceiveAccountStatement	Whether a fund has a related person that can receive account statements at least quarterly to the investors in the pooled investment vehicle(s) that the advisor manages sent by the qualified custodian(s).
ReceiveAuditReport	Whether a fund has a related person that can receive the audit report sent by an independent public accountant audit annually for the pooled investment vehicle(s) that the advisor manages.
ReceiveAnnualSurpriseExamination	Whether a fund has a related person that can receive an annual surprise examination of client funds and securities conducted by an independent public accountant.
ReceiveCustodialControlReport	Whether a fund has a related person that can receive an internal control report with respect to custodial services when the related persons are qualified custodians for client funds and securities prepared by an independent public accountant.
AdvisorQualifiedCustodian	Whether an advisor of a fund that acts as a qualified custodian for clients during the advisory services.
RelatedQualifiedCustodian	Whether a fund has a related person that acts as a qualified custodian for clients during the advisory services.

Item 10

OtherControlCompany	Whether a fund has other unreported companies that directly or indirectly, control the management or policies.
OtherControlPerson	Whether a fund has other unreported people that directly or indirectly, control the management or policies.

Panel C: Variables used in the Empirical analysis

Variable	Definition
1st-order AC	The first order autocorrelation for the monthly return of a fund of the relative year.
Asset	The average monthly asset of a fund in the relative year.
ADV-based Ω-score	The Ω-score that constructed from the amended Form ADV variables in the previous year.
Alpha	Alpha of a fund according to the performance for the relative year.
Appraisal ratio	Appraisal ratio of a fund according to the performance for the relative year.
Log (Asset)	Log of the average monthly asset of a fund in the previous year.
Exempt	Whether a fund's related company is an ERA.
ExtRel	Whether a fund has any kind of external relationship according to the selected amended Form ADV variables in the previous year.
ExtRelMed	Whether a fund's sum of the external relationships according to the selected amended Form ADV variables in the previous year is bigger than or equal to the average total number of the external relationships for funds within the same TASS-style in the same year.
ExtRelMedNoLender	Whether a fund's sum of the external relationships (excluding the *BrokerDealer* and *CommodBroker*) according to the selected amended Form ADV variables in the previous year is bigger than or equal to the median of the sum of the external relationships (excluding the *BrokerDealer* and *CommodBroker*) for funds within the same TASS-style in the same year.
ExtBadRelPerc	Percentage of the external bad variables (with positive LASSO coefficients in Table 4) among all the external relationships.
ExtGoodRelPerc	Percentage of the external good variables (with negative LASSO coefficients in Table 4) among all the external relationships.
Fund age	The age of a fund started from its inception date in the previous year.
High rank	Calculated by $Min\left(\frac{1}{3}, Frank\right)$, where $Frank$ is the fractional rank for funds from 0 to 1, according to their average historical return in the relative year.
High water mark	Whether a fund has a high-water mark in the relative year.
Incentive fee	Incentive fee of a fund in the relative year.
IntRel	Whether a fund has any kind of internal relationships according to the selected amended Form ADV variables in the previous year.
IntRelMed	Whether a fund's sum of the internal relationship according to the selected amended Form ADV variables in the previous year is bigger than or equal to the average total number of the internal relationships for funds within the same TASS-style in the same year.

IntBadRelPerc	Percentage of the internal bad variables (with positive LASSO coefficients in Table 4) among all the internal relationships.
IntGoodRelPerc	Percentage of the internal good variables (with negative LASSO coefficients in Table 4) among all the internal relationships.
Kurtosis	Kurtosis for the monthly return of a fund of the relative year.
Leveraged	Whether a fund uses leverage or not for the relative year.
Lockup period	The lockup period of a fund (measured in months) in the relative year.
Low rank	Calculated by $Min(\frac{1}{3}, Frank - High\ trank - Mid\ trank)$, where $Frank$ is the fractional rank for funds from 0 to 1, according to their average historical return in the relative year.
Management fee	Management fee of a fund.
Margin	Whether a fund leverages using margin for borrowing.
Mid rank	Calculated by $Min(\frac{1}{3}, Frank - High\ trank)$, where $Frank$ is the fractional rank for funds from 0 to 1, according to their average historical return in the relative year.
Min. Investment	Minimum investment of a fund.
NegRet.	Whether a fund's average monthly return is negative or not.
Onshore	Whether a fund is domiciled in the US in the previous year.
Personal capital	Whether the principals of a fund have money invested.
Return	The average monthly return of a fund according to the performance on TASS in the relative year (for Table 1 and Table 2, and Table 10) and the previous year (other tables).
Red. Freq.	Redemption frequency of a fund, measured in days.
Sharpe ratio	Sharpe ratio of a fund according to the monthly return in the relative year.
Skewness	Skewness for the monthly return of a fund in the relative year.
Stdev.	The standard deviation of the return for a fund in the relative year (Table 1, Table 2, and Table 10) or previous year (other Tables).
Sub. Freq.	Subscription frequency of a fund, measured in days.
Umbrella	Whether a fund is with Umbrella Registration in the previous year.
High water mark	Whether a fund has a high watermark in the previous year.

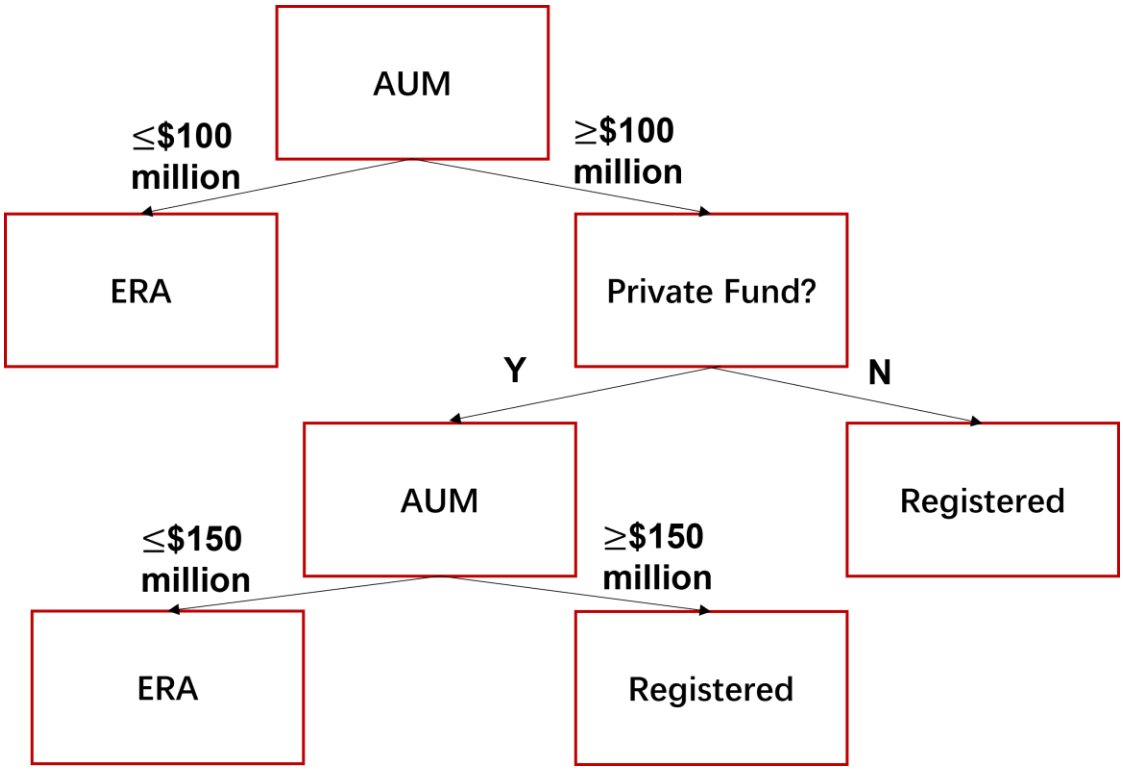
Leveraged	Whether a fund uses leverage in the previous year.
Lockup period	The lockup period for a fund in the relative year (measured in months)

A.2. Figure 1: History of Form ADV

Figure 1 provides a detailed explanation of the timeline for the history of Form ADV.

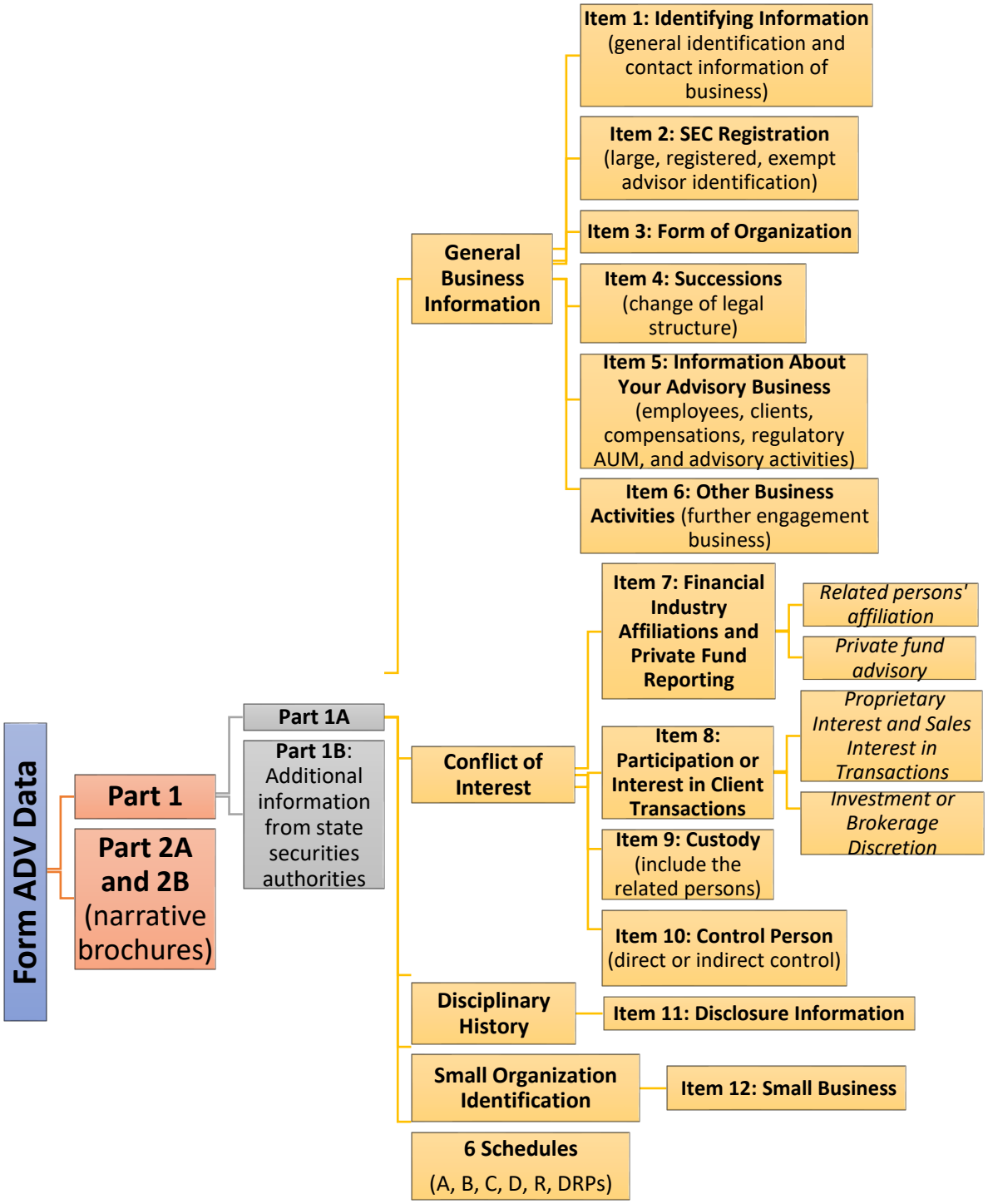
A.3. Figure 2: Definition of the ERA and RIA Funds' Classification

Figure 2 presents the definition of the ERA and RIA funds' classification according to the SEC. For the advisory companies (for relative funds) that with an Asset Under Management (AUM) smaller than or equal to $100 million, or the companies (for relative funds) that only advise for private funds and with an AUM smaller than or equal to $150 million are considered as Exempt Advisors (ERA). The rest of the companies (and relative funds) are considered Registered Advisors (RIA).



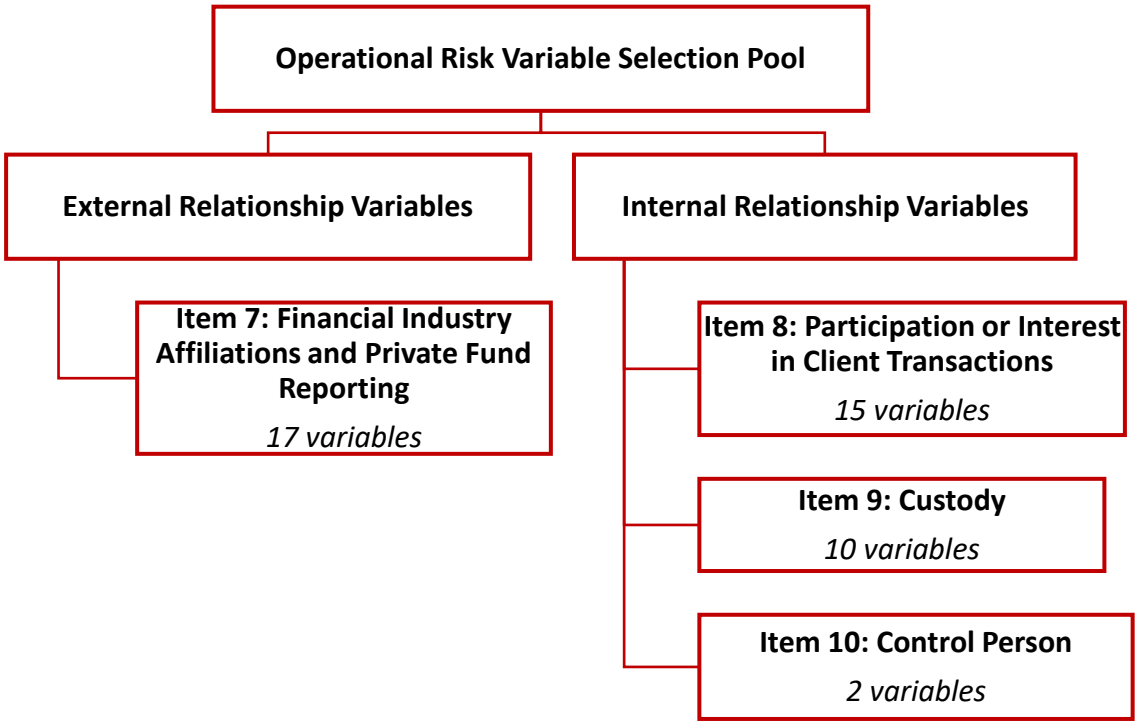
A.4. Figure 3: Form ADV Structure

Figure 3 below presents the general structure for Form ADV data that is disclosed to the public.



A.5. Figure 4: Operational Risk Variable Selection Pool

Figure 4 presents the construction of the variables for our operational risk variables selection pool. Among our total 43 variables. 17 of the variables belong to the external relationship category that is collected from Item 7 of Form ADV Part 1A filling. 26 of the variables belong to the internal relationship category that is collected from Item 8 (15 variables), Item 9 (10 variables), and Item 10 (1 variable).



A.6 Table 2: Operational Risk Percentage-level Variables Predicting Adverse Liquidation Events

This table presents the adverse liquidation prediction results for RIA funds by using the LASSO-selected external and internal good or bad percentage variables and the combination with external or internal relationships by using the Cox-Proportional-Hazards Model below.[60]

$$h_{i,t}(T) = h_{0i,t}(T) \times exp\,(\beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} + \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Return_{i,t-1} + \delta_6 Management\ fee_{i,t-1} + \delta_7 Leveraged_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi})$$

$X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables that represent the percentage of the number of Good or Bad[61] External or Internal relationships the funds involved in according to the total number of the relationships in the relative groups.[62] 'External' and 'Internal' at the bottom of the table represent whether a model uses the selected variable-level external or internal relationships. All models control the TASS-style and year dummies for predictions. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[60] A fund i will be considered as adversely impacted at year t with age T if it is liquidated or unable to contact according to TASS, with a negative average return in the previous 6 months, as well as decreased AUM in the previous 12 months (Liang and Park, 2010).

[61] Good/Bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results.

[62] The total number of the 4 groups of variables are Good External -- 7, Bad External -- 9, Good Internal--9, Bad Internal: 17.
For instance, if fund A is involved in 4 Good External, 5 Bad External, 5 Good Internal, and 12 Bad Internal relationships, the relative values are ExtGoodRelPerc -- 4/7, ExtBadRelPerc -- 5/9, IntGoodRelPerc -- 5/9, IntBadRelPerc -- 12/17.

	Model 1			Model 2			Model 3			Model 4		
	Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ExtGoodRelPerc							-0.03	-0.07		0.42	1.12	
ExtBadRelPerc							1.01	1.89	*	0.58	1.11	
IntGoodRelPerc				-1.14	-2.13	**				-1.19	-2.35	**
IntBadRelPerc				-0.29	-0.63					-0.58	-1.25	
Return				-0.25	-4.02	***	-0.22	-3.46	***	-0.24	-4.06	***
Stdev.				0.07	2.03	**	-0.06	-1.63		0.10	2.65	***
Management fee				-0.15	-1.39		-0.21	-1.98	**	-0.22	-1.98	**
Log(Asset)				-0.29	-6.36	***	-0.27	-5.92	***	-0.33	-7.18	***
Leveraged				-0.07	-0.58		-0.28	-2.34	**	-0.36	-3.10	***
Onshore				-0.31	-2.33	**	-0.32	-2.35	**	-0.40	-3.06	***
High water mark				-0.36	-2.78	***	-0.16	-1.23		-0.13	-1.03	
BrokerDealer	0.19	1.87	*	0.22	1.39							
InvestmentAdvisor	0.66	6.61	***	0.38	2.57	**						
MunicipalAdvisor	0.87	3.84	***	-0.39	-1.30							
SwapDealer	1.00	3.19	***	1.34	3.08	***						
CommodBroker	0.38	4.27	***	0.33	2.37	**						
FuturesCommission	0.19	0.92		-0.27	-0.99							
Banking	-0.23	-1.49		-0.42	-2.02	**						
Trust	-0.64	-3.74	***	-0.16	-0.71							
Accounting	-1.09	-1.56		0.51	1.33							
Law	0.48	2.01	**	0.35	0.93							
Insurance	0.28	1.99	**	0.60	2.80	***						
Pension	0.16	0.70		-1.54	-3.76	***						
RealEstate	0.82	4.51	***	1.68	6.59	***						
LimitedPartnership	-0.10	-0.78		-0.17	-0.79							
ManagingMember	-0.15	-1.49		0.55	3.61	***						
AdvisorPrivateFund	0.46	3.77	***	0.24	1.29							
BuySellYourOwnSecurity	-0.20	-1.51					0.29	1.48				
BuySellYourselfClientSecurity	0.48	5.30	***				0.34	2.57	**			

RecommendSecurityYourOwn	0.24	2.54	**		0.54	3.74	***		
AgencyCrossTransaction	0.52	3.05	***		-0.43	-1.41			
RecommendUnderwriter	0.06	0.54			0.20	1.23			
RecommendSalesInterest	-0.01	-0.05			-0.14	-0.76			
DetermineClientsSecurity	16.80	0.00			6.20	6.98	***		
DetermineNumClientsSecurity	-16.67	0.00			-	-			
DetermineClientsAgent	0.30	1.11			1.06	2.68	***		
DetermineClientsComission	-0.07	-0.34			0.56	2.06	**		
RecommendBrokers	0.40	4.89	***		-0.01	-0.08			
OtherResearch	0.41	4.60	***		0.53	4.17	***		
CompensateNonEmpClientsRef	-0.15	-0.72			0.17	0.55			
CompensatetEmpClientsRef	0.02	0.08			0.50	1.48			
ReceiveCompensateClientsRef	0.09	0.87			0.06	0.38			
CustodyCash/BankAcct	0.27	0.91			0.33	0.69			
CustodySecurities	0.48	1.69	*		-0.14	-0.30			
CustodyCash/BankAcctService	0.32	0.75			0.93	1.68	*		
CustodySecuritiesService	-0.33	-0.77			-0.66	-1.19			
ReceiveAccountStatement	0.54	5.25	***		0.12	0.82			
ReceiveAuditReport	0.10	0.68			-0.26	-1.24			
ReceiveAnnualSurpriseExamination	0.46	2.54	**		0.72	2.85	***		
ReceiveCustodialControlReport	-0.10	-0.40			0.51	1.31			
AdvisorQualifiedCustodian	0.25	0.72			-0.27	-0.44			
RelatedQualifiedCustodian	0.61	2.25	**		-0.02	-0.04			
OtherControlCompany	-3.00	-4.39	***		-2.73	-4.14	***		
Umbrella	0.16	0.73		-0.16	-0.53	-0.07	-0.23	-0.08	-0.24
Num. of Obs.	15,312			11,487		11,487		11,487	
Concordance	79.00%			77.40%		80.60%		80.20%	
Style	Y			Y		Y		Y	
Year	Y			Y		Y		Y	

A.7 Table 3: Operational Risk Percentage-level Variables Predicting Future Appraisal Ratio and Style-adjusted Return

This table presents the appraisal ratio and style-adjusted return (winsorized at top and bottom 1%) prediction results for RIA funds by using the LASSO-selected external and internal good or bad percentage variables and the combination with external or internal relationships by using the OLS regression model below:[63]

$$Appraisal\ ratio_{i,t}\ or\ Style-adjusted\ return_{i,t} = \alpha_{i,t} + \beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} + \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t}$$

$X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables that represent the percentage of the number of Good or Bad[64] External or Internal relationships the funds are involved in according to the total number of the relationships in the relative groups.[65] 'External' and 'Internal' at the bottom of the table represent whether a model uses the selected variable-level external or internal relationships. All the models control TASS-style and year dummies, and all the results are reported with the clustered standard error for TASS-style and year. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[63] We calculate the annual appraisal ratio by regressing the 12-month excess return of fund i on the excess return of the fund's TASS-style index j within the same year (BGLS, 2008). Specifically, $r_{it} - R_{ft} = \alpha_i + \beta_i(r_{jt} - R_{ft}) + \varepsilon_{it}$, where R_{ft} is the 3-month US Treasury Bill return. Furthermore, the style-adjusted return is calculated by $\frac{Return_{it} - \mu_{jt}}{\sigma_{it}}$. $Return_{it}$ is the average monthly return for fund i in year t and σ_{it} is the standard deviation of the average monthly return for fund i in year t. μ_{jt} is the average monthly return for the fund i's relative TASS-style in year t. $\boldsymbol{X_{EORI\ i,t-1}}$ and $\boldsymbol{X_{IORI\ i,t-1}}$ are the collections of the selected external and internal operational risk indicators for fund i in the previous year. $X_{ERI\ i,t-1}$ and $X_{IRI\ i,t-1}$ are the aggregate level of the external and internal relationship indicators for fund i's related advisory firm in the previous year.

[64] Good/Bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results.

[65] The total number of the 4 groups of variables are Good External -- 7, Bad External -- 9, Good Internal--9, Bad Internal: 17.
For instance, if fund A is involved in 4 Good External, 5 Bad External, 5 Good Internal, and 12 Bad Internal relationships, the relative values are ExtGoodRelPerc -- 4/7, ExtBadRelPerc -- 5/9, IntGoodRelPerc -- 5/9, IntBadRelPerc -- 12/17.

	Model 1			Model 2			Model 3			Model 4			Model 5		
	Appraisal Ratio												Style-adjusted Return		
	Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value	
ExtGoodRelPerc							0.00	-0.02		0.12	2.67	***	0.05	1.55	
ExtBadRelPerc							-0.28	-4.82	***	-0.16	-3.01	***	-0.08	-1.94	**
IntGoodRelPerc				0.23	4.64	***				0.14	3.11	***	0.13	3.82	***
IntBadRelPerc				-0.10	-1.94	**				-0.02	-0.35		-0.09	-2.46	**
Stdev.				-0.07	-9.42	***	-0.07	-8.10	***	-0.07	-9.13	***	0.00	-0.47	
Management fee				0.00	-0.32		-0.01	-0.60		-0.01	-1.17		0.01	2.67	***
Log(Asset)				0.03	6.27	***	0.03	6.44	***	0.03	6.00	***	0.02	6.40	***
Leveraged				0.03	2.24	**	0.04	2.72	***	0.05	3.79	***	-0.01	-0.72	
Onshore				0.07	4.51	***	0.05	3.13	***	0.04	3.05	***	0.08	7.22	***
High water mark				0.04	2.95	***	0.05	3.28	***	0.07	5.30	***	0.05	4.25	***
BrokerDealer	-0.12	-9.24	***	-0.07	-3.59	***									
InvestmentAdvisor	0.00	0.40		-0.03	-2.08	**									
MunicipalAdvisor	-0.12	-4.50	***	-0.04	-1.66	*									
SwapDealer	-0.06	-1.70	*	0.02	0.44										
CommodBroker	-0.06	-5.12	***	-0.12	-7.78	***									
FuturesCommission	0.10	3.76	***	0.21	7.03	***									
Banking	0.07	3.67	***	0.05	2.14	**									
Trust	0.00	-0.02		-0.06	-2.56	**									
Accounting	0.05	0.63		0.08	0.71										
Law	0.01	0.22		-0.10	-1.91	*									
Insurance	0.16	8.87	***	-0.24	-6.96	***									
Pension	-0.09	-2.77	***	-0.14	-3.23	***									
RealEstate	-0.05	-1.60		0.12	3.37	***									
LimitedPartnership	-0.09	-4.82	***	0.09	3.45	***									
ManagingMember	0.02	1.70	*	0.03	1.79	*									
AdvisorPrivateFund	-0.10	-6.32		-0.01	-0.67										

BuySellYourOwnSecurity	-0.07	-3.99	***			-0.06	-2.60	***				
BuySellYourselfClientSecurity	-0.01	-1.15				-0.01	-0.94					
RecommendSecurityYourOwn	-0.05	-4.00	***			-0.01	-0.62					
AgencyCrossTransaction	-0.18	-7.98	***			-0.17	-6.76	***				
RecommendUnderwriter	0.02	1.61				-0.03	1.48					
RecommendSalesInterest	0.00	-0.26				-0.03	-1.70	*				
DetermineClientsSecurity	0.05	1.53				-0.08	-2.34	**				
DetermineNumClientsSecurity	-0.40	-8.52	***			-0.33	-7.55	***				
DetermineClientsAgent	-0.18	-5.83	***			-0.13	-3.00	***				
DetermineClientsComission	-0.06	-2.40	**			-0.12	-3.11	***				
RecommendBrokers	-0.04	-3.83	***			-0.05	-3.84	***				
OtherResearch	-0.02	-2.30	**			-0.06	-4.72	***				
CompensateNonEmpClientsRef	0.06	3.23	***			0.14	4.82	***				
CompensatetEmpClientsRef	0.12	5.77	***			0.11	3.37	***				
ReceiveCompensateClientsRef	0.00	0.09				0.10	0.11					
CustodyCash/BankAcct	-0.14	-3.95	***			-0.11	2.14	**				
CustodySecurities	-0.13	-3.45	***			-0.14	-2.78	***				
CustodyCash/BankAcctService	-0.08	-1.82	*			-0.13	-2.19	**				
CustodySecuritiesService	-0.07	-1.44				-0.13	-2.22	**				
AccountStatement	0.05	3.61	***			0.06	3.32	***				
ReceiveAuditReport	0.10	5.51	***			0.10	4.29	***				
ReceiveAnnualSurpriseExamination	0.02	1.05				0.00	0.11					
ReceiveCustodialControlReport	0.12	3.14	***			0.09	2.12	**				
AdvisorQualifiedCustodian	0.12	2.04	**			0.07	0.98					
RelatedQualifiedCustodian	0.02	0.41				-0.22	-4.96	***				
OtherControlCompany	0.06	1.77	*			0.12	3.95	***				
Umbrella	0.03	1.49		0.01	0.39	0.04	1.41		0.01	0.28	0.16	7.47	***
Num. of Obs.	15,312			11,487		11,487			11,487		11,332		
Adj. R^2	12.76%			17.72%		18.10%			14.66%		14.66%		
Style	Y			Y		Y			Y		Y		
Year	Y			Y		Y			Y		Y		

A.8 Table 4: Operational Risk Percentage-level Variables Predicting Future Leveraged

This table presents the leveraged or not prediction results for RIA funds by using the LASSO-selected external and internal good or bad percentage variables and the combination with external or internal relationships by using the Logistic regression model used in this analysis is presented below:

$$Leveraged_{i,t} = \alpha_{i,t} + \beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} + \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t}$$

$Leveraged_{i,t}$ is whether the fund i uses leverage or not for the predicted year t. $X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables that represent the percentage of the number of Good or Bad[66] External or Internal relationships the funds are involved in according to the total number of the relationships in the relative groups.[67] 'External' and 'Internal' at the bottom of the table represent whether a model uses the selected variable-level external or internal relationships. All models control the TASS-style and year dummies for predictions. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[66] Good/Bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results.

[67] The total number of the 4 groups of variables are Good External -- 7, Bad External -- 9, Good Internal--9, Bad Internal: 17.
For instance, if fund A is involved in 4 Good External, 5 Bad External, 5 Good Internal, and 12 Bad Internal relationships, the relative values are ExtGoodRelPerc -- 4/7, ExtBadRelPerc -- 5/9, IntGoodRelPerc -- 5/9, IntBadRelPerc -- 12/17.

	Model 1			Model 2			Model 3			Model 4		
	Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ExtGoodRelPerc							0.43	0.07		0.00	0.00	
ExtBadRelPerc							0.25	0.95		-0.02	-0.09	
IntGoodRelPerc				1.18	5.23	***				0.81	3.74	***
IntBadRelPerc				-0.97	-3.73	***				-0.63	-2.58	***
Return				-0.02	-0.93		0.00	-0.15		-0.02	-0.62	
Stdev.				0.01	0.49		0.00	-0.15		0.00	-0.30	
Management fee				0.33	6.58	***	0.31	6.04	***	0.28	5.81	***
Log(Asset)				0.02	0.96		0.02	1.19		-0.02	-0.86	
Onshore?				0.56	9.29	***	0.52	8.34	***	0.45	7.77	***
High water mark?				0.33	5.40	***	0.25	3.99		0.45	7.78	***
BrokerDealer	0.23	3.90	***	0.24	3.19	***						
InvestmentAdvisor	-0.23	-4.50	***	-0.11	-1.59							
MunicipalAdvisor	-0.38	-2.81	***	-0.29	-1.92	*						
SwapDealer	-0.37	-1.74	*	-0.06	-0.23							
CommodBroker	0.08	1.59		-0.04	-0.65							
FuturesCommission	0.78	6.51	***	0.54	3.99	***						
Banking	0.64	7.62	***	0.46	4.75	***						
Trust	0.19	2.18	**	0.11	0.99							
Accounting	-0.62	-5.02	***	-0.22	-1.11							
Law	-0.30	-1.96	**	0.05	0.25							
Insurance	-0.10	-1.22		0.15	1.34							
Pension	0.05	0.40		0.26	1.49							
RealEstate	1.09	9.05	***	0.78	5.17	***						
LimitedPartnership	0.57	7.15	***	0.67	6.06	***						
ManagingMember	0.14	2.35	**	0.15	2.08	**						
AdvisorPrivateFund	-0.39	-5.72	***	-0.07	-0.81							
BuySellYourOwnSecurity	-0.27	-3.71	***				0.14	1.45				
BuySellYourselfClientSecurity	-0.12	-2.36	**				-0.13	-1.93	*			
RecommendSecurityYourOwn	-0.39	-7.26	***				-0.35	-4.93	***			
AgencyCrossTransaction	-0.26	-2.67	***				0.06	0.57				

RecommendUnderwriter	-0.01	-0.23					0.09	1.12				
RecommendSalesInterest	-0.10	-1.42					0.24	2.70				
DetermineClientsSecurity	-17.14	0.00					-17.43	0.00				
DetermineNumClientsSecurity	16.21	0.00					16.54	0.00				
DetermineClientsAgent	-0.58	-4.61	***				-0.65	-3.32	***			
DetermineClientsComission	-0.44	-4.09	***				-0.38	-2.40	**			
RecommendBrokers	-0.07	-1.65	*				-0.22	-3.62	***			
OtherResearch	0.04	0.92					-0.12	-2.02	**			
CompensateNonEmpClientsRef	0.42	4.73	***				0.82	6.60	***			
CompensatetEmpClientsRef	0.68	6.51	***				-0.18	-1.23				
ReceiveCompensateClientsRef	-0.22	-3.52	***				-0.08	-0.91				
CustodyCash/BankAcct	-0.46	-2.70	***				-0.48	-1.84	*			
CustodySecurities	-0.31	-1.81	*				0.33	1.27				
CustodyCash/BankAcctService	-0.13	-0.62					-0.45	-1.71	*			
CustodySecuritiesService	-0.41	-1.93	**				-0.65	-2.48	**			
AccountStatement	0.82	12.94	***				0.78	9.96	***			
ReceiveAuditReport	-0.41	-5.07					0.76	7.48	***			
ReceiveAnnualSurpriseExamination	0.48	5.24					0.41	3.89	***			
ReceiveCustodialControlReport	-0.83	-5.33					0.98	5.17	***			
AdvisorQualifiedCustodian	-1.15	-3.65					-0.62	-1.65	*			
RelatedQualifiedCustodian	0.34	2.01					-1.12	-5.52	***			
OtherControlCompany	4.92	4.15	***				4.57	4.09	***			
Umbrella	0.44	3.95	***	0.77	5.00	***	0.78	4.92	***	0.68	4.51	***
Num. of Obs.	15,312			11,487			11,487			11,487		
Pseudo R^2	22.82%			32.31%			30.80%			29.56%		
Style	Y			Y			Y			Y		
Year	Y			Y			Y			Y		

A.9 Table 5: Performance and Characteristics Comparison Between the RIA and ERA Funds

This table reports descriptive statistics for ERA and RIA funds in the TASS database that have Form ADV filed by their advisory companies.[68] The final two columns report a t-test for sample differences. ***, **, * indicate statistical significance at the 1%, 5% and 10% level respectively.

	RIA Funds			ERA Funds					
	N	Mean	Stdev.	N	Mean	Stdev.	Diff	*p*-value	
Return	4,431	0.29	0.80	1,242	0.25	0.79	0.04	0.00	***
Stdev.	4,430	2.10	1.59	1,242	2.31	1.62	-0.21	0.00	***
Skewness	4,430	-0.11	0.49	1,242	-0.04	0.51	-0.07	0.00	***
Kurtosis	4,430	-0.70	0.75	1,242	-0.68	0.70	-0.02	0.46	
1st-order AC	4,430	-0.02	0.23	1,242	0.00	0.24	-0.02	0.04	**
Sharpe ratio	4,430	0.22	0.40	1,117	0.21	0.40	0.01	0.00	***
Appraisal ratio	4,431	0.12	0.49	1,119	0.14	0.38	-0.02	0.23	
Alpha	4,431	0.03	0.83	1,119	0.02	0.75	-0.01	0.11	
Management fee	4,334	1.40	0.58	1,239	1.42	0.59	-0.03	0.14	
Incentive fee	4,027	13.24	8.27	1,147	13.78	7.62	-0.54	0.22	
Min. Invt. ($M)	4,392	2.50	75.83	1,230	5.30	142.84	-2.79	0.51	
Asset ($M)	2,702	551.00	17,356.73	591	149.34	354.31	401.66	0.03	**
Fund age	4,431	8.85	5.26	1,245	9.21	5.38	-0.37	0.03	**
Leveraged	4,431	0.46	0.49	1,245	0.48	0.48	-0.02	0.11	
Margin	2,488	0.28	0.45	732	0.27	0.44	0.01	0.65	
High water mark	4,405	0.55	0.50	1,244	0.50	0.48	0.05	0.00	***
Lockup period	4,431	2.15	5.43	1,245	1.60	5.23	0.55	0.00	***
Sub. Freq.	4,431	17.70	13.31	1,245	18.27	11.01	-0.57	0.12	
Red. Freq.	4,431	33.18	38.84	1,245	27.47	30.45	5.70	0.00	***

[68] For the TASS database, we remove the funds that reports quarterly (instead of monthly return) or gross-of-fee returns, and the funds with less than $10 million assets under management. Moreover, we winsorize the top and bottom 5% for the appraisal ratio, as well as top 1% for management fee and incentive fee. Furthermore, all the foreign domiciled funds' assets under management and returns are converted to US-dollar according to the annual exchange rate provided by OECD data (https://data.oecd.org/conversion/exchange-rates.htm).

A.10 Table 6: Univariate Analysis: Comparison of Problem and Nonproblem ERA and RIA Funds

This table reports fund-level performance and characteristics univariate analysis for Problem and Nonproblem ERA and RIA funds. 'Problem Funds' are the funds' advisory companies that answered '*Yes*' at least once to any questions on Item 11 of Form ADV. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

	Problem Funds			Nonproblem Funds					
	N	Mean	Stdev.	N	Mean	Stdev.	Diff	*p*-value	
Return	1,098	0.25	0.64	4,334	0.29	0.81	-0.04	0.19	
Stdev.	1,096	1.89	1.37	4,332	2.18	1.63	-0.29	0.00	***
Skewness	1,096	-0.10	0.53	4,332	-0.09	0.50	-0.01	0.68	
Kurtosis	1,096	-0.64	0.78	4,332	-0.70	0.74	0.07	0.02	**
1st-order AC	1,096	-0.01	0.22	4,332	-0.01	0.23	0.01	0.50	
Sharpe ratio	1,062	0.21	0.38	4,244	0.23	0.41	-0.03	0.07	*
Appraisal ratio	1,064	0.14	0.49	4,245	0.13	0.47	0.02	0.34	
Alpha	1,064	0.03	0.70	4,245	0.03	0.82	0.00	0.91	
Management fee	1,074	1.31	0.67	4,257	1.42	0.57	-0.10	0.00	***
Incentive fee	968	13.86	8.41	3,968	13.56	8.10	0.30	0.37	
Min. Invt. ($M)	1,069	1.14	7.79	4,311	3.49	101.97	-2.35	0.11	
Asset ($M)	605	215.35	663.90	2,625	542.02	16,983.78	-326.68	0.31	
Personal capital ($M)	928	1.36	12.64	3,765	2.63	19.98	-1.27	0.03	**
Fund age	1,098	9.28	5.14	4,334	8.88	5.34	0.41	0.04	**
Leveraged	1,098	0.45	0.48	4,334	0.46	0.49	-0.01	0.45	
Margin	547	0.25	0.43	2,554	0.28	0.45	-0.03	0.16	
High water mark	1,090	0.47	0.50	4,315	0.57	0.49	-0.10	0.00	***
Lockup period	1,098	1.31	4.29	4,334	2.10	5.46	-0.79	0.00	***
Sub. Freq.	1,098	16.32	13.92	4,334	18.10	12.66	-1.77	0.00	***
Red. Freq.	1,098	27.10	34.02	4,334	32.89	37.82	-5.79	0.00	***

A.11 Table 7: Operational Risk Percentage-level Variables Predicting Adverse Liquidation Events (RIA and ERA)

This table presents the adverse liquidation prediction results for RIA and ERA funds by using the LASSO-selected external and internal good or bad percentage variables and the combination with external or internal relationships by using the Cox-Proportional-Hazards Model below.[69]

$$h_{i,t}(T) = h_{0i,t}(T) \times exp\,(\beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} + \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Return_{i,t-1} + \delta_6 Management\ fee_{i,t-1} + \delta_7 Leveraged_{i,t-1} + \delta_E Exempt_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi})$$

$X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables that represent the percentage of the number of Good or Bad[70] External or Internal relationships the funds are involved in according to the total number of the relationships in the relative groups.[71] 'External' and 'Internal' at the bottom of the table represent whether a model uses the selected variable-level external or internal relationships. All models control the TASS-style and year dummies for predictions. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[69] A fund i will be considered as adversely impacted at year t with age T if it is liquidated or unable to contact according to TASS, with a negative average return in the previous 6 months, as well as decreased AUM in the previous 12 months (Liang and Park, 2010).

[70] Good/Bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results.

[71] The total number of the 4 groups of variables are Good External -- 7, Bad External -- 9, Good Internal--9, Bad Internal: 17.
For instance, if fund A is involved in 4 Good External, 5 Bad External, 5 Good Internal, and 12 Bad Internal relationships, the relative values are ExtGoodRelPerc -- 4/7, ExtBadRelPerc -- 5/9, IntGoodRelPerc -- 5/9, IntBadRelPerc -- 12/17.

	Model 1			Model 2			Model 3			Model 4		
	Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ExtGoodRelPerc							0.22	0.69		0.47	1.44	
ExtBadRelPerc							0.04	0.10		1.50	4.33	***
IntGoodRelPerc				-1.41	-2.63	***				-2.09	-4.71	***
IntBadRelPerc				0.20	0.49					-0.18	-1.15	
Return				-0.27	-4.34	***	-0.25	-4.36	***	-0.22	-3.45	***
Stdev.				-0.03	-0.92		0.11	3.01	***	-0.04	-1.25	
Management fee				-0.31	-2.79	***	-0.28	-2.91	***	-0.28	-2.68	***
Log(Asset)				-0.36	-7.66	***	-0.36	-8.07	***	-0.30	-6.58	***
Leveraged				-0.19	-1.61		-0.25	-2.30	**	0.09	0.75	
Onshore				-0.46	-3.24	***	-0.67	-4.92	***	-0.56	-4.25	***
High water mark				-0.38	-2.84	***	0.05	0.45		-0.27	-2.13	**
BrokerDealer	0.01	0.10		-0.01	-0.09							
InvestmentAdvisor	0.30	3.78	***	0.36	2.40	**						
MunicipalAdvisor	0.66	3.07	***	0.56	1.91	*						
SwapDealer	1.04	3.57	***	1.44	3.65	***						
CommodBroker	0.18	2.65	***	0.01	0.08							
FuturesCommission	-0.13	-0.69		-0.30	-1.20							
Banking	-0.55	-4.05	***	-0.07	-0.34							
Trust	-0.52	-3.41	***	-0.12	-0.59							
Accounting	-0.96	-4.55	***	0.43	1.26							
Law	0.37	1.67	*	0.38	0.95							
Insurance	0.50	3.91	***	0.90	4.18	***						
Pension	0.22	1.11		-0.95	-2.40	**						
RealEstate	-0.66	-3.62	***	-0.69	-2.05	**						
LimitedPartnership	0.09	0.78		-0.18	-0.80							
ManagingMember	0.07	0.91		-0.38	-2.38	**						
AdvisorPrivateFund	0.33	2.83	***	-0.24	-1.45							
BuySellYourOwnSecurity	-0.21	-1.55					0.22	1.07				
BuySellYourselfClientSecurity	-0.36	-4.02	***				0.30	2.11	**			

AgencyCrossTransaction	-0.20	-1.18				-0.13	-0.56			
RecommendUnderwriter	-0.07	-0.80				0.15	1.03			
RecommendSalesInterest	-0.18	-1.52				0.32	1.74	*		
DetermineClientsSecurity	14.10	42.47	***			16.06	32.69	***		
DetermineNumClientsSecurity	-	-				-	-			
DetermineClientsAgent	0.30	1.22				1.43	2.91	***		
DetermineClientsComission	0.15	0.73				0.71	2.59	***		
RecommendBrokers	0.18	2.22	**			0.35	2.62	***		
OtherResearch	0.34	4.17	***			0.33	2.54	**		
CompensateNonEmpClientsRef	0.25	1.19				0.01	0.04			
CompensatetEmpClientsRef	-0.01	-0.04				0.42	1.02			
ReceiveCompensateClientsRef	0.15	1.57				0.11	0.67			
CustodySecurities	-0.07	-0.65				0.09	0.55			
CustodyCash/BankAcctService	0.40	1.13				1.04	1.56			
CustodySecuritiesService	-0.45	-1.25				-0.91	-1.35			
ReceiveAccountStatement	0.28	2.71	***			0.34	2.14	**		
ReceiveAuditReport	0.02	0.15				-0.21	-0.96			
ReceiveAnnualSurpriseExamination	0.40	2.28	**			0.61	2.44	**		
ReceiveCustodialControlReport	0.38	1.49				0.38	1.04			
AdvisorQualifiedCustodian	-0.01	-0.03				0.27	0.55			
RelatedQualifiedCustodian	0.16	0.58				0.06	0.15			
OtherControlPerson	0.32	9.28	***			-16.24	0.00			
OtherControlCompany	-0.12	-1.65	*			0.10	1.17			
Exempt	0.32	1.02		-17.43	0.00	-0.52	-1.47		-17.16	0.00
Umbrella	-0.71	-3.98	***	-0.36	-0.97	-0.14	-0.40		-0.33	-0.85
Num. of Obs.	18,229			13,776		13,776			13,776	
Concordance	71.50%			79.40%		79.50%			78.10%	
Style	Y			Y		Y			Y	
Year	Y			Y		Y			Y	

A.12 Table 8: Operational Risk Percentage-level Variables Predicting Appraisal Ratio and Style-adjusted Return (ERA and RIA)

This table presents the appraisal ratio and style-adjusted return (winsorized at top and bottom 1%) prediction results for RIA and ERA funds by using the LASSO-selected external and internal good or bad percentage variables and the combination with external or internal relationships by using the OLS regression model below:[72]

$$
\begin{aligned}
&Appraisal\ ratio_{i,t}\ or\ Style-adjusted\ return_{i,t} \\
&\quad = \alpha_{i,t} + \beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} \\
&\quad + \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} \\
&\quad + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} + \delta_E Exmept_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} \\
&\quad + \varepsilon_{i,t}
\end{aligned}
$$

$X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables that represent the percentage of the number of Good or Bad[73] External or Internal relationships the funds are involved in according to the total number of the relationships in the relative groups.[74] 'External' and 'Internal' at the bottom of the table represent whether a model uses the selected variable-level external or internal relationships. All the models control TASS-style and year dummies, and all the results are reported with the clustered standard error for TASS-style and year. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[72] We calculate the annual appraisal ratio by regressing the 12-month excess return of fund i on the excess return of the fund's TASS-style index j within the same year (BGLS, 2008). Specifically, $r_{it} - R_{ft} = \alpha_i + \beta_i(r_{jt} - R_{ft}) + \varepsilon_{it}$, where R_{ft} is the 3-month US Treasury Bill return. Furthermore, the style-adjusted return is calculated by $\frac{Return_{it} - \mu_{jt}}{\sigma_{it}}$. $Return_{it}$ is the average monthly return for fund i in year t and σ_{it} is the standard deviation of the average monthly return for fund i in year t. μ_{jt} is the average monthly return for the fund i's relative TASS-style in year t.

[73] Good/Bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results.

[74] The total number of the 4 groups of variables are Good External -- 7, Bad External -- 9, Good Internal--9, Bad Internal: 17.
For instance, if fund A is involved in 4 Good External, 5 Bad External, 5 Good Internal, and 12 Bad Internal relationships, the relative values are ExtGoodRelPerc -- 4/7, ExtBadRelPerc -- 5/9, IntGoodRelPerc -- 5/9, IntBadRelPerc -- 12/17.

	Model 1			Model 2			Model 3			Model 4			Model 5		
	Appraisal Ratio												Style-adjusted Return		
	Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value	
ExtGoodRelPerc							0.01	0.21		-0.04	-0.93		-0.02	-0.82	
ExtBadRelPerc							-0.76	-2.47	**	-0.05	-2.66	***	-0.04	-1.64	
IntGoodRelPerc				0.23	3.86	***				0.25	4.04	***	0.12	2.72	***
IntBadRelPerc				-0.01	-0.29					0.00	0.20		-0.02	-0.88	
Stdev.				-0.07	-19.52	***	-0.07	-21.21	***	-0.08	-19.50	***	0.00	1.48	
Management fee				0.01	0.66		-0.01	-0.65		0.00	0.23		0.00	-0.38	
Log(Asset)				0.03	6.01	***	0.02	3.88	***	0.02	4.23	***	0.02	5.96	***
Leveraged				0.06	4.51	***	0.07	5.81	***	0.08	5.80	***	0.01	1.23	
Onshore				0.07	4.75	***	0.04	2.84	***	0.04	2.71	***	0.08	7.08	***
High water mark				0.05	3.28	***	0.08	5.65	***	0.10	6.55	***	0.05	4.25	***
BrokerDealer	-0.11	-8.80	***	-0.03	-1.50										
InvestmentAdvisor	0.00	0.08		0.03	1.53										
MunicipalAdvisor	-0.12	-4.71	***	-0.07	-2.51	**									
SwapDealer	0.00	-0.01		-0.10	-2.16	**									
CommodBroker	-0.03	-2.52	**	-0.12	-7.32	***									
FuturesCommission	0.08	3.09	***	0.16	5.54	***									
Banking	0.13	7.50	***	0.03	1.24										
Trust	0.00	-0.19		-0.03	-1.38										
Accounting	0.05	2.03	**	0.03	0.55										
Law	0.04	1.39		-0.04	-0.97										
Insurance	-0.14	-8.00	***	-0.28	-11.23	***									
Pension	0.14	4.69	***	0.18	4.32	***									
RealEstate	0.03	1.11		-0.05	-1.32										
LimitedPartnership	0.09	5.47	***	0.11	4.47	***									
ManagingMember	0.02	1.51		0.00	-0.04										
AdvisorPrivateFund	-0.07	-4.43	***	0.00	0.17										
BuySellYourOwnSecurity	0.08	4.32	***				-0.07	-2.99	***						
BuySellYourselfClientSecurity	-0.05	-4.02	***				-0.01	-0.53							

AgencyCrossTransaction	-0.19	-8.32	***				-0.13	-5.19	***					
RecommendUnderwriter	-0.04	-2.80	***				-0.04	-2.50	**					
RecommendSalesInterest	-0.03	-1.90	*				-0.09	-4.45	***					
DetermineClientsSecurity	-0.17	-5.83	***				-0.17	-4.14	***					
DetermineNumClientsSecurity	-0.46	-11.73	***				-0.42	-8.38	***					
DetermineClientsAgent	-0.14	-4.59	***				0.06	1.09						
DetermineClientsComission	-0.09	-3.71	***				-0.15	-3.71	***					
RecommendBrokers	-0.02	-1.88	*				0.01	1.06						
OtherResearch	-0.05	-4.78	***				-0.08	-5.73	***					
CompensateNonEmpClientsRef	0.07	3.18	***				0.13	3.82	***					
CompensatetEmpClientsRef	0.10	3.96	***				0.10	2.42	**					
ReceiveCompensateClientsRef	0.01	1.00					-0.07	-3.69	***					
CustodySecurities	-0.03	-1.85	*				0.00	-0.02						
CustodyCash/BankAcctService	-0.09	-2.06	**				-0.16	-2.78	***					
CustodySecuritiesService	-0.05	-1.23					-0.16	-2.70	***					
ReceiveAccountStatement	0.00	0.20					-0.04	-2.59	***					
ReceiveAuditReport	0.05	2.72	***				0.02	0.87						
ReceiveAnnualSurpriseExamination	0.02	0.73					-0.01	-0.48						
ReceiveCustodialControlReport	0.07	1.89	*				-0.12	-0.75						
AdvisorQualifiedCustodian	-0.04	-0.63					0.01	0.20						
RelatedQualifiedCustodian	-0.01	-0.15					-0.24	-5.54						
OtherControlPerson	-0.06	-7.77	***				-0.18	-2.34	**					
OtherControlCompany	-0.01	-1.34					0.02	2.88	***					
Exempt	-0.17	-4.48	***	-0.18	-1.52		-0.29	-6.45	***	-0.12	-0.94		-0.21	-4.31	***
Umbrella	0.08	3.09	***	0.08	2.07	**	-0.01	-0.44		0.07	1.82	*	0.11	3.85	***
Num. of Obs.	18,229			13,776			13,776			13,776			13,245		
Adj. R^2	8.88%			16.93%			17.06%			13.59%			4.84%		
Style	Y			Y			Y			Y			Y		
Year	Y			Y			Y			Y			Y		

A.13 Table 9: Operational Risk Percentage-level Variables Predicting Future Leveraged (ERA and RIA)

This table presents the leveraged or not prediction results for RIA and ERA funds by using the LASSO-selected external and internal good or bad percentage variables and the combination with external or internal relationships by using the Logistic regression model used in this analysis is presented below:

$$Leveraged_{i,t} = \alpha_{i,t} + \beta_{ExtGoodRelPerc} X_{ExtGoodRelPerc\ it-1} + \beta_{ExtBadRelPerc} X_{ExtBadRelPerc\ it-1} + \beta_{IntGoodRelPerc} X_{IntGoodRelPerc\ i,t-1} + \beta_{IntBadRelPerc} X_{IntBadRelPerc\ i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} + \delta_E Exempt_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t}$$

$Leveraged_{i,t}$ is whether the fund i uses leverage or not for the predicted year t. $X_{ExtGoodRelPerc}$, $X_{ExtBadRelPerc}$, $X_{IntGoodRelPerc}$, and $X_{IntBadRelPerc}$ are variables that represent the percentage of the number of Good or Bad[75] External or Internal relationships the funds are involved in according to the total number of the relationships in the relative groups.[76] 'External' and 'Internal' at the bottom of the table represent whether a model uses the selected variable-level external or internal relationships. All models control the TASS-style and year dummies for predictions. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[75] Good/Bad relationships are classified by whether the related variables have negative/positive coefficients according to the LASSO results.

[76] The total number of the 4 groups of variables are Good External -- 7, Bad External -- 9, Good Internal--9, Bad Internal: 17.
For instance, if fund A is involved in 4 Good External, 5 Bad External, 5 Good Internal, and 12 Bad Internal relationships, the relative values are ExtGoodRelPerc -- 4/7, ExtBadRelPerc -- 5/9, IntGoodRelPerc -- 5/9, IntBadRelPerc -- 12/17.

	Model 1			Model 2			Model 3			Model 4		
	Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ExtGoodRelPerc							-0.23	-1.49		0.08	0.92	
ExtBadRelPerc							-1.24	-5.45	***	-0.51	-3.14	***
IntGoodRelPerc				0.55	1.96	*				0.43	3.50	***
IntBadRelPerc				-0.02	-0.20					-0.15	-0.99	
Return				0.04	1.36		0.03	1.32		0.05	1.65	*
Stdev.				-0.01	-0.33		-0.05	-3.28	***	-0.02	-1.28	
Management fee				0.26	5.24	***	0.17	3.82	***	0.23	4.59	***
Log(Asset)				0.03	1.70	*	0.01	0.49		0.02	1.16	
Onshore				0.32	5.19	***	0.20	3.36	***	0.46	7.80	***
High water mark				0.57	9.10	***	0.44	7.72	***	0.40	6.57	***
BrokerDealer	-0.09	-1.62		0.13	1.63							
InvestmentAdvisor	-0.25	-6.07	***	-0.06	-0.86							
MunicipalAdvisor	-0.56	-5.10	***	-0.33	-2.21	**						
SwapDealer	-1.00	-5.32	***	-0.02	-0.09							
CommodBroker	0.16	4.02	***	-0.06	-0.97							
FuturesCommission	0.64	6.67	***	0.30	2.33	**						
Banking	-0.17	-2.44	**	0.43	4.38	***						
Trust	0.26	3.51	***	0.16	1.52							
Accounting	0.00	-0.03		-0.18	-0.93							
Law	-0.32	-2.44	**	0.01	0.06							
Insurance	-0.17	-2.56	**	-0.22	-1.98	**						
Pension	0.39	3.22	***	0.17	0.96							
RealEstate	1.00	9.16	***	0.66	4.49	***						
LimitedPartnership	0.37	5.41	***	0.58	5.44	***						
ManagingMember	0.19	4.26	***	0.14	2.01	**						
AdvisorPrivateFund	-0.49	-7.72	***	-0.05	-0.60							
BuySellYourOwnSecurity	-0.21	-2.94	***				-0.21	-2.18	**			
BuySellYourselfClientSecurity	-0.12	-2.41	**				-0.12	-1.79	*			
AgencyCrossTransaction	-0.21	-2.32	**				-0.01	-0.06				
RecommendUnderwriter	-0.18	-3.59	***				-0.13	-1.90	*			

RecommendSalesInterest	-0.10	-1.59					-0.20	-2.28	**			
DetermineClientsSecurity	-11.22	-0.09					-14.00	-0.02				
DetermineNumClientsSecurity	9.95	0.08					12.83	0.01				
DetermineClientsAgent	-0.55	-4.55	***				-0.85	-3.87	***			
DetermineClientsComission	-0.20	-1.95	*				-0.44	-2.58	***			
RecommendBrokers	0.01	0.19					0.08	1.36				
OtherResearch	-0.15	-3.54	***				0.09	1.41				
CompensateNonEmpClientsRef	0.34	3.91	***				0.38	2.85	***			
CompensatetEmpClientsRef	1.08	9.35	***				0.04	0.23				
ReceiveCompensateClientsRef	0.04	0.80					-0.19	-2.18	**			
CustodySecurities	-0.18	-3.42	***				-0.24	-3.27	***			
CustodyCash/BankAcctService	-0.05	-0.27					-0.52	-2.02	**			
CustodySecuritiesService	-0.35	-1.79	*				-0.65	-2.56	***			
ReceiveAccountStatement	0.43	7.43	***				0.56	7.25	***			
ReceiveAuditReport	0.20	2.58	***				0.46	4.57	***			
ReceiveAnnualSurpriseExamination	0.36	4.14	***				0.33	3.16	***			
ReceiveCustodialControlReport	0.54	3.71	***				1.05	5.58	***			
AdvisorQualifiedCustodian	-1.12	-3.75	***				-0.57	-1.58				
RelatedQualifiedCustodian	0.00	0.00					-1.01	-5.03	***			
OtherControlPerson	-1.43	-8.32	***				0.56	0.79				
OtherControlCompany	0.21	5.81	***				0.59	5.57	***			
Exempt	-0.80	-5.35	***	-0.44	-0.60		-0.23	-1.08		-0.24	-0.32	
Umbrella	0.27	2.77	***	0.64	3.70	***	0.47	3.23	***	0.58	3.37	***
Num. of Obs.	18,229			13,776			13,776			13,776		
Pseudo R^2	9.91%			22.37%			23.40%			21.94%		
Style	Y			Y			Y			Y		
Year	Y			Y			Y			Y		

A.14 Table 10: ADV-based Ω-score and Future Adverse Outcomes (ERA and RIA)

This table presents the fund performance and adverse liquidation events prediction by using the constructed LASSO-constructed ADV-based Ω-score for ERA and RIA funds. Models 1, 2, and 3 present the style-adjusted return (winsorized at top and Bottom 1%), appraisal ratio, as well as the leveraged or not prediction (Logit) according to the equation below:[77]

$$Style-adjusted\ return_{i,t}\ or\ Appraisal\ ratio_{i,t}\ or\ Leverage_{i,t} = \alpha_{i,t} + \beta_1 ADV-Based\ \Omega\ score_{i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Management\ fee_{i,t-1} + \delta_6 Leveraged_{i,t-1} + \delta_E Exempt_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t}$$

Model 4 presents the adversely impacted events prediction by using the ADV-based Ω-score according to the equation below:[78]

$$h_{i,t}(T) = h_{0i,t}(T) \times exp\ (\beta_1 ADV-Based\ \Omega\ score_{i,t-1} + \delta_1 Log\ assets_{i,t-1} + \delta_2 High\ water\ mark_{i,t-1} + \delta_3 Stdev_{i,t-1} + \delta_4 Onshore_{i,t-1} + \delta_5 Return_{i,t-1} + \delta_6 Management\ fee_{i,t-1} + \delta_7 Leveraged_{i,t-1} + \delta_8 High\ water\ mark_{i,t-1} + \delta_E Exempt_{i,t-1} + \delta_U Umbrella_{i,t-1} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi})$$

The style-adjusted return and appraisal ratio prediction results are reported with the clustered standard error for TASS style and year. All models control the TASS-style and year dummies for predictions. All the models in this table control the TASS-style and year dummies and results in Panel A are reported with the clustered standard error for TASS-style and year. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[77] We calculate the annual appraisal ratio by regressing the 12-month excess return of fund i on the excess return of the fund's TASS-style index j within the same year (BGLS, 2008). Specifically, $r_{it} - R_{ft} = \alpha_i + \beta_i(r_{jt} - R_{ft}) + \varepsilon_{it}$, where R_{ft} is the 3-month US Treasury Bill return. Furthermore, the style-adjusted return is calculated by $\frac{Return_{it} - \mu_{jt}}{\sigma_{it}}$. $Return_{it}$ is the average monthly return for fund i in year t and σ_{it} is the standard deviation of the average monthly return for fund i in year t. μ_{jt} is the average monthly return for the fund i's relative TASS-style in year t. $Leveraged_{i,t}$ is whether the fund i uses leverage or not for the predicted year t.

[78] A fund i will be considered as adversely impacted at year t with age T if it is liquidated or unable to contact according to TASS, with a negative average return in the previous 6 months, as well as decreased AUM in the previous 12 months (Liang and Park, 2010).

	Model 1			Model 2			Model 3			Model 4		
	Style-adjusted Return			Appraisal Ratio			Leveraged			Adverse Liquidation Events		
	Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ADV-based Ω Score	0.00	-6.82	***	0.00	-3.98	***	-0.05	-6.90	***	0.04	4.23	***
Return							0.03	1.27		-0.20	-4.00	***
Stdev.	0.00	1.63		-0.08	-26.42	***	-0.06	-4.37	***	0.09	2.93	***
Management fee	0.00	-0.34		0.00	-0.48		0.13	3.57	***	-0.32	-4.01	***
Log(Asset)	0.02	7.72	***	0.02	4.67	***	-0.02	-1.16		-0.38	-10.17	***
Leveraged	0.02	2.37	**	0.09	8.89	***				-0.27	-2.98	***
Onshore	0.08	9.43	***	0.03	2.73	***	0.39	8.36	***	-0.71	-6.62	***
High water mark	0.04	4.62	***	0.09	8.57	***	0.35	7.59	***	0.05	0.51	
Exempt	0.01	1.34		-0.02	-1.90	*	-0.61	-10.80	***	-0.05	-0.42	
Umbrella	0.03	1.30		-0.04	-1.41		0.47	3.75	***	-0.09	-0.32	
Num. of Obs.	13,245			13,564			13,776			13,776		
Adj. R^2	4.25%			15.12%								
Pseudo R^2							22.56%					
Concordance										79.20%		
Style	Y			Y			Y			Y		
Year	Y			Y			Y			Y		

A.15 Table 11: ADV-based Ω-score and Fund Flows (ERA and RIA)

This table presents the fund flow[79] prediction by using the constructed ADV-based Ω-score according to the LASSO regression for RIA and ERA funds.

$$Flow_{i,t} = \alpha_{i,t} + \beta_1\, ADV - Based\ \Omega\ score_{i,t-1} + \delta_1\, High\ rank_{i,t-1} + \delta_2 Mid\ rank_{i,t-1} + \delta_3 Low\ rank_{i,t-1} + \delta_4 Log\ assets_{i,t-1} + \delta_5 Stdev_{i,t-1}$$
$$+ \delta_6 Management\ fee_{i,t-1} + \delta_E Exempt_{i,t-1} + \delta_U Umbrella_{i,t} + \sum_{j=1}^{14} \gamma_j StyleDummies_{ji} + \sum_{q=1}^{9} \eta_q YearDummies_{qi} + \varepsilon_{i,t}$$

Model 2 presents the fund flow prediction result with the interaction terms between the *ADV-based Ω-score* and three ranks (*High rank*, *Mid rank,* and *Low rank*).[80] *ADV-based Ω-score* represents the fund's previous year's operational risk score, *High rank*, *Mid rank,* and *Low rank* are computed according to a fund's average monthly return in the previous year. *Stdev.*, *Log(Asset),* and *Umbrella* are the standard deviation for monthly return, log of the average monthly estimated assets, and Umbrella Registration indicator of the funds in the previous year. *Management fee* is the management fee for funds. All the flows for offshore funds are adjusted according to the exchange rate for the relative currency and predicted year. All models control the TASS-style, year, and Firm dummies for predictions. All the results are reported with the clustered standard error for TASS style, firm, and year. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

[79] Fund flow for fund i in year t is calculated by $Flow_{i,t} = \frac{Assets_{i,t} - Assets_{i,t-1} * (1 + Return_{i,t})}{Assets_{i,t-1}}$.

[80] Specifically, *High trank*, *Mid trank,* and *Low trank* are computed as $Min(\frac{1}{3}, Frank_{i,t-1})$, $Min(\frac{1}{3}, Frank_{i,t-1} - High\ rank_{i,t-1})$ and $Min(\frac{1}{3}, Frank_{i,t-1} - High\ rank_{i,t-1} - Mid\ rank_{i,t-1})$ respectively (Getmansky et al., 2018). Where $Frank_{i,t-1}$ is the fractional rank for RIA funds from 0 to 1, according to their average monthly return in the previous year.

	Model 1			Model 2		
	Coef.	*t*-Value		Coef.	*t*-Value	
ADV-based Ω Score	0.00	-3.71	***	-0.02	-8.75	***
ADV-based Ω Score*High trank				0.00	-1.35	
ADV-based Ω Score*Mid trank				-0.07	-10.58	***
ADV-based Ω Score*Low trank				-0.08	-6.73	***
High trank	4.35	4.50	***	-4.37	-4.11	***
Mid trank	-0.70	-4.49	***	-0.69	-3.87	***
Low trank	-3.76	-6.91	***	-3.94	-7.44	***
Stdev.	-0.04	-6.21	***	-0.04	-6.31	***
Management fee	0.01	1.13		-0.01	-1.01	
Log(Asset)	0.02	4.96	***	0.02	4.89	***
Exempt	0.02	1.60		-0.03	-2.00	**
Umbrella	0.00	-0.08		0.02	0.62	
Num. of Obs.	13,776			13,776		
Adj. R^2	61.80%			62.81%		
Style	Y			Y		
Firm	Y			Y		
Year	Y			Y		

A.16 Table 12: Summary Statistics for ADV-based Ω-Score Within Different Styles

Table 2 presents the mean and median for RIA funds' calculated ADV-based Ω-Score within different TASS-style.

Style	Mean	Median
Convertible Arbitrage	11.66	10.84
Dedicated Short Bias	11.25	11.25
Emerging Markets	10.74	10.80
Equity Market Neutral	10.74	11.16
Event Driven	11.91	11.63
Fixed Income Arbitrage	13.68	13.40
Fund of Funds	6.75	6.75
Global Macro	11.46	11.88
Long/Short Equity Hedge	11.27	10.90
Multi-Strategy	12.80	12.93
Options Strategy	10.27	11.68
Other	11.16	10.64
Undefined	13.40	12.60

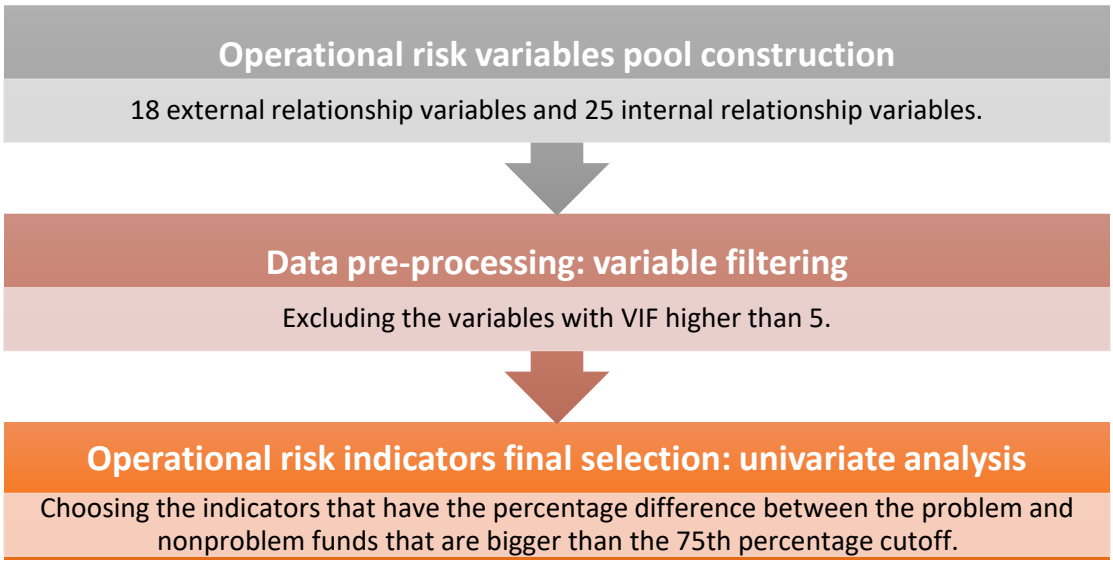
A.17 BGLS Define ω-Score construction and future adverse outcomes, as well as the fund flows for RIA funds

In this section, we use the ω-Score constructed by BGLS (2008) to predict the future performance, liquidation, and fund flows for RIA funds, as a comparison with our constructed ADV-based Ω-Score by using the purely LASSO regression described in the main text. A potential challenge for CCA is that the imbalance number of the two sets of variables may cause inaccurate results. However, the number of the TASS variables is limited, compared with the 36 selected variables by LASSO regression in our study. Consequently, we use a four-step LASSO-combined indicator selection process to find out the key operational risk indicators from the amended Form ADV filing.

A potential problem is that the variables in the pool may suffer from the multi-collinearity issue in future regression analysis. Due to this concern, we filter the variables according to the Variance Inflation Factor (VIF) score. A variable with a VIF that is higher than 5 should be considered a high collinearity variable, which will be dropped from our operational risk variable pool. Eventually, we adopt the univariate analysis approach developed by BGLS (2008) to find out the variables that have a stronger relationship with the problem funds. Specifically, we choose the variables that have a percentage difference between the problem and non-problem funds that are bigger than the 75th percentage cutoff compared with external and internal relationships respectively. A visualized variable selection process for this method can be illustrated in Figure 6.

Figure 5: Operational Risk Indicator Selection Process for BGLS (2008) CCA-based method

Figure 5 illustrates our operational risk indicator selection process for the CCA-based method of operational risk score construction for RIA funds.



After the selection process, 13 variables (7 external and 6 internal relationships) are selected for the CCA-ADV-based Ω-Score. Table 3 presents the CCA results by using the method conducted by BGLS (2008) for the operational risk score metric. We can find out that the maximum correlation between the TASS variables and ADV operational risk indicators is 70%, which increases more than 67% to the 42% reported by BGLS (2008). The value for each variable is the correlation between the constructed CCA-ADV-based Ω-Score by using the raw coefficient (unshown) and the related variables for each fund. After finishing constructing the operational risk score, we then can compare the prediction power for this

BGLS (2008)-style score and the ADV-based Ω-Score developed in our paper for future adverse outcomes and fund flows.

Table 13: ADV-based Ω-Score Construction According to the Canonical Correlation Analysis (CCA)

Table 13 presents the CCA results for the ADV-based Ω-Score using the method conducted by BGLS (2008). ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

TASS Variables			ADV Indicators		
Return	-0.10	***	BrokerDealer	0.74	***
Stdev	-0.39	***	InvestmentAdvisor	0.44	***
Log(Asset)	-0.43	***	CommodBroker	-0.14	***
Leveraged	-0.73	***	BankingThrifting	0.89	***
Age	-0.23	***	Trust	0.45	***
Margin	-0.40	***	Insurance	0.59	***
Personal capital	-0.43	***	ManagingMember	-0.26	***
Onshore	-0.56	***	BuySellYourselfClientSecurity	0.13	***
Personal capital	-0.31	***	RecommendSecurityYourOwn	0.33	***
Accepts managed accts.	-0.40	***	RecommendUnderwriter	0.10	***
			RecommendSalesInterest	0.37	***
			OtherReserach	-0.14	***
			CompensateNonEmpClientsRef	-0.36	***
Correlation between TASS and ADV panels	0.70	***			

Table 14 presents the performance, and liquidation prediction for RIA funds by using the CCA-ADV-based Ω-Score prediction for the adverse outcome for RIA funds. Panel A presents the appraisal ratio, style-adjusted return, and leveraged prediction, compared with our pure LASSO-based regression, the operational risk score in the style-adjusted return is insignificant, although the sign of the coefficient is negative. Furthermore, the appraisal ratio prediction finds out that the CCA-based operational risk score can negatively and significantly predict the funds that were not leveraged in the previous year. However, compared with the *t*-value (-3.65) in our main regression in Table 8, our ADV-based Ω-Score that uses the weights defined by the LASSO process outperforms the CCA-style operational risk score. Similarly, according to Panel B, the coefficient for ADV-based Ω-Score (LASSO) presents significance at a 1% level, compared with 5% for the CCA-style score.

Table 14: CCA-ADV-based Ω-Score Predicting Future Adverse Outcomes

Table 14 presents the future appraisal ratio, style-adjusted return (winsorized at top and Bottom 1%), and leveraged and liquidation prediction for RIA funds by using the CCA-ADV-based Ω-Score constructed in the spirit of BGLS (2008). Panel A presents the appraisal and leverage prediction, and all models control the TASS style and year (as well as the clustered standard errors) for predictions. Panel B presents the adverse impacted funds' prediction. All models control the TASS style, age, and year (as well as the clustered standard errors) for predictions. Values in parentheses represent the hazard ratio. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

Panel A: CCA-ADV-based Ω-score Predicting Style-adjusted Return and Leveraged															
	Model 1			Model 2			Model 3			Model 4			Model 5		
	Style-adjusted Return						Appraisal Ratio						Leveraged?		
	Full Sample						Previously Leveraged			Previous Non-leveraged			Full Sample		
	Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*t*-Value		Coef.	*z*-Value	
ADV-based Ω-score (CCA)	-0.54	-0.98		-0.50	-0.73		-1.47	-1.85	*	0.20	0.12		-27.16	-6.90	***
Return													0.01	0.27	
Stdev.	0.00	-0.96		-0.04	-7.00	***	-0.04	-5.27	***	-0.04	-4.15	***	-0.03	-0.90	
Management fee	-0.01	-0.74		0.02	1.14		-0.01	-0.42		0.12	2.54	**	0.02	0.18	
Log(Asset)	0.02	2.60	**	0.03	3.73	***	0.05	4.53	***	0.02	1.45		0.02	0.48	
Leveraged	0.00	0.17		0.01	0.47										
Onshore	0.00	-0.14		-0.02	-0.64		-0.04	-0.92		0.00	-0.01		1.55	10.38	***
High water mark	0.07	2.78	***	0.11	3.81	***	0.12	2.59	***	0.14	3.29	***	-0.03	-0.22	
Umbrella	0.12	3.90	***	0.01	0.36		-0.08	-1.52		0.09	1.64		0.36	1.97	**
Style	Y			Y			Y			Y			Y		
Year	Y			Y			Y			Y			Y		
Num. of Obs.	7,132			7,132			3,561			3,571			7,132		
Adj. R^2	3.78%			12.26%			17.97%			7.49%					
Pseudo R^2													25.49%		

Panel B: CCA-ADV-based Ω-score Predicting Future Adversely Impacted Events									
	Model 1			Model 2			Model 3		
	Full Sample			Previous Problem Funds			Previous Nonproblem Funds		
	Coef.	*z*-Value		Coef.	*z*-Value		Coef.	*z*-Value	
ADV-based Ω-score (CCA)	-9.10	-0.99		0.35	2.01	**	-17.17	-1.47	
Return	-0.05	-0.33		-0.31	-1.56		-0.89	-1.91	*
Stdev.	-0.22	-2.61	**	0.00	0.04		-0.01	-0.10	
Management fee	-0.14	-0.50		0.00	0.02		-0.21	-2.44	**
Log(Asset)	-0.21	-2.17	**	-0.65	-4.27	***	-0.17	-0.49	
Leveraged	0.12	0.42		-0.01	-0.04		-0.15	-1.48	
Onshore	-0.36	-1.31		-0.18	-0.42		0.24	0.81	
High water mark	-1.50	-3.13	***	0.28	0.75		-0.18	-0.64	
Umbrella	-0.81	-1.85	*	-0.35	-0.40		-1.36	-2.67	***
Style	Y			Y			Y		
Year	Y			Y			Y		
Num. of Obs.	7,132			918			6,214		
Concordance	77.70%			96.70%			78.50%		

After finishing comparing the performance and liquidity prediction power for the BGLS-style CCA and our LASSO-based operational risk metric, we then finally look at the fund flow prediction. Consistent with the prediction results in Table 9, the CCA-based operational risk score can still negatively predict the future fund flow for the full RIA fund sample (although the significant level is lower than that of the LASSO-ADV-based Ω-score). However, when coming to a less noisy sample, with winsorized flows and with clustered standard errors for firms, there is no significant relationship between the operational risk (CCA-based) and the investor's future decision. All in all, the analysis in this section shows that the BGLS-style ADV-based Ω-score still presents the power for performance, liquidation, and fund flow prediction, while our ADV-based Ω-score according to the LASSO regression coefficients in Table 4 presents a more robust and higher prediction power for funds adverse outcomes and investors' future decisions.

Table 15 CCA-ADV-based Ω-Score Predicting Future Fund Flows

Table 15 presents the future fund flow prediction for RIA funds by using the CCA-ADV-based Ω-Score constructed in the spirit of BGLS (2008). All models control the TASS-style and year-clustered standard errors for predictions. ***, **, * indicate the statistically significant at the 1%, 5%, and 10% levels respectively.

	Model 1			Model 2		
	Full Sample			Winsorize top and bottom 1% fund flows		
	Coef.	*t*-Value		Coef.	*t*-Value	
ADV-based Ω-score (CCA)	-1.79	-2.14	**	-0.38	-0.62	
High trank	5.02	16.82	***	3.45	16.23	***
Mid trank	-0.37	-2.68	***	-0.98	-9.57	***
Low trank	-4.82	-16.65	***	-3.44	-14.83	***
Stdev.	-0.01	-0.82		0.00	-0.26	
Management fee	-0.01	-0.54		-0.01	-0.68	
Log(Asset)	0.03	2.79	***	0.02	1.80	*
Umbrella	-0.08	-1.46		-0.01	-0.36	
Style	Y			Y		
Firm	Y			Y		
Year	Y			Y		
Num. of Obs.	7,132			6,824		
Adj. R^2	70.50%			69.91%		