Do Sell-Side Analysts Play a Role in Hedge Fund Activism? Evidence from Textual Analysis*

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Abstract

We investigate variation in information production by sell-side analysts and its potential role in hedge fund activist intervention, an important external corporate governance mechanism that creates shareholder value. Using textual analysis to derive an activism dictionary from intervention objectives and tactics, we find substantially more activism content in pre-intervention analyst reports of target firms than propensity score matched control firms. Activism content is associated with more detailed reports containing more quantitative information. Target firm intervention-date stock returns are significantly higher when activist intention (13D) filings are supported by reports with more general and objective-specific activism content. 31.9% of activists' public letters to stakeholders directly mention sell-side analysis, amplifying the association between target returns and analyst report information. The relationship between analyst information and activism returns is robust to using brokerage closures as an exogenous shock and is consistent with analyst incentives. Activist funds with no prior disclosed position in target firms and more experienced funds capture higher returns from sell-side information. Overall, our results suggest sell-side analysts play a significant informational role in supporting hedge fund activism.

Keywords: analyst reports, hedge fund activism, hedge funds, information production, sell-side analysts, textual analysis

1. Introduction

Hedge fund activism has played an increasingly important role in capital markets over the last decade. The number of activist hedge funds has almost doubled since 2001 (Brav et al. 2015a), and total assets under management grew approximately tenfold from 2003 to around $115 billion in 2015 (PwC 2016). This rapid growth has substantially impacted public companies. According to former US SEC Chair Mary Jo White, activist hedge funds have "undeniably changed the corporate landscape" (White 2015).

Prior literature investigates hedge fund activism's impact on firm activities, shareholders, and other stakeholders but has yet to broadly examine the interaction between activist hedge funds and other capital market participants such as sell-side analysts. Analysts play information discovery and interpretation roles around corporate events (Chen et al. 2010) by conducting independent research to estimate future firm fundamentals (Jung et al. 2014). Analysts tend to align their coverage with buy-side institutions' information needs, because their compensation, promotion, and reputation depend on their ability to generate commissions for brokerage houses and win favorable ratings from the buy-side institutions (Groysberg et al. 2011; Harford et al. 2019). Given these incentives, analysts may play an informational role in hedge fund activism, producing research and substantiating relevant information for intervention objectives and tactics.

A case study of Wasau Paper by Brav et al. (2016) provides one example of how sell-side analysts' information is used by activist hedge funds to justify an intervention. The authors show that in a January 2014 letter,[1] Jeffrey Smith of the activist hedge fund Starboard Value directly quotes a report by sell-side analyst Mark Wilde of Deutsche Bank that recommends asset disposition. This October 2012 sell-side report states, "for nearly a decade, we've argued that

[1] This letter is available at https://www.sec.gov/Archives/edgar/data/105076/000141588914000603/starboardsc13dafeb182014.pdf.

Wasau ought to exit all paper operations and focus on its tissue business." A similar example is seen in Third Point LLC's intervention of Ligand Pharmaceuticals, Inc. In a September 2005 letter[2] written to David E. Robinson, the chairman, president, and CEO of Ligand Pharmaceuticals, Inc., Third Point LLC manager Daniel Loeb quoted problems revealed by sell-side analysts, including the poor reputation of senior executives, a "David Robinson Discount," and one of the worst product launches in history. We provide a third detailed example of a hedge fund activist's (Ellington Management targeting EMC) use of sell-side analyst reports in panel A of Appendix 1.

Given the anecdotal evidence above, we examine the role of sell-side analysts in relation to activist hedge funds by investigating two specific questions. First, relative to similar firms, what specific types of information do sell-side analysts produce in their coverage of hedge funds' target firms? Second, does the information analysts produce influence hedge fund intervention outcomes? We use reports issued by sell-side analysts to examine these questions. In contrast to other outputs (e.g., recommendations, price targets, and earnings estimates), analyst reports provide more information and cover a wide range of topics (Huang et al. 2014), which may be used to derive a variety of activism issues (Brav et al. 2008). Moreover, compared to conference call transcripts, which can be biased by managers' opinions and coincide with earnings announcements (Chen et al. 2010), sell-side reports contain information that analysts independently discover and interpret.

We begin by analyzing the text of analyst reports and develop a new activism dictionary based on the classifications of hedge fund objectives and tactics used by Brav et al. (2008).[3] We use propensity score matching, following prior studies (e.g., Brav et al. 2018), to construct a set of matched treatment and control firms and then analyze the text of sell-side reports up to three

[2] The letter is available at https://www.sec.gov/Archives/edgar/data/886163/000089914005000884/l2992329d.txt.
[3] Activism objective and tactic classifications are generally applied within many studies including Cheng et al. (2012), Brav et al. (2015a), Cheng et al. (2015), Khurana et al. (2018), Wong (2020), and DesJardine and Durand (2020).

months before and after hedge fund intervention. We find that sell-side reports on target firms exhibit significantly more activism dictionary content than control firms, including activism content related to both specific and general intervention objectives, validating our activism dictionary. Further analysis shows that activism content in pre-intervention sell-side reports of target firms is positively associated with report length and quantitative information. These report characteristics substantially decrease after hedge fund intervention for treatment firms. Our results suggest that sell-side analysts produce more activism-related information, more detailed reports (Gibbons et al. 2021), and more easily measurable information (Campbell et al. 2021) before intervention to substantiate new facts and relevant issues about target firms.

In the next part of the study, we investigate the potential effects of analysts' information production on hedge fund intervention outcomes, specifically intervention-date target equity returns.[4] If activism content in analyst reports is supportive of hedge funds' interventions, the verifiability of information raises the importance and relevance of topics (Huang et al. 2018) and demonstrates the validity of facts. Investors may pay a premium for reduced information uncertainty and greater awareness of activism issues from sell-side analysts, leading to higher intervention stock returns. Moreover, specific content in analyst reports provides justifications for opinions (Asquith et al. 2005). In other words, analyst reports that take an activist stance can implicitly rationalize and substantiate hedge funds' intervention actions, signaling to other investors a greater likelihood of successful intervention.

To capture supportiveness of sell-side analyst report content for intervention events, we scale the number of categorical words in pre-intervention reports by the number of activism words

[4] We cannot observe the direction of ex ante information flow between sell-side analysts and activist hedge funds nor do we attempt to examine whether analysts' information production helps activist hedge funds identify targets.

in 13D filings.[5] This variable represents the degree to which report content extends and supports activism issues communicated directly by each activist hedge fund. We find that intervention-date stock returns are higher for targets with higher levels of these textual measures in pre-intervention analyst reports. For example, a 10-word increase in the number of activism words in analyst reports per each activism word in 13D filings is associated with a 2.01% increase in three-day cumulative abnormal returns, equivalent to a $4.39 million average increase in target stock market value.

We next examine activist hedge funds' direct use of sell-side information. We manually collect activists' letters written to other shareholders, boards of directors, and management following 13D filings. We find that a substantial percentage (31.9%) of publicly available letters to these stakeholders mention sell-side analysis. When ex ante sell-side information production is higher, activist letters containing any sell-side analysis are associated with higher target intervention returns, suggesting that activist hedge funds benefit from publicly using analyst information to support their objectives and tactics.

For our findings above, one could argue that investors have alternative information sources, such as news articles, that may have publicly accessible content similar to that of analyst reports. Investors may connect news article content with hedge funds' 13D filings and react in the stock market based on the relevance of these alternative information sets. To address this endogeneity concern, we use the closure of sell-side brokerage firms as a shock to the issuance of analyst reports. Prior research shows that brokerage firm closures can substantially reduce analyst coverage (Kelly and Ljungqvist 2012). We find that the positive effects of analyst report supportiveness on stock

[5] Schedule 13D is an SEC filing submitted by anyone within 10 days of acquiring beneficial ownership of more than 5% of shares outstanding in a public company. Item 4 of 13D filings allows activists to describe the purpose (i.e., objectives and/or tactics) of their transaction.

returns are reversed for hedge fund activist targeted firms with brokerage closures, supporting the informational effect of relevant analyst reports on market reactions to intervention announcements.

Next, we address an important alternative explanation: hedge funds cooperate with sell-side analysts to drive down target firm stock prices ex ante in order to capture more incremental value at intervention. Klein et al. (2019) refer to this arrangement as a "quid pro quo." To test this possibility, we use prime brokerage data and find no effect of related content on intervention outcomes in cases where target firm sell-side reports come from analysts who are employees of an activist hedge funds' prime broker(s).

We next look at why sell-side analysts would produce activism-related research. We find that pre-intervention analyst reports contain more activism content when target firms have higher institutional ownership and more Bloomberg terminal news attention, as well as when reports are produced by analysts from financial institutions with investment banking services (i.e., potentially not independent research). These findings suggest that sell-side analysts are incentivized to produce activism-related research that will be recognized by activist hedge funds and buy-side institutions in general. Further, activist hedge funds have incentives to use supportive sell-side information as it improves gains to intervention and associated increases in fund performance fees.

Lastly, we examine whether hedge fund characteristics affect the positive relation between the supportiveness of sell-side analyst information and hedge fund intervention stock returns. The verifiability of analyst reports related to intervention events can validate activism issues and reduce investors' information uncertainty, leading to a higher target price premium. We use the absence of 13F filings disclosing target firm equity ownership prior to hedge fund intervention to proxy for the reduction in information uncertainty for other investors and find a similar increase in target firm returns. Reputable and experienced hedge funds are better able to integrate information to

facilitate intervention and substantiate evidence used to more effectively solicit desirable settlements with target firm management (Boyson et al. 2019; Levit 2019; Wiersema et al. 2020). Accordingly, we find that the interaction between sell-side report content and interventions involving more experienced hedge funds (at least 11 years old) also exhibit higher target returns.

Our work contributes to the literature on hedge fund activism by investigating the role of sell-side analysts as an additional source of information about targeted firms. Prior research shows that activist hedge funds effect major changes in target firms and create value for shareholders (e.g., Brav et al. 2008; Brav et al. 2010; Bebchuk et al. 2015; Brav et al. 2015b; Brav et al. 2015a). We shed light on the information role that sell-side analysts play by constructing an activism-related dictionary. We also show that sell-side analysts provide ex ante supportive content (i.e., lengthier, more detailed reports containing "harder" quantitative information), which is associated with higher returns to intervention. To our knowledge, this is the first study to show that sell-side analysts are a valuable resource for hedge fund interventions.

We also contribute to the literature on sell-side analysts by further exploring the information role of sell-side research for hedge funds. Prior studies focus on the information role of analysts related to corporate events such as earnings releases and conference calls (e.g., Chen et al. 2010; Huang et al. 2014; Huang et al. 2018). Our study shows the information produced by analysts is also valued by an increasingly impactful capital market participant, activist hedge funds. Although sell-side analysts may struggle to capture the attention of buy-side clients (Spence et al. 2019), our study shows that supportive analyst report content relevant to activism assists in the value creation by activist hedge funds in the form of higher intervention-date equity market returns.

2. Literature review and conjectures

Hedge fund activism: Impact, objectives, and tactics

Over the past two decades, activist hedge funds have exerted significant influence and imposed substantial changes on their target firms. Many studies show that hedge fund activism creates value for shareholders and improves firm performance, both in the short- and long-term. The seminal study by Brav et al. (2008) examines a sample of 1,059 hedge fund activism events from 2001 to 2006 and shows that abnormal returns to targets after activist intervention announcements are significantly positive. Following that study, other papers have consistently produced similar findings for both short- and long-term stock market performance (e.g., Clifford 2008; Griffin and Xu 2009; Klein and Zur 2009; Brav et al. 2015b). Hedge fund activism also plays a role in corporate governance by enacting major changes in target firms. The extant activism literature shows a variety of such changes, including improvements in productivity (Brav et al. 2015a), capital allocation efficiency (Brav et al. 2015a), labor productivity (Brav et al. 2015b), tax efficiency (Cheng et al. 2012), accounting conservatism (Cheng et al. 2015), innovation efficiency (Brav et al. 2018), and product differentiation (Aslan and Kumar 2016).

Hedge funds often approach their target firms with publicly stated objectives. Prior studies (e.g., Brav et al. 2008; Greenwood and Schor 2009; Brav et al. 2015a) summarize these objectives into five categories: (i) general undervaluation/maximize shareholder value, (ii) capital structure, (iii) business strategy, (iv) sale of target company, and (v) governance. Activist hedge funds use various tactics to effectively fulfill these objectives. Ranging from the least to the most aggressive approaches, these tactics include frequent communication with the target firm's board, management, or other shareholders (e.g., via open letters); board representation; confrontation with management or the board; formal shareholder proposals; proxy fights; lawsuits; and takeover bids.

The role of analysts in information production

As information intermediaries in capital markets, sell-side analysts collect and generate new information for investors and/or analyze and clarify existing information. In prior studies, these two information production functions are termed the information discovery and information interpretation roles (e.g., Ivković and Jegadeesh 2004; Chen et al. 2010). Analysts use multiple sources to gather information, including visiting corporate sites (Cheng et al. 2019), investigating supply chains (i.e., "channel checks"), surveying customers (Brown et al. 2015), and interacting with managers (Mayew 2008). Sell-side analysts with high levels of financial expertise often introduce new topics and make insights through this information discovery role (Chen et al. 2010).

Sell-side analysts also interpret information, which can attract investors' limited attention and raise their awareness of relevant issues. For example, Johnston et al. (2009) examine the value of sell-side debt analysts' interpretation of credit rating changes. Analysts can include verifiable, quantitative information that is more valued by investors (Kecskés et al. 2017) and better signal the reliability of specific information with their reputational capital (Stickel 1992). Further, to gain a competitive advantage, analysts often combine existing information from various public material and private non-material sources, as described by mosaic theory (Cheynel and Levine 2020).[6]

The information conveyed in sell-side analysts' research is valuable to markets by promoting stock liquidity and contributing to price discovery (Madureira and Underwood 2008), improving the accuracy of firms' own earnings estimates and recommendations (Klein et al. 2020), providing access to more substantive and value-adding interactions with companies (Spence et al. 2019), facilitating corporate disclosures (Keskek et al. 2014; Rubin et al. 2017), and improving corporate governance (Tan 2014). While most prior studies focus on how analysts' information

[6] Information flow from sell-side analysts to activist hedge funds and the information-processing function of activist hedge funds is unobservable. We therefore make no distinction between information discovery and interpretation.

affects conventional investors and coverage firms, a few examine interactions between analysts and other capital market participants. We extend this line of research by specifically exploring the role of the information produced by sell-side analysts in hedge fund activism.

Analysts have at least three incentives to produce activism content for hedge funds: recognition from buy-side institutions, contribution to investment banking services, and improved financial media visibility. We do not know whether analysts can predict hedge funds' activism agendas, but analysts may construct coverage firm portfolios that are favored by hedge funds. One key reason for producing such content is that analysts' compensation and promotion depend on their reputation and ability to win favorable ratings from buy-side institutional clients (Groysberg et al. 2011). Analysts devote more effort to researching high-potential firms that can generate larger returns for buy-side institutions (Harford et al. 2019). Annually, buy-side institutions evaluate sell-side analysts, and their assessments form the basis "all-star" analyst selections and the allocation of buy-side investors' trading commissions across brokerage firms (Ljungqvist et al. 2007; Maber et al. 2014).

Another important source of compensation for sell-side analysts is investment banking business generated from coverage firms (Groysberg et al. 2011). Since hedge fund activists drive changes that require investment banking services (e.g., spin-offs, mergers, recapitalizations, etc.), sell-side analysts have incentives to propose potential activist targets and identify specific activism tactics and objectives to help secure related investment banking business for their employer. Lastly, analysts choose coverage firms that can increase their visibility to buy-side institutions (Harford et al. 2019). Media coverage, especially financial institutions' news coverage (e.g., Bloomberg), not only raises buy-side recognition of sell-side analysts, but also better disseminates their earnings forecasts and recommendations to investors (Bradshaw et al. 2021, Chiu et al. 2021).

Sell-side analysis and hedge fund activism

Analyst reports cover a wide range of topics that can be relevant to activist hedge funds, including asset disposition, mergers, payout policy, recapitalizations, financial performance, business strategies, competitive position within an industry, risk exposure, and management effectiveness (Huang et al. 2014). These topics can be the foundation for activist hedge funds to develop and propose various objectives (e.g., Brav et al. 2008; Brav et al. 2015a). Moreover, hedge funds need to carefully choose tactics to effectively engage with the management of their target firms (Brav et al. 2008). Sell-side analysts are an important source of company management access (Brown et al. 2016), and their reports can help hedge funds determine which tactics are most likely to be successful when engaging a target. Given sell-side analysts' research incentives and the nature of analyst report content, we expect that pre-intervention sell-side analyst reports are likely to cover activism issues that are recognized by hedge funds. Derived from the activism objectives and tactics identified by Brav et al. (2008), we use textual analysis to create a new dictionary of key hedge fund activism terms and then test its representativeness using analyst reports.

We exploit the information production through analyst reports released before hedge fund intervention filings and examine the effect on shareholder gains associated with said interventions. We identify two primary reasons why hedge funds use sell-side research and may also value research for activism events. First, buy-side institutions' investment decisions that are supported by analyst reports can more effectively signal to investors their care and prudence as they fulfill their fiduciary responsibility (O'Brien and Bhushan 1990). Two information sources can reinforce one another if the first source provides specific data that are made more informative after additional explanation and interpretation by the second source (e.g., Brenner et al. 1996; Chen et al. 2010). The recipient of verifiable information is then less likely to question the validity of facts in the

message (e.g., Koehler 1993). We posit that analyst report content which supports activism issues raised in 13D filings can reduce other investors' information uncertainty and raise awareness of these issues, leading to more positive activism-date equity market reactions.

Second, supportive information can signal that activist hedge funds are likely to be able to successfully confront target firms and solicit settlements from management (Levit 2019; Wiersema et al. 2020). Specific content in sell-side analyst reports can also be used to justify opinions (Asquith et al. 2005). Analyst reports that take an activist stance can implicitly rationalize and substantiate hedge funds' intervention actions, helping to convince markets that hedge fund intervention is likely to be well executed. For example, sell-side research often presents sum-of-the-parts analyses[7] (Arzac 2008; Imam et al. 2008), which can be used by activist hedge funds to show that breaking up a target company will increase shareholder value. If activist hedge funds use sell-side analysis explicitly in their justification for activism issues (i.e., in communications to boards of directors, management, etc.), other shareholders may value this supportive information, leading to improved returns for the activist hedge funds' investors, and subsequent increases in the fund's performance-based fees (Liang 1999).

Based on these two arguments, we examine four attributes of information supportiveness: verifiability (activism content), specificity (specific activism objective content), comprehensiveness (length of reports), and reliability (quantitative information). We focus on pre-intervention analyst reports that may contain information supporting intervention events. We scale the number of times each information attribute is used in pre-intervention reports by the number of activism words used in hedge funds' intervention disclosures (13D filings) to examine whether

[7] Sum-of-the-parts analysis independently values each business unit within a diversified firm. These individual valuations are then summed for comparison to the current market value of the entire firm, often to determine if a diversification discount or premium exists.

the relative supportiveness of each information attribute in pre-intervention reports has an impact on intervention outcomes.

3. Data

Sample construction

Following Brav et al. (2008), we begin assembling our hedge fund activism event dataset by collecting Schedule 13D filings from the SEC's EDGAR database over the period of 2008 to 2017. From these 13D filings, we exclude filers classified as banks, brokerage companies, regular corporations, foreign institutions, individuals, insurance companies, pension funds, and trusts. We cross check with a list of activist hedge funds to narrow down the set of 13D filings.[8] We also exclude Schedule 13D filings related to risk arbitrage, distress financing, and mergers and acquisitions, as well as those targeted by investment trusts or closed-end funds. Moreover, we follow the procedures in Brav et al. (2008) to collect additional activism events that are not claimed through Schedule 13D filings when a hedge fund owns less than 5% of the target company's shares. These steps yield 4,669 activist hedge fund target events.

Because we carry out propensity score matching in our main analyses, we require annual accounting information for each observation. Therefore, we limit the dataset to only the first-time target event for each firm and require at least one year of accounting data from Compustat before and after the event. This procedure drops our total to 1,800 intervention events. We merge the remaining events with other datasets for matching criteria such as institutional ownership and have 1,213 events after merging. In total, 819 events are matched with a control observation based on the propensity score matching model in Brav et al. (2008). A summary of this data sample selection process is presented in panel A of Table 1.

[8] The list of activist hedge funds is kindly shared from Brav et al. (2008) and includes additional Google search information to identify new activist hedge funds since 2008. Please refer to their study for a detailed description.

Next, we manually collect sell-side analyst reports from the Thomson One Investext database. We convert each portable document format (PDF) report file into text and employ optical character recognition when text is not internally available within a PDF document. We collect and convert analyst reports from three months before until three months after each intervention date for both treatment and control firms. We merge our report data with other datasets such as Compustat, CRSP, and I/B/E/S for further tests. Panel B of Table 1 presents report-level summary statistics. In total, an untabulated 15,490 (11,996) reports are issued within 90 days of intervention dates for target (matched) firms. The average length of reports is approximately 3,371 total words.

Summary statistics

Panel C of Table 1 provides firm-level summary statistics of variables used in our empirical tests for both target and matched firms. All continuous variables are winsorized at the 1% level. The variable *CAR[-1,+1]* is cumulative abnormal returns from one day before intervention events to one day after. For the treatment firms, the event date is the date of the 13D filing; for control firms, the event date is the same as that of the matched treatment firm. The average intervention-date *CAR[-1,+1]* is 1.37% for all firms and 2.65% for target firms, comparable to Brav et al.'s (2008) estimate of 2%. *CAR_PRIOR_ACT* is the cumulative 10-day abnormal return ending before the start of the activist intervention-date windows for CARs of issuance of analyst reports. The mean (median) of *CAR_PRIOR_ACT* of –0.101% (0.000%) shows a moderate pre-intervention stock price decline. Summary statistics for the variables capturing other firm characteristics are comparable to those of prior studies (e.g., Huang et al. 2014; Huang et al. 2018). These include return on assets (*ROA*), market capitalization (*MV*), financial leverage (*FINLEV*), book-to-market ratio (*BTM*), and an indicator variable for actual earnings falling short of sell-side consensus in the quarter prior to activism (*MISS*). On average, 16% of announced earnings miss analysts'

expectations, which is comparable to findings in recent studies (e.g., Huang et al. 2018). We also include institutional investor ownership (*INST*) to control for the effects of monitoring by financial institutions. Detailed descriptions of all variables are provided in Appendix 2.

Propensity score matching

We use propensity score matching to prepare a dataset of control firms to our treatment group (i.e., activism targets) for further manual collection of analyst reports. Before matching, we identify an initial pool of candidate matches comprising public firms not targeted by activist hedge funds during our sample period. In total 39,308 firm-year observations are in this pool. Each control firm ideally has the same characteristics as each treatment firm except that the latter is targeted by activist hedge funds. For each target firm, we identify a non-target control firm with the closest propensity score in event year t-1. Following Brav et al. (2008), we use the following probit model to estimate the probability of being targeted by activist hedge funds:

$$D\_TARGET_{i,t} = \beta_0 + \beta_1 MV_{i,t-1} + \beta_2 Q_{i,t-1} + \beta_3 GROWTH_{i,t-1} + \beta_4 ROA_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIVYLD_{i,t-1} + \beta_7 RND_{i,t-1} + \beta_8 HHI_{i,t-1} + \beta_9 ANALYST_{t-1} + \beta_{10} INST_{i,t-1} + \epsilon_{i,t}. \quad (1)$$

D_TARGET equals one if the firm is the target of hedge fund activism in year t and zero otherwise.

The results of the probit model are presented in panel A of Table 2. The pseudo R^2 of 4.89% is higher than the 2.68% found by Brav et al. (2008). Target firms have low growth but are still profitable: *Q* and *GROWTH* have negative coefficients, while *ROA* has a positive coefficient. Panel A also shows that target firms tend to have lower dividend payouts (*DIVYLD*) and higher book leverage (*LEV*).[9] Target firms are also relatively more industrially diversified (*HHI*) and tend to have higher institutional ownership (*INST*). The sign of *ANALYST* is significantly positive (coefficient 0.012, t-stat 5.876), offering preliminary evidence that sell-side coverage plays some

[9] All results in our study are unchanged when we use book (*LEV* as in Brav et al. 2008) or financial leverage (*FINLEV*).

role with respect to activist hedge funds.[10] The effects of these variables are all consistent with prior hedge fund activism studies (e.g., Brav et al. 2008).

Using the predicted value of the probit model as the propensity score, we match each hedge fund target firm with a control firm that has the closest propensity score in the same year, without replacement and within a caliper of 3% propensity score. We identify 819 treatment-match pairs. We compare the statistics of the treatment and matched firms in panel B of Table 2. The mean differences of most variables between the treatment and match firms are not statistically significant, indicating balanced treatment and matched samples. For each treatment and matched firm, we then include the preceding and succeeding firm-year observations for further analysis.

We also calculate the area under the receiver operating characteristic (ROC) curve (Hosmer et al. 2004) and present the results in panel C of Table 2. ROC curves have been used extensively in the accounting literature (e.g., Lisowsky 2010, etc.) to estimate both the validity and predictive ability of logistic models on out-of-sample period observations. An area under the ROC curve of 0.50 represents a model that performs no better than chance. Our ROC curve is approximately 0.70, indicating strong discriminatory power of the matching model to hedge fund activism target firms.

4. Empirical results

The information production role of analysts before intervention

To investigate the information production role of analysts before hedge fund intervention, we analyze content in pre-intervention analyst reports. We use the categorization of objectives and tactics in Brav et al. (2008) to develop a custom activism-related dictionary.[11] We identify keywords, synonyms, and related words for each specific objective and tactic. The complete

[10] Approximately 40% of firm-year observations in panel A of Table 2 have no sell-side analyst coverage. Untabulated results show no differences between matched samples that exclude or include firms with no analyst coverage.
[11] The categorization of Brav et al. (2008) is further demonstrated (e.g., Brav et al. 2015a) and applied (e.g., Klein and Zur 2009; Boyson and Mooradian 2011; Boyson and Pichler 2019) in prior studies.

dictionary is provided in Appendix 3. We analyze the text of reports by counting the number of words and word stems that match our dictionary.[12] The average number of activism words in our target firm pre-intervention reports is 3.1, the magnitude of which is comparable to a similar debt-equity conflict event dictionary in De Franco et al. (2014) which finds a mean of 3.5 keywords across their sample of sell-side debt analyst reports.

We next create an activism dictionary variable *DIC_ACT* by scaling the number of activism words by the total number of words in each report. To examine content characteristics of analyst reports and potential associations with this activism dictionary, we construct three additional measures: *DIC_SPE, LENGTH,* and *QUANT*. Brav et al. (2008) group activism objectives into one general category and four categories of specific objectives: capital structure, business strategy, sale of targets, and corporate governance. *DIC_SPE* is the scaled sum of keywords in pre-intervention analyst reports from the list in panel A of Appendix 3 for all four specific objectives. We expect that content in analyst reports related to specific objectives can help investors understand activism issues. *LENGTH* is the natural logarithm of the number of total words in each report. Lengthier reports are more detailed and convey more information to investors (Gibbons et al. 2021). *QUANT* is the total count of numbers and numeric phrases scaled by the total count of words and numbers, following Campbell et al. (2021). This measure captures whether textual disclosures are more quantitative in nature, as such disclosures tend to convey more precise and transparent information and may reduce investors' uncertainty when assessing activism-related content.

Table 3 presents the results of our tests using the activism dictionary and sell-side analyst reports. Panel A shows results from univariate tests on the activism dictionary variable and other

[12] Application examples of the activist dictionary in sell-side analyst reports (with dictionary terms displayed in bold type) prior to Ellington Management's targeting of EMC are shown in panel B of Appendix 1.

variables capturing content characteristics. We include only pairs of firms that have at least one analyst report before and one after intervention to ensure a balanced sample for comparison.[13] Our cross-sections examine analyst reports issued three months before and after hedge fund intervention for treatment and matched firms.[14] Relative to the control subsample (20.07), the number of analyst reports per firm is substantially higher in the treatment group (23.76), indicating more aggregate sell-side information is produced on firms targeted by activist hedge funds. Importantly, we find that the percentage of words in analyst reports that appear in the activism dictionary is significantly higher for the treatment group than the control group. Our univariate t-test shows that before hedge fund intervention, *DIC_ACT* for the treatment group is 0.045‰ higher (t-stat = 3.146), significant at the 1% level. The t-test comparing post-intervention activism content is similar. This statistical evidence validates our activism dictionary. We also find that pre-intervention analyst reports of treatment firms have more specific activism content, more total words, and more quantitative information than those of control firms.

We also see time-series differences. After hedge fund intervention, analyst reports on treatment firms have significantly less specific activism content, are shorter in length, and provide less quantitative information, suggesting that the supportive role of sell-side report information content for activist hedge funds is generally higher prior to target firm intervention. In contrast, post-intervention, we do not see significantly less overall activism content (*DIC_ACT*) among the treatment firms than during the pre-intervention period (t-stat = 1.335). Because analysts play both information discovery and interpretation roles, they may need to elaborate on general activism

[13] This restriction leads to an approximately 4% reduction in the number of reports in our sample.
[14] As a robustness test, we also restrict the sample to analyst reports issued one, two, or six months before and after hedge fund intervention. The results are similar to those shown in Table 3.

issues in both pre- and post-intervention reports, leading to insignificant changes in the percentage of activism content.

Another inconsistency in these univariate results is that the difference-in-difference (DiD) estimator for specific activism content *DIC_SPE* is not statistically significant. *DIC_SPE* decreases for the treatment group after the intervention but decreases for the control group even more. Analysts typically cover specific activism content to postulate hedge fund intervention agendas, which can be made available through 13D filings. Treatment firms may not have such information needs after intervention, resulting in less specific activism content coverage. Matched firms experience a greater reduction in such information needs as they do not face the potential threat of being targeted after treatment firm intervention events are revealed (Gantchev et al. 2019).

We next investigate the relationship between sell-side analysts' production of activism-related information and other information attributes by running regressions of *DIC_ACT* on *QUANT* and *LENGTH*, respectively. We do not test *DIC_SPE* since it is a subset of *DIC_ACT*. We follow Table V in Brav et al. (2008) in choosing control variables, including the following firm characteristics: *ROA* (return on assets), *MV* (market capitalization), *FINLEV* (financial leverage), and *BTM* (book-to-market ratio). To proxy for investor expectations, we include cumulative 10-day abnormal returns before each analyst report issuance date (*CAR_PRIOR_REP*) and an indicator variable equal to one if prior-quarter earnings miss expectations (*MISS*). We include brokerage and year fixed effects in each regression specification. The results are presented in panel B of Table 3. Coefficients for *LENGTH* and *QUANT* are positive and highly significant. These results suggest that sell-side analysts use quantitative information and more detailed reports to validate and better interpret activism-related issues before hedge fund intervention.

Analysts' informational role and its effect on hedge fund intervention equity returns

We next investigate whether sell-side analysts' information production has an impact on the stock market reaction of target firms to intervention events. To capture the interaction between analyst reports and information from activist hedge funds, we scale pre-intervention report content characteristics by the number of activism words in 13D filings that hedge funds use to directly describe their intervention intentions and/or motivation. These ratios capture the extent to which hedge funds' activism issues are supported by various content characteristics in pre-intervention reports.[15] For example, *REP_ACT_13D* is the number of activism words in pre-intervention-event sell-side reports scaled by the number of activism words in 13D filings.[16] *REP_SPE_13D* is the number of specific objective activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_LEN_13D* and *REP_QNT_13D* are the total number of words (length) and the count of numbers/quantitative words, respectively, in pre-event sell-side reports scaled by the number of activism words in 13D filings. *REP_LEN_13D* proxies for the relative overall amount of information contained in sell-side analyst reports, while *REP_QNT_13D* represents the extent to which the hedge funds' activism issues are supported by "harder," more easily verifiable information (Bertomeu and Marinovic 2016; Liberti and Petersen 2019).

To better interpret coefficients, we scale each of these variables by 1,000. We use the propensity score matched sample and interact each of these variables with *TREAT*, which indicates whether the firm is in the treatment subsample. These interaction terms are our variables of interest.

[15] The average length of analyst reports in our sample is approximately 8.4 pages, while item 4 of hedge funds' 13D filings, which we use to calculate the variable *13D_ACT*, typically contains only a few paragraphs to explain the activists' intervention. We replace missing values of *13D_ACT* with zero, but our analysis is not sensitive to exclusion of observations with empty item 4 sections. Please refer to summary statistics in panel C of Table 1 for more details.

[16] We do not use the percentage of activism words in 13D filings and the percentage of content characteristic in analyst reports when constructing our variables because information consumers are predisposed to connect words between documents rather than compare percentages of certain content. For example, Thayer (2011) shows that investors spend more time reading other credible documents (e.g., analyst reports) relevant to existing beliefs (e.g., item 4 of 13Ds).

Because the control firms do not have 13D filings, we use the treatment sample average number of 13D activism words (10) to calculate ratios for the control subsample.[17] We run regressions of hedge fund intervention-date [-1,+1] cumulative abnormal returns on these independent textual interaction variables, collapse all analyst report characteristics to the firm-level, and include firm controls from Brav et al. (2008). The results are presented in Table 4.

In column (1) of Table 4, the variable of interest, *REP_ACT_13D×TREAT*, has a coefficient of 2.008 (t-stat = 2.264), which is significant at the 5% level. This result indicates that a 10-word increase in the number of activism words in analyst reports per each activism word in 13D filings leads to a 2.01% increase in intervention-date CARs for target firms than for control firms. This effect is equivalent to an economically significant $4.39 million average increase in target stock market value.[18] The variables of interest in the other columns are also statistically significant and can be interpreted similarly: a one-standard-deviation increase in *REP_SPE_13D*, *REP_LEN_13D*, and *REP_QNT_13D* leads to 0.67%, 0.77%, and 0.71% higher CARs or $1.47, $1.69, and $1.54 million increases in target stock market value, respectively. As an untabulated robustness test, we also include the length of 13D filings as a control variable for the amount of intervention-supportive evidence directly provided by each activist hedge fund. Our Table 4 results still hold.[19] Moreover, one might argue that we overstate the effect by including in our analysis only the activism words in 13D filings, since the entire filing could be viewed as related to activism. To mitigate this concern, we run these tests again using the number of total words for item 4 of 13D filings as the denominator in our four variables of interest and obtain similar results. In another

[17] As a robustness test, we also use the paired treatment firm 13D activism words for each matched firm to compute each textual ratio. The results are similar.

[18] We multiply the average market capitalization of target firms by 2.01%: exp (5.386)×2.01% = $4.39 million.

[19] Another potential confounding factor is pre-intervention non-hedge-fund institutional trading. Gantchev and Jotikasthira (2018) find that institutional stock sales predict hedge fund activism and that activists capture benefits from this increase in liquidity. We add institutional trading firm controls (*ΔMF holdings/SHROUT* and *Inst. net volume/SHROUT)* used in Gantchev and Jotikasthira (2018). These untabulated results are similar.

robustness test, we use only treatment firms in each specification, omitting *TREAT* and its interaction terms. The regression coefficients for the four textual variables of interest (*REP_ACT_13D*, *REP_SPE_13D*, etc.) remain positive and statistically significant.

Overall, these DiD findings indicate that sell-side analysts' supportive evidence—more activism-related content, longer reports, and more quantitative information in pre-intervention reports—has a positive effect on returns to hedge fund activist intervention.

Activist hedge funds' letters to shareholders, boards, and/or management

Activist hedge funds use various intervention tactics, ranging from mild private communications with board members and/or management to aggressive lawsuits against target firms. Tactics via public information channels such as letters to shareholders (and/or other relevant stakeholders, including management or boards of directors) cannot only pressure the target firm but also communicate to outsiders the hedge fund's ex ante beliefs about the potential success of intervention. More specifically, if activist hedge funds directly mention sell-side analysts' relevant information in stakeholder letters, other investors may consider the intervention better justified and thus more likely to deliver additional shareholder value. We investigate this conjecture by testing the effect of letters to stakeholders on the positive association between analysts' informational production and activist hedge fund intervention returns.

We manually collect publicly available letters issued to shareholders, boards of directors, and/or management written by activist hedge funds. For the treatment firms in our sample, we find 152 letters attached to 13D filings and collect 36 additional letters through Factiva. Out of these 188 total letters,[20] approximately 31.9% mention some sell-side analysis, such as report content, recommendations, specific analyst names, or their affiliated brokerage firms. We create an

[20] Our readings of 13D filings and Factiva news articles reveal the existence of 44 additional letters, but these letters are not publicly available.

indicator variable *LETTER*, which takes the value of one if the stakeholder letter includes one of these mentions, and zero otherwise. We use the same model specification as in Table 4, but limit the analysis to our treatment sample and interact *LETTER* with our four textual measures. The results are presented in Table 5. Each interaction term has a positive, statistically significant coefficient, suggesting that, for target firms with more pre-intervention supportive information production from analysts, activist hedge fund letters to shareholders, management, or boards of directors mentioning sell-side analysis improve intervention outcomes, supporting our conjecture.

Identification of sell-side analysts' informational role in hedge fund intervention

One can argue that investors have access to alternative information sources, such as media coverage, that can be related to hedge funds' 13D filings, and that they react based on the relevance of these alternative information sets. Although it is difficult to capture the full information set for empirical studies, we explore exogenous variation in analyst reports to mitigate this endogeneity concern. We follow prior literature (e.g., Kelly and Ljungqvist 2012) and use the termination of analyst coverage as an exogenous shock to test the causal effect of analysts' informational roles with respect to hedge fund intervention outcomes. We identify 72 brokerage firms over our sample period that do not issue earnings estimates in subsequent years.[21]

We create an indicator variable *CLOSE* that equals one if a target firm was affected by any terminated analyst coverage, and zero otherwise. We use the same model specification as in Table 5 and interact the indicator variable *CLOSE* with each of the four textual measures. We expect that sell-side analysts' informational impact on intervention-date stock returns will diminish for target

[21] Kelly and Ljungqvist (2012) identify 43 brokerage closures between January 2000 and January 2008. We identify brokerage closures in a slightly different way. Thomson Reuters no longer identifies brokerage firms. We identify closures without knowing the names of brokerage firms, but we are still able to identify affected firm stocks through I/B/E/S earnings estimate files. (Please see https://wrds-www.wharton.upenn.edu/pages/support/data-overview/wrds-overview-ibes-historical-earnings-estimate-database/)

firms with terminated analyst coverage. The results are presented in Table 6. Each interaction term has a significant and negative coefficient, indicating that terminated analyst coverage diminishes the influence of sell-side information production on hedge fund intervention stock returns. For example, in column (1), the variable of interest *REP_ACT_13D×CLOSE* has a coefficient of -3.715 (t-stat = -2.043), significant at the 5% level. The results in other columns can be interpreted similarly. We believe this evidence mitigates causality concerns between supportive analyst information production and activist hedge fund intervention returns.[22]

Quid pro quo between activist hedge funds and sell-side analysts

One could also argue that the effect of activism content in analyst reports on intervention outcomes is driven by a "quid pro quo" between activist hedge funds and sell-side analysts. Klein et al. (2019) show that opportunistic hedge fund trading is significantly higher when an analyst's recommendation originates from the hedge fund's prime broker. Activist hedge funds may pressure their prime broker's sell-side analysts to use report language and/or changes in recommendations to drive the target's stock price down prior to the announcement of interventions. Hedge funds in this scenario benefit from the decrease in stock price prior to their 13D intervention announcement, earning larger profits. Sell-side analysts benefit from better external evaluations and higher prime brokerage revenue, which are related to their compensation (Brown et al. 2015).

We examine whether the effect of sell-side activism-related information on intervention outcomes is driven by this shared prime brokerage subsample. We obtain initial data of prime brokers from the SEC website. Investment advisers registered with the SEC file form ADV to disclose information about identification, business operations, and certain events.[23] These advisers

[22] In an untabulated test, we find a positive and statistically significant coefficient for *ANALYST* using only the subsample of target firms with no analyst coverage terminations.

[23] For a detailed description of form ADV, please refer to: https://www.sec.gov/about/forms/formadv-instructions.pdf. The data of form ADV are provided by the SEC at: https://adviserinfo.sec.gov/compilation.

voluntarily report their prime brokerage(s) in Schedule D of item 1 of form ADV. We supplement the data by manually searching the S&P Capital IQ database, which provides prime brokerage information as well. We also consult Eureka Hedge, a major hedge fund database company, and cross check our data with their data. In our collected dataset, each hedge fund may have multiple prime brokers. Out of 269 unique activist hedge funds in our sample, we successfully identify the prime brokers of 232 funds, which are involved in 694 of 819 overall intervention events.

We create an indicator variable *SAME_PB*, which takes the value of one if the hedge fund uses the same prime broker as one of the sell-side analysts who produce pre-intervention reports. We use the same model specification as in Table 5 and interact *SAME_PB* with each textual variable to test whether a shared prime broker has a significant impact on the positive relation between analyst information production and hedge fund intervention returns. The results are presented in Table 7. Each interaction term has a negative, statistically insignificant coefficient. These findings are inconsistent with the quid pro quo between traditional hedge funds and sell-side analysts shown by Klein et al. (2019). We therefore do not find support for this alternative explanation.

Analysts' incentives and activism-related report content

So far, we have found that sell-side analysts play an informational role in activist hedge fund intervention returns. In this section, we explore sell-side analysts' incentives for producing activism content. Prior literature shows that analysts' compensation and promotion depend on favorable ratings from buy-side clients (Groysberg et al. 2011), their visibility among financial market participants (Bradshaw et al. 2021, Chiu et al. 2021), and the implicit contributions they make to securing investment banking business derived from coverage firms (Harford et al. 2019).

We use three measures to proxy for these incentives. *INST_OWN* is the percentage of target firm institutional ownership, capturing the potential level of recognition from buy-side institutions. *INST_ATTEN* is the ranking, on a scale of 0 to 4, of target firm Bloomberg news searches[24] on the date prior to analyst report issuance. *INVEST_BANK* is an indicator variable that takes the value of one if an analyst's employer offers investment banking and trading services, and zero otherwise.[25] We obtain institutional ownership data from WRDS and brokerage service data from Capital IQ or the research firm's website. We use these variables to test the effect of each incentive on the production of activism content prior to activist hedge fund intervention in Table 8. In each column, the variable of interest has a positive, statistically significant coefficient, suggesting that sell-side analysts have strong incentives to produce reports with more activism-related content.[26]

Analyst report information, hedge fund characteristics, and returns to activism

Activist hedge funds' target firm 13F filings prior to intervention

We next examine differences in the impact of sell-side information production on intervention returns for activist hedge funds with and without prior 13F filings in target firms. Form 13F is an equity holding report required to be filed quarterly by all institutional investment managers with at least $100 million in assets under management. We posit that when activist hedge funds' target equity ownership is not disclosed prior to intervention, target stock prices benefit

[24] *INST_ATTEN* is a variation of the *HEAT* indicator variable used by Ben-Rephael et al. (2017). We also collect the number of general audience news outlet article mentions of each sell-side analyst's name in Factiva for a random sample of analysts covering firms targeted by activist hedge funds and use this variable in place of *INST_ATTEN*. These untabulated results remain positive but are statistically insignificant.

[25] Related to the "quid pro quo" analysis in Table 7, one can argue that these research production incentives are primarily driven by sell-side analysts whose employers are also activist hedge funds' prime brokers. We rule out this possibility by excluding these shared prime broker observations and find similar results.

[26] In an untabulated test, we examine analyst-level variation in activism-related report content by comparing the difference between specifications (similar to those in panel B of Table 3 and in Table 8) with and without analyst fixed effects. We find that adding analyst fixed effects substantially increases the adjusted R^2 for *DIC_ACT* from 0.199 to 0.533. An *F*-statistic of these fixed effects shows their joint significance at the 0.01% level. These results indicate that some sell-side analysts idiosyncratically produce more activism-related information than others.

more from activism-supportive sell-side information, as other shareholders experience a greater reduction in information uncertainty. In our sample, 56.5% of activist interventions have no prior target 13F filing. We create an indicator variable *NO_13F*, which takes the value of one if the hedge fund has no prior ownership disclosure in the target firm prior to intervention, and zero otherwise. We use the same model specification as in Table 5 and interact *NO_13F* with our four textual measures. The results are presented in panel A of Table 9. Each interaction term has a positive, statistically significant coefficient, indicating that sell-side analyst information has a more pronounced impact on intervention stock returns of target firms lacking prior activist 13F filings.

Activist hedge fund experience

We further posit that experienced hedge funds will better capture any incremental target firm stock returns arising from sell-side analysts' supportive information. Experienced activist hedge funds more effectively pressure management (Krishnan et al. 2016) and may use confirmatory sell-side information to create public pressure. Moreover, the psychology literature shows that the receiver (investors) values the qualification of the messenger (activist hedge funds) when information is confirmatory (e.g., Hirst et al. 1995; Clement et al. 2003; Mercer 2004).

We search Capital IQ and other data sources to determine each activist hedge fund's inception date. We create an experience indicator variable *ACT_EXP*, which takes the value of one if the hedge fund's age is above the sample median of 11 years, and zero otherwise. We use the same model specification as in Table 5 and interact *ACT_EXP* with our four textual measures. The results are presented in panel B of Table 9. Each interaction term has a positive coefficient that is statistically significant, suggesting that interventions of more experienced hedge fund activists incrementally benefit from sell-side analysts' supportive information.[27]

[27] Correlations between *LETTER*, *CLOSE*, *SAME_PB*, *NO_13F*, and *ACT_EXP* range from -0.17 to 0.10, suggesting that these indicator variables capture distinct activist hedge fund and/or sell-side analyst characteristics.

5. Conclusion

As hedge fund activism has increasingly become a prominent phenomenon, it has substantially changed and shaken up public companies. To both inform and justify their activist interventions, hedge funds may rely on sell-side analyst research. Sell-side reports include detailed information about coverage firms including valuation, proprietary quantitative metrics, prescriptions for maximizing shareholder value, and other information related to objectives and tactics that activist hedge funds can use.

We examine the specific types of information sell-side analysts produce in their coverage of hedge funds' target firms and whether the information analysts produce influence hedge fund intervention outcomes. We introduce an activism-related dictionary and employ textual analysis methods to show that sell-side analyst reports covering firms subsequently targeted by activist hedge funds have significantly more pre-intervention content related to activism than control firms. We further show that activism content in pre-intervention analyst reports is positively associated with lengthier reports and more quantitative information. More importantly, we find that, relative to activist 13D filings, these informational components of pre-intervention sell-side analyst reports are associated with higher intervention-date target firm stock returns. Target returns are also higher when letters to shareholders, directors, and/or management contain references to sell-side analysis, providing direct evidence of hedge fund activists' successful use of this supporting information to validate their objectives and tactics.

The relationship between sell-side analyst report content and intervention returns is robust to an identification test using brokerage firm closures as an exogenous shock to analyst coverage. We caution, however, that we are unable to observe ex ante information flow between sell-side analysts and activist hedge funds. Therefore, we are unable to determine whether activist hedge

funds identify targets independently from sell-side analysts. However, we rule out an important alternative explanation that a quid pro quo drives hedge funds' influence on pre-intervention analyst report content by testing events when hedge funds' prime brokers and sell-side analysts' employers are the same. We also conduct cross-sectional analyses, which show that the level of sell-side report content related to activism is consistent with analyst incentives. We further identify two scenarios with respect to active hedge fund characteristics: (i) funds that do not file a 13F indicating equity ownership prior to intervention, and (ii) funds with greater experience. Consistent with information asymmetry and uncertainty reduction, the relationship between sell-side information production and target firm intervention returns is more pronounced in these scenarios.

Sell-side research faces both regulatory (e.g., MiFID II, etc.) and business-model viability challenges (e.g., competition from free or low-cost information sources, etc.) that make it difficult to cover many public firms. If sell-side research continues to decline, our evidence suggests that gains to activist target firm shareholders and associated improvements in corporate governance realized by hedge fund activism may decrease as markets would have less verifiable and relevant information from sell-side analysts. Regulators and policymakers contemplating actions that could further debilitate sell-side research should consider potential unintended consequences that may impair its important, supportive informational role with respect to hedge fund activism.

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Appendix 1: EMC/Ellington Management example

Panel A: Excerpt of Ellington Management Letter to the board of directors of EMC Corporation, October 8, 2014 (Activism Date: October 8, 2014)[28]

Core EMC's closest peer . . . currently trades at ~6x 2015E EBITDA and ~13x 2015E P/E, a premium to Core EMC of ~80% and ~70%, respectively. This is even despite the fact that Core EMC is the market leader in storage with such attractive assets as VNX, Data Domain, Isilon, XtremIO, RSA and Pivotal (all of which are included in Core EMC). Core EMC, if it traded as a standalone company, would undoubtedly trade at a *premium* to NetApp.

The discount serves no one's benefit—not shareholders, not employee-shareholders and not the executives trying to run the company. Here is a brief sampling of what independent observers have said:

"In fact, ***at current price we believe investors are getting core EMC ($16B sales, 20% Op margins, $1.35 EPS) for FREE*** *as EMC's price reflects value of: VMW ($15.85), Emerging storage ($6.24), RSA ($2.99), Pivotal ($1.71) and Cash on hand ex-VMW ($1.21).* ***Should core EMC get valued close to NTAP, it would add an incremental ~$10 to EMC's stock****"* – RBC Capital Markets (10/7/14)

*"****The case for a VMware spinoff is straightforward, more compelling if combined with cash****. Based on our SOTP, core EMC remains undervalued, trading on P/E of 9x versus the IT Enterprise/Hardware sector of 12x, despite superior growth and technology positioning potential"* – Credit Suisse (7/24/14)

"[O]ngoing lackluster relative share performance should leave us / investors to question (or pressure) EMC's willingness to do something else to unlock value […] (e.g., ***consideration for any distribution of VMware shares to EMC shareholders****). […] [W]e believe the current valuation warrants EMC management to provide investors with a better understanding of how the company plans to unlock what appears to be a* ***very discounted EMC Information Infrastructure valuation****"* – Stifel Nicolaus (1/12/14)

"Core EMC' getting no respect. 4 years with no gains? *– 'Core EMC' has been essentially flattish over a 4 year horizon, suggesting all gains in EMC shares over the last 4 years have come from appreciation in VMW stock*"—ISI (1/29/14)

. . .

"Our view is that over time ***vSAN will create some challenges for traditional storage vendors, including EMC****. We believe that as the product matures there is a risk of conflict with many of VMware's traditional storage partners. In particular, it will be interesting how EMC manages this conflict as* ***there will clearly be sales overlap and competition between EMC and VMware****. In fact, we believe that* ***the EMC parent may have two sales forces competing against each other****."* – Barclays (7/21/14)

[28] The full letter is available at https://www.businesswire.com/news/home/20141008005668/en/Elliott-Management-Sends-Letter-Board-Directors-EMC. Emphasis is in the original.

Panel B: Excerpts of sell-side analyst reports on EMC prior to activism[29]

January 20, 2014: Evercore Partners analysts Rob Cihra and Edison Yu "Our $31 price target applies a 13x P/E to "core" EMC-only CY14E EPS then adds back its ~80% ownership of VMware (VMW) using EVR's price target discounted 15%; all equivalent to a consolidated CY14E P/E of 15x and 9x EV/FCF. While in some cases just an academic exercise, we believe it is appropriate to factor **sum-of-the-parts** into valuing EMC since VMW operates independently with a publicly-traded stock."
January 27, 2014: BMO Capital Markets analyst Keith Bachman **"**Why not EMC? With **activist investors** pushing large tech companies such as eBay for various results, including potentially **breaking up** of a company, we ask why not EMC? While we are not aware of **activists** engaging in or with EMC, we think our **sum-of-the-parts** analysis suggests shareholder value could be created in the near and medium term by **selling** certain **assets**."
January 27, 2014: Wells Fargo Securities analyst Maynard Um "We expect Pivotal to see strength and achieve, if not beat, the $300MM target set out for revenue last year and ultimately expect a **spin-off** to potentially unlock the value."
January 29, 2014: FBN Securities analyst Shebly Seyrafi "[W]e remain positive on the stock as the **sum-of-the-parts** valuation shows that an investor can purchase shares of EMC for ~5x EPS."
January 29, 2014: Janney Capital Markets analysts Bill Choi and Robert Simmons "Our $32 FV (fair value) is based on SOTP (**sum-of-the-parts**) analysis. At last night's close, based on consensus estimates, core storage (ex-VMW) is trading at 6.9x NTM EPS. We have applied an 12x multiple to our 2015 core storage EPS… [o]ur FV implies 15.0x consolidated 2015 EPS of $2.14." "Valuation is attractive on a **sum-of-the-parts** basis with core storage trading below 8x NTM core storage earnings."
February 10, 2014: UBS analyst Steven Milunovich "After paying off the $1.7bn convert, EMC has room for additional debt—nudging from an **activist** for a larger **repurchase** or **break up** would not be shocking. Still, EMC needs to keep some powder dry for strategic **acquisitions** though it claims it does not need to alter its 'string of pearls' approach."

[29] Activist dictionary terms are in bold type.

Appendix 2: Variable descriptions

Variable	Description
Dependent variables	
DIC_ACT	The number of activism dictionary-related words/phrases divided by the number of total words in each sell-side analyst report. The ratio is presented in permille (i.e., per 1,000)
CAR[-1,+1]	Cumulative abnormal return from one day before intervention events to one day after. For treatment firms, the event date is the date of 13D filing; for control firms, the event date is the same as the event date of the matched treatment firm
Independent variables	
DIC_SPE	The number of specific activism objectives-related words divided by the number of total words in each analyst report. The ratio is presented in permille (i.e., per 1,000)
LENGTH	The natural logarithm of the number of total words in analyst reports
QUANT	The percentage of quantitative information (numbers and numeric phrases) in analyst reports
CAR_PRIOR_REP	The cumulative 10-day abnormal return ending before the start of the activist intervention-date windows for CARs of issuance of analyst reports
REP_ACT_13D	The number of activism words in pre-intervention-date analyst reports scaled by the number of activism words in 13D filings
REP_SPE_13D	The number of specific activism words in pre-intervention-date analyst reports scaled by the number of activism words in 13D filings
REP_LEN_13D	The number of total words (length) in pre-intervention-date analyst reports scaled by the number of activism words in 13D filings
REP_QNT_13D	The number of quantitative words in pre-intervention-date analyst reports scaled by the number of activism words in 13D filings
CAR_PRIOR_ACT	The cumulative 10-day abnormal return ending before the start of the [-1,+1] testing window for CARs of hedge fund intervention events
ROA	Return on total assets defined as earnings before interest, tax, depreciation and amortization divided by total assets (EBITDA/AT)
FINLEV	The ratio of long-term debt to the sum of debt and market value of equity
BTM	Book-to-market ratio defined as *CEQ/(PRCC_F×CSHO*)
MISS	An indicator variable that equals one if the actual EPS of the firm is less than the last consensus EPS forecast, and zero otherwise
INST	The proportion of firm shares held by institutional investors
LNMV	Natural logarithm of firm equity market capitalization

Variable	Description
TREAT	An indicator variable that takes the value of one if the firm has been targeted by an activist hedge fund during the sample period (treatment group), and zero otherwise (control group)
Other variables	
D_TARGET	An indicator variable that takes the value of one if the company is targeted by an activist hedge fund, and zero otherwise
Q	Tobin's Q defined as (book value of debt + market value of equity)/(book value of debt + book value of equity)
GROWTH	Sales growth rate over the previous year, defined as ($SALE_t$ – $SALE_{t-1}$)/ $SALE_{t-1}$
LEV	The ratio of debt to total assets
DIVYLD	Dividend yield defined as (common dividend + preferred dividends) / (market value of common stocks + book value of preferred)
RND	Research and development (R&D) scaled by total assets
HHI	Herfindahl-Hirschman index of sales in the firm's various business segments, as reported by Compustat
ANALYST	The number of sell-side analysts covering the company from I/B/E/S
LETTER	An indicator variable that takes the value of one if the stakeholder letter mentions analysts, and zero otherwise
CLOSE	An indicator variable that equals one if a target firm was affected by any terminated analyst coverage, and zero otherwise
SAME_PB	An indicator variable that takes the value of one if the hedge fund uses the same prime broker as one of the sell-side analysts who produce pre-intervention analyst reports, and zero otherwise
INST_OWN	The percentage of target- firm institutional ownership, capturing the potential level of recognition from buy-side institutions.
INST_ATTEN	The ranking, on a scale of 0 to 4, of target- firm Bloomberg news searches on the date prior to analyst report issuance
INVEST_BANK	An indicator variable that takes the value of one if an analyst's employer has investment banking and trading services, and zero otherwise
NO_13F	An indicator variable that takes the value of one if the hedge fund has no prior ownership disclosure in the target firm prior to intervention, and zero otherwise
ACT_EXP	An indicator variable that takes the value of one if the hedge fund's age is above the sample median of 11 years, and zero otherwise

Appendix 3: Activism dictionary based on Brav et al. (2008)

Panel A: Objectives

#	Primary	Secondary	Percent	Keywords
1	General Undervaluation/Maximize Shareholder Value		48.3	undervalu,under-valu,maximiz
2	Capital Structure	Excess cash, under-leverage, dividends/repurchases	12.7	cash hold,excess,repurchas,payout,dividend,buyback,buy back
2	Capital Structure	Equity issuance, restructure debt, recapitalization	6.1	balance sheet,equity issu,equity offer,restructur,recapitaliz
3	Business Strategy	Operational efficiency	12.4	margin,fixed cost,variable cost,cost sav,input cost,cost of good
3	Business Strategy	Lack of focus, business restructuring and spinning off	9.1	sum of part,sum of the part,spinoff,spin-off,spin off, operational focus,business focus,dispos,break up
3	Business Strategy	M&A: as target (against the deal/for better terms)	7.5	target,deal terms,better terms,higher pric
3	Business Strategy	M&A: as acquirer (against the deal/for better terms)	2.4	acquir,acquis,lower pric,better pric,synerg
3	Business Strategy	Pursue growth strategies	1.1	growth strat
4	Sale of Target Company	Sell company or main assets to a third party	14.0	asset sale,asset dispos,subsidiar
4	Sale of Target Company	Take control/buyout company and/or take it private	4.2	private equity,buyout,private buy
5	Governance	Rescind takeover defenses	5.7	remove take,rescind take,takeover,taking over,poison pill, golden parachute,staggered board
5	Governance	Oust CEO, chairman	5.6	dismissal,terminat,duality
5	Governance	Board independence and fair representation	15.0	fair rep,board indep
5	Governance	More information disclosure/potential fraud	5.5	fraud,disclos,transparen,audit
5	Governance	Excessive executive compensation/pay for performance	4.7	salar,compensat,bonus

Panel B: Tactics

#	Primary	Percent	Keywords
1	The hedge fund intends to communicate with the board/management on a regular basis with the goal of enhancing shareholder value	48.3	letter
2	The hedge fund seeks board representation without a proxy contest or confrontation with the existing management/board	11.6	board rep
3	The hedge fund makes formal shareholder proposals, or publicly criticizes the company and demands change	32.0	propos
4	The hedge fund threatens to wage a proxy fight in order to gain board representation, or to sue the company for breach of fiduciary duty, etc.	7.6	breach,fiduci
5	The hedge fund launches a proxy contest in order to replace the board	13.2	proxy
6	The hedge fund sues the company	5.4	litigation,lawsuit
7	The hedge fund intends to take control of the company, for example, with a takeover bid	4.2	takeover,take control

Notes: Percentages displayed are the proportion of sample observations in Brav et al. (2008) matching objectives and tactics categories, respectively.

TABLE 1
Sample and summary statistics

Panel A: Selection of intervention events

	Number of events
All intervention events, 2008–2017	4,669
Include only the first intervention event for each year	1,800
Merge with Compustat data	1,517
Merge with other datasets for target firms' characteristics	1,213
After propensity score matching	819

Panel B: Report-level summary statistics for target and matched firms (before and after intervention)

	N	Mean	SD	P25	P50	P75
DIC_ACT	27,486	0.873‰	0.870‰	0.000‰	0.185‰	0.643‰
DIC_SPE	27,486	0.752‰	0.892‰	0.000‰	0.000‰	0.484‰
LENGTH	27,486	8.123	0.748	1.792	7.744	8.199
QUANT	27,486	6.802%	5.533%	0.680%	2.592%	4.932%
CAR_PRIOR_REP	27,486	0.000	0.109	-1.404	-0.039	-0.001
ROA	27,486	0.085	0.144	-0.618	0.061	0.104
MV	27,486	7.374	1.467	3.679	6.323	7.471
FINLEV	27,486	0.210	0.205	0.000	0.028	0.166
BTM	27,486	0.542	0.425	-0.750	0.269	0.462
MISS	27,486	0.096	0.295	0.000	0.000	0.000

Panel C: Firm-level summary statistics for target and matched firms (before intervention)

	N	Mean	SD	P25	P50	P75
CAR[-1,+1]	1,638	1.370%	6.093%	-1.409%	0.000%	3.197%
REP_ACT_13D	1,638	0.003	0.004	0.000	0.002	0.004
REP_SPE_13D	1,638	0.003	0.003	0.000	0.002	0.004
REP_LEN_13D	1,638	0.354	0.429	0.000	0.277	0.507
REP_QNT_13D	1,638	0.028	0.039	0.000	0.016	0.039
CAR_PRIOR_ACT	1,638	-0.101%	12.980%	-4.543%	0.000%	4.328%
ROA	1,638	0.013	0.251	-0.002	0.074	0.126
MV	1,638	5.386	2.165	4.163	5.548	6.921
FINLEV	1,638	0.190	0.241	0.000	0.083	0.322
BTM	1,638	0.634	0.858	0.262	0.516	0.903
MISS	1,638	0.158	0.365	0.000	0.000	0.000
INST	1,638	0.453	0.610	0.000	0.434	0.819

Notes: This table reports sample selection and summary statistics of variables used in Table 3 (report-level) and Table 4 (firm-level). Detailed definitions of all variables are provided in Appendix 2.

TABLE 2

Propensity score matching

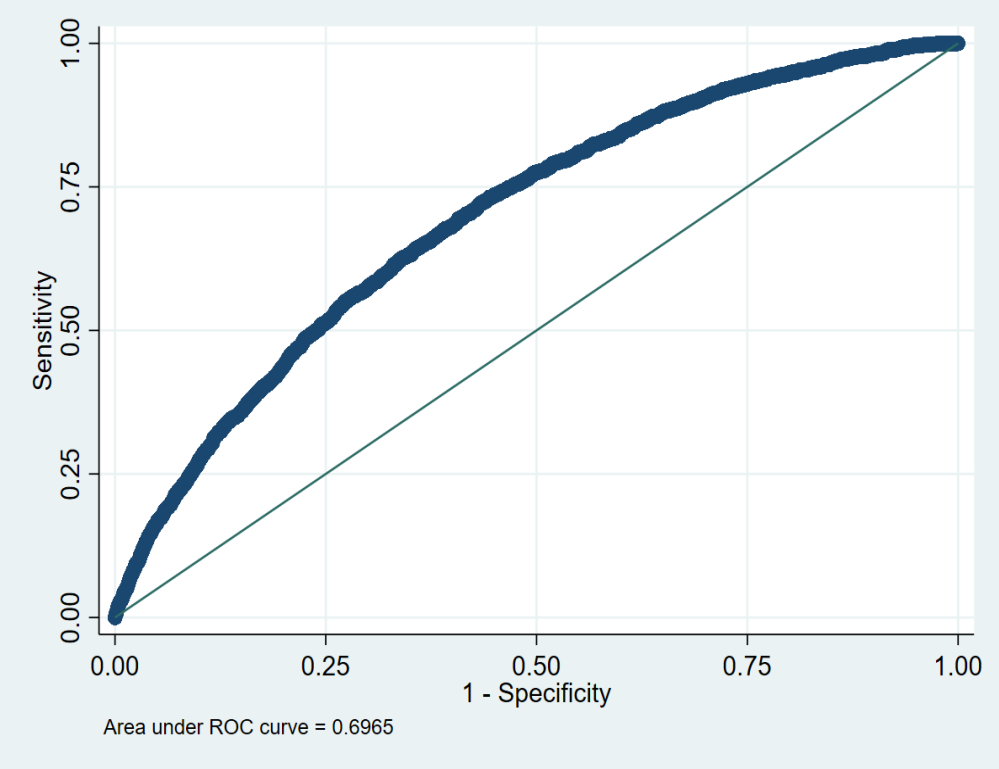
Panel A: Probit analysis of targeting by activist hedge funds

Variables	*D_TARGET*
MV	-0.000***
	(-7.883)
Q	-0.099***
	(-12.017)
GROWTH	-0.076***
	(-4.542)
ROA	0.067**
	(2.207)
LEV	0.012**
	(2.197)
DIVYLD	-1.219***
	(-4.390)
RND	0.498***
	(5.744)
HHI	-1.080***
	(-2.821)
ANALYST	0.012***
	(5.876)
INST	0.543***
	(16.304)
Constant	-1.796***
	(-90.699)
Observations	66,198
Pseudo R^2	0.0489

Panel B: Differences between treatment and control groups

Variable	Treatment	Match	Difference	t-stat	p-value
MV	1808.100	1882.500	-74.400	-0.335	0.737
Q	1.479	1.660	-0.182	-1.419	0.156
GROWTH	0.118	0.104	0.014	0.602	0.547
ROA	0.034	0.022	0.012	0.823	0.411
LEV	1.414	1.453	-0.039	-0.530	0.596
DIVYLD	0.011	0.012	-0.001	-0.984	0.325
RND	0.068	0.069	0.000	-0.031	0.975
HHI	0.009	0.007	0.002	1.914	0.056
ANALYST	5.019	4.897	0.122	0.515	0.606
INST	0.240	0.256	-0.016	-1.189	0.235

Panel C: ROC curve



Notes: Panel A reports the effects of covariates on the probability of being targeted by activist hedge funds. The dependent variable is an indicator variable equal to one if there is an activist hedge fund targeting the firm during the following year (that is, all covariates are lagged by one year). Detailed definitions of all variables are provided in Appendix 2. ** and *** represent significance levels of 5% and 1%, respectively. Panel B reports comparison of control variables between treatment and matched firms. The treatment group contains firms that are targeted by activist hedge funds. We use a one-to-one nearest-neighbor propensity score match method without replacement. To ensure there are no significant differences between treatment and matched firms, we use the caliper matching method and require a caliper of 3% during the match. Detailed definitions of all variables are provided in Appendix 2. Panel C reports the receiver operating characteristic (ROC) curve. The x-axis represents the false positive fraction, while the y-axis represents the true positive fraction.

TABLE 3
Activism dictionary and sell-side analyst reports

Panel A: Univariate DiD tests of textual characteristics in analyst reports

	Treatment Group (Target Firms)		Control Group (Matched Firms)		Cross-Sectional Difference	
Pre-Intervention	N	Mean	N	Mean	Mean Diff	t-stat
DIC_ACT	8,586	0.894‰	6,539	0.849‰	0.045‰***	3.146
DIC_SPE	8,586	0.862‰	6,539	0.788‰	0.074‰***	3.146
LENGTH	8,586	8.141	6,539	8.106	0.035**	2.881
QUANT	8,586	6.961%	6,539	6.628%	0.333%***	3.688
Post-Intervention						
DIC_ACT	6,904	0.913‰	5,457	0.823‰	0.090‰***	5.782
DIC_SPE	6,904	0.699‰	5,457	0.606‰	0.093‰***	6.202
LENGTH	6,904	8.117	5,457	8.128	-0.011	-0.826
QUANT	6,904	6.817%	5,457	6.756%	0.061%	0.610
Post – Pre	Time-Series Estimator	t-stat	Time-Series Estimator	t-stat	DiD Estimator	t-stat
DIC_ACT	0.019‰	1.335	-0.026‰*	-1.689	0.047‰**	2.190
DIC_SPE	-0.157‰***	-11.722	-0.176‰***	-12.090	0.019‰	1.000
LENGTH	-0.025*	-2.111	0.022	1.526	-0.047**	-2.556
QUANT	-0.168%*	-1.757	0.144%	1.407	-0.272%**	-2.010

Panel B: Activism dictionary and general analyst report content

Variables	(1) *DIC_ACT*	(2) *DIC_ACT*
LENGTH	0.232***	
	(9.367)	
QUANT		0.004***
		(12.144)
CAR_PRIOR_REP	0.102	0.129
	(1.159)	(1.551)
ROA	0.474***	0.381***
	(4.493)	(3.709)
MV	-0.042***	-0.034**
	(-2.946)	(-2.430)
FINLEV	-0.175**	-0.150**
	(-2.254)	(-1.999)
BTM	-0.048	-0.055
	(-1.172)	(-1.357)
MISS	-0.053	-0.065*
	(-1.364)	(-1.742)
	-1.230***	0.119
Constant	(-5.523)	(0.796)
Observations	8,586	8,586
Adjusted R^2	0.238	0.272
Brokerage fixed effects	Yes	Yes
Year fixed effects	Yes	Yes

Notes: Panel A reports univariate DiD tests of our activism dictionary and other textual information measures. The variables are the average content intensity in analyst reports issued within three months before or after hedge fund intervention. For example, pre-intervention *DIC_ACT* is the permille (i.e., per 1,000) of activism dictionary words used in each analyst report. The activism dictionary is based on the objectives and tactics identified by Brav et al. (2008) and is available in Appendix 3. Panel B presents OLS regressions of activism-related textual information (*DIC_ACT*) in sell-side analyst reports on more general report characteristics (*LENGTH, QUANT*). We include only treatment firms and pre-intervention analyst reports in the sample. *QUANT* is the percentage of numbers and numeric phrases in analyst reports. *LENGTH* is the natural logarithm of the number of total words in each analyst report. Detailed descriptions of all variables are in Appendix 2. t-statistics in parentheses are based on standard errors estimated with two-way cluster control at the brokerage- and firm-levels. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% two-tailed test level, respectively.

TABLE 4
The role of analysts for activist hedge fund intervention returns

	(1)	(2)	(3)	(4)
Variables	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*
REP_ACT_13D×TREAT	2.008**			
	(2.264)			
REP_SPE_13D×TREAT		1.943**		
		(2.082)		
REP_LEN_13D×TREAT			0.018**	
			(2.377)	
REP_QNT_13D×TREAT				0.182**
				(2.302)
TREAT	0.019***	0.019***	0.019***	0.020***
	(4.623)	(4.703)	(4.729)	(5.516)
REP_ACT_13D	-0.588			
	(-1.248)			
REP_SPE_13D		-0.516		
		(-0.995)		
REP_LEN_13D			-0.005	
			(-1.173)	
REP_QNT_13D				-0.059
				(-1.523)
CAR_PRIOR_ACT	-0.011	-0.011	-0.011	-0.010
	(-0.609)	(-0.601)	(-0.602)	(-0.560)
ROA	-0.008	-0.008	-0.008	-0.009
	(-0.943)	(-0.948)	(-0.951)	(-0.985)
MV	0.000	0.000	0.000	0.001
	(0.603)	(0.593)	(0.658)	(0.780)
FINLEV	0.005	0.005	0.005	0.005
	(0.680)	(0.672)	(0.732)	(0.740)
BTM	0.000**	0.000**	0.000*	0.000**
	(1.967)	(1.976)	(1.961)	(2.020)
MISS	0.000	0.000	0.000	0.000
	(0.015)	(0.009)	(0.033)	(0.001)
INST	0.000	0.000	0.000	0.000
	(0.058)	(0.069)	(0.076)	(0.060)
Constant	0.008	0.008	0.008	0.008
	(0.452)	(0.441)	(0.447)	(0.412)
Observations	1,638	1,638	1,638	1,638
Adjusted R^2	0.048	0.048	0.049	0.047
Year fixed effects	Yes	Yes	Yes	Yes

Notes: This table presents OLS regressions of intervention-event date CARs (i.e., at the hedge fund activist target firm-level) on textual measures of information in sell-side analyst reports issued 90 days before hedge fund

intervention relative to information contained in activist hedge fund 13D filings. *TREAT* is an indicator variable set to one if a firm is the target of hedge fund activism and zero for matched control firms. *REP_ACT_13D* is the number of activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_SPE_13D* is the number of specific activism words in pre-event analyst reports scaled by the number of activism words in the 13D filings. *REP_LEN_13D* and *REP_QNT_13D* are the number of total words (length) and count of numbers/quantitative words, respectively, in pre-event analyst reports scaled by the number of activism words in 13D filings. Detailed descriptions of all variables are in Appendix 2. t-statistics in parentheses are based on standard errors estimated with cluster control at the firm-level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% two-tailed test level, respectively.

TABLE 5

Direct use of sell-side information by activist hedge funds: Letters to shareholders, boards, and management

	(1)	(2)	(2)	(4)
Variables	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*
REP_ACT_13D×LETTER	3.928**			
	(2.079)			
REP_SPE_13D×LETTER		0.345**		
		(2.003)		
REP_LEN_13D×LETTER			3.907**	
			(1.974)	
REP_QNT_13D×LETTER				0.030*
				(1.677)
REP_ACT_13D	0.476			
	(1.250)			
REP_SPE_13D		0.074		
		(1.300)		
REP_LEN_13D			0.534	
			(1.298)	
REP_QNT_13D				0.005
				(1.246)
LETTER	-0.013	-0.008	-0.012	-0.010
	(-1.068)	(-0.771)	(-1.002)	(-0.807)
Observations	819	819	819	819
Adjusted R^2	0.014	0.015	0.014	0.012
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Notes: This table presents OLS regressions of intervention-event date CARs (i.e., at the hedge fund activist target firm-level) on textual measures of information in sell-side analyst reports issued 90 days before activist hedge fund intervention. The variables of interest are the interaction terms between *LETTER* and the report content variables. *LETTER* is an indicator variable that takes the value of one if the hedge fund issues a letter to shareholders, the board of directors, or management mentioning sell-side analysis, and zero otherwise. *REP_ACT_13D* is the number of activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_SPE_13D* is the number of specific activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_LEN_13D* and *REP_QNT_13D* are the number of total words (length) and count of numbers/quantitative words, respectively, in pre-event analyst reports scaled by the number of activism words in 13D filings. Detailed descriptions of all other variables are in Appendix 2. t-statistics in parentheses are based on standard errors estimated with cluster control at the firm-level. * and ** indicate statistical significance at the 10% and 5% two-tailed test level, respectively.

TABLE 6
Identification of analysts' role in hedge fund activism: Brokerage firm closures

	(1)	(2)	(3)	(4)
VARIABLES	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*
REP_ACT_13D×CLOSE	**-3.715****			
	(-2.043)			
REP_SPE_13D×CLOSE		**-3.787****		
		(-2.019)		
REP_LEN_13D×CLOSE			**-0.034****	
			(-2.041)	
REP_QNT_13D×CLOSE				**-0.342***
				(-1.912)
REP_ACT_13D	1.368**			
	(2.176)			
REP_SPE_13D		1.385**		
		(2.114)		
REP_LEN_13D			0.013***	
			(2.604)	
REP_QNT_13D				0.126**
				(2.242)
CLOSE	0.029**	0.029**	0.029**	0.024*
	(2.075)	(2.070)	(2.107)	(1.820)
Observations	819	819	819	819
Adjusted R^2	0.017	0.017	0.019	0.009
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Notes: This table presents OLS regressions of intervention-event date CARs (i.e., at the hedge fund activist target firm-level) on textual measures of information in sell-side analyst reports issued 90 days before activist hedge fund intervention. The variables of interest are the interaction terms between *CLOSE* and the report content variables. *CLOSE* is an indicator variable that takes the value of one if the brokerage firm has terminated coverage of the target firm during our sample period, and zero otherwise. *REP_ACT_13D* is the number of activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_SPE_13D* is the number of specific activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_LEN_13D* and *REP_QNT_13D* are the number of total words (length) and count of numbers/quantitative words, respectively, in pre-event analyst reports scaled by the number of activism words in 13D filings. Detailed descriptions of all control variables are in Appendix 2. t-statistics in parentheses are based on standard errors estimated with cluster control at the firm-level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% two-tailed test level, respectively.

TABLE 7

"Quid pro quo" effect: Target firms with the same sell-side analyst and activist hedge fund prime brokerage

	(1)	(2)	(3)	(4)
Variables	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*
REP_ACT_13D×SAME_PB	-1.768			
	(-0.907)			
REP_SPE_13D×SAME_PB		-2.028		
		(-1.009)		
REP_LEN_13D×SAME_PB			-0.009	
			(-0.568)	
REP_QNT_13D×SAME_PB				-0.011
				(-0.040)
REP_ACT_13D	1.327**			
	(1.967)			
REP_SPE_13D		1.155		
		(1.508)		
REP_LEN_13D			0.011**	
			(2.107)	
REP_QNT_13D				0.106
				(1.548)
SAME_PB	0.037**	0.036**	0.031**	0.024
	(2.432)	(2.372)	(2.263)	(1.156)
Observations	694	694	694	694
Adjusted R^2	0.011	0.007	0.011	0.002
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Notes: This table presents OLS regressions of intervention-event date CARs (i.e., at the hedge fund activist target firm-level) on textual measures of information in sell-side analyst reports issued 90 days before activist hedge fund intervention. The variables of interest are the interaction terms between *SAME_PB* and the report content variables. *SAME_PB* is an indicator variable that takes the value of one if a report-producing sell-side analyst and the activist hedge fund share the same (prime) brokerage, and zero otherwise. *REP_ACT_13D* is the number of activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_SPE_13D* is the number of specific activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_LEN_13D* and *REP_QNT_13D* are the number of total words (length) and count of numbers/quantitative words, respectively, in pre-event analyst reports scaled by the number of activism words in 13D filings. Detailed descriptions of all control variables are in Appendix 2. t-statistics in parentheses are based on standard errors estimated with cluster control at the firm-level. ** indicates statistical significance at the 5% two-tailed test level.

TABLE 8
Analysts' incentives for producing activism content

Variables	(1) *DIC_ACT*	(2) *DIC_ACT*	(3) *DIC_ACT*
INST_OWN	0.223***		
	(4.780)		
INST_ATTEN		0.003***	
		(4.051)	
INVEST_BANK			1.081***
			(10.792)
CAR_PRIOR_REP	-0.002	0.001	0.002
	(-0.024)	(0.008)	(0.025)
ROA	0.508***	0.518***	0.518***
	(5.124)	(5.196)	(5.188)
MV	-0.050***	-0.041***	-0.041***
	(-3.871)	(-3.203)	(-3.172)
FINLEV	-0.188***	-0.223***	-0.224***
	(-2.737)	(-3.277)	(-3.278)
BTM	-0.027	-0.049	-0.048
	(-0.758)	(-1.363)	(-1.335)
MISS	-0.018	-0.008	-0.008
	(-0.556)	(-0.232)	(-0.244)
Constant	0.094	0.226*	0.224*
	(0.734)	(1.752)	(1.736)
Observations	15,710	15,710	15,710
Adjusted R^2	0.204	0.199	0.199
Brokerage fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

Notes: This table presents OLS regressions of sell-side analyst activism-related reports on proxies of analysts' incentives. *DIC_ACT* is the percentage of activism dictionary content in each analyst report issued within [-90, 90] days of activist hedge fund intervention. *INST_OWN* is the target firm's percentage of institutional ownership. *INST_ATTEN* is the ranking of target firm Bloomberg news searches on the date prior to analyst report issuance. *INVEST_BANK* is an indicator variable that takes the value of one if the analyst's brokerage firm has both investment banking and trading services, and zero otherwise. Detailed descriptions of other independent variables are in Appendix 2. t-statistics in parentheses are based on standard errors estimated with two-way cluster control at the brokerage- and firm-levels. We include only treatment firms in this analysis. * and *** indicate statistical significance at the 10% and 1% two-tailed test level, respectively.

TABLE 9

Hedge fund characteristics and the role of analysts for hedge fund intervention returns

Panel A: No pre-intervention 13F filings

	(1)	(2)	(3)	(4)
Variables	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*
REP_ACT_13D×NO_13F	2.449**			
	(2.270)			
REP_SPE_13D×NO_13F		2.563**		
		(2.277)		
REP_LEN_13D×NO_13F			0.020**	
			(2.283)	
REP_QNT_13D×NO_13F				0.193*
				(1.871)
REP_ACT_13D	-0.316			
	(-0.387)			
REP_SPE_13D		-0.366		
		(-0.433)		
REP_LEN_13D			-0.001	
			(-0.163)	
REP_QNT_13D				-0.002
				(-0.019)
NO_13F	-0.011*	-0.011*	-0.011*	-0.008
	(-1.744)	(-1.748)	(-1.680)	(-1.356)
Observations	819	819	819	819
Adjusted R^2	0.017	0.017	0.018	0.008
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Panel B: Activist hedge fund experience

	(1)	(4)	(2)	(3)
Variables	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*	*CAR[-1,+1]*
REP_ACT_13D×ACT_EXP	2.589**			
	(2.393)			
REP_SPE_13D×ACT_EXP		2.779**		
		(2.460)		
REP_LEN_13D×ACT_EXP			0.020**	
			(2.141)	
REP_QNT_13D×ACT_EXP				0.237**
				(2.303)
REP_ACT_13D	-0.389			
	(-0.478)			
REP_SPE_13D		-0.431		
		(-0.522)		
REP_LEN_13D			-0.001	
			(-0.128)	
REP_QNT_13D				-0.048
				(-0.801)
ACT_EXP	-0.011	-0.011	-0.009	-0.009
	(-1.495)	(-1.524)	(-1.341)	(-1.395)
Observations	702	702	702	702
Adjusted R^2	0.017	0.018	0.016	0.010
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Notes: Panel A presents OLS regressions of intervention-event date CARs (i.e., at the hedge fund activist target firm-level) on textual measures of information in sell-side analyst reports issued 90 days before activist hedge fund intervention. The variables of interest are the interaction terms between NO_13F and the report content variables. NO_13F is an indicator variable that takes the value of one if the hedge fund does not file a 13F document disclosing holdings of target firm equity within 3 months before hedge fund intervention, and zero otherwise. *REP_ACT_13D* is the number of activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_SPE_13D* is the number of specific activism words in pre-event analyst reports scaled by the number of activism words in 13D filings. *REP_LEN_13D* and *REP_QNT_13D* are the number of total words (length) and count of numbers/quantitative words, respectively, in pre-event analyst reports scaled by the number of activism words in 13D filings. Panel B presents OLS regressions of intervention-event date CARs on textual measures of information in sell-side analyst reports issued 90 days before activist hedge fund intervention. The variables of interest are the interaction terms between *ACT_EXP* (hedge fund experience) and report content variables. *ACT_EXP* (experience) is an indicator variable that takes the value of one if the hedge fund age is above the sample median age of 11 years, and zero otherwise. Detailed descriptions of all other variables are in Appendix 2. t-statistics in parentheses are based on standard errors estimated with cluster control at the firm-level. * and ** indicate statistical significance at the 10% and 5% two-tailed test level, respectively.