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BOOK REVIEWS

Economics and Business Review, Vol. 3 (17), No. 1, 2017: 38-72
DOI: 10.18559/ebr.2017.1.3

Friends or foes? Activist hedge funds and other institutional investors[1]

Andrew Carrothers[2]

Abstract: The aim of this paper is to contribute to the understanding of the relationship between activist hedge funds and other institutional investors. Hedge funds are more likely to target firms with high levels of institutional ownership and demonstrate a preference for short-term focused institutional investors. Hedge fund activism generates short run and long run abnormal returns without increasing stock return volatility. Regardless of the investment horizon, volatility is inversely related to prior period institutional ownership. The trading behavior of institutional owners with different investment horizons is consistent with hedge fund activism creating value. These findings hold regardless of whether investment horizon is based on portfolio churn rate or type of institution. Overall the results suggest a mutually beneficial relationship between activist hedge funds and other institutional investors.

Keywords: hedge funds, shareholder activism, institutional investors, corporate governance.

JEL codes*:* G18; G23; G34, O16.

Introduction

The primary contributions of this paper are twofold. Taken together my results show that hedge fund activism creates value at target firms – by contributing to the discussion on the value of hedge fund activism this study has policy implications with respect to the regulation of hedge funds. Support for hedge fund activism is not universal. Proponents argue that activist hedge funds are beneficial[3] – they create value because they are better able than traditional institutional investors to reduce traditional agency problems at target firms. Critics

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[3] Many papers find that hedge fund activism creates value by driving changes that improve governance and/or long-term operating performance (e.g., Armour & Cheffins, 2012; Clifford, 2008; Katelouzou, 2013; Klein & Zur, 2009a; Brav, Jiang, & Kim, 2011; Bebchuk, Brav & Jiang, 2015).

hold that the benefits of activism do not accrue to stakeholders equally[4] and deny that activism creates long-term value – any shareholder benefit is short-term in nature and based on financial manipulation[5] rather than true value creation. My study contributes to this important discussion by showing that hedge funds do not avoid targets with high levels of institutional ownership and that the trading behavior of institutional investors with different investment time horizons is consistent with hedge fund activism creating value.

The second contribution is to the broad literature on the monitoring and governance roles of institutional investors. Institutional ownership should matter (Bhagat, Black, & Blair, 2004) in that shareholder wealth creation should follow directly from improved company performance driven by institutional owners monitoring and agitating for change at firms in their portfolios. However, it is unclear whether activism by institutional investors is effective at creating value. While the literature confirms that institutional owners have an impact on corporate governance by exerting influence at firms in their portfolios (e.g., Parino, Sias, & Starks, 2003; Allen, 2001) and by championing changes to governance rules through the shareholder proposal process (Gillan & Starks, 2000), it is not clear that traditional institutional investors are effective in using access and influence to increase shareholder value.[6] In contrast hedge funds are agents of change with specific goals that depend on unique situations prevalent at target firms – actions to improve target firm governance (e.g., board representation or CEO replacement) are part of larger agendas to improve the performance of the target company (Kahan & Rock, 2007). When hedge funds take the lead the constraints that limit the ability of other institutional investors to engage in effective activism are no longer binding. By explicitly or implicitly supporting activist hedge fund agendas, other institutional investors play an important role in improving governance, performance and shareholder value at target firms – hedge funds have a track record of delivering increased shareholder value and hedge funds rely on institutional investors to implement their agendas. Overall, the results of this paper suggest that activist hedge funds and other institutional investors are compatible – they are friends, not foes. The economic implication is that this new style of shareholder activism creates value through cooperation

[4] Klein and Zur (2009a) find that hedge fund activism transfers wealth from bondholders to shareholders. Greenwood and Schor (2009) argue that the abnormal returns associated with hedge fund activism are limited to activism campaigns that result in a takeover of the target firm.

[5] For example, in The New York Times "Claiming Stock Manipulation, Biovail Sues Hedge Fund" on February 23, 2006, J. Anderson covers a lawsuit alleging price manipulation. "This action arises from a massive, illegal and continuing stock market manipulation scheme, which has targeted and severely harmed Biovail, among other companies, and which has resulted in immense ill-gotten profits for SAC Capital and other extremely powerful hedge funds," the lawsuit says.

[6] For examples that find no evidence that activism by traditional institutional investors has a meaningful impact on long-term operating performance or stock returns at target firms see Song and Szewczyk (2003), Romano (2001), Del Guercio & Hawkins (1998), and Wahal (1996).

between hedge funds and other institutional investors to improve performance and corporate governance at target firms.

The paper is divided into 2 major sections. The first deals with framing the empirical results of this study in the context of the existing literature. Section 2 is devoted to describing the data and presenting the results. The paper is closed with Conclusions.

1. Extending the literature on shareholder activism

In the mid-1980s traditional institutional investors, particularly public and union pension funds, emerged as the most frequent shareholder activists. In the past decade, however, hedge funds have overtaken all others as the most prevalent in the investor activism space (Gillan & Starks, 2007). The nature of activism by hedge funds is different from that of other institutional investors such as banks, insurance companies, mutual funds, pension funds and endowment funds, which are all subject to regulatory and political restrictions, conflicts of interest and liquidity constraints (e.g., Armour & Cheffins, 2012; Klein & Zur, 2006; Thompson, 2006). While hedge funds and other institutional investors both use tactics such as discussions with directors and executives, formal shareholder proposals and media campaigns, hedge funds use them as part of escalating agendas that can also include proxy contests, lawsuits and takeover bids (e.g., Gantchev, 2013; Gillan & Starks, 2007). Hedge fund activism is not limited to the US – Cheffins (2013) notes the campaign by hedge fund Pershing Square Capital Management at Canadian Pacific Railways as a prominent example of offensive (as opposed to defensive) shareholder activism in a Canadian context. In general, activism by other institutional investors focuses on changing corporate governance *rules* whereas hedge funds address specific governance issues as part of larger plans to improve target firm performance (Kahan & Rock, 2007). There is an extensive literature on institutional investors and corporate governance[7] and, more recently there has been increasing interest in hedge fund activism.[8] Yet we know little about how activist hedge funds interact with other institutional investors.

[7] Since the seminal paper by Shleifer and Vishny (1986) identified the impact of large shareholders on corporate governance, the literature has extensively examined shareholder proposals and voting, proxy contests, and the influence and wealth effects of institutional investor activism (e.g., Smith, 1996; Del Guerio & Hawkins, 1998; Gillan & Starks, 1998, 2000; Prevost & Rao, 2000; Romano, 2001; Karpoff, 2001; Parrino et al., 2003). Bebchuck, Hirst, and Rhee (2013) document the success of the Shareholders Rights Project in gaining approval of precatory shareholder proposals and commitment to declassify corporate boards at S&P 500 companies.

[8] See, for example, Kahan & Rock (2007), Brav, Jiang, Partnoy, & Thomas (2008), Klein & Zur (2009a, b), Greenwood & Schor (2009), Gantchev (2013), Gantchev & Jotikasthira (2015), and Bebchuk et al. (2015).

Since hedge funds typically acquire minority ownership positions in target firms (e.g., Katelouzou, 2013; Brav, Jiang, & Kim, 2009), they rely on support from other shareholders to successfully implement activist agendas. Given that institutional ownership at publically traded firms exceeded 60% in 2005 (Gillan & Starks, 2007), it is clear that institutional investors collectively control sufficient power to influence the effectiveness of hedge funds. On one hand, if hedge fund activism is based on self-serving financial manipulation, hedge funds would avoid targets with high levels of institutional ownership because other institutional investors would act to protect their own interests. Hedge funds would be harmed if other institutional investors decide to support incumbent management and impede agenda implementation or choose to liquidate holdings in response to activism and drive share price down. On the other hand, if hedge fund activism creates value that other institutional investors cannot because they face structural and regulatory constraints (Admati & Pfleiderer, 2009), then hedge funds should expect support for their agendas and prefer high levels of institutional ownership at target firms.

Turning to the preferences of other institutional investors, their trading behavior should reflect their perception of hedge fund activism. Non-declining post-activism levels of institutional ownership would be a clear indication that institutional owners view activism as beneficial, with institutional investors holding their positions to profit as share price increases in response to improved performance. However, even if overall levels decline, the trading behavior of different types of institutional investors could still indicate that hedge fund activism creates value. Institutional investors differ in their investment objectives, trading styles, regulatory environment, clientele, investment time horizon, and portfolio choices (e.g., Verado, 2010; Gillan & Starks, 2007). The literature investigates investment time horizon as an important dimension of institutional investor heterogeneity (e.g., Gaspar, Massa, & Matos, 2005; Yan & Zhang, 2009). Stable long-term focused ownership levels indicate that long-term focused investors anticipate value creation (Chen, Harford, & Li, 2007) while decreasing short-term ownership levels could simply reflect profit-taking to take advantage of abnormal returns at target firms.

In this paper I provide a comprehensive analysis of the interaction between activist hedge funds and other institutional investors at target firms. In particular I focus on the following questions: Do hedge funds target firms with high levels of institutional ownership and, if so, do they prefer targets with short or long-term focused institutional investors? What are the trading behaviors of institutional owners in response to hedge fund activism? What is the impact of investment time horizon on institutional trading? Are hedge funds compatible with other institutional investors?

First, I find that the level of institutional ownership has a meaningfully large and statistically significant impact on the likelihood of a firm becoming a hedge fund target. In my sample of hedge funds matched with their five nearest neigh-

bors, the probability of being targeted increases by 4.0% for a one standard deviation increase in the level of institutional ownership. The preference that hedge funds have for high levels of institutional ownership may be the result of hedge funds benefiting from the influence of institutional investors over target firm executives and boards (e.g., institutional investor implicit or explicit support for the activist agenda), from lower activism costs (e.g., reduced communication costs to get large shareholders to support activism), or from explicit voting support in hostile proxy contests (Armour & Cheffins, 2012). Brav, Dasgupta, and Matthews (2015) model the process by which other institutional investors interact to support the lead activist through formal voting or informal non-public engagement. In a complementary investigation Boyson and Pichler (2016) find that when institutional investors are better able to coordinate there is an increased probability that the target company will take action to resist the activist agenda in a way that directly obstructs shareholder coordination.

Having established that hedge funds prefer high levels of institutional ownership I move to the question of the impact of institutional investor heterogeneity. Hedge funds may prefer targets with high levels of short-term investors simply because they want to match with others with similar investment time horizons. For example, the investment time horizon of hedge funds in my sample matches very closely with institutional investors with shorter (i.e., below median) investment time horizons; the mean (median) investment time horizon of activist hedge funds is 1.8 (2.1) years compared to 1.6 (2.1) years for short-term focused institutional investors. Or hedge funds may have other reasons for preferring investors with short-term investment horizons. Gantchev and Jotikasthira (2015) find that block selling by specific institutional investors to satisfy liquidity requirements acts as a trigger for hedge funds to acquire initial ownership positions. Institutional investors with shorter term investment time horizons such as mutual funds and independent investment advisors are more likely to have unanticipated liquidity needs than longer-term institutional investors with predictable cash requirements such as pension funds (Gaspar et al., 2005). It follows that firms with high levels of short-term focused institutional ownership are more likely to be hedge fund targets. Moreover hedge funds typically increase their holdings after establishing initial positions (Brav, Jiang, Partnoy, & Thomas, 2008) and may find it easier to do so because of liquidity created by short-term focused institutional investors selling to lock in gains from short-term abnormal returns. Hedge funds may also benefit because new investors on the opposite side of these trades are likely to be supportive because the activist agendas are public information at the time of the purchase decisions. As well, hedge funds may expect those short-term focused institutional investors who do not exit immediately after the initiation of activism to be either informed[9] or intuitive enough to recognize the value of supporting

[9] Yan and Zhang (2009) find that short-term focused institutional investors are better informed and trade to exploit their informational advantage.

activism to profit from ultimately higher share prices that reflect the full value of successful activism.

Alternatively hedge funds may prefer targets with high levels of long-term focused ownership since institutions with long investment time horizons are more likely to monitor firms in an effort to improve governance and firm performance (e.g., Chen et al., 2007; Bhagat et al., 2004). Hedge funds may expect support from long-term focused institutional investors because such investors are better able to evaluate the potential of the activism to enhance value. To test the impact of the institutional investment time horizon on hedge fund targeting, I classify other institutional investors as short and long-term based on portfolio churn rate and type of institution. For churn rates I define institutions as short-term (long-term) if their portfolio churn rates are greater than (less than) the median institutional investor churn rate. For institutional type I define institutions as short-term (long-term) if they tend to have active trading (buy-and-hold) investing styles. In general banks, insurance companies, pension funds and endowment funds tend to adopt buy-and-hold investing styles while independent investment advisors and mutual funds tend to adopt more aggressive trading styles and/or engage in liquidity-motivated trading (Edelen, 1999).

I show that for both definitions of investment time horizon, higher levels of short-term focused institutional ownership have large and statistically significant impact on the probability that firms will become targets of hedge funds. Using the churn rate (institution type) approach the likelihood of being targeted increases by 3.5% (4.7%) for a one standard deviation increase in the level of short-term focused institutional ownership. In contrast long-term focused institutional ownership does not affect the likelihood of being targeted by hedge funds – although hedge funds may benefit from the support of long-term focused institutional investors, their presence at target firms is not a significant factor in the decision to proceed with activism.

The results so far suggest that hedge funds expect to benefit from the support of other institutional investors. If the relationship is mutually beneficial the behaviors of other institutional investors should reflect the belief that hedge fund activism creates value. Parrino et al. (2003) document the trading effectiveness of institutional investors who are dissatisfied with management at portfolio firms – a reasonable extension of their main result is to expect institutional investors to "vote with their feet" if they perceive hedge fund activism to be value destroying. Bebchuk et al. (2015) find that hedge fund activism is associated with long-term improvement in target firm operating performance and that short-term abnormal returns correctly predict the long-term consequences of the activism. There is general consensus that stock markets view hedge fund activism favorably.[10] I confirm that hedge fund activism gen-

[10] Examples of studies that document the short and long-term returns to hedge fund activism include Brav et al. (2008), Clifford (2008), Kahan and Rock (2007), Boyson and Mooradian (2007), and Klein and Zur (2009b).

erates significant short-term and long-term abnormal returns and also show that there is no increase in stock return volatility. The actual trading behavior of other institutional investors reveals that they benefit from activism regardless of their investment time horizon. Compared to the year prior the level of long-term focused institutional ownership does not change in the two years following the initiation of activism. A decrease in overall institutional ownership in the year after the hedge fund activism event is entirely driven by selling by institutions with short-term investment horizons. The levels of overall and short-term focused institutional ownership return to pre-event levels within two years. The behavior of institutional investors suggests that they view hedge fund activism favorably – long-term investors hold their positions to profit from long-term abnormal return; short-term investors take profits but, in aggregate, return seeking more.

2. Data and Empirical Results

2.1. Data

The 1934 Securities Exchange Act, Section 13(d), requires investors who acquire beneficial ownership of more than 5% of the shares of a publicly traded company and who plan to exert influence over the control of that company to disclose their ownership position and their intent within ten days of taking the position. The SEC defines the term beneficial ownership to include any person who directly *or indirectly* has the power to vote or sell the shares so that, for example, the beneficial ownership report (Schedule 13D) would include the personal holdings of hedge fund managing partners in addition to the holdings of the fund itself. The SEC requires firms to identify the reason(s) for acquiring the shares. The original data for hedge fund activism events are 1220 Schedule 13D filings[11] between July 17, 1995, and December 26, 2007. There was a total of 223 unique hedge fund companies making Schedule 13D filings concerning a total of 1007 unique target firms.[12]

I supplement the activist hedge fund information from the Schedule 13D filings with target firm financial, operating and share price information from the CRSP-COMPUSTAT merged database and institutional ownership information from Thompson Reuters. Since the subsequent analysis uses the combination of firm and year as the unique identifier, the number of usable observations decreases. First, of the 1220 events, 73 target companies have two or

[11] The 13D filing date is a good proxy for the date at which the hedge fund's intentions become public information – the schedule is filed with the SEC and is provided to the company that issued the securities and to each exchange where the security is traded. Any material changes in the facts contained in the schedule require a prompt amendment.

[12] Refer to Brav et al. (2009).

more Schedule 13D filings in a given year. Second, not all of the targets firms have stock price information in CRSP, company performance information in COMPUSTAT, and institutional ownership information in Thompson Reuters Institutional (13f) Holdings. Of the 1007 companies in the initial hedge database I base my subsequent analysis on 613 event-year matches (from June 20, 1997 to December 26, 2007) corresponding to 540 unique target companies and 198 hedge fund companies. I winsorize all variables at the top and bottom one percent. See Appendix A for detailed definitions of variables used in this study. For this sample the average ownership position declared in the original Schedule 13D filings was 7.5%. The average maximum ownership position of the hedge funds was 11.4% (based on required amendment filings). All data are publicly available. The composite data sets I use to produce all figures and tables are my own.

2.2. Discussion of results

Table 1 provides a summary of activist hedge fund events (i.e., 13D filings) by disclosed objectives and tactics. The Schedule 13D filing consists of seven sections.[13] Item 4 identifies the *purpose of the transaction* which, along with supplemental news and internet searches, is the source data for the objectives and tactics; Item 5 describes the *interest in securities of the issuer* which provides specific information regarding beneficial ownership level. Hedge funds may identify multiple objectives and may use multiple tactics so total percentages in Table 1 exceed one hundred. Hedge fund objectives include *general undervaluation* (48.0%), *governance* (28.1%), *sale of target company* (20.6%), *business strategy* (20.3%), and *capital structure* (19.2%). *General undervaluation* describes events in which the hedge fund plans to solve the undervaluation issues using tactics that are no more aggressive than communication with the target firm's executive officers and board of directors. This objective is mutually exclusive of the remaining objectives. *Governance* indicates that the hedge fund is focused on any of the following: executive compensation, takeover defenses, CEO or chairman replacement, board independence or fair representation, information disclosure or fraud. *Sale of target company* indicates that the hedge fund activism is focused on the following: sale of the company or its main assets to a third party, taking majority control of the company or taking the company private. *Business strategy* targets the following: business focus, excess diversification, business restructuring, growth strategy, or blocking or renegotiating

[13] 1) Security and Issuer, 2) Identity and Background, 3) Source or Amount of Funds or Other Consideration, 4) Purpose of Transaction, 5) Interest in Securities of the Issuer, 6) Contracts, Arrangements, Understandings or Relationships with Respect to Securities of the Issuer, and 7) Material to Be Filed as Exhibits.

Table 1. Summary of activist hedge fund events by stated objectives and tactics

Panel A		
Hedge Fund Objective	**# of events**	**% of total events**
General undervaluation	294	48.0%
Governance	172	28.1%
Sale of target company	126	20.6%
Business strategy	124	20.3%
Capital structure	118	19.2%
Panel B		
Tactic	**# of events**	**% of total events**
Change through communication with the board of directors and senior management	302	49.3%
Change through seeking representation on board of directors without a proxy contest or management confrontation	78	12.7%
Change through formal shareholder proposals or public letters	225	36.7%
Change through threat of lawsuit or proxy fight	46	7.5%
Change through proxy contests to replace the board of directors	92	15.0%
Change through proceeding with lawsuit against target	34	5.5%
Change through takeover bid	21	3.4%

The sample includes 613 events (SEC Schedule 13D filings) from 1997 to 2007 for which target firm institutional ownership and other control variable information is available. Panel A presents a summary of the objectives of the hedge fund as declared in the 13D filing. "General undervaluation" indicates that the intent of the hedge fund was non-specific, such as improving the company or improving shareholder value. (This information was usually in Item 4 of the Schedule 13D filing, sometimes confirmed from news articles. This objective is mutually exclusive of the remaining objective categories). "Governance" includes: takeover defenses; CEO/chairman replacement; board independence or fair representation; information disclosure; fraud; and executive compensation. "Business strategy" includes: lack of business focus; excess diversification; business restructuring including spinning off of business segments; blocking a pending M&A deal involving the company or changing the terms of the deal; and growth strategy. "Sale of target company" includes: sale of the company or its main assets to a third party; majority control of the company; buy-out of the company; and privatization of the company. "Capital structure" includes: excess cash; under-leverage; restructuring of debt; recapitalization; share repurchase; dividend payment; and equity issuance. Panel B summarizes tactics employed by the hedge fund to achieve the stated objectives.

a pending merger and acquisition (M&A) deal. *Capital structure* indicates that the hedge fund is focused on any of the following at the target firm: excess cash, leverage, debt structure, recapitalization, share repurchase, dividend payment or equity issuance. Panel B summarizes tactics used by hedge funds to achieve stated objectives. Hedge fund activism often proceeds through a sequence of escalating steps (Gantchev, 2013). Table 1 presents the tactics in the order of escalating activism – tactics can be non-hostile or hostile. The non-hostile tactics are: change through communication with the board of directors and senior management (49.3%); and change through seeking representation on the board

of directors without a proxy contest or management confrontation (12.7%). Change through formal shareholder proposals or public letters (36.7%) can be either hostile or non-hostile. Hostile tactics are: change through the threat of a lawsuit or proxy fight (7.5%); change through proxy contests to replace the board of directors (15.0%); change through proceeding with a lawsuit against the target (5.5%); and change through takeover bid (3.4%).

Table 2 presents summary statistics of firm characteristics based on observations from 1997 to 2007. All data are fiscal year end of the year prior to the 13D filing. Panel A presents data for firms subject to targeting by hedge funds. Panel B presents data for matched firms, specifically the five nearest neighbors based on industry (3 digit SIC code), market to book ratio, and market value of equity from the COMPUSTAT universe during the subject years. These three criteria are the basis for generating matched sample results elsewhere in the paper. Table 2 summarizes prior year data because hedge funds evaluate target firms based on information available at the time of the analysis. Compared to matched firms, targets have: a) similar return on assets and worse yields from equity markets (combined stock return and dividend and share repurchase yield); b) lower q and lower percentage sales growth; c) similar levels of leverage and d) better cash flows. The target and matched firms are similar in size since market value of equity was one of the matching criteria. When compared to the entire universe of COMPUSTAT firms during the subject years, target firms are smaller (details not included in the table).

Table 2. Summary statistics of firm characteristics

Panel A – Firms subject to hedge fund SEC 13D filings between 1997 and 2007								
Variable	**Obs**	**Mean**	**Std Dev**	**Min**	**Max**	**p25**	**p50**	**p75**
Total Market Value of Equity ($millions)	613	1150.8	3844.1	4.2	41295.9	66.6	215.6	801.4
Return on Assets	613	0.088	0.156	–0.977	0.581	0.029	0.099	0.162
Stock Return	613	0.115	0.631	–0.857	4.190	–0.222	0.030	0.300
Dividend and Share Repurchase Yield	613	0.027	0.051	0.000	0.269	0.000	0.001	0.034
Sales Growth	613	0.096	0.312	–0.797	3.247	–0.025	0.063	0.166
Market to Book Ratio	613	2.149	3.499	–10.765	30.738	1.034	1.691	2.744
q	613	1.875	1.443	0.371	17.932	1.069	1.481	2.262
Leverage	613	0.325	0.314	0.000	1.446	0.016	0.278	0.520
Free Cash Flow Ratio	613	0.015	0.165	–1.195	0.440	–0.023	0.018	0.076
Research & Development/Total Assets	613	0.040	0.083	0.000	0.830	0.000	0.000	0.044

cont. Table 2

Panel B – Matched Firms (5 Nearest Neighbors)								
Variable	**Obs**	**Mean**	**Std Dev**	**Min**	**Max**	**p25**	**p50**	**p75**
Total Market Value of Equity ($millions)	2907	1219.4	3981.7	1.4	41295.9	51.4	201.5	778.5
Return on Assets	2907	0.086	0.185	–0.977	0.581	0.025	0.098	0.171
Stock Return	2907	0.159	0.720	–0.857	4.190	–0.241	0.033	0.360
Dividend and Share Repurchase Yield	2907	0.021	0.041	0.000	0.269	0.000	0.000	0.027
Sales Growth	2907	0.192	0.505	–0.797	4.208	–0.004	0.101	0.251
Market to Book Ratio	2907	2.445	3.885	–10.765	30.738	1.095	1.754	2.760
q	2907	2.138	2.240	0.371	17.932	1.074	1.466	2.246
Leverage	2907	0.337	0.297	0.000	1.446	0.046	0.308	0.543
Free Cash Flow Ratio	2907	–0.013	0.186	–1.195	0.440	–0.029	0.012	0.060
Research & Development/Total Assets	2907	0.042	0.096	0.000	0.830	0.000	0.000	0.039

The table shows summary statistics of sample firm characteristics based on observations from 1997 to 2007. See Appendix A for definitions of all variables. All values are lagged by one year. "Obs" is the number of observations. Panel A presents data for firms subject to hedge fund SEC 13D filings between the years 1997 and 2007; Panel B presents data for matched firms (5 nearest neighbors from the Compustat universe during the subject years) based on 3 digit SIC code, market to book ratio, and market value of equity. Data in the full sample is winsorized at the top and bottom 1%.

Table 3 presents summary statistics of institutional ownership measures at target firms. The source of information for institutional holdings is Thompson Reuters Institutional (13f) Holdings. The SEC requires institutional investment managers (including banks, insurance companies, investment advisors, pension funds, endowment funds and hedge funds) with at least $100 million in equity assets to file quarterly reports of their equity holdings. A minor limitation of this data is that institutional investors may choose not to report holdings of individual securities when the number of shares is less than 10,000 *and* the market value is less than $200,000. Since I am interested in the relationships between hedge funds and "other" institutional investors I exclude hedge funds when calculating all measures of institutional ownership. All values in Table 3 are year end prior to the hedge fund activism event. Institutional ownership (IO) is the percent of the target firm's outstanding shares owned by institutional investors. Target firms in the sample have mean (median) institutional ownership of 55.9% (58.8%). The mean (median) institutional ownership of the five nearest neighbor firms is 39.7% (33.8%). The mean (median) difference of 16.2% (25.0%) is statistically significant at the 1% level – firms targeted by hedge funds have higher levels of institutional ownership than their peers.

Table 3. Summary statistics of firm institutional ownership

Panel A – Firms Targeted by Hedge Funds								
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**	**p25**	**p50**	**p75**
Institutional Ownership (IO)	613	0.5590	0.3214	0.0001	1.0000	0.2804	0.5883	0.8576
Short-term Focused IO ($SIO_{churn\ rate}$)	613	0.3811	0.2304	0.0000	0.8355	0.1838	0.3808	0.5636
Long-term Focused IO ($LIO_{churn\ rate}$)	613	0.1763	0.1282	0.0000	0.4566	0.0651	0.1685	0.2621
Short-term Focused IO ($SIO_{institutional\ type}$)	613	0.3841	0.2222	0.0000	0.7794	0.1971	0.3938	0.5828
Long-term Focused IO ($LIO_{institutional\ type}$)	613	0.1740	0.1238	0.0000	0.4411	0.0621	0.1642	0.2760
Panel B – Matched Firms – Five Nearest Neighbors								
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**	**p25**	**p50**	**p75**
Institutional Ownership (IO)	2907	0.3970	0.3131	0.0001	1.0000	0.1115	0.3380	0.6544
Short-term Focused IO ($SIO_{churn\ rate}$)	2907	0.2765	0.2341	0.0000	0.8355	0.0678	0.2217	0.4496
Long-term Focused IO ($LIO_{churn\ rate}$)	2907	0.1185	0.1122	0.0000	0.4566	0.0247	0.0865	0.1814
Short-term Focused IO ($SIO_{institutional\ type}$)	2907	0.2750	0.2262	0.0000	0.7794	0.0722	0.2314	0.4496
Long-term Focused IO ($LIO_{institutional\ type}$)	2907	0.1201	0.1118	0.0000	0.4411	0.0220	0.0864	0.1983
Panel C – Test of Mean and Median Differences[a]: Target Firms vs. Matched Firms								
Variable		**Mean**	**SD**	**t-score**	**Median**	**χ^2-score[b]**		
Difference - Institutional Ownership (IO)		0.1620	0.0140	11.59***	0.2502	83.82***		
Difference - Short-term Focused IO ($SIO_{churn\ rate}$)		0.1046	0.0104	10.08***	0.1591	82.20***		
Difference - Long-term Focused IO ($LIO_{churn\ rate}$)		0.0578	0.0051	11.30***	0.0820	65.43***		
Difference -Short-term Focused IO ($SIO_{institutional\ type}$)		0.1092	0.0100	10.89***	0.1624	95.61***		
Difference -Long-term Focused IO ($LIO_{institutional\ type}$)		0.0539	0.0051	10.65***	0.0778	75.88***		

[a] H0: Difference=0, Ha: Difference>0.
[b] Continuity corrected Pearson χ^2 score.

The table shows summary statistics of firm characteristics regarding institutional ownership (excluding ownership by hedge funds) based on observations from 1997 to 2007. All values are based on year end prior to the hedge fund SEC 13D filing. Institutional Ownership (IO) is the fraction of the firm's outstanding shares owned by institutional investors. Institutional ownership is further classified as short-term (SIO) and long-term (LIO) based on the fraction

of the firm's outstanding shares that are owned by institutional investors with a short-term and long-term focus, respectively, based on portfolio churn ratio (see Appendix B) and institutional type (investment companies and independent investment advisors are short-term, and banks, insurance companies, and others including pension, endowment funds and sovereign wealth funds are long-term). "Obs" is the number of observations. Panel A presents data for firms targeted by hedge funds; Panel B presents data for matched firms (5 nearest neighbors) based on 3 digit SIC code, market to book ratio, and market value of equity from the Compustat universe during the subject years; Panel C presents results for tests of significance regarding the differences between Panels A and B. ***, **, * indicate significance level at 1%, 5%, and 10% level respectively.

To further explore why hedge funds prefer targets with high levels of institutional ownership I examine institutional investor heterogeneity in the context of investment time horizon based on portfolio churn rate and type of institution. For churn rates I classify institutional investors as short-term and long-term focused based on the methodology in Yan and Zhang (2009). Using each institutional investor's aggregate share purchases and sales I calculate an average quarterly churn rate, $\overline{CRq}$, (i.e., the mean of the four quarterly churn rates in each year) for each institutional investor based on the minimum of aggregate purchases and sales. Yan and Zhang indicate that the advantage of their approach is that it minimizes the impact of investor cash flow on portfolio turnover and is philosophically similar to the CRSP approach to calculating mutual fund turnover. Note that it is common practice with financial industry professionals to use the minimum of aggregate purchases and sales to calculate portfolio turnover. Sorting by $\overline{CRq}$ and year, I define institutional investors as short-term focused if their $\overline{CRq}$ is greater than or equal to the median $\overline{CRq}$ for that year. Institutional investors are long-term focused if their $\overline{CRq}$ is below median. I define short-term focused institutional ownership ($SIO_{churn\ rate}$) for each target-company-year observation in the data set as the number of shares held by short-term institutional investors divided by the total number of shares outstanding and long-term institutional ownership ($LIO_{churn\ rate}$) as the number of shares held by long-term institutional investors divided by the total number of shares outstanding. By construction IO equals the sum of $SIO_{churn\ rate}$ and $LIO_{churn\ rate}$. See Appendix B for details. Table 4 provides a summary of the mean and median $\overline{CRq}$ and inferred investment time horizon for each year between 1997 and 2007, and the overall values for all year – Panels A and B present the results for short and long-term focused institutional investors, respectively. Overall mean (median) $\overline{CRq}$ and investment time horizon for short-term focused investors were 15.2% (12.1%) and 1.6 (2.1) years, respectively. In comparison overall mean (median) $\overline{CRq}$ and investment time horizon for long-term focused investors were 5.0% (5.1%) and 5.0 (4.9) years respectively. Panel C presents the results for hedge funds that made 13D filings between 1997 and 2007 – hedge funds in the sample match closely with short-term focused institutional investors. Overall mean (median) $\overline{CRq}$ and investment time horizon were 14.0% (11.8%) and 1.8 (2.1) years.

Table 4. Summary statistics of institutional investor portfolio churn rate and investment time horizon

Panel A – Short-Term Focused Institutional Investors								
Year	**Obs**	**Mean $\overline{CRq}$ (/qtr)**	**SD**	**Min**	**Max**	**Median $\overline{CRq}$ (/qtr)**	**Mean ITH[a] (years)**	**Median ITH[b] (years)**
1997	648	0.152	0.152	0.074	1.786	0.109	1.6	2.3
1998	755	0.136	0.093	0.081	1.181	0.113	1.8	2.2
1999	822	0.146	0.090	0.083	1.406	0.124	1.7	2.0
2000	906	0.200	0.165	0.098	1.979	0.154	1.3	1.6
2001	885	0.171	0.119	0.086	1.370	0.136	1.5	1.8
2002	904	0.156	0.128	0.077	1.640	0.118	1.6	2.1
2003	972	0.147	0.104	0.072	1.225	0.115	1.7	2.2
2004	928	0.150	0.111	0.075	1.682	0.121	1.7	2.1
2005	1088	0.137	0.102	0.066	1.516	0.111	1.8	2.3
2006	1221	0.143	0.104	0.068	1.332	0.113	1.7	2.2
2007	1167	0.145	0.111	0.073	1.983	0.114	1.7	2.2
Overall	10296	0.152	0.118	0.066	1.983	0.121	1.6	2.1
Panel B – Long-Term Focused Institutional Investors								
Year	**Obs**	**Mean $\overline{CRq}$ (/qtr)**	**SD**	**Min**	**Max**	**Median $\overline{CRq}$ (/qtr)**	**Mean ITH[a] (years)**	**Median ITH[b] (years)**
1997	647	0.049	0.016	0.002	0.074	0.051	5.1	4.9
1998	755	0.055	0.017	0.002	0.081	0.058	4.5	4.3
1999	822	0.054	0.019	0.000	0.083	0.058	4.6	4.3
2000	905	0.064	0.021	0.000	0.098	0.065	3.9	3.8
2001	885	0.058	0.018	0.000	0.086	0.061	4.3	4.1
2002	903	0.051	0.016	0.000	0.077	0.053	4.9	4.7
2003	971	0.048	0.015	0.003	0.071	0.050	5.2	5.0
2004	927	0.047	0.017	0.000	0.075	0.049	5.3	5.1
2005	1088	0.042	0.015	0.000	0.066	0.043	6.0	5.8
2006	1221	0.041	0.015	0.000	0.068	0.042	6.0	6.0
2007	1167	0.045	0.016	0.002	0.073	0.045	5.6	5.6
Overall	10291	0.050	0.018	0.000	0.098	0.051	5.0	4.9
Panel C – Hedge Funds								
Year	**Obs**	**Mean $\overline{CRq}$ (/qtr)**	**SD**	**Min**	**Max**	**Median $\overline{CRq}$ (/qtr)**	**Mean ITH[a] (years)**	**Median ITH[b] (years)**
1997	29	0.176	0.214	0.043	1.113	0.116	1.4	2.2
1998	38	0.138	0.087	0.044	0.570	0.117	1.8	2.1
1999	44	0.130	0.071	0.039	0.390	0.109	1.9	2.3
2000	47	0.148	0.097	0.032	0.561	0.127	1.7	2.0
2001	59	0.168	0.156	0.034	1.158	0.133	1.5	1.9
2002	69	0.155	0.099	0.021	0.523	0.128	1.6	2.0
2003	77	0.147	0.086	0.035	0.468	0.118	1.7	2.1

cont. Table 4

Year	Obs	Mean $\overline{CRq}$ (/qtr)	SD	Min	Max	Median $\overline{CRq}$ (/qtr)	Mean ITH[a] (years)	Median ITH[b] (years)
2004	88	0.138	0.070	0.038	0.363	0.119	1.8	2.1
2005	108	0.122	0.067	0.014	0.351	0.113	2.1	2.2
2006	121	0.139	0.155	0.000	1.606	0.119	1.8	2.1
2007	131	0.124	0.069	0.002	0.327	0.111	2.0	2.2
Overall	811	0.140	0.108	0.000	1.606	0.118	1.8	2.1

[a] inferred from mean churn rate
[b] inferred from median churn rate

The table provides a summary of the average quarterly churn rate, $\overline{CRq}$, and investment time horizon (ITH) for institutional investors for each year between 1997 and 2007 and overall for all years based on the methodology described in Appendix B. Panel A presents the results for short-term focused institutional investors; Panel B presents the results for long-term focused institutional investors; and Panel C presents the results for hedge funds. "Obs" is the number of observations.

The Thomson Reuters data includes a variable, TYPECODE, to denote the type of institution (i.e., banks, insurance companies, investment companies and their managers, independent investment advisors and all others including pension, endowment and sovereign wealth funds). The ability to effectively use this code (without adjustment) as a measure of investor heterogeneity is limited because of inconsistent code use over time and high use of the "all other" category.[14] To ensure that improper coding does not distort ownership summary statistics and regression results I manually correct for the errors in mapping. For institutional type I define institutional investors as short-term focused if they are TYPECODE 3 or 4 (investment companies and independent investment advisors) and long-term focused if they are TYPECODE 1, 2, or 5 (banks, insurance companies and others including pension, endowment and sovereign wealth funds). In general, banks, insurance companies, pension funds and endowment funds tend to adopt buy-and-hold investing styles

[14] The acknowledged problem with this coding follows: "The TYPECODE variable was designed to distinguish among different types of institutional managers. It has the problem of sudden change from a non-five value to five in December 1998, March 1999, and June 1999. TYPECODE in the S34 set have serious classification errors in recent years, such that the Other group is unrealistically large. Many Banks (TYPECODE = 1) and Independent Investment Advisors (TYPECODE = 4) are improperly classified in the Others (TYPE = 5) group in 1998 and beyond. For example, in the first quarter of 1999, the number of independent investment advisors drops from over 1200 to about 200, while the Other group jumps from roughly 100 to over 1300 . Thompson Financial Network explains that a mapping error occurred when integrating data from another source, regret that the problem occurred, but they have no plans to fix the problem." Page 16 of User's Guide to Thomson Reuters Mutual Fund and Investment Company Common Stock Holdings Databases on WRDS available at http://wrds-web.wharton.upenn.edu/wrds/ds/tfn.

while independent investment advisors and mutual funds tend to adopt more aggressive trading styles and/or engage in liquidity-motivated trading (Edelen, 1999). $SIO_{\text{institution type}}$ ($LIO_{\text{institution type}}$) equals the number of shares held by short-term (long-term) focused institutional investors divided by the total number of shares outstanding.

The balance of Table 3 shows that compared to matched firms, firms targeted by hedge funds have significantly higher levels (at the 1% level) of both short-term and long-term institutional ownership. The results using churn rate and institutional type are very similar. By churn rate target firms have mean (median) short-term focused institutional ownership of 38.1% (38.1%) compared to matched firm mean (median) levels of 27.7% (22.2%) – the mean (median) difference is 10.5% (15.9%). Target firms have mean (median) long-term focused institutional ownership of 17.6% (16.9%) while the mean (median) level for matched firms is 11.9% (8.7%) – the mean (median) difference is 5.8% (8.2%). Note that short-term focused institutional ownership is much higher than long-term focused institutional ownership at both target and matched firms. By type of institution target firms have mean (median) short-term focused institutional ownership of 38.4% (39.4%) compared to matched firm mean (median) levels of 27.5% (23.1%) – the mean (median) difference is 10.9% (16.2%). Target firms have mean (median) long-term focused institutional ownership of 17.4% (16.4%) while the mean (median) level for matched firms is 12.0% (8.6%) – the mean (median) difference is 5.4% (7.8%).

Compared to matched firms, the targets of hedge funds have higher levels of institutional investors regardless of investment time horizon. However given the relatively higher ownership positions of short-term focused institutional investors at target firms, investment time horizon may be a particularly important factor for hedge funds when engaging in activism. For example, when a hedge fund is soliciting support for its activist agenda, institutional owner investment time horizon may be a meaningful differentiator in that short-term focused owners control more votes implying that they can exert more influence over target firm directors and executives.

Table 5. Probit analysis of the effect of institutional ownership on hedge funds' targeting

	(1)	**(2)**	**(3)**
	Marginal Effects	**Marginal Effects**	**Marginal Effects**
q	–0.0141***	–0.0143***	–0.0140***
	(0.0044)	(0.0044)	(0.0043)
Growth	–0.0610***	–0.0622***	–0.0619***
	(0.0176)	(0.0177)	(0.0176)
ROA	0.0233	0.0223	0.0204
	(0.0415)	(0.0416)	(0.0412)

cont. Table 5

	(1)	(2)	(3)
	Marginal Effects	**Marginal Effects**	**Marginal Effects**
Leverage	0.0120	0.0133	0.0174
	(0.0211)	(0.0210)	(0.0211)
R&D	0.1073	0.0992	0.1044
	(0.0806)	(0.0812)	(0.0802)
DSR Yield	0.2076*	0.2195*	0.2173*
	(0.1244)	(0.1244)	(0.1229)
IO	0.1129***		
	(0.0183)		
$SIO_{churn\ rate}$		0.1334***	
		(0.0277)	
$LIO_{churn\ rate}$		0.0732	
		(0.0555)	
$SIO_{institutional\ type}$			0.1811***
			(0.0325)
$LIO_{institutional\ type}$			–0.0368
			(0.0625)
Year Fixed Effects	Y	Y	Y
Observations	3,520	3,520	3,520
Pseudo R^2	0.1722	0.1729	0.1747

This table reports the impact of institutional ownership on the probability of a firm being the target of hedge funds. Sample years are 1997 to 2007 inclusive. All independent variables are lagged by one year. The dependent variable is equal to 1 if the firm is a hedge fund target during the year. Institutional Ownership (IO) is the fraction of the firm's outstanding shares owned by institutional investors. Institutional ownership is further classified as short-term (SIO) and long-term (LIO) based on the fraction of the firm's outstanding shares that are owned by institutional investors with a short-term and long-term focus, respectively, based on portfolio churn ratio (see Appendix B) and institutional type (investment companies and independent investment advisors are short-term, and banks, insurance companies, and others including pension, endowment funds and sovereign wealth funds are long-term). All regressions control for q, sales growth (Growth), return on assets (ROA), leverage, research and development (R&D), and dividend and share repurchase (DSR) yield and year fixed effects (See Appendix A for definitions). Observations are from a matched sample (5 nearest neighbor firms) based on 3 digit SIC code, market to book ratio, and firm size based on market value of equity. Cluster-robust cluster standard errors are in parentheses with clustering at firm level. ***, **, * indicate significance level at 1%, 5% and 10% level respectively.

Subsequent regression analysis provides a more rigorous examination of the relationships among hedge fund activism and target firm institutional ownership levels and investment time horizon while controlling for other target firm characteristics such as operating performance, capital structure and growth opportunities. First, I determine what factors influence the probability of a firm being targeted by hedge funds. Table 5 presents the marginal results of three probit regression specifications indicated by (1), (2) and (3). This table reports the impact of the previously defined measures of institutional owner-

ship (which exclude hedge funds) on the probability of the firm being the targeted by hedge funds. All independent variables are lagged by one year. The dependent variable, Y_i, is equal to 1 if the firm i is a hedge fund target during the year. In regression (1), the explanatory variable is institutional ownership (IO). The regression controls for year fixed effects, q, sales growth, return on assets, leverage, research and development and dividend and share repurchase yield (see Appendix A for definitions). The main effect probit model is $\Phi^{-1}(p_i) = \mathrm{x}_i'\beta = \sum_i x_i\beta_i$, where $\Phi^{-1}(\ )$ is the inverse of the cumulative normal distribution function. Marginal effects are defined as the derivative of p_i[15] with respect to each independent variable so the value of marginal effects depends on the values of all of the independent variables. The marginal effect of the j^{th} element in x_i' in the probit model is equal to $\phi(x_i'\beta)\cdot b_j$ where $\phi(x_i'\beta)$ is the density function of the standard normal distribution evaluated at $\mathrm{x}_i'\beta$, and b_i is the estimated regression coefficient for j^{th} element in x_i'. Marginal effects represent the change in probability of being a target for a very small change in one independent variable, holding all others fixed. In regression (1) the coefficients for q, sales growth, and institutional ownership are significant at the 1% level and the coefficient for dividend and share repurchase yield is significant at the 10% level. Based on the regression results a firm has a 2.7% lower chance of being a target for a one standard deviation higher level of q (i.e., 4.22 vs. 2.09), a 2.7% lower chance of being a target for a one standard deviation higher level of sales growth (i.e., 65.3% vs. 17.5%), a 0.9% higher chance of being a target for a one standard deviation higher level of dividend and share repurchase yield (i.e., 6.6% vs. 2.2%) and an 4.0% greater chance of being a target for a one standard deviation higher level of institutional ownership (i.e., 74.6% vs. 42.5%). Unexploited growth opportunities, sales growth, dividend yield and institutional ownership all have statistically significant effects on the probability of the firm being a target of activist hedge funds – hedge funds are more likely to target low growth, undervalued firms with high levels of institutional ownership. The results of the first specification are consistent with those in Brav et al. (2008) who interpret the impact of q on the probability of being a hedge fund target as an indication that activist hedge funds are value investors seeking to profit from long-term target firm share price appreciation resulting from changes at the target firm to exploit growth opportunities. The results for q, sales growth, and dividend and share repurchase yield are similar in the remaining probit regression specifications in Table 5 and require no further discussion.

Regression (2) examines the impact of investment time horizon of institutional owners (based on churn rate) on the probability that a firm will be targeted by an activist hedge fund. The level of short-term focused institutional ownership has a meaningfully large and a statistically significant (at the

[15] $p_i = \mathrm{Prob}(Y_i = 1) = \Phi(x_i'\beta)$.

1% level) impact on the likelihood of being targeted. The likelihood of being a target increases by 3.4% for a one standard deviation higher level of short-term focused institutional ownership (i.e., increase from 29.4% to 53.1%). Long-term focused institutional ownership does not impact the likelihood that a firm with be targeted by hedge funds. Regression (3) examines the impact of the investment time horizon of institutional owners (based on institutional type) on the probability that a firm will be targeted by an activist hedge fund. Once again the level of short-term focused institutional ownership has a meaningfully large and a statistically significant (at the 1% level) impact on the likelihood of being targeted. The likelihood of being a target increases by 2.7% for a one standard deviation higher level of short-term focused institutional ownership (i.e., increase from 29.4% to 52.3%). Long-term focused institutional ownership does not impact the likelihood that a firm with be targeted by hedge funds.

To summarize: the univariate results in Table 3 show that the levels of all types of institutional owners at target firms are significantly higher than at matched firms. The levels of short-term exceed those of long-term at both target and matched firms. Table 4 shows that the investment time horizons of activist hedge funds closely match with those of short-term focused institutional investors. The multivariate results in Table 5 confirm that institutional ownership has a statistically significant and meaningfully large impact on the likelihood of hedge fund targeting. Moreover hedge funds demonstrate a particular preference for institutional investors with a short-term time horizon. The results are robust across different classifications of the investment time horizon.

To determine whether hedge fund activism is beneficial for other institutional investors I investigate abnormal returns at hedge fund targets. Expected returns should motivate the trading behavior of institutional investors and behavior should reflect institutional investors' attitudes towards hedge funds. Using event study methodology based on total returns (i.e., price changes plus distributions) I find economically and statistically significant target firm abnormal returns in both the short and long run. Figure 1 shows the average cumulative abnormal return (CAR) and trading volumes for target firm shares over the 41-day event window (+/– 20 days) surrounding the date of the Schedule 13D filing. To calculate abnormal return I use the market model based on the value-weighted NYSE/AMEX/NASDAQ index from CRSP. The estimation window for the market model parameters and normal trading volume is the interval from 100 to 40 days prior to the date of Schedule 13D filing. On average there is a share price increase of three percent from ten days and one day prior to the event. On the event day and day after there is an additional increase of two percent. The total cumulative abnormal return by 20 days after the event is 7.1%. The results show abnormally high trading volumes in the period from

ten days prior to two days after the Schedule 13D filing date. Overall 61.4% of the activism events have a positive cumulative abnormal return in the minus 20 to plus 20-day window. By percentile the CARs for the +/– 20-day window are –34.6% (5th), –6.0% (25th), 5.0% (50th), 18.9% (75th), and 48.4% (95th). The abnormal return results are similar for alternative specifications for the event window. For example, the average CAR increases to 8.1% by 40 days after the Schedule 13D filing.

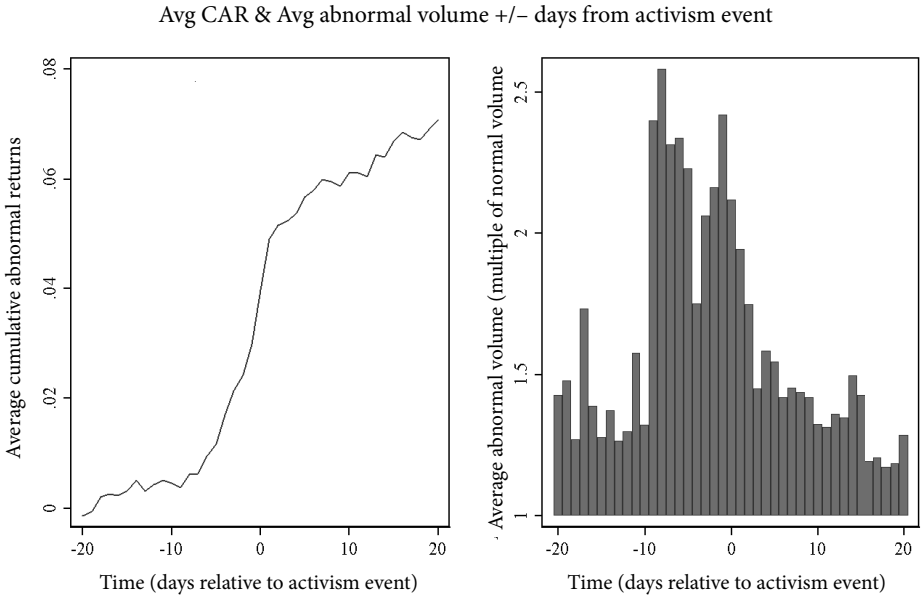

Figure 1. Short run abnormal returns from hedge fund activism

Buy and hold abnormal return (BHAR) is preferable to CAR when evaluating long-term stock price performance (Barber & Lyon, 1997). For the long range study I define abnormal return as the difference between the target firm stock return and the return on the NYSE/AMEX/NASDAQ index from CRSP based on monthly total returns. Figure 2 plots the average buy and hold abnormal return for target firms from twelve months prior to the Schedule 13D filing to 24 months after. The results demonstrate negative abnormal returns in the interval between six months and one month prior to the 13D filing ($BHAR_{5mth\ to\ -1\ mth}$ = –5%). This negative abnormal return sharply reverses during the month prior to the activism event. The average buy and hold abnormal return continues to increase until approximately 20 months after the Schedule 13D filing ($BHAR_{-1mth\ to\ 20\ mth}$ = 23%) after which the returns are consistent with the overall market index.

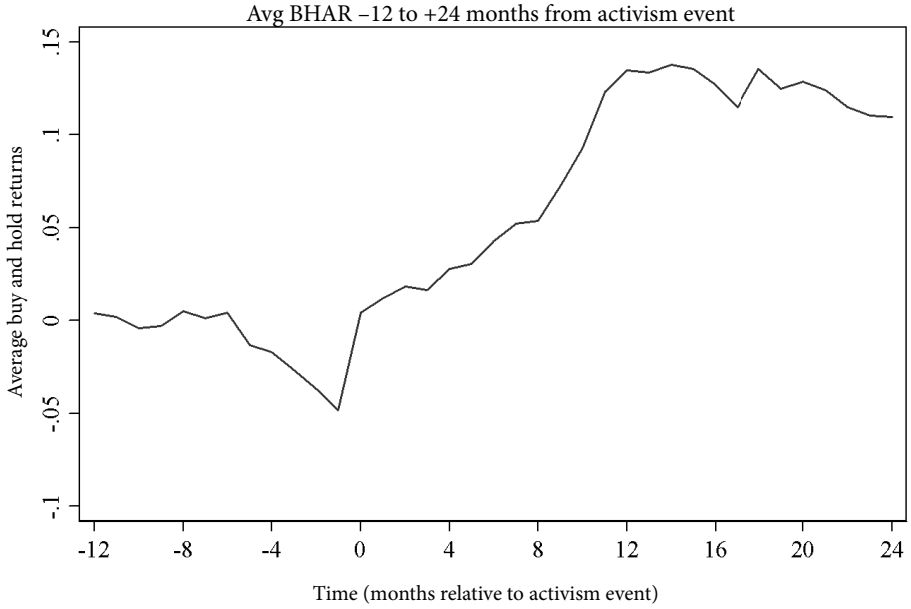

Figure 2. Long run abnormal returns from hedge fund activism

The abnormal return results show that, regardless of investment time horizon, other institutional investors can benefit from returns to hedge fund activism – target firm institutional investors have a valid reason to like the arrival of hedge funds at target firms.

To evaluate whether abnormal returns associated with hedge fund activism are the result of improved performance at target firms being reflected in the market price of the target firm shares I examine the volatility of stock returns at target firms. It is possible that activism increases the risk of target firms and that higher returns could be coincident with higher volatility. In the literature, for example, Klein and Zur (2009a) document the shift of wealth from bondholders to equity holders as a result of activism and suggest that increases in leverage, dividends and share repurchases increase the risk of target firms. Stock return volatility may provide insight into the returns associated with hedge fund activism. Post event increases in volatility could signal that the higher returns are simply coincident with higher risk associated with holding an ownership position in the target firm. In contrast stable or decreasing post-activism volatility strengthens the argument that the long-term returns to activism are driven by performance improvements at target firms. Consider Figures 3 and 4 which depict the short-run and long-run stock return volatility at firms targeted by hedge funds. Figure 3 shows the average daily vari-

ance of returns[16] in the +/– 20 day window surrounding the 13D filing. While there are indications of increases in variance in the days immediately before and after the 13D filing there is no apparent trend of increasing volatility after the activism event.

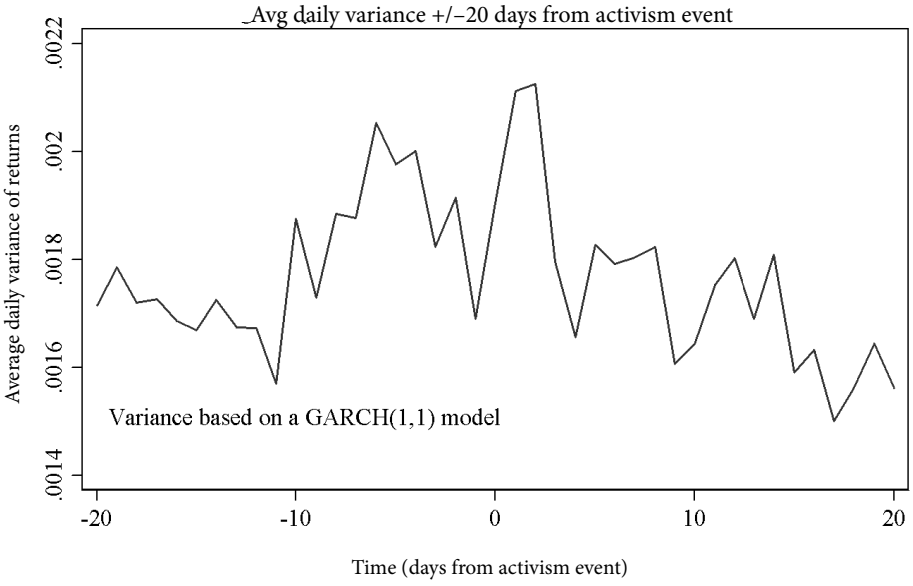

Figure 3. Short run variance of stock returns at target firms

Figure 4 examines a longer time frame showing the average monthly variance at target firms in the +/– 24 months surrounding the 13D filing. The dashed line represents the average for all observations in the sample, and suggests an increase in volatility after hedge fund activism. However the database includes activism events up to December 26, 2007 so the plus 24 month observations are influenced by the impact of the 2008/09 financial crisis on firm volatility. Based on the dates of activism events in the sample the post-activism average volatility is influenced by the financial crisis while the pre-activism volatility is not. The solid line adjusts for the financial crisis by removing observations after August 31, 2008 (1,494 from a total of 30,178 monthly observations). The 2008/09 financial crisis was arguably one of the most significant financial events since the Great Depression and increased the stock return volatility of all publically traded firms, not just those firms that were targets of hedge fund activism.

[16] All volatility data presented are based on a GARCH (1, 1) model for estimating variance of target firm returns. See Appendix C for details.

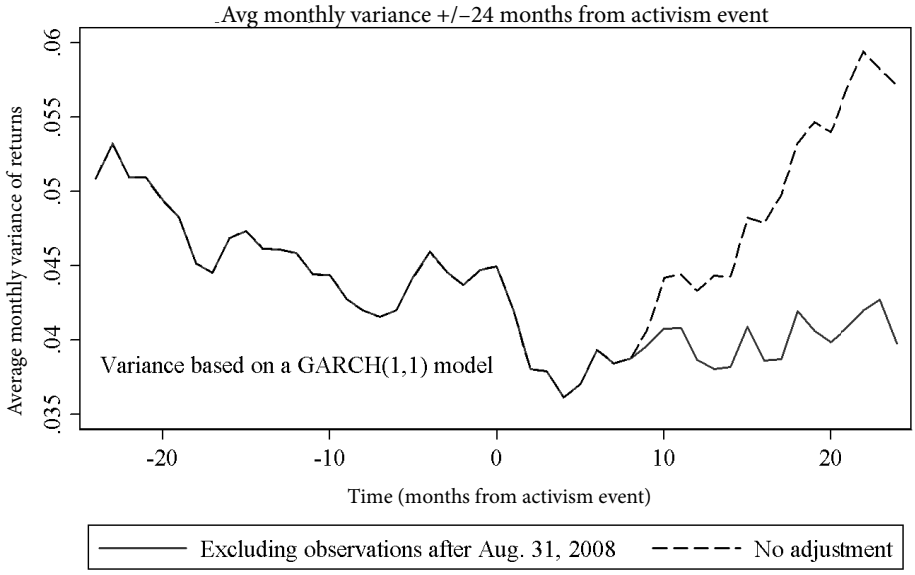

Figure 4. Variance of returns at firms subject to hedge fund activism

While a graphical depiction of average results is intuitively interesting I use regression analysis to robustly test for changes in target firm stock return volatility before and after hedge fund activism and to confirm the relationships between abnormal returns and volatility and between the measures of institutional ownership and volatility. To avoid the distorting effect of the financial crisis I exclude post August 31, 2008 observations from the analysis. All the variables in Table 6 are quarterly and observations occur during the +/– eight quarters surrounding hedge fund activism events. The dependent variable in both regressions is the quarterly standard deviation of stock returns.[17] Both regressions control for prior quarter return on assets, q, dividend and share repurchase yield, leverage, and cash flow – prior period return on assets and dividend and share repurchase yield are inversely related to stock return volatility (1% significance level). In regression (1) the explanatory variable of interest is a dummy that equals 1 if the observation occurs after the SEC 13D filing. The regression coefficient is not significantly different from zero indicating that the standard deviation of stock returns is the same before and after hedge activism. Regression (2) includes quarterly abnormal return as an explanatory variable in addition to the dummy variable from the first regression. There is a significant (1% level) inverse relationship between abnormal return and stock return volatility. A 1% increase in quarterly abnormal return is associated with a 0.56%

[17] The dependent variable equals the square root of the estimate of quarterly variance based on a GARCH(1, 1) model. I derived similar results using realized variance (not tabulated) to those presented in Tables 6 and 7. See Appendix C for further details.

Table 6. Volatility of stock returns of firms targeted by hedge fund

Variable	(1)	(2)
Dummy = 1 if observation is after activism event	0.0014	0.0042
	(0.0050)	(0.0047)
Quarterly Holding Period Abnormal Return		–0.0561***
		(0.0081)
Return on Assets$_{\text{prior quarter}}$	–0.6392***	–0.6266***
	(0.0585)	(0.0592)
$q_{\text{prior quarter}}$	0.0016	0.0022
	(0.0017)	(0.0017)
Dividend and Share Repurchase Yield$_{\text{prior quarter}}$	–1.0560***	–0.9367***
	(0.2203)	(0.2085)
Leverage$_{\text{prior quarter}}$	0.0074	0.0020
	(0.0144)	(0.0158)
Free Cash Flow Ratio$_{\text{prior quarter}}$	0.0166	0.0100
	(0.0194)	(0.0194)
Constant	0.7849***	0.5348***
	(0.0830)	(0.0479)
Year Fixed Effect	Y	Y
Industry Fixed Effects (3 digit SIC code)	Y	Y
Observations	8,937	8,267
R-squared	0.378	0.398

This table examines quarterly stock return volatility in the +/– eight quarters surrounding hedge fund SEC 13D filings between 1997 and 2007. The dependent variable in all regressions is the quarterly standard deviation of stock returns based on a GARCH(1,1) model. In regression (1), the explanatory variable of interest is a dummy that equals 1 if the observation occurs after the 13D filing. Regression (2) includes the dummy variable from the first regression and adds quarterly abnormal return as an explanatory variable. All regressions control for industry (3 digit SIC) and year fixed effects. All explanatory/control variables are based on quarterly data. The regressions control for return on assets, q, dividend and share repurchase yield, leverage, cash flow ratio (See Appendix A for definitions). Cluster-robust cluster standard errors are in parentheses with clustering at firm level. ***, **, * indicate significance level at 1%, 5% and 10% level respectively.

decrease in the standard deviation of quarterly returns. Confirming this inverse relationship the Spearman rank correlation between quarterly abnormal returns and stock return standard deviation is –0.12. Firms that are targeted by hedge funds generate long-term abnormal returns and these returns are not associated with higher levels of volatility. Moreover firms with higher abnormal returns experience lower stock return volatility. I interpret these results to indicate that the higher returns at target firms after hedge fund activism are not simply reflective of an increased risk premium to compensate for increased risk created by the activism. Overall the results are consistent with hedge fund activism creating wealth through performance improvement at the target firm.

Given that target firm ownership by other institutional investors is important to hedge funds and that, all else equal, hedge funds should prefer target firms to have lower stock return volatility I investigate whether ownership levels and trading behavior of other institutional investors are related to target firm volatility. Table 7 reports the relationships between the levels of and changes in institutional ownership and stock return volatility at firms subject to hedge fund activism. The dependent variable in all regressions is the quarterly standard deviation of stock returns in the 24 months following the 13D filing. All regressions control for prior quarter return on assets, q, dividend and share repurchase yield, leverage, and cash flow – prior period return on assets (leverage) is inversely (directly) related to stock return volatility. The results from the first regression confirm significant (1% level) inverse relationships between the level of and change in institutional ownership at target firms and the stock return volatility in the subsequent quarter – at target firms, on average, a 0.01 higher level of (increase in) institutional ownership precedes a 0.13% (0.11%) lower standard deviation of returns. The regression (2) results show that these relationships hold (at the 1% significance level) for both short-term focused and long-term focused institutional investors. At target firms, on average, a 0.01 higher *level* of short (long) term institutional ownership precedes a 0.10% (0.21%) lower standard deviation of returns. Target firm return volatility is more sensitive to prior period levels of long-term focused institutional ownership – a one-sided t-test confirms that the LIO regression coefficient is significantly more negative (1% level) than the SIO regression coefficient (t-score = –2.71, p-value = 0.0030). A 0.01 *increase* in short (long) term institutional ownership during the prior quarter precedes a 0.10% (0.13%) lower level of volatility. However the impact of the change in short-term focused ownership is not significantly different from that of long-term focused ownership. An F-test confirms that the regression coefficients for ΔSIO and ΔLIO are not significantly different ($F = 1.48$, Prob > $F = 0.224$). The results show that the ownership levels and trading behavior of institutional investors is inversely related to subsequent levels of target firm stock return standard deviation and may provide additional insight into why hedge funds choose to target firms with higher levels of institutional ownership. Assuming a preference for lower target firm volatility, hedge funds could benefit from the lower volatility at target firms associated with high institutional ownership. Moreover hedge funds may recognize these other institutional investors as sophisticated and optimize the implementation of the activist agenda to minimize the impact on return volatility associated with institutional investors selling their positions in target firms.

Having established that hedge fund activism generates both short and long-term abnormal returns without increasing volatility I return to the question of whether other institutional investors' trading behavior reflects a positive view of hedge funds. If target firm institutional owners have an unfavorable view of hedge funds, they would simply liquidate their positions in target firms after

Table 7. Impact of institutional ownership on the volatility of stock returns of firms targeted by hedge funds

Variable	(1)	(2)
Institutional Ownership (IO)$_{\text{prior quarter}}$	–0.1343***	
	(0.0182)	
Short-Term Focused Institutional Ownership (SIO)$_{\text{prior quarter}}$		–0.0984***
		(0.0227)
Long-term Focused Institutional Ownership (LIO)$_{\text{prior quarter}}$		–0.2118***
		(0.0332)
Δ Institutional Ownership (IO)$_{\text{prior quarter}}$	–0.1056***	
	(0.0212)	
Δ Short-Term Focused Institutional Ownership (SIO)$_{\text{prior quarter}}$		–0.0971***
		(0.0234)
Δ Long-term Focused Institutional Ownership (LIO)$_{\text{prior quarter}}$		–0.1285***
		(0.0275)
Return on Assets$_{\text{prior quarter}}$	–0.5058***	–0.5095***
	(0.0708)	(0.0709)
q$_{\text{prior quarter}}$	0.0017	0.0012
	(0.0021)	(0.0021)
Dividend and Share Repurchase Yield$_{\text{prior quarter}}$	–0.3565	–0.3120
	(0.2299)	(0.2287)
Leverage$_{\text{prior quarter}}$	0.0328*	0.0343**
	(0.0170)	(0.0171)
Free Cash Flow Ratio$_{\text{prior quarter}}$	0.0043	0.0075
	(0.0260)	(0.0261)
Constant	0.4414***	0.4293***
	(0.0280)	(0.0282)
Year Fixed Effect	Y	Y
Industry Fixed Effects (3 digit SIC code)	Y	Y
Observations	3,402	3,402
R-squared	0.440	0.443

This table reports the relationships between the levels of and changes in institutional ownership stock return volatility at firms targeted by hedge funds between 1997 and 2007. The dependent variable in all regressions is the quarterly standard deviation of stock returns based on a GARCH(1,1) model in the 24 months following the activism event. All regressions control for industry (3 digit SIC) and year fixed effects. All explanatory/control variables are based on quarterly data. Institutional Ownership (IO) is the fraction of the firm's outstanding shares owned by institutional investors. Institutional ownership is further classified as short-term (SIO) and long-term (LIO) based on the fraction of the firm's outstanding shares that are owned by institutional investors with a short-term and long-term focus, respectively, based on portfolio churn ratio using the methodology in Appendix B. The regressions control for return on assets, q, dividend and share repurchase yield, leverage, and cash flow ratio (Appendix A for definitions). Cluster-robust cluster standard errors are in parentheses with clustering at firm level. ***, **, * indicate significance level at 1%, 5% and 10% level respectively.

the arrival of hedge funds. If overall levels decline it is important to evaluate the impact of investment time horizon on the trading behavior of institutional owners. Stable long-term focused ownership levels would indicate that long-term focused investors like activism because it creates value at target firms. Decreasing short-term focused ownership levels may be consistent with profit-taking by short-term investors driven by short-term abnormal returns at target firms. Table 8 provides insight into levels of and changes in institutional ownership at target firms in the years before and after hedge fund activism. The regression specification is:

$$y_{i,t} = \sum_{j=-2}^{+2} \alpha_j + \sum_{j=-2}^{+2} \beta_j D_{i,j} + FE_{\text{3digitSIC}} + FE_{\text{year}} + \varepsilon_{i,t}. \quad (1)$$

where:

$y_{i,t}$ – the measure of institutional ownership (IO, $\text{SIO}_{\text{churn rate}}$, $\text{LIO}_{\text{churn rate}}$, $\text{SIO}_{\text{institutional type}}$, and $\text{LIO}_{\text{institutional type}}$) for firm i in year t,

$D_{i,j}$ – a dummy variable equal to 1 if firm i will be (was) subject to a hedge fund SEC 13D filing j years relative to the current year,

$\text{FE}_{\text{3digitSIC}}$ and FE_{year} – control for industry (based on 3 digit SIC code) and year fixed effects,

$\varepsilon_{i,t}$ – an error term.

The β_j coefficients represent the abnormal level of the institutional ownership measure at target firms compared to normal levels at matched firms in the relative year indicated by j. For example, if $j = -2$ and $y_{i,t} = \text{IO}_{i,t}$, β_{-2} represents the abnormal level of institutional ownership at firm i (which will be the subject of a hedge fund 13D filing in two years) compared to the average level of institutional ownership at the five nearest neighbor firms that match with firms that will be the target of hedge fund activism in two years.

In the five-year window (+/– two years) surrounding the 13D filing the coefficients for all dummies for all regressions are positive and statistically significant at the 1% level (except β_1 in the $\text{SIO}_{\text{churn rate}}$ regression at 5% significance). These results are consistent with the findings in Table 3. Compared to their matched peers firms that are targets of hedge funds have higher levels of institutional ownership, regardless of investment time horizon or institution type. For example, the results in column 3 are for long-term focused institutional ownership based on churn rate, $\text{LIO}_{\text{churn rate}}$. In the year prior to an event LIO at targets is a full 3.0% higher than at matched firms. In the two years following the event LIO is 3.3% and 2.7% higher than at matched firms for the respective years.

Table 8 also shows the *change* in the measures of institutional ownership in the years surrounding the hedge fund 13D filing. Using the year prior to the

Table 8. Institutional ownership in target firms before and after hedge fund hedge fund targeting

Variable	IO	$SIO_{churn\ rate}$	$LIO_{churn\ rate}$	$SIO_{institutional\ type}$	$LIO_{institutional\ type}$
$D_{i,-2}$	0.0905***	0.0654***	0.0261***	0.0706***	0.0214***
	(0.0139)	(0.0104)	(0.0053)	(0.0102)	(0.0049)
$D_{i,-1}$	0.0973***	0.0681***	0.0297***	0.0722***	0.0260***
	(0.0132)	(0.0096)	(0.0052)	(0.0094)	(0.0049)
$D_{i,0}$	0.0503***	0.0335***	0.0170***	0.0322***	0.0192***
	(0.0128)	(0.0095)	(0.0051)	(0.0090)	(0.0049)
$D_{i,1}$	0.0540***	0.0210**	0.0325***	0.0296***	0.0238***
	(0.0140)	(0.0102)	(0.0057)	(0.0099)	(0.0055)
$D_{i,2}$	0.0819***	0.0557***	0.0273***	0.0456***	0.0359***
	(0.0160)	(0.0117)	(0.0064)	(0.0111)	(0.0066)
α_i	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y
Ind. fixed effects (3 digit SIC code)	Y	Y	Y	Y	Y
Observations	14,629	14,629	14,629	14,629	14,629
R-squared	0.706	0.677	0.628	0.681	0.657
Tests of significant changes in levels of institutional ownership[a]					
Coefficients $\beta_1 - \beta_{-1}$	–0.0433***	–0.0471***	0.0028	–0.0426***	–0.0022
F- Score	12.34	22.72	0.29	21.14	0.20
Coefficients $\beta_2 - \beta_{-1}$	–0.0154	–0.0124	–0.0024	–0.0266**	0.0099
F- Score	1.07	1.13	0.14	6.05	2.35

[a] Test of H0: $\beta_x - \beta_y = 0$.

This table presents changes in measures of target firm institutional ownership in the years before and after being targeted by hedge funds. The regression specification is $y_{i,t} = \sum_{j=-2}^{+2} \alpha_j + \sum_{j=-2}^{+2} \beta_j D_{i,j} + FE_{3\text{digitSIC}} + FE_{\text{year}} + \varepsilon_{i,t}$ where $y_{i,t}$ is the measure of institutional ownership (defined below) for firm *i* in year *t*, $D_{i,j}$ is a dummy variable equal to 1 if firm *i* will be (was) subject to a hedge fund SEC 13D filing *-j* years relative to the current year, $FE_{3\text{digitSIC}}$ and FE_{year} control for industry (based on 3 digit SIC code) and year fixed effects, and $\varepsilon_{i,j}$ is an error term. The dependent variables in the separate regressions are measures of institutional ownership at target firms: Institutional Ownership (IO) is the fraction of the firm's outstanding shares owned by institutional investors. Institutional ownership is further classified as short-term (SIO) and long-term (LIO) based on the fraction of the firm's outstanding shares that are owned by institutional investors with a short-term and long-term focus, respectively, based on portfolio churn ratio (see Appendix B) and institutional type (investment companies and independent investment advisors are short-term, and banks, insurance companies, and others including pension, endowment funds and sovereign wealth funds are long-term). Observations are from a matched sample (5 nearest neighbor firms) based on 3 digit SIC code, market to book ratio, and firm size based on market value of equity. Cluster-robust cluster standard errors are in parentheses with clustering at firm level. ***, **, * indicate significance level at 1%, 5% and 10% level respectively.

filing as a reference the Table 8 regression results indicate that both overall and short-term focused target firm institutional ownership levels (based on churn rate) decrease significantly (1% level) in the year after the filing but return to pre-event levels within two years.[18] In contrast long-term focused institutional ownership remains at pre-event levels in the two years following the 13D filing regardless of whether churn rate or institutional type is the basis for defining investment time horizon.

Institutional investors are heterogeneous in their trading behavior in response to hedge fund activism and this response casts light on the attitudes of institutional investors toward hedge funds. Institutional owners with a long-term investing horizon would simply liquidate their positions immediately if they perceived hedge fund activism to be focused on short-term manipulation of share price to the detriment of other shareholders. The tendency of long-term focused institutional investors to hold their target firm ownership positions long after the 13D filing suggests that they believe that hedge funds seek to profit from their activism through increased target firm share price driven by long-term improvement of target firm performance. The trading behavior of short-term focused institutional investors suggests that they, too, hold a favorable view of hedge funds. Short-term focused institutional investors reduce their holdings in target firms after the 13D filing to lock-in the short run abnormal returns associated with activism. The fact that short-term focused institutional investment at target firms increases between one and two years after the event suggests that these investors anticipate continued benefits from the activism.[19] Short-term focused institutional investors do not sell their position because they dislike activism – they sell to capture profits and return seeking more. Long-term focused institutional investors maintain their holdings in target firms after the 13D filing because they want to benefit from long-term compounded returns that are better than those generated by the market – long-term focused institutional investors view hedge fund activism favorably.

Conclusions

There is a mutually beneficial relationship between activist hedge funds and the other institutional owners at target firms – in general they are friends, not foes. Hedge funds demonstrate a preference for high levels of target firm institutional ownership suggesting that they seek the support of other institu-

[18] Untabulated results confirm that SIO based on institutional type returns to pre event levels within three years.

[19] Table 8 shows that levels of short-term focused institutional owners, based on churn rate, return to pre-event levels within two years. When institutional type is the basis for defining investment time horizon, although the levels two years after the activism have not fully rebounded, they increase significantly between years one and two.

tional investors in implementing activist agendas. Institutional heterogeneity is a meaningful differentiator for hedge funds and investment time horizon is an important measure of heterogeneity. Activist hedge fund investment time horizon matches with that of short-term focused institutional investors and hedge funds demonstrate a preference for short-term focused institutional investors. Liquidity trading by short-term investors may allow hedge funds to favorably acquire initial positions in target firms and profit-taking by short-term owners may provide a favorable environment for hedge funds to increase their holdings and attract new owners who are activism supporters. Institutional investors, regardless of investment time horizon, benefit from target firm ownership because hedge fund activism generates large short-term and long-term abnormal returns without increasing volatility. Hedge funds may benefit from lower target firm stock return volatility associated with high levels of institutional ownership, particularly long-term focused ownership. The findings in this paper are consistent with the hedge fund activism creating value at target firms – short-term abnormal returns do not reverse over time, target firm return volatility does not increase after activism and the trading behavior of both short and long-term focused institutional owners reflect value creation at target firms. Regardless of the efficacy of traditional institutional investors as activists their presence at firms targeted by hedge funds is an indirect path through which other institutional investors improve governance, performance and shareholder value at target firms – hedge funds have a track record of activism that delivers increased shareholder value and hedge funds rely on the implicit or explicit support of institutional investors to implement their agendas.

After a brief pause during the financial crisis of 2008–09 rapid global growth resumed in the hedge fund industry. There is a dearth of literature regarding the impact of the crisis on the effectiveness of hedge fund activism and the strategies they use and the ongoing relationship between activist hedge funds and other institutional investors. A logical extension of this paper is to extend the data set to include the downturn of 2008–09 and subsequent recovery.

Appendix A. Definition of variables

Variable Name	Variable Definition
Dividend and Share Repurchase Yield	total dividend payment and total expenditures on share repurchases all divided by market value of equity
Free Cash Flow	net income plus depreciation & amortization plus interest after tax minus the increase in net working capital minus capital expenditures
Free Cash Flow Ratio	free cash flow divided by total assets
Institutional Ownership (IO)	fraction of the target firm's outstanding shares owned by institutional investors
Leverage	book value of debt divided by sum of book value of debt and book value of equity
Long-term focused institutional ownership (LIO)	fraction of the target firm's outstanding shares owned by institutional investors with a long-term focus
Market to Book Ratio	fiscal year-end share price times common shares outstanding divided by book value of equity
Market Value of Equity	share price at fiscal year-end times the total number of shares outstanding
Q	sum of book value of debt and market value of equity all divided by the sum of book value of debt and book value of equity
Research and Development (R&D)	research and development expense divided by prior year total assets
Return on Assets (ROA)	earnings before interest, taxes, depreciation, and amortization (EBITDA) divided by prior year total assets
Sales Growth	increase in sales over prior year divided by prior year sales
Short-term focused institutional ownership (SIO)	fraction of the target firm's outstanding shares owned by institutional investors with a short-term focus
Stock Return	fiscal year-end price plus all per share dividend payments during the fiscal year all divided by prior fiscal year end share price

Appendix B. Determining portfolio churn rate and investment time horizon of institutional investors

Since I am interested in the relationships between activist hedge funds and other institutional investors I exclude activist hedge funds from the sample when calculating churn rate and investment time horizon.

Step 1
Using information from Schedule 13F quarterly filings of equity holdings:

$$\text{Aggregate Purchases}_{k,t} = \sum_{i=1}^{N_k} \left(\#_{k,i,t} \, \text{Price}_{i,t} - \#_{k,i,t-1} \, \text{Price}_{i,t-1} - \#_{k,i,t} \, \Delta\text{Price}_{i,t} \right) \text{ for } \#_{k,i,t} > \#_{k,i,t-1}, \quad \text{(B.1)}$$

$$\text{Aggregate Sales}_{k,t} = \sum_{i=1}^{N_k} \left| \#_{k,i,t} \text{ Price}_{i,t} - \#_{k,i,t-1} \text{ Price}_{i,t-1} - \#_{k,i,t} \Delta\text{Price}_{i,t} \right| \text{ for } \#_{k,i,t} \leq \#_{k,i,t-1}, \quad \text{(B.2)}$$

where:

$\#_{k,i,t}$ – the number of firm *i* shares held by institutional investor *k* at the end of quarter *t*,

$\text{Price}_{i,t}$ – the share price for firm *i* at the end of quarter *t*,

N_k – is the number of different firms in which institutional investor *k* has equity holdings.

Step 2

Find the quarterly churn rate for each institutional investor

$$\text{Quarterly Churn Rate}_{k,t} = CRq_{k,t} = \frac{\min\left(\text{Aggregate Purchases}_{k,t}, \text{Aggregate Sales}_{k,t}\right)}{\sum_{i=1}^{N_k} \frac{\left(\#_{k,i,t} \text{ Price}_{i,t} - \#_{k,i,t-1} \text{ Price}_{i,t-1}\right)}{2}}. \quad \text{(B.3)}$$

Step 3

Find the average quarterly churn rate for each institutional investor

$$\text{Average Quarterly Churn Rate}_{k,\text{year}} = \overline{CRq}_{k,\text{year}} = \frac{1}{4} \sum_{qtr=1}^{4} CRq_{k,qtr} \text{ for } qtr \in year. \quad \text{(B.4)}$$

Step 4

Based on $\overline{CRq}$, sort all institutional investors into two portfolios. An institutional investor is short-term focused if its churn rate is greater than or equal to the median of $\overline{CRq}$ for each year and long-term focused if its churn rate is below median.

Step 5

For each firm, SIO is the number of shares held by short-term focused institutional investors divided by the total number of shares outstanding. LIO is the number of shares held by long-term focused institutional investors divided by the total number of shares outstanding. Note that Tables 6 and 7 are based on quarterly data. To calculate quarterly SIO and LIO, I use the quarterly churn rate, *CRq*, from step 2 to sort the institutional investors into short-term and long-term focused.

Appendix C. Estimating Stock Return Volatility

GARCH (1, 1) *Model*

Some of the results in this paper are based on estimates of target firm stock return variance. A common approach in the empirical literature is to use a first-order generalized autoregressive conditional heteroscedasticity model – GARCH (1, 1) – Bollerslev (1986). I collected daily share price information for all target firms for the time period December 31, 1992, to December 31, 2009, from CRSP. The continuously compounded return is $r_t = \ln\left(\frac{p_t}{p_{t-1}}\right)$, where p_t and p_{t-1} are the closing share price on day t and $t-1$ respectively. I assume that $r_t = \overline{r} + \sigma_t \varepsilon_t$ where $\overline{r}$ is the mean continuously compounded daily return (which may vary over time), σ_t^2 is the variance of daily returns, and ε_t is a sequence of $N(0, 1)$ i.i.d. random variables. The $a_t = \sigma_t \varepsilon_t = r_t - \overline{r}$ terms are the residuals. In the GARCH(1, 1) specification, the current period estimate of the variance depends on the prior period estimate of the variance and the prior period squared residuals, $\sigma_t^2 = \alpha_0 + \alpha_1 a_{t-1}^2 + \beta_1 \sigma_{t-1}^2$. STATA uses maximum likelihood methodology to estimate the α and β parameters based on a sample of returns. Using post estimation commands I generated the GARCH estimates of daily stock return variance. Monthly stock return variance equals the sum of the daily variances over the month. Quarterly stock return variance equals the sum of the monthly variances over the quarter. Standard deviation equals the square root of variance.

Realized Variance

Realized variance equals sum of squared returns.

$$\mathrm{RV}_{\mathrm{monthly}} = \sum_{i=1}^{n} r_i, \text{ where n is the number of daily returns in the month,} \quad \text{(C.1)}$$

$$\mathrm{RV}_{\mathrm{quarterly}} = \sum_{i=1}^{3} \mathrm{RV}_{\mathrm{monthly}}. \quad \text{(C.2)}$$

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