Costly Communication, Shareholder Activism, and Limits to Arbitrage

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Abstract

Using a unique hand-collected dataset, we show that shareholder activism aimed at open ending U.S. based closed-end funds has become frequent since 1992. We denote this phenomenon as *activist arbitrage* and distinguish it from the standard *pure trading arbitrage*. We document a dual relationship between activist arbitrage and funds' discounts: a high discount increases the probability of an activist attack, while a high probability of ex post attack reduces the ex ante discount. We provide evidence showing that the ease of shareholder communication is a major determinant for the emergence of activist arbitrage. This holds for the time series – activist arbitrage has become much more common following the law reform of 1992 that lifted restrictions on shareholder communication – as well as for the cross section – activist arbitrage is more likely in funds that exhibit low costs of communication. Overall, our results provide direct evidence on the presence of arbitrage activities, but also demonstrate the existence of limits to arbitrage. Costly communication is identified as such limit.

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1. Introduction

The role of arbitrageurs in financial markets is undeniable. One of the main debates in financial economics centers on the possibility that arbitrageurs are constrained in their arbitrage activities. Proponents of the efficient markets hypothesis (e.g., Friedman (1953) and Fama (1965)) argue that arbitrage is almost unlimited and thus leads to efficient asset prices. On the other hand, the growing literature on limits to arbitrage (for example: DeLong, Shleifer, Summers, and Waldmann (1990) and Shleifer and Vishny (1997)) points out that mispricing may persist in equilibrium for long periods of time since arbitrageurs have to bear costs and risks and thus are constrained in their activities.

One of the main examples provided by proponents of the second view for the existence of limits to arbitrage concerns closed-end funds (CEFs). A closed end fund is an investment firm, whose own shares are traded in the market. An empirical fact is that the prices of these funds tend to deviate from their net asset values (NAVs) for long periods of time and to typically trade at substantial discounts.[1] Attempts to explain this pattern by pointing out that the methods used to calculate the NAVs overstate the value of the assets due to agency costs, tax liabilities, or illiquidity of the underlying assets have largely failed (Malkiel (1977)). This has led Lee, Shleifer, and Thaler (1991) to propose that discounts arise due to the presence of irrational traders and that they persist due to the constraints that prevent arbitrageurs from making a profit on the resulting mispricing. Indeed, Pontiff (1996) and, more recently, Gemmill and Thomas (2002), have provided empirical evidence consistent with the view that arbitrageurs might be limited in their ability to purchase discounted funds while shorting the funds' underlying assets for the length of time necessary to profit from the correction in fund prices.[2]

While Pontiff (1996), Gemmill and Thomas (2002), and others focus on a *pure trading arbitrage*, i.e., arbitrage that involves only buying and selling of assets in financial markets in hope of price convergence, we focus on an alternative type of arbitrage, which we denote as

[1] This fact is unique to closed-end funds. In an open-end fund, investors can redeem their share from the fund for the net asset value at any point in time and thus the share price is forced to be equal to the NAV.

[2] Ignoring all limits to arbitrage, Thompson (1978), Brauer (1988) and Pontiff (1995) show that discounted funds provide profitable arbitrage opportunities. Specifically, abnormal returns can be earned through a passive strategy of buying the shares of CEFs with high discounts and shorting the shares of low discount CEFs. For a thorough review of the closed-end-fund literature, see Dimson and Minio-Kozerski (1999).

activist arbitrage. With this type of arbitrage, the arbitrageur acquires shares in the discounted fund, and then, instead of waiting for the share price to converge to the NAV, he takes actions to affect the policies within the fund in a way that will move the share price towards the NAV. For example, the arbitrageur can take actions to open end the fund, which, in case of success, will equate the share price to the NAV.

Existence of the two forms of arbitrage is not unique to close-end funds. In a general corporate setting, an investor can either use his information for pure trading, or can use it to intervene within the firm and take actions that will change its value. Such intervention could be via a shareholder proposal for corporate restructuring or a proxy contest to replace the board. Bolton and Van Thadden (1998), Kahn and Winton (1998), and Maug (1998) provide theoretical models that highlight the trade offs between the two types of arbitrage in a regular corporation.[3] Closed-end funds provide a unique place to analyze the activist arbitrage because the increase in value of the firm following a successful intervention (open-ending) is clearly defined (the discount).

Some prior research on closed-end funds recognizes the possibility of activist arbitrage, but argues that this type of arbitrage is very costly and difficult to execute (Lee, Shleifer, and Thaler (1991)) and may fail due to resistance of managers and blockholders (Barclay, Holderness, and Pontiff (1993)). Indeed, activist arbitrage has been quite rare in the U.S. closed-end fund industry until the early 1990s. Since 1992, however, when the SEC made changes to the law relaxing constraints on communication among shareholders of public corporations, this type of arbitrage has become very common. Specifically, several arbitrageurs have become very active in initiating proxy contests and referendums targeted at open ending or liquidating deeply discounted closed end funds. Most of these attempts have been met with resistance from funds' managements. Still, quite a few of these attempts have succeeded despite such resistance, or have become credible enough to cause a significant shrinkage of the discount.[4]

[3] Dodd and Warner (1983), DeAngelo and DeAngelo (1989), Gordon and Pound (1993), Ikenberry and Lakonishok (1993), Carleton, Nelson, and Weisbach (1998), Del Guercio and Hawkins (1999), and Gillan and Stark (2000) provide empirical analysis of shareholder activism.

[4] Activist arbitrage can also be pursued via takeovers. In such arbitrage, the arbitrageur acquires control over the firm, and makes restructuring decisions without being dependent on the votes of other shareholders. A recent evaluation of the takeover mechanism vs. the proxy contest mechanism in a general corporate setting is performed

Our first goal in this paper is to document the phenomenon of activist arbitrage in closed-end funds and to study its relation with the discounts at which funds are traded. Using an extensive hand-collected dataset of all domestic and international equity funds based in the U.S., over the period between 1989 and 2003, we document an increasing trend of strong and frequent activist arbitrage. We show that the probability that a fund will be attacked by activist arbitrageurs increases in the size of the discount at which the fund is traded. This suggests that arbitrageurs perceive that they can make higher profits by attacking funds that are traded at larger discounts, or, they do not seem to believe that measurement issues, as mentioned before, are the main factors driving these discounts. We also show that the probability of an ex-post attack has a negative effect on the ex-ante discount. This suggests that there is a rational component in the discount. When an attack, which subsequently may lead to convergence of the price to the NAV, is likely, the forward-looking share price incorporates this and rises closer to the NAV.[5]

Our second goal is to study the effect of communication on activist arbitrage, and via that on fund discounts. We hypothesize that communication and coordination among shareholders play a key role in enabling the type of arbitrage studied in this paper. In order to lead an attack on a discounted closed-end fund, an arbitrageur needs to communicate with many other shareholders and convince them to vote for his plan. Thus, the ability to communicate and coordinate should be an important factor in determining whether such activist arbitrage will be attempted. Following the same logic, costs and limits on communication (such as the law before 1992) constitute limits to arbitrage.

The first piece of evidence that supports the role of communication is found in the time series. Following the change in the law in 1992 that enabled shareholder communication, the

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by Bebchuk and Hart (2001). Interestingly, takeovers are virtually non existent in the closed-end fund industry. One reason may be that they are subject to the famous free-rider problem, identified by Grossman and Hart (1980). We believe, however, that the main reason is the anti-pyramiding provision, enacted in the Investment Company Act of 1940, that prevents registered investment companies from holding more than 3% of the shares of other registered investment companies. The National Securities Markets Improvement Act of 1996 classifies private funds as investment companies for the purpose of being subject to the 3% limitation. This prevents most potential activist arbitrageurs from attempting a takeover of a closed-end fund.

[5] It should be noted, however, that despite this strong effect, discounts have not decreased after 1992, when the attacks became much more common, compared to their levels during 1988-1992. This suggests that other forces that generate discounts became stronger in the late 1990s. After 2000 (up till the end of 2004), however, overall discounts have been declining. The explanation of what generally determines the level of the discount is beyond the scope of this paper.

number of attacks on closed end funds increased dramatically. Before the change in the law, communication among shareholders was severely restricted by the SEC, as any type of communication between shareholders had to be approved by the SEC. The change in 1992 lifted many of these restrictions, and thus made communication and activist arbitrage much more feasible. This, we believe, led to the increase in the number of activists' attacks.[6]

Since it is possible that the dramatic change in the magnitude of activist arbitrage after 1992 may be due to other factors that are unrelated to the change in the law, we provide additional, cross-sectional, evidence to strengthen our thesis that communication is important in enabling activist arbitrage. We use fund-specific variables that proxy for the cost of communication, and test whether these explain differences in the probability of attack in the cross section. We use three such variables. The first variable is turnover, which measures the frequency at which the shares of the closed-end fund change hands. We argue that a high turnover indicates greater costs of communication, since it suggests that shareholders are changing frequently and thus are difficult to be located and communicated with. Pound (1988) was the first one to suggest this variable as a proxy for the cost of communication. The second variable is the percentage of institutional ownership in the fund. Institutional investors typically hold larger accounts and are more tuned to the market. Thus, they are easier to locate and communicate with. We hypothesize that a greater percentage of institutional ownership indicates smaller communication costs. The third variable that we use is the average size of trade in the fund's shares. We argue that a greater size of trade indicates that, on average, shareholders hold bigger accounts in the fund, and thus that overall the fund has fewer shareholders, so communication is easier.[7] Our cross-sectional tests show that these three variables are indeed important in explaining the probability of attack. Their effects go in the expected directions.

We perform additional tests to check the combined effect of the change in the law in 1992 with that of cross-sectional variables. These tests reinforce the conclusion that

[6] In Section 2, we provide a broad discussion on the change in the law and its implications. Additional references are Pound (1991), who provides an excellent discussion on the restrictions in the old law and their detrimental effect on the proxy process, and Choi (2000), who brings evidence on the increase in number of proxy contests in regular corporations following the change in the law in 1992.

[7] Ultimately, we are interested in knowing the number of shareholder accounts for each fund, and use that as a proxy for costs of communication. However, despite our efforts, we were not able to get a version of this variable that is accurate enough for our purposes. See Section 4 for more details.

communication among shareholders is important for activist arbitrage. First, we show that the effect of the proxies for communication costs, described in the previous paragraph, strengthened after the change in the law in 1992. Our interpretation is that prior to 1992, communication was severely restricted by the SEC for all funds, so that differences in costs of communication across funds did not play a big role. This changed in 1992 following the removal of restrictions by the SEC. Second, we use different variables to proxy for the quality of governance of individual funds. We find that, while bad-governance funds were more likely to be avoided by activist arbitrageurs before 1992, they became more likely targets after 1992. This is expected since communication among shareholders is particularly important for activists in bad-governance funds, where the management is fighting hard against open-ending attempts and trying to put more restrictions on transmission of information.

To summarize our findings and put them in the perspective of the vast literature on arbitrage, we believe two main conclusions should be drawn from our study. The first conclusion is that arbitrage activities are alive. We bring direct evidence on such activities occurring over more than a decade in one of the most puzzling assets traded in financial markets. Our evidence shows that arbitrageurs respond to profit opportunities and that they perform an important role in the determination of asset prices in financial markets.[8]

The second conclusion is that limits to arbitrage do exist. Different authors have emphasized different factors that lead to limits on arbitrage activities. Campbell and Kyle (1993) focus on fundamental risk, i.e., the risk that something will change in the fundamentals of the assets, while the arbitrage strategy is being pursued. DeLong, Shleifer, Summers, and Waldmann (1990) argue that noise-trading risk, i.e., the risk that noise trading will increase the degree of mispricing, may warrant arbitrage activities unprofitable. Many authors (for example, Mitchell and Pulvino (2001), Mitchell, Pulvino, and Stafford (2002), and Pontiff (1996)) look at the transaction costs and holding costs that arbitrageurs have to incur while pursuing an arbitrage strategy. Others (Geczy, Musto, and Reed (2002) and Lamont and Thaler (2003)) discuss the importance of short-sales constraints.

[8] Two other papers study open ending of closed-end funds: Brauer (1984) and Del Guercio, Dann, and Partch (2003). However, they do not look at the attacks of arbitrageurs on closed-end funds. They also do not simultaneously study the effect of the discount on the probability of open ending and that of the probability of open ending on the discount, and do not look at the effects of communication and the law.

The limits to arbitrage featured in our paper emanate from a different source: the need to communicate and coordinate with other agents in order to pursue a profitable arbitrage strategy. At the basis of this argument lies the idea that different agents may not agree on the true value of the asset. Some may think that open ending a discounted closed-end fund is in the best interest of shareholders, for example, because mangers charge too high fees, which dissipate the NAV (as is suggested by the theoretical work of Berk and Stanton (2004), and Cherkes, Sagi, and Stanton (2005)). Others may think open ending a discounted closed-end fund is not in the best interest of shareholders because closed end funds are efficient in managing long-term portfolios, and thus will provide higher long-term returns than open-end funds (as is suggested by the theoretical work of Stein (2005)). The idea of disagreement is very natural. In fact, it is mirrored in the academic literature, as different authors have different views regarding the source of the discount and whether or not it should trigger open ending.[9] In light of such disagreement, arbitrageurs who want to initiate a proxy contest aimed at open ending a fund need to be able to communicate with other shareholders and convince them that their view of the world is right. This communication is costly and constrained in our world, and thus arbitrage is limited.[10]

One may argue that communication and coordination among participants in financial markets may be important only for the type of arbitrage studied in this paper – i.e., activist arbitrage via proxy contests. After all, the arbitrageurs, whose actions are documented here, need the votes of other shareholders to change the structure of the fund and complete the arbitrage strategy. We believe, however, that communication and coordination are crucial in other types of arbitrage, not documented here. As argued by Shleifer and Vishny (1997), even in a pure-trading arbitrage, an arbitrageur, who is financially constrained, needs to be able to communicate to providers of capital that his arbitrage strategy is profitable. At times in which his position might be losing money the arbitrageur needs to convince his investors that his rationale for the causal mechanism driving prices is the correct one (see Brav and Heaton

[9] This disagreement can be viewed as the 'model risk' in the terminology of Lee, Shleifer and Thaler (1991).

[10] One manifestation of these limits in our dataset can be found in the fact that, despite great profit opportunities in the closed-end fund industry, only a handful of arbitrageurs were involved in activist arbitrage during the period of time studied in our paper. The complexity of pursuing an activist arbitrage strategy involving lengthy campaigns, direct communication with shareholders, and possible legal liability requires a lot of expertise and knowledge from the arbitrageur. Thus, unlike standard textbook arbitrage in which many shareholders take a small part in an arbitrage activity, we can clearly see how few activist arbitrageurs are controlling this type of arbitrage activity, and pursuing it against more and more funds.

(2002)). Moreover, as argued by Abreu and Brunnermeier (2003) (and demonstrated empirically by Brunnermeier and Nagel (2004)), also in a setting of pure-trading arbitrage, lack of communication and coordination among arbitrageurs can make them choose to ride on a bubble, rather than go against it and correct the mispricing. Thus, our empirical results have implications for a broader context than the one studied in this paper.

The remainder of this paper is organized as follows. In Section 2 we trace the history of the SEC regulations of the proxy process and highlight the dramatic changes that occurred in 1992 regarding the ability of stockholders to communicate with each other as well as with arbitrageurs. We also provide some institutional details and examples of activist arbitrage in the closed-end fund industry. Section 3 describes the unique dataset used for the empirical analysis in this paper. In Section 4 we develop the empirical methodology used for the empirical analysis. Then we present our empirical results on the relations between activist arbitrage and closed end funds' discounts and on the effects of communication costs on the activist arbitrage. Section 5 concludes and outlines areas for future research.

2. Background

2.1. SEC Regulation of the Proxy Process

2.1.1. Regulation prior to 1992: Limitations on Shareholder Communication

Dissident shareholders have two main avenues via which they can impose changes in a corporation. They can initiate a proxy contest to replace the board of directors and achieve ultimate control over the corporation, or they can make a shareholder proposal to improve corporate governance measures, alter corporate decisions, etc. The issues raised by dissidents in proxy contests and shareholder proposals are resolved by shareholders' voting. In the voting process, also called proxy process, the dissident shareholders try to get the proxies (votes) of other shareholders to support the changes they wish to make.

The rules governing the proxy process were first established by the Securities and Exchange Commission (SEC) in 1935 under the authority granted by Section 14(a) of the Securities Exchange Act of 1934 (see SEC (1935)). In establishing the rules, the intent of the SEC was to insure that shareholders were accurately informed about voting issues and that

voting was fair, honest, and immune from manipulation by soliciting parties. One of the first rules enacted by the SEC required any party soliciting proxies (requesting votes) from other shareholders to register and disclose information such as the name and ownership position of the soliciting party, the matters to be voted on, the intended vote of the soliciting party, and other matters. The information could not contain statements that were false or misleading. The proxy solicitation documents were reviewed by the SEC, which often exercised its power to require significant changes before approval.

The proxy rules evolved significantly after 1935. The most significant amendments were enacted in 1956 following an increase in public controversy over proxy contests for control of large, visible corporations (see SEC (1956)). These amendments created major deterrents on communication among shareholders during the course of a proxy process. The main component of the 1956 amendments was a change in the definition of a proxy solicitation. Previously, solicitation had been defined to involve only a formal request for a proxy. Under the new definition, a solicitation consisted of *any* communication under circumstances reasonably calculated to influence voting decisions. This liberal interpretation of solicitation dramatically expanded the power of the SEC to require registration and review of proxy communications. In particular, the new definition allowed the agency to assert control over *any* communications between a soliciting party and shareholders (not only the solicitation document itself); public statements made by dissidents and third parties allied with dissidents; analyses of voting issues rendered by parties with no formal affiliation with any party (such as investment analysts); and any impromptu communications made through television, speeches or on the radio. The second major component of the 1956 amendments was the increase in the requirements of disclosure about the identity, intentions, and associations of dissidents attempting to elect a competing slate of directors. Finally, the third broad component of the new proxy rules placed restrictions on communications containing complex, sophisticated, or forward-looking language, or questioning the competence of other soliciting parties, especially the incumbent management. As examples of statements that might be misleading (and therefore disallowed), the new rules mentioned predictions regarding future sales, earnings or dividends and ad homonym attacks on the competency or integrity of the current management.

Clearly, these rules had a stifling effect on stockholder communication. By placing almost *any* communication among shareholders under the control of the SEC, and by making it

difficult to disseminate detailed and predictive information in proxy campaigns, the regulations limited the provision of private information on voting issues. Providers of private information had to bear the direct costs of dealing with the SEC – such as filing costs, costs of delay, and risk of being disapproved. They had to give up anonymity, and bear the risk of being sued when the communication might be interpreted as violating the regulations.[11] Thus, the regulations disturbed the working of the voting market considerably. Importantly, the impact of the regulations fell probably mostly on dissidents, who typically start the proxy process at a disadvantage relative to the incumbent management. The 1956 regulations remained in place till 1992 and were, in fact, reinforced several times in further regulations and court decisions during that period.

2.1.2. The 1992 Reform: Enhanced Shareholder Communication

The limitations on shareholder communication in the pre-1992 law have been subject to wide criticism. Pound (1991) summarized the criticism from an academic point of view. In policy circles, SEC Chairman at the time, Richard Breeden, ironically stated that: "If political elections were subject to the SEC's old guidelines, every time citizens wanted to discuss their views on President Bush, Bill Clinton or Ross Perot, they would have to file a description of themselves and their views with the SEC".[12] Finally, in October 1992, the SEC enacted major revisions in the proxy rules in order to increase shareholder communication (see SEC (1992)).

The new rules curtailed the definition of a proxy solicitation to exclude any communication by shareholders when not directly seeking the power to vote as proxy for other shareholders, as long as the shareholders' motive is only to gain pro rata with other shareholders. The 1992 amendments also specifically excluded shareholders' public statements of their voting intentions and/or voting rationale (including public speeches, press releases, newspaper advertisements, and internet communications) from the definition of a solicitation. These changes effectively allowed independent shareholders to freely engage in communication during

[11] Note that law suits are possible even if the communication passes through the SEC. Pound (1991, pp 269-278) provides an excellent discussion on this issue and other implications of the 1956 regulations.

[12] David R. Sands, *Investors Victors in Wide SEC Reforms*, WASHINGTON TIMES, Oct. 16, 1992, at C1.

(and before) a proxy process without being monitored by the SEC, and without bearing the liability imposed by law on proxy solicitations.[13]

To sum up, the reform of 1992 lifted restrictions on communication among shareholders in the proxy process. This change is expected to make the proxy process easier for dissident shareholders, and thus to decrease the limits to activist arbitrage. In this paper, we document and study activist arbitrage in the closed-end fund industry. We analyze the effect of the 1992 reform on this arbitrage, and more generally the relation between this arbitrage and costs of communication.

2.2. Activist Arbitrage in the Close-End Fund Industry

2.2.1. The Arbitrageurs

The textbook treatment of arbitrage activity typically posits that a large number of investors add a smaller portion of a mispriced asset to their well-diversified portfolio thus leading to the elimination of observed mispricing. One of the distinctive features of the study that we conduct is the ability to identify the arbitrageurs that are active in the CEF market, the funds that they are involved in, and the extent of cooperation among these activists. Indeed, only a handful of arbitrageurs tend to actively engage in attempts to liquidate or open-end CEFs. Consider, for example the following passage from a recent Business Week article:

> "Some institutions are more aggressive than others. A few groups are known for their activism: Newgate Management Associates, based in Greenwich Conn., Harvard College, City of London Investment Management, Lazard Freres & Co., and Phillip Goldstein, who runs Opportunity Partners, a $40 million hedge fund that specializes in closed-end funds in Pleasantville, N.Y. Their stake in a closed-end fund does not guarantee an open-ending, but the odds are higher."[14]

Similarly, in reviewing arbitrage activity in CEFs, an article published in Forbes reviewed the activity of a key activist, Phillip Goldstein, and commented that:

> "Goldstein's Opportunity Partners is joined in these battles by some heavy weight speculators: Harvard, [George] Soros Fund Management, Michael Price's Mutual

[13] In 1998, the SEC instituted another pro-dissidents reform in the proxy rules. This reform made it easier for shareholders to include a broader range of proposals in companies' proxy materials. In this paper, we do not focus on this reform.

[14] Toddi Gutner, *When the lead comes off closed-end funds*, BUSINESS WEEK, Sep.29, 1997.

> Qualified, investment bank Lazard Freres and Newgate Management based in Greenwich, Conn."[15]

As we review each of the histories of the equity CEFs in our database it is evident that the arbitrageurs that are mentioned in the previous quotes are, with minor exceptions, the ones that tend to engage in activist arbitrage.[16] This evidence is important since a small set of risk-averse arbitrageurs will be unwilling to take large stakes in underperforming CEFs thus limiting their ability to easily eliminate observed discounts (Barberis and Thaler (2003)). Moreover, the activity of only a small number of institutions suggests that coordination among their actions is likely to be paramount in successful open ending.

Since some of the activist activity that we focus on is relatively unexplored we now proceed with a detailed description of the evolution of an activist attempt at open-ending. This example reflects some key commonalities in the behavior of dissident shareholders and managements. Figure 1 provides illustration of the example.

[Insert Figure 1 here]

2.2.2. Activist Example: The Growth Fund of Spain

The Growth Fund of Spain conducted an IPO in early 1990. The fund's prospectus required that if a discount of greater than ten percent would persist for twelve weeks, and if a ten percent shareholder would submit a written request, the fund will have to propose a reorganization into an open-end structure to be passed by a three-fourths vote. In early 1996 management submitted a preliminary proxy statement inviting the fund shareholders to the annual meeting to be held the following May indicating that both the discount and written request conditions were met (PRE 14A filed on March 8th 1996). Management indicated its opposition to open-ending, however. Since the vote in favor was only 30 percent of outstanding shares the proposal failed (N-30D filed on July 30th 1996). At the same meeting shareholders also considered a proposal by Cargill Financial Markets PLC that the fund make a practice of making repurchases at three-month intervals. This proposal did pass with a majority of the

[15] Thomas Easton, *Try your hand at fund arbitrage*, FORBES, 09/08/1997 Vol. 160(5), page 209.
[16] Other key players include Ron Olin, founder of Deep Discount Advisors, Bankgesellschaft Berlin AG, and Laxey Partners Limited.

voting shares. Shortly thereafter Cargill Financial Markets sent a letter to the fund requesting that a proposal that the fund be converted into open-end investment company be included in the proxy materials for the Fund's 1997 annual meeting of shareholders. The management chose, however, not to include Cargill's proposal in the proxy material thus thwarting the attempt to open-end (see both SC 13D filed on November 22nd 1996 and DEF 14A filed on April 9th 1997).

In June 1997, the fund's largest shareholder, Bankgesellschaft Berlin AG, expressed its interest in eliminating the fund discount, which at the time was 19 percent. It suggested measures including open-ending, tender offers, and liquidation. It also suggested that it may increase its holdings to gain a majority, seek representation on board, or solicit a proxy (SC 13D filed June 18th 1997). By October 1997, Bankgesellschaft Berlin sent a letter requesting that its nominees, rather than the fund nominees be included on the proxy for the meeting of shareholders (SC 13D/A filed October 8th 1997). By the time the letter was sent Bankgesellschaft Berlin had increased the shares held to 9.2 percent of shares outstanding. The fund then replied that the Bank's letter had arrived too late, and the Bank's nominees would not be included for consideration in the special meeting scheduled for early December.

In response, Bankgesellschaft Berlin decided to solicit its own proxies for the upcoming special meeting in December. The Bank proposed two nominees to the board and asked shareholders that they return the Bank's proxy, not the fund's (PREC14A filed November 3rd 1997, SC 13D/A filed November 4th 1997 and DEFC14A filed November 6th 1997). The fund responded with a letter, (DEFA14A filed November 24th 1997) to shareholders suggesting that the Bank's intention is to realize a short-term gain, while diminishing the long run return of the fund. Bankgesellschaft Berlin then responded by sending a letter to fund managers demanding a proposal that the fund be open ended. By this time the Bank had increased its holding of the fund shares to 11 percent (SC 13D/A filed November 26th 1997). In addition, the Bank sent a letter to shareholders announcing that at the December special meeting, the Bank's nominees received a plurality of votes and would take office upon the upcoming merger transaction. The Bank's nominees won the board positions by a landslide: 8,663,028 to 1,772,125 over the fund's nominees (SC 13D/A filed December 16th 1997 and N-30D filed August 3rd 1998).

In September of 1998, the newly elected board of the fund filed a proposal that the fund be converted into an open-end investment company (PRE 14A filed September 11th 1998). The proposal passed with 11,399,716 votes in favor and only 221,207 against.

3. Data

Using the Center for Research in Security Prices ("CRSP"), we gathered information on all closed end funds that were in existence sometime over the period 1988 through 2002. We then constrained this sample to funds managing either domestic or international equity, including specialized equity funds. Eliminated from the sample are closed end funds investing in convertible bond, preferred stock, taxable bond, real estate, private equity, and municipal debt. We also excluded exchange traded funds, funds incorporated outside the U.S, and funds for which we were unable to obtain Net Asset Value (NAV) information. We cross checked our list of funds with various Barron's publications to make sure that our sample encompasses all public equity funds that were traded sometime after 1988. We conducted a similar comparison using data obtained from Lipper and various Morningstar's Principia publications for all closed end funds. The resulting sample includes 142 closed end funds that were traded sometime over the period 1988-2002.

Based on this sample, we hand-collected, all reports filed with the SEC through Edgar. Since the information on Edgar is typically not available prior to the mid-90s we used Lexis Nexis for filings in earlier years. We retrieved registration statements, proxy related materials, and annual reports. We also searched for news stories using databases such as factiva (formerly Dow Jones Interactive), Proquest, Lexis Nexis, as well as news published on the internet. For each fund, we then formed a summary of all events that might potentially be related to arbitrage activity of the kind we study in this paper. These events include funds' decisions to repurchase shares, conduct rights offerings, merge, liquidate, and open end, as well as detailed timeline of dissident activity to open end the fund whether successful or not.

To assess the completeness of the resulting fund activity we purchased various monthly publications from Thomas Herzfeld Advisors. These publications provide a thorough description of the full universe of closed end funds' corporate activity ranging from liquidations and mergers that have already been consummated to outstanding and unresolved activities (such as tender

offers, rights offerings, and dissident activity). We then cross checked that the events outlined in the Herzfeld publication match those compiled from the sources described earlier.

Since the regression analysis hinges on the construction of indicator variables for various degrees of arbitrage activity, we constructed three fund activity indicators denoted "strong", "medium" and "weak." The indicator variable "strong" receives the value '1' if an open ending, merger, or liquidation have occurred in a given year and zero otherwise. The variable "medium" receives the value '1' if an attempt (either by the management or a dissident) has been made to open-end or liquidate the fund in a given year and zero otherwise. Finally, we recorded events in which CEFs conduct more mundane corporate activity such as share repurchases and rights offerings – which sometimes come as a response to an attack of activist arbitrageurs – as "weak" and assigned a value '1' to a fund-year if such activity is detected and zero otherwise. In later analysis, we equate the existence of either "medium" or "strong" activity to an open-ending attempt, and the existence of "strong" activity to a successful open-ending. The "weak" indicator ended up not delivering significant results.

Table 1 Panel A reports the summary statistics (the mean, median, and standard deviation among all existing funds at each year) of major fund characteristics variables. We purchased monthly NAV and price data from Securities Data Corporation (SDC). In a few cases in which the data is missing we obtained the NAV and price data from Herzfeld Advisors. Following the practice in the literature, fund discount is calculated as (NAV-Price)/NAV. In most years, about 80%-90% of the CEFs trade in discount, similar to the numbers documented in the prior research. Institutional holdings are from Thomson Financial's Spectrum Data, and insider holdings are from Thomson Financial's Lancer Analytics. From CRSP we also obtained information about price, volume, return, dividend, market capitalization, and turnover rate. Fund age is calculated as the time, in years, since the fund first listed on CRSP. The annual dividend yield is calculated as the difference between the annual buy and hold return with dividends and the buy and hold return without dividends.

Table 1 Panel B lists the summary statistics of the governance variables for the full sample period and sub-periods (1988-1992, 1993-1998, 1999-2002). We collected information on the existence of a staggered board, supermajority, special meeting, and confidential voting by

examination of the funds' filings with the SEC which were discussed earlier.[17] Information on lifeboat provisions, which entail commitment of the fund to take action to reduce the discount in certain circumstances, was purchased from Thomas Herzfeld Advisors and augmented by a review of funds' activities that we compiled. Finally, information on management fees was purchased from SDC. It can be seen that most of these variables have some but little variation within the same fund. To disentangle time trends from composition effects, we separately report the summary statistics in each period for old and new funds, depending on whether the fund has been in our sample for more than three years.

[Insert Table 1 here]

Figure 2 plots the time trends of open-ending attempts (i.e., "medium" and "strong" activities) and actual open-endings, liquidations and mergers into open-end funds (i.e., "strong" activities) from 1988 to 2003.[18] There is a clear upward trend in open-ending attempts after the law change, especially after 1994. In early 1990s, only 3-4% of the funds were subject to activist arbitrage attacks. In the peak of 1999-2000, it rose to 27% of the sample funds.

[Insert Figure 2 here]

4. Empirical Results

4.1. Review of CEF Discounts

To set the stage for the empirical analysis, we begin with a review of the key cross-sectional determinants of CEF discounts documented in the literature. Most of the existing work focuses on noise-trader risk, agency costs, and the costs of arbitrage (transaction and holding costs) as the main explanations for the discounts. Table 2 presents a brief review using our sample data, where regressions are presented using the full sample, i.e., 1988 through 2002. The dependent variable is *DISCOUNT*, defined as (NAV-Price)/NAV. The first column provides

[17] We do not present statistics on confidential voting since there is little cross-sectional variation in this variable.

[18] Information is retrieved for one more year into 2003 because in the analysis open-ending activities will be regressed on lagged variables.

results based on a pooled regression with year fixed effects while the second column provides results based on a Fama-MacBeth type regression.

[Insert Table 2 here]

We start with funds' market value and share price. Pontiff (1996) argues that high transaction costs increase the costs of arbitrage trading, and thus generate a higher degree of mispricing, i.e., a higher discount. He argues that transaction costs are greater for small funds and funds with a low market price. The rationale for the inclusion of market price is that the bid-ask spread tends to be relatively fixed at low prices. As a result, low-price securities tend to have higher proportional transaction cost. We include these variables in the regression along with share turnover as alternative measure of liquidity.[19] We measure fund size by the market capitalization (*MV*) of the fund in log dollars; market price (*P*) of the fund shares is also expressed in log dollars; and share turnover (*TO*) is given by the yearly share volume scaled by shares outstanding. We find that market capitalization does not impact the magnitude of the discounts when other characteristics are controlled for. However, the results in Table 2 indicate that lower share price is indeed associated with higher discount, consistent with Pontiff (1996). Similarly, share turnover is inversely related to fund discount, consistent with the idea that more liquid CEFs tend to trade at lower discounts.[20]

Our next variable is also motivated by Pontiff (1996). The pure-trading arbitrage of CEFs requires taking opposite positions in the underlying assets. Consequently, the ease of replicating the fund portfolios is a determinant for the cost of arbitrage. Specifically, the more unconventional the underlying assets are, the more costly arbitrage is, and the more likely it is that the price will deviate from its NAV. On the other hand, a CEF might go public precisely because investors are willing to pay a premium for the hard-to-replicate fund assets, which could

[19] The turnover variable will be used later on in our analysis under a different interpretation.

[20] It is possible, that the inverse relation between fund discount and share price is driven by a mechanical correlation given that the denominator of the dependent variable, *NAV*, is highly correlated with price (the correlation exceeds 0.9). We therefore consider two alternative liquidity measures that do not involve price or NAV normalization (results are not tabulated). The first measure, following, Bekaert, Harvey, and Lundblad (2005), is the proportion of zero-return days for each fund-year where days without any price change reflect very thin trades (or no trades). The second measure is based on Pastor and Stambaugh (2003) who argue that illiquidity can be proxied by a stronger relation between daily returns and signed lagged dollar volume. We estimate for each fund-year these liquidity measures. We find that for both measures higher illiquidity is indeed associated with higher fund discounts although only the second measure is marginally significant.

lead to higher (lower) premium (discount). Which effect dominates is an empirical question. Similar to Pontiff (1996) and Gemmill and Thomas (2002), we use residual standard deviation of a fund's NAV return (*STDNAV*) as a proxy for the replicability of the fund's underlying portfolio. The residual obtains from a regression of a fund's NAV return on the Fama-French three factors plus an additional momentum factor. These four factors were all obtained from Ken French's web site. To this we add two MSCI international indices representing the European market and the Far East market. We find that the effect of *STDNAV* on discount is negative and significant in the two specifications, suggesting that the second effect above dominates the first one.[21]

Pontiff (1996) also argues that higher dividend yields should make it easier to execute a pure-trading arbitrage and thus be associated with lower discounts. A dividend payout is essentially a partial liquidation of the fund share, and thus draws price closer to the NAV. Further, higher dividends increase the liquidity of the assets because the cash flows become more front-loaded. The regression results show that dividend yield (*DIV*) is significantly (at the 2.5% level) negatively related to discount, consistent with the findings by Pontiff (1996). A one percentage point increase in the dividend yield is associated with 0.3-0.5 percentage point decrease in the discount.

The expense ratio (*FEES*) and the proportion of fund shares held by insiders (*INSIDER*) have been commonly adopted as proxies for agency costs. Fees do not seem to be related to deeper discounts.[22] A lack of relation between fees and discount is also documented by Malkiel (1977), Barclay, Holderness and Pontiff (1993), Gemmill and Thomas (2002) and Del Guercio, Dann, and Partch (2003). On the other hand, higher insider ownership is overall significantly associated with higher discount, consistent with the hypothesis of insiders' private benefit of control.

Another variable we consider is fund age (*AGE*). The literature has documented that CEFs go public when investors demand for their assets is high. This leads to funds trading at a

[21] The inverse relation between *STDNAV* and fund discount differs from that documented by Pontiff (1996) and Gemmill and Thomas (2002) and may very well arise due to the different sample that is used in our study. Additional robustness tests yield similar results.

[22] The result does not change much if *FEES* is replaced with the residuals from a regression of *FEES* on fund characteristics that could affect expenses for non-agency related reasons: fund size; turnover; the fund being primarily invested in international stocks, specialized stocks, or small-cap stocks, and a time trend.

premium after their initial public offering which over time turns into a discount. The regression results are consistent with this pattern although the statistical significance is low.

Lastly, we also consider the presence of a lifeboat provision (*LIFEBOAT*). Such provision entails commitment of the fund to take action to reduce the discount in certain circumstances. Thus, it puts an upper bound on fund discount. Lifeboat provisions vary in their rigidity: from some promise of remedial measures (such as share repurchase) to a firm commitment of open-ending when the discount rises above a certain threshold. A lifeboat dummy is coded as one if the fund has genuine lifeboat provision or specifies explicit dates of tender offers or repurchase. As expected, *LIFEBOAT* seems to reduce discount but the magnitude is moderate: the existence of a lifeboat provision reduces the discount by 1.4-1.8 percentage points, with marginal significance.

For robustness check, Column 3 of Table 2 considers a more parsimonious alternative to year dummies. Following Lee, Shleifer and Thaler (1991), we use the difference between the return on small stocks and the return on large stocks as a proxy for investor sentiment. The results show that the proxy for sentiment is significantly related to the discount in the expected direction.

Overall, a handful of covariates are able to explain a reasonable portion of the cross-sectional variation in the fund discount: they jointly explain 18.2% of the total variation in *DISCOUNT* at the fund-year level with year dummies. We will include these covariates as we proceed to analyze the relation between the discounts and activist arbitrage.

4.2. Analysis of Activist Arbitrage

4.2.1. Model Specification

The focus of the paper is the analysis of the activist arbitrage aiming at open-ending closed-end funds. Of particular interest to us are the questions of how the improved shareholder communication affects the pattern of arbitrage, and how the fund discount reflects the prospect of such arbitrage.

Obviously, the occurrence of activist arbitrage and the fund discount are simultaneously determined: we expect activists to be more likely to attack deeply discounted CEFs, as they provide higher profitability in case of success. In the meanwhile, in a world with rational

expectations, CEF discounts should take into account the funds' susceptibility to open-ending. Thus, a simple reduced-form regression of observed attacks on observed discounts would underestimate the sensitivity of attacks to discounts and would underplay the rational-expectations component in both activist attacks and CEF discounts

The structural model underlying our analyses reflects those effects. It can be written as follows:

$$\begin{aligned} Attack^{*}_{i,t} &= \beta Discount_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t}, \\ Attack_{i,t} &= I(Attack^{*}_{i,t} > 0), \\ Discount_{i,t} &= \mu_1 X_{i,t} + \mu_2 Z_{i,t} + \omega_{i,t}, Z \neq \Theta, \\ \rho &= corr\left(\varepsilon_{i,t}, \omega_{i,t-1}\right) \neq 0. \end{aligned} \tag{1}$$

In (1), subscripts *i*, and *t* index for fund and year respectively. $Attack^{*}_{i,t}$ is a latent variable for the propensity of fund *i* to be under open-ending attack in year *t*, and $Attack_{i,t}$ is the observed binary outcome. $Discount_{i,t}$ is the fund discount. $X_{i,t}$ is a vector of fund characteristics (such as fund size) or market conditions (such as market index return), and could include variables that do not vary across time (such as some of the fund governance variables). Finally, $Z_{i,t}$ is a vector of instrumental variables that affect discounts directly and affect the probability of attacks only through the effect on fund discounts.

If the error disturbances from the *Attack* and the *Discount* equations ($\varepsilon_{i,t}$ and $\omega_{i,t-1}$) are uncorrelated, then system (1) is reduced to equations that could be estimated separately. A key feature of our model, however, is that $\rho = corr\left(\varepsilon_{i,t}, \omega_{i,t-1}\right) < 0$, that is, the residuals from the discount equation reflect (negatively) the propensity of attacks that is not explainable by observables. This is a feature of rational expectations: A high probability of attack should narrow the discount, as a successful attack is expected to eliminate the discount altogether. In such a setup, the identification of (1) relies on $Z_{i,t}$ being nonempty.

To estimate (1), and test the null hypothesis $H_0 : corr\left(\varepsilon_{i,t}, \omega_{i,t-1}\right) = 0$, we apply two different methods. The first method is a two-stage conditional maximum likelihood (2SCML)

method introduced by River and Vuong (1988).[23] To apply this method, we rewrite equation (1) as:

$$Attack^{*}_{i,t} = \beta Discount_{i,t-1} + \gamma X_{i,t-1} + \theta\varpi_{i,t-1} + \eta_{i,t}, \quad (2)$$

where $\varepsilon_{i,t} = \theta\varpi_{i,t-1} + \eta_{i,t}$ is a linear projection of $\varepsilon_{i,t}$ onto $\omega_{i,t-1}$. Testing the null hypothesis that $H_0 : corr\left(\varepsilon_{i,t}, \omega_{i,t-1}\right) = 0$ is equivalent to testing $H_0 : \theta = 0$.

Equation (2) is estimated using a two-step procedure. In the first step, we estimate the *Discount* equation in (1) and save the residuals $\hat{\varpi}_{i,t}$. In the second step, we estimate equation (2) using the probit method, where $\omega_{i,t-1}$ is replaced with $\hat{\varpi}_{i,t-1}$ (*RESIDUALDISC*). If $H_0 : \theta = 0$ is not rejected, the system is reduced to a simple probit. Otherwise the endogeneity of $Discount_{i,t-1}$ should not be ignored.

The instrumental variables that enter the *Discount* equation but not the *Attack* equation (directly) are:

- *P*: The level of fund price need not affect the decision to attack a fund, as arbitrageurs consider the discrepancy between the price and the NAV rather than the level of the price itself. The price, however, has a strong explanatory power for the discount. This is because the price and NAV are cointegrated, while the price is more volatile than the NAV.[24]
- *DIV*: Higher dividends should lead to a lower discount because the payout is essentially a partial liquidation of the fund. Conditional on the level of the discount, dividends ought not to be a factor driving activist arbitrage.
- *LIFEBOAT*: A lifeboat imposes an upper bound of the discount. However, conditional on the magnitude of the discount, it should not affect the probability of an attack.

[23] The standard 2SLS method is not appropriate for our model because of two reasons: (1) A binary outcome (open-ending) naturally involves non-linearity between the (observed) outcome and inputs; (2) Discount is affected by the propensity of an open-ending attack ($Attack^{*}_{i,t}$), rather than follows a selection equation conditional on the observed outcome ($Attack_{i,t}$). An alternative method is the generalized two-stage simultaneous probit (G2SP) as discussed by Heckman (1978). We choose River and Vuong (1988) for both tractability in computation and ease of interpretation.

[24] This is evident from the fact that the volatility of fund return is 50-100% higher than that of the NAV return (see Table 1), indicating that there is additional information (or noise) that affects price but not the NAV, resulting in an inverse relation between price and discount.

The regressions include year fixed effects to capture market conditions (such as interest rates) and noise trader sentiments. Other covariates include variables that would also appear in the *Attack* equation: *MV*, *STDNAV*, *AGE*, *TO*, *FEES*, *GOV*, and *INSIDER*. *GOV* is an index (0-3) aggregated over the existence of staggered board, supermajority, and special meeting.[25] The higher the index, the more power the managers have over outsider shareholders (thus governance becomes worse).[26] The attack equation also includes an indicator variable for the occurrence of an open-ending attempt during the previous year, *PASTATTK*.

The 2SCML estimation procedure introduced above belongs to the class of limited information maximum likelihood (LIML) methods. It is "limited" in the sense that it incorporates simultaneous information in a sequence rather than imposing an integrated constraint on a structural model. The LIML method is usually easy to compute and intuitive to interpret, but is not efficient. For robustness check, we apply also the full information maximum likelihood (FIML) method (once we identify that the feedback effect from attacks to discount is significant).[27]

The FIML method relies on the conditional joint distribution of *Attack* and *Discount*. Assume that the disturbances in the joint equation system (1) are jointly normally distributed, each with zero mean, and covariance Σ, given by[28]

$$\Sigma = \begin{bmatrix} 1 & \rho\sigma \\ \rho\sigma & \sigma^2 \end{bmatrix}. \tag{3}$$

Rational expectations in the market suggest that $\rho = corr\left(\varepsilon_{i,t}, \omega_{i,t}\right) < 0$. The Appendix shows that the log likelihood for an attack for an individual fund-year observation in our simultaneous equation model is:

[25] Data also provides information about the existence of confidential voting. However, there is virtually no cross-sectional variation in this provision.

[26] Special meetings are usually called by managements, and thus can be used by them to shorten the time available to dissidents to collect proxies. See Pound (1988).

[27] To be more specific, the LIML estimation extracts from the data information about the conditional distributions *f(Discount|X,Z)* and *f(Attack|Discount, X)* sequentially although all variables are simultaneously determined. The FIML method, on the other hand, estimates the joint distribution *f(Attack,Discount|X,Z)* in a simultaneous system.

[28] In binary response analyses (e.g., probit and logit), the dispersion of the error disturbances are in general not identified. Coefficients are conventionally estimated assuming unit variance error disturbance. This normalization does not affect the calculation of marginal probabilities, which are what researchers are interested in.

$$l_{i,t} = y_{i,t} \ln\left[\Phi\left(u_{i,t-1}\right)\right] + (1 - y_{i,t}) \ln\left[1 - \Phi\left(u_{i,t-1}\right)\right] - \ln\left(\sigma_{i,t-1}\right) - \frac{\left(Discount_{i,t-1} - \mu_1 X_{i,t-1} - \mu_2 Z_{i,t-1}\right)^2}{2\sigma^2_{i,t-1}}, \quad (4)$$

where $y_{i,t}$ is the binary dependent variable of an attack, and

$$u = \frac{\beta Discount + \gamma X + \rho / \sigma \left(Discount - \mu_1 X - \mu_2 Z\right)}{\sqrt{1 - \rho^2}}.$$

In (4), ϕ, Φ are the density and cumulative probability functions of the standard normal distribution. The parameter set $\{\mu_1, \mu_2, \beta, \gamma, \rho, \sigma\}$ is simultaneously estimable using the maximum likelihood method. The estimates of key interest are $\hat{\beta}$ (the sensitivity of attacks on discount corrected for endogeneity) and $\hat{\rho}$.[29]

4.2.2. Activist Arbitrage and Discounts

Table 3 displays the results from the LIML estimation. The dependent variable in panel A is a dummy for the occurrence of an attempted open-ending, including both successful and unsuccessful resolutions (i.e., "strong" and "medium" activity), at the fund-year level. The dependent variable in panel B is a dummy for actual open-ending (i.e., "strong" activity). The mean of the two dependent variables are 15.2% and 3.9%, respectively, out of all fund-year observations. Reported coefficients are marginal probability values in percentage points for a unit change in the covariates around their respective mean values.

[Insert Table 3 Here]

A simple regression of *Attack* on *Discount* shows that a one percentage point increase in the *observed* discount is associated with a 0.69 percentage point increase in the probability of an attempted open-ending (column 1 of Panel A) and 0.10 percentage point increase in the probability of an actual open-ending (column 1 of Panel B). When adding the feedback effect,

[29] Evan, Oates, and Schwab (1992) use a similar method to estimate the feedback effect from peers in teenage behavior. Their case is a mirror image to ours. Their model controls for the endogenous formation of peers in order not to over-estimate the peer effects on teen pregnancy.

i.e., the variable *RESIDUALDISC* into the equation (column 2), the attack-to-discount sensitivity increases by more than 50% to 1.25 (Panel A) and 0.31 (Panel B) percentage points, while the coefficients on *RESIDUALDISC* are -0.70 (Panel A) and -0.26 (Panel B) percentage point. All these coefficients are statistically significant at the less than 1% level. Columns 3 and 4 add other covariates as controls. The coefficient estimates of these two key variables remain qualitatively the same and statistically significant.

The magnitude of the coefficients in column 4 (with a full set of control variables) implies that for a one percentage point *exogenous* increase in the fund discount, the probability of an attempted (actual) open-ending increases by 0.84 (0.30) percentage point; on the other hand, a 0.33 (0.26) percentage point increase in the anticipated probability of an attempted (actual) open-ending is associated with a one percentage point narrowing in the current discount. The first part suggests that arbitrageurs are indeed more attracted to funds with deeper discounts. The latter part demonstrates the feedback effect: its significance (at less than the 5% level) indicates that there is a rational component in the CEF discounts that incorporates the prospects of activist arbitrage.[30] In other words, anticipated arbitrage activities result in fund prices closer to the underlying net asset values.

Table 4 lists estimates from the FIML system (4) in comparison with a simple probit estimation disregarding the feedback effect from activist arbitrage to the discount (that is, constraining ρ to be zero). The estimates are comparable to those in Table 3. In particular, the marginal effect of a one percentage point increase in the fund discount is a 0.80 (0.29) percentage point increase in the probability of an attempted (actual) open-ending. The marginal probability estimate would drop to 0.56 (0.08) percentage point if the feedback effect is ignored. The measure for the magnitude of this feedback effect is the estimated $\hat{\rho}$ which is -0.24 (-0.45), significant at the 10% (1%) level. It is not surprising that the prospect of actual open-ending has a stronger feedback effect on the discount (both in terms of the magnitude and significance) because an ex post open-ending is more effective in eliminating the discount than an attempt with uncertain outcome.

[30] In the lack of perfect instruments that extract all variations in *DISCOUNT* other than the component that reflects the fund's susceptibility to open-ending attacks, the test of the feedback effect tends to have low power because the variable *RESIDUALDISC* also contains some exogenous component of *DISCOUNT* that are positively associated with *ATTACK*. Therefore, finding a significantly negatively coefficient on *RESIDUALDISC* is a strong evidence for the feedback effect. For the same reason, the inverse of the coefficient estimate on *RESIDUALDISC* does not have the convenient interpretation of the sensitivity of discount to the anticipated probability of an attack.

[Insert Table 4 Here]

4.2.3. Communication, the Law Reform of 1992, and Activist Arbitrage

The law reform of 1992 lifted barriers on communication among shareholders during the proxy process. Since communication is particularly important for activist arbitrage, we expect the law reform to increase the level of such arbitrage activities. We provided preliminary evidence of this trend in Figure 2. Regression analysis provides further support. Columns 5 and 6 of Table 3 break the sample by the dependent variable into two sub-periods: 1989-1993 (pre law reform) and 1994-2003 (post law reform).[31] Other things equal, there is an 8.48 (*t*-statistic = 3.58) percentage point increase in the probability of open-ending attempts during the 1994-2003 period compared to 1989-1993, calculated as the differences of attack probabilities between the two sub-periods by setting all regressors in Table 3 to be the all-sample mean. The results regarding the probability of actual open-ending are less striking: the probability in the second sub-period increases by 1.22 (*t*-statistic = 1.13) percentage points. These results are consistent with the evidence in Choi (2000), who examines the impact of the 1992 SEC reforms on shareholder-sponsored corporate governance proposals. Choi (2000) finds that the reforms led to the entry of new groups that sponsored more shareholder proposals although these proposals were not more successful.

Other than the increase in activity, there are several other notable changes in the pattern of activist arbitrage after the law reform (shown in Columns 5 and 6 in Table 3). First, the feedback effect from attempted open-endings seems to have weakened during the post-law period (in Column 6 of Panel A, the coefficient on *RESIDUALDISC* is not significant). This result reflects the fact that the actual-to-attempted open-ending ratio is much lower in the second period (see Figure 2). While the proxy reform encouraged more attacks on CEFs, the outcomes have also become less certain. Consistent with this reasoning, the feedback effect from actual open-ending remains significant (at the 5% level) during the post-law period (see Column 6 of Panel B).

Second, the effect of fund governance on the tendency of activist attack is noticeably different before and after the law change. Here, the governance is an index (0-3) aggregated

[31] The sample period is split by 1993 rather than 1992 because all regressors in (2) are lagged by one year.

over the existence of staggered board, supermajority, and special meeting. The higher the index, the more power the managers have over outsider shareholders. Pro-manager governance is termed "bad" governance in the recent literature (e.g., Gompers, Ishii, and Metrick (2003), Del Guercio, Dann, and Partch (2003)). After 1993, the addition of one of the three provisions is associated with an increase of 3.9 percentage points in the probability of attack (significant at the 1% level). Moreover, funds with higher insider ownership invite more attacks after 1993 (significant at the 5% level). Such relations were non-existent beforehand. This evidence echoes Choi's (2000) finding that after the proxy reform firms with stronger management entrenchment (as measured by insider ownership) and more pro-manager governance became more frequent targets of proxy proposals and contests. In our view, the result provides additional support to the role of communication: since communication among shareholders is particularly important when managers have more power in fighting against dissidents, activist arbitrage against firms with pro-manager governance became more prominent after the change in the law.[32] Interestingly, although high fees may also point to bad governance, we find that high-fee funds are overall less susceptible to attacks in the post-law era (significant at the 2.5% level). This may be because high fees dissipate the NAV quickly, and thus make activist arbitrage more costly.

Overall, we do not intend to overstate the conforming time-series pattern because it does not uniquely identify the effect of the law change: it could also represent a trend or a coincidental time variation of unmodeled factors that impact arbitrage activities. To further support the role of communication, we now turn to present evidence using cross sectional measures for the ease of communication. We consider the following proxies for communication (*COMMINICATION*): CEF share turnover rate, size of trades by CEF shareholders, and institutional ownership. Table 5 reports the results.

[Insert Table 5 here]

First, consider share turnover. High turnover makes communication more difficult for two reasons (see also the motivation by Pound (1988)). First, given the time lag at which

[32] Strong management entrenchment (higher insider ownership and more anti-takeover defenses) naturally makes it more difficult for outsider activists to carry out their agenda. The data reflects this as well. Panel B of Table 3 indicates that the probability of successful open-ending is not significantly related to insider ownership or the governance index. Combined with the latter's positive relation to attempted attacks in the post-law era, we infer that stronger management entrenchment leads to lower success rate of activist arbitrage. Choi (2000) has similar findings.

account names become available to activists, the latter may not get up-to-date shareholder contacts at high turnover funds. Second, there is a time gap, usually varying between 10 to 60 days, between the record date (which qualifies a shareholder to vote the proxy) and the actual vote date. High turnover causes a separation of voting rights and cash flow rights for a large number of shareholders. Investors with short holding periods (corresponding to high turnover) may cease to be shareholders by the voting date or expect to quit the fund soon. Either way, they do not have the incentive to cast a careful vote. Column 1 of Table 5 (repeated from Table 3) reveals this pattern regarding turnover (*TO*). After 1993, a 100 percentage point increase in the annual turnover rate is associated with a 7.9 percentage point lower probability of an attempted (actual) open-ending, significant at the 2.5% level. Such an effect was non-existent in the earlier period, probably because communication was severely restricted by law for all funds, so that cross-sectional differences did not matter much for the probability of activist arbitrage. It is interesting to note that while we identify high turnover as an impediment to activist arbitrage, it is commonly believed that this variable encourages pure-trading arbitrage. This is because high turnover indicates high level of liquidity. This ambivalent effect of liquidity on arbitrage is consistent with the analysis of Kahn and Winton (1998) and Bolton and von Thadden (1998) on regular corporations: while liquid trading enhances securities pricing efficiency, it discourages value-improving intervention by informed shareholders.

Another natural candidate for the communication proxy would be the average shareholder account size. CEFs in the U.S. are predominantly held by retail investors, the median institutional holding is about 10-15% for most years (the corresponding figure for regular COMPUSTAT firms during the same period is about 35%).[33] Holding the market value of a fund constant, the smaller the average holding per account, the more shareholders an arbitrageur needs to contact and persuade in order to obtain a critical mass of support. Accessing a large number of shareholders is logistically difficult, and motivating them is even more so, either because small shareholders have a stronger tendency to free ride, or because they are not able to make sensible votes due to lack of information or lack of financial sophistication.[34]

[33] Gemmill and Thomas (2002) document that the CEFs in U.K. are predominantly institution-owned.

[34] Open-ending is just one type of proxy proposals shareholders receive. Some proposals are dubious of pursuing sponsors' private agenda rather than general shareholder welfare (see evidences in Choi (2000)). Managers frequently cite this reason to persuade shareholders to vote against the dissidents.

Direct information about individual account size with reasonable accuracy is not available despite our effort. We hand collected from CEF's semi-annual N-SAR reports to the SEC the total number of shareholder accounts reported by the funds (item 74X). We were only able to locate this information for about a third of the funds in our sample. Even this smaller sample of collected data, however, is not an accurate proxy for the real number of accounts because it does not separate the true individual accounts (where the beneficial owner lists directly as a shareholder) and the omnibus account (also called the street accounts, where numerous individuals are lumped under one account with a financial intermediary). The identities of the shareholders in the latter accounts are not revealed to the fund, let alone to the activists.

However, it is reasonable to assume that the size of a typical trade by an investor in a fund is significantly positively correlated with his total holdings in the fund. (Battalio and Mendenhall (2005) use trade size to proxy for large/small investors.) The TAQ and ISSM databases provide information at a tick-by-tick frequency, from which we aggregate into annual variables. In particular, we look at the average trade size (in 1,000 shares) of a fund-year, and the proportion of trades that are more than 2,000 and 5,000 shares. The trade size measure as a proxy for account size remains valid even if big and small shareholders do not trade at comparable frequency,[35] as long as there is no systematic cross sectional difference in the relative trading frequency of the big and the small.

Columns 2 and 3 of Table 5 show the effect of trading size on the occurrence of activist arbitrage. In the post-1993 period, every 1,000 share increase in the average trading size (the mean and standard deviation are 1.26 and 0.71 thousand shares) is associated with a 3.8 percentage point increase in the probability of attempted open-ending. Using the proportion of trades above 2,000 (5,000, not tabulated) shares yields similar results: the marginal probability effects are 0.49 (0.85) percentage points. To appreciate the magnitude, the mean (standard deviation) values of the two variables are 11.46% and 3.31% (6.49% and 2.89%). All the coefficients described above are different from zero at less than the 5% significance level. Interestingly, none of these variables shows up any significance in the earlier period.

[35] For example, Barber, Lee, Liu, and Odean (2005) show that individual investors trade about 50% more frequently than institutions.

Finally, the share of institutional ownership in a fund is also used as a proxy for the ease of shareholder communication. Using a dummy variable for institutional shares being greater than 15%,[36] the probability effect is 5.7 percentage points, significant at the 2.5% level. Using the level of institutional ownership (not tabulated), a one percentage point increase in the institutional ownership is associated with a 0.20 percentage point increase in the probability of an open-ending attack, significant at the 2.5% level. All these evidences point to the same message: investor communication is an important factor for activist arbitrageurs to launch their attacks.

5. Conclusion

We document strong and frequent pressure of activist arbitrageurs against closed-end funds since 1992. We find that this activist arbitrage is targeted mainly towards deeply discounted funds. Moreover, the funds' discounts reflect the possibility of this arbitrage in a forward-looking way. We show that shareholder communication is a major determinant for the probability of activist arbitrage. Thus, costs of communication – imposed by law, ownership structure, or trading environment of funds – are identified as a limit to arbitrage. We believe that communication and coordination across shareholders are relevant not only for activist arbitrage, but also for pure-trading arbitrage.

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[36] In an interview with the authors, Phil Goldstein indicated that he tended to target funds with 15% (or more) institutional ownership to avoid retail investor apathy.

Appendix:

Derivation of the FIML Likelihood Function (Equation (4)**)**

The likelihood for an individual attack in our simultaneous equation model is (the *i*, *t* subscripts are omitted without confusion):

$$L = g\left(Attack = 1, Discount\right)^{Attack} g\left(Attack = 0, Discount\right)^{1-Attack}. \tag{5}$$

The joint density function is

$$g(Attack = 1, Discount) = \int_{-\beta Discount - \gamma X}^{\infty} f\left(\varepsilon, Discount - \mu_1 X - \mu_2 Z\right) d\varepsilon, \tag{6}$$

and

$$g(Attack = 0, Discount) = \int_{-\infty}^{-\beta Discount - \gamma X} f\left(\varepsilon, Discount - \mu_1 X - \mu_2 Z\right) d\varepsilon, \tag{7}$$

Where $f\left(\varepsilon, \varpi\right)$ is the bivariate normal density function, and can be expressed as the product of a conditional distribution and a marginal distribution:

$$f\left(\varepsilon, \varpi\right) = f\left(\varepsilon \mid \varpi\right) f\left(\varpi\right). \tag{8}$$

The conditional distribution $f\left(\varepsilon \mid \varpi\right)$ is normal with mean $\rho\varpi / \sigma$ and variance $1-\rho^2$. Therefore the joint density function of (6), assuming all variables are jointly normal, can be rewritten as

$$g\left(Attack = 1, Discount\right) = \Phi\left(u\right) \phi\left(\frac{Discout - \mu_1 X - \mu_2 Z}{\sigma}\right), \tag{9}$$

where

$$u = \frac{\beta Discount + \gamma X + \rho / \sigma \left(Discount - \mu_1 X - \mu_2 Z\right)}{\sqrt{1 - \rho^2}}, \tag{10}$$

and ϕ, Φ are the density and cumulative probability functions of the standard normal distribution. Equation (7) could be rewritten analogously.

Combining Equations (3) to (10) gets us the expression of (4).

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Table 1. Summary Statistics

This table reports the summary statistics of the main variables. Panel A shows the mean, median, and standard deviation of each variable calculated over each year. Panel B reports the mean values of the governance variables (mostly dummy variables) over different sub-periods and separately for old and new funds. Old (new) funds are defined as funds that have existed in our sample for more than (less than or equal to) three years in our sample. Standard deviation for non-dummy variables is reported in the parentheses.

Panel A: Fund Characteristics

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Number of Funds	53	62	82	84	92	99	123	122	123	121	113	111	102	95	89
% trading at a discount	81%	79%	83%	79%	68%	55%	71%	78%	86%	83%	82%	89%	92%	86%	88%
Discount	14.0	9.7	10.2	8.0	5.6	1.8	6.0	11.2	13.0	13.5	13.6	16.3	23.0	15.4	13.3
	20.2	12.5	11.5	8.8	5.8	1.8	6.3	12.8	15.2	15.9	18.1	19.1	23.6	17.4	14.2
	17.7	17.7	11.6	12.3	10.4	11.7	11.0	12.2	11.3	12.2	16.1	15.9	16.1	14.4	15.4
Market cap (in $Mill')	159	177	155	170	177	194	220	212	229	255	239	248	267	247	222
	69	88	85	93	98	111	133	121	125	136	105	101	123	101	102
	228	234	210	245	270	276	271	277	303	349	401	448	453	435	376
Annual turnover (in %)	60	116	95	76	80	110	102	87	87	102	96	84	78	54	50
	49	57	67	59	64	92	86	79	85	96	92	80	69	48	44
	50	171	73	77	57	108	65	47	38	56	49	45	44	28	31
Dividend yield (in %)	3.1	4.0	3.5	4.0	3.1	2.1	2.0	1.8	2.3	2.4	3.4	2.9	3.4	3.4	2.9
	2.6	3.3	2.4	2.7	1.8	0.8	0.9	0.6	1.2	0.9	1.0	0.9	1.1	1.3	1.3
	3.3	3.6	3.7	3.8	3.5	3.0	2.8	2.9	3.0	3.8	5.3	4.1	5.1	4.8	4.5
Insider ownership (%)	1.0	1.7	1.7	4.5	2.3	2.6	1.6	3.9	2.5	2.9	1.6	6.8	4.3	7.6	7.6
	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.0	0.7	0.4
	1.8	3.2	4.8	12.5	6.5	9.2	7.7	15.4	9.5	10.5	4.0	11.9	9.5	12.5	14.7
Institution ownership (%)	12.1	13.5	11.0	13.4	12.8	12.9	11.1	13.5	15.8	20.1	19.4	19.4	20.3	22.1	22.3
	6.6	8.0	6.7	8.6	9.1	9.9	8.7	11.9	15.7	18.4	18.5	18.0	16.9	19.5	19.5
	12.3	13.2	11.3	14.8	12.6	10.8	9.7	9.0	9.8	13.6	14.0	15.3	16.4	17.5	17.7
Fund age	7	7	6	6	6	7	6	7	8	9	10	11	12	14	15
	2	2	3	3	3	4	4	5	6	7	8	9	10	11	12
	13	12	11	11	11	10	10	10	10	10	10	10	11	11	11
Avg trade size (1,000 shares)	1.4	1.6	1.8	1.3	1.0	1.1	1.2	1.1	1.3	1.3	1.3	1.4	1.4	1.4	1.1
	1.1	1.4	1.3	1.1	0.9	1.0	0.9	1.0	1.2	1.2	1.2	1.3	1.3	1.2	1.0
	1.0	0.9	1.7	0.8	0.5	0.8	0.8	0.5	0.6	0.6	0.7	0.8	0.7	0.8	0.7
Standard deviation of fund NAV (in %)	4.3	3.3	3.2	3.3	3.7	3.8	4.0	4.2	4.3	4.4	5.0	5.8	6.2	5.7	4.8
	3.1	2.4	2.4	2.6	2.8	3.1	3.1	3.2	3.8	3.6	4.4	5.2	5.7	5.3	4.3
	2.6	2.3	2.6	2.6	2.6	2.5	2.7	2.9	2.7	2.4	2.7	3.1	3.4	3.1	2.6
Standard deviation of fund return (in %)	4.9	5.4	6.4	6.2	6.2	5.9	6.5	5.9	5.8	5.8	6.2	6.2	6.7	6.6	6.4
	4.2	4.5	4.7	4.8	5.0	5.4	5.9	5.2	5.4	5.3	5.9	6.0	6.3	6.1	6.0
	2.7	2.8	3.7	3.4	3.1	3.0	3.1	2.7	2.5	2.5	2.6	2.7	3.0	3.1	2.9

Panel B: Fund Governance

	1988-2002	1988-1992		1993-1998		1999-2002	
	All Funds	Old Funds	New Funds	Old Funds	New Funds	Old Funds	New Funds
Staggered board	0.38	0.09	0.03	0.42	0.30	0.67	0.47
Supermajority	0.11	0.07	0.16	0.13	0.06	0.10	0.00
Special meeting	0.60	0.70	0.56	0.63	0.52	0.58	0.67
Lifeboat	0.53	0.44	0.57	0.54	0.54	0.52	0.60
Management fees	1.79	1.45	2.01	1.62	2.03	1.90	2.22
	(0.90)	(0.58)	(0.61)	(0.86)	(0.71)	(1.06)	(0.49)

Table 2. Cross-Sectional Determinants of Close-End Fund Discounts

The dependent variable is close end fund discount in percentage points by firm-year observations. The first column reports estimates from a pooled regression with year fixed effects; the second column reports the Fama-MacBeth regression, and the third column adopts a pooled regression without year fixed effects. *MV* is market capitalization, *P* is market price, *STDNAV* is the residual standard deviation of monthly NAV returns. *AGE* is fund age in years. *TO* is the annual turnover rate of the fund shares. *DIV* is the annualized dividend yield. *FEES* is the management fees as percentage of assets under management. *INSIDER* is the ownership share of insiders. *LIFEBOAT* is a dummy variable for the existence of a lifeboat provision. *SMB* is the Fama-French small-minus-big annual returns. Bold fonts represent statistical significance at less than the 5% level. In pooled regressions, standard errors adjust for autocorrelation using the Newey-West method with half-window width equal to 4 years. In Fama-MacBeth regressions, stadard errors adjust for autocorrelation of all orders assuming an AR(1) process of the time-series coefficient estimates. The number of observations is 1,477.

	(1) Year FE	(2) Fama-MacBeth	(3) Pooled
MV	0.828	0.404	0.814
	(1.08)	(0.49)	(1.06)
P	**-2.962**	**-3.561**	**-4.041**
	-(2.49)	**-(1.97)**	**-(3.37)**
STDNAV	**-0.760**	**-0.637**	0.494
	-(2.80)	**-(2.35)**	(0.39)
AGE	-0.094	-0.055	-0.011
	-(1.74)	-(0.45)	-(0.23)
TO	**-0.021**	-0.005	**-0.037**
	-(2.65)	-(0.54)	**-(4.96)**
DIV	**-0.499**	**-0.422**	**-0.323**
	-(3.53)	**-(2.64)**	**-(2.46)**
FEES	0.735	0.714	0.590
	(0.52)	(0.97)	(0.40)
INSIDER	0.101	**0.110**	0.092
	(1.71)	**(4.61)**	(1.56)
LIFEBOAT	-1.843	**-1.394**	-1.702
	-(1.59)	**-(2.96)**	-(1.36)
SMB	--	--	**-0.107**
	--	--	**-(2.85)**
CNST	17.515	20.281	14.749
	(1.81)	(1.88)	(1.50)
Rsqr	0.182	--	0.070

Table 3. Determinants of Open-Ending Attacks

The dependent variable is the occurence of an open-ending attack at the fund-year level. All regressors are lagged for one year. Reported are marginal probability coefficients and t-statistics (in parentheses) from probit estimation where marginal probabilities are evaluated at the mean values of all regressors. *MV, STDNAV, AGE, TO, FEES*, and *INSIDER* are defined in Table 2. *DISCOUNT* is the fund discount in percentage point. *RESIDUALDISC* is the residuals from a regression of fund discount on all available regressors that affect discount directly. *GOV* is the sum of three indicator variables: staggered board, supermajority vote, and special meetings. *PASTATTK* is a dummy variable for the occurence of an attack during the previous year. Bold fonts represent statistical significance at less than the 5% level.

	Panel A: Open-Ending Resolutions					
	Full Sample				1989-1993	1994-2003
	1	2	3	4	5	6
DISCOUNT	**0.691**	**1.247**	**0.538**	**0.839**	**0.597**	**0.631**
	(9.83)	**(8.29)**	**(7.92)**	**(5.54)**	**(3.48)**	**(3.21)**
RESIDUALDISC	**--**	**-0.697**	**--**	**-0.333**	**-0.491**	-0.018
	--	**-(4.31)**	**--**	**-(2.04)**	**-(2.87)**	-(0.08)
LN(MV)	--	--	-1.086	-0.660	**1.742**	-1.976
	--	--	-(1.15)	-(0.68)	**(2.23)**	-(1.59)
STDNAV	--	--	0.323	0.347	0.123	0.277
	--	--	(0.90)	(0.99)	(0.36)	(0.63)
AGE	--	--	**-0.249**	-0.205	-0.093	-0.264
	--	--	**-(2.25)**	-(1.91)	-(1.12)	-(1.79)
TO	--	--	**-0.072**	**-0.053**	-0.011	**-0.079**
	--	--	**-(3.01)**	**-(2.35)**	-(0.75)	**-(2.45)**
FEES	--	--	**-3.586**	**-3.319**	-0.143	**-4.716**
	--	--	**-(2.60)**	**-(2.40)**	-(0.12)	**-(2.57)**
GOV	--	--	**2.423**	**2.720**	**-2.141**	**3.881**
	--	--	**(2.45)**	**(2.68)**	**-(2.05)**	**(3.00)**
INSIDER	--	--	0.139	0.108	-0.008	**0.208**
	--	--	(1.73)	(1.29)	-(0.10)	**(1.96)**
PASTATTK	--	--	**16.914**	**17.384**	**6.083**	**19.143**
	--	--	**(8.89)**	**(8.98)**	**(3.96)**	**(7.79)**
NOB	1477	1477	1477	1477	371	1106
Goodness of Fit	0.014	0.016	0.167	0.176	0.128	0.176

	Panel B: Open-Ending					
	Full Sample				1989-1993	1994-2003
	1	2	3	4	5	6
DISCOUNT	**0.098**	**0.314**	**0.084**	**0.302**	**0.128**	**0.242**
	(2.88)	**(4.08)**	**(2.61)**	**(4.08)**	**(3.05)**	**(2.84)**
RESIDUALDISC	--	**-0.268**	--	**-0.264**	**-0.134**	**-0.190**
	--	**-(3.19)**	--	**-(3.30)**	**-(3.02)**	**-(2.03)**
LN(MV)	--	--	-0.681	-0.490	0.040	-0.708
	--	--	-(1.34)	-(1.10)	(0.24)	-(1.34)
STDNAV	--	--	-0.166	-0.123	-0.345	-0.010
	--	--	-(0.82)	-(0.64)	-(1.99)	-(0.05)
AGE	--	--	-0.123	**-0.153**	0.011	**-0.247**
	--	--	-(1.63)	**-(1.99)**	(0.75)	**-(2.12)**
TO	--	--	-0.022	-0.022	-0.003	-0.025
	--	--	-(1.83)	-(1.93)	-(0.67)	-(1.71)
FEES	--	--	-0.083	-0.401	0.411	-0.804
	--	--	-(0.14)	-(0.68)	(1.31)	-(1.06)
GOV	--	--	0.082	-0.172	-0.197	0.146
	--	--	(0.14)	-(0.34)	-(0.74)	(0.25)
INSIDER	--	--	-0.022	-0.035	-0.019	-0.005
	--	--	-(0.41)	-(0.73)	-(0.82)	-(0.10)
PASTATTK	--	--	0.256	-0.376	0.181	-1.575
	--	--	(0.11)	-(0.18)	(0.33)	-(0.53)
NOB	1477	1477	1478	1477	371	1106
Goodness of Fit	0.002	0.007	0.008	0.016	0.114	0.015

Table 4. FIML Estimation of Attack-Discount Simultaneous System

This table reports the estimates from the full-information maximum likelihood (FIML) system (equation (4)), where the sensitivity of open-ending attacks on fund discount takes into account the feedback effect from the possible attacks to the discounts. As a comparison, single equation probit estimation (ignoring the feedback effect) is reported side-by-side. Reported are coefficients (scaled by 100), t-statistics, and marginal probabilities (evaluated at the mean values of all covariates). Also reported are likelihood ratio statistics comparing the two sets of estimation and the corresponding p-values. Bold fonts represent statistical significance at less than the 5% level. The ATTACK variable in Panel A (Panel B) is an indicator variable for the occurence of all open-ending attacks (successful open-endings). There are 1,477 fund-year observations.

	Open-Ending Attacks					
	Single Equation Probit			FIML Estimate		
	COEF*100	t-stat	Marg. Pr.	COEF*100	t-stat	Marg. Pr.
CNST	-92.91	-1.41	--	-93.64	-1.34	--
LN(MV)	-3.72	-0.70	-0.69	-4.50	-0.82	-0.85
STDNAV	1.64	0.87	0.30	1.50	0.73	0.28
AGE	-1.07	-1.88	-0.20	-1.00	-1.74	-0.19
TO	**-0.30**	**-2.36**	**-0.06**	-0.24	-1.48	-0.04
FEES	**-16.68**	**-2.22**	**-3.10**	**-18.16**	**-2.03**	**-3.43**
GOV	**16.60**	**3.07**	**3.08**	**14.55**	**2.58**	**2.75**
INSIDER	0.73	1.63	0.14	0.61	1.29	0.12
PASTATTK	**97.76**	**9.39**	**18.14**	**89.78**	**7.16**	**16.94**
DISCOUNT	**3.04**	**8.40**	**0.56**	**4.26**	**4.30**	**0.80**
Rho	--	--	--	-0.24	-1.78	
Sigma(e2)	--	--	**--**	**13.08**	**68.72**	
LL Statistic:	13.05	P-val:	0.000			

	Successful Open-Ending					
	Single Equation Probit			FIML Estimate		
	COEF*100	t-stat	Marg. Pr.	COEF*100	t-stat	Marg. Pr.
CNST	-20.04	-0.23	--	-21.25	-0.26	
LN(MV)	-11.33	-1.57	-0.74	-12.09	-1.67	-0.82
STDNAV	-1.79	-0.63	-0.12	-1.71	-0.66	-0.12
AGE	-1.84	-1.68	-0.12	-1.88	-1.57	-0.13
TO	**-0.43**	**-2.20**	**-0.03**	-0.28	-1.01	-0.02
FEES	-4.09	-0.42	-0.27	-8.73	-0.69	-0.60
GOV	2.93	0.37	0.19	-1.69	-0.27	-0.13
INSIDER	-0.21	-0.29	-0.01	-0.46	-0.60	-0.03
PASTATTK	5.56	0.16	0.36	16.43	0.47	1.26
DISCOUNT	**1.28**	**2.66**	**0.08**	**4.07**	**3.24**	**0.29**
Rho	--	--	--	**-0.45**	**-2.56**	
Sigma(e2)	--	--	**--**	**13.06**	**75.76**	
LL Statistic:	2.54	P-val:	0.111			

Table 5: Effects of Shareholder Communication

The dependent variable is the occurence of an open-ending attempt at the fund-year level. All regressors are the same as in Table 3 except that each column uses a different proxy for shareholder communication (*COMMUNICATION*). The default measure is turnover in Column 1 (repeated from Columns 5 and 6 in Table 3 Panel A). Columns 2 and 3 use the averate trade size (in 1,000 shares) and the proportion of trades that are more than 2,000 shares (in percentage points). Column 4 uses the dummy variable equal to one if the institutional ownership exceeds 15% for the fund-year. All regressors in Table 3 enter as control but only coefficients on *DISCOUNT*, *RESIDUALDISC*, and *COMMUNICATION* are reported (other coefficients are repetitively similar from those in Table 3 and are thus omitted). Reported are marginal probability coefficients and t-statistics (in parentheses) from probit estimation where marginal probabilities are evaluated at the mean values of all regressors. Bold fonts represent statistical significance at less than the 5% level.

	Turnover		Avg Trade Size (1,000)		%(Trade > 2,000)		(%Institution>15%)	
	1989-1993	1994-2003	1989-1993	1994-2003	1989-1993	1994-2003	1989-1993	1994-2003
	1		2		3		4	
DISCOUNT	**0.597**	**0.631**	**0.854**	**0.679**	**0.863**	**0.634**	**0.721**	**0.624**
	(3.48)	**(3.21)**	**(4.05)**	**(3.47)**	**(4.14)**	**(3.20)**	**(4.04)**	**(3.21)**
RESIDUALDISC	**-0.491**	-0.018	**-0.702**	0.005	**-0.713**	0.046	**-0.566**	0.001
	-(2.87)	-(0.08)	**-(3.38)**	(0.02)	**-(3.45)**	(0.21)	**-(3.23)**	(0.00)
COMMUNICATION	-0.011	**-0.079**	-0.509	**3.778**	-0.129	**0.490**	-2.204	**5.732**
	-(0.75)	**-(2.45)**	-(0.58)	**(2.36)**	-(0.94)	**(2.63)**	-(1.38)	**(2.40)**
NOB	371	1106	366	1091	366	1091	371	1106
Goodness of Fit	0.128	0.176	0.241	0.183	0.244	0.185	0.241	0.186

Figure 1: Activist Example: The Growth Fund of Spain (1996-1999)

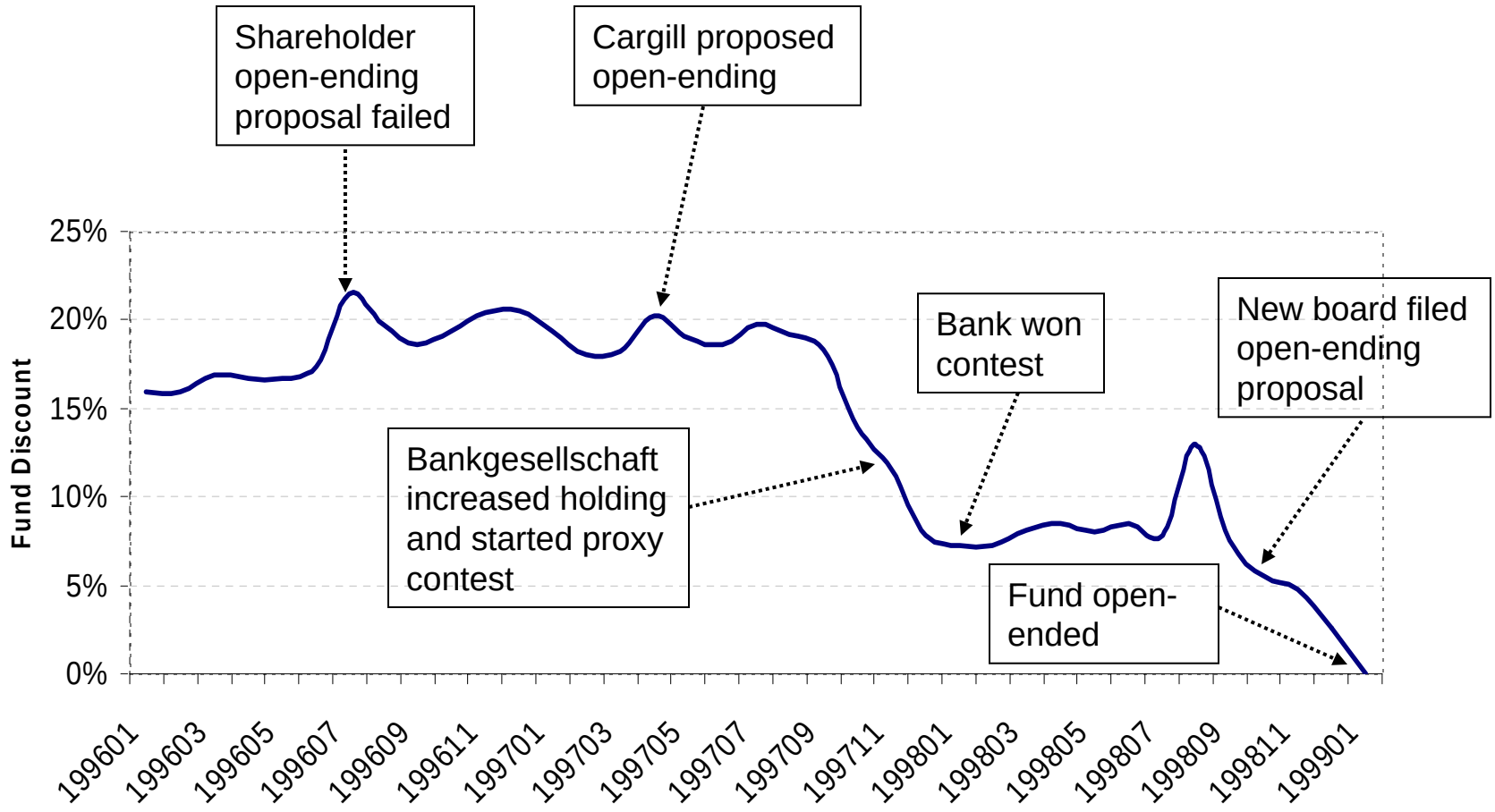

Figure 2. Open-Ending Attacks and Successful Open-Endings 1988-2003