Uncovering Hedge Fund Skill from the Portfolio Holdings They Hide[*]

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ABSTRACT

This paper studies the "confidential holdings" of institutional investors, especially hedge funds, where the quarter-end equity holdings are disclosed with a delay through amendments to the Form 13F and are usually excluded from the standard databases. Funds managing large risky portfolios with non-conventional strategies seek confidentiality more frequently. Stocks in these holdings are disproportionately associated with information-sensitive events or share characteristics indicating greater information asymmetry. Confidential holdings exhibit superior performance up to twelve months, and tend to take longer to build. Together the evidence supports private information and the associated price impact as the dominant motives for confidentiality.

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Mandatory disclosure of holdings in public companies by investors is an essential part of the securities market regulation. At the core of this regulation is the Section 13(f) of the Securities Exchange Act of 1934 that requires institutional investment managers to disclose their quarterly portfolio holdings. The quarterly reports, filed to the Securities and Exchange Commission (SEC) on the Form 13F, disseminate the public information about holdings and investment activities of institutional investors. The 13(f) rule, however, allows the Commission the discretion to delay disclosure that is "necessary or appropriate in the public interest or for the protection of investors." When filers request confidential treatment for certain holdings, they are allowed to omit those holdings off their Form 13F pending a decision by the SEC. After a request is denied, or after the approved period of confidentiality expires, the filers must reveal those holdings by filing *amendments* to their *original* Form 13F. Throughout the paper, we refer to these amendments as "confidential filings," and the positions included in such filings as "confidential holdings."

Among all institutional investors, hedge fund management companies (henceforth, "hedge funds") are most aggressive in seeking confidentiality, and are the focused sample of most of our analyses. Constituting about 30% of all institutions, hedge funds account for 56% of all the confidential filings. Conditional on confidential filing, hedge funds on average relegate about one-third of their total portfolio values into confidentiality, while the same figure is one-fifth for investment companies/advisors and one-tenth for banks and insurance companies. These stylized facts make hedge funds the ideal subjects to analyze the motives and consequences of confidential treatment.

Private information along with the associated price impact underlies the motives for confidentiality seeking. It is in the best interest of investment managers not to disclose their informed positions before they have fully reaped the benefits of their private information (Huddart, Hughes, and Levine (2001)). Timely disclosure of portfolio holdings may reveal information about proprietary investment strategies which outside investors can free-ride on without incurring the costs of research

themselves. Hence some delay in disclosure is desirable for the preservation of incentives to collect and process information, which contributes to the informational efficiency of financial markets (Grossman and Stiglitz (1980)). As a matter of fact, several hedge funds and successful investors including Warren Buffett and Philip Goldstein have appealed to the SEC for an exemption from revealing their positions in the 13F forms.[1] Moreover, it also has to be the case that the institutions intend to take advantage of the private information beyond the normal delay of 45 days to justify seeking confidentiality.

Price impact concerns naturally interact with private information for two reasons. First, in equilibrium, stocks that are more prone to informed trading should incur higher price impact (Glosten and Milgrom (1985) and Kyle (1985)). Second, when the disclosed holdings are informed, an increase in free-riding activity reduces the returns of the filing managers by causing security prices to move before the managers can fully implement their investment strategies. Such a scenario is analyzed in Frank, Poterba, Shackelford, and Shoven (2004), and Verbeek and Wang (2010).

Price impact may also be unrelated to information. Recent holdings information can allow outside speculators to anticipate further trades of the filers, whereas the speculators may trade ahead of the filers to capture the temporary price impact even if the filers' trades are liquidity-driven. Distressed sellers are particularly vulnerable to "predatory trading" (Brunnermeier and Pedersen (2005)). The fear of being front-run thus motivates filers to seek confidentiality till the desired transactions are complete. This motive can be exemplified by the "quant meltdown" in August 2007. Quant-oriented hedge funds, which employed similar strategies and attempted to cut their risks simultaneously in response to their losses, blamed mandatory holdings disclosure for contributing to a "death spiral" in the summer of 2007 (Khandani and Lo (2007)).

Finally, delaying disclosing positions through confidential filing could also serve as an alternative to "window dressing," i.e., trading strategies meant to generate differences between the portfolios on the reporting date and those held at other times (Haugen and Lakonishok (1988),

Lakonishok, Shleifer, Thaler, and Vishny (1991), Musto (1997, 1999), Ng and Wang (2004), and Agarwal, Gay, and Ling (2012)). Seeking confidentiality may incur lower cost to the filing managers than engaging in pre-disclosure trading if the main purpose is to hide certain positions from outside investors because these stocks are perceived as undesirable due to, for example, poor past performance or high risk.

Using a complete sample of all original and amendments to 13F filings during the period of 1999–2007, our study uncovers several pieces of empirical evidence that support private information as the predominant motive for confidentiality. First, hedge funds with characteristics associated with more active portfolio management, such as those managing large and concentrated portfolios, and adopting non-standard investment strategies (i.e., higher idiosyncratic risk), are more likely to request confidentiality. Second, the confidential holdings are more likely to consist of stocks associated with information-sensitive events such as mergers and acquisitions, and stocks subject to greater information asymmetry, i.e., those with smaller market capitalization and fewer analysts following. Third, confidential holdings of hedge funds exhibit significantly higher abnormal performance compared to their original holdings for different horizons ranging from 2 months to 12 months. For example, the difference over the 12-month horizon ranges from 5.2% to 7.5% on an annualized basis.

To the extent that the private information and price impact hypotheses are inherently connected, our findings are indeed consistent with both. Confidential treatment allows hedge funds to accumulate larger positions in stocks, and to spread the trades over a longer period of time; such a relief benefits both informed and liquidity-motivated trading. Hedge funds trade about three times more in the confidential stocks compared to stocks included in their original holdings; they also take almost three times as long to complete the accumulation of the confidential stakes. Such trades may well be motivated by information, as indicated by the superior performance of confidential holdings as a whole; nevertheless price impact is a necessary component in the consideration.

Lastly, confidential holdings consist of stocks that have performed relatively well recently, ruling out performance-based window dressing as a major motivation for filing confidentially. We do, however, find stocks in confidential holdings to have higher idiosyncratic volatility and total volatility, consistent with a risk-based window dressing motive (Musto (1997, 1999)) as well as an information motive because idiosyncratic volatility is also an established proxy for stock-specific information (Durnev, Morck, Yeung, and Zarowin (2003)).

Given the perceived benefits of seeking confidentiality, it is necessary to discuss the associated costs. Gaining confidential treatment is not meant to be a trivial task and is not guaranteed.[2] The applying institution must provide a sufficient factual basis for the objection to public disclosure, including a detailed position-by-position description of the manager's investment strategy (e.g., risk arbitrage), along with supporting analysis that public disclosure of the securities would reveal the investment strategy and harm the manager's competitive position. If denied (which usually takes two to twelve months during our sample period), the institution is obligated to file an amendment disclosing all the confidential positions immediately (within six business days).[3]

Analyzing the SEC denial outcomes reveals that hedge funds incurring higher past denial rates and applying to seeking confidentiality for larger positions are more likely to be denied of confidential treatment. We also find a significant positive market reaction, averaging around 1%, associated with the involuntary disclosure of positions due to denials within 180 days. In contrast, there is no significant market reaction when hedge funds voluntarily disclosed their confidential filings that were not denied and that experienced the same length of delay. The contrast suggests that denials force revelation of information that has yet to be impounded into the stock prices, which may interfere with the filer's plan to further accumulate position in the stock. This puts a constraint on hedge funds' seeking confidentiality without strict compliance to the rules, as denials impose costs on future applications.

Our study contributes to the literature in several ways. Most specifically, our study provides new evidence on the stock-picking skill of hedge funds from the superior performance of their holdings that are likely to be motivated by private information. Our paper adds to the literature that evaluates the performance and information content of institutional investors' holdings (Grinblatt and Titman (1989, 1993), Grinblatt, Titman, and Wermers (1995), Daniel, Grinblatt, Titman, and Wermers (1997), Chen, Jegadeesh, and Wermers (2000), Wermers (2000, 2003), Kacperczyk, Sialm, and Zheng (2005, 2008), Wermers, Yao, and Zhao (2007), and Huang and Kale (2009) on mutual funds; and Griffin and Xu (2009) and Aragon and Martin (2009) on hedge funds.) By incorporating the confidential holdings and comparing them to the original holdings, our study provides a more complete picture of the stock-picking ability of hedge funds. Moreover, our research also calibrates the limitations of using the conventional institutional quarterly holdings databases that mostly exclude confidential holdings. While any error due to the omission in evaluating the aggregate portfolio performance of all institutions is likely to be small, there can be a significant conditional bias in analyzing position changes of specific types of institutions and those around specific events (such as M&As.)

More generally, our paper contributes to the literature that studies the effects of portfolio disclosure on money managers, including those on the investment decisions (Musto (1997, 1999)), performance evaluation (Kempf and Kreuzberg (2004)), strategic behavior (e.g., free riding and front running) by other market participants (Wermers (2001), Frank, Poterba, Shackelford, and Shoven (2004), Verbeek and Wang (2010)), intra-quarter trading (Wang (2010)), and flow-performance relation (Ge and Zheng (2006)). Our findings suggest that confidential treatment attenuates some of the tensions arising from holdings disclosure analyzed in these papers. Our focus on hedge funds also helps settle the controversy regarding the value and effect of the "non-transparent" holdings in a lightly regulated sector and identify the key factors that influence the cross-sectional variation in the confidential filing activities.

Finally, our study contributes to the literature of mandatory *ownership* and *holdings*[4] disclosure, which is less studied than that of *issuer* disclosure. In the context of issuer disclosure, stricter requirements lead to more liquid and efficient capital markets which can reduce the disclosing parties' cost of capital, but may also impose cost on them in losing competitive advantage or bargaining power due to the revelation of information to their competitors (Diamond and Verrecchia (1991), Fishman and Hagerty (1998, 2003), and Admati and Pfleiderer (2000)). Analogously, the coexistence of mandatory ownership and holdings disclosure, and occasional relief through confidentiality weighs the benefits of market transparency of capital movements and investor monitoring of money managers against the costs of diluting the incentives to acquire information by active portfolio managers and of increasing their transaction costs.

Changes in holdings can convey underlying fundamental information to the market—either because the change in positions reveals the filer's private information about the value of the securities; or because the change in ownership represents potential shift in corporate control. While disclosure enables investors to make informed assessment about how the investor structure of a particular firm may reflect or impact the value of the shares, some delay in revelation is necessary for such information to be generated and acquired in the first place. This trade-off is analogous to the ones analyzed in the literature on insider trading disclosure (Fishman and Hagerty (1995), John and Narayanan (1997), Huddart, Hughes, and Brunnermeier (1999), Huddart, Hughes, and Levine (2001), and George and Hwang (2007)) and patent protection for firms to preserve their incentives to engage in R&D (Wright (1983)).

The remainder of the paper is organized as follows. Section I provides background information regarding the SEC ownership and holdings disclosure rules. Section II describes the construction and overview of the sample, and outlines the empirical motivation. Section III analyzes the determinants of confidential filings at the institution level and confidential holdings at the stock level. Section IV

examines the abnormal returns of confidential holdings of hedge funds relative to those of their original holdings. Section V models the determinants of denials of confidential filings and presents the event study of the market's reaction to disclosure of denied confidential filings. Finally, Section VI concludes.

I. Institutional Background

The current ownership and holdings disclosure rules mandated by the SEC consist of five overlapping parts: Schedule 13D for large (above 5%) active shareholders, Schedule 13G for large passive shareholders, Form 13F for general institutional holdings, Section 16 regarding ownership by insiders, and Form N-CSR and Form N-Q for quarterly or semi-annual disclosure of holdings required for mutual funds.

Among the five regimes, the Form 13F requirement under the Section 13(f) (passed by the Congress in 1975, and adopted by the SEC in 1978) of the Securities Exchange Act of 1934, covers by far the largest number of institutional investors: all institutional investment managers (including foreign investors) that have investment discretion over $100 million or more in Section 13(f) securities (mostly publicly traded equity; but also include convertible bonds and options) are required to disclose their quarter-end holdings in these securities. We refer to the date when the Form 13F is filed with the SEC as the "filing date," and the quarter-end date on which the portfolio is being disclosed as the "quarter-end portfolio date." According to the SEC rule, the maximum lag between the two dates is 45 calendar days. The same rule, however, allows the SEC the discretion to delay or prevent disclosure of certain holdings, usually up to one year (which can be extended further) from the date required for the original 13F form. Such holdings will be disclosed in an amendment to the original Form 13F after a request is denied, or after the confidentiality period expires. Figure 1 illustrates the time line of the original and confidential 13F filings.

[Insert Figure 1 here.]

The confidential treatment of some holdings as deemed appropriate by the SEC was justified on the grounds of protecting public interest, mainly of the investment managers and the investors whose assets are under management, because "disclosure of such strategy would impede competition and could cause increased volatility in the market place."[5] In 1998, the SEC staff issued interpretive guidance aimed at tightening the rules and restricting the conditions for confidentiality to prevent it from being used to mislead or manipulate the market.[6] Our sample period (1999–2007) starts with the inauguration of the SEC's electronic filing system, which also coincides with the new regime.

The triggering event for the 1998 rule tightening was the confusion over the 13F reporting of investor Warren Buffett which caused a significant decline in the share price of Wells Fargo & Co. in August 1997. The 13F form did not show Berkshire Hathaway's well-known 8% stake in the bank, only because it was reported in a confidential filing. But the misunderstanding in the market caused Wells Fargo's stock price to drop by 5.8% in one hour after Buffett's 13F filing.[7] A more recent event further illustrates the tension arising from confidential filing. On August 14, 2007, D.E. Shaw & Company, one of the largest quant-oriented hedge fund managers, filed an entirely blank Form 13F for its second-quarter portfolio. That is, the fund manager was seeking from the SEC a confidential treatment of its entire portfolio, based on the argument that "copycat investors" were mimicking its strategies or could front-run on its large positions. The SEC denied the request on October 19, 2007, forcing the firm to file an amended Form 13F on October 29, 2007, which covered 3,991 positions valued at $79 billion. Similar but less extreme requests from D. E. Shaw were rejected by the SEC before.[8] More recently, the confidential treatment received a new burst of attention in November 2011 when Berkshire Hathaway disclosed a bet of $10.7 billion on IBM, a position the fund accumulated in secrecy with the help of two quarters' confidential treatment.[9]

It is worth noting that the confidential treatment under Section 13(f) does not over-ride other SEC ownership or holdings disclosure rules. For example, there is no confidential treatment for the

disclosure of a beneficial owner of more than 5% of a company's equity under Schedule 13D or 13G. The same can be said about the holdings disclosure required for registered investment companies (mostly mutual funds), which was changed from a semi-annual to a quarterly basis (with a 60-day delay) in 2004. Nevertheless, there are more than sporadic observations in our sample where the confidential positions would be required to file 13G (such as the Warren Buffett position in Wells Fargo) or quarterly holdings for a mutual fund management company (such as T. Rowe Price and American Funds). In such cases, the confidential treatment may still afford an effective delay if the 13F disclosure is the most binding (e.g., Schedule 13G allows a 45-day delay from the year-end, and the disclosure requirement for mutual funds was semi-annual before 2004).

Despite their potential importance, confidential holdings have not been systematically studied because they are generally not included in the conventional databases of institutional quarterly holdings, such as the Thomson Reuters Ownership Data (formerly the CDA/Spectrum database).[10] In a contemporaneous working paper, Aragon, Hertzel, and Shi (2011) also study hedge funds' use of confidential filings. In addition to having a more comprehensive sample of hedge funds, we conduct more analyses (such as characteristics of heavy users, trading behavior during confidential periods, as well as market reactions to the disclosure of confidential filings) to shed light on the costs and benefits associated with seeking confidentiality. Aragon, Hertzel, and Shi (2011), on the other hand, link hedge funds' confidential filings to their overall performance at the fund level.

We verify that over 90% of the confidential holdings in our sample period are not covered by the Thomson Reuters Ownership Data. The example of hedge fund, Stark Onshore Management LLC (manager number 10375 in Thomson Reuters), illustrates such omissions. In Appendix A, we list all the confidential holdings of Stark Onshore Management during our sample period. We observe that, except for two stocks (Multi Fineline Electronix In., CUSIP = 62541B10 and Rouse Co., CUSIP = 77927310),

all the other 53 confidential holdings in the amendments are not included in the Thomson Reuters database.

II. Sample Overview and Empirical Motivation

A. Sample of Original and Amendments to 13F Filings

A key data component to this study is the original 13F filings and amendments to these filings by all institutions. We retrieve directly both the original and amendment 13F filings (forms 13F-HR and 13F-HR/A[11]) dated between March 1999 and June 2007 from the SEC's EDGAR database. Our sample starts with the inauguration of the SEC's requirement of electronic filing of Form 13F, and ends in 2007 to allow ex post performance evaluation. We retrieve information about original filings directly from the SEC (rather than from Thomson Reuters), to maintain symmetry and comparability between the paired filings. Despite the large variation in the reporting style and format, we are able to process the complete holdings information for 91% of all the 13F filings using a combination of automated programming and manual processing. The resulting initial sample consists of 3,315 filing institutions, covering 86.1% of the institutions that report their original 13F filings to Thomson Reuters over the same period and 174 more institutions that do not appear in the database at all.

Amendments to 13F filings contain two types of information: disclosure of a change in a position that was previously filed or a new holding that was previously excluded from the original filings. We define a confidential holding as one that was excluded from the original filing or the difference between the amended position and the originally filed position. Our results are qualitatively similar if we impose a threshold for the difference in the second component or simply exclude the second component. Based on the main criteria, our initial sample consists of 1,857 confidential filings (including both the denied and non-denied cases) and 53,296 original 13F filings. By searching for key words (such as "denied" and "no longer warranted") on the first page of the amendments, we are able to separate amendments

filed before or upon the expiration of confidential treatment and those filed in response to denials. Out of 1,857 confidential filings, 17.4% are denied by SEC.

Table I provides the summary statistics. Panel A reports the distribution of length of delay between filings and the quarter-end portfolio dates. Over 86% of original filings are filed within 45 days of the end of quarter, conforming to the requirement by the SEC.[12] On the other hand, about 93% of confidential filings are filed more than 45 days from the quarter-end, justifying resorting to the amendments for delayed disclosure. Surprisingly, the distribution of the duration of confidentiality does not differ qualitatively between amendment filings that result from SEC rejections and the rest (not tabulated). Such a lack of difference has two implications: First, some institutions file amendments before the expiration of the confidential period, presumably because they have completed their strategy. Second, even denied applications effectively afford significant delays in disclosure.[13]

[Insert Table I here.]

In the analyses that follow, we exclude confidential holdings filed within 45 days of delay, as motives to conceal positions in these filings cannot be justified. We also filter out both types of filings with extremely long delays from their quarter-end portfolio dates: more than 180 days for the original filings and more than 1,505 days (four years plus the 45 days allowed for the original 13F filings) for the confidential filings. We suspect that these observations are results of data recording errors or irregular circumstances. These three filters combined remove about 1.3% of original filings and about 8.9% of confidential filings (see panel A of Table I). Our results are not sensitive to the particular numerical choices we use in these filters.

The resulting final sample consists of 52,272 original filings by 3,134 institutions, and 1,554 confidential filings by 232 institutions. Panel B of Table I summarizes the number of filings, number of institutions, the dollar value, and the number of stocks in this final sample. In classifying the type of institutions, we refine the Thomson Reuters classification of five institution types with manual checking.

We describe the details of this classification in the Appendix B. Using this scheme, we classify 13F institutions as hedge funds, investment companies/advisors, banks and insurance companies, and others. Our refined classification scheme renders "others" into a small category (about 4% of the sample, from 37% in the original Thomson Reuters classification) of miscellaneous types.

Conditional on an institution filing both an original and an amended 13F at the end of a given quarter, the dollar value of the stock positions included in the confidential filings is significant: their average (median) value is 27.3% (13.4%) of the value of the complete portfolio of the institution. Moreover, confidential holdings tend to be larger positions than those in the original holdings. The average confidential holding represents 1.25% of all the shares outstanding by the issuer, as compared to the average of 0.68% for the original holdings.

Hedge funds, the focus of our analyses, are manually classified 13F-filing institutions whose major business is sponsoring/managing hedge funds according to the information revealed from a range of sources, including the institution's own websites, SEC filings, industry directories and publications, and news article searches.[14] A Form 13F is filed at the "management company" rather than at the "portfolio" or at the individual fund level. For the purpose of our study, we restrict our sample to relatively "pure-play" hedge funds (such as Renaissance Technologies), and investment companies where hedge funds represent their core business (such as D.E. Shaw), and do not include full-service banks whose investment arms engage in hedge fund business (such as Goldman Sachs Asset Management), nor do we include mutual fund management companies that enter the hedge fund business (a relatively recent trend analyzed by Agarwal, Boyson, and Naik (2009), Cici, Gibson, and Moussawi (2010), and Nohel, Wang, and Zheng (2010)). Such restriction ensures that the equity holdings in the 13F filings are informative about the investments of hedge funds (Griffin and Xu (2009), and Agarwal, Fos, and Jiang (2010)). Our final sample consists of 942 unique hedge funds.

For robustness, we repeat our analyses by cross-validating our hedge fund classification against information from Form ADV by investment advisors to register with the SEC. Specifically, we follow the prior literature (Brunnermeier and Nagel (2004) and Griffin and Xu (2009)) to affirm the classification of a hedge fund if (1) at least 50% of its clients are "other pooled investment vehicles (e.g., hedge funds)" or "high net worth individuals," and (2) it charges performance-based fees. This alternative filter produces a smaller list of 781 hedge funds. However, from other reliable information sources, we find that the 161 institutions excluded by this filter indeed have major hedge fund business. In fact, the Form ADV-based filter excludes well-established hedge funds such as Appaloosa, AQR, Bridgewater, Citadel, Fortress, Magnetar, and Relational Capital to name just a few. For this reason, we use this alternative list only for robustness check, and report the results in Table IA.I in the Internet Appendix.[15]

Panel C of Table I lists the ten institutions that are the most frequent confidential filers during our sample period, and the ten institutions that receive the highest number of rejections from the SEC for their applications. The majority of institutions on both lists are hedge funds, and the rest are investment companies/advisors. Berkshire Hathaway is on both lists. D. E. Shaw and Caxton Corporation (currently renamed "Caxton Associates"), two of the top ten hedge fund companies in the U.S. as of 2007, have been rejected by the SEC for 100% of their applications during our sample period.[16]

Both panels B and C of Table I indicate that hedge funds are by far the leading category of confidential filers. They constitute for about 30% of all institutions, but 56% of all confidential filings, and take majority seats among the top 10 filers. Conditional on seeking confidential treatment, hedge funds on average relegate 23% of the stocks in their complete portfolio, or 34% of the total portfolio value, to confidential filings. In comparison, the same figures for non-hedge fund institutions are much smaller (13% and 21% for investment companies/advisors, and 9% and 11% for banks and insurance companies, respectively). Such patterns are consistent with hedge funds being active portfolio managers

using proprietary trading strategies, for which delay in disclosure is important in order to protect private information and to minimize price impact. Moreover, hedge funds (especially the "pure play" ones) tend to manage more concentrated portfolios, and are far less subject to other regulatory requirements for disclosure compared to other investment managers (such as mutual funds and pension funds). As a result, confidential treatment under Section 13(f) provides more value of privacy to hedge funds. For these reasons, we focus on hedge funds as the primary subjects for our study, while providing brief overview for the other two categories of institutions (investment companies/advisors, and banks and insurance companies).

B. Motivations for Empirical Analyses

Building on the prevalence and distribution of confidential filings, we motivate our empirical studies of the incentives and consequences of seeking confidentiality from three strands of theoretical literature: that on mandatory disclosure, on informed trading, and on strategic trading by speculators. Some of the insights in the section also came up during our discussions with hedge fund managers and other industry sources.

Private information is at the heart of the literature that studies the impact of mandatory disclosure on informed trading (e.g., Fishman and Hagerty (1995), John and Narayanan (1997), Huddart, Hughes, and Brunnermeier (1999), Huddart, Hughes, and Levine (2001), and George and Hwang (2007)). Our setting is a mirror image of the standard one in this literature in that we analyze the benefits of seeking relief from mandatory disclosure. Most relevant to our context is perhaps the work by Huddart, Hughes, and Levine (2001, henceforth "HHL"), which extends the Kyle (1985) model of an informed trader by introducing mandatory disclosure of trades at the end of each trading period. HHL proves the existence of a mixed strategy equilibrium in which the informed trader adds a random noise to a linear strategy in each period in order to avoid full retrieval of the private information by the market maker. Such a

"dissimulation" strategy minimizes the loss in trading profits due to mandatory disclosure.

We present a modified HHL model that better fits our context in part I of the Internet Appendix of this paper.[17] The model predicts a positive relation between the benefits of confidentiality and information asymmetry. The intuition is relatively straightforward. Dissimulation in the HHL model is costly to the informed trader (relative to the no-disclosure benchmark) because some trades are made opposite to the direction of the private information. The loss is positively related to the ex ante information advantage of the informed trader. Relief from mandatory disclosure eliminates the need for dissimulation during the confidential periods, and hence restores some of the loss in trading profits which is positively related to information asymmetry.

Assuming an exogenous cost of seeking confidentiality, the model thus suggests that the stocks in confidential holdings should exhibit higher information asymmetry or are more likely to be associated with information-sensitive events. The same model also predicts that traders who possess more private information could benefit more from avoiding disclosure. Hence, hedge funds that deploy more active and less conventional portfolio strategies should seek confidential treatment more often. Our empirical study relates the likelihood of stocks being included in confidential holdings and that of hedge funds seeking confidentiality to proxies of information asymmetry and portfolio styles. Sections III.A and III.B will discuss the empirical proxies for these characteristics and test their relation to confidentiality.

Private information and price impact are inherently inseparable as motives for confidentiality because, as shown by the classical microstructure models (e.g., Kyle (1985)), potential private information as perceived by the market maker is the reason for price impact to submitted trades. For this reason, confidentiality helps mitigating the price impact which may arise due to either trading by informed traders themselves or front-running by other traders. Confidentiality not only allows the informed traders to spread their trading over a longer period of time under minimal dissimulation (as shown by our model in the Internet Appendix), it also protects them from being strategically traded

against (i.e., front-run) by others. Less informed traders can benefit from the knowledge about more informed traders at the latter's cost (Foster and Viswanathan (1994) and Madrigal (1996)). Such costs have been empirically shown to be substantial for the informed traders. Frank, Poterba, Shackelford, and Shoven (2004) show that the after-fee returns of informed actively managed mutual funds could be rendered indistinguishable, or even lower than those of "copycat funds" who replicate their holdings as soon as the holdings are disclosed. It is worth noting that uninformed (liquidity-driven) traders can also be vulnerable to the increased price impact due to front-running. Most notably, speculators could engage in "predatory trading" to exploit traders in distress (e.g., Brunnermeier and Pedersen (2005), Attari, Mello, and Ruckes (2005), Carlin, Lobo, and Viswanathan (2007), and Pritsker (2009)).

Given the normal 45-day delay allowed for regular 13F filings, confidential treatment is necessary only if the private information has not run its full course after the normal delay (the "long-lived information" hypothesis), and that hedge funds need to build/dispose their confidential positions across multiple quarters (the "slow-building" hypothesis). Prior research provides some evidence that information of positions by institutional investors is longer lasting than the quarterly frequency of mandatory disclosure. Notably, Chen, Jegadeesh, and Wermers (2000) show that profits from mutual fund research tend to accrue over a period of 12 to 18 months after the new position is added to a fund's portfolio. We verify the "long-lived information" premise (in Section V.B) with an event study that uncovers abnormal returns upon premature disclosure of confidential holdings due to an exogenous reason—quick denial by the SEC of hedge funds' confidentiality application. To test the "slow building" hypothesis, we examine (in Section III.C) whether hedge funds build their confidential positions more slowly and over more quarters than their positions disclosed at the end of the quarter.[18]

What ultimately differentiates informed from liquidity-driven trading is the realized performance of the confidential holdings. Section IV thus analyzes the abnormal returns of confidential holdings during the confidential periods. If confidential treatment is sought for non-informational reasons, then

the realized performance of the confidential holdings should be close to neutral. Nevertheless, a neutral performance in this case does not refute the benefits of confidentiality because the counterfactual—conducting large and sequential trades in the open air—may well lead to subpar performance.

Lastly, we consider the portfolio-distortion motives behind confidentiality seeking in Sections III.B and IV.D. Such a motive takes three basic forms, the main purpose of each of which is to present a portfolio to market participants that differs from the actual one. The first is the "window dressing" motive, that is, hiding stocks that have characteristics that reflect negatively on the portfolio manager (i.e., poor past performance) or are perceived as undesirable by investors (i.e., high risk). The second is the "portfolio blurring" hypothesis, that is, hiding part of the portfolio which makes it more difficult for outside speculators (including both copycats and front runners) to reverse-engineer the trading strategy. Finally, there can be nefarious motive of misleading the market and manipulating the prices by hiding stocks. The filing institutions can potentially benefit from the temporary market reaction and eventual price reversion by placing side trades including using derivatives. Such behavior is illegal, and hence is usually difficult to detect in data.

Though different motives are not necessarily mutually exclusive and can share common predictions, the presence of positive abnormal returns of confidential holdings supports hedge funds benefiting from private information with mitigated price impact. Findings about performance should be viewed as a *lower bound* estimate for the abnormal return of information-driven confidential holdings if other portfolio-distortion motives are also present.

III. Determinants of Confidential Filings and Holdings of Hedge Funds

By focusing on hedge funds, this section discusses the determinants of confidential filings at the institutional level (using institution-quarter data) and confidential holdings at the stock level (using institution-quarter-holding data). Unless otherwise specified, we adjust standard errors for

heteroskedasticity and cluster them at the filing institution level, as well as control for time fixed effects by including quarter dummies.

A. Hedge Fund Characteristics and Propensity of Confidential Filings

We resort to the following models to relate the characteristics of hedge funds to their propensity to use confidential filings. The first is a probit model:

$$(CF_{j,q} > 0) = (\beta InstChar_{j,q} + \lambda_q + \varepsilon_{j,q} > 0), \tag{1}$$

and the second is tobit model:

$$\begin{aligned} &(Latent) \qquad CF^*_{j,q} = \gamma InstChar_{j,q} + \lambda_q + \omega_{j,q}, \\ &(Observed)\ CF_{j,\,q} = \max(CF^*_{j,q}, 0). \end{aligned} \tag{2}$$

The dependent variable in (1), ($CF_{j,q} > 0$), is the indicator variable for the existence of a confidential filing in the institution-quarter *(j, q)*. The dependent variable in (2) is the dollar value proportion of confidential holdings in the total portfolio (that includes both confidential holdings and holdings disclosed in the original 13F filings) of the given institution-quarter. The regressors in both models include a vector of institutional characteristics variables (*InstChar*) and quarterly dummies to control for unspecified time effects.

We report the results in Table II. In addition to the coefficients and their associated *t*-statistics, we also report the average partial effects (APE) to facilitate the interpretation of the economic magnitude. For the probit model, the APE is defined as:

$$APE = E\left(\partial \Pr(CF_{j,\,q} > 0) / \partial InstChar_{j,\,q}\right) = \beta E\left[\phi\left(\beta InstChar_{j,q} + \lambda_q\right)\right]. \tag{3}$$

where $\phi(\bullet)$ is the standard normal probability density function. We construct the empirical analogue by replacing parameters with their estimates and using sample average to proxy for expectation.

[Insert Table II here.]

The γ estimate in the tobit model indicates the partial effect of the regressors on the latent

variable: $\partial CF^{*}_{j,q} / \partial InstChar_{j,q}$, which is not usually of interest. Instead, the more meaningful APE concerns the effect of the regressors on the actual choice of confidential holdings, that is, $\partial CF_{j,q} / \partial InstChar_{j,q}$, which could be expressed as follows:

$$APE = E\left(\frac{\partial CF_{j,q}}{\partial InstChar_{j,q}} \right) = \gamma E\left[\Phi\left(\frac{\gamma InstChar_{j,q} + \lambda_q}{\sigma_{\varpi}} \right) \right], \tag{4}$$

where $\Phi(\bullet)$ is the cumulative probability function of the standard normal distribution. The reported APE are the empirical analogues to (4).

Table II uses a set of *InstChar* variables, which we construct mostly based on 13F quarterly holdings, to capture the degree of active portfolio management and the market impact of the institutions. More specifically, *Age* is the number of years since the institution's first appearance on Thomson Reuters. *PortSize* is the total equity portfolio size calculated as the market value of its quarter-end holdings. *Turnover* is the inter-quarter portfolio turnover rate calculated as the lesser of purchases and sales divided by the average portfolio size of the last and the current quarter.[19] *PortHHI* is the Herfindahl index of the portfolio, calculated from the market value of each component stock. *PortRet*, *PortVol*, and *IdioVol* are the monthly average return, total volatility, and idiosyncratic volatility of the portfolio during the quarter, assuming that the institution maintains the holdings of the last quarter-end. We compute *IdioVol* as the standard deviation of the residuals from the Carhart (1997) four-factor model (market, size, book-to-market, and momentum) using imputed monthly returns for the 36-month period ending in the current quarter. We define |*Flow*| as the absolute change in total portfolio value between two consecutive quarters, net of the change due to returns, scaled by the portfolio size at the previous quarter-end. That is,

$$\left| Flow_{j,q} \right| = \left| \frac{PortSize_{j,q} - PortSize_{j,q-1}(1 + PortRet_{j,q})}{PortSize_{j,q-1}} \right|.$$

Table II reveals that several characteristics are significantly associated with more frequent confidential filings. First two are portfolio size (*PortSize*) and absolute flows (|*Flow*|), consistent with larger hedge funds that have higher inflows or outflows bearing higher market impact and also having potentially larger capacity in collecting private information. An inter-quartile change in these two variables is associated with an increase in the probability of confidential filing by 2.7 and 0.3 percentage points. Second, several characteristics associated with active portfolio management are uniformly associated with more confidential filings. They include high portfolio turnover rate (*Turnover*), high portfolio concentration as measured by the Herfindahl index (*PortHHI*) (Kacperczyk, Sialm, and Zheng (2005)), and high portfolio idiosyncratic return volatility (*IdioVol*). The changes in the probability of confidential filing corresponding to the inter-quartile ranges of these three variables are 3.2, 0.9, and 0.7 percentage points. These numbers are economically significant relative to the unconditional probability of 3.4%.

We argue that such a pattern is supportive of private information. First, a recent paper by Titman and Tiu (2011) finds that better hedge funds (in terms of Sharpe ratios and information ratios) exhibit lower R-squared values with respect to systematic factors. Second, a long-equity portfolio with high idiosyncratic risks, conditional on portfolio concentration, implies component stocks of high idiosyncratic variations. Durnev, Morck, Yeung, and Zarowin (2003) show that such stocks contain more firm-specific information. Finally, this pattern echoes Agarwal, Fos, and Jiang's (2010) finding that hedge funds which choose not to report to any commercial databases tend to have higher idiosyncratic volatility compared to the funds that report. Both their findings and ours indicate that hedge funds who adopt less conventional investment strategies value privacy more—they are more likely to refrain from voluntary disclosures or to seek exemptions from mandatory ones.

An alternative way to characterize hedge funds is to look at their stated investment styles. Such information is only publicly available for the funds that voluntarily report to commercial hedge fund

databases. Based on the 450 sample hedge funds (as 13F filing institutions) that have matches in a union of five major hedge fund databases (Center for International Securities and Derivative Markets (CISDM), Eurekahedge, Hedge Fund Research (HFR), Morgan Stanley Capital International (MSCI), Tremont Advisory Shareholder Services (TASS, now Lipper)),[20] we find that the top styles associated with seeking confidentiality are: Event Driven, Multi-Strategy, and Relative Value Arbitrage. Indeed these categories are likely candidates for "risk arbitrage" and "block positioning", two major allowable reasons in the SEC guidelines for delay in disclosure.

B. Characteristics of Confidential Holdings

We next examine the characteristics of stocks in confidential holdings and relate them to the various motives behind seeking confidentiality.

The event that best exemplifies sensitive information, and acknowledged by the SEC as acceptable motives for confidentiality, is an "open risk arbitrage," which involves a long position in the target stock (possibly paired with a short position in the acquirer's stock if a stock deal) right after the deal is announced. The position is expected to be reversed when the deal is closed, and the profits come from the price convergence to the offer. We use the indicator variable (*M&A*) for a stock of the target in an announced (but not completed) M&A deal during the one-year period ending in the portfolio quarter as a proxy for the merger arbitrage motive of the confidential filing. About 86% of the announced deals in our sample are eventually completed. We retrieve the data on M&A attempts, defined as an intended change-of-control, from Securities Data Company (SDC).[21] Our final sample has 4,726 announced deals during the period from 1998 to 2007

In addition, we use several variables that are firm-specific drivers of information asymmetry, including firm size (Chari, Jagannathan, and Ofer (1988), Llorente, Michaely, Saar, and Wang (2002)), illiquidity (Glosten and Milgrom (1985)), distress risk (Griffin and Lemmon (2002)), and analyst

following (Brennan and Subrahmanyam (1995), Hong, Lim, and Stein (2000), Chang, Dasgupta, and Hilary (2006)). More specifically, we obtain market capitalization (*Size*) at the end of the quarter from the CRSP database. We compute book-to-market ratios (*B/M*) at year ends using data from the CRSP and COMPUSTAT databases. We also include the market (CRSP value-weighted index) adjusted past twelve-month return (*Adj. Past Return*) to control for momentum. We employ a variant of the Amihud (2002) illiquidity measure (developed by Hasbrouck (2009)) as the proxy for trading liquidity (*Illiquidity*). We compute this measure as the yearly average of the square root of |return|/(price × volume). We measure analyst coverage of a firm by counting the number of analysts in the I/B/E/S database (available through WRDS) that make at least one forecast or recommendation on the firm during the year (*Analysts*). We proxy the probability of financial distress with the distance-to-default (*DtD*), which refers to the number of standard deviation decreases in firm value before it drops to the face value of debt (i.e., the firm is in default). This measure is motivated by Merton's (1974) bond pricing model and estimated for each firm at the end of each year following the procedure in Vassalou and Xing (2004). Because *DtD* is a one-sided measure, we use a dummy variable for *DtD* to be smaller than 1.64 as an indicator for non-negligible distress risk (i.e., the estimated probability of distress being 5% or higher). Finally, we measure the *Volatility* and *IdioVol* by the standard deviation of the returns and residuals from Carhart (1997) four-factor model for past 36 months of stock returns, respectively.

Panel A of Table III reports the summary statistics of the stock-level variables discussed above separately for positions included in the original filings and those in the confidential filings of hedge funds. Differences along all dimensions are statistically significant at the 1% level in favor of greater information asymmetry in the confidential holdings. Stocks in confidential holdings of hedge funds are smaller, have higher book-to-market ratio, lower analyst coverage, higher distress risk, higher volatility, and higher idiosyncratic volatility compared to the stocks in the original filings. Moreover, stocks in confidential holdings are far more likely to have been recent targets in M&A announcements, a

probability of 7.5% versus 4.1% for the original filings, pointing to risk arbitrage as an important motive underlying confidential treatment.[22] The Stark Onshore Management LLC featured in Appendix A is an example: 39 out of 55 confidential holdings were targets in M&A announcements within a year up to the end of the quarter.

[Insert Table III here.]

Many of the variables, such as *Size*, *Illiquidity*, *Analyst*, and *Idio. Vol.*, also represent established proxies for trading liquidity. Hence, some of the results also conform to the price impact motive, which is closely intertwined with private information, as we discuss before in Section II.B. On the other hand, stocks in confidential filings experience slightly higher (not statistically significant) market-adjusted returns in the past twelve months as those of original holdings, which contradicts a performance-based window dressing motive where money managers hide losing positions in order to make their disclosed portfolios look smart. Nevertheless, significantly higher total and idiosyncratic volatilities of the confidential holdings are still consistent with a risk-based window dressing motive of money managers to make their portfolio appear less risky to their investors. This result is analogous to Musto's (1999) findings regarding money-market fund managers' over-weighting less risky government issues before portfolio disclosure dates.

We supplement the univariate analyses in panel A of Table III with multivariate logistic regressions. The model specification is as follows:

$$CH_{i,j,q} = (\lambda StockChar_{i,q} + \alpha_q + \delta_{Ind} + \varepsilon_{i,j,q} > 0), \tag{5}$$

where $CH_{i,j,q}$ is a dummy variable equal to one if stock *i* is in the confidential holdings of institution *j* in quarter *q*. The all-sample average of $CH_{i,j,q}$ is 2.2%. $StockChar_{i,q}$ is the same vector of stock characteristics variables used in panel A. In addition to the quarterly dummies (α_q), the Fama and French (1997) 10 industry dummies (δ_{Ind}) are added to regression in equation (5) to control for unobserved heterogeneity at the industry level. Results without the industry dummies are qualitatively

similar and marginally stronger. We report the estimated coefficients $\hat{\lambda}$, their associated *t*-statistics, and the average partial effects (APE) of the $StockChar_{i,q}$ variables in panel B of Table III. More specifically, we compute the APEs as the empirical analogue to

$$E\left[\partial \Pr\left(CH_{i,j,q}=1\right)/\partial StockChar_{i,q}\right]=\lambda E\left\{\frac{\exp\left(\lambda StockChar_{i,q}+\alpha_q+\delta_{Ind}\right)}{\left[1+\exp\left(\lambda StockChar_{i,q}+\alpha_q+\delta_{Ind}\right)\right]^2}\right\}.$$

Because *Size*, *Analyst*, *Illiquidity*, *Volatility*, and *Idio. Vol.* have high pairwise correlations (with absolute values above 0.60), we try specifications that have only one of these five variables at a time (corresponding to columns 1 to 5), as well as having four of these five variables together in specifications (6) and (7). Results in panel B provide messages broadly consistent with those in panel A.

More specifically, targets of announced M&A deals have probabilities of being confidential holdings that are two percentage points higher than non-targets, about doubling the unconditional probability for stocks to appear in confidential filings. Inter-quartile changes in *Size*, *Illiquidity*, *Analyst*, and *Idio. Vol.* are associated with incremental probabilities of –1.5, –0.3, –0.1 and 0.1 percentage points. Such magnitudes (especially the one associated with *Size*) are sizable relative to the unconditional probability, indicating that these variables are driving significant portion of variations in the data.

C. Trading during the Confidential Period

If hedge funds are protecting private information through confidentiality because the information still has value and they have not completed accumulating the position, then they should be expected to trade more in the confidential stocks during the period of confidentiality. Given that revealing information about the holdings helps the convergence of price to the private valuation of the informed trader (*e.g.*, Huddart, Hughes, and Levine (2001)), hedge funds should not be averse to disclosure if they have completed the planned acquisitions.[23] This section investigates these issues by analyzing inter-

quarter trading during the confidential periods. We report the results in Table IV.

[Insert Table IV here.]

Table IV reveals several notable contrasts between hedge funds' trading in confidential and original holdings from the two-sample t-tests. The initial positions (as percentage of shares outstanding) are only slightly (not significant) larger in the confidential holdings, but hedge funds trade more aggressively on their confidential positions during the following quarters within the confidential periods. The aggressiveness in trading is measured by both total trading volume (the sum of unsigned inter-quarter changes in holdings, scaled by either shares outstanding or by the initial position), and the difference between the maximum and initial position (using the same scaling variables). Trading activities in confidential holdings almost triple those in original holdings by the same funds using all measures, and all differences but one are significant at the 5% level. For example, the average total trading volume in confidential stocks is 0.96% of the shares outstanding, versus 0.34% for the average stock in the original holdings. The maximum position in a confidential stock during the confidential period is 6.55 times the initial position on average, while the same multiple for a stock in the original holdings is 3.03. Finally, it takes much longer for hedge funds to accumulate to the maximum position of a confidential holding (2.58 quarters on average) than a regular holding (0.93 quarters), justifying the price impact motive for seeking confidentiality beyond the normal delay of 45 days from the quarter end.

Hedge fund managers may choose to disclose after liquidation, or after completing the accumulation of their positions but before liquidating them. Of the 37,204 confidential holdings examined in Table IV, the managers disclose 27,306 (73.4%) positions after liquidating them. Out of the remaining 9,898 (26.6%), 7,844 (79.3%) see no further acquisition in the confidential holdings in the quarter after the disclosure while 2,054 (20.7%) exhibit further build-up in the positions. The overall evidence suggests that hedge funds have mostly completed their trades in the confidential holdings upon

post-confidentiality disclosure.

IV. Performance of Confidential Holdings of Hedge Funds

The presence of positive abnormal returns is necessary to differentiate the private information hypothesis from alternative motives to seek confidentiality. Though price impact influences the pace at which the price adjusts to information, it should not affect the cumulative stock return over the entire confidential period, extending up to twelve months. Hence performance analysis in this section provides a sharp test of the private information hypothesis.

A. Choice of Performance Measure

We adopt two abnormal performance measures. The first measure is the Carhart (1997) four-factor alpha using imputed daily returns assuming the holdings at the end of the previous quarter. We do not resort to Fung and Hsieh (2004) hedge fund factors because they are meant for alternative asset classes while we are analyzing equity positions exclusively. The second performance measure is the Daniel, Grinblatt, Titman, and Wermers (1997) (henceforth "DGTW") benchmark-adjusted return. We form 125 portfolios, in June of each year, using all the common stocks listed on NYSE, AMEX, and NASDAQ based on a three-way quintile sorting along the size (using the NYSE size-quintile), book-market ratio, and momentum dimensions. The abnormal performance of a given stock is its return in excess of that of the benchmark portfolio to which it belongs, and the average DGTW benchmark-adjusted return for each portfolio aggregates over all the component stocks using value-weighting in the portfolio. Sensitivity analysis using equal weights yields similar results.

While alpha is the most commonly used metric to assess abnormal returns in the literature, the DGTW measure has the advantage for its focus on stock picking abilities. Daniel, Grinblatt, Titman, and Wermers (1997) decompose the superior performance of money managers into stock selectivity, style timing, and execution costs. Given that applications for confidential treatment need to be made at

the individual stock level, the justifiable private information should mostly be stock-specific rather than about asset classes or overall market timing. Further, our analyses are based on holdings that do not incorporate transaction costs. Therefore, the DGTW measure, which corresponds to the stock characteristic selectivity component, serves well as a complement to the more conventional alpha measures.

B. Comparing Return Performance of Confidential and Original Holdings

We assess the performance of confidential holdings by comparing their abnormal returns during the confidential periods to those of the original holdings of the same institution during the same periods of time. We group the length of confidential periods into seven grids from two months up to one year, where each specific horizon includes confidential periods that are at least as long as that horizon but shorter than the next horizon. For example, all confidential filings that are filed at a delay of at least three months but shorter than four months from the portfolio at the end of the quarter are grouped in the three-month horizon grid. Constraining performance evaluation of confidential holdings to be within their confidential periods is necessary to both ensure the property motive for remaining confidential and to avoid the price impact due to disclosure.

Panel A of Table V reports the return performance of original and confidential holdings separately, as well as their differences, using value-weighted four-factor alpha and the DGTW benchmark-adjusted return measure. For the DGTW measure, we use the same benchmark portfolio throughout the return horizon under consideration to ensure consistency.

[Insert Table V here.]

The results provide strong evidence that confidential holdings exhibit higher benchmark-adjusted returns compared to original holdings over all seven horizons from two to twelve months, where the differences are statistically significant at the 10% level or better for all but one horizon. The difference

in the four-factor alpha amounts to 2.57 (2.05) basis points daily over the two-month (twelve-month) horizon, corresponding to annualized return spreads of 6.48% (5.17%) in favor of confidential holdings.[24] Similarly, the difference in the DGTW measure is 5.26% (7.51%) over the two-month (twelve-month) horizon. The presence of such superior returns supports that confidential holdings are more informed than original holdings. Moreover, the persistence of the abnormal returns up to one year suggests that returns are unlikely to be driven by the temporary price pressure from trading by the filers.

Griffin and Xu (2009) document limited evidence of skill by hedge funds using the original holdings from Thomson Reuters Ownership database. To facilitate comparison, we apply their methodology separately on hedge funds' original and confidential holdings, that is, we compute the raw returns and DGTW benchmark-adjusted returns at three months after the quarter-end for each institution-quarter using both value- or equal-weighting, and then average across all institution-quarter portfolios in the sample period. We report the results in panel B of Table V. We replicate the results of Griffin and Xu (2009) regarding original holdings, but further show that the confidential holdings significantly outperform the original holdings of hedge funds by 5.0% (3.5%) per annum using the value-weighted (equal-weighted) DGTW benchmark-adjusted returns. This comparison reiterates the private information motive underlying hedge funds' confidential filings as well as the presence of their superior stock selection ability.

C. Acquisition- and Disposition-Motivated Confidential Holdings

Hedge funds may seek confidential treatment for stocks that are part of their ongoing acquisition or disposition plans. When information driven, the nature of the two types could be quite different as the former (latter) should entail positive (negative) private information. A separation of the two types can sharpen our tests.

The acquisition/disposition purpose is not explicitly stated in the confidential filings and

therefore can only be identified with an approximation algorithm. For each stock in a confidential filing, we compare the position (adjusted for stock splits) at the current quarter-end (*t*) to that of the same stock by the same institution at the previous quarter-end (*t-1*), and classify net increase (decrease) as acquisition (disposition). In case of no change (5.4% of the sample), we break the tie by relying on the position change of the same stock in the next quarter forward (*t+1*) relative to the current one. This algorithm is analogous to Lee and Ready (1991) in classifying the direction of trades. Such an algorithm classifies 80.7% (19.3%) of the confidential positions of hedge funds as acquisition- (disposition-) motivated. Table VI replicates Table V separately for acquisitions and dispositions.

[Insert Table VI here.]

Table VI confirms that acquisition-motivated confidential holdings exhibit higher benchmark-adjusted returns compared to original holdings, and differences are statistically significant for almost all horizons up to one year. The spreads at different horizons are also economically significant. At the one-year horizon, the performance difference amounts to 3.88 and 7.06 percentage points using four-factor alphas and DGTW measures respectively. In contrast, results of disposition-motivated subsample are not nearly as consistent, possibly because on-going dispositions are more likely to be liquidity driven. In such cases, hedge funds may still benefit from confidential filings in mitigating the adverse price impact that might ensue had they carried out the disposition in the open, even though we do not observe as strong abnormal returns of these confidential positions.

In a robustness check, we classify acquisitions and dispositions by primarily relying on the position changes from the current to the subsequent quarter end (i.e., a "forward" rather than the "backward" classification approach used in Table VI). We report the results in Table IA.II in the Internet Appendix and find them to be qualitatively similar.

D. Sensitivity checks

First, like all the studies based on the quarter-end holdings data, our study does not capture the effects of inter-quarter trades and assumes that portfolios at any given time are identical to those at the previous quarter end. If some inter-quarter trades are informed (see Puckett and Yan (2011) for such evidence), then our return results are biased downwards. Assuming quarter-end portfolio formation also tends to produce conservative return measures if the positions are actually accumulated throughout the quarter. However, this stringent assumption is necessary to avoid any look-back bias or attributing superior performance to momentum trading, and is the default method adopted by the literature. If we adopt the same aggregation procedure as in panel A of Table V but use beginning of the quarter as the portfolio formation date, return measures are markedly higher: 3.2% for original and 5.0% for confidential holdings during the holding quarter. The difference of 1.8% (7.2% annualized) is highly significant (*t*-statistic = 4.81). The truth is probably somewhere between, but we do not wish to over-interpret the strengthened results given the possible look-back bias for any assumed portfolio formation date other than the quarter end.

Second, the presence of derivatives in hedge funds' positions may bias our results if they are systematically used to offset the long positions filed in the 13F, especially those in the confidential holdings. While we cannot refute such a possibility due to the lack of disclosure and transparency of derivatives holdings and short positions, two pieces of evidence are helpful. The first piece is provided by Ang, Gorovyy, and van Inwegen (2011) showing that hedge funds following equity and event-driven strategies (which constitute a great majority of the funds in our sample) have the lowest leverage through derivatives among all major strategy categories. The second piece of evidence comes from our own analysis of abnormal performance of confidential and original holdings after excluding those stock positions that are accompanied with reported positions in call and/or put options. For this purpose, we collect information on all option positions included in both confidential and original holdings from SEC's EDGAR database.[25] For our sample hedge funds, the median position in options in zero; and the

mean call, put, and a combination of call and put positions are 0.8%, 0.6%, and 0.6% of the stock positions. Once the stocks with option positions are excluded, confidential holdings continue to outperform the original holdings in the two-month to twelve-month horizons: with the four-factor alpha ranging from 2.48% to 1.64%, and the DGTW measure from 4.76% to 7.01%. We report the results in Table IA.III of the Internet Appendix.

Needless to say, confidential treatment is not the only way that hedge funds can gain undisclosed long exposure in a stock. Derivatives contracts such as total return swaps that are traded over the counter can accomplish the same goal. Nevertheless the two approaches are far from perfect substitutes even without considering differential transaction costs. For example, when the block-building aims at influencing corporate policies or control, then the long position with which the voting rights are endowed becomes necessary. This explains why confidential treatment is constantly sought after by M&A arbitrageurs and activist shareholders.

Next, we replicate panel A of Table V for the category of investment companies/advisors, and report results in Table IA.IV of the Internet Appendix. The abnormal returns for the confidential holdings of this category are similar to those of hedge funds but weaker in magnitude. This is expected as hedge funds are arguably the most active portfolio managers and among the most aggressive in seeking private information. Banks and insurance companies are only sporadic users of the confidential treatment (see panel B of Table I) and their confidential holdings do not exhibit any positive abnormal returns.

Finally, we ensure that our results are not driven by a handful of outlying institutions listed in panel C of Table I, who seek confidentiality frequently and have been rejected most of the time. Such institutions, notably, Caxton Corporation and D.E. Shaw & Co. Inc., may resort to confidential filings as a systematic way to avoid revealing their holdings, rather than to protect occasional stock-level private information. When we exclude these two institutions, we find slightly stronger results, as shown in

Table IA.V of the Internet Appendix.

V. Denial of Confidentiality Requests

The SEC rules state clearly that confidential treatment is meant to be an exception rather than a rule. Given the perceived benefits of seeking confidentiality, it is necessary to discuss the associated costs of doing so, especially beyond the intended purpose. So far in our analyses, we have pooled confidential filings that are denied with those that are not denied; among the latter we cannot accurately distinguish between applications that are approved and those that do not receive SEC decision before the term expires. An analysis of the causes for rejection and the resulting market responses helps us to assess the cost of denials.

A. Causes for Denials of Confidentiality Requests

The SEC does not publicize the specific reasons for rejecting individual applications other than stating the general principle of requiring adequate factual support for the need of confidentiality on a stock-by-stock basis. Therefore, we attempt to reverse-engineer the causes for denials on a large sample basis using the following probit model:

$$(Denial_{j,q} > 0) = (\delta CFChar_{j,q} + \omega InstChar_{j,q} + \vartheta_q + \xi_{j,q} > 0), \quad (6)$$

The dependent variable, ($Denial_{j,q} > 0$), is the indicator variable for the denial of a confidential filing in the institution-quarter *(j, q)*. The regressors include a vector of confidential filing characteristics (*CFChar*), institutional characteristics (*InstChar*), and quarterly dummies to control for unspecified time effects.

Table VII reports the estimation of equation (6), conditional on the subsample of confidential filings. We first identify several observable characteristics from confidential filings, i.e., the number of past filings (*# Past CF*), the frequency of denials in the past (*% Past Denied*), the number of distinct

stocks in the filings as a fraction of total number of distinct stocks held (*% Conf. Stocks*), the value of the confidential holdings (*Value CF*), the value of the confidential holdings as fraction of the value of total holdings (*% Value CF*), and the average shares in confidential holdings as a percentage of shares outstanding (*Avg. Conf. Position*). Since four of our variables — *% Conf. Stocks*, *% Value CF*, *Log(Value CF)*, and *Avg. Conf. Position*, are highly correlated, we first report the results by including them individually in specifications (1) to (4) in Table VII. The next two specifications (5) and (6) show the results pooling the regressors but still excluding either *% Value CF* or *Log(Value CF)* due to the near-perfect collinearity between these two variables.

[Insert Table VII here.]

We expect the denial decision to be positively related to *% Conf. Stocks*, *Value CF*, *% Value CF*, and *Avg. Conf. Position* given that the intended purpose of the amendment to 13(f) is to provide occasional relief from disclosure for a small number of stocks by institutions who can demonstrate adequate factual support. We also expect that institutions that have been denied frequently in the past earn a reputation of potential abusers, which endangers their future prospects of obtaining approvals. Our findings are broadly consistent with these predictions.

First, in all specifications, we find denial probabilities are positively related to past denial rates, and this is the single most important predictor of future denials. For two otherwise comparable institutions with past denial rates of zero and 50% respectively, the probability of their being denied in the future will differ by 27 percentage points, indicating a serious cost from a bad reputation.[26] Second, we observe higher denial probabilities are positively and significantly (at the 5% level) associated with both *% Conf. Stocks* and *Avg. Conf. Position* indicating greater probability of denial when funds try to mask a larger portion of their portfolios.

The above results are robust to the inclusion of fund characteristics that we employ earlier in Table II to analyze the determinants of seeking confidentiality. In addition, we find negative

coefficients on *Log(PortSize)* and *Turnover*, statistically significant at the 5% and 10% levels, respectively. Therefore, the confidentiality requests by larger and more actively managed (*i.e.*, high turnover) hedge funds are less likely to be denied by the SEC, consistent with these funds being the ones likely to possess private information and being vulnerable to price impact.

B. Market Reaction to Disclosure of Confidential Filings

We study the market's reaction to the disclosure of the confidential filings, especially ones in response to the SEC denials, for two related purposes. First, a significant market reaction to positions involuntarily disclosed due to relatively speedy denials is a powerful piece of evidence supporting the private information motive of seeking confidentiality. Moreover, such a market reaction is costly to the filers because the market price adjustment prevents the filers from further benefiting from the private information now prematurely revealed. This should restrain the institutions from seeking confidentiality aggressively because, as Table VII shows, past denials make future denials more likely.

To sharpen our tests, we focus on the market's reaction to the quick denials, classified as filings that are denied within 45 to 180 days after the quarter-end portfolio date. In these cases, funds will be forced to reveal their stock positions earlier than they would choose to. If the positions contain private information, their exogenous revelation should generate market reactions. In contrast, after a similar length of delay, when hedge funds voluntarily disclose their confidential holdings that are not denied, there should not be significant market responses because the funds presumably have fully benefitted from their information.

We design the tests along this line and report the results in Table VIII. More specifically, Table VIII reports the average cumulative abnormal returns (CAR) for the quick denials and non-denial cases of confidential filings over three windows around the event date: [–1, +1], [–2, +2], and [–5, +5] days. The event date is the amendment filing date that discloses the confidential positions. We conduct the

event study separately for the involuntary disclosures due to denials and the voluntary disclosures of non-denial cases. For each stock in each filing, we first estimate abnormal returns using a market model with equally-weighted CRSP market index. We estimate the factor loadings with daily data over a period of 300 to 91 days before the event date, and use Scholes and Williams (1977) approach to account for non-synchronous trading. We then equally weight the CARs of individual stocks to compute the CARs for each filing. The mean CARs for the quick denials over the three windows are positive: 0.54%, 0.97%, and 1.19%, and are all significant at the 5% level. In contrast, the mean CAR figures for the non-denial cases of confidential filings are smaller and none is significant. These results again support the private information hypothesis.

[Insert Table VIII here.]

VI. Concluding Remarks

Despite a general lack of economically significant and persistent abnormal performance among active portfolio managers as a whole as documented by the literature (French, 2008), our study of a selective subset of institutional investors' portfolios, i.e., the confidential holdings of hedge funds, reveals positive evidence of managerial skill in stock picking.

Our findings also offer an explanation to the ongoing resistance by investment managers against ownership and holdings disclosure, and inform the debate on the optimal level of ownership or holdings disclosure. While timely disclosure contributes to market transparency and enhances investor monitoring of money managers, it may also dilute the incentives for active portfolio managers to acquire information by encouraging free riding and front running. We show that confidential treatment provides tangible relief for institutions from revealing their private information about the issuers before reaping the full benefits, and from incurring additional trading costs due to leakage of information regarding

their own on-going trading plans. Except for a handful of extreme cases, we find that the great majority of institutions resort to confidentiality selectively.

Our study also points to the limitation of using conventional 13F databases that ignore confidential holdings. The bias is likely to be small if the purpose of the research is to track aggregate institutional holdings in public companies or to assess the overall portfolio performance of any large sample of institutional investors. However, given the importance of confidential holdings conditional on a confidential filing (on average, one-third of the total portfolio value for hedge funds), their disproportionate association with information sensitive events (notably M&As), and their concentration on stocks with higher level of information asymmetry, ignoring them could be a significant omission in analyzing position changes of individual institutions or in response to specific events. Such information is also potentially important for investment managers who use Form 13F information in formulating investment strategies, predicting implementation costs, and identifying likely counterparties in large trades.

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Appendix A: Confidential Holdings of Stark Onshore Management LLC

This table lists all the common stock confidential holdings reported in the 13F amendments filed by Stark Onshore Management LLC over the sample period 1999Q1-2007Q2. "Issuer Name" is the name of the company issuing the common stock. "Shares" is the number of shares held by Stark Onshore on the portfolio date. "Portfolio Date" is the quarter-end date for which the portfolio holdings are reported. "Filing Date" is the date when the 13F amendment is filed. "Thomson Reuters" is an indicator variable for whether the holding is reported to the Thomson Reuters Ownership Database. "M&A Target" is an indicator variable for whether the issuer company was a target in a merger and acquisition announcement during the four-quarter period ending in the portfolio quarter.

Issuer Name	CUSIP	Shares	Portfolio Date	Filing Date	Thomson Reuters	M&A Target
Anthem Inc	94973V10	67,360	9/30/2004	2/14/2005	No	No
Cox Communications Inc	22404410	269,964	9/30/2004	2/14/2005	No	No
Metro-Goldwyn-Mayer Inc	59161010	60,000	9/30/2004	2/14/2005	No	Yes
Sears Holdings	81238710	390,800	12/31/2004	5/13/2005	No	Yes
Symantec Corp	87150310	161,650	12/31/2004	8/16/2005	No	No
Gold Fields Ltd	38059T10	73,277	3/31/2005	8/16/2005	No	No
Symantec Corp	87150310	161,650	3/31/2005	8/16/2005	No	No
Sungard Data Systems	86736310	1,557,250	3/31/2005	9/27/2005	No	Yes
Unocal Corp	91528910	393,650	3/31/2005	9/27/2005	No	No
MCI Communications Corp	55269110	2,103,850	3/31/2005	2/15/2006	No	Yes
Sungard Data Systems	86736310	1,557,250	6/30/2005	9/27/2005	No	Yes
Unocal Corp	91528910	393,650	6/30/2005	9/27/2005	No	Yes
Brookstone Inc	11453710	98,463	6/30/2005	10/7/2005	No	Yes
Infousa Inc New Com	45670G10	221,542	6/30/2005	10/7/2005	No	Yes
Metals Usa Inc	59132420	183,275	6/30/2005	10/7/2005	No	Yes
Cablevision Systems Corp	12686C10	281,250	6/30/2005	1/6/2006	No	Yes
Medicis Pharmaceutical	58469030	13,750	6/30/2005	1/6/2006	No	No
AT&T Corp	00195750	6,250	6/30/2005	2/15/2006	No	Yes
MCI Communications Corp	55269110	1,119,450	6/30/2005	2/15/2006	No	Yes
Gold Banc Corp Inc	37990710	555,203	9/30/2005	12/15/2005	No	No
AT&T Corp	00195750	6,250	9/30/2005	2/15/2006	No	Yes
Bei Technologies Inc	05538P10	46,200	9/30/2005	2/15/2006	No	Yes
Cablevision Systems Corp	12686C10	281,250	9/30/2005	2/15/2006	No	Yes
Chiron Corp	17004010	506,040	9/30/2005	2/15/2006	No	Yes
Hibernia Corp	42865610	525,000	9/30/2005	2/15/2006	No	Yes
MCI Communications Corp	55269110	1,119,450	9/30/2005	2/15/2006	No	Yes

Issuer Name	CUSIP	Shares	Portfolio Date	Filing Date	Thomson Reuters	M&A Target
Medicis Pharmaceutical	58469030	13,750	9/30/2005	2/15/2006	No	No
Metals Usa Inc	59132420	185,775	9/30/2005	2/15/2006	No	Yes
Petrokazakhstan Inc	71649P10	93,750	9/30/2005	2/15/2006	No	No
Guidant Corporation	40169810	61,650	9/30/2005	5/19/2006	No	Yes
Boston Scientific Corp	10113710	506,250	12/31/2005	5/19/2006	No	No
Guidant Corporation	40169810	397,011	12/31/2005	5/19/2006	No	Yes
Ipayment, Inc	46262E10	26,360	12/31/2005	5/19/2006	No	Yes
Independence Comm. Bank Corp	45341410	373,797	12/31/2005	6/5/2006	No	Yes
Albertson's Inc	01310410	392,240	3/31/2006	6/5/2006	No	Yes
Independence Comm. Bank Corp	45341410	13,677	3/31/2006	6/5/2006	No	Yes
Education Management Corp	28139T10	411,591	3/31/2006	8/15/2006	No	Yes
Thomas Nelson	64037610	75,360	3/31/2006	8/15/2006	No	Yes
Capital One Financial	14040H10	110,000	3/31/2006	11/20/2006	No	No
Engelhard Corp	29284510	72,800	3/31/2006	11/20/2006	No	Yes
Keyspan Corp	14040H10	396,780	3/31/2006	2/20/2007	No	Yes
Capital One Financial	14040H10	145,000	6/30/2006	11/20/2006	No	No
Commercial Capital Bancorp, Inc	20162L10	443,073	6/30/2006	11/20/2006	No	Yes
Exelon Corp	30161N10	783,500	6/30/2006	11/20/2006	No	No
Fisher Scientific Intl	33803220	116,080	6/30/2006	11/20/2006	No	Yes
Kinder Morgan Inc	49455P10	202,340	6/30/2006	11/20/2006	No	Yes
Nco Group Inc	62885810	407,999	6/30/2006	11/20/2006	No	Yes
Public Service Enterprise Group	74457310	730,774	6/30/2006	11/20/2006	No	No
Keyspan Corp	49337W10	540,040	6/30/2006	2/20/2007	No	Yes
Longview Fibre Co	54321310	40,000	6/30/2006	2/20/2007	No	Yes
Constellation Energy Group Inc	21037110	648,660	6/30/2006	5/3/2007	No	Yes
Northwestern Corp	66807430	175,832	6/30/2006	5/3/2007	No	Yes
Univision Communications Inc	91490610	1,298,435	6/30/2006	5/3/2007	No	Yes
Multi Fineline Electronix In	62541B10	933,653	3/31/2007	5/16/2007	Yes	No
Rouse Co	77927310	269,910	9/30/2004	11/25/2004	Yes	Yes

Appendix B: The Classification of 13F Filing Institutions

The classification of institution types employed in this paper refines the one used in the Thomson Reuters database. Thomson Reuters divides all institutions into five types: banks (type code = 1, mostly commercial banks), insurance companies (type code = 2), investment companies (type code = 3, mostly mutual fund management companies), independent investment advisors (type code = 4, including asset management companies, investment banks, brokers, private wealth management companies, etc.), and others (type code = 5, including pension funds, endowment funds, most of the hedge funds, financial arms of corporations, and others). The type code 5, especially since 1998, is known to be problematic in that the category could include many misclassified institutions that should be assigned with the other type codes (mostly, type code 4), a problem acknowledged by the database. As a result, the "other" category, instead of being a residual claimant, turns out to be the largest category in the Thomson database, accounting for over 50% of all institutions in recent years.

We made the following changes to the Thomson classification of institutional categories. We first divide all institutions into four groups: (i) hedge funds, (ii) investment companies and investment advisors (a combination of type 3 and type 4 institutions by the Thomson classification, excluding hedge funds), (iii) banks and insurance companies (a combination of type 1 and type 2 institutions by the Thomson classification), and (iv) other institutions. For institutions in our sample that are not covered by Thomson, we manually classify them.

Next, we made major corrections for the "other" category as classified by Thomson. First, we reassign all hedge funds from this category. Second, we reassign an institution which has type code 5 after 1997 to an earlier code, if available and if different from 5. Third, we manually classify the remaining institutions (mainly based on information from the institutions' websites and news articles) and reassign all investment companies and advisors. After all these corrections, the "other" category shrinks sharply to about 4% of all institutions in our sample.

[1] Such attempts have not been successful. Philip Goldstein, an activist hedge fund manager at Bulldog Investors, likens his stock holdings to "trade secrets" as much as the protected formula used to make Coke, and contends that complying with the 13F rule "constitute[s] a 'taking' of [the fund's] property without just compensation in violation of the Fifth Amendment to the Constitution." For a more detailed discussion, see Philip Goldstein's interview in September 12, 2006 issue of *Business Week*: http://www.businessweek.com/print/investor/content/sep2006/pi20060913_356291.htm.

[2] For the initial SEC release in 1979, please see http://www.sec.gov/rules/final/34-15979.pdf. The current SEC official guideline for 13F amendments is available at: http://www.sec.gov/about/forms/form13f.pdf. Section "Instructions for Confidential Treatment Requests" details the requirements.

[3] Although the SEC does not provide information about all denial cases, we find online documents for a few cases. For example, see http://www.sec.gov/rules/other/34-52134.pdf for the rejection of the request from a hedge fund, Two Sigma. There are several other cases of rejections of confidential treatment requests including those by Warren Buffett: http://www.sec.gov/rules/other/34-50206.htm, http://www.sec.gov/rules/other/34-43142.htm, and http://www.sec.gov/litigation/admin/34-43909.htm.

[4] There is a subtle difference between ownership and holdings. Some rules (such as Schedule 13(d) and 13(g)) require disclosure by the beneficial owners, while others (such as Section 13(f)) mandate disclosure of holdings over which the investment manager has investment discretion but not necessarily beneficial ownership.

[5] Report of Senate Comm. on Banking, Housing and Urban Affairs, S. Rep. No. 75, 94th Cong., 1st Sess. 87 (1975). See Lemke and Lins (1987) for a detailed discussion of the background, legislative history, and requirements of the institutional disclosure program under Section 13(f) of the Securities Exchange Act of 1934.

[6] See http://www.sec.gov/divisions/investment/guidance/13fpt2.htm for the letter issued by the SEC in June 1998 where they explain the specific requirements and conditions for granting confidentiality.

[7] For a full story, please see "Large Investors Face Stiff Rules on SEC Filings," by Paul Beckett, *The Wall Street Journal*, June 19, 1998.

[8] See "SEC: D.E. Shaw Disclosure Request Part of Regular Process," by Marietta Cauchi, *Dow Jones Newswires,* January 2005.

[9] See "Mum's the Word for Some Investors --- SEC Allows Money Managers Who Say Confidentiality Is Key to Conceal Certain Stock Holdings," *The Wall Street Journal,* December 8, 2011.

[10] The manual for Thomson Reuters Ownership Data, available through Wharton Research Data Services (WRDS), provides the following caveat about its S12 (for mutual funds) and S34 (for institutions) data: "The holdings in the S12 and S34 sets

are rarely the entire equity holdings of the manager or fund. There are minimum size requirements and confidentiality qualifications." It also explicitly acknowledges the lack of coverage on confidential holdings in a research guide: http://wrds-web.wharton.upenn.edu/wrds/support/Data/_004Research%20Applications/_003Research%20Guides/_000Files%20for%20Thomson%20Reuters%2013F%20Database%20Research%20Applications/Institutional_Trades.cfm.

[11] A form 13F-HR/A states on its cover regarding whether it is an "Amendment" (i.e., whether it adds new holdings) or a "Restatement." For our purpose, we only include forms with the "Amendment" box checked.

[12] Aragon and Martin (2009) also found similar proportions of delayed original 13F filings. We do not observe a systematic pattern in late filing of original Form 13F. For example, only a very small number of institutions are repeatedly late. Systematically late or missing filings entail legal risk for the filers.

[13] The effective delay in disclosure enjoyed by denied confidential treatment could potentially invite abuse. Our informal conversation with the SEC staff indicates that institutions which received repeated rejections could receive warnings and will be subject to more timely review in future applications. This view is consistent with our empirical analysis in Section V. Moreover, the average time it takes for the SEC to reject applications had shortened considerably from the earlier to the later years of our sample, from over a year to about nine months.

[14] For more details on the classification criteria of 13F-filing hedge funds, see Agarwal, Fos, and Jiang (2010).

[15] An internet appendix for this article is available online in the "Supplements and Datasets" section at http://www.afajof.org/supplements.asp.

[16] We followed these two institutions out of the sample period. Caxton ceased to seek confidential treatment after October 2005 when eight of its applications were rejected all at once. D. E. Shaw stopped confidential filing after its last one in our sample in June 2007 for about a year. It has filed three applications since June 2008 each of which covers 2–3 stocks only (compared to hundreds and thousands before). All the three applications received speedy reviews and were approved by the SEC. These two cases are consistent with the discussion in footnote 13.

[17] Our model, like ones in HHL and other related papers, analyzes the disclosure of trades rather than that of positions which is the subject of our empirical tests. For the purpose of theoretical motivation, we assume that the main cost of disclosing quarter-end positions come from the revelation of trades. In reality, quarter-end position disclosure only reveals inter-quarter, but not intra-quarter, trades. However, the intuition of our model goes through.

[18] It is worth noting that intra-quarter trades underestimate the prevalence of "slow building." Wang (2010) shows that money managers are more likely to initiate new trades at the beginning of the quarter, and tend to complete new round-trip trades

toward the end of the quarter. Such trading pattern reflects a trade-off between minimizing the impact from disclosure and compromising on the quality of trades.

[19] We calculate purchases (sales) as the sum of the products of positive (negative) changes in the number of shares in the holdings from the previous to the current quarter-end and the average of the stocks prices at the two quarter-ends. The logic of using the *lesser* (rather than the average) of purchases and sales is to free the measure from the impact of net flows—a practice used in mutual fund research (e.g., by Morningstar) in defining portfolio turnover rates.

[20] Agarwal, Fos, and Jiang (2010) provides a detailed description of the union database as well as its matching to the 13F data.

[21] Edmans, Goldstein, and Jiang (2011) use this data. We thank the authors for sharing this data with us.

[22] In contrast, *future* M&A targets are not over-represented in the confidential holdings, that is, hedge funds speculating on future M&A activities do not systematically resort to confidential filings to hide their predicted targets. One explanation is that the SEC exercises heightened scrutiny on trading before M&A announcement. Therefore, hedge funds may not want to explicitly seek confidentiality for such potentially legally sensitive positions.

[23] In fact, some successful money managers, such as Warren Buffet (Berkshire Hathaway) and David Einhorn (Greenlight Capital), frequently talk in public about the positions they have taken.

[24] Using the simple one-factor alpha would yield a difference of 1.76 (2.74) basis points per day over the two-month (twelve-month) horizon, corresponding to annualized return spreads of 4.43 (6.90) percentage points.

[25] Almost all exchange traded options are "13(f) securities" and their holdings are required to be disclosed in the Form 13F. We verify the Form 13F coverage by cross-checking with the OptionMetrics database (available through WRDS). Note that information on the option holdings is not available in Thomson Reuters Ownership database.

[26] This pattern is also consistent with persistence in some applicants' noncompliance which leads to repeated rejections. We find that past denials not only lead to higher likelihood of future denials, but also lead to faster denials in the future. On average, every past denial cuts 10 days into the time it takes for the SEC to deny an application from the same fund in the future. This additional piece of evidence supports the reputation hypothesis.

Figure 1

Time Line of the Original and Confidential 13F Filings

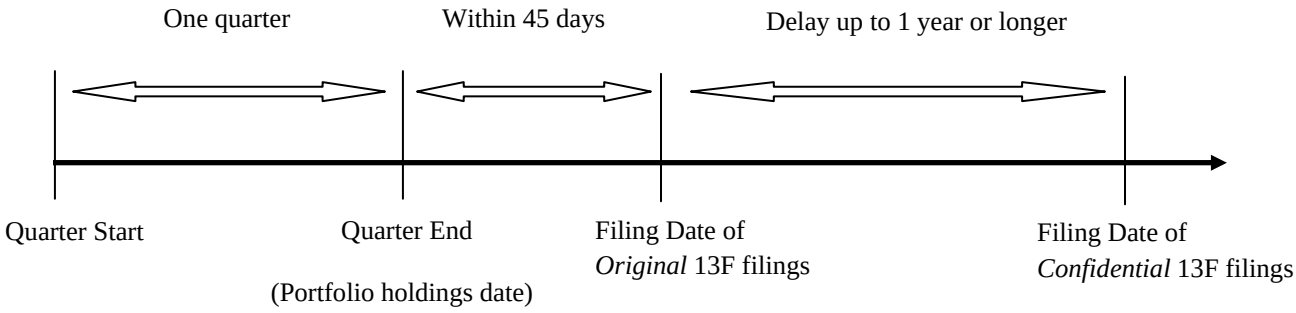

Table I
Summary Statistics of 13F Original and Confidential Filings

Panel A of the table reports the distribution of the delay (in number of days) between the quarter-end portfolio date and the filing date for all original and confidential 13F filings (the "preliminary sample"). In Panel B, we use the "final sample" that excludes observations with extreme delays, i.e., more than 180 days for the original filings, and confidential filings with less than 45-day or more than 1,505-day (4 years plus 45 days) delay. Panel B summarizes the number of filings, the number of institutions, the dollar value, the number of stocks, and the average stock ownership share in the final sample. The classification of institutions (Hedge Fund, Investment Company or Advisor, Bank and Insurance) is described in the Appendix B. The statistics for the two types of holdings are reported separately, and those of the confidential holdings are compared to the combined portfolio of the confidential filings and their corresponding original holdings. Panel C reports the number of confidential filings and percent of rejected filings of the top ten institutions that seek confidential treatment and the top ten institutions that are most frequently denied of their requests for confidential treatment. Both the original and confidential filings are at the institution level. The institution types "HF" and "INVCO" are abbreviations of "Hedge Fund" and "Investment Company or Advisor".

Panel A: Delay Period between Portfolio Date and Filing Date

Original 13F Form Filings									Total
Delay (in days)	0–30	31–45	46–60	61–180	> 180				
Number	12,332	33,645	5,424	1190	705				53,296
Percent	23.14%	63.13%	10.18%	2.23%	1.32%				
Confidential 13F Form Filings									
Delay (in days)	0–30	31–45	46–60	61–180	181–410	411–775	776–1505	> 1505	
Number	34	105	123	485	703	277	103	27	1,857
Percent	1.83%	5.65%	6.62%	26.12%	37.86%	14.92%	5.55%	1.45%	
Total									55,153

Panel B: Summary Statistics of Original and Confidential Holdings by Institution Types

	Institution type			
	Hedge Fund	Investment Company or Advisor	Bank and Insurance	Total
Original 13F Form Filings				
# of institutions	942	1,842	350	3,134
# of 13F filings	14,002	31,963	6,307	52,272
$ million per institution-quarter (Mean)	1,313.2	3,366.3	6,755.6	3,225.5
$ million per institution-quarter (Median)	270.0	268.3	486.0	286.9
# of stocks per institution-quarter (Mean)	138.3	219.3	539.5	235.9
# of stocks per institution-quarter (Median)	63.0	92.0	220.0	90.0
% of outstanding shares (Mean)	1.16%	0.51%	0.52%	0.69%
% of outstanding shares (Median)	0.36%	0.10%	0.06%	0.13%
Confidential 13F Form Filings				
# of institutions	106	103	23	232
# of 13F filings	870	627	57	1,554
$ million per institution-quarter (Mean)	743.0	1,048.1	793.3	876.3
% to original and conf. holdings combined (Mean)	33.8%	20.6%	11.4%	27.3%
$ million per institution-quarter (Median)	156.4	151.5	49.6	147.8
% to original and conf. holdings combined (Median)	23.7%	5.3%	0.2%	13.4%
# of stocks per institution-quarter (Mean)	77.2	67.3	61.5	72.2
% to original and conf. holdings combined (Mean)	22.8%	13.2%	9.4%	18.3%
# of stocks per institution-quarter (Median)	7.0	11.0	7.0	8.0
% to original and conf. holdings combined (Median)	12.0%	3.2%	0.3%	6.7%
% of outstanding shares (Mean)	1.24%	1.29%	1.15%	1.25%
% of outstanding shares (Median)	0.76%	0.61%	0.43%	0.68%

Panel C: Top Ten Institutions Seeking Confidentiality and Top Ten Denied Institutions

Top Ten Institutions Seeking Confidentiality	Inst. Type	# Conf. Filings	% Rejected
Chesapeake Partners Management Co.	INVCO	112	6.3%
UBS Oconnor, L.L.C.	HF	79	1.3%
T. Rowe Price Assoc Inc	INVCO	70	5.7%
Berkshire Hathaway Inc	INVCO	65	72.3%
Satellite Asset Management	HF	64	9.4%
Lehman Brothers Inc.	INVCO	49	0.0%
HBK Investments, L.P.	HF	48	27.1%
Polygon Investment Partners	HF	40	0.0%
M.H. Davidson & Company	HF	39	0.0%
Stark Offshore Management, L.L.C.	HF	38	2.6%
Total:		604	79
% of the full sample		38.9%	29.3%

Top Ten Institutions with Denied Confidential Requests	Inst. Type	# Conf. Filings	% Rejected
Berkshire Hathaway Inc	INVCO	65	72.3%
D. E. Shaw & Co., Inc.	HF	17	100.0%
Relational Investors, L.L.C.	HF	24	62.5%
HBK Investments, L.P.	HF	48	27.1%
Staro Asset Management, L.L.C.	HF	25	52.0%
SAB Capital Advisors, L.L.C.	HF	26	46.2%
Atlantic Investment Co	INVCO	12	91.7%
RBS Partners, L.P.	HF	31	29.0%
Caxton Corporation	HF	9	100.0%
Two Sigma Investments, L.L.C.	HF	10	80.0%
Total:		267	154
% of the full sample		17.2%	57.0%

Table II
Determinants of 13F Confidential Holdings of Hedge Funds

This table reports the results of the determinants of 13F confidential filings of hedge funds. The dependent variable of the probit model is an indicator variable for a filing to be confidential. The dependent variable of the tobit model is the dollar value of confidential holdings as a percentage of the total dollar value of holdings for an institution-quarter. Reported are coefficient estimates, and their *t*-statistics (in parentheses) and associated average partial effects (APE, in percentage points). *Log(Age)* is natural logarithm of the number of years since the institution's first appearance on Thomson Reuters. *PortSize* is the total equity portfolio size of an institution calculated as the market value of its quarter-end holdings. *Turnover* is the inter-quarter portfolio turnover rate calculated as the lesser of purchases and sales divided by the average portfolio size of the last and the current quarter. *PortHHI* is the Herfindahl index of the portfolio, calculated from the market value of each component stock. *PortRet* and *PortVol* are the monthly average return and volatility on the portfolio during the quarter, assuming that the institution maintains the holdings of the last quarter-end. |*Flow*| is the absolute change in total portfolio value between two consecutive quarters net of the increase due to returns, expressed as a percentage of the portfolio size at the previous quarter-end. *IdioVol* is the idiosyncratic volatility computed from the residuals to the four factors (market, size, book-to-market, and momentum) using imputed monthly returns for the 36-month period ending in the current quarter. Standard errors are adjusted for heteroskedasticity and clustering at the institution level. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level respectively.

	Probit Regressions			Tobit Regressions		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Age)	–0.001	–0.017	–0.018	0.018	0.005	0.004
	(–0.06)	(–0.81)	(–0.90)	(0.26)	(0.08)	(0.06)
	–0.01%	–0.12%	–0.12%	0.06%	0.02%	0.01%
Log(PortSize)	0.191***	0.200***	0.198***	0.127***	0.133***	0.131***
	(9.55)	(10.82)	(10.15)	(3.54)	(3.70)	(3.70)
	1.30%	1.36%	1.34%	0.43%	0.45%	0.44%
Turnover	1.837***	1.859***	1.861***	1.575***	1.587***	1.589***
	(15.30)	(15.17)	(15.29)	(3.75)	(3.82)	(3.83)
	12.47%	12.60%	12.60%	5.34%	5.38%	5.38%
PortHHI	3.175***	2.937***	2.912***	2.603***	2.409***	2.396***
	(14.64)	(14.80)	(14.84)	(6.93)	(6.36)	(6.17)
	21.55%	19.91%	19.72%	8.82%	8.16%	8.12%
PortRet	–0.070	–0.100	–0.163	0.097	0.064	0.032
	(–0.16)	(–0.24)	(–0.37)	(0.18)	(0.13)	(0.06)
	–0.48%	–0.68%	–1.10%	0.33%	0.22%	0.11%
|Flow|	0.196***	0.192***	0.194***	0.170***	0.167***	0.168***
	(6.61)	(6.42)	(6.53)	(4.11)	(4.13)	(4.14)
	1.33%	1.30%	1.31%	0.58%	0.57%	0.57%
PortVol	0.759		–1.402	0.861		–0.802
	(0.98)		(–1.01)	(0.75)		(–0.49)
	5.15%		–9.50%	2.92%		–2.72%
IdioVol		4.846***	6.696**		4.068*	5.123*
		(3.10)	(2.40)		(1.94)	(1.73)
		32.85%	45.35%		13.79%	17.35%
Constant	–3.902***	–3.975***	–3.914***	–3.092***	–3.124***	–3.089***
	(–21.10)	(–24.24)	(–20.88)	(–9.76)	(–10.17)	(–9.73)
Observations	12,845	12,845	12,845	12,845	12,845	12,845
Pseudo R-square	0.106	0.109	0.109	0.110	0.112	0.113
Unconditional Mean	3.39%	3.39%	3.39%	1.21%	1.21%	1.21%

Table III
Stock Characteristics of the Original and Confidential 13F Holdings of Hedge Funds

Panel A compares the summary statistics of stocks in original and confidential 13F holdings of hedge funds. All variables, unless otherwise specified, are calculated at the fiscal year-end before the portfolio dates. *Size* is the quarter-end market capitalization of the stock in millions of dollars. *B/M* is the firm's book-to-market ratio. *Adj. Past Return* is the stock return during the twelve months prior to the quarter-end portfolio date adjusted by CRSP value-weighted market return. *Illiquidity* is the variant of Amihud (2002) illiquidity measure, computed as the yearly average of the square root of daily |Return|/(Price×Vol). *Analysts* is the number of I/B/E/S analysts covering the firm during the year. (*DTD < 1.64*) is the dummy variable for the Merton (1974) distance-to-default measure to be smaller than 1.64 (implying a 5% or higher default probability). *Volatility* and *Idio. Vol* are total and idiosyncratic volatilities from the four-factor model using past 36 monthly stock returns. *M&A* is an indicator variable that takes a value of 1 for the stock of the firm that was an announced M&A target during the four-quarter period ending in the portfolio quarter. The standard errors of the two sample t-tests adjust for clustering at the stock and quarter levels. Panel B reports the results from logistic regressions modeling the determinants of 13F confidential holdings at the stock level. The dependent variable is an indicator variable for a stock to be included in the confidential holdings of an institution-quarter. Each column reports estimated coefficients, their *t*-statistics (in parentheses), and the average partial effects (APE, in percentage points). All standard errors adjust for heteroskedasticity and clustering at the institution level. Quarterly dummies and Fama-French 10-industry dummies are included in all specifications in Panel B. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level.

Panel A: Summary Statistics of Stocks of Original and Confidential Holdings of Hedge Funds

	Size	B/M	Adj. Past Return	Illiquidity	Analysts	DTD < 1.64	Volatility	Idio. Vol	M&A
Confidential 13F Form Filings									
Mean	7,781.3	0.557	17.6%	0.094	14.31	21.4%	0.515	0.451	7.5%
Median	1,374.5	0.463	5.7%	0.047	12.00	0	0.445	0.386	0
Std. Dev.	23,959.4	0.411	60.9%	0.143	11.09	41.0%	0.265	0.243	26.4%
Min	25.6	0.038	–74.2%	0.003	1.00	0	0.137	0.110	0
Max	244,686.7	2.258	291.8%	1.147	52.00	1	1.333	1.210	1
# obs	38,126	38,126	38,126	37,999	38,069	38,126	38,068	38,068	38,126
Original 13F Form Filings									
Mean	16,882.7	0.505	12.9%	0.089	16.26	14.5%	0.442	0.388	4.1%
Median	2,477.4	0.411	2.7%	0.031	14.00	0	0.380	0.328	0
Std. Dev.	39,989.8	0.388	55.2%	0.174	12.18	35.2%	0.238	0.221	19.9%
Min	25.6	0.038	–74.2%	0.003	1.00	0	0.137	0.110	0
Max	244,686.7	2.258	291.8%	1.147	52.00	1	1.333	1.210	1
# obs	1,723,003	1,722,978	1,723,003	1,717,361	1,720,719	1,723,003	1,720,629	1,720,629	1,723,003
Two-sample Tests (Conf.- Original)									
Differences in Mean	–9,101***	0.051***	4.7%	0.005	–1.944***	0.069***	0.073***	0.062***	3.4%***
Clustered *t*-stat.	(–7.29)	(3.46)	(1.63)	(0.85)	(–4.86)	(4.68)	(5.36)	(5.42)	(3.33)

Panel B: Determinants of Confidential Holdings of Hedge Funds – Stock Level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
M&A	0.932***	0.951***	0.956***	0.942***	0.938***	0.946***	0.945***
	(22.81)	(20.22)	(21.90)	(20.19)	(20.47)	(22.63)	(22.64)
	1.93%	1.97%	1.98%	1.95%	1.94%	1.95%	1.95%
Log(Size)	–0.148***					–0.252***	–0.251***
	(–26.39)					(–38.05)	(–37.22)
	–0.31%					-0.52%	–0.52%
Illiquidity		-0.296***				-2.031***	–2.044***
		(–6.11)				(–26.77)	(–26.90)
		–0.61%				–4.19%	–4.22%
Log(Analysts)			–0.110***			–0.020**	–0.020**
			(–9.84)			(–2.21)	(–2.14)
			–0.23%			–0.04%	–0.04%
Volatility				0.728***		0.187***	
				(13.41)		(3.96)	
				1.51%		0.39%	
Idio. Vol.					0.833***		0.195***
					(14.12)		(3.71)
					1.73%		0.40%
DTD < 1.64	0.016	0.217***	0.156***	–0.059**	–0.074***	–0.012	–0.007
	(0.80)	(8.78)	(6.80)	(–2.19)	(–2.83)	(–0.51)	(–0.32)
	0.03%	0.45%	0.32%	–0.12%	–0.15%	–0.02%	–0.01%
B/M	–0.185***	0.083***	–0.024	0.009	–0.010	–0.114***	–0.114***
	(–8.32)	(3.14)	(–1.01)	(0.38)	(–0.41)	(–5.26)	(–5.26)
	–0.38%	0.17%	–0.05%	0.02%	–0.02%	–0.24%	–0.24%
Adj. Past Return	0.026**	0.051***	0.007	0.013	–0.001	0.128***	0.126***
	(2.39)	(3.91)	(0.59)	(1.08)	(–0.06)	(11.50)	(11.32)
	0.05%	0.11%	0.01%	0.03%	0.00%	0.26%	0.26%
Constant	–3.784***	–5.020***	–4.777***	–5.293***	–5.282***	–2.827***	–2.828***
	(–44.24)	(–66.03)	(–60.69)	(–66.20)	(–66.47)	(–29.55)	(–29.34)
Observations	1,761,104	1,755,335	1,758,763	1,758,672	1,758,672	1,755,335	1,755,335
Unconditional Mean	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
Pseudo R-squared	0.104	0.0976	0.0987	0.0988	0.0991	0.110	0.110

Table IV
Trading during Confidential Periods

This table reports the trades of confidential holdings by hedge funds seeking confidential treatment within the confidential periods, and compares them with the trades of original holdings by the same funds in the same periods. The initial position of confidential holdings is the position for which confidential treatment is sought, scaled by number of shares outstanding. The initial positions of original holdings are the contemporaneous positions of the same fund in original holdings. The total trade volume is the sum of absolute values of quarter-to-quarter position changes in the confidential or contemporaneous original stocks within the confidential period. Increase from initial to maximum (max) position is the difference between the maximum position and the initial position of the fund in the confidential stock or contemporaneous original stocks. Summary statistics for initial position, total trade volume, and increase from initial to max position are reported after scaling each of these variables by (a) the number of shares outstanding, and (b) the initial position. Time to max position is the number of quarters between the initial position and the maximum position within the confidential period. The last two rows of the table reports the differences between each of the variables (initial position, total trade volume, and increase from initial to max position, and time to max position) for confidential and original holdings and the two-sample mean difference *t*-statistics are reported in parentheses below. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level respectively.

Variable	Initial Position	Total Trade Volume	Maximum - Initial	Total Trade Volume	Maximum - Initial	Time to Maximum
	% of Shares Outstanding			Multiple of initial position		Quarters
Confidential Holdings						
Mean	0.30%	0.96%	0.25%	14.77	6.55	2.58
Median	0.11%	0.50%	0.05%	3.00	0.51	1.00
Std. Dev.	0.57%	1.23%	0.45%	33.65	18.49	3.16
Min	0.00%	0.00%	0.00%	0.00	0.00	0.00
Max	4.88%	5.86%	2.25%	193.01	114.94	11.00
N	37,204	37,204	37,204	37,204	37,204	37,204
Original Holdings						
Mean	0.28%	0.34%	0.09%	5.55	3.03	0.93
Median	0.05%	0.07%	0.00%	1.00	0.00	0.00
Std. Dev.	0.74%	0.80%	0.29%	20.34	12.74	1.24
Min	0.00%	0.00%	0.00%	0.00	0.00	0.00
Max	4.88%	5.86%	2.25%	193.01	114.94	9.00
N	97,723	97,723	97,723	97,717	97,717	97,723
Two-sample Tests						
Difference in Mean (Conf. - Original)	0.02%	0.62%***	0.16%***	9.22**	3.52*	1.66***
t-stat	(0.21)	(3.77)	(3.03)	(2.45)	(1.77)	(2.95)

Table V

Abnormal Returns: Comparison of Original and Confidential Holdings of Hedge Funds

Panel A reports the Carhart (1997) four-factor alpha and the Daniel, Grinblatt, Titman, and Wermers (1997) (DGTW) benchmark-adjusted returns for both original and confidential 13F holdings of hedge funds, and the differences between the two types. Confidential filings are grouped by the length of their confidential periods and evaluated for their abnormal performance at seven horizons from two months up to one year. The paired original holdings are by the same institutions and during the same period. The four-factor alpha (in basis points daily) is computed from the daily value-weighted portfolio returns. The DGTW benchmark-adjusted returns are first computed for each stock and then are averaged at the portfolio level using value weights of the portfolio. Both abnormal return measures are first calculated for each original or confidential 13F filing, and then averaged at the institution-level. Panel B follows the Griffin and Xu (2009) approach by reporting the raw returns and DGTW benchmark-adjusted returns evaluated three months after the portfolio holding quarter-end for original and confidential 13F holdings of hedge funds, and the differences between he two. Return measures are first calculated for each institution-quarter portfolio using value or equal weights of the portfolio holdings and then averaged across the institution-quarter portfolios in the sample period. Both raw and DGTW benchmark-adjusted returns are annualized. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level respectively.

Panel A: Abnormal Returns of Original and Confidential Holdings

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Daily Four-factor Alphas							
Conf. Holdings (in basis points)	5.39	5.04	4.36	3.74	4.32	3.7	4.5
Original Holdings (in basis points)	2.82	2.72	2.77	2.54	2.45	2.38	2.44
Diff: Conf. - Orig. (in basis points)	2.57***	2.31**	1.59**	1.21	1.88***	1.31*	2.05***
Annualized Diff.	6.48%***	5.83%**	4.01%**	3.04%	4.73%***	3.31%*	5.17%***
t-stat.	3.02	2.22	2.05	1.04	2.68	1.72	3.11
# of Conf. Filings	81	35	144	24	162	112	309
# of Original Filings	14,000	14,000	13,997	13,992	13,990	13,986	13,976
DGTW Benchmark-adjusted Returns							
Conf. Holdings	5.48%	1.97%	0.89%	3.86%	2.64%	4.86%	8.08%
Original Holdings	0.22%	0.26%	0.15%	0.19%	0.17%	0.29%	0.57%
Diff: Conf. - Original	5.26%***	1.71%**	0.74%	3.67%**	2.47%**	4.57%***	7.51%***
Annualized Diff.	31.56%***	6.83%**	2.22%	8.80%**	4.94%**	6.09%***	7.51%***
t-stat.	6.78	2.39	0.93	2.56	2.46	2.83	4.27
# of Conf. Filings	78	34	142	19	165	102	331
# of Original Filings	13,973	13,973	13,973	13,973	13,973	13,973	13,973

Panel B: Comparison to Griffin and Xu (2009)

	# of 13F Filings		Raw Returns			DGTW benchmark-adjusted Returns		
	Conf.	Orig.	Conf.	Orig.	Diff.	Conf.	Orig.	Diff.
Value-Weighted Returns								
1999-2007	870	14,002	19.97%	13.00%	6.98%***	6.37%	1.39%	4.99%***
t-stat.			6.88	31.18	2.65	3.13	5.48	2.63
Equal-Weighted Returns								
1999-2007	870	14,002	22.09%	14.36%	7.73%***	5.52%	2.02%	3.50%*
t-stat.			7.10	33.16	2.74	2.66	8.36	1.82

Table VI
Abnormal Returns of Acquisition- and Disposition-Motivated Confidential Holdings of Hedge Funds

This table repeats the analyses in Table V, except separately for acquisition- and disposition-motivated confidential holdings. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level respectively.

Panel A: Daily four-factor alphas

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Acquisition Sample							
Conf. Holdings (basis points)	5.57	5.34	2.75	5.38	4.44	3.88	3.98
Original Holdings (basis points)	2.80	2.70	2.75	2.51	2.43	2.37	2.44
Diff: Conf. - Orig. (basis points)	2.77**	2.64**	0.00	2.87**	2.01***	1.52*	1.54**
Annualized Diff.	6.97%**	6.66%**	0.003%	7.23%**	5.06%***	3.82%*	3.88%**
t-stat.	2.13	2.32	0.00	2.55	2.58	1.86	2.25
# of Conf. Filings	59	47	115	34	141	101	288
# of Original Filings	14,000	14,000	13,997	13,992	13,990	13,986	13,976
Disposition Sample							
Conf. Holdings (basis points)	3.21	4.74	6.05	2.92	1.85	-0.52	2.95
Original Holdings (basis points)	2.80	2.70	2.75	2.51	2.43	2.37	2.44
Diff: Conf. - Orig. (basis points)	0.41	2.04	3.30***	0.41	–0.58	–2.88***	0.51
Annualized Diff.	1.03%	5.14%	8.32%***	1.04%	–1.47%	–7.27%***	1.29%
t-stat.	0.40	1.56	3.39	0.23	–0.58	–3.05	0.57
# of Conf. Filings	49	29	55	12	51	40	155
# of Original Filings	14,000	14,000	13,997	13,992	13,990	13,986	13,976

Panel B: DGTW benchmark-adjusted returns

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Acquisition Sample							
Conf. Holdings	4.64%	1.56%	–0.63%	4.15%	2.22%	4.61%	7.63%
Original Holdings	0.22%	0.26%	0.15%	0.19%	0.17%	0.29%	0.57%
Diff: Conf. - Original	4.42%***	1.29%*	–0.78%	3.96%***	2.06%**	4.32%***	7.06%***
Annualized Diff.	26.53%***	5.18%*	–2.33%	9.51%***	4.11%**	5.76%***	7.06%***
t-stat.	6.12	1.81	-0.97	2.76	2.05	2.63	3.95
# of Conf. Filings	59	29	131	19	149	97	307
# of Original Filings	13,973	13,973	13,973	13,973	13,973	13,973	13,973
Disposition Sample							
Conf. Holdings	5.24%	1.07%	5.92%	5.69%	0.94%	–4.21%	3.51%
Original Holdings	0.22%	0.26%	0.15%	0.19%	0.17%	0.29%	0.57%
Diff: Conf. - Original	5.02%***	0.80%	5.77%***	5.50%	0.77%	–4.50%**	2.94%
Annualized Diff.	30.15%***	3.22%	17.32%***	13.20%	1.55%	–6.00%**	2.94%
t-stat.	6.13	0.74	5.85	0.58	0.60	-2.40	1.42
# of Conf. Filings	40	13	57	6	65	34	190
# of Original Filings	13,973	13,973	13,973	13,973	13,973	13,973	13,973

Table VII
Determinants of Denials of Confidential Filings

This table estimates the denial decisions of the SEC on applications for confidential treatment using the probit model. The sample includes all confidential filings by hedge funds. *# Past CF* is the number of past confidential filings by the same institution. *% Past Denied* is the percent of past confidential filings denied by the SEC. *% Conf. Stocks* is the number of distinct stocks contained in the confidential filing as a percentage of the total portfolio. *Value CF* is the market value of confidential holdings in the given filing. *% Value CF* is the market value of confidential holdings as percentage of value of total portfolio. *Avg. Conf. Position* is the average number of shares of confidential holdings as a percentage of shares outstanding. The fund characteristics are as defined in Table II. All standard errors adjust for heteroskedasticity and clustering at the institution level. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Confidential Filing Characteristics							
Log(# Past CF)	–0.085	–0.133	–0.115	–0.140	–0.068	–0.042	–0.060
	(–0.83)	(–1.49)	(–1.21)	(–1.62)	(–0.67)	(–0.40)	(–0.50)
% Past Denied	3.158***	3.201***	3.187***	3.189***	3.109***	3.278***	3.677***
	(14.09)	(14.48)	(14.16)	(11.98)	(14.05)	(12.50)	(9.37)
% Conf. Stocks	0.513**				1.405***	0.735***	1.062**
	(2.24)				(3.14)	(3.16)	(2.34)
Avg. Conf. Position		12.482***			14.929***	16.120***	10.082**
		(2.81)			(3.17)	(3.95)	(2.07)
% Value CF			0.247		–0.853**		–1.289**
			(1.18)		(–2.18)		(–2.44)
Log(Value CF)				0.001		–0.062*	
				(0.03)		(–1.70)	
Fund Characteristics							
Log(Age)							–0.058
							(–0.41)
Log(PortSize)							–0.144**
							(–1.96)
Turnover							–1.279*
							(–1.86)
PortHHI							–0.567
							(–0.74)
PortRet							1.660
							(0.77)
|Flow|							0.095
							(1.30)
IdioVol							4.867
							(1.01)
Constant	–1.568***	–1.489***	–1.441***	–1.325**	–1.772***	–1.772***	–0.433
	(–6.54)	(–8.28)	(–6.78)	(–2.31)	(–7.57)	(–7.57)	(–0.85)
Observations	713	713	713	713	713	713	629
Unconditional Mean	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	19.4%
Pseudo R-squared	0.413	0.417	0.408	0.406	0.432	0.430	0.481

Table VIII
Market Reactions to the Disclosure of the Confidential 13F Filing by Hedge Funds

This table reports the market reactions to the disclosure of the confidential 13F filing by hedge funds. We report the mean cumulative abnormal returns (CAR) associated with the disclosure of the quickly-denied confidential filings that are disclosed within 45-180 days after the quarter-end portfolio date, and disclosure of the non-denial cases of confidential filings with similar delay in disclosure. Each confidential filing is treated as one event with equal weights assigned to the stock positions included in the filing. Abnormal returns are estimated from the market model using the equally-weighted CRSP market index over the period from 300 to 91 days prior to the event date. Betas are estimated using Scholes and Willams (1977) approach to account for non-synchronous trading. CARs are reported over the (–1, +1), (–2, +2), and (–5, +5) windows around the event date. The *z*-statistics from the Patell test (with two tails) to test if the mean cumulative abnormal returns are statistically different from zero are provided in the parentheses below the mean CARs. % positive represents the proportion of portfolios that have positive abnormal returns and the *z*-statistics from the generalized sign test (with two tails) to test their statistical significance are reported below in parentheses. Num is the number of events, i.e., confidential filings. ***, ** and * indicate significance at 1%, 5%, and 10% respectively.

	Quickly-denied Confidential Filings			Non-denied Confidential Filings		
		(1)	(2)		(3)	(4)
Windows	Num	Mean CAR (%)	% Positive	Num	Mean CAR (%)	% Positive
(-1,+1)	66	0.54%**	63.6%**	197	0.39%	52.3%
		(2.42)	(2.34)		1.45	0.926
(-2,+2)	66	0.97%***	63.6%**	197	0.30%	53.8%
		(2.61)	(2.09)		1.25	1.353
(-5,+5)	66	1.19%**	62.1%***	197	0.52%	52.8%
		(2.18)	(2.58)		0.842	1.068

Internet Appendix for

"Uncovering Hedge Fund Skill from the Portfolio Holdings They Hide"*

This Internet Appendix consists of two parts. Part I provides a model where confidential treatment is allowed as a relief from mandatory portfolio disclosure. Part II tabulates the additional results for sensitivity analyses and robustness checks for some of the empirical tests that we conduct in the published paper.

Part I. A Model of Portfolio Disclosure and Confidential Treatment

A. Overview

Several theoretical papers analyze how informed traders behave under mandatory disclosure (Fishman and Hagerty (1995), John and Narayanan (1997), Huddart, Hughes, and Brunnermeier (1999), Huddart, Hughes, and Levine (2001), and George and Hwang (2007)). Of these, Huddart, Hughes, and Levine (2001, henceforth HHL) provide perhaps the most relevant theoretical framework for studying the confidential treatment of portfolio disclosure through amendments to Form 13F. HHL build on Kyle (1985) model by introducing mandatory disclosure by an informed trader without imposing limitation on trade size. HHL show that under mandatory disclosure, the informed trader's profits are lower and the price discovery faster, compared to the no disclosure case in Kyle model. The authors prove the existence of a mixed strategy equilibrium in which the informed trader adds a random noise to a linear strategy in each period in order to avoid full retrieval of the private information by the market maker. Such a "dissimulation" strategy minimizes the loss in profits due to mandatory disclosure.

We consider a modified version of the HHL model to analyze confidential treatment, or relief from mandatory disclosure of Form 13F. The 13F regulation requires the informed trader to disclose his position at the end of each quarter, which reveals information about his trades as in HHL. However, if the informed trader obtains confidential treatment over a certain period (typically up to one year), then he does not disclose his position over that period, as in the Kyle (1985) model. The informed trader's decision to seek confidentiality will then depend on the tradeoff between the benefit of increased profits

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under confidentiality and the cost of seeking confidentiality.

Our model fits the main institutional features of confidential treatment but is highly stylized with two major simplifications. First, like models in HHL and other related papers, ours analyzes the disclosure of trades rather than that of positions which is the subject of our empirical tests. For the purpose of theoretical motivation, we assume that the main concern to hedge funds of disclosing quarter-end positions is the revelation of trades. In reality, the disclosure of quarter-end positions only reveals inter-quarter, but not intra-quarter, trades. However, the intuition of our model goes through when the revelation of trades is incomplete from quarter-end disclosure. Second, the model does not incorporate the possibility that other speculators may front-run the informed trader and thus reduce the latter's expected profits even further (Foster and Viswanathan (1994) and Madrigal (1996)). To the extent that confidentiality reduces front-running, the benefits of confidentiality in reality may be greater than what is considered in this model.

B. Model

Following Kyle (1985), there is a risky security and a risk-free security with zero risk-free rate in the market. In each of the N periods, $n = 1, 2, \ldots, N$, traders submit orders, and a market maker sets the price. There are two types of traders. One informed trader learns of the true value v of the risky security at the beginning of period 1 and strategically submits order x_n in period n to maximize his expected profits. The noise traders' trade in any period n is normally distributed, $u_n \sim N(0, \sigma_u^2)$. The market maker knows the prior distribution $v \sim N(0, \Sigma_0)$. The random variables $v, u_1, u_2, \ldots, u_N$ are mutually independent. All agents are risk-neutral. Finally, the market maker observes the total order flow $y_n = x_n + u_n$ but not its decomposition in period n. The market maker sets the price so that he makes zero expected profits.

The set up of mandatory disclosure follows HHL: in every period $1 \le n \le N$, the informed trader is required to disclose his trade x_n to the regulator *after* trading occurs. The regulator disseminates such information to all market participants instantly. We introduce confidential treatment by allowing the informed trader to seek relief from disclosing his trades. The trader incurs an exogenous cost $c_{CT} > 0$ to apply for confidential treatment from period 1 to period $n_d - 1$ which, if granted, relieves him from the requirement of mandatory disclosure during these periods. The parameter c_{CT} can represent the direct cost of providing the required justification to the regulatory body as well as the indirect reputation cost

(i.e., denial of an inadequately motivated application increases the chance of denial of future applications[1]).

The informed trader's decision to seek confidentiality thus depends on the impact of confidential treatment on his expected profits. Let Π_{n_d} denote the total expected profits of the informed trader if confidentiality applies till period $n_d - 1$ and then mandatory disclosure follows in every period thereafter to period N. Let Π_1 be the total expected profit of the informed trader in the absence of confidential treatment, that is, when disclosure occurs in every period (as in HHL). Finally, let *Pr* be the probability that the confidentiality application gets approved. The informed trader chooses to apply for confidential treatment if and only if

$$\Pi_{n_d} - \Pi_1 > c_{CT} / Pr \tag{1}$$

For simplicity we assume that *Pr,* the probability of obtaining approval, is independent of the potential benefits of confidentiality to the trader.[2] Then the probability-adjusted cost c_{CT} / Pr is exogenous.

Suppose confidentiality applies to periods $1,\ldots,n_d - 1$ after which normal disclosure resumes. Let p_n denote the stock price that the market maker sets based on the total order flow in period *n,* and p_n^* be the stock price that the market maker updates to at the end of the period if the trade by the informed trader (x_n) during the period is disclosed. During the periods when confidentiality applies, p_n remains to the end of the period.

Using the standard technique from Kyle (1985), we will show that a unique equilibrium exists in which the informed trader's strategy is of the following form

$$\begin{aligned} x_n &= \beta_n (v - p_{n-1}^*), \text{ if } n < n_d \text{ or } n = N \\ x_n &= \beta_n (v - p_{n-1}^*) + z_n, \text{ if } n_d \le n \le N-1 \end{aligned} \tag{2}$$

where $z_n \sim N(0, \sigma_{z_n}^2)$ is normally distributed and independent of v and $\{u_t\}_{1 \le t \le N}$. Intuitively, (2) indicates that the informed trader adopts a linear strategy during the non-disclosure periods (as in Kyle (1985)) but adds a normal disturbance during the disclosure periods (as in HHL). The linear coefficient β_n measures how aggressively he trades on his private information in each period, and the noise

[1] This relation is supported by our empirical tests in Section V.A of the published paper.

[2] This assumption is supported by our empirical finding that the likelihood of denial is not systematically correlated with fund characteristics (Table VII in the published paper), and that confidential holdings in denied filings exhibit similar magnitude of abnormal returns as those that are not denied (which imply comparable levels of private information).

variance $\sigma_{z_n}^2$ represents the level of dissimulation employed to mask private information in the disclosed trade.

The market maker's optimal response to the informed trader's strategy (2) is to set the trading price p_n as a linear function of the total order flow,

$$p_n = p_{n-1}^* + \lambda_n (x_n + u_n), \tag{3}$$

The linear coefficient λ_n represents the impact of order flow on price, or the market depth. If the informed trader's action is disclosed at the end of the period, the market maker updates the price based on the following linear rule

$$p_n^* = p_{n-1}^* + \gamma_n x_n, \tag{4}$$

The linear coefficient γ_n captures how responsive the market price is to the disclosure of trade information.

Let π_n denote the informed trader's profits on positions in period n, and $\tilde{\pi}_n$ denote his total profits over the periods $n, n+1, \ldots, N$. In other words,

$$\pi_n = (v - p_n)x_n, \quad \tilde{\pi}_n = \sum_{k=n}^{N} \pi_n = \sum_{k=n}^{N} (v - p_k)x_k \tag{5}$$

In equilibrium, the informed trader chooses a trading strategy to maximize his expected profits $E[\tilde{\pi}_n \mid p_1^*, \ldots, p_{n-1}^*, v]$ at the beginning of every period n. The conditional variance $\Sigma_n = Var(v \mid p_1^*, \ldots, p_{n-1}^*)$ represents the extent of the remaining private information of the informed trader, after $n-1$ rounds of trades.

The following Proposition characterizes the strategies and expected profits of the informed trader, and the pricing rules by the market maker. In the proof of the proposition, we also show that this is the unique equilibrium when strategies are constrained to be of the linear forms as in (2) − (4).

Proposition: Assume that the informed trader discloses per-period trade starting from period n_d with $1 \le n_d \le N$. Then

(i) There are constants α_n, δ_n, λ_n, β_n, Σ_n, γ_n, $\sigma_{z_n}^2$, such that the strategies satisfy (2) – (4), and the informed trader's expected profits are given by

$$E[\tilde{\pi}_n \mid p_1^*, \ldots, p_{n-1}^*, v] = \alpha_{n-1}(v - p_{n-1}^*)^2 + \delta_{n-1}, \text{ for } 1 \le n \le N. \tag{6}$$

Given Σ_0 and σ_u^2, the constants α_n, λ_n, β_n, Σ_n, γ_n, and $\sigma_{z_n}^2$ solve the following recursive equation system:

(a) If $n_d \le n \le N$,

$$\begin{aligned} &\lambda_{n+1} = \lambda_n, \alpha_{n-1} = \frac{1}{4\lambda_n}, \beta_n = \frac{1}{2\lambda_n(N-n+1)}, \\ &\gamma_n = 2\lambda_n, \sigma_{z_n}^2 = \frac{N-n}{N-n+1}\sigma_u^2, \Sigma_n = \frac{N-n}{N-n+1}\Sigma_{n-1} \end{aligned} \tag{7}$$

(b) If $n = n_d - 1$,

$$\lambda_{n+1} = \frac{\lambda_n}{4\mu_n}, \alpha_{n-1} = \frac{1}{4\lambda_n(1-\mu_n)}, \beta_n = \frac{1-2\mu_n}{2\lambda_n(1-\mu_n)}, \Sigma_n = (1-\lambda_n\beta_n)\Sigma_{n-1} \tag{8}$$

(c) If $n < n_d - 1$

$$\lambda_{n+1} = \frac{\lambda_n}{4\mu_n(1-\mu_{n+1})}, \alpha_{n-1} = \frac{1}{4\lambda_n(1-\mu_n)}, \beta_n = \frac{1-2\mu_n}{2\lambda_n(1-\mu_n)}, \Sigma_n = (1-\lambda_n\beta_n)\Sigma_{n-1} \tag{9}$$

(d) In the first period, the market depth parameter is given by

$$\lambda_1 = \begin{cases} \dfrac{\sqrt{1-2\mu_1}}{2(1-\mu_1)}\dfrac{\sqrt{\Sigma_0}}{\sigma_u}, \text{ if } n_d > 1 \\ \dfrac{1}{2}\sqrt{\dfrac{1}{N}}\dfrac{\sqrt{\Sigma_0}}{\sigma_u}, \text{ if } n_d = 1 \end{cases} \tag{10}$$

where the constants $\mu_n \equiv \alpha_n\lambda_n$, for $1 \le n \le n_d - 1$.

(ii) The sequence of constants $\{\mu_n\}_{1\le n<n_d}$ that appear in the recursive formulas (8) – (10) do not depend on Σ_0 and σ_u, and are uniquely determined by the following equations:

$$0 \le \mu_n < 1/2, \quad 1 \le n < n_d \tag{11}$$

$$8(\mu_n^3 - \mu_n^2) - (N - n_d + 1)(2\mu_n - 1) = 0, \text{ if } n = n_d - 1 \tag{12}$$

$$8(1-2\mu_{n+1})(\mu_n^3 - \mu_n^2) - 2\mu_n + 1 = 0, \text{ if } n < n_d - 1 \tag{13}$$

(iii) The expected profits of the informed trader in period *n* is given by

$$E[\pi_n] = \lambda_n\sigma_u^2, \text{ for } 1 \le n \le N \tag{14}$$

The total expected profits of the informed trader is equal to $\Pi_{n_d} = \left(\sum_{n=1}^{N}\lambda_n\right)\sigma_u^2$.

(iv) The benefit of confidentiality, or the incremental profit from confidentiality, $\Pi_{n_d} - \Pi_1$, is increasing

in the extent of asymmetric information, Σ_0.

Proof of the Proposition appears in Section C of this document. The solution given in the above proposition is reducible to the Kyle (1985) model ($n_d = N$) or the HHL model ($n_d = 1$) as special cases. Part (i) gives the recursive formulas for the strategy parameters. Part (ii) directly computes the series of key constants μ_n (used in the recursive formulas) through backward induction, starting with $n = n_d - 1$. Part (iii) shows that the informed trader's profits are always proportional to the noise trader volume (σ_u^2) by the market depth parameter (λ_n), regardless of the disclosure regime. Market depth, however, is endogenously determined in equilibrium by the market maker's pricing rule given the informed trader's trading strategy.

Of most direct relevance to our empirical tests is the prediction in part (iv) of the Proposition which posits that the informed trader can benefit more from confidentiality when he commands more ex ante information advantage (higher Σ_0), which is also a direct measure of information asymmetry. Given the exogenous cost of seeking confidentiality, the Proposition predicts that the informed trader (e.g., a hedge fund manager) is more likely to seek confidentiality on a position when there is greater asymmetric information about the value of the stock.

C. Proof of the Proposition

Part (i): We proceed by proving (a) – (d) sequentially.

Case (a): Because the informed trader discloses in periods $n_d, n_{d+1}, \ldots, N$, the model in the last $N - n_d + 1$ periods maps exactly to the HHL model with prior variance $\Sigma_{n_d - 1}$. Thus, the solution of HHL (their Proposition 4) applies, with the total number of periods replaced by $N - n_d + 1$, and the prior variance Σ_0 replaced by $\Sigma_{n_d - 1}$. More precisely, the equilibrium strategies satisfies (2) – (4) and

$$\lambda_{n+1} = \lambda_n = \frac{1}{2\sigma_u}\sqrt{\frac{\Sigma_{n_d-1}}{N - n_d + 1}}, \beta_n = \frac{1}{2(N-n+1)\lambda_n}, \gamma_n = 2\lambda_n, \sigma_{z_n}^2 = \frac{N-n}{N-n+1}\sigma_u^2,$$
$$\Sigma_n = \frac{N-n}{N-n+1}\Sigma_{n-1}, \quad \text{for } n_d \le n < N. \tag{15}$$

The equation (A17) in the proof of Proposition 4 of HHL implies that (6) holds with

$$\alpha_{n-1} = \frac{1}{4\lambda_n}, \text{ for } n_d \le n \le N. \tag{16}$$

(15) and (16) complete the proof of (7) in case (a).

Case (b): Since there is no disclosure in period $n = n_d - 1$, Theorem 2 of Kyle (1985) applies.[3] Therefore, (6) holds and

$$\begin{aligned} &\alpha_{n_d-2} = \frac{1}{4\lambda_{n_d-1}(1-\mu_{n_d-1})}, \Sigma_{n_d-1} = (1-\lambda_{n_d-1}\beta_{n_d-1})\Sigma_{n_d-2}, \\ &\lambda_{n_d-1} = \beta_{n_d-1}\frac{\Sigma_{n_d-1}}{\sigma_u^2}, \beta_{n_d-1} = \frac{1-2\mu_{n_d-1}}{2\lambda_{n_d-1}(1-\mu_{n_d-1})}, \end{aligned} \tag{17}$$

(16) implies that

$$\lambda_{n_d} = \frac{1}{4\alpha_{n_d-1}} = \frac{\lambda_{n_d-1}}{4\alpha_{n_d-1}\lambda_{n_d-1}} = \frac{\lambda_{n_d-1}}{4\mu_{n_d-1}}. \tag{18}$$

(17) and (18) complete the proof of (8) in case (b).

Case (c): When $n < n_d - 1$, the recursive equations (Theorem 2) in Kyle (1985) apply in both period n and period $n+1$. Therefore,

$$\alpha_{n-1} = \frac{1}{4\lambda_n(1-\mu_n)}, \lambda_n = \beta_n\frac{\Sigma_n}{\sigma_u^2}, \Sigma_n = (1-\beta_n\lambda_n)\Sigma_{n-1}, \beta_n = \frac{1-2\mu_n}{2\lambda_n(1-\mu_n)}. \tag{19}$$

The recursive formulas for α_{n-1} in (17) and (19) imply that, for $1 \le n < n_d - 1$,

$$\lambda_{n+1} = \frac{1}{4\alpha_n(1-\mu_{n+1})} = \frac{\lambda_n}{4\mu_n(1-\mu_{n+1})}. \tag{20}$$

(19) and (20) complete the proof of (9) in case (c).

Case (d): If $n_d > 1$, then (19) implies that

$$\lambda_1 = \beta_1\frac{\Sigma_1}{\sigma_u^2} = \frac{\beta_1(1-\lambda_1\beta_1)\Sigma_0}{\sigma_u^2} = \frac{1-2\mu_1}{4\lambda_1(1-\mu_1)^2}\frac{\Sigma_0}{\sigma_u^2}.$$

Therefore, $\lambda_1 = \frac{\sqrt{1-2\mu_1}}{2(1-\mu_1)}\frac{\sqrt{\Sigma_0}}{\sigma_u}$. If $n_d = 1$, then (15) implies that $\lambda_1 = \frac{1}{2}\sqrt{\frac{1}{N}}\frac{\sqrt{\Sigma_0}}{\sigma_u}$.

[3] This case is not exactly the same as the Kyle (1985) model because the informed trader discloses trades in the next period $n+1$ and thereafter. For the argument of Kyle (1985) to apply to period n, we only need that the future expected profits (from period $n+1$ onwards) are in the form given in equation (6), which has been proved in case (a).

Part (ii): The proof of this part will need the following lemma.

Lemma. Suppose $K > 0$, then there is a unique solution $\mu \in (0,1)$ to the following equation

$$8\mu^3 - 8\mu^2 - K(2\mu - 1) = 0. \tag{21}$$

Furthermore, $0 < \mu < 1/2$.

Proof of the Lemma. By taking the derivative, it is easy to show that the function $f(\mu) = \frac{8\mu^2(1-\mu)}{1-2\mu}$ is increasing for $\mu \in (0,1/2)$. Because $f(\mu)$ approaches 0 as $\mu \searrow 0^+$, and ∞ as $\mu \nearrow 1/2^-$, there is a unique $\mu \in (0,1/2)$ such that $f(\mu) = K$, i.e., (21) is satisfied. Because $f(\mu) < 0$ for $\mu \in (1/2,1)$, the above solution is also the unique solution in the interval $(0,1)$. Q.E.D.

We first show that μ_{n_d-1} is given by equation (12). The equation (15) imply that

$$\lambda_{n_d} = \frac{1}{2}\beta_{n_d}\frac{\Sigma_{n_d-1}}{\sigma_u^2}, \beta_{n_d} = \frac{1}{2(N - n_d + 1)\lambda_{n_d}}. \tag{22}$$

Equations (17) and (22) imply that

$$\frac{\lambda_{n_d}}{\lambda_{n_d-1}} = \frac{1}{2}\frac{\beta_{n_d}}{\beta_{n_d-1}}, \frac{\beta_{n_d}}{\beta_{n_d-1}} = \frac{\lambda_{n_d-1}}{\lambda_{n_d}}\frac{1-\mu_{n_d-1}}{(N-n_d+1)(1-2\mu_{n_d-1})}. \tag{23}$$

Combining the two equalities in (23), we obtain

$$\left(\frac{\lambda_{n_d}}{\lambda_{n_d-1}}\right)^2 = \frac{1}{2}\frac{1-\mu_{n_d-1}}{(N-n_d+1)(1-2\mu_{n_d-1})}. \tag{24}$$

Rewriting equation (16) as

$$\frac{\lambda_{n_d}}{\lambda_{n_d-1}} = \frac{1}{4\mu_{n_d-1}}, \tag{25}$$

plugging (25) into (24), and reorganizing terms, we obtain equation (12) that determines μ_{n_d-1}. Note that the second order condition $\lambda_n(1-\alpha_n\lambda_n) > 0$ in Theorem 2 of Kyle (1985) implies that $0 < \mu_{n_d-1} < 1$. It

follows from the Lemma that there is a unique root μ_{n_d-1} of equation (12) inside the interval (0, 1). In addition, $0 < \mu_{n_d-1} < \frac{1}{2}$.

Next, we prove that μ_n is given by equation (13) if $n < n_d - 1$. For $n < n_d - 1$, (17) and (19) imply that

$$\begin{aligned} &\lambda_n = \beta_n \frac{\Sigma_n}{\sigma_u^2}, \beta_n = \frac{1-2\mu_n}{2\lambda_n(1-\mu_n)}, \\ &\lambda_{n+1} = \beta_{n+1} \frac{\Sigma_{n+1}}{\sigma_u^2}, \Sigma_{n+1} = (1-\beta_{n+1}\lambda_{n+1})\Sigma_n, \beta_{n+1} = \frac{1-2\mu_{n+1}}{2\lambda_{n+1}(1-\mu_{n+1})}. \end{aligned} \tag{26}$$

From (26) we obtain

$$\frac{\lambda_{n+1}}{\lambda_n} = \frac{\beta_{n+1}(1-\lambda_{n+1}\beta_{n+1})}{\beta_n} = \frac{1}{2(1-\mu_{n+1})}\frac{\beta_{n+1}}{\beta_n}. \tag{27}$$

Next, plugging the equality $\beta_n = \frac{1-2\mu_n}{2\lambda_n(1-\mu_n)}$ and $\beta_{n+1} = \frac{1-2\mu_{n+1}}{2\lambda_{n+1}(1-\mu_{n+1})}$ from (26) into (27) and reorganizing, we obtain

$$\left(\frac{\lambda_{n+1}}{\lambda_n}\right)^2 = \frac{2(1-\mu_n)}{1-2\mu_n}\frac{1-2\mu_{n+1}}{4(1-\mu_{n+1})^2}. \tag{28}$$

Rewrite (20) as

$$\frac{\lambda_{n+1}}{\lambda_n} = \frac{1}{4\mu_n(1-\mu_{n+1})}. \tag{29}$$

After substituting (29) into (28) and using some simple algebra, we obtain equation (13) that determines μ_n given μ_{n+1} (replicated here):

$$8(1-2\mu_{n+1})(\mu_n^3 - \mu_n^2) - 2\mu_n + 1 = 0. \tag{30}$$

By the second order condition in Kyle (1985), $0 < \mu_n < 1$. It then follows from the lemma that if $0 < \mu_{n+1} < \frac{1}{2}$, there is a unique root μ_n of (30) in $(0, \frac{1}{2})$. Now it follows by induction that $0 < \mu_n < \frac{1}{2}$ for each $1 \le n \le n_d - 1$, which proves (11).

Part (iii): Proposition 4 of HHL shows that the expected profit $E[\pi_n]$ is equal to $\frac{\sigma_u}{2}\sqrt{\frac{\Sigma_{n_d\text{-}1}}{N-n_d+1}} = \lambda_n\sigma_u^2$, if $n_d \le n \le N$. For $n < n_d$, using (2), (3), (8), and (9), the expected profit in period n is given by

$$E[x_n(v-p_n)] = E[\beta_n(v-p_{n-1}^*)(v-p_{n-1}^* - \lambda_n(\beta_n(v-p_{n-1}^*)+u_n))]$$
$$= \beta_n(1-\lambda_n\beta_n)\Sigma_{n-1} = \beta_n\Sigma_n = \lambda_n\sigma_u^2.$$

Part (iv): Since λ_n is proportional to $\frac{\sqrt{\Sigma_0}}{\sigma_u}$, the total profit function $\Pi_{n_d} = \sum_{n=1}^{N}\lambda_n\sigma_u^2$ is proportional to $\sqrt{\Sigma_0}\sigma_u$, and so is the total profit function in the full-disclosure case Π_1 . Therefore, the benefit of confidentiality $\Pi_{n_d} - \Pi_1$ is proportional to $\sqrt{\Sigma_0}\sigma_u$, and is thus increasing in Σ_0 . Q.E.D.

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Part II. Additional Tables for Sensitivity Analyses and Robustness Checks

Table IA.I: Abnormal Returns of Original and Confidential Holdings of Hedge Funds: Alternative Hedge Fund List

Table IA.II: Abnormal Returns of Acquisition- and Disposition-Motivated Confidential Holdings: Forward-Looking Classification

Table IA.III: Abnormal Returns of Original and Confidential Holdings without accompanying option positions

Table IA.IV: Abnormal Returns of Original and Confidential Holdings of Investment Companies or Advisors

Table IA.V: Abnormal Returns of Original and Confidential Holdings of Hedge Funds excluding Caxton and D.E. Shaw

Table IA.I
Abnormal Returns of Original and Confidential Holdings of Hedge Funds: Alternative Hedge Fund List

This table repeats the analyses in panel A of Table V in the published paper except using an alternative list of hedge funds using the Form ADV information as described in Section II.A. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Daily Four-factor Alphas							
Conf. Holdings (in basis points)	6.16	4.50	4.29	4.23	4.10	3.76	4.27
Original Holdings (in basis points)	3.00	2.82	2.83	2.60	2.45	2.34	2.43
Diff: Conf. - Orig. (in basis points)	3.16***	1.68	1.46*	1.63	1.65**	1.42*	1.85**
Annualized Diff.	7.96%***	4.23%	3.67%*	4.10%	4.15%**	3.57%*	4.65%**
t-Stat.	3.45	1.43	1.77	1.38	2.27	1.76	2.54
# of Conf. Filings	73	29	118	23	136	89	262
# of Original Filings	10,434	10,434	10,431	10,428	10,426	10,423	10,417
DGTW Benchmark-adjusted Returns							
Conf. Holdings	6.15%	0.03%	0.74%	1.59%	2.06%	6.69%	8.63%
Original Holdings	0.24%	0.27%	0.15%	0.21%	0.16%	0.26%	0.59%
Diff: Conf. - Original	5.91%***	-0.24%	0.59%	1.38%	1.90%*	6.43%***	8.04%***
Annualized Diff.	35.46%***	-0.98%	1.76%	3.31%	3.79%*	8.58%***	8.04%***
t-Stat.	6.60	-0.29	0.64	0.90	1.78	3.63	4.04
# of Conf. Filings	71	28	116	18	138	83	277
# of Original Filings	10,415	10,415	10,415	10,415	10,415	10,415	10,415

Table IA.II
Abnormal Returns of Acquisition- and Disposition-Motivated Confidential Holdings: Forward-Looking Classification

This table repeats the analyses of Table VI in the published paper except classifying acquisition- and disposition-motivated confidential holdings based on a forward-looking algorithm. For each stock in a confidential filing, we compare the position (adjusted for stock splits) at the current quarter-end (*t*) to that of the same stock by the same institution at the following quarter-end (*t+1*), and classify net increase (decrease) as acquisition (disposition). Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A: Daily four-factor alphas

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Acquisition Sample							
Conf. Holdings (in basis points)	9.03	7.46	4.38	9.93	3.32	4.10	4.05
Original Holdings (in basis points)	2.80	2.70	2.75	2.51	2.43	2.37	2.44
Diff: Conf. - Orig. (in basis points)	6.23***	4.76***	1.63**	7.42***	0.89	1.73**	1.61**
Annualized Diff.	15.69%***	11.98%***	4.11%**	18.69%***	2.24%	4.35%**	4.05%**
t-Stat.	6.94	4.66	1.99	6.90	1.19	2.17	2.27
# of Conf. Filings	49	51	103	30	97	72	215
# of Original Filings	14,000	14,000	13,997	13,992	13,990	13,986	13,976
Disposition Sample							
Conf. Holdings (in basis points)	2.28	0.09	3.94	3.24	3.16	3.17	3.34
Original Holdings (in basis points)	2.80	2.70	2.75	2.51	2.43	2.37	2.44
Diff: Conf. - Orig. (in basis points)	-0.52	-2.62**	1.19	0.73	0.73	0.80	0.90
Annualized Diff.	-1.31%	-6.59%**	2.99%	1.84%	1.84%	2.00%	2.28%
t-Stat.	-0.57	-2.37	1.47	0.61	0.98	1.00	1.35
# of Conf. Filings	58	32	92	23	122	91	258
# of Original Filings	14,000	14,000	13,997	13,992	13,990	13,986	13,976

Panel B: DGTW benchmark-adjusted returns

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Acquisition Sample							
Conf. Holdings	9.23%	3.69%	0.29%	8.66%	3.61%	10.96%	5.00%
Original Holdings	0.22%	0.26%	0.15%	0.19%	0.17%	0.29%	0.57%
Diff: Conf. - Original	9.01%***	3.43%***	0.14%	8.47%***	3.44%***	10.6%***	4.43%**
Annualized Diff.	54.07%***	13.71%***	0.42%	20.33%***	6.88%***	14.22%***	4.43%**
t-Stat.	10.49	4.33	0.17	5.73	2.96	5.64	2.47
# of Conf. Filings	46	24	111	15	105	67	251
# of Original Filings	13,973	13,973	13,973	13,973	13,973	13,973	13,973
Disposition Sample							
Conf. Holdings	1.34%	-2.42%	2.06%	-8.43%	1.37%	-4.98%	3.95%
Original Holdings	0.22%	0.26%	0.15%	0.19%	0.17%	0.29%	0.57%
Diff: Conf. - Original	1.12%*	-2.68%***	1.91%**	-8.62%***	1.20%	-5.27%***	3.38%*
Annualized Diff.	6.73%*	-10.71%***	5.74%**	-20.69%***	2.40%	-7.03%***	3.38%*
t-Stat.	1.76	-3.05	2.32	-5.37	1.16	-3.33	1.88
# of Conf. Filings	57	21	93	12	131	79	291
# of Original Filings	13,973	13,973	13,973	13,973	13,973	13,973	13,973

Table IA.III
Abnormal Returns of Original and Confidential Holdings without accompanying option positions

This table repeats the analyses of panel A of Table V in the published paper except excluding the stocks positions accompanied with call/put option positions in the original and confidential holdings. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Daily Four-factor Alphas							
Conf. Holdings (in basis points)	5.29	4.72	3.79	1.91	4.00	3.73	4.08
Original Holdings (in basis points)	2.82	2.72	2.77	2.54	2.45	2.38	2.44
Diff: Conf. - Orig. (in basis points)	2.48***	2.00*	1.03	-0.62	1.55**	1.35*	1.64**
Annualized Diff.	6.24%***	5.03%*	2.59%	-1.57%	3.91%**	3.40%*	4.13%**
t-Stat.	2.89	1.95	1.32	-0.51	2.19	1.78	2.46
# of Conf. Filings	81	34	143	22	160	112	301
# of Original Filings	14,000	14,000	13,997	13,992	13,990	13,986	13,976
DGTW Benchmark-adjusted Returns							
Conf. Holdings	4.98%	1.05%	0.64%	-0.55%	2.36%	4.28%	7.58%
Original Holdings	0.22%	0.26%	0.15%	0.19%	0.17%	0.29%	0.57%
Diff: Conf. - Original	4.76%***	0.79%	0.50%	-0.74%	2.19%**	4.00%**	7.01%***
Annualized Diff.	28.58%***	3.14%	1.49%	-1.77%	4.39%**	5.33%**	7.01%***
t-Stat.	6.09	1.06	0.62	-0.51	2.16	2.45	3.97
# of Conf. Filings	78	34	142	17	163	102	325
# of Original Filings	13,973	13,973	13,973	13,973	13,973	13,973	13,973

Table IA.IV
Abnormal Returns of Original and Confidential Holdings of Investment Companies or Advisors

This table repeats the analyses of panel A of Table V in the published paper except focusing on the confidential and original holdings of investment companies or advisors. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Daily Four-factor Alphas							
Conf. Holdings (in basis points)	2.89	1.04	2.29	3.40	5.23	2.37	3.81
Original Holdings (in basis points)	2.47	2.54	2.80	2.71	2.55	2.68	2.72
Diff: Conf. - Orig. (in basis points)	0.42	-1.50	-0.50	0.69	2.68***	-0.31	1.09
Annualized Diff.	1.06%	-3.77%	-1.27%	1.75%	6.75%***	-0.79%	2.74%
t-Stat.	0.58	-1.50	-0.62	0.76	3.29	-0.38	1.59
# of Conf. Filings	93	22	105	22	110	67	209
# of Original Filings	31,953	31,952	31,951	31,949	31,946	31,945	31,935
DGTW Benchmark-adjusted Returns							
Conf. Holdings	2.11%	0.63%	-1.02%	2.83%	1.50%	2.75%	1.83%
Original Holdings	0.07%	0.06%	0.14%	0.09%	0.12%	0.18%	0.34%
Diff: Conf. - Original	2.04%**	0.57%	-1.15%	2.73%*	1.38%	2.57%	1.49%
Annualized Diff.	12.23%**	2.27%	-3.46%	6.56%*	2.76%	3.42%	1.49%
t-Stat.	2.56	0.64	-1.23	1.92	0.99	1.29	0.70
# of Conf. Filings	94	24	104	21	107	65	217
# of Original Filings	31,876	31,876	31,876	31,876	31,876	31,876	31,876

Table IA.V
Abnormal Returns of Original and Confidential Holdings of Hedge Funds excluding Caxton and D.E. Shaw

This table repeats the analyses of panel A of Table V in the published paper except excluding Caxton Corporation and D.E. Shaw & Co. Inc. from the sample of hedge funds. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	Return Horizons						
	2m	3m	4m	5m	6m	9m	12m
Daily Four-factor Alphas							
Conf. Holdings (in basis points)	5.39	5.04	4.36	3.75	4.38	3.74	4.57
Original Holdings (in basis points)	2.82	2.73	2.77	2.54	2.45	2.38	2.44
Diff: Conf. - Orig. (in basis points)	2.57***	2.31**	1.59**	1.21	1.93***	1.36*	2.13***
Annualized Diff.	6.48%***	5.83%**	4.01%**	3.04%	4.86%***	3.42%*	5.36%***
t-Stat.	3.02	2.22	2.05	1.04	2.72	1.75	3.17
# of Conf. Filings	80	35	143	23	160	110	290
# of Original Filings	13,952	13,952	13,950	13,945	13,943	13,940	13,930
DGTW Benchmark-adjusted Returns							
Conf. Holdings	5.55%	2.19%	0.89%	4.07%	2.75%	5.13%	8.41%
Original Holdings	0.21%	0.26%	0.14%	0.18%	0.15%	0.27%	0.56%
Diff: Conf. - Original	5.34%***	1.93%***	0.75%	3.89%***	2.60%**	4.86%***	7.85%***
Annualized Diff.	32.04%***	7.73%***	2.24%	9.34%***	5.19%**	6.48%***	7.85%***
t-Stat.	6.82	2.64	0.94	2.64	2.53	2.91	4.34
# of Conf. Filings	77	33	142	18	162	100	312
# of Original Filings	13,930	13,930	13,930	13,930	13,930	13,930	13,930