Prime (Information) Brokerage*

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ABSTRACT

This paper documents that hedge funds gain an information advantage from their prime brokerage services-providing banks regarding the banks' corporate borrowers. Hedge funds make informed trades in the stocks of firms that obtain loans from their prime-broker banks. The connected hedge funds make abnormally large trades prior to the loan announcement and these trades outperform other trades. The outperformance is particularly strong for (i) trades of hedge funds that have high revenue generation potential for prime brokers and (ii) trades in borrowing firms with high information asymmetry. Finally, we find that these informed trades are based on information regarding the borrowing firm in general, rather than just information about the loan.

Keywords: hedge funds, prime brokers, investment banks, informed trading, loan originations
JEL Classification: G11; G12; G14; G23

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1. Introduction

Prime brokers are central to the operation of most hedge funds. In addition to execution and custody services, prime brokers provide financing to hedge funds for their leveraged and short positions. In return, investment banks receive a substantial amount of revenue from hedge funds that use their prime brokerage services.[1] While the importance of the traditional services that prime brokers provide their hedge fund clients is well-understood (e.g., Aragon and Strahan (2012)), this study uncovers a new benefit prime-broker banks provide hedge funds: an information advantage regarding the banks' corporate clients.

Investment banks often receive private information regarding their corporate clients as part of their advisory and origination activities. We use the setting of loan originations to identify the possession of nonpublic information by banks. A large literature in banking argues that banks obtain access to nonpublic information concerning the borrower as part of the due diligence process (e.g., Rajan (1992), Sufi (2007), Demiroglu and James (2010)). We argue that information-hungry hedge funds could access such non-public information through the unique relationship they have with their prime-broker banks.[2] Although prime brokerage desks themselves are unlikely to possess such non-public information about banks' corporate clients, we believe the lucrative fees paid by hedge funds could enable them to receive preferential access to avenues of such non-public information (research analysts, exclusive conferences, onsite and offsite gatherings, etc.). If hedge funds do gain such an information edge due to their prime-broker connections, we would expect

[1] According to an estimate published on *Forbes*, prime brokerage services revenue account for about 35% of total equities trading revenues of investment banks (see "Improving Prime Brokerage Market Share Should Lift Profits at Goldman, Morgan Stanley", October 7, 2015). Another article published in *Bloomberg News* on March 21, 2005, "Investment Banks Are Too Dependent on Hedge Funds", estimates that more than one in every eight dollars of investment bank revenue comes from hedge fund clients.

[2] Hedge funds constantly seek for an information edge. For some anecdote evidence, see, for example, "Hedge Fund Billionaire Is Guilty of Insider Trading," *New York Times*, May 11, 2011; "Steve Cohen Misses His Chats with Corporate Insiders," *Bloomberg View*, June 4, 2012; "Surveys Give Big Investors an Early View from Analysts," *New York Times*, July 15, 2012.

hedge funds to make informed trades in the shares of firms that borrow from the fund's prime-broker bank.

We test this hypothesis by combining data on hedge fund prime-broker banks, loan originations, and hedge fund firms' 13F stock and option holdings. Using the merged dataset, we examine whether hedge funds make larger, more profitable trades in the stocks of firms to which their prime-broker banks originate loans. We refer to the stocks of firms that receive a bank loan in a given quarter as *treated* stocks in that quarter, and the hedge funds whose prime-broker bank is the lead arranger of the loan as *connected* hedge funds. We test our hypothesis by comparing connected hedge funds' trades in treated stocks to other trades in our sample. To control for unobserved fund-company or stock characteristics that could systematically vary between connected and unconnected funds or between treated and untreated stocks, respectively, we include both fund-company × quarter and stock × quarter fixed effects in our test specification.

Our regression specification *simultaneously* explores (i) across-stock variations within each hedge fund portfolio and (ii) across-fund variation within each stock event.[3] Controlling for time variant fund-company and stock characteristics eliminates the following two concerns at the same time: (i) value-relevant nonpublic information about the treated loan stock can reach both connected and non-connected hedge funds through other channels; (ii) connected hedge funds might simply be more skilled and thus make informed trades in both treated and untreated stocks. In short, these fixed effects allow us to control for a variety of confounding factors and rule out alternative explanations, such as connected hedge funds making informed trades in treated stocks for reasons unrelated to their prime-broker connection.

[3] We only observe portfolio holdings at the hedge fund company level. We use hedge fund and hedge fund company interchangeably in the context of portfolio holdings.

Our results support the hypothesis that hedge funds gain an information advantage from their prime-broker banks. First, we find that connected hedge funds make abnormally large trades of treated stocks *prior to* loan announcements. We measure trade size using the absolute value of holding changes in the quarter prior to the loan announcement, scaled by the fund's assets under management (AUM). Our result shows that the absolute value of portfolio weight changes in treated stocks by connected hedge funds are 2.7 basis points (bps) higher than the control groups. This finding is economically significant given that the mean and median of absolute portfolio weight changes for all positions in our sample are 32 bps and 6 bps, respectively.

More importantly, we find that connected hedge funds perform better in their trades of treated stocks compared to the control groups. We measure the return that a fund earns in a trade by multiplying the portfolio weight change in the quarter prior to the loan announcement with the abnormal stock return in the subsequent quarter (i.e., the loan announcement quarter). We calculate abnormal stock returns using both Carhart (1997) four-factor alphas and Daniel et al. (DGTW, 1997) characteristic-adjusted returns. Our results show that the contribution of a trade in a treated stock to the fund's quarterly abnormal performance is 0.290 bps to 0.243 bps higher compared to other trades. This effect is economically significant as its magnitude is almost twice as large as the sample average of 0.07 bps per trade. Because the average connected fund company holds six treated stocks in a given quarter, these estimates suggest that an average connected fund company generates additional abnormal profits of $413.7k - $493.8k per quarter from their trades of treated stocks compared to other trades. To ensure that our results are not spurious, we carry out a falsification test by changing the loan origination dates to one- or two-years prior to the actual dates and do not find any evidence of outperformance.

Next, we conduct two cross-sectional tests to investigate the scenarios under which the information advantage is more pronounced. First, we test whether the information edge that connected funds have is increasing in their revenue generation potential to prime-broker banks. We construct two variables to measure a fund company's revenue generation potential: (i) its AUM in long-short equity strategies, and (ii) use of leverage financing.[4] Our results show that connected funds with greater revenue potential earn significantly higher returns in treated stocks compared to other connected funds. Second, we test whether the information edge of connected hedge funds depends on the information asymmetry of the borrowing firm. More information asymmetry around the borrowing firm should increase the returns to trading on any informational edge. We follow prior literature (e.g., Dennis and Mullineaux (2000), Sufi (2007)) and use three proxies for the borrowing firm's information asymmetry: (i) credit rating, (ii) number of lenders, and (iii) number of lead arrangers. As expected, the connected hedge funds' outperformance is particularly strong for their trades on borrowing firms with high information asymmetry.

Finally, we carry out a number of additional analyses. First, we find no evidence of reversal in the outperformance of connected funds' trades in treated stocks, which suggests that the outperformance is not driven by temporary price pressure but by permanent price movements. Second, we investigate whether the information that connected hedge funds have is specific to the loan or about the borrowing firm in general. We repeat our main analysis but remove the three-day announcement return of the loan from the treated stocks' quarterly returns and find similar results, which suggests that the information edge that connected funds have is about the firm in

[4] Because prime brokers generate revenue through commissions by executing trades and fees by providing financing for leveraged and short positions, hedge funds that primarily trade in equities and those who take short positions have particularly high revenue potential. A report on prime brokerage by Barclays Capital Solutions Group in June 2015, titled "More with Less: Impact of Regulations on the Hedge Fund Financing Model", notes that long-short equity funds are one of the most valuable types for prime brokerage revenues.

general rather than purely about the loan. Third, we find no evidence that the hedge funds whose prime-broker banks are mere participants in a loan (i.e., not a lead arranger) gain an information edge about the borrowing firm, which is consistent with the unique role of lead banks in the loan origination process (e.g., Sufi (2007)). Lastly, we examine hedge funds' equity option holdings and continue to find evidence that connected hedge funds enjoy an information advantage from their prime broker connections.

Overall, while our evidence is consistent with prime-broker banks sharing material nonpublic information with their hedge fund clients, an alternative explanation is that the information shared is immaterial on its own but becomes valuable once combined with other information signals that the connected hedge funds have. The former explanation is in line with studies that argue that private information could flow from the corporate loan desk to other affiliated groups of investment banks (Acharya and Johnson (2007), Massa and Rehman (2008), and Chen and Martin (2011)).[5] While these three studies document information flow from one unit to another within the institution, our study suggests that information flows from investment banks to external parties, in particular their prime brokerage hedge fund customers. The latter explanation is consistent with the evidence in the literature that hedge funds are better at processing information (e.g., Solomon and Soltes (2015)). Regardless of how connected hedge funds gain an edge, our results suggest that prime-broker banks provide a valuable function of "information brokerage" to hedge fund clients.

[5] Although Chinese walls are set up to prevent such information transfer, as noted by the U.S. Securities and Exchange Commission (SEC), these information barriers could be inadequate. The SEC published "Staff Summary Report on Examinations of Information Barriers: Broker-Dealer Practices Under Section 15(g) of the Securities Exchange Act of 1934" in September 2012. The report notes that controls to prevent misuse of material non-public information (MNPI) were not often adequate. For example, the report states, "the apparent absence of related monitoring or other controls raises serious concerns about the ability of broker-dealers to guard adequately against misuse of MNPI in firm and customer trading."

Our paper contributes to the nascent literature on hedge funds' prime brokers. A number of studies in this literature show that prime broker distress can cause contagion among hedge funds sharing the same broker (e.g., Klaus and Rzepkowski (2009), Boyson, Stahel, and Stulz (2010), and Aragon and Strahan (2012)). We add to this literature by uncovering a function of "information brokerage" that prime-broker banks provide to hedge fund clients.[6] In this regard, our study is related to Chung and Kang (2016), who document co-movement in the returns of hedge funds sharing the same prime broker. While their evidence is consistent with prime brokers sharing information with hedge fund clients, their setting does not allow them to directly examine whether and what information prime brokers share with their hedge fund clients. Our paper uses detailed holdings level data combined with corporate events when such information sharing is possible and carefully controls for many unobservable factors using two sets of high-dimensional fixed effects. Different from Chung and Kang (2016), our setting also allows us to analyze the heterogeneity in hedge funds clients of a given prime broker as we find that only hedge funds with high revenue potential enjoy this information advantage.

Our study also adds to the large strand of literature on hedge fund performance.[7] Our paper suggests that hedge funds' connections to their prime brokers represent an important source of alpha. More specifically, our paper adds to the literature documenting that hedge funds trade on nonpublic information. Ivashina and Sun (2011) and Massoud et al. (2011) show that hedge funds

[6] Our focus on prime-broker banks that provide a variety of prime brokerage services (e.g., leverage, security lending, custody and centralized clearing, trade execution, etc.) to hedge fund clients is different from prior studies that analyze brokerage houses that execute trades for institutional clients. For instance, Griffin, Shu, and Topaloglu (2012) find little evidence of informed trading by the average brokerage house client of investment banks. Di Maggio et al. (2017) find that, after large informed trades, a significantly higher volume of other institutional investors execute similar trades through the same broker.

[7] The literature that analyzes informed trading by hedge funds includes, among others, Brunnermeier and Nagel (2004), Aragon and Martin (2012), Agarwal et al. (2013), Klein and Li (2015), Gao and Huang (2016), and Gargano, Rossi, and Wermers (2017). There is also a large literature that studies hedge funds' ability to generate positive alpha (e.g., Brown, Goetzmann, and Ibbotson (1999), Agarwal and Naik (2000), Kosowski, Naik, and Teo (2007), Aggarwal and Jorion (2010), Jagannathan, Malakhov, and Novikov (2010), and Sun, Wang, and Zheng (2012)).

that *directly* invest in syndicated loans make informed trades in the equity of the borrowing firm. Our paper differs from these two studies as we find that funds that do not directly participate in the loans also trade on private information about borrowing firms provided by their prime brokers. In addition, Qian and Zhong (2018) find that hedge funds earn abnormal returns in stocks after their IPO, especially when their prime brokers serve as the IPO underwriters. Share allocation in IPOs plays a critical role in their setting and could well be driving their main results. Our setting avoids this pitfall and allows for a cleaner test of any information advantage hedge funds have because of their prime broker connections.

The remainder of this paper proceeds as follows. Section 2 describes data and variable construction. Section 3 discusses the design of our empirical analyses. Section 4 examines the size and performance of trades by hedge funds. Section 5 sets forth our conclusions.

2. Data and Variable Construction

2.1. Data

We combine a multitude of datasets for our analysis. First, information on hedge funds and their prime brokers comes from Mullally (2016), who forms a union of four commercial hedge fund databases (the "union" database) based on the algorithm of Joenväärä, Kosowski, and Tolonen (2014). Specifically, the union database combines the Trading Advisor Selection System (TASS), Hedge Fund Research (HFR), EurekaHedge, and Morningstar hedge fund databases. The union database contains information on hedge funds' returns, assets under management (AUM), contractual features, and service providers. The information on funds' service providers includes the name of each fund's prime broker(s). To mitigate concerns about survivorship bias in the commercial hedge fund databases, we only use data from 1994 through 2014.

Jorion and Schwarz (2014) document that hedge funds often report to multiple databases and begin doing so at different points in time. We take advantage of these strategic listing decisions to create a time series of hedge fund – prime broker observations. Specifically, for each hedge fund in the union database, we assume that the first broker a fund reports to any commercial database was the fund's broker since its inception. If the fund subsequently begins reporting to another database and lists a different prime broker, we update that fund's broker accordingly and fill in the broker data until the fund reports to another database or the sample period ends in 2014. We employ this algorithm for each fund in the union database and then aggregate the funds' brokers at the fund company level to create a list of brokers that each fund company uses in each month.

Next, we obtain stock and options holdings data from three sources. First, we use the Thomson Reuters 13F Institutional Holdings data to obtain information on stock holdings at the hedge fund company level. Institutions that hold at least $100 million in Section 13(f) securities are required to disclose their institution-level holdings on a quarterly basis.[8] However, as noted by Ben-David et al. (2016), the Thomson Reuters 13F database suffers from several data quality issues such as stale and omitted institutional reports and excluded securities after June 2013. To mitigate these concerns, we use a second source of holdings data from June 2013 onward: the 13F filing data directly obtained from the SEC's EDGAR website and made available to researchers via the Wharton Research Data Services (WRDS) platform. Our data on hedge fund firms' equity option holdings comes from WhaleWisdom which obtains the data on 13F institutional holdings directly from the SEC EDGAR database. We obtain data on stock prices and returns from the Center for Research in Security Prices (CRSP).

[8] Section 13(f) securities are primarily U.S. exchange-traded stocks (e.g., NYSE, AMEX, NASDAQ). See the following link for more information on 13F filings: https://www.sec.gov/divisions/investment/13ffaq.htm.

Finally, we obtain information about corporate loans from Loan Pricing Corporation's (LPC) Dealscan database. This database contains detailed information about bank loans made to US and foreign corporations, with coverage starting from around the mid-1980s. Chava and Roberts (2008) report that Dealscan coverage is comprehensive from 1995 onward. We use the Compustat-Dealscan link made publicly available by Michael Roberts (see Chava and Roberts (2008)) to link this database with Compustat. We manually name-match each lender in the Dealscan data to our list of prime brokers. In our main analysis, we focus on hedge funds' connections to the lead arrangers since it is the job of the lead arranger to conduct due diligence on the borrower and process information (e.g., Sufi (2007), Ivashina (2009)).

Prior studies have shown that some hedge funds directly invest in loans to obtain private information about the borrowing firm, especially during loan renegotiations (e.g., Ivashina and Sun (2011) and Massoud et al. (2011)). We manually compare our list of hedge funds to the list of lenders in Dealscan to identify instances in which a hedge fund also participates in a given loan. To ensure that hedge funds' direct investment into loans do not drive our results, we exclude hedge fund companies (39 in total) that have ever co-invested in a syndicated loan. We also exclude hedge fund firms that are "quantitative" in nature as these firms base their trading strategies on primarily statistical analyses rather than firm fundamentals (10 in total).

To ensure the accuracy of our data, we address an important concern about the Dealscan data. Financial institutions have multiple subsidiaries and often engage in mergers and acquisitions that change their holding structures. Unfortunately, Dealscan does not retain the historical ownership structure. Instead, all lending entities are linked to their most recent parent. This practice leads to many loans being incorrectly attributed to the wrong parent bank. For example, Dealscan attributes loans made by Merrill Lynch in 2001 to Bank of America even though the two firms did

not merge until 2008. We examine each of the individual lender names in our sample and match the lending entity to the correct parent bank at the time of loan origination to ensure that the actual lender is correctly identified. Lastly, we eliminate all loans to borrowers that do not have common stocks in the CRSP database.

We construct our merged dataset as follows. First, we merge the Dealscan data to the union hedge fund database by manually matching the prime broker names in the union database to the lead lenders in Dealscan. This generates a mapping from each loan event to a set of hedge funds that are "connected" to the loan through their prime broker(s). The unit of observation in this merged dataset is a fund-broker-loan combination where each loan is denoted by a stock-quarter pair. Second, we eliminate fund-broker-loan observations made to companies before a hedge fund's inception date or after a fund died. Third, we manually match hedge fund companies in the union database to those in the 13F database and obtain their quarterly stock holdings. We eliminate any fund quarters in which the fund company held fewer than 10 stocks. We also remove hedge fund firms that are affiliated with financial institutions in the Dealscan list of lenders (15 funds). Finally, we only retain 13F institutions that are classified as pure play hedge funds firms as defined in Agarwal et al. (2013).

After the above procedures, our final sample contains 449 hedge fund companies and their quarterly holdings from 11,619 distinct fund-quarters from 1994Q1 to 2014Q4. These companies use 74 different prime brokers and hold the stocks of companies that received 8,908 distinct loans. 54 out of the 74 brokers in our sample are associated with a bank that made at least one loan during our sample period. In 5,743 out of the 11,619 distinct fund-quarters in our sample, hedge funds hold the stock of at least one firm to whom their prime-broker bank originates a loan.

2.2. Summary Statistics

We report summary statistics in Table 1. Panel A contains the statistics for the fund company variables, aggregated at the quarterly horizon. The average (median) fund company holds 132 (60) stocks. Across all fund-quarters in our sample, on average, fund companies hold the stocks of 2.8 firms that received loans from the fund company's prime-broker bank. However, for quarters in which the fund company holds the stock of at least one firm to whom its broker makes a loan, funds hold an average (median) of 5.78 (2) stocks that receive loans. The mean (median) hedge fund company in our sample holds $1,779 ($410) million in long equity positions.

[Insert Table 1 about here]

Panel B contains the statistics on the stock position level variables. The average (median) absolute quarterly position change in our sample is 0.32% (0.06%), scaled by the hedge fund company's AUM. For an average (median) position, the quarterly *Four-Factor Alpha* is -0.11% (-0.52%) and the quarterly *DGTW* is 0.00% (-0.57%). The average values of our two trade return measures, *Alpha×ΔOwnership* and *DGTW×ΔOwnership*, are 0.068 bps and 0.071 bps. The median values of both measures are close to zero. It suggests that the incremental contribution to the fund company's quarterly abnormal return from a typical position change is relatively small. The statistics on the loan variables are contained in Panel C. The average (median) loan has principal amount of $1,104 ($500) million, has 10.8 (8) members in the syndicate, has 2.3 (2) lead lenders, and has 1.5 (1) facilities.

3. Empirical Design

The objective of our empirical analysis is to investigate whether hedge funds gain an information edge from their relationships with prime-broker banks that possess non-public

information about corporate clients. To examine this question, we use the setting of loan originations by banks to corporate borrowers. Banks expend considerable resources to perform due diligence and screen firms before granting loans. For our sample of loans, the median time between the day a bank receives the mandate for a loan and the day the loan is closed is 75 days. As argued by both academics and practitioners, banks obtain nonpublic information about borrowing firms during the loan origination process (e.g., Rajan (1992), Sufi (2007), Taylor and Sansone (2007), Demiroglu and James (2010)). Thus, the event of loan origination, during which the lead bank collects non-public information about the borrower, provides a unique setting to investigate whether hedge funds gain an information advantage from their prime-broker connections.

Hedge funds' trades should reflect this information edge. Therefore, in our empirical analysis we test whether hedge funds make informed trades on the stocks of firms to which their prime broker's affiliated bank initiates bank loans. We refer to the stocks of firms that receive a bank loan as treated stocks and the hedge funds whose prime broker initiates the loans as connected hedge funds. We have two conjectures if connected hedge funds gain an information edge due to their prime-broker connection. First, we expect these hedge fund clients to exhibit abnormal trading activity (i.e., make larger trades) in treated stocks prior to the loan announcements. Second, we expect the trades in treated stocks by connected hedge funds to be more profitable when compared to appropriate control groups.

To test the hypothesis, we use the dataset described in Section 2 above that combines data on hedge funds, hedge fund prime-broker banks, loan originations, and hedge fund 13F stock and option holdings. Our unique setting allows us to explore both (i) across-stock variations within each hedge fund portfolio and (ii) across-fund variation within each stock event. We illustrate our

test design with the following example. Hedge fund H1 uses prime broker P1. Hedge fund H2 uses prime broker P2. Both funds own and trade in Microsoft and Apple shares. Prime broker P1's affiliated bank makes a loan to Microsoft. We refer Microsoft as the treated stock and H1 as the connected hedge fund. If our hypothesis is true, H1 would be more informed about Microsoft. Our analysis examines whether H1 makes larger and more profitable trades in Microsoft prior to the loan announcement (i.e., the trade in treated stock by connected fund), compared to other trades, i.e., H1's trades in Apple and H2's trades in Microsoft.

In particular, we carry out the following regression to test our hypothesis:

$$y_{i,j,t} = \beta * Loan_{i,j,t} + \gamma_{i,t} + \kappa_{j,t} + \eta_{i,j,t}, \quad (1)$$

where *i* indexes hedge fund firms, *j* indexes stocks, and *t* indexes time. The dependent variable is either the size or next-quarter performance of the trade by hedge fund company *i* in stock *j* in quarter *t*. $Loan_{i,j,t}$ is an indicator variable equal to one if hedge fund company *i*'s prime-broker bank initiates a loan to stock *j* in the subsequent quarter, i.e., quarter *t+1*. $\gamma_{i,t}$ represents fund-company × quarter fixed effects, which allows us to control for both observable and unobservable time variant fund-company characteristics. Similarly, $\kappa_{j,t}$ represents stock × quarter fixed effects and allows us to control for both observable and unobservable time variant stock characteristics. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company × quarter and stock × quarter.

Essentially, our regression specification simultaneously explores (i) across-stock variations within each hedge fund portfolio and (ii) across-fund variation within each stock event. Our unique setting allows us to include both sets of high-dimensional fixed-effects in the regressions.[9] For a

[9] We also find similar results if we include only one set of the high-dimensional fixed effects, either fund-company × quarter or stock × quarter fixed effects (see Tables IA.1-3 of the Internet Appendix for details).

given loan event, certain hedge funds are "connected" based on their prime-broker banks whereas others are not. This variation allows us to include stock × quarter fixed effects. Similarly, for a given hedge fund company in a quarter, some of the fund's stock positions are in firms that obtain a loan from the fund's prime-broker banks while other stock positions are in firms that either do not obtain a loan or obtain a loan from a different bank. This variation allows us to use fund company × quarter fixed effects. Using our example above where Microsoft receives a loan, this test uses all four trades in the estimation and filters out any time variant omitted variable specific to hedge fund H1 or Microsoft in that quarter.

Controlling for time variant fund-company and stock characteristics is necessary to address concerns that (i) treated stocks are different from non-treated stocks and (ii) connected hedge funds are different from non-connected funds. In particular, it eliminates the following two concerns at the same time: (i) value-relevant nonpublic information about the treated loan stock can reach both connected and non-connected hedge funds through other channels; (ii) connected hedge funds might simply be more skilled and thus make informed trades in both treated and untreated stocks. In short, this specification allows us to control for many potential confounding effects and rules out alternative explanations that connected hedge funds make informed trades in treated stocks for reasons unrelated to their prime-broker connection.

4. Empirical Results

4.1. Hedge Fund Trading Before Loan Announcements

In this section, we examine hedge funds' trades in the stocks of firms to whom their prime broker's affiliated bank initiates a loan. We have two conjectures if connected hedge funds gain an information edge due to their prime-broker connection. First, we expect these hedge fund clients

to exhibit abnormal trading activity (i.e., make larger trades) in treated stocks prior to the loan announcements. Second, we expect the trades in treated stocks by connected hedge funds to be more profitable compared to appropriate control groups.

We start with analyzing hedge funds' trade size in the calendar quarter before a loan announcement. We define a loan event as an instance where a bank initiates a loan to a firm. Our hypothesis is that, if hedge funds obtain an information advantage from their prime-broker connection about these stocks, they will make bigger size changes in their portfolios for these treated stocks in the quarter before the loan event.

To test this hypothesis, we estimate a regression as in Eq. (1) as discussed in Section 3 above. However, unlike other events like mergers, the direction of the stock price reaction to the announcement of a loan is not obvious ex-ante. In fact, just 47.6% of these loan events have positive 3-day (-1 day to +1 day) cumulative abnormal returns. For this reason, we use $|\Delta Ownership|_{i,j,t}$, the absolute value of the change in fund company *i*'s ownership in stock *j* scaled by its AUM in the quarter prior to the loan being initiated (i.e., change from the holdings at the end of *t*-1 to the holdings at the end of *t*), as the dependent variable in these regressions. Note that quarter *t* refers to the quarter prior to the loan announcement quarter in our regression specifications. We use the change in stock holdings for the quarter prior to the loan announcement to ensure that we are not capturing trade decisions driven simply by the public announcement of the loan. Because our regressions include both fund-company × quarter and stock × quarter fixed effects, any potential fund-company or stock control variables would be subsumed by these fixed effects.

[Insert Table 2 about here]

We present the estimation results in Column 1 of Table 2. The key coefficient of interest, *Loan*, is positive and statistically significant at the 1% level. Specifically, the coefficient on *Loan* is 0.027 with a *t*-statistic of 3.97. Our result indicates that connected hedge funds make trades in treated stocks that are 2.7 bps larger in size than the trades in the control groups. Given that the sample mean and median of $|\Delta Ownership|$ are 32 bps and 6 bps, this effect is economically large.

Next, we investigate whether connected hedge funds have abnormal performance in their trades of these treated stocks. The result on larger size trades by connected hedge funds in treated stocks does not necessarily indicate that these are informed trades. If hedge funds gain an information advantage due to their relationship with their prime brokers, one would expect these funds to make both larger and more profitable trades before loan events. To test this conjecture, we estimate the regression described in Eq. (1) in which the dependent variable is a measure of trade performance.

We create trade performance measures at the fund-stock-quarter level by combining information on a given stock's abnormal returns over a performance window and a given fund's trade on that stock. The nature of the 13F holdings data dictates our choice of the return window. We calculate a stock's cumulative abnormal return over each calendar quarter. This makes performance comparison across funds and stocks straightforward since different loans are initiated on different dates during any given quarter. The first stock abnormal return measure we compute is *Four-Factor Alpha*. It is calculated using the Carhart (1997) model, which includes the Fama-French (1993) market, size, and value factors plus the momentum factor (Jegadeesh and Titman (1993)). We first estimate the betas for each stock in a quarter using the past year's daily stock returns. We then calculate the quarterly *Four-Factor Alpha* as the fund's cumulative return for a given quarter minus the sum product of its factor exposures times the factors' cumulative returns.

Our second return measure is *DGTW*, which we compute as the difference between the stock's cumulative monthly return and that of its characteristic-based portfolio as in Daniel et al. (1997). We use the change in ownership from the quarter prior to the loan is announced to remove any influence of the public announcement on the hedge funds' portfolio decisions.

Our trade profitability measures are equal to the product of the fund's change in ownership scaled by AUM in the calendar quarter before the loan announcement and the stock abnormal return in the subsequent quarter (i.e., the quarter of the loan announcement). For example, if a fund reduces its holding for a stock in the quarter prior to the loan announcement by 1% of AUM and the abnormal return measure for the stock in the subsequent quarter is -3%, the trade profitability measure is 0.03%, or 3bps (=-1% × -3%). These measures can be interpreted as the incremental contribution to the fund company's quarterly abnormal return from the trade in a given stock. It is important to note that this calculation "signs" and "scales" a given stock return variable for each fund based on the direction and size of that fund's trade. We compare the performance of the funds' trading in the stocks receiving loans to other trades using these profitability measures.

We estimate the regression specification in Eq. (1) and present the results in Columns 2 and 3 of Table 2. The coefficients on *Loan* are positive and statistically significant at the 5% level in both cases. Our results indicate that connected funds' trading in treated stocks outperform other types of trades by between 0.290 and 0.243 basis points per quarter based on *Four-Factor Alpha* and *DGTW*, respectively. These estimates are economically significant as their magnitudes are almost twice as large as the sample average of 0.07 bps per quarter. Given that the average connected fund company in our sample has AUM of $2,837.73 million, this outperformance translates to an additional $68,957 - $82,294 in abnormal quarterly profits per trade for a connected hedge fund company. Given that the average connected fund company holds six treated stocks in

a given quarter, this result suggests that the fund company is receiving additional abnormal profits of $413.7k - $493.8k per quarter from their trades in the stocks of firms to whom the fund's prime-broker bank provides a loan.

In summary, the results in Table 2 show that the connected hedge funds make abnormally large trades prior to the loan announcement and these trades display superior performance, which supports the idea that these hedge funds gain an information advantage from their prime-broker connections.

4.2. Revenue Potential for Prime Brokers and Hedge Fund Trading Performance

In this subsection, we explore the economic incentives for prime brokers to provide this service to their hedge fund clients. Specifically, we examine whether the information advantage that connected hedge funds have is increasing in the strength of their relationship with the prime-broker bank. We use a hedge fund's revenue generation potential to the prime-broker bank to proxy for their relationship strength. To test this conjecture, we carry out the following regression:

$$y_{i,j,t} = \beta_1 * I_{i,t} * Loan_{i,j,t} + \beta_2 * Loan_{i,j,t} + \gamma_{i,t} + \kappa_{j,t} + \eta_{i,j,t}, \qquad (2)$$

where the dependent variable is trade performance as described above; $I_{i,t}$ is an indicator variable for the strength of hedge fund *i*'s relationship with the prime broker; $\gamma_{i,t}$ represents fund-company × quarter fixed effects; $\kappa_{j,t}$ represents stock × quarter fixed effects. Note that the direct effect of the indicator variable gets absorbed in the fund-company × quarter fixed effects.

Since we do not directly observe the fees each hedge fund client pays to its broker(s), we use two proxies for this variable. Our first proxy for this variable is the level of a fund company's AUM in long-short equity strategies. Because prime brokers earn commissions by executing trades and providing financing for leveraged and short positions, fund companies that primarily trade in

equities and those who take short positions presumably generate more revenue for the prime brokers.[10] We expect investment banks to have stronger relationships with these clients. For this reason, we expect that these hedge fund clients will perform better on the loan stocks in their portfolios. In particular, we construct an indicator variable, *High Equity AUM*, to be equal to 1 when a fund company is in the top quartile of equity AUM and 0 otherwise. If larger revenue potential leads to more information edge for hedge fund clients, we expect the coefficient on *Loan* × *High Equity AUM* to be positive and statistically significant.

We present the results in Panel A of Table 3. The evidence supports our prediction. The coefficients on *Loan* × *High Equity AUM* are large and statistically significant at the 5% level for both profitability measures. Connected fund companies with high levels of equity AUM outperform connected funds with lower equity AUM on their trades of treated stocks by 0.432 – 0.451 basis points per quarter. In dollar terms, these numbers correspond to $250,849 and $260,714 in additional abnormal quarterly trading profits per connected trade for an average connected fund company in the high equity AUM group.

[Insert Table 3 about here]

Next, we construct an additional variable that measures another source of revenue for prime brokers – funds' use of leverage financing. Our financing measure for each fund company is constructed by multiplying the AUM of each equity fund by an indicator variable that takes the value of 1 if the fund uses leverage or margin financing. The variable *High Leverage* equals 1 when a fund company is in the top quartile of our measure of financing and 0 otherwise. We

[10] A report by Barclays Capital Solutions Group in 2015, titled "More with Less – Impact of Regulations on the Hedge Fund Financing Model", notes that long-short equity and statistical arbitrage funds are the two most valuable types for prime brokerage revenues. Statistical arbitrage funds do not have a large impact in our setting given their investment strategies are unlikely to rely on the type of fundamental information obtained from corporate lending activities.

estimate Eq. (2) using this variable and present the results in Panel B. We find that funds with higher broker financing outperform other connected funds with lower broker financing on their trades of treated stocks by 0.498 to 0.538 basis points per quarter. These results provide further evidence in support of our main hypothesis as they suggest that the information advantage to hedge fund firms depends on the strength of relationship with their prime-broker banks.

4.3. Information Asymmetry and Hedge Fund Trading Performance

The information edge that a connected hedge fund can potentially derive from the connection to their prime-broker banks depends on the information asymmetry between insiders of a firm and the outside market. Prior literature has shown that investment managers invest more and perform better in their trades in stocks with high information asymmetry when they have an information advantage in those stocks (e.g., Coval and Moskowitz (2002), Teo (2009)). We construct several proxies for high information asymmetry about the borrowing firm and carry out the following regression:

$$y_{i,j,t} = \beta_1 * I_{j,t} * Loan_{i,j,t} + \beta_2 * Loan_{i,j,t} + \gamma_{i,t} + \kappa_{j,t} + \eta_{i,j,t}, \qquad (3)$$

where the dependent variable is trade performance as described above; $I_{j,t}$ is an indicator variable for high information asymmetry in stock j; $\gamma_{i,t}$ represents fund-company × quarter fixed effects; $\kappa_{j,t}$ represents stock × quarter fixed effects. Note that the direct effect of the indicator variable for high information asymmetry gets absorbed in the stock × quarter fixed effects.

Our first proxy for high information asymmetry about the borrowing firm is based on the firm's senior unsecured ratings.[11] We divide our sample borrowers into two groups: borrowers

[11] A number of prior studies, including Dennis and Mullineaux (2000), Ivashina (2009), and Ross (2010), use bond ratings as proxies for information asymmetry about a firm.

with an investment grade rating at the time of loan and borrowers without such a rating. In the regression specification, $I_{j,t}$ equals 1 when a borrower does not have an investment grade rating, i.e., it either has a speculative grade rating or it is not rated at all. Panel A of Table 4 reports the results of this analysis. Consistent with our hypothesis, we find that connected funds' outperformance is greater in their trades in treated stocks with high information asymmetry compared to their trades in treated stocks with low information asymmetry. The coefficients on the interaction term, *Loan* × *Unrated/Speculative* dummy, are 0.175 and 0.185 and statistically significant at the 5% level.

[Insert Table 4 about here]

Next, we use the syndicate size and the number of lead arrangers as proxies for underlying information asymmetry between borrowers and the outside market. Sufi (2007) finds that syndicate sizes are small when borrowing firms have high information asymmetry. On the other hand, when information asymmetry is not a concern, syndicates are large and the loan resembles a public debt. This follows from the intuition that banks have a relative advantage in screening and monitoring borrowers with high information asymmetry. Dennis and Mullineaux (2000) suggest that syndicated loans are positioned between the two extremes, sole-lender bank loans and public debt. We expect that connected funds' information advantage would be higher for borrowers with large information asymmetry, which we proxy by loans that have a small syndicate size (i.e., number of lenders is less than the median syndicate size in our sample) or a single lead arranger.

Panel B of Table 4 reports the results of the analysis in which we use the size of the syndicate as our measure of information asymmetry. Connected hedge funds outperform significantly more when the loan has a small syndicate size as compared to loans with large

syndicate size. Specifically, the coefficients for the interaction term, *Loan* × *Small Syndicate*, are 0.186 and 0.125 and statistically significant at the 5% level or better.

Lastly, in Panel C, we measure information asymmetry by examining the number of lead arrangers in the syndicate. Again, connected hedge funds' outperformance is significantly greater on loans that have a single lead arranger as compared to loans with multiple lead arrangers. Specifically, the coefficients on the interaction term, *Loan* × *Sole Lead*, are 0.132 and 0.064 and statistically significant.

4.4. Additional Analyses

4.4.1. Placebo Tests

The results in Tables 2 – 4 provide strong evidence consistent with our hypothesis. One potential explanation for our results that does not rely on sharing of information obtained in conjunction with underwriting by a bank is that perhaps there is a fund-broker-stock informational relationship that is present regardless of the underwriting of a loan. To rule out this possibility, we conduct placebo tests in which we change the loan initiation dates for each treated stock. If hedge funds' performance edge is coming from information uncovered by their prime broker banks *during* the due diligence process, we should not find any evidence of outperformance in "placebo" quarters when the banks are not involved in the loan process. Specifically, we estimate the same regressions as in Columns 2 and 3 of Table 2 except that we change the loan initiation dates to one or two-years prior to the actual dates. Table 5 contains the results of these placebo tests, with Panel A using minus one-year and Panel B using minus two-year. In both panels, we find that the coefficients on *Loan* are small in magnitude and statistically insignificant. These results suggest

that the information connected funds are trading on is only obtained during the time period in which their prime-broker bank is actually making the loan.

[Insert Table 5 about here]

4.4.2. Lead vs. Non-Lead Banks

In a syndicated loan, the lead arranger establishes a relationship with the firm, performs screening and due diligence, and negotiates terms of the contract. The lead arranger then turns to participant lenders to arrange commitments to fund portions of the loan (e.g., Dennis and Mullineaux (2000), Sufi (2007)). While the participants receive an "information memorandum" from the lead that contains descriptive and financial information concerning the borrower, participants are not involved in due diligence or negotiations with the borrower. Hence, we do not expect the participant lenders to have all nonpublic information about the borrower that the lead uncovers during the due diligence process. Consequently, hedge funds whose prime-broker banks participate in loans but do not perform the role of lead arranger might not gain an information edge.

[Insert Table 6 about here]

To test this hypothesis, we rerun the analysis in Table 2 except that *Loan* now equals one if hedge fund company *i*'s prime-broker bank is a participant in a loan to stock *j*. For this analysis, we exclude fund-stock-quarter observations where a hedge fund's prime-broker bank is a lead arranger in a loan to the firm. The results of this analysis are reported in Table 6. The coefficient on *Loan* is small and statistically insignificant from zero in both columns. This suggests that hedge funds whose prime-broker banks are mere participants in a loan (and not the lead arranger) do not gain an information edge in their trades on the borrowing firm's stock. This result highlights the

unique role of lead prime-broker banks in the information brokerage function that we document in this paper.

4.4.3. Information Advantage or Temporary Price Pressure?

Our baseline results show that hedge funds earn abnormally high returns in their trades in the shares of firms that borrow from the fund's prime-broker bank. We now examine whether the superior performance we document is driven by an informational edge or temporary price pressure. The latter explanation is possible if trades in the loan stock made by the connected hedge funds (and possibly other market participants) create a temporary price movement in the loan announcement quarter but later on reverse. To rule out this possibility, we examine the returns connected funds would earn on their trades in the loan stocks should they hold their positions for each of the next 4 quarters. More specifically, we re-estimate Eq. (1) but we change the quarter over which we calculate the stock's abnormal return. If the higher returns connected funds earn is driven by temporary price pressure, any trading profits we observe in the loan announcement quarter would be lost once prices for the loan stocks revert to their fundamental levels.

[Insert Table 7 about here]

We present the regression results in Table 7. Columns 1 – 4 contain the results using *Four-Factor Alpha* as the return measure; Columns 5 – 8 contain the results with *DGTW* is the return measure. For convenience, we reprint our base results from Table 2 in Columns 1 and 5 of Table 7 to facilitate the comparison of the trading profits in the quarter in which the loan is initiated (i.e., t+1) and the trading profits connected funds would earn in subsequent quarters (i.e., t+2 to t+4). We do not find any evidence of performance reversal during the subsequent quarters. The coefficients on *Loan* for the subsequent quarters are small and statistically insignificant in all cases,

which suggests that connected funds' trading profits are not simply the result of temporary price pressure on the stocks receiving loans.[12] This finding further supports the conjecture that hedge funds gain valuable information edge due to their prime-broker connections.

4.4.4. What Type of Information Do Connected Hedge Funds Have?

One natural question that arises when considering our results revolves around the type of information hedge funds are able to extract about the firms receiving loans. Specifically, are hedge funds receiving information specific to a given loan contract or are they receiving more general information about the borrowing firm that is uncovered during the due diligence process? To answer this question, we recompute our stock return variables by subtracting the 3-day cumulative abnormal return (-1 day to +1 day) around a loan initiation date from the entire quarterly abnormal return. We then re-estimate the regressions in Columns 2 and 3 of Table 2 using the new stock return variables. If connected hedge funds are receiving information purely about the details of the loan contracts, then the connected hedge funds' trading profits should be driven by the announcement return when loan details are publicly disclosed. Hence, we would expect the coefficient on *Loan* to become statistically insignificant after removing the 3-day cumulative abnormal return around loan announcement. However, if funds are receiving information about the borrowing firms in general, we expect the coefficients to remain positive and statistically significant. We present the results from these tests in Table 8.

[Insert Table 8 about here]

[12] For robustness, we also estimated regressions using the cumulative abnormal returns for two, three, and four quarters and find that connected funds continue to earn positive and significant returns on their trades of treated stocks for all horizons.

We continue to find positive and statistically significant coefficients on *Loan*. In fact, the coefficients for both the regressions of *Four-Factor Alpha* and *DGTW* are almost identical to those on the same regressions in Table 2. Specifically, the coefficient on *Loan* in Column 2 changes from 0.290 to 0.239 while the coefficients in Column 3 change from 0.243 to 0.209. These results suggest that the funds are receiving information about the firms in general rather than just information specific to the loans themselves.

4.4.5. Loan Announcement Time

In this section, we divide our sample of loan events based on when the loan occurs during the quarter. We would expect that the 13F holdings changes from the beginning to the end of quarter $t-1$ to be more likely to reflect informed trading if the loan was announced in the first half of quarter t. The reason is that the quarterly frequency 13F holdings data is less likely to capture informed trades prior to loan announcement if the loan occurs in the later months of the calendar quarter. For example, if a loan deal is closed and publicly announced late in a calendar quarter (e.g., September 20th), it is less likely that the lead bank would have already performed the necessary due diligence and uncovered valuable non-public information by the end of the previous quarter (e.g., June 30th).

To test this conjecture, we construct two indicator variables, *Half1* and *Half2*, which are equal to 1 for stocks that announce loans in the first and second half of the quarter, respectively, and 0 otherwise. We then estimate the following regressions:

$$y_{i,j,t} = \beta_1 * Half1_{j,t} * Loan_{i,j,t} + \beta_2 * Half2_{j,t} * Loan_{i,j,t} + \gamma_{i,t} + \kappa_{j,t} + \eta_{i,j,t}, \qquad (4)$$

where the dependent variables are trade performance as described above; $\gamma_{i,t}$ represents fund-company × quarter fixed effects; $\kappa_{j,t}$ represents stock × quarter fixed effects. Note that the direct

effect of the indicator variable for loan announcement time gets absorbed in the stock × quarter fixed effects. We present the results of these regressions in Table 9.

[Insert Table 9 about here]

The results are consistent with our intuition. We find that the coefficients on *Loan*×*Half1* are positive and statistically significant at the 1% level, while those on *Loan*×*Half2* are much smaller and less statistically significant. The coefficients on *Loan*×*Half1* are at least 1.5 times as large as the coefficients on *Loan*×*Half2*, though the difference in the two coefficients is not statistically significant at conventional levels. In untabulated results, we also find that hedge funds make larger size trades (based on changes in quarterly holdings) on the stocks of firms who receive loans in the first half of the quarter, compared to the second half of the quarter. Taken together, the results suggest that funds' quarterly holdings capture larger and more profitable trades on treated stocks when loan events are closer to the holdings report date.

4.4.6. Buys vs. Sells

One natural question that arises is whether the trading profits we documented above are equally driven by connected hedge funds' buy vs. sell trades (i.e., increases vs. decreases in a position). To investigate this issue, we estimate the following regression:

$$y_{i,j,t} = \beta_1 * Buy_{i,j,t} * Loan_{i,j,t} + \beta_2 * Sell_{i,j,t} * Loan_{i,j,t} + \lambda * Buy_{i,j,t} + \gamma_{i,t} + \kappa_{j,t} + \eta_{i,j,t}, (5)$$

where *Buy* is an indicator variable equal to 1 for observations in which fund *i* increases or hold constant its position in stock *j* in quarter *t*, *Sell* is an indicator variable equal to 1 for observations in which fund *i* decreases its position in stock *j* in quarter *t*. We present results of these regressions in Table 10.

[Insert Table 10 about here]

As shown in both columns of Table 10, the coefficients of *Loan×Buy* are positive and significant at the 1% level, while the coefficients of *Loan×Sell* are insignificant, which means that the buy trades are driving the abnormal profits of connected hedge funds we document in Table 2. There could be multiple explanations for this finding. It is possible that positive information is more likely to be shared and prime brokers are cautious about sharing any negative information regarding their corporate loan clients. Alternatively, it could be the case that our tests do not capture informed trading on negative news as cleanly as they capture informed trading on positive news. For example, it is possible that hedge funds use derivatives markets to trade on negative news. Regardless, the fact that our trading profitability results are concentrated in funds' buy trades rather than their sell trades helps rule out the possibility that our results are driven by an inability to observe short positions in the 13F holding data. This data limitation would only affect our analysis of the sell trades, rather than that of the buy trades.

4.4.7. Option Trading

In our last set of analysis, we examine hedge funds' equity option holdings from their 13F filings. Equity option holdings provide an additional setting to test our hypothesis. It also allows us to ensure that our results are not ignoring potential profitable trading in derivatives by hedge funds. In particular, we use hedge funds' trades of call and put options to determine whether connected funds continue to trade more profitably in securities of firms that receive loans from their prime broker banks.[13]

We estimate trade profitability in the same way as in our prior analyses, by multiplying a hedge fund's change in its option position by the stock's abnormal return in the next quarter. To

[13] In 3,505 out of the 13,090 (about 27.78%) distinct fund-quarters in our sample, hedge fund firms hold at least one equity option position.

calculate a fund's change in exposure to the stock underlying the options, we multiply the changes in the value of underlying shares by 0.5 and then divide it by the hedge fund firm's total AUM.[14] Because options represent leveraged positions, the average size for these trades is significantly higher than that of the funds' equity trades (see Panel A of Table 11). Specifically, we estimate the following regression:

$$y_{i,j,t} = \beta_1 * Call_{i,j,t} * Loan_{i,j,t} + \beta_2 * Put_{i,j,t} * Loan_{i,j,t} + \lambda * Call_{i,j,t} + \gamma_{i,t} + \kappa_{j,t} + \eta_{i,j,t}, \quad (6)$$

where *Call* is an indicator variable equal to 1 for observations in which fund *i* held call options for stock *j* in quarter *t* and *Put* is an indicator variable equal to 1 for observations in which fund *i* held put options for stock *j* in quarter *t*. $y_{i,j,t}$ continues to represent the profitability of fund *i*'s trade in stock *j* in quarter *t*. Table 11 contains the results.

[Insert Table 11 about here]

The results in Panel B of Table 11 show that connected funds' call option trades in firms receiving loans from their prime broker banks are significantly more profitable compared to the control groups, while the profitability of their trades in put options is not statistically different from the control groups. There are three points to make about this result. First, it provides further evidence that connected hedge funds gain an informational advantage from their prime broker banks. Second, the fact that the abnormal profitability comes from connected funds' call positions and not their put positions is consistent with the buy vs. sell analysis in the previous section. Lastly, since connected funds betting against loan stocks could potentially use put options, the fact we only observe profitable trading in calls provides suggestive evidence that the profitability of trades

[14] According to the 13F disclosure rule for holdings of equity options, the institutional investor needs to report in the 13F form the number of shares and the value in terms of the stock underlying the options, not the options themselves. In addition, the strike price and expiration date of the options are not required to be disclosed, which limits our ability to calculate precisely the delta of each option position. For simplicity, we assume the delta of all option position is 0.5 (roughly at the money).

being concentrated in "buys" rather than "sells" is likely to be driven by selective sharing of positive information rather than the result of non-connected funds having unobserved short positions in treated firms' stock.

5. Conclusion

Prime brokers' traditional roles to hedge funds include providing financing, trade execution, custody services, and capital introduction. In this paper, we document a new value-added function that prime broker banks provide to their hedge fund clients: an information advantage regarding the banks' corporate clients. We use the setting of loan originations to identify the possession of nonpublic information by banks and test whether hedge funds gain an information advantage from the unique relationship they have with their prime-broker banks. Consistent with our hypothesis, we find that hedge funds make informed trades on the stocks of firms that obtain loans from the funds' prime-broker banks.

In particular, we find that connected hedge funds make abnormally large trades prior to the loan announcement and these trades subsequently generate superior performance compared to other trades. In dollar terms, this outperformance translates to $413.7k - $493.8k in abnormal profits per quarter for an average connected hedge fund company in our sample. Furthermore, the outperformance is particularly strong for (i) trades of connected hedge funds with high revenue generation potential for prime brokers, and (ii) trades in borrowing firms with high information asymmetry. In addition, we find that the information edge connected hedge funds have is about the borrowing firm in general, rather than purely about the loan. Finally, we find that the information advantage regarding the borrowing firm is not present for hedge funds whose prime-broker banks participate in loans but do not perform the role of lead arranger.

Our evidence of informed trading ahead of loan announcements is consistent with material nonpublic information flow from prime-broker banks to their hedge fund clients. It is also possible that the information shared is immaterial on its own but becomes valuable once combined with other information signals that these connected hedge funds have. Regardless of the source of the information advantage by connected hedge funds, our analysis uncovers that prime-broker banks provide a valuable function of "information brokerage" to hedge fund clients.

Our results have implications for academics as well as regulators. For academics, our paper adds to our understanding of the roles that prime-broker banks play in the financial industry. It also sheds light on the potential sources of nonpublic information that sophisticated investors such as hedge funds enjoy. For regulators, our evidence suggests that it is possible that certain financial institutions could be breaching the Chinese walls that are supposed to exist between divisions to provide information to more favored clients.

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Table 1 – Summary Statistics

Panel A of this table reports summary statistics for the hedge fund company variables we use in our analysis. We report the statistics of these variable tabulated at the fund company-quarter level. Panel B contains summary statistics for the stock holding variables we use in our analysis. The statistics for these variables are tabulated at the individual holding level (i.e., fund company-quarter-stock level). |*ΔOwnership*| is the absolute value of the percentage change of a fund company's AUM for a given stock holding. *Loan* is an indicator variable equal to 1 if the hedge fund company's prime broker initiates a loan on the stock in the following quarter, and 0 otherwise. *Four-Factor Alpha* is calculated using the Carhart (1997) model. We first estimate the betas for each stock in a quarter using the past year's daily stock returns and then calculate the quarterly *Four-Factor Alpha* as the fund's cumulative return for a given quarter minus the sum product of its factor exposures times the factors' cumulative returns. *DGTW* is calculated as the difference between the stock's cumulative monthly return in a given quarter and that of its characteristic-based portfolio as in Daniel et al. (1997). *Alpha × ΔOwnership* and *DGTW × ΔOwnership* are trade profitability measures, equal to the product of the fund's ownership change in a stock (*ΔOwnership*) in a calendar quarter and the next-quarter stock abnormal return (*Four-Factor Alpha* or *DGTW*). All variables in Panels A and B are winsorized at the 1% and 99% levels. Panel C presents summary statistics for the characteristics of the 9,064 unique loans we use in our analysis.

Panel A. Fund Company Variables

				Distribution		
	N	Mean	Std. Dev	10th	50th	90th
Number of Stocks Held	11,619	131.69	216.57	17.00	60.00	306.00
Number of Loan Stocks Held	11,619	2.76	6.40	0.00	0.00	7.00
Number of Prime Brokers	11,619	1.96	1.22	1.00	2.00	4.00
Fund Company AUM (in $ mill.)	11,619	1,778.95	7,445.41	84.51	410.05	2,875.32

Panel B. Stock Holding Characteristics

				Distribution		
	N	Mean	Std. Dev	10th	50th	90th
|ΔOwnership| (scaled by AUM)	1,813,816	0.32%	0.68%	0.00%	0.06%	0.88%
ΔOwnership (scaled by AUM)	1,813,816	0.00%	0.01%	0.00%	0.00%	0.00%
Loan	1,813,816	0.017	0.129	0.000	0.000	0.000
Four-Factor Alpha (quarterly)	1,813,816	-0.11%	19.20%	-22.19%	-0.52%	21.43%
DGTW (quarterly)	1,811,776	0.00%	18.66%	-21.48%	-0.57%	21.31%
Alpha × ΔOwnership (basis point)	1,813,816	0.068	8.934	-3.851	0.000	3.993
DGTW × ΔOwnership (basis point)	1,811,776	0.071	8.711	-3.760	0.000	3.918

Panel C. Loan Characteristics

				Distribution		
	N	Mean	Std. Dev	10th	50th	90th
Size of Loan ($ million)	8,895	1,103.85	2,011.34	111.20	500.00	2500.00
# Members of Syndicate	8,908	10.79	9.96	2.00	8.00	22.00
# Leads	8,908	2.27	1.80	1.00	2.00	4.00
# Facilities Per Loan	8,908	1.48	0.95	1.00	1.00	2.00

Table 2 –Hedge Fund Trading Before Loan Announcements

This table reports results that compare the size and returns on hedge funds trades in stocks of firms that receive loans from their prime broker's affiliated banks, to returns of other trades in the control group. Trade size is calculated as the absolute change in ownership (in percentage points of assets of management). We calculate trade returns as $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company *i*'s portfolio weight change in stock *j* in quarter *t* and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock *j* over the quarter *t+1*. Column 1 contains the results for trade size while Columns 2 and 3 contain the results for trade profitability. All regressions are estimated based on Eq. (1) with both fund-company × quarter and stock × quarter fixed effects. The variable of interest is *Loan*, an indicator variable equal to one if hedge fund company *i*'s prime-broker bank initiates a loan to stock *j* in quarter *t+1*, and zero otherwise. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
	|ΔOwnership|	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan	0.023***	0.290***	0.243***
	(3.05)	(3.43)	(2.90)
Fund Comp. × Qtr. FE	Yes	Yes	Yes
Stock × Qtr. FE	Yes	Yes	Yes
Observations	1,748,521	1,748,521	1,746,623
Adj. R-squared	0.442	0.0314	0.0319

Table 3 – Revenue Potential to Prime Brokers and Performance of Hedge Fund Trades

This table reports the estimation results of Eq. (2) to examine whether the information advantage that hedge funds gain from their prime-broker connection is related to their revenue potential to prime brokers. The dependent variable is trade returns, $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company *i*'s portfolio weight change in stock *j* in quarter *t* and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock *j* over the quarter *t+1*. In Panel A, revenue potential is measured by hedge funds' AUM in equity styles (e.g., long-short or market neutral). The indicator variable, *High Equity AUM*, equals to 1 when a hedge fund company is in the top quartile of equity AUM and 0 otherwise. In Panel B, revenue potential is measured by hedge funds' use of prime broker financing. The variable, *High Leverage*, equals 1 when a fund company is in the top quartile of leverage usage, and 0 otherwise. Leverage usage is measured by multiplying the AUM of fund by an indicator variable that takes the value of 1 if the fund uses leverage or margin financing. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. High Equity AUM

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan × High Equity AUM	0.432**	0.451**
	(2.17)	(2.20)
Loan	0.123*	0.083
	(1.70)	(1.19)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,652,159	1,650,389
Adj. R-squared	0.0340	0.0342

Panel B. High Leverage

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan * High Leverage AUM	0.538**	0.498**
	(2.25)	(2.10)
Loan	0.145*	0.122
	(1.92)	(1.65)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,469,300	1,467,715
Adj. R-squared	0.0358	0.0362

Table 4 – Information Asymmetry and Performance of Hedge Fund Trades

This table reports the estimation results of Eq. (3) to examine whether the information advantage that hedge funds gain from their prime-broker connection is related to information asymmetry about the borrowing firm. The dependent variable is trade returns, $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company i's portfolio weight change in stock j in quarter t and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock j over the quarter t+1. In Panel A, information asymmetry is measured by borrowing firm's credit rating. The indicator variable, *Unrated/Speculative*, equals to 1 when a borrowing firm either does not have a rating or has a speculative rating. In Panel B, information asymmetry is measured by the size of the lending syndicate. The variable, *Small Syndicate*, equals 1 when the number of lenders in a loan is less than the median syndicate size in the sample. In Panel C, information asymmetry is measured by the number of lead arrangers in the syndicate. The variable, *Sole Lead*, equals 1 when a loan has exactly one lead arranger. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. t-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. Non-Investment Grade

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan × Unrated/Speculative	0.175**	0.185**
	(2.02)	(2.12)
Loan	0.008	-0.036
	(0.09)	(-0.44)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0312	0.0314

Panel B. Number of Lenders

	(1) Four-Factor Alpha × ΔOwnership	(2) DGTW × ΔOwnership
Loan × Small Syndicate	0.186***	0.125**
	(2.91)	(2.11)
Loan	0.059	0.046
	(1.45)	(1.23)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0312	0.0314

Panel C. Number of Lead Banks

	(1) Four-Factor Alpha × ΔOwnership	(2) DGTW × ΔOwnership
Loan × Sole Lead	0.132***	0.064*
	(3.23)	(1.67)
Loan	0.029*	0.022
	(1.81)	(1.53)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0318	0.0318

Table 5 – Performance of Hedge Fund Trades: Placebo Tests

This table reports results from placebo tests where we repeat the regression analysis in Columns 2 and 3 of Table 2, except that we change the loan origination dates to one- or two-years prior to the actual dates. Panel A presents the results by changing the loan origination date to one-year prior to the actual date and Panel B presents the results by changing it to two-year prior. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. One Year Prior

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan	0.062	0.069
	(0.82)	(0.92)
Fund Comp. × Qtr. FE	Yes	Yes
Stock-Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0452	0.0486

Panel B. Two Years Prior

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan	0.055	0.095
	(0.62)	(0.96)
Fund Com. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0452	0.0486

Table 6 – Performance of Hedge Fund Trades: Non-Lead Banks

This table reports results that compare returns on hedge funds trades in stocks of borrowing firms where the fund's prime-broker banks are non-lead participant banks in the loan, to returns of other trades in the control group. We calculate trade returns as $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company *i*'s portfolio weight change in stock *j* in quarter *t* and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock *j* over the quarter *t+1*. The table reports the results of multivariate regressions as in Eq. (1) with both fund-company × quarter and stock × quarter fixed effects. The variable of interest is *Loan*, an indicator variable equal to one if hedge fund company *i*'s prime-broker bank initiates a loan to stock *j* in the quarter *t+1*, and zero otherwise. In this analysis, we exclude fund-stock-quarter observations where a hedge fund's prime-broker bank is a lead arranger in a loan to the firm. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan	0.070	0.048
	(1.09)	(0.74)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,808,419	1,806,382
Adj. R-squared	0.0250	0.0250

Table 7 – Performance of Hedge Fund Trades: Information or Temporary Price Pressure?

This table reports the estimation results of Eq. (1) to examine whether the information advantage that hedge funds gain from their prime-broker connection is permanent or temporary. The dependent variable is trade returns, $\Delta Ownership_{i,j,t} \times Return_{j,t+k}$, that is, the product of hedge fund company i's portfolio weight change in stock j in quarter t and a subsequent quarter stock abnormal return. $Return_{j,t+k}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock j over the quarter t + k where k=1, 2, 3, or 4. Note that the results in Columns 1 and 5 of this table are the same as in Columns 2 and 3 of Table 2, respectively. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. t-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	Four-Factor Alpha × ΔOwnership				DGTW × ΔOwnership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	t+1	*t+2*	*t+3*	*t+4*	*t+1*	*t+2*	*t+3*	*t+4*
Loan	0.290***	0.080	-0.068	0.030	0.243***	0.062	-0.049	0.081
	(3.43)	(1.05)	(-1.11)	(0.50)	(2.90)	(0.86)	(-0.74)	(1.37)
Fund Comp. × Qtr. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock × Qtr. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,748,521	1,715,938	1,686,520	1,657,921	1,746,623	1,714,067	1,684,636	1,656,049
Adj. R-squared	0.0312	0.0304	0.0290	0.0275	0.0314	0.0303	0.0287	0.0278

Table 8 – Information Content: Loan vs. Firm

This table reports results of our investigation of whether the information that connected hedge funds have is specific about the loan or about the firm in general. To test this idea, we repeat the analysis in Columns 2 and 3 of Table 2 except that we remove the three-day loan announcement return from the treated stock abnormal return measures. The dependent variable is trade performance, measured by the product of hedge fund company *i*'s portfolio weight change in stock *j* in quarter *t* and the subsequent quarter stock abnormal return (either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return). Standard errors are adjusted for heteroscedasticity and clustered by fund-company and stock. *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan	0.239***	0.209**
	(2.91)	(2.57)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0309	0.0313

Table 9 – Loan Announcement Time and Hedge Fund Trades

This table reports the estimation results of Eq. (4) to examine whether the returns of hedge fund trades as measured by 13F holding changes vary with the loan announcement time during the quarter. We construct two indicator variables, *Half1* and *Half2*, which are equal to 1 for stocks that announce loans in the first and second half of the quarter, respectively, and 0 otherwise. We interact each of them with the indicator variable, *Loan*. The dependent variable is the performance of hedge fund trades, measured by the product of hedge fund company *i*'s portfolio weight change in stock *j* in quarter *t* and the subsequent quarter stock abnormal return (either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return). Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan × Half1	0.365***	0.341***
	(3.37)	(3.06)
Loan × Half2	0.226**	0.158
	(2.31)	(1.59)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0314	0.0319

Table 10 – Performance of Hedge Fund Trades: Buys vs. Sells

This table reports the estimation results of Eq. (5) to examine whether the information advantage that hedge funds gain from their prime-broker connection is concentrated in either their buy or sell trades. The dependent variable is trade returns, $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company i's portfolio weight change in stock j in quarter t and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock j over the quarter t+1. *Buy* is an indicator variable equal to 1 for fund-stock-quarter observations in which a fund increased or kept constant the number of shares it held and 0 otherwise. *Sell* is equal to 1 − *Buy*. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. t-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan × Buy	0.484***	0.508***
	(3.34)	(3.39)
Loan × Sell	0.122	0.014
	(1.09)	(0.13)
Buy	-0.082*	-0.005
	(-1.90)	(-0.14)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	1,748,521	1,746,623
Adj. R-squared	0.0314	0.0319

Table 11 – Equity Option Trading of Hedge Funds

Panel A of this table reports summary statistics of hedge fund trading in equity options based on data from 13F filings. *ΔOwnership* measures a fund's change in exposure to the stock underlying the options. To calculate it, we multiply the changes in the value of underlying shares by 0.5 (assuming option delta equal to 0.5) and then divide it by the hedge fund firm's total AUM. Other variables are defined the same way as in Table 1. Panel B of this table reports the estimation results of Eq. (6) to examine whether the information advantage that hedge funds gain from their prime-broker connections is also present in their trading of option securities. The dependent variable is trade returns, $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company i's portfolio weight change in exposure to stock j underlying the options in quarter t and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock j over the quarter t+1. *Call* is an indicator variable equal to 1 for fund-stock-quarter observations in which a fund held call options and 0 otherwise. *Put* is an indicator variable equal to 1 for fund-stock-quarter observations in which a fund held put options and 0 otherwise. Standard errors are adjusted for heteroscedasticity and double clustered by fund-company and stock. t-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. Summary Statistics

				Distribution		
	N	Mean	Std. Dev	10th	50th	90th
ΔOwnership	122,822	0.07%	9.28%	-0.40%	0.00%	0.43%
Call	122,822	0.523	0.499	0.000	1.000	1.000
Four-Factor Alpha	122,822	0.08%	19.36%	-19.33%	0.04%	19.37%
DGTW	122,711	0.15%	19.01%	-18.97%	0.09%	19.28%
Alpha × ΔOwnership (basis point)	122,822	0.037	114.908	-3.591	0.000	3.427
DGTW × ΔOwnership (basis point)	122,711	-0.158	86.268	-3.454	0.000	3.370

Panel B. Regression Results

	(1)	(2)
	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan × Call	9.878*	13.271*
	(1.78)	(1.85)
Loan × Put	-0.318	0.187
	(-0.08)	(0.05)
Call	-0.910	-0.256
	(-1.54)	(-0.76)
Fund Comp. × Qtr. FE	Yes	Yes
Stock × Qtr. FE	Yes	Yes
Observations	110,064	109,962
Adj. R-squared	0.012	0.010

Internet Appendix

"Prime (Information) Brokerage"

Table A – Variable Definition

Variable	Description
Fund-company variables	
Number of Stocks Held	The total number of stocks disclosed in the fund company's 13F filing in a given quarter.
Fund Returns	The average of the annual returns of the hedge funds managed by a fund company.
Fund Flows	The average of annual percentage flows of the hedge funds managed by a fund company.
Fund Size	The average of the assets under management of the hedge funds managed by a fund company.
Management Fee	The average management fee changed by the hedge funds managed by a fund company.
Incentive Fee	The average incentive fee changed by the hedge funds managed by a fund company.
Lockup Period	The average lockup period, in months, enforced by the hedge funds managed by a fund company.
High Water Mark	The percentage of hedge funds managed by a fund company that have a high water mark provision.
Offshore	The percentage of hedge funds managed by a fund company that are domiciled offshore.
Stock-holding variables	
$\lvert \Delta Ownership \rvert$	The absolute value of the percentage change of a fund company's AUM for a given stock holding.
Momentum	The cumulative stock return for the prior six months.
Institutional Ownership	The percentage of shares outstanding owned by 13F institutions
Market Capitalization	The total number of shares outstanding multiplied by current share price.
Amihud	Monthly average of the square root of the absolute value of the daily return over daily dollar volume (scaled by 10^6).
Book-to-Market	The ratio of the book value of equity (assumed to be available six months after the fiscal year end) over month-end market capitalization.

Table IA.1 – Summary Statistics of Control Variables

Panel A of this table reports summary statistics for the hedge fund company variables we use in our analysis. We report the statistics of these variable tabulated at the fund company – quarter horizon. Panel B contains summary statistics for the stock holding variables we use in our analysis. The statistics for these variables are tabulated at the individual holding level. *Loan* is an indicator variable equal to 1 if the hedge fund company's prime broker initiates a loan on the stock in the following quarter, and 0 otherwise. *Four-Factor Alpha* is calculated using the Carhart (1997) model. We first estimate the betas for each stock in a quarter using the past year's daily stock returns and then calculate the quarterly *Four-Factor Alpha* as the fund's cumulative return for a given quarter minus the sum product of its factor exposures times the factors' cumulative returns. *DGTW* is calculated as the difference between the stock's cumulative monthly return in a given quarter and that of its characteristic-based portfolio as in Daniel et al. (1997). All other variables in Panels A and B are defined in the Appendix and are winsorized at the 1% and 99% levels. Panel C presents summary statistics for the characteristics of loans we use in our analysis.

Panel A. Fund Company Control Variables

				Distribution		
	N	Mean	Std. Dev	10th	50th	90th
Fund Company AUM (in $ mill.)	10,918	9.28%	15.93%	-6.89%	8.19%	27.63%
Fund Returns	10,812	0.99%	3.65%	-2.73%	0.22%	5.62%
Fund Flow	10,918	47.41%	45.43%	0.00%	39.53%	100.00%
Management Fee	10,911	136.32%	36.58%	100.00%	142.99%	200.00%
Incentive Fee	10,911	18.62	3.55	15.00	20.00	20.00
Lockup Period (months)	10,886	0.85	0.31	0.22	1.00	1.00
High Water Mark (0/1)	10,918	0.35	0.40	0.00	0.15	1.00
Offshore (0/1)	10,918	9.28%	15.93%	-6.89%	8.19%	27.63%

Panel B. Stock Holding Control Characteristics

				Distribution		
	N	Mean	Std. Dev	10th	50th	90th
Momentum	1,812,993	7.62	34.66	-30.93	5.25	45.36
Institutional Ownership	1,668,558	0.69	0.23	0.36	0.73	0.95
Market Capitalization ($ million)	1,813,244	13728.95	32740.29	199.59	2284.50	34119.26
Amihud	1,813,238	0.07	0.39	0.00	0.00	0.04
Book-to-Market	1,808,164	0.57	0.56	0.13	0.42	1.12

Table IA.2 – Performance of Hedge Fund Trades: Same Fund, Different Stocks

This table reports results that compare the size and returns of hedge fund trades in stocks of firms that do and do not receive loans from their prime broker's affiliated banks. Trade size is calculated as the absolute change in ownership (in percentage points of assets of management). We calculate trade returns as $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company *i*'s portfolio weight change in stock *j* in quarter *t* and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock *j* over the quarter *t+1*. Panel A reports the univariate results and Panel B reports the results of multivariate regressions as in Eq. (1) with fund-company × quarter fixed effects. The variable of interest is *Loan*, an indicator variable equal to one if hedge fund company *i*'s prime-broker bank initiates a loan to stock *j* in quarter *t+1*, and zero otherwise. The stock-level control variables are defined in the Appendix. Standard errors are adjusted for heteroscedasticity and clustered by fund-company × quarter and *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. Univariate Tests

	|ΔOwnership|	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan Stocks	0.445	0.333	0.330
No Loan Stocks	0.328	0.063	0.067
Difference	0.117***	0.270***	0.263***
p-value of Difference	0.000	0.004	0.003

Panel B. Multivariate Regressions

	(1)	(2)	(3)
	|ΔOwnership|	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan	0.012*	0.319***	0.306***
	(1.73)	(4.10)	(3.88)
Log(1 + Market Cap.)	0.055***	-0.004	-0.007
	(10.14)	(-0.82)	(-1.63)
Book-to-Market	-0.002	-0.010	-0.005
	(-0.79)	(-0.91)	(-0.52)
Amihud	0.000	-0.003*	-0.003**
	(0.39)	(-1.71)	(-2.15)
Momentum	0.000***	-0.001*	-0.000
	(3.89)	(-1.76)	(-0.93)
Inst. Ownership	0.106***	-0.035	0.046
	(4.48)	(-1.00)	(1.36)
Fund Comp. × Qtr. FE	Yes	Yes	Yes
Observations	1,663,187	1,663,187	1,661,289
Adj. R-squared	0.445	0.0180	0.0184

Table IA.3 – Performance of Hedge Fund Trades: Same Stock, Different Fund

This table reports results that compare the size and returns of hedge funds trades in stocks of firms that receive loans from their prime broker's affiliated banks, to returns of the trades in the same stock of unconnected hedge funds. Trade size is calculated as the absolute change in ownership (in percentage points of assets of management). We calculate trade returns as $\Delta Ownership_{i,j,t} \times Return_{j,t+1}$, that is, the product of hedge fund company *i*'s portfolio weight change in stock *j* in quarter *t* and the subsequent quarter stock abnormal return. $Return_{j,t+1}$ is either the cumulative Carhart (1997) four-factor alpha or DGTW-adjusted return for stock *j* over the quarter *t+1*. Panel A reports the univariate results and Panel B reports the results of multivariate regressions as in Eq. (2) with stock × quarter fixed effects. The variable of interest is *Loan*, an indicator variable equal to one if hedge fund company *i*'s prime-broker bank initiates a loan to stock *j* in quarter *t+1*, and zero otherwise. The stock-level control variables are defined in the Appendix. Standard errors are adjusted for heteroscedasticity and clustered by stock × quarter and *t*-statistics are reported below the coefficients in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. Univariate Tests

	|ΔOwnership|	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Connected Funds	0.445	0.333	0.330
Unconnected Funds	0.362	0.087	0.108
Difference	0.083***	0.246***	0.222***
p-value of Difference	0.000	0.000	0.000

Panel B. Multivariate Regressions

	(1)	(2)	(3)
	|ΔOwnership|	Four-Factor Alpha × ΔOwnership	DGTW × ΔOwnership
Loan	0.024***	0.257***	0.211***
	(3.90)	(3.66)	(3.06)
Management Fee	0.018***	-0.050	0.003
	(2.58)	(-0.85)	(0.05)
Incentive Fee	0.006***	0.011*	0.009
	(9.82)	(1.70)	(1.37)
Lockup	0.056***	0.031	0.032
	(10.97)	(0.55)	(0.55)
High Water Mark	0.149***	0.116	0.107
	(21.27)	(1.59)	(1.50)
Offshore	0.078***	0.077	0.024
	(14.02)	(1.46)	(0.47)
Flow	-0.318***	-1.529**	-0.736
	(-6.36)	(-2.49)	(-1.23)
Average Return	-0.000***	0.000	0.002
	(-3.12)	(0.22)	(0.82)
# Stocks	-0.000***	-0.000***	-0.000***
	(-64.83)	(-5.31)	(-5.19)
Log(1+AUM)	0.000***	-0.000	-0.000
	(7.10)	(-0.87)	(-1.19)
Stock × Qtr. FE	Yes	Yes	Yes
Observations	178,810	178,810	178,639
Adj. R-squared	0.0518	0.0202	0.0196