JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 50, No. 4, Aug. 2015, pp. 869–902
COPYRIGHT 2015, MICHAEL G. FOSTER SCHOOL OF BUSINESS, UNIVERSITY OF WASHINGTON, SEATTLE, WA 98195
doi:10.1017/S0022109015000393

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

Future Lending Income and Security Value

Melissa Porras Prado*

Abstract

I test the Duffie, Gârleanu, and Pedersen hypothesis that security prices incorporate expected future securities lending income. To determine whether institutional investors anticipate gains from future lending of securities, I examine their trading behavior around loan-fee increases. The evidence suggests that institutions buy shares in response to an increase in lending fees, and that this could explain the premium associated with high-lending-fee stocks. Expected future lending income affects stock prices, although the effect seems to be attenuated by the negative information that arises from short selling.

I. Introduction

The securities lending market has grown dramatically in the past decade. In July 2008, the New York Stock Exchange reported a peak short interest of 18.6 million shares, equal to 4.7% of total shares outstanding. In that same year, the balance of securities on loan in the United States grew to $685 billion, according to Data Explorers' securities lending yearbook.

Figure 1 plots the average equal- and value-weighted annualized loan fees and loan quantities for stocks from June 2006 through Dec. 2008. Average loan spreads widened from an average of 20–30 basis points (bps) (80 bps equal weighted) in

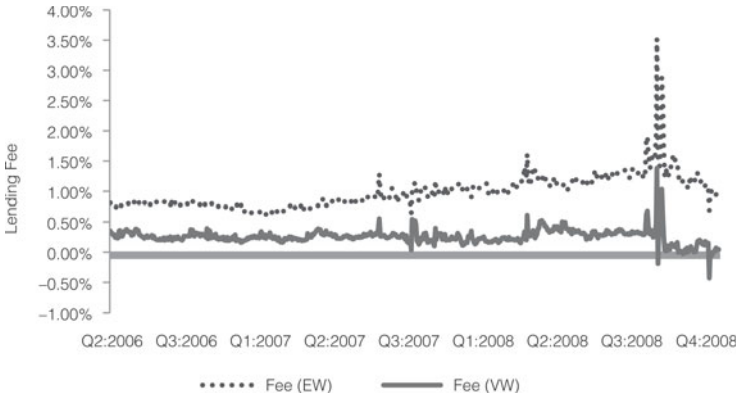
*Porras Prado (corresponding author), melissa.prado@novasbe.pt, Nova School of Business and Economics, INOVA, Universidade Nova de Lisboa, Campus de Campolide, 1099-032 Lisboa, Portugal. I thank Hendrik Bessembinder (the editor) and Adam Reed (the referee) for helping improve this article. Special words of gratitude also for Miguel Ferreira for all his guidance and help. I also thank Dion Bongaerts, Dirk Brounen, Richard Evans, Bruce Grundy, Zsuzsa Huszár, Hao Jiang, Charles Jones, David Ling, Andy Naranjo, Mahendrarajah Nimalendran, Burt Porter, Jay Ritter, Pedro Saffi, Pedro Santa-Clara, Elvira Sojli, Marta Szymanowska, Mathijs van Dijk, Manuel Vasconcelos, and Marno Verbeek for comments on earlier drafts. I thank seminar participants at the University of Florida, Stockholm School of Economics, Universidade Católica Portuguesa, the 2011 Society for the Advancement of Economic Theory (SAET) conference, the 2011 European Financial Data Institute (EUROFIDAI) International Finance Meeting, the 2011 Symposium on Finance Karlsruhe Institute of Technology (KIT), Robeco Asset Management, and Risk Management Association (RMA)/University of North Carolina at Chapel Hill (UNC) Kenan-Flagler Academic Forum for Securities Lending Research for comments and suggestions. I am grateful to Data Explorers Limited for providing the data and Inessa Love for making available her panel vector autoregression (PVAR) routines. This article was previously circulated as "The Price of Prospective Lending: Evidence from the Security Lending Market" and "The Price of Prospective Lending: Evidence from Short Sale Constraints," which is part of my dissertation research at Rotterdam School of Management (RSM) Erasmus University.

FIGURE 1

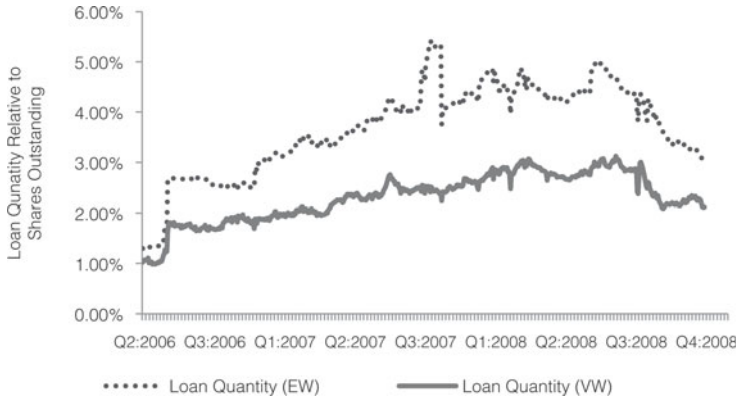
Daily Lending Fee and Loan Quantity

Graph A of Figure 1 shows the daily equal-weighted (EW) and value-weighted (VW) average lending fees for all stocks in the Data Explorers data set for June 2006 to Dec. 2008, and Graph B shows the daily loan quantity relative to shares outstanding.

Graph A. Daily Fee



Graph B. Daily Loan Quantity



2006 to over 100 bps (350 bps equal weighted) at the height of the 2008 crisis.[1] The number of shares borrowed relative to shares outstanding reached a maximum of 3.1% in 2008 (5.4% on an equal-weighted basis).

[1]Securities lending involves the temporary transfer of securities by a lender to a borrower. The borrower is required to provide collateral to the securities lender in the form of cash or other securities. Legal title passes on both sides of the transaction so that borrowed securities and collateral can be sold or re-lent. Borrowers are typically required to post collateral of 102 to 105 cents per dollar of security, beyond the 50% margin, when the lender is a U.S. broker-dealer; see D'Avolio (2002) for more details. Loan income can be economically significant. Lending returns are comprised of the securities lending (fee) return and the reinvestment on the cash collateral. If the borrower provides securities as collateral to the lender, the borrower pays a fee to borrow the securities. If the borrower provides cash as collateral, the lender pays interest to the borrower (the rebate rate) and reinvests the cash at the current short-term interest rate. The fee is then the difference between the short-term rate and the rebate rate, expressed in bps per year. Note that the growth in the security lending market was much less in 2012–2013.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

The business of securities lending became lucrative for funds with large portfolios of stocks. Dimensional Fund Advisors, for example, earned $182 million in net lending revenue for fiscal year 2008. According to Data Explorers, U.S. investment companies earned almost $1.5 billion overall in 2008 from lending securities.

When they lend shares to short sellers, institutional investors benefit by receiving lending income. I examine whether security prices incorporate this future expected lending income. Duffie, Gârleanu, and Pedersen (2002) predict that investors are willing to pay more than their valuation of the share if they expect to profit from lending in the future when the opportunity arises. The stock price will reflect the expected future income associated with the potential of lending the asset. The prospect of lending fees increases prices beyond even the most optimistic buyer's valuation of the security's future dividends.

Yet, the fact that there is excess demand for shorting can imply that there is negative information that is not yet incorporated into prices. Diamond and Verrecchia (1987) argue that because sale proceeds cannot be reinvested and borrowing securities to short sell incurs additional cost, short sellers are likely to be informed investors. Empirical tests corroborate the information content of shorts, as future returns are predictably low when short-sale volume is high.[2] Christophe, Ferri, and Angel (2004), Christophe, Ferri, and Hsieh (2010), Karpoff and Lou (2010), and Boehmer, Jones, and Zhang (2011) find direct evidence that short sellers actually anticipate earnings surprises, financial misconduct, and analyst downgrades. Anticipated lending income means that the same signal that exerts upward pressure on price also exerts downward pressure, due to the implied negative information. The outcome of these two competing effects is an empirical question. I address whether institutional investors anticipate lending income and are willing to pay a premium for stocks in which they expect high lending fees.

Both the theoretical and empirical literature agree that short-selling frictions have important implications for asset prices. At the same time, there is no consensus as to the source of price inflation associated with short-sale constraints, such as the presence of a high borrowing fee. Disagreement models, such as Miller's (1977) model, attribute price inflation to the optimism of the marginal investors. Any restriction would lead to the price being set by the most optimistic buyers because short sales, in the presence of divergence of opinions, effectively increase the supply of shares, thereby correcting the exuberant but downward-sloping demand.

In static models, the price is as high as the valuation of the most optimistic investors (e.g., Miller (1977), Chen, Hong, and Stein (2002)). In a dynamic setting, short-sale constraints can cause prices to be higher than the valuation of

[2]Brent, Morse, and Stice (1990), Senchack and Starks (1993), Aitkan, Frino, McCorry, and Swan (1998), Dechow, Hutton, Meulbroek, and Sloan (2001), D'Avolio (2002), Desai, Ramesh, Thiagarajan, and Balachandran (2002), Geczy, Musto, and Reed (2002), Jones and Lamont (2002), Christophe, Ferri, and Angel (2004), Lamont (2012), Asquith, Pathak, and Ritter (2005), Boehme, Danielsen, and Sorescu (2006), Boehmer, Jones, and Zhang (2008), Diether, Lee, and Werner (2009), and Boehmer, Huszár, and Jordan (2010) show that short sales predict abnormally low future returns.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

all investors. In Harrison and Kreps's model (1978), differences of opinion, together with short-sale constraints, create a speculative premium.[3]

Duffie et al. (2002) present a dynamic model of asset valuation in which short selling requires searching for security lenders and bargaining over the lending fee. Search frictions allow for lender expropriation, and the expectation of lending fees, in turn, increases the equilibrium price. This suggests that price inflation could represent a capitalization of future lending income. In the Treasury repo market, Duffie (1996) shows that special repo rates increase the equilibrium price of the underlying instrument. Duffie et al. extend the theoretical relation to equity and fixed-income security lending. The present article builds on the theoretical research of Duffie et al. by investigating empirically whether security prices in the equity market incorporate prospective security lending income.

In the present article, several empirical findings suggest that institutions respond to increases in lending fees, and that their trading behavior contributes to the overvaluation of high-fee stocks. In a univariate analysis, I observe an increase in institutional ownership and number of institutions investing in a stock 2 quarters before and 2 quarters after it becomes expensive to borrow. The average inventory levels in these stocks increase 2 quarters before the fee reaches the threshold level, and this trend continues in the following quarters. There is no such similar trend in the stocks that are not expensive to borrow. I also observe an increase in the number of stocks on loan in the quarters following the high fee, suggesting that the increased inventory translates in part into loans. Moreover, the actual fee on high-fee stocks decreases sharply in accordance with an increase in supply.

Impulse-response functions following a panel vector autoregression (PVAR) show that a 1-standard-deviation increase in the lending fee increases institutional ownership by 0.50% and the number of institutions holding the stock by 0.90% in the following quarter.

I find that institutions tend to buy shares in response to an increase in lending fee. An observed increase in lending fee for a stock makes institutions 1.33 times more likely to buy. Institutions also respond to the predictable component in lending fees, suggesting that they actually anticipate lending income.

I also examine the security lending practices of mutual funds in particular and find the aggregate lending income to be an important predictor of whether a mutual fund will allow security lending. Mutual funds are also two times more likely to increase their holdings in a stock if the stock has experienced an increase in lending fee, suggesting that mutual funds could be buying high-fee stocks for the purpose of lending.

It is important to note that the overvaluation associated with high lending fees is most pronounced among stocks that institutional investors are trading in the direction of the high fee, possibly to gain lending income. For example, among stocks with intense institutional trading, the contemporaneous average 4-factor-alpha spread between high- and low-fee stocks is 2.78% per month (t-statistic = 3.52). Among stocks with low institutional trading, the contemporaneous risk-adjusted-return spread between high- and low-fee stocks is actually negative and

[3]According to Scheinkman and Xiong (2003) and Hong, Scheinkman, and Xiong (2006), this speculative premium leads to high turnover and overpricing, and even to bubbles.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

statistically significant. When including firm-level controls in a Fama–MacBeth (1973) specification, the contemporaneous difference in risk-adjusted return between a top-fee-quintile stock that is bought by institutional investors and a high-fee stock that is not bought by institutions is 2.64% per year. This suggests that institutional investors tend to trade in the direction of high expected lending income, and that those trades contribute to the premium on high-fee stocks. These results are consistent with the view that institutional investors are willing to pay a premium for high-fee stocks, and that future lending income is capitalized into prices.

I also find that institutions are less willing to purchase shares that experienced both an increase in borrowing cost and negative earnings news. The results seem to suggest that there is a trade-off between lending income and the implied negative information from short selling. Moreover, the premium for high-fee stocks is insignificant in the subsample of stocks that experience a negative information shock.

These findings combined are consistent with the view that institutional investors realize the advantages of security lending, and that the expectation of lending income contributes to some of the overvaluation of high-fee stocks.

My results have important implications for the literature on equity lending. The balancing out of the two forces, capitalized lending income and the negative information inherent in short selling, could explain why Kaplan, Moskowitz, and Sensoy (2013) find that although making securities available for lending is profitable, it does not affect the price of the underlying securities. The capitalization of lending income can also explain the pricing differences among various measures of short-sale constraints. Lending income could explain Boehmer et al.'s (2010) finding that stocks with low short interest experience positive abnormal returns, given that D'Avolio (2002) shows that the mean loan fee is also high in the first short-interest-portfolio decile, especially when considering that there is high potential for lending in the future for the low-short-interest decile. Similarly, the capitalization of lending income can explain the finding of Autore, Boulton, and Braga-Alves (2015) that stocks with low short interest reaching threshold levels of failure become more overvalued than do threshold stocks with high short interest. My results show that institutional investors seem to respond to an increase in expected lending income when the expectation is formed using signals from publicly available failure-to-deliver data.

This work contributes to the literature on short-sale constraints and valuation. Seneca (1967), Miller (1977), Harrison and Kreps (1978), Figlewski (1981), and Morris (1996), among others, argue that security prices are upward biased when there are short-sale constraints because negative information is not fully incorporated into prices. My results suggest that short-selling constraints can cause prices to deviate from the intrinsic value due to the capitalization of future lending income. The tendency of institutional investors to trade in the direction of high expected lending income exacerbates the price overreaction, thereby contributing to the premium on high-fee stocks. To the best of my knowledge, I am the first to show empirically that future lending expectation affects current stock prices, and that the extent of this effect arises from a trade-off between negative information and security lending income.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

The article is organized as follows: Section II describes the data and the summary statistics. Section III reports the univariate results on the response of institutional investors to an increase in lending fee, and Section IV presents the multivariate analysis. In Section V, I test whether institutional investors are willing to pay a premium for high-fee stocks. Section VI documents a trade-off between lending income and the implied negative information from short selling. Section VII examines the security lending and portfolio decisions of mutual funds. Section VIII includes a robustness check of the results, and Section IX concludes.

II. Data

The data for this study come from various sources. I obtain quarterly institutional holdings for all common stocks from the Thomson Reuters CDA/Spectrum database of U.S. Securities and Exchange Commission (SEC) 13F filings. Institutional ownership for each stock is defined as the number of shares held by institutional investors divided by the total number of shares outstanding.[4] I exclude observations with total institutional ownership greater than 100%. Stock return, share price, number of shares outstanding, and turnover data come from the Center for Research in Security Prices (CRSP) for all NYSE/AMEX/NASDAQ stocks, and the data on book value of equity and dividends come from Compustat. S&P 500 constituent data are from the Compustat annual updates index constituents. The information on earnings and surprises comes from the unadjusted surprise history file in the Institutional Brokers' Estimate System (IBES).

The security lending data are from Data Explorers, which collects data from custodians and prime brokers that lend and borrow securities. The data include daily stock-level information on the loan fee, the borrowed amount, and the dollar value and quantity of shares available for lending. This covers the equity lending supply, loan prices, and quantities for 4,393 U.S. firms from June 2006 through Dec. 2008. Although the sample period is short, it does coincide with the 2 years when security lending activity and income reached their highest levels. I supplement the loan data with short-interest data from Short Squeeze and with failure-to-deliver records from the SEC. Failure-to-deliver data include the total number of fails-to-deliver (i.e., the balance level outstanding) recorded in the National Securities Clearing Corporation's (NSCC) Continuous Net Settlement (CNS) system aggregated over all NSCC members.[5]

My main tests use quarterly and monthly data. For the quarterly institutional ownership trading tests, because institutional ownership data are reported quarterly, I compute quarterly averages of equity lending variables for each stock. Because I calculate the change in fee, I lose the third quarter of 2006. The final merged sample covers 30,642 firm-quarter observations for 4,040 stocks. In the second set of tests, I examine whether the monthly overvaluation associated with the presence of high fees is more pronounced among stocks that institutions are

[4]This represents the long institutional ownership, not net institutional ownership, of a stock.

[5]Available at http://www.sec.gov/foia/docs/failsdata.htm. Data prior to Sept. 16, 2008, include only securities with a balance of total fails-to-deliver of at least 10,000 shares as of a particular settlement date. Data after that date include all securities with a balance of total fails-to-deliver as of a particular settlement date.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

trading in the direction of the increasing borrowing cost. There are again 4,040 stocks in the sample, for a total of 66,011 firm-month observations.

Table 1 shows summary statistics. Panel A reports the number of observations (*N*), means, medians, standard deviations (stdev), and quartile distributions

TABLE 1

Descriptive Statistics

Table 1 presents the descriptive statistics (Panel A) of the variables used in this study. Panel B reports the average differences between stocks with annualized lending fees below 1% and stocks with fees above 1% and the test of equality of the means (*t*-test) and medians (Wilcoxon) across both groups. The details of data sources and variable definitions are in the Appendix.

Panel A. Sample Descriptive Statistics

	N	Mean	P25	Median	P75	Stdev
IO (%)	30,642	54.24	28.98	57.74	80.43	29.45
NIO (%)	30,642	139.53	28.00	77.00	160.00	194.52
ΔIO	30,642	0.57	−1.82	0.29	2.87	7.44
ln(1 + NIO)	30,642	2.47	−6.41	0.86	9.33	21.57
FEE (%)	25,468	0.99	0.14	0.17	0.55	2.60
FEE_INCREASE	30,642	0.35	0.00	0.00	1.00	0.48
ΔFEE	30,642	−0.01	−0.04	0.00	0.03	1.24
ON_LOAN (%)	30,642	4.20	0.35	2.40	6.15	5.09
SHORT_INTEREST (%)	30,642	4.07	0.02	1.80	6.31	5.81
UTILIZATION (%)	30,642	21.92	2.60	13.15	33.73	23.77
INVENTORY (%)	30,642	15.23	5.77	14.86	23.32	10.51
INVENTORY_ACCOUNTS	30,642	331.35	39.67	176.00	403.67	462.95
ACTIVE_AGENTS	30,642	25.01	4.00	21.00	38.00	23.58
FAILURE (%)	9,264	0.23	0.03	0.08	0.21	0.59
FAILURE_OCCURRENCE	30,642	0.54	0.00	0.00	1.00	0.97
M_CAP	30,642	4,196,263	99,428	353,076	1,615,062	18,700,000
MTB	30,642	1.44	0.37	0.90	1.74	2.47
BID-ASK (%)	30,642	0.02	0.00	0.00	0.00	0.66
TURNOVER (%)	30,642	180.51	44.19	123.44	235.64	224.38
PRICE	30,642	23.21	6.69	15.12	30.20	43.24
SP500 (%)	30,642	0.02	0.00	0.00	0.00	0.13
AGE	30,642	15.89	4.00	11.00	22.00	16.26
RETURN (%)	30,642	−2.93	−9.60	0.00	3.34	14.20
DIVIDEND	30,642	0.38	0.00	0.00	1.00	0.49
ST_DEV (%)	30,642	33.65	19.33	30.98	46.20	20.39
NUM_ANALYST	30,642	17.86	3.00	12.00	26.00	19.31

Panel B. Differences between High- and Low-Fee Stocks

	Low-Fee Stocks	High-Fee Stocks	Difference	*p*-Value *t*-Test	*p*-Value Wilcoxon
IO (%)	62.76	36.81	−25.95	0.00	0.00
NIO (%)	178.90	59.02	−119.88	0.00	0.00
ΔIO	0.52	0.69	0.17	0.06	0.49
ln(1+NIO)	1.63	4.19	2.56	0.85	0.80
FEE (%)	0.21	4.26	4.05	0.00	0.00
FEE_INCREASE	0.39	0.27	−0.12	0.00	0.00
ΔFEE	−0.15	0.27	0.42	0.00	0.00
ON_LOAN (%)	4.34	3.93	−0.41	0.00	0.00
SHORT_INTEREST (%)	3.94	4.33	0.39	0.00	0.00
UTILIZATION (%)	17.70	30.57	12.88	0.00	0.00
INVENTORY (%)	18.78	7.97	−10.81	0.00	0.00
INVENTORY_ACCOUNTS	434.66	120.01	−314.65	0.00	0.00
ACTIVE_AGENTS	29.81	15.19	−14.62	0.00	0.00
FAILURE (%)	0.11	0.35	0.24	0.00	0.00
FAILURE_OCCURRENCE	0.33	0.97	0.64	0.00	0.00
M_CAP	5,819,798	875,123	−4,944,675	0.00	0.00
MTB	1.31	1.71	0.39	0.00	0.03
BID-ASK (%)	0.02	0.02	0.00	0.53	0.01
TURNOVER (%)	195.93	148.96	−46.97	0.00	0.00
PRICE	28.55	12.27	−16.28	0.00	0.00
SP500 (%)	0.02	0.00	−0.02	0.00	0.00
AGE	19.78	10.45	−9.33	0.00	0.00
RETURN (%)	−2.49	−3.84	−1.35	0.00	0.00
DIVIDEND	0.46	0.23	−0.22	0.00	0.00
ST_DEV (%)	32.52	35.97	3.44	0.00	0.00
NUM_ANALYST	21.72	9.97	11.75	0.00	0.00

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

(25%, 75%) of the variables. The average institutional ownership (IO) in the sample of common equity stocks is 54.24%, representing 140 institutional investors, on average (NIO). The average annualized fee (FEE) over the sample period is 0.99%. The loan fee increased for about 35% of the stocks, although the average change in fee is a reduction of 1 bp. On average, 4.20% of the shares outstanding are borrowed (ON_LOAN), and the average short interest (SHORT_INTEREST) is 4.07%.

Panel B of Table 1 reports the differences between the stocks with fees below and above 1%, a threshold used by D'Avolio (2002) and Porras Prado, Saffi, and Sturgess (2012) to classify stocks as on special. The stocks with high fees (above 1%) differ significantly from the low-fee stocks. Most notably, the average institutional ownership of the top-fee quintile is significantly lower than that of the low-fee stocks, 36.81% versus 62.76%. This is in line with D'Avolio (2002) and Nagel (2005), who show that stock loan supply tends to be scarce and short selling more expensive when institutional ownership is low. The average annual fee is 4.26% for the top-fee stocks, a number similar to that found by D'Avolio (2002), who documents a value-weighted average fee of 4.30% for stocks on special. Moreover, stocks in the high-fee group are shorted more; have lower inventory, both in number of accounts and in levels (and therefore also higher utilization rates); are smaller; have higher turnover; are more volatile; and have lower returns.

III. Univariate Results

In Figure 2, I use the same 1% threshold of when a stock becomes expensive, borrowing from D'Avolio (2002) and Porras Prado et al. (2012), and examine the percentage change in institutional ownership 2 quarters before and 2 quarters after a stock reaches the threshold level.[6] Graphs A and B show the percentage change of institutional ownership for stocks with short-selling fees above 1% (Graph A) and below 1% (Graph B) 2 quarters before and 2 quarters after classification at time *t*. Institutions are increasing their positions in both high- and low-fee stocks prior to time *t*, but this effect is much larger for the high-fee stocks. Interestingly, institutions continue to increase their holdings in these high-fee stocks in the quarters following the stock becoming special. Institutional ownership increases 7.4% in the 2 quarters following the fee level reaching 1%, from 36.81 to 39.57 percentage points. This increase pertains only to the high-fee stocks, as there is no increase in institutional ownership in the remaining stocks (Graph B). In fact, there appears to be a decline of 3.5% in institutional ownership in the following 2 quarters in stocks whose fees are not above 1% at time *t*.[7] A similar trend is visible in the number of institutional investors holding each stock. Graphs C and D show the percentage change in the number of institutional investors holding stocks with lending fees above 1% (Graph C) and stocks with fees below that

[6] A similar pattern arises when looking at the top-fee quintile of stocks.

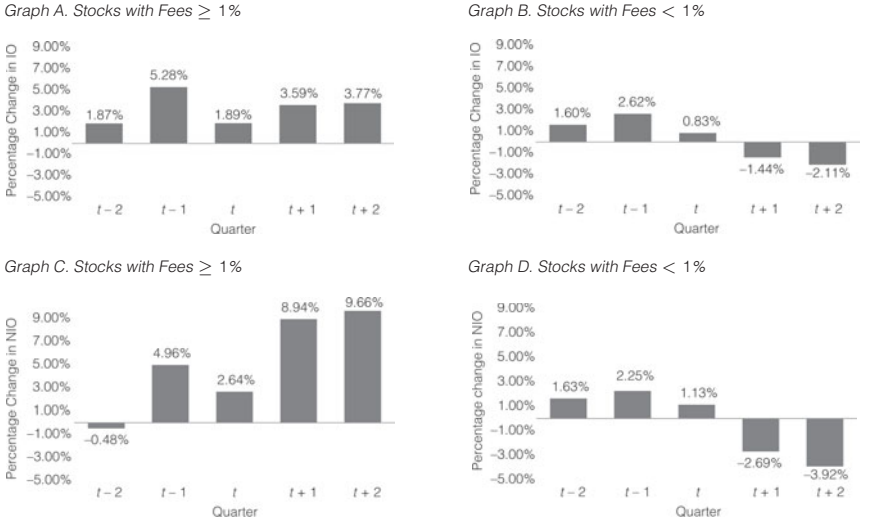
[7] In unreported results, the average institutional ownership change around high fees is significantly higher for stocks held mostly by funds that allow security lending versus stocks held mostly by mutual funds that are not allowed to lend.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

FIGURE 2

Quarterly Institutional Ownership Changes of High-Fee Stocks

Graphs A and B of Figure 2 show the percentage change in institutional ownership for stocks with an annualized lending fee of 1% at time *t* (Graph B) and the remaining stocks with a lending fee below 1% at time *t* (Graph A), 2 quarters before and 2 quarters after the lending fee reaches the 1% threshold. Graphs C and D show the percentage change in the number of institutional investors for stocks with an annualized lending fee of 1% at time *t* (Graph D) and the remaining stocks with a lending fee below 1% at time *t* (Graph C), 2 quarters before and 2 quarters after the lending fee reaches the 1% threshold. The details of data sources and variable definitions are in the Appendix.



level (Graph D) 2 quarters before and 2 quarters after classification at time *t*. The number of institutions holding the high-fee stocks increases from 59, on average, at time *t*, to 64 and 70 in the next 2 quarters, respectively, an increase of 18.6%. In the low-fee stocks, the average number of institutions investing in those shares actually drops 6.7% from 179 to 167 in the following 2 quarters. This univariate analysis suggests that a high fee sparks the interest of institutional investors.

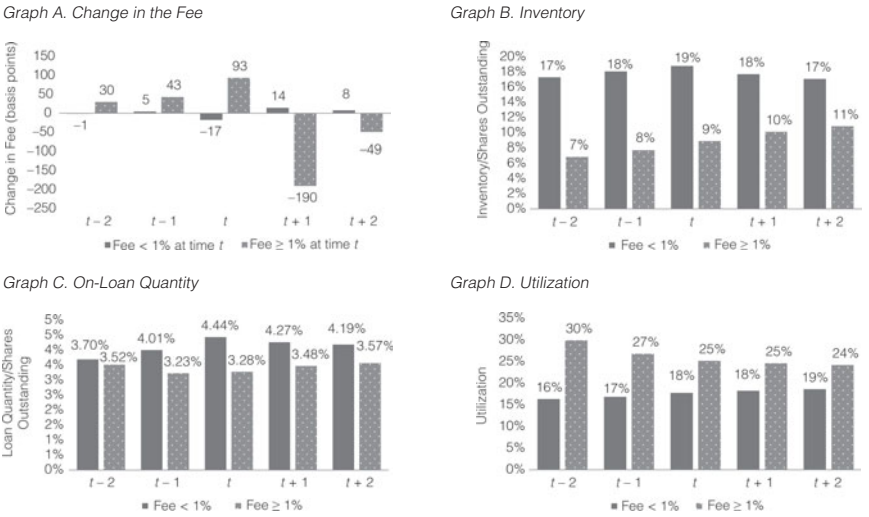
To determine whether institutional investors are buying the high-fee stocks for the purpose of lending to short sellers, in Figure 3 I examine the change in average fee, inventory, loan quantities, and utilization of stocks 2 quarters before and 2 quarters after a stock reaches the threshold level of fees of 1%. For stocks that are expensive to borrow, the average fee (Graph A) decreases by 190 and 49 bps following a peak at time *t* in the following 2 quarters, a finding consistent with the idea that institutional ownership translates into an increase in supply, which in turn decreases the loan fee. In effect, the average inventory levels relative to shares outstanding (Graph B) already start to increase 2 quarters before the fee reaches the threshold level, and this trend continues in the following quarters. There is no such similar trend in the stocks that are not expensive to borrow. I also observe an increase in the number of stocks on loan in the quarters following the high fee (Graph C). Although the increase is not that large relative to shares outstanding, it suggests that the increased inventory translates in part into loans. Moreover, I do not observe an increase in loan quantities for the stocks with lower lending fees. In terms of utilization (Graph D) and the value of assets on loan relative to the

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

FIGURE 3

Inventory and Loan Quantity of High-Fee Stocks

Figure 3 presents the change in fee in bps, the percentage inventory, on-loan quantities, and utilization of high- (FEE $\geq$ 1%) and low-fee (FEE $<$ 1%) stocks, 2 quarters before and 2 quarters after the lending fee reaches the 1% threshold at time *t*. The details of data sources and variable definitions are in the Appendix.



lendable asset value, the increased inventory leads to a reduction in utilization and the increased loan quantities lead to an increase, so the net effect is no significant change in utilization for the high-fee stocks.

IV. Institutional Trading in Response to an Increase in Lending Fee

In this section I test whether an increase in borrowing charges triggers the interest of institutional investors, by examining how an increase in lending fee influences changes in institutional holdings. To explain the joint relation of institutional ownership and the loan fee, I use a first-order PVAR approach.[8] This is a multivariate simultaneous equation system that treats all variables as endogeneous, while allowing for unobserved stock heterogeneity, using the Blundell and Bond (1998) system generalized method of moments (GMM) dynamic panel instrumental-variables (IV) estimation.[9] The estimator relies on first differences to eliminate unobserved stock-specific effects and then uses the lagged levels and difference values of the endogeneous variables as instruments for subsequent first differences.[10]

[8]The estimation is implemented using a PVAR routine by Inessa Love. See Love and Zicchino (2006) for computational details.

[9]The Blundell and Bond (1998) system GMM, outlined by Arellano and Bover (1995) and fully developed by Blundell and Bond (1998), is an augmented version of the Arellano–Bond (1991) estimator.

[10]First differences are used as instruments in the levels equation, and lagged levels are used as instruments in the first-difference equation.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

First, to capture institutional ownership trading as a function of the fee, I specify a first-order vector autoregression (VAR) model as follows:[11]

$$y_{i,t} = \Upsilon_0 + \Upsilon_1 y_{i,t-1} + f_i + d_t + \epsilon_{i,t}, \quad (1)$$

where $y_{i,t}$ is a vector including the change in institutional ownership (ΔIO) and the annualized lending fee in Panel A of Table 2. In Panel B, I include the quarterly stock return to control for changes in stock price, which might lead to changes in short sellers' demand and, in turn, lending fees and institutional ownership. f_i introduces stock fixed effects, and d_t introduces period-specific time dummies. In Panels C and D, the $y_{i,t}$ vector includes changes in the natural log of 1 plus

TABLE 2

Institutional Ownership Trading around Fee Increases in a PVAR

The PVAR approach is a multivariate simultaneous equation system that treats all variables as endogeneous, while allowing for unobserved firm heterogeneity. The lag length of 1 was selected following the AIC. The specification of the first-order VAR is as follows:

$$y_{i,t} = \Upsilon_0 + \Upsilon_1 y_{i,t-1} + f_i + d_t + \epsilon_{i,t},$$

where $y_{i,t}$ is a vector including the change in institutional ownership (ΔIO) and the annualized lending fee in Panel A. In Panel B, I include the quarterly stock return to control for changes in stock price, which might lead to changes in short sellers' demand and, in turn, lending fees and institutional ownership. f_i introduces stock fixed effects, and d_t introduces period-specific time dummies. In Panels C and D, the $y_{i,t}$ vector includes changes in the natural log of 1 plus the number of institutional investors (Δln(1 + NIO)). Panel C is the two-variable PVAR, and Panel D includes the stock return. FEE is the average percentage short-sale fee, and RETURN is the quarterly stock return. Robust *t*-statistics are reported. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$. The details of data sources and variable definitions are in the Appendix.

Panel A. ΔIO VAR Analysis

	Dependent Variable: ΔIO_t	
	Coefficient	*t*-Statistic
ΔIO_{t-1}	−0.315***	−24.14
FEE_{t-1}	0.366**	2.71
	Dependent Variable: FEE_t	
	Coefficient	*t*-Statistic
ΔIO_{t-1}	−0.005***	−3.39
FEE_{t-1}	0.239***	3.58

Panel C. Δln(1+NIO) VAR Analysis

	Dependent Variable: $\Delta \ln(1+NIO)_t$	
	Coefficient	*t*-Statistic
$\Delta \ln(1+NIO)_{t-1}$	−0.211***	−7.37
FEE_{t-1}	0.660**	2.51
	Dependent Variable: FEE_t	
	Coefficient	*t*-Statistic
$\Delta \ln(1+NIO)_{t-1}$	−0.003***	−4.52
FEE_{t-1}	0.241***	3.94

Panel B. ΔIO VAR Analysis

	Dependent Variable: ΔIO_t	
	Coefficient	*t*-Statistic
ΔIO_{t-1}	−0.326***	−24.55
FEE_{t-1}	0.514***	4.27
$RETURN_{t-1}$	−1.028***	−6.49
	Dependent Variable: FEE_t	
	Coefficient	*t*-Statistic
ΔIO_{t-1}	−0.005***	−3.36
FEE_{t-1}	0.280***	4.37
$RETURN_{t-1}$	−0.222	−0.59
	Dependent Variable: $RETURN_t$	
	Coefficient	*t*-Statistic
ΔIO_{t-1}	−0.001***	−3.18
FEE_{t-1}	0.003	0.64
$RETURN_{t-1}$	0.008	0.45

Panel D. Δln(1+NIO) VAR Analysis

	Dependent Variable: $\Delta \ln(1+NIO)_t$	
	Coefficient	*t*-Statistic
$\Delta \ln(1+NIO)_{t-1}$	−0.213***	−10.07
FEE_{t-1}	0.947***	3.55
$RETURN_{t-1}$	−0.624	−1.30
	Dependent Variable: FEE_t	
	Coefficient	*t*-Statistic
$\Delta \ln(1+NIO)_{t-1}$	−0.004***	−4.69
FEE_{t-1}	0.285***	4.83
$RETURN_{t-1}$	−0.231	−0.57
	Dependent Variable: $RETURN_t$	
	Coefficient	*t*-Statistic
ΔIO_{t-1}	−0.001***	−5.59
FEE_{t-1}	0.004	0.86
$RETURN_{t-1}$	0.008	0.47

[11] The lag length was selected following the Akaike information criterion (AIC).

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

the number of institutional investors ($\Delta \ln(1 + \text{NIO})$). Panel C is the two-variable PVAR, and Panel D includes the stock return. The results are in Table 2.[12]

There is a positive relation between the lagged annualized fee and changes in institutional ownership (Panel A of Table 2). An increase in institutional ownership in turn reduces the lending fee. The results are even stronger when controlling for lagged stock returns (Panel B). An increase in the fee leads to an increase in the number of institutions holding the stocks (Panels C and D).

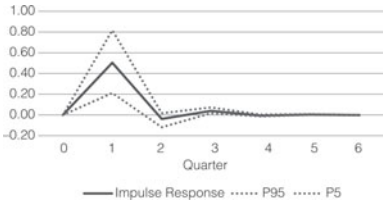
The impulse-response functions in Figure 4 further describe the reaction of institutional investor ownership changes to the innovations in the lending fee, while holding all other shocks at 0. A 1-standard-deviation shock in the fee increases institutional investor ownership by 0.50% (Graph B) in the following quarter. Consistent with the findings of Porras Prado et al. (2012), the fee itself drops significantly with an increase in institutional ownership as the supply of shares increases (Graph A). Graphs C and D show the reaction of the change in the number of institutions holding the stock to a 1-standard deviation-shock to the fee (Graph D) and the reaction of the fee to a 1-standard-deviation shock to the change in the number of institutional holdings (Graph C). A 1-standard-deviation increase in the fee increases the number of institutional investors by 0.90% in the following quarter. A 1-standard-deviation increase in the number of institutions in turn reduces the lending fee by 8 bps. The results are similar when I use

FIGURE 4

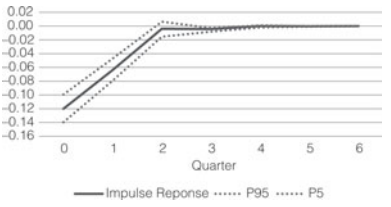
Impulse Response of Institutional Trading to FEE

Figure 4 presents the impulse-response functions describing the reaction of the change in institutional ownership (ΔIO) to a 1-standard-deviation innovation in fee (Graph A), and the reaction of fee (Graph B) to a 1-standard-deviation innovation in the change in institutional ownership. The impulse-response functions in Graphs C and D describe the reaction of the change in the number of institutional owners ($\Delta \ln(1 + \text{NIO})$ to a 1-standard-deviation innovation in fee (Graph C), and the reaction of fee (Graph D) to a 1-standard-deviation innovation in the change in the number of institutions. The impulse-response functions follow from a first-order VAR model specification and fund- and period-specific fixed effects. The details of data sources and variable definitions are in the Appendix.

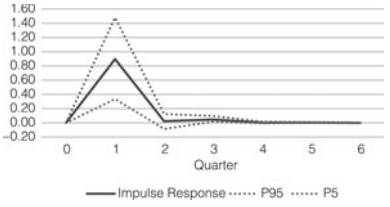
Graph A. Response of ΔIO to FEE



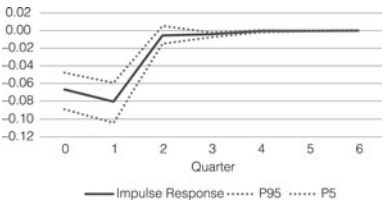
Graph B. Response of FEE to ΔIO



Graph C. Response of Δln(1+NIO) to FEE



Graph D. Response of FEE to Δln(1+NIO)



[12]The particular ordering of the specification is important. The variables that appear earlier in the system are assumed to be more exogeneous, whereas the later ones are assumed to be more endogeneous. Nonetheless, the results are robust to changes in the order.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

a dummy variable to indicate the presence of a high fee in the previous quarter or an increase in lending fee. Figure A1 in the Internet Appendix (available at www.jfqa.org) shows the impulse-response graphs for the reaction of both institutional ownership changes and the change in the number of institutions to the presence of a high fee or fee increase.

Next I examine how an increase in lending fee influences institutional trading (TRADING) in a fixed-effects panel regression. The specification is:

$$\begin{aligned}(2)\quad \text{TRADING}_{i,t} &= \alpha_i + \alpha_t + \beta_1 \text{FEE_INCREASE}_{i,t} + \beta_2 \ln(\text{M_CAP})_{i,t} \\ &\quad + \beta_3 \text{BID-ASK}_{i,t} + \beta_4 \text{TURNOVER}_{i,t} + \beta_5 \text{PRICE}_{i,t} \\ &\quad + \beta_6 \text{SP500}_{i,t} + \beta_7 \text{AGE}_{i,t} + \beta_8 \text{ST_DEV}_{i,t} + \beta_9 \text{RETURN}_{i,t-1} \\ &\quad + \beta_{10} \text{MTB}_{i,t} + \beta_{11} \text{DIVIDEND}_{i,t} + \beta_{12} \text{NUM_ANALYST}_{i,t} + \epsilon_{i,t},\end{aligned}$$

where the dependent variable is the change in institutional ownership (ΔIO), or changes in the natural log of 1 plus the number of institutional investors (Δln(1+NIO)) in stock i at time t. I also run the specification with the dependent variable in levels, $\text{IO}_{i,t}$, the level of institutional ownership in stock i at time t and the natural log of 1 plus the number of institutional investors, $\ln(1 + \text{NIO})$. $\text{FEE_INCREASE}_{i,t}$ is a dummy variable that equals 1 if the average quarterly lending fee on the stock has increased over the previous quarter. Following Gompers and Metrick (2001) and Yan and Zhang (2009), I include the stock characteristics firm size ($\text{M_CAP}_{i,t}$) (the natural log of equity market capitalization), past quarterly return ($\text{RETURN}_{i,t-1}$), price ($\text{PRICE}_{i,t}$), age ($\text{AGE}_{i,t}$), S&P index inclusion ($\text{SP500}_{i,t}$), and volatility ($\text{ST_DEV}_{i,t}$) to control for the common determinants of institutional holdings. To control for liquidity and transaction costs, I include the bid–ask spread ($\text{BID-ASK}_{i,t}$) and $\text{TURNOVER}_{i,t}$, which also accounts for differences in opinions, as in Boehme et al. (2006).[13] I include market-to-book ($\text{MTB}_{i,t}$) value because research by Jiang (2009) shows that institutions trade in the direction of intangible information inherent in the book-to-market ratio. $\text{DIVIDEND}_{i,t}$ is an indicator variable that equals 1 if the stock pays a dividend as reported in Compustat. Finally, to control for the visibility of stocks, I include $\text{NUM_ANALYST}_{i,t}$, which is the number of analysts following the stock, as reported in the unadjusted surprise history file in IBES, where missing values are set to 0. The regression includes year and stock fixed effects. Robust standard errors are clustered by stock to account for within-firm serial correlation. Last, I examine whether institutional investors buy a stock in a fixed-effects logit specification with the same control variables ($\text{CONTROLS}_{i,t}$), where a buy ($\text{BUY}_{i,t}$) is a dummy variable equal to 1 when institutional investors increase their holdings in the stock.

$$\begin{aligned}(3)\quad \text{Prob}(\text{BUY}_{i,t} &= 1|\text{FEE_INCREASE}_{i,t}, \text{CONTROLS}_{i,t}, \alpha_i, \alpha_t) \\ &= \frac{\exp^{\alpha_i+\alpha_t+\beta_1 \text{FEE_INCREASE}_{i,t}+\text{CONTROLS}'_{i,t}\beta}}{1+\exp^{\alpha_i+\alpha_t+\beta_1 \text{FEE_INCREASE}_{i,t}+\text{CONTROLS}'_{i,t}\beta}},\end{aligned}$$

where α_i introduces stock fixed effects and α_t introduces period-specific time dummies.

[13]The results are robust to the inclusion of analyst dispersion, but this limits the sample size to only the largest stocks.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

In the first two columns in Table 3, the dependent variable is the level of institutional ownership and the log of 1 plus the number of institutional investors. Column 1 shows that, in line with Yan and Zhang (2009), institutions prefer to hold larger stocks, stocks with higher turnover, and stocks with lower MTB ratios. Consistent with the findings in Gompers and Metrick (2001), the coefficient on past return is significantly negative. Institutions also prefer dividend-paying stocks, as the coefficient of the dividend-paying dummy is positive and significant.

TABLE 3

Institutional Ownership Trading Behavior around Fee Increases

Table 3 presents a panel regression of institutional ownership and trading on an indicator variable of fee increase and stock-specific control variables and year dummies. Panel data are for U.S. common equity stocks from the last quarter of 2006 to the last quarter of 2008. Column 5 reports the odds of buying a stock following a logit specification, where a buy is defined as an increase in institutional ownership. Results are reported in percentages. Robust *t*-statistics are given in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$. The details of data sources and variable definitions are in the Appendix.

	IO_t	$\ln(1+NIO)_t$	ΔIO_t	$\Delta \ln(1+NIO)_t$	$ODDS_BUY_t$
	1	2	3	4	5
$FEE_INCREASE_{t,t-1}$	0.975***	1.888***	0.887***	1.395***	1.334***
	(10.81)	(7.96)	(8.74)	(5.31)	(10.36)
$\ln(M_CAP)_t$	5.046***	25.122***	2.596***	8.608***	2.065***
	(15.40)	(26.01)	(13.77)	(16.06)	(14.41)
$BID\text{-}ASK_t$	0.268**	−0.263***	0.029	0.185***	0.995
	(2.56)	(−3.34)	(0.41)	(3.61)	(−0.27)
$TURNOVER_t$	0.003***	0.002*	0.000	0.001	1.000
	(4.64)	(1.77)	(0.08)	(1.28)	(0.69)
$PRICE_t$	−0.009	0.038**	−0.005	0.021*	0.998
	(−1.04)	(1.99)	(−1.60)	(1.88)	(−1.56)
$SP500_t$	2.750	7.737	0.904	9.540***	1.255
	(0.63)	(0.86)	(0.76)	(3.64)	(0.56)
AGE_t	0.225	0.967*	−0.086	−0.763	0.945**
	(1.28)	(1.75)	(−0.50)	(−0.89)	(−2.10)
ST_DEV_t	−0.002	0.113***	−0.045***	−0.122***	0.989***
	(−0.42)	(6.81)	(−10.09)	(−8.50)	(−10.06)
$RETURN_{t-1}$	−0.055***	−0.188***	−0.012***	−0.028***	0.997***
	(−16.53)	(−19.58)	(−3.64)	(−3.09)	(−3.05)
MTB_t	−0.582***	−2.577***	0.025	0.265	0.983
	(−5.28)	(−6.29)	(0.42)	(1.48)	(−1.21)
$DIVIDEND_t$	0.941***	3.389***	−0.041	−0.824	1.201**
	(3.09)	(4.17)	(−0.18)	(−1.21)	(2.36)
$NUM_ANALYST_t$	0.270***	0.858***	−0.104***	−0.416***	0.981***
	(11.33)	(12.31)	(−7.52)	(−7.89)	(−5.88)
Stock fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	30,642	30,642	30,642	30,642	29,681
No. of stocks	4,040	4,040	4,040	4,040	3,621
R^2/pseudo R^2	11.69%	19.34%	4.02%	5.39%	3.89%

Column 2 of Table 3 shows that larger and higher-priced stocks, dividend-paying stocks, and stocks that are younger and more volatile are held by a higher number of institutional investors. Institutions also seem to prefer stocks that have seen lending fees rise. Stocks with increases in borrowing costs have a 0.98% higher institutional ownership (column 1), and 1.89% more institutions hold the stock (column 2), in terms of levels. Columns 3–5 describe the trading behavior of institutional investors. Institutions tend to trade larger and less volatile stocks, which have seen their returns decrease. More important, an increase in lending

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

fees is associated with an increase of 0.89% in institutional ownership and 1.40% more institutions holding the stock. Column 5 reports the odds following the panel logit regression of the likelihood of buying a stock. Stocks that experience an increase in lending fees are 1.33 times more likely to be bought by institutional investors.

The Expected Future Lending Income

To determine whether institutional investors anticipate lending income and trade in the direction of high expected lending fees, I first predict an increase in lending fee as a function of publicly available information and stock characteristics, and study the relation between expected lending income and institutional ownership. A second prediction includes proprietary information on inventory and loan values as reported by Data Explorers, which more institutions are starting to subscribe to.

An important determinant of short-sale fees is the frequency of so-called failure-to-deliver occurrences within a quarter. At the time a short position is initiated, the short seller has 3 days to locate and borrow the shares from a securities lender. Short sellers that have not located shares from owners by that time are said to have failed to deliver (see Evans, Geczy, Musto, and Reed (2009) for details). According to Blocher, Reed, and Van Wesep (2013), the failure-to-deliver list attracts investors' attention and signals an increased likelihood that stocks may be becoming special. I use the failure-to-deliver data to test whether an increase in expected borrowing fees would trigger the interest of institutional investors and prompt their increased ownership. The advantage of using the cumulative occurrence of a failure to determine whether security lenders discount expected lending income in their valuation is that it is public information.[14]

In the second prediction I add utilization, which is the value of assets on loan from beneficial owners (beneficial owner value on loan) relative to the total lendable asset value (beneficial owner inventory value) from Data Explorers. In both predictions I also include common short-sale determinants. Dechow et al. (2001) show that short sellers position themselves in stocks with low ratios of fundamentals to market values, so as before I include the MTB ratio. I include the standard deviation of returns and turnover, similar to Boehme et al. (2006), as a measure of divergence of opinion, as the heterogeneity of beliefs about a firm's fundamentals is expected to be related to the degree of short selling (Miller (1977)). Diether et al. (2008) show that short sellers position themselves in stocks with positive returns, and therefore I include past quarterly return. Additional costs to short sellers are dividend payments, because stock prices tend to fall by less than the amount of the dividend the short seller is required to reimburse, which could lead to a lower lending fee. I therefore include an indicator of whether the stock pays dividends. Other stock characteristics included are size, age, S&P 500 indicator, bid–ask spread, and the price level.

In Table 4, columns 1 and 2 in Panel A show the predictive regressions, and columns 1–6 in Panel B are the panel regressions of institutional trading on the

[14]The results are robust to exclusion of the failure occurrence variable.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

TABLE 4

Institutional Trading and the Change in Predicted Fee

Table 4 presents a panel regression of institutional ownership on predicted fee increase and stock-specific control variables and year dummies (Panel A). Panel B is the prediction regression; column 1 corresponds to Pred(FEE_INCREASE) and column 2 to Pred(FEE_INCREASE)2. Both stages are estimated jointly to ensure the standard errors in the second stage are adjusted to account for the estimation in the first stage. Results are reported in percentages. Robust *t*-statistics are given in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$. The details of data sources and variable definitions are in the Appendix.

Panel A. First Stage: Prediction

	Prob(FEE_INCREASE)$_{t,t-1}$	Prob(FEE_INCREASE)2$_{t,t-1}$
	1	2
ln(M_CAP)$_t$	0.038***	0.039***
	(6.87)	(6.91)
BID-ASK$_t$	−0.000	−0.000
	(−0.04)	(−0.03)
TURNOVER$_t$	0.001***	0.001***
	(6.91)	(5.73)
PRICE$_t$	0.000	0.000
	(0.02)	(0.05)
SP500$_t$	−0.152**	−0.115*
	(−2.47)	(−1.86)
AGE$_t$	0.003***	0.003***
	(4.85)	(5.79)
ST_DEV$_t$	−0.004***	−0.004***
	(−7.22)	(−7.94)

Panel B. Second Stage: Institutional Trading

	ΔIO$_t$	Δln(1+NIO)$_t$	ODDS_BUY$_t$	ΔIO$_t$	Δln(1+NIO)$_t$	ODDS_BUY$_t$
	1	2	3	4	5	6
Pred(FEE_INCREASE)$_{t,t-1}$	5.948***	11.580***	1.233***			
	(4.23)	(3.16)	(3.09)			
Pred(FEE_INCREASE)2$_{t,t-1}$				4.992***	3.006	1.387***
				(4.30)	(1.02)	(5.20)
ln(M_CAP)$_t$	0.255***	0.661***	1.991***	0.260***	0.799***	1.951***
	(4.92)	(4.88)	(11.17)	(5.15)	(6.10)	(10.89)
BID-ASK$_t$	0.032	−0.005	0.989	0.032	−0.003	0.988
	(0.47)	(−0.03)	(−0.53)	(0.48)	(−0.02)	(−0.53)
TURNOVER$_t$	0.001	0.001*	1.000*	0.001	0.002***	1.000
	(0.54)	(1.74)	(1.72)	(0.95)	(3.35)	(1.56)
PRICE$_t$	−0.000	0.005*	0.997*	−0.000	0.005	0.997*
	(−0.28)	(1.69)	(−1.81)	(−0.31)	(1.57)	(−1.88)
SP500$_t$	0.338	0.347	1.627	0.272	−0.175	1.797
	(0.89)	(0.35)	(1.08)	(0.73)	(−0.19)	(1.30)

(continued on next page)

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

TABLE 4 (continued)

Institutional Trading and the Change in Predicted Fee

Panel A. First Stage: Prediction (continued)

	Prob(FEE_INCREASE)$_{t,t-1}$	Prob(FEE_INCREASE)2$_{t,t-1}$
	1	2
RETURN$_{t-1}$	0.027	0.019
	(1.10)	(0.78)
MTB$_t$	−0.015***	−0.018***
	(−3.42)	(−4.03)
DIVIDEND$_t$	0.025	0.013
	(1.27)	(0.67)
ln(1+FAILURE_OCCURRENCE)$_t$	0.199***	0.142***
	(10.82)	(7.05)
UTILIZATION$_t$		0.003***
		(7.10)
Stock fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
No. of obs.	29,681	29,682
No. of stocks	3,622	3,622

Panel B. Second Stage: Institutional Trading (continued)

	ΔIO$_t$	Δln(1+NIO)$_t$	ODDS_BUY$_t$	ΔIO$_t$	Δln(1+NIO)$_t$	ODDS_BUY$_t$
	1	2	3	4	5	6
AGE$_t$	−0.020***	−0.064***	0.937*	−0.019***	−0.055***	0.936*
	(−5.48)	(−6.73)	(−1.90)	(−5.42)	(−6.23)	(−1.91)
ST_DEV$_t$	−0.034***	−0.066***	0.988***	−0.035***	−0.075***	0.990***
	(−9.53)	(−7.22)	(−6.66)	(−10.34)	(−8.85)	(−5.73)
RETURN$_{t-1}$	1.132***	4.653***	1.339***	1.145***	4.733***	1.373***
	(7.95)	(12.58)	(6.14)	(8.22)	(13.34)	(6.73)
MTB$_t$	0.143***	0.613***	0.960**	0.140***	0.580***	0.956**
	(6.13)	(10.11)	(−2.25)	(6.15)	(10.03)	(−2.45)
DIVIDEND$_t$	−0.596***	−1.092***	1.187**	−0.581***	−0.996***	1.175*
	(−5.01)	(−3.53)	(2.00)	(−5.00)	(−3.36)	(1.88)
NUM_ANALYST$_t$	−0.038***	−0.129***	0.973***	−0.037***	−0.126***	0.974***
	(−9.59)	(−12.16)	(−6.73)	(−9.21)	(−11.90)	(−6.73)
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	29,681	29,682	29,681	29,682	29,681	29,682
No. of stocks	3,622	3,622	3,622	3,622	3,622	3,622

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

predicted fee. The two stages are estimated simultaneously to adjust the standard errors in the second stage for the estimation error in the first stage.

The first two columns in Table 4 show that failure to deliver is an important determinant of the actual lending fee. A failure to deliver increases the likelihood of a fee increase.[15] An increase in predicted fee leads to a much stronger response in institutional ownership than does the actual fee change (column 1 of Panel B). An increase in expected lending fee increases institutional ownership of stocks by 5.95%, and numbers of institutions increase by 11.58%. Institutional investors are 1.24 times more likely to buy shares of stocks whose lending fee they expect to increase. Institutional investors respond more to the expected fee than an actual fee increase, suggesting that they buy stocks in anticipation of lending income in the future when the opportunity to lend arises. Institutional investors respond slightly less to the predicted fee when proprietary information is included in the prediction regression (column 2), but the response is still greater than that to the actual fee increase.

V. The Price of Prospective Lending

Next I test whether the overvaluation associated with high fees is more pronounced among stocks that institutions are trading. I perform a monthly Fama–MacBeth (1973) analysis and a two-way (5×5) independent portfolio sort of institutional trading and lending fee to test whether there is a higher premium on high-fee stocks, measured as the difference in returns between high- and low-fee stocks, in stocks with high levels of institutional trading.

First, in Figure 5, I rank stocks into five groups on the basis of the amount of trading (i.e., change in institutional ownership in each quarter) and calculate for each group the average change in fee in bps. As shown in Graph A, the stocks with the highest increase in institutional ownership also have, on average, increasing lending fees, whereas the sold stocks have seen lending-fee declines. Graph B clearly distinguishes the direction of the trade, with the sample partitioned into buy or sell, an increase or decline in institutional ownership, respectively. The figure shows that institutions tend to sell stocks with declining lending fees and buy stocks with increasing lending fees.

In Table 5, I perform a portfolio analysis, sorting each stock into fee and institutional trading quintiles. The first two quintiles represent an average decrease in ownership, and as of quintile 3, the average change is an increase in holdings, which is increasing in quintiles 4 and 5. The premium on high-fee stocks, the difference in returns between high- and low-fee stocks, is positive and significant only for stocks that are highly bought by institutional investors. On a raw return basis, the top-fee and institutional trading quintile has a positive return of 1.08%. The difference in contemporaneous raw returns between the high-fee stocks in the highest institutional trading quintile and the lowest-fee stocks is 2.23%. This difference cannot be explained by the 1-factor or 4-factor model, so the risk-adjusted premium on the high-fee stocks is more than 2.75% per month.

[15]The results are similar when predicting the actual fee level.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

FIGURE 5

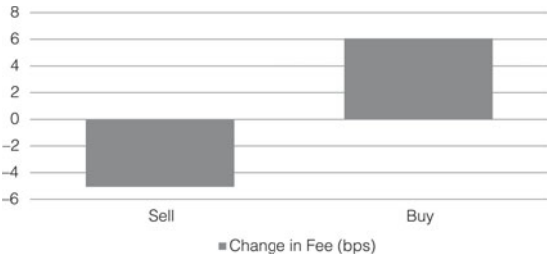
Trade and Fee Rank

In Figure 5, a stock is ranked into five groups for each quarter according to the change in institutional ownership. Graph A shows the average change in fee in bps for stocks in each institutional trading quintile. Graph B shows the average change in fee in bps for stocks that are bought and sold by institutional investors. A buy corresponds to an increase in institutional ownership, and a sell corresponds to a decrease. The details of data sources and variable definitions are in the Appendix.

Graph A. Institutional Trade Rank and Change in Lending Fee



Graph B. Institutional Trade and Change in Lending Fee



The premium difference between high- and low-fee stocks that are bought by institutional investors versus the ones that are sold is 5.99%. These results are consistent with the premise that institutional investors trade in the direction of high fees to gain lending income, thereby contributing to the overvaluation of high-fee stocks.

I also perform a Fama–MacBeth (1973) analysis that allows for the inclusion of additional stock-level controls. I control for size, MTB value, liquidity as measured by bid–ask spread and turnover, the number of analysts following the stock, and two dummy variables that equal 1 when a stock pays a dividend or is in the S&P 500 index. I classify stocks as SPECIAL if they are in the top 20% of the fee distribution. I interact this indicator variable with another indicator variable that equals 1 if institutional investors purchase the stock, to test whether the high premium on high-fee stocks versus low-fee stocks is higher when the stocks are acquired by institutional investors.

As can be seen from the results in column 1 of Table 6, a stock in the top-fee quintile does not trade at a premium in itself, as indicated by a negative coefficient on the indicator variable SPECIAL. The positive and statistically significant interaction term of $SPECIAL_t$ and BUY_t shows that the overvaluation is present solely for stocks that are bought by institutional investors. The difference in risk-adjusted return between a stock that is bought by institutional investors and is in the top 20% of the fee distribution and a top-fee-quintile stock that is not bought by institutions is 2.64% (0.22×12) per year.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

TABLE 5

Institutional Trading and Fee: Independent Sort

In Table 5, the stocks are sorted each month into five equal-weight portfolios using the lending fee and change in institutional ownership with respect to the previous quarter. The first two institutional ownership quintiles represent an average decrease in ownership, and as of quintile 3, the average change is an increase in holdings, which is increasing in quintiles 4 and 5. The time-series averages of equal-weighted daily return and factor model alphas are reported in percentages. The alphas are the intercepts from the capital asset pricing model (CAPM) in Panel B and the Carhart (1997) 4-factor model in Panel C. The *t*-statistics are Newey–West (1987) adjusted for 5 lags and are shown in parentheses below the coefficient estimates. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$.

		Fee					
	ΔIO_t	1	2	3	4	5	(H − L)
Panel A. Average Return$_t$							
Decrease	1	−2.88	−4.76	−5.31	−4.93	−6.47	−3.60***
		(−1.62)	(−2.42)	(−3.29)	(−2.30)	(−3.35)	(−5.12)
	2	−5.83	−7.68	−12.09	−7.75	−11.29	−5.46***
		(−4.69)	(−3.28)	(−7.31)	(−4.59)	(−9.35)	(−6.90)
	3	−6.32	−11.82	−13.72	−8.43	−14.20	−7.88***
		(−3.71)	(−3.06)	(−9.56)	(−3.36)	(−5.00)	(−5.73)
	4	−2.34	−3.64	−5.75	−5.13	−5.27	−2.93*
		(−1.91)	(−1.86)	(−3.40)	(−1.60)	(−1.97)	(−1.77)
Increase	5	−1.15	−1.18	−1.94	−2.11	1.08	2.23**
		(−0.82)	(−0.68)	(−1.11)	(−1.06)	(0.56)	(2.68)
	(H − L)	1.73**	3.58***	3.37***	2.82***	7.56***	5.83***
		(2.49)	(5.32)	(5.87)	(4.63)	(7.43)	(6.09)
Panel B. CAPM Alpha$_t$							
Decrease	1	−1.75	−3.52	−4.13	−3.65	−5.33	−3.58***
		(−4.33)	(−4.35)	(−7.33)	(−5.58)	(−6.42)	(−4.68)
	2	−4.92	−6.93	−11.87	−7.10	−10.55	−5.64***
		(−5.41)	(−3.36)	(−5.71)	(−8.44)	(−11.34)	(−7.04)
	3	−5.47	−11.04	−13.38	−7.51	−13.47	−8.00***
		(−5.91)	(−2.99)	(−9.26)	(−4.98)	(−6.10)	(−4.79)
	4	−1.57	−2.54	−4.84	−3.95	−4.07	−2.51*
		(−2.72)	(−4.20)	(−3.95)	(−1.98)	(−2.74)	(−1.91)
Increase	5	−0.20	−0.09	−0.56	−1.28	2.55	2.75***
		(−0.44)	(−0.22)	(−0.90)	(−1.14)	(3.14)	(3.87)
	(H − L)	1.55**	3.43***	3.56***	2.37***	7.88***	6.33***
		(2.23)	(4.91)	(5.82)	(3.85)	(6.38)	(6.37)
Panel C. Carhart 4-Factor Alpha$_t$							
Decrease	1	−2.01	−3.41	−4.10	−3.57	−5.21	−3.21***
		(−4.19)	(−3.85)	(−6.03)	(−5.07)	(−5.04)	(−5.09)
	2	−5.03	−6.73	−12.22	−7.06	−10.58	−5.55***
		(−5.60)	(−3.46)	(−6.64)	(−7.48)	(−17.37)	(−4.92)
	3	−5.22	−10.47	−13.52	−7.20	−13.41	−8.18***
		(−5.70)	(−3.19)	(−9.31)	(−4.85)	(−5.52)	(−4.18)
	4	−1.69	−2.53	−4.78	−3.99	−3.90	−2.21
		(−3.06)	(−4.08)	(−3.50)	(−2.03)	(−2.66)	(−1.55)
Increase	5	−0.09	−0.16	−0.55	−1.25	2.69	2.78***
		(−0.22)	(−0.30)	(−0.81)	(−0.98)	(4.08)	(3.52)
	(H − L)	1.91**	3.25***	3.55***	2.32***	7.90***	5.99***
		(2.56)	(4.39)	(4.90)	(3.31)	(5.24)	(5.67)

In column 2 of Table 6, I interact the special indicator variable with another indicator variable that equals 1 if institutional investors purchased the stock in the previous quarter (BUY_{t-1}) to test whether institutional trading behavior contributes to the overvaluation associated with high fees. The univariate and multivariate analyses show that institutions already have positioned themselves into stocks 1 quarter before the stocks are classified as expensive. Specifically, I am interested to see whether stocks that have been bought by institutions in the previous

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

TABLE 6

Abnormal Return and Institutional Buying

Table 6 presents a Fama–MacBeth (1973) regression explaining the Carhart (1997) 4-factor alpha with factor loadings estimated over the prior 3 years using monthly data. The alphas are winsorized at 1% to minimize the impact of outliers. The reported results are in percentages. Stocks are classified as $SPECIAL_t$ if they belong to the highest fee quintile. $\widehat{SPECIAL}_t$ is an indicator variable that equals 1 if the stock is ranked as the highest predicted-fee quintile. I predict the lending fee as a function of the occurrence of a failure to deliver and stock characteristics such as size, MTB, age, standard deviation of returns, S&P 500 indicator, bid–ask spread, turnover, price, past return, and whether the stock pays dividends. The second prediction used for $\widehat{SPECIAL2}_t$ includes proprietary information on utilization levels as reported by Data Explorers. Robust *t*-statistics are given in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$. The details of data sources and remaining variable definitions are in the Appendix.

	1	2	3	4
BUY_t	−0.053			
	(−1.36)			
$SPECIAL_t$	−0.209**	−0.313***		
	(−2.21)	(−4.22)		
$SPECIAL_t \times BUY_t$	0.224*			
	(1.81)			
BUY_{t-1}		−0.040	−0.000	0.009
		(−0.95)	(−0.00)	(0.28)
$SPECIAL_t \times BUY_{t-1}$		0.362**		
		(2.58)		
$\widehat{SPECIAL}_t$			−0.159	
			(−1.62)	
$\widehat{SPECIAL}_t \times BUY_{t-1}$			0.190**	
			(2.15)	
$\widehat{SPECIAL2}_t$				−0.346***
				(−2.98)
$\widehat{SPECIAL2}_t \times BUY_{t-1}$				0.180
				(1.55)
$\ln(M_CAP)_t$	−0.004	−0.008	−0.002	−0.011
	(−0.09)	(−0.17)	(−0.03)	(−0.25)
$BID\text{-}ASK_t$	0.117***	0.116***	0.118***	0.113***
	(3.19)	(3.17)	(3.23)	(3.16)
$TURNOVER_t$	0.013***	0.013***	0.013***	0.014***
	(2.88)	(2.86)	(3.02)	(3.20)
$SP500_t$	0.021	0.022	0.020	0.015
	(0.25)	(0.26)	(0.24)	(0.18)
MTB_t	0.011	0.011	0.012	0.016
	(0.52)	(0.51)	(0.58)	(0.72)
$DIVIDEND_t$	−0.257***	−0.265***	−0.259***	−0.263***
	(−3.90)	(−3.97)	(−3.95)	(−3.97)
$NUM_ANALYST_t$	−0.018***	−0.018***	−0.018***	−0.018***
	(−3.18)	(−3.26)	(−3.37)	(−3.13)
Constant	0.353	0.399	0.282	0.432
	(0.52)	(0.60)	(0.43)	(0.67)
No. of obs.	66,011	62,010	62,010	62,010
R^2	7.39%	3.48%	3.51%	3.68%

quarter, possibly to gain lending income, subsequently trade at a premium when the stocks become expensive to borrow. Moreover, by lagging the institutional ownership trade variable, I avoid the contemporaneous price impact associated with the purchase of the share by the institution. The difference in risk-adjusted return between a high-fee stock that was bought by institutional investors in the previous quarter and a top-fee-quintile stock that was not bought by institutions is 4.32% (0.36 × 12) per year.

In column 3 of Table 6, I study the relation between expected lending income and returns. I predict the lending fee as a function of publicly available information

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

(as in the first stage of Table 4) and test whether the premium on high-expected-fee stocks (the difference in returns between high-expected- and low-expected-fee stocks) is positive and significant for stocks that have been bought previously by institutional investors. $\widehat{\text{SPECIAL}}_t$ refers now to a stock in the top quintile of the predicted fee distribution. The coefficient on the interaction between high expected fee and institutional buying is positive and significant but smaller economically. Stocks in the top-fee quintile that have been bought by institutional investors in the previous quarter experience a 19-bp increase in monthly abnormal return, or 2.28% per year.

In column 4 of Table 6, the prediction includes proprietary loan information. Here the abnormal return associated with high-fee stocks that have been bought by institutional investors, although positive, is not significant.

Although institutions seem to respond by increasing their holdings more strongly to an increase in expected lending fee than to the actual fee, the premium they pay is smaller, possibly because of the uncertainty associated with the expectation. Nonetheless, the results are consistent with the premise that institutional trading in the direction of the high fee contributes to the overvaluation of high-fee stocks.

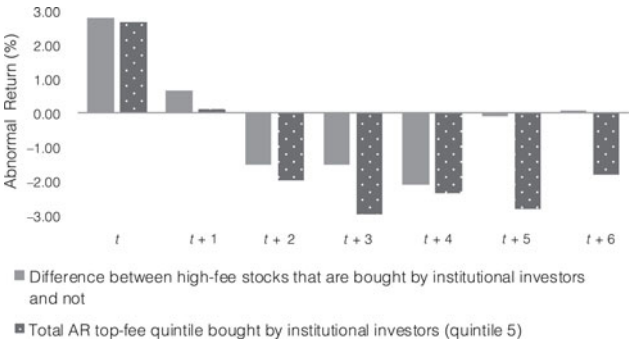
In Figure 6, I take a closer look at the abnormal returns in the subsequent 6 months using the same portfolio and Fama–MacBeth (1973) analyses. Graph A (dotted bar) shows the total annualized 4-factor abnormal return of the top-fee quintile of stocks following a calendar portfolio approach, up to 6 months after being ranked into the top-fee quintile at time *t*. The graph also shows the difference between the premium on high- minus low-fee stocks for stocks that have been

FIGURE 6

Abnormal Return and Fee

Graph A of Figure 6 (dotted bar) shows the total annualized 4-factor abnormal return (AR) of the top-fee quintile of stocks following a monthly calendar portfolio approach, up to 6 months after being ranked into the top-fee quintile at time *t*. The graph also shows the difference between the premium on high- minus low-fee stocks for stocks that have been bought by institutional investors in the previous quarter and the premium for stocks for which the institutional holdings did not increase (solid bar). Graph B (dotted bar) shows the total annualized 4-factor AR of the top-fee quintile of stocks after controlling for stock characteristics such as size, MTB, age, standard deviation of returns, S&P 500 indicator, bid–ask spread, turnover, number of analysts, and whether the stock pays dividends in a Fama–MacBeth (1973) regression. The graph also shows the difference between the premium on high- minus low-fee stocks for stocks that have been bought by institutional investors in the previous quarter and the premium for stocks for which the institutional holdings did not increase (solid bar). The details of data sources and variable definitions are in the Appendix.

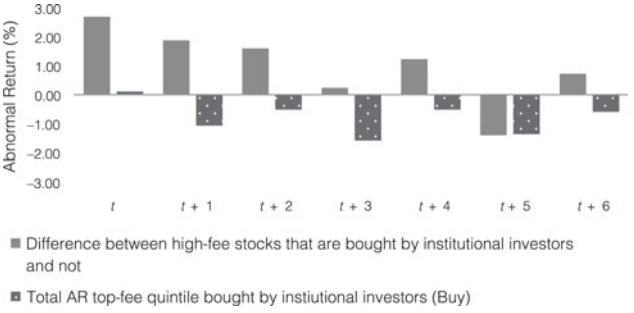
Graph A. Portfolio Abnormal Return of Top-Fee Quintile



https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

FIGURE 6 (continued)
Abnormal Return and Fee

Graph B. Fama–MacBeth Abnormal Return of Top-Fee Quintile



bought by institutional investors in the previous quarter and the premium for stocks for which the institutional holdings did not increase (solid bar).

Graph B of Figure 6 (dotted bar) shows the total annualized 4-factor abnormal return of the top-fee quintile of stocks after controlling for stock characteristics such as size, MTB value, age, standard deviation of returns, S&P 500 indicator, bid–ask spread, turnover, number of analysts, and whether the stock pays dividends in a Fama–MacBeth (1973) regression.

The annualized abnormal returns (dotted bars) are positive at time *t*, but decrease in the following quarters in line with the reduction in short-selling constraint leading to a decrease in returns, as in Cohen, Diether, and Malloy (2007). The graph also shows the difference between the premium on high- minus low-fee stocks for stocks that have been bought by institutional investors in the previous quarter and the premium for stocks for which the institutional holdings did not increase (solid bars), the equivalent of the interaction term of SPECIAL and the increase in the institutional ownership indicator variable. As can be seen from the solid bars, the premium difference-in-difference is positive and significant at least in the following quarter after the stock is classified as special.

VI. Negative Information Trade-Off

The fact that stocks with high lending fees trade at a premium to low-fee stocks and that the premium is related to institutional trading suggests two results: Future lending income is capitalized into prices, and institutions anticipate the lending income and contribute to the overvaluation. This does not mean that the negative information inherent in short selling could not offset this effect.

Disagreement models suggest that excess demand for shorting implies there is negative information that is not yet incorporated into prices. The fact that short-sale trades predict future stock returns suggests that short sellers are informed, and could potentially have access to private information.

This means that the same signal that exerts upward pressure on price, because of the lending income, could also exert downward pressure, because of the implied negative information. The effects of these two competing factors could balance out.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

I examine the interplay of information from disagreement predictions by first examining how an increase in lending fee influences the buying behavior of institutional investors in the presence of negative news. I specifically test whether institutions are less willing to purchase stocks that experience an increase in borrowing cost but also have negative earnings news in a panel logit regression. I include two measures of negative news. The first measure is an indicator variable that equals 1 if the company announces negative earnings (NEGATIVE_EARNINGS$_{i,t}$), as reported in the unadjusted surprise history file in IBES. The second is the earnings surprise, the announced earnings in excess of analysts' consensus forecasts. This dummy variable (NEGATIVE_SURPRISE$_{i,t}$) equals 1 if the reported earnings are lower than analyst expectations.

I measure the differential response of institutional investor's holdings to an increase in fee and a change in fee for stocks with negative news by including an interaction between the fee increase (FEE_INCREASE$_{i,t}$) or the change in fee (ΔFEE$_{i,t}$) and the negative news variable. The results in Table 7 show that both the fee-increase dummy and the change in fee increase the likelihood the stock will be bought, but this effect weakens in the presence of negative information. The results suggest that institutional investors realize there is a trade-off between lending income and the implied negative information from short selling, as they are less willing to buy high-fee stocks that experience a negative information shock.

TABLE 7

Negative Information Trade-Off

Table 7 presents a panel logit regression for U.S. common equity stocks from June 2006 to Dec. 2008 of an increase in institutional ownership (buy) on loan-fee increase and stock-specific control variables and year dummies. Results are reported in odds. The first measure is an indicator variable that equals 1 if the company announces negative earnings (NEGATIVE_EARNINGS$_{i,t}$). The second measure equals 1 if the earnings surprise, the announced earnings in excess of the analysts' consensus forecasts, is negative (NEGATIVE_SURPRISE$_{i,t}$). Robust *t*-statistics are given in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$. The details of data sources and variable definitions are in the Appendix.

	1	2	3	4
FEE_INCREASE$_{t,t-1}$	1.363***		1.355***	
	(10.28)		(10.17)	
NEGATIVE_EARNINGS$_t$	0.959	0.925		
	(−0.71)	(−1.52)		
NEGATIVE_EARNINGS$_t$ × FEE_INCREASE$_{t,t-1}$	0.882*			
	(−1.73)			
ΔFEE$_{t,t-1}$		1.085***		1.077***
		(6.44)		(6.08)
NEGATIVE_EARNINGS$_t$ × ΔFEE$_{t,t-1}$		0.923***		
		(−3.69)		
NEGATIVE_SURPRISE$_t$			1.002	0.971
			(0.04)	(−0.51)
NEGATIVE_SURPRISE$_t$ × FEE_INCREASE$_{t,t-1}$			0.899	
			(−1.42)	
NEGATIVE_SURPRISE$_t$ × ΔFEE$_{t,t-1}$				0.936***
				(−2.98)
ln(M_CAP)$_t$	2.049***	2.075***	2.057***	2.082***
	(14.23)	(14.48)	(14.30)	(14.55)
BID-ASK$_t$	0.994	0.993	0.994	0.993
	(−0.29)	(−0.35)	(−0.28)	(−0.33)
TURNOVER$_t$	1.000	1.000	1.000	1.000
	(0.72)	(0.89)	(0.67)	(0.85)
PRICE$_t$	0.998	0.997	0.998	0.998
	(−1.57)	(−1.56)	(−1.55)	(−1.54)

(continued on next page)

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

TABLE 7 (continued)

Negative Information Trade-Off

	1	2	3	4
$SP500_t$	1.254	1.203	1.262	1.216
	(0.55)	(0.46)	(0.57)	(0.48)
AGE_t	0.944**	0.947**	0.944**	0.947**
	(−2.12)	(−2.05)	(−2.11)	(−2.03)
ST_DEV_t	0.989***	0.989***	0.989***	0.989***
	(−10.07)	(−10.61)	(−10.05)	(−10.59)
$RETURN_{t-1}$	0.998***	0.997***	0.998***	0.997***
	(−3.00)	(−2.86)	(−3.03)	(−2.88)
MTB_t	0.984	0.984	0.983	0.983
	(−1.18)	(−1.17)	(−1.19)	(−1.20)
$DIVIDEND_t$	1.198**	1.199**	1.200**	1.199**
	(2.33)	(2.35)	(2.36)	(2.35)
$NUM_ANALYST_t$	0.981***	0.911***	0.980***	0.981***
	(−5.81)	(−5.66)	(−5.84)	(−5.71)
Stock fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
No. of obs.	29,681	29,681	29,681	29,681
No. of stocks	3,621	3,621	3,621	3,621
Pseudo R^2	3.91%	3.67%	3.89%	3.65%

Then, I test whether the overvaluation associated with high-fee stocks is also less pronounced when stocks experience a negative information shock. I rerun the Fama–MacBeth (1973) analysis for the subsample of stocks that experience a negative information shock using the same two measures, negative earnings and negative earnings surprise, in Panel A of Table 8. The coefficient on the interaction of the high-fee indicator and whether the stock was bought in the previous quarter by institutions is not significant, both for the actual fee (columns 1–3) and

TABLE 8

Abnormal Return and Institutional Buying in the Negative News Subsample

Table 8 presents a Fama–MacBeth (1973) regression explaining the Carhart (1997) 4-factor alpha with factor loadings estimated over the prior 3 years using monthly data. The alphas are winsorized at 1% to minimize the impact of outliers. The reported results are in percentages. Panel A reports the results for the sample of stocks with negative earnings news. The first subsample is of companies announcing negative earnings, as reported in the unadjusted surprise history file in IBES. The second sample is for stocks with announced earnings short of the analysts' consensus forecasts. Panel B reports the results for the sample of stocks with no negative earnings news. Stocks are classified as $SPECIAL_t$ if they belong to the highest fee quintile. $\widehat{SPECIAL}_t$ is an indicator variable that equals 1 if the stock is ranked as the highest predicted-fee quintile; the fee is predicted as a function of the occurrence of a failure to deliver and stock characteristics such as size, MTB, age, standard deviation of returns, S&P 500 indicator, bid–ask spread, turnover, price, past return, number of analysts, and whether the stock pays dividends. The second prediction used for $\widehat{SPECIAL2}_t$ includes proprietary information on utilization levels as reported by Data Explorers. Robust *t*-statistics are given in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$.

Panel A. Negative News Subsample

	1	2	3	4	5	6
BUY_{t-1}	−0.110	−0.035	0.060	0.064	0.029	0.067
	(−0.90)	(−0.38)	(0.57)	(0.81)	(0.27)	(1.00)
$SPECIAL_t$	−0.216	−0.425***				
	(−1.70)	(−3.74)				
$SPECIAL_t \times BUY_{t-1}$	0.339	0.359				
	(1.37)	(1.64)				
$\widehat{SPECIAL}_t$			−0.275**	−0.141		
			(−2.13)	(−0.90)		

(continued on next page)

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

TABLE 8 (continued)

Abnormal Return and Institutional Buying in the Negative News Subsample

Panel A. Negative News Subsample (continued)

	1	2	3	4	5	6
$\widehat{SPECIAL}_t \times BUY_{t-1}$			0.094	0.115		
			(0.44)	(0.66)		
$\widehat{SPECIAL2}_t$					−0.202	−0.347**
					(−1.70)	(−2.61)
$\widehat{SPECIAL2}_t \times BUY_{t-1}$					0.015	0.133
					(0.10)	(0.85)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Negative news	Earnings	Earnings Surprise	Earnings	Earnings Surprise	Earnings Earnings	Earnings Surprise
No. of obs.	8,979	23,125	8,979	23,125	8,979	23,125
Pseudo R^2	6.47%	3.86%	6.41%	3.91%	6.40%	3.92%

Panel B. No Negative News Subsample

	1	2	3
BUY_{t-1}	−0.031	−0.012	0.001
	(−0.82)	(−0.36)	(0.02)
$SPECIAL_t$	−0.403***		
	(−4.03)		
$SPECIAL_t \times BUY_{t-1}$	0.428**		
	(2.31)		
$\widehat{SPECIAL}_t$		−0.167	
		(−1.31)	
$\widehat{SPECIAL}_t \times BUY_{t-1}$		0.238*	
		(1.98)	
$\widehat{SPECIAL2}_t$			−0.443***
			(−3.43)
$\widehat{SPECIAL2}_t \times BUY_{t-1}$			0.277*
			(2.03)
Controls	Yes	Yes	Yes
No. of obs.	53,031	53,031	53,031
Pseudo R^2	3.75%	3.82%	3.96%

the expected fee (columns 4–9). The premium that institutional investors pay for high-fee stocks is insignificant in the subsample of stocks that experience a negative information shock, but remains significant in the subsample of stocks for which there is no negative information release (Panel B of Table 8).

VII. Mutual Fund Security Lending and Portfolio Decisions

Both the univariate and multivariate analyses present evidence consistent with the idea that institutional investors are willing to purchase high-fee shares to gain lending income. In this section, I focus on the willingness to purchase shares with increasing lending fees of a particular set of institutional investors, namely, mutual funds. Following Evans, Ferreira, and Porras Prado (2012), I examine the security lending practices and portfolio decisions of mutual funds to determine whether mutual funds are more likely to allow security lending if the aggregate lending fee was high in the previous month, and how an increase in lending fee influences their portfolio allocations.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

Evans et al. (2012) examine the security lending practices of mutual funds and their impact on performance, using a sample of 2,093 active and 186 passive equity funds over the 1996–2008 period. They collect the N-SAR-B annual fund filings from the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database. The N-SAR form provides information on whether or not a fund is allowed by its prospectus to lend securities and whether or not it actually lends equities.

If institutional investors are buying high-fee stocks for the purpose of lending, there will be a positive relation between allowing a security lending program and the level of lending fees. For the sample period between 2002 and 2008, I obtain aggregate monthly value-weighted average lending fees from Data Explorers and match these to the data of Evans et al. (2012) to test whether the aggregate lending income in the previous month is an important predictor of whether a mutual fund will allow security lending. In line with Evans et al. (2012), I include both family-level controls, such as family size, lagged average family performance rank, the Herfindahl index of total net assets (TNA) in each Morningstar investment objective, average active share, family flow, and family expense ratio, as well as the percentage of index, subadvised, and broker funds in the family, and fund-level controls such as fund size, turnover, age, active share, and lagged performance rank.[16] Columns 1–4 of Table 9 report the odds following a logit regression of the likelihood of allowing a security lending program for the sample period 2002–2008 (columns 1 and 2) and the period under study 2006–2008 (columns 3 and 4).

The aggregate lending fee is indeed an important predictor, as a 1% increase in lending fee makes mutual funds 3.10 times more likely to allow security lending for the sample period 2002–2008 and 1.92 times more likely for the period 2006–2008. In columns 2 and 4 of Table 9, I introduce fund fixed effects, and the identification will thus come from the funds that experienced a change in security lending allowance. In the Evans et al. (2012) sample period, 17.81% of active funds and 38.5% of index funds switched from prohibiting to allowing security lending. Less than 3% of the active and index funds switched from allowing to prohibiting security lending. So although changes are not uncommon, the introduction of fixed effects does significantly lower the number of observations. Column 2 shows that funds that changed their security lending practice were 2.9 times more likely to allow security lending if the fee in the previous month was as high as 1% in the sample period 2002–2008. For the subsample 2006–2008, the odds of allowing security lending when changing the lending status were as high as 9.5 times more likely.

For mutual funds the security lending fee seems to be an important reason for allowing a security lending program. This is consistent with anecdotal evidence that mutual funds are shifting their lending strategy from volume-oriented lending, in which funds lend out a large percentage of easy-to-find securities, toward value lending, a strategy involving lending only those securities that generate significant revenues (Peterson LaBarge (2011)). However, the question remains

[16]The results are robust to just the inclusion of fund-level controls or just family controls. For more details on the data sources, refer to Evans et al. (2012).

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

TABLE 9

Mutual Fund Security Lending Decision

Table 9 shows the odds following a logit regression of the fund decision to allow security lending using fund family and fund characteristics as explanatory variables. The data are from Evans et al. (2012). SECURITY_LENDING_ALLOWED is a dummy variable that equals 1 if a fund is allowed to lend shares, and 0 otherwise (N-SAR form question 70N). TNA is the fund's total net assets in $millions. FAMILY_TNA is the sum of the total net assets of management company in $millions. AVERAGE_FAMILY_PERFORMANCE_RANK is the average of the performance rank of funds in the fund family. AVERAGE_FAMILY_EXPENSE_RATIO is the average expense ratio of funds in the fund family. INVESTMENT_OBJECTIVE_HERFINDAHL is a Herfindahl index of the Morningstar investment objective of funds in the fund family. FAMILY_NET_FLOW is the average net flow of funds in the fund family. AVERAGE_FAMILY_ACTIVE_SHARE is the average active share of funds in the fund family. INDEX_FUNDS_IN_FAMILY is the percentage of index funds in the fund family. SUBADVISED_IN_FAMILY is the percentage of subadvised funds in the fund family. BROKER_FUNDS_IN_FAMILY is the percentage of funds sold through brokers as measured by the presence of a front load, rear load, or 12b-1 above 0.25% in the fund family. TURNOVER_MF is the ratio of aggregated sales or aggregated purchases of securities divided by the average 12-month total net assets of the fund. ACTIVE_SHARE refers to the active share measure of Cremers and Petajisto (2009). FUND_PERFORMANCE_RANK is the rank quintile within investment style using 36 months of past fund returns. AGE_MF is measured as the current date minus the first offer date. Robust *t*-statistics are given in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$.

	1	2	3	4
$AGGREGATE_FEE_{t-1}$	3.102***	2.887***	1.917***	9.492***
	(6.14)	(6.55)	(3.78)	(6.20)
$log(FAMILY_TNA)_t$	1.066**	0.986	1.133***	4.626***
	(2.07)	(−0.37)	(3.39)	(10.02)
$AVERAGE_FAMILY_PERFORMANCE_RANK_{t-1}$	0.958*	0.959	0.899***	0.700***
	(−1.68)	(−1.22)	(−3.06)	(−4.86)
$INVESTMENT_OBJECTIVE_HERFINDAHL_t$	0.991***	0.999	0.993**	0.996
	(−3.62)	(−0.06)	(−2.37)	(−0.54)
$AVERAGE_FAMILY_ACTIVE_SHARE_t$	0.986*	0.973***	0.992	0.825***
	(−1.94)	(−4.21)	(−0.80)	(−8.08)
$FAMILY_NET_FLOW_t$	0.982***	0.965***	0.999	0.968**
	(−3.85)	(−7.30)	(−0.02)	(−2.57)
$\%\ INDEX_FUNDS_IN_FAMILY_t$	1.039***	1.032***	1.046***	0.879***
	(3.78)	(2.69)	(4.01)	(−3.04)
$\%\ SUBADVISED_IN_FAMILY_t$	0.986***	1.027***	0.989***	0.918***
	(−9.66)	(16.82)	(−6.12)	(−13.49)
$\%\ BROKER_FUNDS_IN_FAMILY_t$	0.996	0.996*	1.000	1.012
	(−1.24)	(−1.87)	(0.02)	(1.62)
$AVERAGE_FAMILY_EXPENSE_RATIO_t$	1.338	0.189***	1.630**	0.001***
	(1.48)	(−9.59)	(1.97)	(−11.04)
$ln(AGE_MF)_t$	0.697***	1.172***	0.744***	4.768***
	(−4.70)	(2.69)	(−3.33)	(7.39)
$TURNOVER_MF_t$	1.02	1.512***	0.989	5.462***
	(0.28)	(10.29)	(−0.25)	(12.11)
$ACTIVE_SHARE_t$	1.002	0.973***	1.002	0.948***
	(0.57)	(−8.19)	(0.59)	(−4.85)
$ln(TNA)_t$	0.889***	0.968	0.842***	0.697***
	(−3.00)	(−1.01)	(−3.60)	(−2.89)
$FUND_PERFORMANCE_RANK_{t-1}$	0.992	0.967**	1.005	0.936**
	(−0.55)	(−2.56)	(0.28)	(−2.47)
Fund fixed effects	No	Yes	No	Yes
Subsample	2002–2008	2002–2008	2006–2008	2006–2008
No. of obs.	107,267	20,577	49,820	5,528
No. of funds	1,999	300	1,721	161

regarding whether they would buy a stock for the purpose of gaining lending income. To address this question, I look at the underlying holdings of mutual funds and test whether an increase in lending fee would lead to an increased likelihood of a fund increasing its holdings in that particular stock. The holdings data are from the Mutual Fund Holdings Database of Thomson Financial.

Table 10 reports the results of a logit regression of the likelihood of a mutual fund increasing the holdings in a stock. I include the same control variables as

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

in the previous institutional holdings regressions: size, MTB value, age, standard deviation of returns, S&P 500 indicator, bid–ask spread, turnover, price, number of analysts, past return, and whether the stock pays dividends. To account for seasonal changes in the holdings, I also include period fixed effects. In line with the findings on institutional investors in general, the first column in Table 10 shows that mutual funds are 1.70 times more likely to increase their holdings in a stock if the stock has experienced an increase in lending fee. In the second column, I introduce fund–stock pair fixed effects to capture the variation within the portfolio, and the results are even stronger. When changing their portfolio holdings, mutual funds are two times more likely to increase their allocation to stocks with increasing fees. The findings are in line with a quote from the Beneficial Owner & Pension Fund Securities Lending Handbook ((2011), p. 16): "Within the securities lending world, the basic premise is that you have to buy the underlying securities and lend them out" (available at http://pt.scribd.com/doc/40623419/Securities-Lending-Handbook-2011#scribd).

TABLE 10

Mutual Fund Portfolio Decision

Table 10 reports the odds following a logit regression of the likelihood of a mutual fund increasing its holdings in a stock. The holdings data are from the Mutual Fund Holdings Database of Thomson Financial. Robust *t*-statistics are given in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.10$.

	1	2
$FEE_INCREASE_{t,t-1}$	1.700**	2.009***
	(2.33)	(15.86)
$\ln(M_CAP)_t$	1.022	1.176***
	(1.56)	(16.65)
$BID\text{-}ASK_t$	0.998***	1.001
	(−3.35)	(1.48)
$TURNOVER_t$	1.011***	1.014***
	(3.36)	(9.15)
$PRICE_t$	0.999***	0.999***
	(−3.51)	(−4.62)
$SP500_t$	0.928***	0.930**
	(−4.19)	(−2.74)
AGE_t	1.000	0.997
	(0.94)	(−1.52)
ST_DEV_t	0.999***	1.000
	(−3.46)	(0.91)
$RETURN_{t-1}$	0.996***	0.995***
	(−7.10)	(−35.86)
MTB_t	0.967***	0.969***
	(−2.79)	(−8.96)
$DIVIDEND_t$	0.989	0.899***
	(−1.03)	(−11.95)
$NUM_ANALYST_t$	1.001**	1.008***
	(1.97)	(27.24)
Period fixed effects	Yes	Yes
Fund–stock fixed effects	No	Yes
No. of obs.	4,768,145	3,402,451

VIII. Alternative Interpretation

An alternative interpretation of the results is that institutional investors are covering their short-sale positions and are caught in a so-called "short squeeze."

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

That is, institutions holding short positions are forced to purchase shares when the price increases rapidly, in order to exit their short position. In Oct. 2008, a short squeeze temporarily drove the shares of Volkswagen on the Xetra DAX from €210.85 to over €1,000 in under 2 days (Gow (2008)).

To rule out this possibility, I rerun the trading and return analysis, now controlling for the level of short interest. Conceivably, if institutional investors are forced to close their positions, the maximum amount they will need to buy is the amount of outstanding shorts. Alternatively, I use the percentage of shares borrowed as reported by Data Explorers. The inclusion of short interest in Table A1 of the Internet Appendix (columns 1–3 of Panel A) does not reduce the economic effect of the response in institutional ownership, as the coefficients on the dummy-fee increase remain economically significant. Moreover, short interest reduces neither the number of institutions holding the stock in response to a fee increase nor the likelihood that the stock will be bought. In columns 4–6, I include the number of shares borrowed as a proxy for the number of stocks to be covered in the event of a squeeze. The effect of a fee increase on the change in institutional ownership (column 4), on the number of institutional investors (column 5), and on the probability of purchase (column 6) remains significant.

In an alternative test, I split the sample of stocks into large and small on the basis of market capitalization, as short squeezes are more frequent among small-capitalization stocks. A stock is classified as small if its market capitalization is below $2 billion, and large if its market capitalization is higher than $10 billion.

In Panel B of Table A1 of the Internet Appendix, I examine the relation between the fee-increase dummy and institutional trading separately for large- and small-capitalization stocks. The response of institutional investors to an increase in lending fee is much more pronounced for the larger stocks, in terms of the increase in holdings and the likelihood of purchase. The effect is about twice as strong for larger stocks than for small-capitalization ones. The effect of an increase in the fee is larger only for smaller stocks for the number of institutions holding the stock.

The fact that total institutional ownership does not increase for small-capitalization stocks and that the likelihood of purchase is economically smaller provides evidence that my results are not driven by any squeeze on small-capitalization stocks. The results mostly come from the larger stocks in the sample, for which a short squeeze is less likely to occur.

In Table A2 of the Internet Appendix, I test whether the return results are robust to the inclusion of short interest or loan quantity (Panel A). The inclusion of both short interest (columns 1–3) or loan quantity (columns 4–6) does not reduce the significance of the interaction between institutional buying and the return on high-fee stocks. Once I account for the level of short selling, the annualized risk-adjusted-return difference between the high-fee stocks that were previously bought by institutions and the high-fee stocks that were not is 4.39% (0.366×12).

In Panel B of Table A2 in the Internet Appendix, I again split the sample into small- and large-capitalization stocks. If a short squeeze is responsible for the findings, I would expect a greater overvaluation effect for small-capitalization stocks, for which a squeeze is much more likely. The premium on high-fee stocks versus low-fee stocks is still higher when the stocks were acquired in the previous

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

quarter by institutional investors, but the premium is significant only for the larger-capitalization stocks, further providing support against a short squeeze as driving the results.

IX. Conclusion

By lending shares to short sellers, institutional investors benefit by receiving lending income. In 2008, institutions made $1.5 billion this way. In this study I test the Duffie et al. (2002) hypothesis that security prices incorporate expected future securities lending income. To determine whether institutional investors anticipate gains from the future lending of securities, I examine their trading behavior around changes in loan fees.

Impulse-response functions following a PVAR show that a 1-standard-deviation increase in the lending fee increases institutional ownership by 0.50% and the number of institutions holding the stock by 0.90% in the following quarter. This suggests that institutions buy shares in response to an increase in lending fees, and that this could explain the premium associated with high-lending-fee stocks.

In effect, the overvaluation associated with high lending fees is most pronounced among stocks that institutional investors are trading in the direction of the high fee, possibly to gain lending income. For example, among stocks with intense institutional trading, the average contemporaneous 4-factor-alpha spread between high- and low-fee stocks is 2.78% per month (t-statistic = 3.52). Among stocks with low institutional trading, the risk-adjusted-return spread between high- and low-fee stocks is actually negative and statistically significant. When including firm-level controls in a Fama–MacBeth (1973) specification, the difference in risk-adjusted return between a high-fee stock that is bought by institutional investors and a top-fee-quintile stock that is not bought by institutions is 2.64% per year.

Overall, this study identifies an important mechanism that drives the overvaluation of high-fee stocks by showing that institutional investors trade in the direction of the high fee to gain lending income, and thereby contribute to the overvaluation. The results further imply that overpricing caused by the presence of short-sale constraints is partly a result of capitalized lending income.

Appendix. Variable Description

IO: Institutional investor ownership. The number of shares held by institutional investors divided by the total number of shares outstanding. Observations with total institutional ownership greater than 100% excluded. (Source: The institutional holdings data are from CDA/Spectrum. The data about stock prices and returns come from CRSP.)

NIO: Number of institutional investors holding the shares. (Source: CDA/Spectrum.)

ΔIO: First difference of institutional ownership. (Source: CDA/Spectrum.)

($\Delta \ln(1 + \text{NIO})$): First difference of the natural log of 1 plus the number of institutional investors. (Source: CDA/Spectrum.)

FEE: Weekly value-weighted-average fee. (Source: Data Explorers.)

ΔFEE: First difference of fee. (Source: Data Explorers.)

FEE_INCREASE: Dummy variable equal to 1 if the loan fee increased. (Source: Data Explorers.)

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

ON_LOAN: Quantity of borrowed securities as a percentage of shares outstanding. (Source: Data Explorers.)
SHORT_INTEREST: Total of outstanding shorted shares. (Source: shortsqueeze.com.)
UTILIZATION: Value of assets on loan from beneficial owners relative to the lendable asset value. (Source: Data Explorers.)
INVENTORY: Available inventory quantity from beneficial owners as a percentage of shares outstanding. (Source: Data Explorers.)
INVENTORY_ACCOUNTS: Total number of inventory accounts. Separate count for each row of inventory held by each underlying beneficial owner or fund that owns the security. (Source: Data Explorers.)
ACTIVE_AGENTS: Number of custodians with open transactions. (Source: Data Explorers.)
FAILURE (%): The total number of fails-to-deliver (i.e., the balance level outstanding) recorded in the National Securities Clearing Corporation's (NSCC) Continuous Net Settlement (CNS) system aggregated over all NSCC members as a function of the shares outstanding. (Source: Federal Reserve Web site (www.federalreserve.gov/).)
FAILURE_OCCURRENCE: Total cumulative occurrence of fails-to-deliver for the specific time period. (Source: Federal Reserve Web site (www.federalreserve.gov/).)
M_CAP: Market capitalization. Price $\times$ shares outstanding. (Source: CRSP.)
MTB: Market-to-book ratio. Market capitalization divided by the book value for the fiscal year ended before the most recent June 30. (Source: Compustat/CRSP.)
BID-ASK: Difference between the closing bid and ask quotes for a security over the security price. (Source: CRSP.)
TURNOVER: Volume over shares outstanding. (Source: CRSP.)
PRICE: Share price. (Source: CRSP.)
SP500: Dummy variable that equals 1 if a company is in the S&P 500 index. (Source: Compustat Annual Updates Index Constituents.)
AGE: Firm age calculated as the number of years since first returns appear in CRSP. (Source: CRSP.)
ST_DEV: Volatility, measured as the standard deviation of monthly returns over a year. (Source: Monthly price and return data from CRSP.)
RETURN: Quarterly stock return.
4-FACTOR_ALPHA: Monthly Carhart (1997) 4-factor alpha with factor loadings estimated over the prior 3 years using monthly data. The alphas are winsorized at 1% to minimize the impact of outliers.
SPECIAL: Dummy variable that equals 1 if the stock is in the top-fee quintile.
BUY: Dummy variable that equals 1 if institutional investors purchased the stock in the previous quarter.
DIVIDEND: Dummy variable that equals 1 if the firm pays dividends. (Source: Compustat.)
NEGATIVE_EARNINGS: Dummy variable that equals 1 if the firm has announced negative earnings, as reported in the unadjusted surprise history file in IBES. (Source: Unadjusted surprise history file in IBES.)
NEGATIVE_SURPRISE: Announced earnings in excess of the analysts' consensus forecasts. Equals 1 if the earnings surprise is negative. (Source: Unadjusted surprise history file in IBES.)
NUM_ANALYST: Number of analysts following the stock, as reported in the unadjusted surprise history file in IBES. Missing values are set to 0. (Source: Unadjusted surprise history file in IBES.)
SECURITY_LENDING_ALLOWED: A dummy variable that equals 1 if a fund is allowed to lend shares, and 0 otherwise. (Source: N-SAR form question 70N, see also Evans et al. (2012).)
TNA: The fund's total net assets in $millions. (Source: CRSP mutual fund database.)
FAMILY_TNA: The sum of the total net assets of management company in $millions. (Source: CRSP mutual fund database.)
AVERAGE_FAMILY_PERFORMANCE_RANK: is the average of the performance rank of funds in the fund family. (Source: CRSP mutual fund database.)

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

AVERAGE_FAMILY_EXPENSE_RATIO: The average expense ratio of funds in the fund family. (Source: CRSP mutual fund database.)
INVESTMENT_OBJECTIVE_HERFINDAHL: A Herfindahl index of the Morningstar investment objective of funds in the fund family.
FAMILY_NET_FLOW: The average net flow of funds in the fund family. (Source: CRSP mutual fund database.)
AVERAGE_FAMILY_ACTIVE_SHARE: The average active share of funds in the fund family.
INDEX_FUNDS_IN_FAMILY: The percentage of index funds in the fund family.
SUBADVISED_IN_FAMILY: The percentage of subadvised funds in the fund family.
BROKER_FUNDS_IN_FAMILY: The percentage of funds sold through brokers as measured by the presence of a front load, rear load, or 12b-1 above 0.25% in the fund family.
TURNOVER_MF: The ratio of aggregated sales or aggregated purchases of securities divided by the average 12-month total net assets of the fund. (Source: CRSP mutual fund database.)
ACTIVE_SHARE: The active share measure of Cremers and Petajisto (2009).
FUND_PERFORMANCE_RANK: The rank quintile within investment style using 36 months of past fund returns.
AGE_MF: Measured as the current date minus the first offer date. (Source: CRSP mutual fund database.)

References

Aitken, M. J.; A. Frino; M. S. McCorry; and P. L. Swan. "Short Sales Are Almost Instantaneously Bad News: Evidence from the Australian Stock Exchange." *Journal of Finance*, 53 (1998), 2205–2223.

Arellano, M., and S. Bond. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies*, 58 (1991), 277–297.

Arellano, M., and O. Bover. "Another Look at the Instrumental Variables Estimation of Error-Components Models." *Journal of Econometrics*, 68 (1995), 29–51.

Asquith, P.; P. A. Pathak; and J. R. Ritter. "Short Interest, Institutional Ownership, and Stock Returns." *Journal of Financial Economics*, 78 (2005), 243–276.

Autore, D. M.; T. J. Boulton; and M. V. Braga-Alves. "Failures to Deliver, Short Sale Constraints, and Stock Overvaluation." *Financial Review*, 50 (2015), 143–172.

Blocher, J.; A. V. Reed; and E. D. Van Wesep. "Connecting Two Markets: An Equilibrium Framework for Shorts, Longs, and Stock Loans." *Journal of Financial Economics*, 108 (2013), 302–322.

Blundell, R., and S. Bond. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics*, 87 (1998), 115–143.

Boehme, R. D.; B. R. Danielsen; and S. M. Sorescu. "Short-Sale Constraints, Differences of Opinion, and Overvaluation." *Journal of Financial and Quantitative Analysis*, 41 (2006), 455–487.

Boehmer, E.; Z. R. Huszár; and B. D. Jordan. "The Good News in Short Interest." *Journal of Financial Economics*, 96 (2010), 80–97.

Boehmer, E.; C. M. Jones; and X. Zhang. "Which Shorts Are Informed?" *Journal of Finance*, 63 (2008), 491–527.

Boehmer, E.; C. M. Jones; and X. Zhang. "What Do Short Sellers Know?" Working Paper, EDHEC (2011).

Brent, A.; D. Morse; and E. K. Stice. "Short Interest: Explanations and Tests." *Journal of Financial and Quantitative Analysis*, 25 (1990), 273–289.

Carhart, M. M. "On Persistence in Mutual Fund Performance." *Journal of Finance*, 52 (1997), 57–82.

Chen, J.; H. Hong; and J. C. Stein. "Breadth of Ownership and Stock Returns." *Journal of Financial Economics*, 66 (2002), 171–205.

Christophe, S. E.; M. G. Ferri; and J. J. Angel. "Short Selling Prior to Earnings Announcements." *Journal of Finance*, 59 (2004), 1845–1875.

Christophe, S. E.; M. G. Ferri; and J. Hsieh. "Informed Trading before Analyst Downgrades: Evidence from Short Sellers." *Journal of Financial Economics*, 95 (2010), 85–106.

Cohen, L.; K. B. Diether; and C. J. Malloy. "Supply and Demand Shifts in the Shorting Market." *Journal of Finance*, 62 (2007), 2061–2096.

Cremers, M., and A. Petajisto. "How Active Is Your Fund Manager? A New Measure That Predicts Performance." *Review of Financial Studies*, 22 (2009), 3329–3365.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press

D'Avolio, G. "The Market for Borrowing Stock." *Journal of Financial Economics*, 66 (2002), 341–360.
Dechow, P. M.; A. P. Hutton; L. Meulbroek; and R. G. Sloan. "Short-Sellers, Fundamental Analysis, and Stock Returns." *Journal of Financial Economics*, 61 (2001), 77–106.
Desai, H.; K. Ramesh; S. R. Thiagarajan; and B. V. Balachandran. "An Investigation of the Informational Role of Short Interest in the NASDAQ Market." *Journal of Finance*, 57 (2002), 2263–2287.
Diamond, D. W., and R. E. Verrecchia. "Constraints on Short-Selling and Asset Price Adjustment to Private Information." *Journal of Financial Economics*, 18 (1987), 277–311.
Diether, K. B.; K. Lee; and I. M. Werner. "Short-Sale Strategies and Return Predictability." *Review of Financial Studies*, 22 (2009), 575–607.
Duffie, D. "Special Repo Rates." *Journal of Finance*, 51 (1996), 493–526.
Duffie, D.; N. Gârleanu; and L. H. Pedersen. "Securities Lending, Shorting and Pricing." *Journal of Financial Economics*, 66 (2002), 307–339.
Evans, R. B.; M. A. Ferreira; and M. Porras Prado. "Equity Lending, Investment Restrictions, and Fund Performance." Working Paper, University of Virginia (2012).
Evans, R. B.; C. C. Geczy; D. K. Musto; and A. V. Reed. "Failure Is an Option: Impediments to Short Selling and Options Prices." *Review of Financial Studies*, 22 (2009), 1955–1980.
Fama, E., and J. MacBeth. "Risk, Return and Equilibrium: Empirical Tests." *Journal of Political Economy*, 81 (1973), 607–636.
Figlewski, S. "The Informational Effects of Restrictions on Short Sales: Some Empirical Evidence." *Journal of Financial and Quantitative Analysis*, 16 (1981), 463–476.
Geczy, C. C.; D. K. Musto; and A. V. Reed. "Stocks Are Special Too: An Analysis of the Equity Lending Market." *Journal of Financial Economics*, 66 (2002), 241–269.
Gompers, P. A., and A. Metrick. "Institutional Investors and Equity Prices." *Quarterly Journal of Economics*, 116 (2001), 229–259.
Gow, D. "Porsche Makes More VW Stock Available to Desperate Short-Sellers." *The Guardian*. Available at: http://www.theguardian.com/business/2008/oct/29/vw-volkswagen-short-selling (Oct. 29, 2008).
Harrison, J. M., and D. M. Kreps. "Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations." *Quarterly Journal of Economics*, 92 (1978), 323–336.
Hong, H.; J. Scheinkman; and W. Xiong. "Asset Float and Speculative Bubbles." *Journal of Finance*, 61 (2006), 1073–1117.
Jiang, H. "Institutional Investors, Intangible Information and the Book-to-Market Effect." *Journal of Financial Economics*, 96 (2009), 98–126.
Jones, C. M., and O. A. Lamont. "Short-Sale Constraints and Stock Returns." *Journal of Financial Economics*, 66 (2002), 207–239.
Kaplan, S. N.; T. J. Moskowitz; and B. A. Sensoy. "The Effects of Stock Lending on Security Prices: An Experiment." *Journal of Finance*, 68 (2013), 1891–1936.
Karpoff, J. M.; and X. Lou. "Short Sellers and Financial Misconduct." *Journal of Finance*, 65 (2010), 1879–1913.
Lamont, O. A. "Go Down Fighting: Short Sellers vs. Firms." *Review of Asset Pricing Studies*, 2 (2012), 1–30.
Love, I., and L. Zicchino. "Financial Development and Dynamic Investment Behavior: Evidence from Panel VAR." *Quarterly Review of Economics and Finance*, 46 (2006), 190–210.
Miller, E. "Risk, Uncertainty, and Divergence of Opinion." *Journal of Finance*, 32 (1977), 1151–1168.
Morris, S. "Speculative Investor Behavior and Learning." *Journal of Financial Economics*, 111 (1996), 1111–1133.
Nagel, S. "Short Sales, Institutional Investors and the Cross-Section of Stock Returns." *Journal of Financial Economics*, 78 (2005), 277–309.
Newey, W. K., and K. D. West. "A Simple, Positive-Definite, Heteroscedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica*, 55 (1987), 703–708.
Peterson LaBarge, K. "Security Lending Is Still No Free Lunch." Vanguard Research. Available at https://personal.vanguard.com/pdf/icrsl.pdf (July 2011).
Porras Prado, M.; P. A. C. Saffi; and J. Sturgess. "Equity Lending Markets and Ownership Structure." Working Paper, Universidade Nova de Lisboa (2012).
Scheinkman, J., and W. Xiong. "Overconfidence and Speculative Bubbles." *Journal of Political Economy*, 111 (2003), 1183–1219.
Senchack, A. J., and L. T. Starks. "Short-Sale Restrictions and Market Reaction to Short-Interest Announcements." *Journal of Financial and Quantitative Analysis*, 28 (1993), 177–194.
Seneca, J. J. "Short Interest: Bearish or Bullish?" *Journal of Finance*, 22 (1967), 67–70.
Yan, X. S., and Z. Zhang. "Institutional Investors and Equity Returns: Are Short-Term Institutions Better Informed?" *Review of Financial Studies*, 22 (2009), 893–924.

https://doi.org/10.1017/S0022109015000393 Published online by Cambridge University Press