# Securities Lending and Trading by Active and Passive Funds*

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**Abstract**

I study the market for lending and borrowing securities in the United States. I find that by making securities available for borrowing, mutual funds acquire information about short selling, which they exploit for trading. Funds with discretion in their investment choices rebalance their portfolios away from borrowed stocks, avoiding capital losses on stocks with decreasing prices. Funds also trade more aggressively on stocks with stronger signals. Finally, active funds charge lower lending fees than passive funds, consistent with funds paying for the information with lower fees.

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# 1 Introduction

At the end of 2018, U.S. mutual funds had $695 billion of outstanding securities loans, representing over 80% of all outstanding short interest.[1] The funds earned more than $2 billion in lending fees during the year, with 28% of active funds and 61% of index funds lending some of their portfolio securities.[2] Besides lending fees, lender funds also gain real-time information about short selling in the borrowed stocks. The information is possibly valuable given that short interest has been shown to predict stock price declines.[3] This raises the question of whether fund-level borrowing contains information, and whether lender funds exploit this information for trading.

This article is, to the best of my knowledge, the first to use stock-loan level data to study the securities lending practices of U.S. mutual funds. The key finding is that funds use the information they gain from stock lending to rebalance their portfolios away from stocks that are borrowed. In addition, stock loans predict negative future returns that do not revert even twelve calendar quarters after the loan, confirming that the stock loans are a valuable trading signal. Additionally, I find the rebalancing by active funds to be profitable: compared to similar funds, lender funds gain about 18% of the value of the position in the stock by rebalancing away from the borrowed stocks. Finally, I find that active funds charge lower lending fees than passive funds, a result that cannot be explained by differences in loan risk. This is consistent with active funds "buying" information from the borrowers by charging lower lending fees.

I use regulatory filings submitted to the SEC to construct a novel dataset on securities lending by around 3,500 U.S. mutual funds belonging to a sample of the largest mutual fund families. The final dataset contains about 23,000 fund-quarter and 456,000 fund-

[1] The total value of short interest on 31.12.2018 was $855 billion. Source: Compustat supplemental short interest file.

[2] Data collected from SEC N-CEN filings.

[3] See, for example, Rapach, Ringgenberg, and Zhou (2016).

stock-quarter observations from 2001 to 2017. Most importantly, the data identify, for each fund, the list of securities that are at least partially on loan. This enables me to study in detail the securities lending and trading practices of mutual funds: specifically, whether funds trade the stocks that are borrowed from them. The data also contain multiple fund-level variables on securities lending: the value of securities on loan, the securities lending collateral held by the fund, as well as the fee income the fund earned from securities lending.

My main hypothesis is that lender funds gain information about short-selling on borrowed stocks, and then use this signal to rebalance away from those stocks. This hypothesis rests on two assumptions. First, borrowing a stock indicates short-selling. Short sellers must borrow the stocks they sell to deliver them to the buyer by the settlement date. There are other reasons to borrow a stock, such as borrowing to vote. However, they are unlikely to be major drivers of borrowing demand, as both the regulation that governs securities loans from mutual funds and many fund issuers' lending policies dictate that the funds must participate in any "material votes" in the borrowed stocks, as these may affect the value of the underlying investments.

The second assumption is that funds can trade on that information. This assumption clearly holds only to the extent that funds have discretion in their holdings and portfolio allocation. To deal with this issue, I classify mutual funds into two categories according to the degree of discretion they have in their portfolio allocations: active funds and index funds. For the purposes of this study, I consider non-index funds as "active"; these funds have few restrictions and can trade on information to improve performance relative to their benchmarks. Instead, index funds have relatively little discretion in their portfolio allocations as they must hold securities within their target index, and can therefore not tilt their holdings aggressively away from borrowed stocks.

To test the main hypothesis, I first investigate whether funds react to stock borrowing

by balancing their portfolio holdings away from borrowed stocks. I do this by regressing fund portfolio weights in stocks on a loan dummy and its leads and lags. The coefficients of the loan dummies provide an estimate of the intensity of rebalancing by lender funds around stock loans. There are, however, potential confounding factors that drive portfolio rebalancing, such as news or other signals observed also by non-lenders. I control for these effects by performing a quasi-difference-in-differences analysis and by including various fixed effects and controls.

Using a large panel regression setting, I find that lender funds with discretion in their portfolio holdings – i.e., active funds – trade in response to the borrowing of a stock. These funds reduce their weight in borrowed stocks by about 2 percentage points compared to similar non-lender funds in the five quarters that follow a loan. Index funds show no statistically significant deviation from similar non-lenders either before or after a stock is borrowed.

Second, I study whether mutual funds' trading in reaction to the borrowing of a stock is profitable. I examine the returns of the stocks that are lent by each fund type, as well as cross-sectional differences in the returns of borrowed stocks. I find that stock prices decline on average 10% in the eight quarters following a loan from a mutual fund. This finding not only resonates with prior research on short interest and price predictability, but also provides evidence that loan-level signals are valuable. Moreover, stocks for which active funds undertake more rebalancing tend to experience lower returns. I estimate that funds gain about 18% of the initial value of the position by avoiding losses compared to similar funds by reducing their holdings in borrowed stocks.

I find additional evidence consistent with mutual funds trading on the information acquired through stock lending. Funds that have more latitude to trade on the information they gain from borrowers, i.e., active funds, earn lower lending fees. I find no evidence that the lower fees reflect lower risk in lending programs: there is no difference across

fund types in the collateral levels held by lenders. Moreover, mutual funds' loan counterparties are predominantly the final borrowers' prime brokers, that are generally creditworthy. Additionally, as the loans are collateralized at over 100%, securities lending incurs little risk.[4]

Finally, passive funds may be seen as natural lenders, as they have stable and transparent portfolios and little flexibility in their investment choices. As a result, passive funds are less likely to take advantage of short sellers' information or to "front run" them, so short sellers might therefore prefer passive lenders. In support of this idea, I find that 63% of passive funds participate in the lending market compared to 48% of active funds. The fraction of portfolio value on loan for passive funds is also up to three times higher than active funds. However, the variation of this measure within fund issuers is not statistically significant, indicating that there is issuer-level variation in engagement in securities lending. This is also supported by both documentary and anecdotal evidence,[5] indicating that issuer-level strategies may affect the quantity and type of securities offered on loan, and whether funds engage in "quantity lending" (pushing as large a share of their holdings as possible) or "quality lending" (lending only high-fee securities).

This article contributes to several strands of literature, including those on the market for lending securities and the role mutual funds hold in the securities lending market. Several studies document the rising importance of lending fee revenues in mutual funds' business model, sometimes at the expense of portfolio returns (Blocher and Whaley 2016; Johnson and Weitzner 2019). Instead, I focus on another, indirect, source of revenues associated with stock lending. I present new evidence that lending funds gain information from borrowers and trade profitably on it. I also present evidence that passive funds

[4] A lender collateralized at, for example, 102% will incur losses only if the security on loan increases by over 2% within a day and the borrower reneges on the loan, as in this case the collateral will not cover the repurchase of the security at market price. This is further supported by evidence in the N-CEN filings, where *no* lender funds indicate having incurred losses from their securities lending practices.

[5] See, for example, https://personal.vanguard.com/pdf/ISGSL.pdf (accessed on 09.10.2019).

earn considerably higher fees from lending than active funds, which is consistent with the latter paying for information with lower lending fees.

Another strand of literature relates to short selling and short selling risk. Engelberg, Reed, and Ringgenberg (2017) show that short selling risk in the form of higher lending fees or unexpected recalls impacts short selling activity negatively, and thus lowers price efficiency. D'Avolio (2002) shows that expensive-to-borrow stocks and recalls are rare on average, but that their incidence increases in the divergence of opinion among investors, and Saffi and Sigurdsson (2011) show that lending supply has a significant positive impact on price efficiency. Kolasinski, Reed, and Ringgenberg (2013) show that stock lending fees are largely insensitive to demand shocks when demand is moderate, but at high demand levels positive shocks lead to significantly higher fees. I contribute to this literature in multiple ways. First, I show that mutual funds are the dominant source of lendable shares, with their outstanding loans covering more than 80% of the total value of short interest. Second, I show that although active funds lend securities, their subsequent portfolio rebalancing implies a lower lending supply by them. Instead, passive funds do not rebalance their portfolios away from the stocks they lend, which suggests that they can act to stabilise lending supply. Their presence may, therefore, contribute positively to the incentives to short sell, thus improving price efficiency.

This article also relates to the literature on passive investment and Exchange Traded Funds (ETFs), where several papers have studied ETFs' impact on, e.g., stock comovement (see for example Da and Shive 2018); volatility (see for example Ben-David, Franzoni, and Moussawi 2017); liquidity (Hegde and McDermott 2004; Richie and Madura 2007; Hamm 2014); or how they enable a short seller to create a "synthetic short" in hard-to-borrow underlying stocks (see Li and Zhu 2017). I contribute to this strand of literature by showing that passive funds can contribute to price efficiency by lowering the indirect costs of short selling, and by stabilizing stock lending supply.

The paper proceeds as follows: Section 2 presents the regulations on securities lending by mutual funds. Section 3 details the hypotheses to be tested. Section 4 describes the data and reports descriptive statistics. Sections 5 presents the main tests and results. Section 6 presents additional evidence in support of the hypotheses. Section 7 concludes.

# 2 Securities lending market

## 2.1 Regulatory framework

The regulatory framework governing securities lending by funds regulated under the Investment Companies Act of 1940 – which covers most US mutual funds and ETFs – is set in a series of no-action letters between the SEC and fund management companies.[6] The current rules stipulate that funds (1) may lend at most one third of their total assets, (2) must receive collateral at least equal to 100% of the value of investments on loan, (3) must be able to terminate the loan at any time, and (4) should earn a reasonable return on the loan. Additionally, funds should invest cash collateral in securities that offer maximum liquidity and a reasonable return. In practice, collateral is nearly always invested in money market funds or directly in T-bills. The ability to terminate the loans at will essentially means that the loans are overnight and rolled over daily until either party ends the loans. This is a major difference compared to repurchase agreements, which are generally for a fixed maturity.

Even though the lenders pass on the shares and the attached voting rights to the borrower, both the loaned securities and the collateral are recorded in the holdings and balance sheet of a lender fund.

[6] SEC "no-action letters" can be requested to certify that e.g., a product or service does not constitute a violation of securities law that the SEC would pursue enforcement action against the requester.

Most funds cite the regulatory maximum of one third of total assets as their upper limit on lending, even despite lending much less. One exception to this are State Street SPDR funds, that say they "may lend up to 40% of the value of the fund's net assets, in line with industry standards and below the regulatory limit of 50%."[7] The 50% limit referred to by State Street takes into account the fact that the collateral that borrowers post is included in the assets of the lenders, so even with no excess collateral (i.e. collateralization at 100% of the loan value) the fund can lend 50% of its *net* assets, as this then represents only 1/3 of the *total* assets of the fund.

The lending activity itself is generally performed by one of three parties: the custodian that holds the fund's securities, a third-party lending agent, or by the fund (issuer) itself. In 2019, about 84% of funds had external lending agents, and in about 35% of cases the external lending agent is also the custodian. In total, about 55% of funds had third-party lending agents.[8] Regardless of the identity of the lending agent, it is reasonable to assume that the portfolio managers can get real-time information about any outstanding and newly issued loans, as they should be aware of their actual portfolio holdings, and as loans affect both the total assets of the funds through collateral and the returns of the funds through the lending fees. Moreover, lending fee revenue may, in the case of index funds, impact the tracking error of the fund relative to the index, and thus the funds performance relative to the index. Moreover, as funds identify any outstanding securities loans in regulatory filings, it is clear that this information is available also to the portfolio managers.

Short sellers may not always know what type of lender they face when approaching a lending agent, and prior to engaging the loan. When they approach the internal lending agents of e.g., Blackrock or Vanguard – two of the largest companies that primarily

[7] https://global.spdrs.com/blog/post/2018/august/a-closer-look-at-securities-lending-and-etfs.html, accessed on 10.09.2018.

[8] Source: N-CEN filings accessed on SEC Edgar.

issue passive funds – borrowers can be fairly certain that the lender fund is an index fund. They have less such certainty when dealing with third-party lending agents: third-party lending agents such as BBH or State Street handle securities lending for a variety of clients including both active and passive funds. Moreover, most have in place a "queuing" system where all lenders that make a stock available to borrow are placed in a queue in the order of arrival.[9] However, the lending agents may at least informally reveal the type or identity of the lender when negotiating the fee, so as to reassure the borrower e.g., of a lower recall risk or of lesser information leakage. Lenders are also unlikely to know their position in the queue.

## 2.2 Securities lending market structure

A typical securities lending transaction involves four parties. On one side of the transaction, there is the securities lender and its lending agent (who can be either internal or a third-party external agent), and on the other side there is the final borrower and its broker. The lending agent and the broker act as intermediaries between the lender and the borrower, and generally the borrower's broker commits to finding a lender to enable and settle the borrower's short positions.

The brokers are generally the largest and most recognised investment banks, and many fund management companies explicitly name the prime brokers that their agents are allowed to lend to in the Master Securities Lending Agreements (MSLAs).

The loans are most often between the lender and the borrower's broker, who in turn lends the stock further to the ultimate borrower (e.g., a hedge fund). This has two benefits for the lender: the prime brokers are generally much more creditworthy than a typical short seller, and the lenders may not want to reveal its identity or portfolio

[9] Lending agents may also have other criteria for determining the queue position, such as the size of the available position; larger positions that can fulfil loans on their own are more likely to have higher priority.

holdings to a trader that may trade against it.

Lenders' risks are further mitigated by the order in which collateral and the loan securities are transferred: the borrower posts collateral first, only after which will the lending agent release the securities. The same protections apply when the loans are terminated: the borrower returns the securities, and only then will the lending agent release the collateral. Moreover, loans are always fully collateralised with an average haircut of about 3.5% in the data[10], and the collateral is adjusted daily to reflect movements in the underlying security. If the borrower reneges on the loan, the lender can simply use the collateral to repurchase the loaned securities on the secondary market.

The broker on the borrower's side does not know who the actual lender is: the lending agent only reveals the identity of the lender to the credit risk department[11] of the prime broker, who contractually must not reveal the lender's identity to the borrower. The lender, on the other hand, knows which prime broker borrows the securities, but does now know who the ultimate borrower is. While this hides the identity of the borrower from the lender, the position in the borrowed stock is still revealed, as borrowing the stock reveals a short position. If the lender has high confidence that the borrower is informed, the signal he gains from the loan should be valuable and induce him to trade in the same direction as the borrower.

An additional source of protection to the lender comes from the callability of the loan: the lender can at any point in time terminate the loan, and receive the loaned securities back on the settlement date following the recall. This, on the other hand, gives rise to recall risk to the borrower. The borrower or his broker has to find another lender to carry the position. Brokers generally provides a loan "guarantee" to their client: the broker ensures that a client will be able to maintain short positions. If the initial lender

[10]The "industry standard" and most documents describing lending policies set a minimum haircut or excess collateral of 2%.

[11]The borrower is exposed to credit risk of the lender due to the collateral he posts, and as the value of the collateral is higher than that of the securities he borrows.

recalls the shares, the broker will first try to find another lender, or – if all else fails – buy the security to his own account, and then lend it to the client. This, of course, exposes the broker to risk in the underlying security.

# 3 Hypothesis development

In this section, I outline the hypotheses that I test in this article. The central idea is that by participating in the securities lending market, funds gain real-time information about short selling activity. Portfolio managers decide to make their portfolio holdings available to lend, and a loan signals that a borrower has negative information about the stock, inducing the manager to underweight it in order to reduce downside risk.

A complementary mechanism that leads to the same outcome – funds reducing their holdings of stocks on loan – relies on limited attention by portfolio managers: managers may not actively seek to lend securities to gain information, but more passively make securities available to borrow. A loan then draws the manager's attention to the stock that is borrowed, in which case the manager pays more attention to other information, such as short interest or analyst reports, about the security.

In either case, the outcome is that the lender fund reduces its holdings of the stock that is borrowed. The first hypothesis that I test is that funds trade on the information they gain from lending:

**Hypothesis 1.** *Lender funds reduce their holdings of the stocks that are borrowed.*

This contributes to pushing down the price to the fundamental value. Moreover, I expect funds to trade more on stocks where they receive a stronger signal, or where they predict more negative returns. This gives rise to the second hypothesis:

**Hypothesis 2.** *Stocks that are rebalanced more by lender funds after an observed loan have more negative returns after the loan.*

This hypothesis is also consistent with mutual funds exerting more price pressure on the stock they trade, i.e., that the effect does not arise through information but through their trading on the underlying.

The short seller may be adversely impacted by the lenders actions in two cases. First, if the lender "front-runs" to trade on the information by selling the stocks that are borrowed or, second, if the lender recalls the loan to trade. The recall risk affects the expected profitability of short selling, as any recalls will force the short seller (or his broker) to either find an alternative lender or close the position. To avoid this, short seller may be willing to pay a higher fee to lenders that are less likely to recall the shares to trade on the information in the first place. This yields the third hypothesis that I test in this article:

**Hypothesis 3.** *Lenders that cannot trade on the information they gain from stock loans earn higher lending fees than lenders that are likely to trade.*

In aggregate, the aim of the tests is to show that funds gain valuable information from lending their portfolio securities to short sellers, and that they use this information to trade. Crucially, I also show that the trading is profitable, i.e., that the prices of stocks on loan decline in the quarters that follow the loan. Additionally, the tests show that trading by lender funds leads to faster convergence in the target stocks.

# 4 Data and variables

## 4.1 Data

The main data sources of this article are mandatory filings that U.S. mutual funds regulated under the Investment Companies Act of 1940 must submit to the SEC. The quarterly N-Q and semi-annual N-CSR filings contain all portfolio holdings as well as

the statements of operations and the statements of assets and liabilities for each fund. In addition, they contain information on the securities lending practices at the fund level – the main focus of this paper: in particular, they identify the securities currently on loan by each fund and the loan collateral aggregated at the fund level. Additionally, in many cases the filings disclose the total dollar amount of outstanding securities loans as well as the fee income earned from securities lending at the fund level.

I hand-collect information for the ten largest mutual fund and ETF issuers in the U.S.,[12] who together comprise roughly 50% of the total mutual fund market at the end of 2017.[13][14]

Additionally, I collect information from N-SAR and N-CEN filings for the universe of U.S. mutual funds. The N-SAR filings contain self-reported descriptive information such as whether the fund is primarily an equity fund, and a self-reported investment style (items 66A and 66B), whether the fund is an index fund (item 69), as well as information on the fund's investment practices (items 70 A through 70 R). From 2018 onwards, the N-CEN filings replace the N-SAR, and contain some additional more detailed information, such as the identity of the fund's securities lending agent, and whether the agent is affiliated with the fund issuer.[15]

I use CRSP mutual fund data to identify passive funds. If any fund share class is identified as an ETF (index fund) in CRSP, I classify the fund as an ETF (index fund).[16]

[12] Blackrock/iShares, FirstTrust, Wisdomtree, Fidelity, Statestreet/SPDR, Vanguard, VanEck, Dimensional Fund Advisors, Invesco/Powershares, and Franklin Templeton Investments.

[13] CRSP mutual fund holdings.

[14] The data collection from Edgar filings is very labor intensive due to the lack of standardization and consistency in the filings across fund issuers or even within fund issuers over time.

[15] The N-CEN filing also discloses if the fund liquidated any loans, and whether the fund was subject to any "adverse impact" related to the loans, i.e., whether the fund incurred any losses related to the loans; the average monthly value of the securities on loan by the fund; and each fund's principal brokers and the commissions and trade volume associated with each. For ETFs, I can identify creation and redemption volumes, and the average amounts of cash and in-kind securities included in all creation and redemption transaction during the reporting period, as well as all their authorised participants, i.e., brokers or other traders that are allowed to transact directly with the fund to create and redeem ETF shares against the underlying securities basket.

[16] CRSP groups funds into four categories: no index, index-based, index enhanced, and pure index

The correlation between these measures is about 64%. In the main specifications, I use ETFs as a proxy for passive funds, and active funds as all non-ETF funds. There are non-ETF index funds, although a large share of index mutual funds have at least one ETF share class, which according to the methodology described above effectively classifies them as an ETF. On the other hand, there are also ETFs that are not passive funds (so called "active" or "index enhanced" ETFs). I do not seek to exclude them from the "passive funds" in the sample. This, together with the possible misidentification of non-ETF index funds as active funds, biases any results against finding (1) any effect for active funds, and (2) differing effects for passive and active funds.

Finally, I retain funds that are identified as equity or mixed-strategy funds in CRSP, and drop fixed-income funds. I do not exclude synthetic or derivative-strategy funds, as these often also hold at least some equity securities. I only retain funds that hold US stocks, but I do not require the funds to be exclusively focused on the US market: for example, the SPDR S&P Global Dividend ETF and the Invesco International Growth Fund, which hold both international and US equities, remain in the data.

The final sample that is matched to the CRSP mutual fund database covers the period between Q4 2001 and Q4 2017, and contains about 23,000 fund-quarter observations on lending data, and roughly 456,000 fund-stock-quarter observations for stocks on loan.

### 4.2 Variable construction

I obtain the main variable of interest from the SEC data: the stocks that are at least partially on loan by a fund. I thus get the $loan_{f,s,t}$ dummy, which indicates at the quarterly frequency that fund $f$ was lending the stock $s$ at time $t$.

fund.

The SEC filings also give me fund-level information on the quarter-end securities lending practices of funds: total collateral held against securities loans, the total value of securities on loan, and net asset values ($collateral_{f,t}, loanvalue_{f,t}, nav_{f,t}$) are measured at the fund-quarter level, while securities lending fee income ($lendingincome_{f,t}$) is measured semi-annually. I use these to characterise the magnitude of funds' securities lending activity.

In order to measure the intensity or aggressiveness of funds' lending strategies, I compute multiple variables: $collateralshare_{f,t}$ is the share of securities lending collateral a fund holds relative to its net assets, while $lending\ share_{f,t}$ is the value on loan relative to net assets. $Numonloan_{f,t}$ is the number of individual securities on loan. $Numintensity_{f,t}$ is the number of securities on loan ($numonloan_{f,t}$) divided by the total number of holdings, and $loanintensity_{f,t}$ is the value of securities on loan divided by the total value of holdings in the securities on loan. $Overcollateral_{f,t}$ measures the overcollateralization or haircut that a lender fund requires from the borrower, and is measured by the ratio of collateral to value on loan. I additionally use these as controls in tests regarding securities lending fees charged by funds.

For the main tests on portfolio rebalancing following lending in Section 5.1, I construct a variable to measure a fund's over or underweighting in a stock relative to similar funds. By doing this, I aim to address several factors that could drive the results, such as widely observed news that is available to all investment funds, or stock-specific time-varying effects that impact portfolio allocations, such as index effects. I define the benchmark groups according to fund net asset tercile and CRSP Investment Objective Code (IOC), and compute the quarterly average holding for each stock by funds in each group: for stock $s$ in time $t$, I define the average holding of group $g$ in stock $s$ in time $t$ as

$$\widehat{w_{g,s,t}} = \frac{1}{N_{g,t}} \sum_{f} w_{f,s,t},$$

where $N_{g,t}$ is the number of funds in group $g$ in time $t$ and $w_{f,s,t}$ is the holding of fund $f$ in stock $s$ in time $t$, for each fund $f$ in group $g$ in time $t$. The overweighting of stock $s$ by fund $f$ in time $t$ is then

$$\Delta w_{f,s,t} = w_{f,s,t} - \widehat{w_{g,s,t}}. \tag{1}$$

The data from mutual fund filings does not directly reveal the lending fees that borrowers pay, but rather the *net fee* that the lender receives after collateral reinvestment income, rebates to the borrower, and the share of income retained by the lending agent. The data thus identify the left hand side of the following equation

$$\begin{aligned} lending\ income_{f,t} &= \sum_b [fee\ paid_{f,b,t} - rebates_{f,b,t} - agent\ fees_{f,t} + collateral\ reinv.\ income_{f,b,t}] \\ &= fees_{f,t} - rebates_{f,t} - agent\ fees_{f,t} + collateral\ reinv.\ income_{f,t} \end{aligned}$$

for fund $f$ and borrower $b$. This illustrates that the income a fund earns from securities lending is the sum of the gross fees charged to the borrower and the collateral reinvestment income, less rebates paid to the borrower (from the collateral reinvestment) and fees charged by the lending agent. For most easy-to-borrow stocks, the rebates are positive, meaning that the effective lending fees are low. However, hard-to-borrow stocks have negative rebate rates; the borrower pays the lender a fee in excess of the collateral reinvestment yield.

Rearranging this equation and dividing by the value of securities on loan yields average lending rate charged by the lender:

$$\frac{fees_{ft}}{vol_{ft}} = \frac{lending\ income_{ft} - collateral\ reinv.\ income_{ft}}{vol_{ft}} + \frac{agent\ fees_{ft} + rebates_{ft}}{vol_{ft}}$$

My data does not identify the agent fees or rebates paid to the borrower, but I do identify the lending income and the collateral value. I can thus create a proxy for the lending fee by estimating the collateral reinvestment income by multiplying the collateral value by the average contemporaneous money market fund yield.[17] To account for the omission of rebates and agent fees, I include fund issuer fixed effects in all regressions on lending fees and collateral levels. This will account for any systematic differences in agent fees or rebates across fund issuers, and by that address any differences in securities lending strategies. Implicitly, this assumes that the lending agent receives a constant share of lending fee income for any given issuer.

I create the $\widehat{lendingfee}_{ft}$ proxy by dividing the sum of lending income and collateral reinvestment income by the value of outstanding securities loans, and adjust this for the number of quarters the fund has outstanding securities loans in the half-year period to which the N-CSR report refers to. Finally, I annualise the lending fee rate by multiplying by 2. $\gamma_{it}$ is the unobserved issuer fixed effect.

$$\widehat{lendingfee}_{f,t} = \frac{lending\ income_{f,t} - col_{f,t} * r_{MMF,t}}{loanvalue_{f,t}} \times \frac{2}{q_{f,t}} \times 2 + \gamma_{it} \tag{2}$$

Collateral yield and lending yield are computed by dividing the lending income by collateral and net assets respectively. The dummy variable $lending_{f,t}$ is equal to 1 if collateral or value on loan is nonzero, and set to 0 otherwise.

Stock-level variables are computed for each stock at the highest available frequency[18], and aggregated to the quarterly frequency. Short interest is measured as a fraction of the shares outstanding: $shortint\_scaled_{s,t} = shortint_{s,t}/shrout_{s,t}$. Short volume, short interest, and fails to deliver are scaled by shares outstanding, and multiplied by 100.

[17] Almost all securities lending collateral is invested in money market funds or U.S. treasuries.

[18] CRSP, short transactions, and fails to deliver are measured daily; mutual fund flows monthly; and Compustat and securities lending data are measured quarterly.

Market capitalization is computed as the product of CRSP shares outstanding and the closing price. The high-low ratio is computed as $1/2 \times (high - low)/(high + low)$, and the bid-ask ratio is computed as $1/2 \times (ask - bid)/(ask + bid)$ using daily CRSP data and then averaged at the quarterly level for each stock. $Volatility$ is the average daily absolute value of return over the quarter. All variable definitions are collected in Appendix A.

### 4.3 Descriptive statistics

Table 1 presents descriptive statistics for the funds in the sample.

[TABLE 1 HERE]

On average, active funds are significantly larger than passive funds, but earn lower lending fees and lending yields. Overcollateralization is slightly higher for active funds when taking an average, but Table 6 shows that this difference disappears when including fund issuer fixed effects. The lending intensity measures show that passive funds lend a much larger share of their portfolio securities (24% vs 8%), and a slightly larger share of the total holdings of the stocks on loan (30% vs 24%). This indicates that passive funds lend both more widely (more stocks) and more intensively (a larger proportion of the lendable supply). The Collateral/NAV and Value on loan/NAV measures show that passive funds lend a larger share of their portfolios (5% vs 2%), and naturally hold more collateral as a result as a share of total net assets (6% vs. 3%). The average short interest for stocks on loan is lower for passive funds (11% vs. 13%). Liquidity variables such as bid-ask spread and high-low ratio are slightly lower for stocks on loan from passive funds than from active funds. There is no difference in the market capitalization of the stocks on loan, on the other hand.

# 5 Empirical analysis

In this section, I test the hypotheses presented in Section 3. I begin by testing whether funds react to the signal they get from stock borrowing – the main result of this article. Then, I show that stock loans predict future stock returns, i.e., that the borrowers are informed. Finally, I show that stock lending fees that funds charge are affected by the funds' ability to trade on the information.

## 5.1 Trading on lending signals

This section presents the main test and results of this paper. Specifically, I identify the stock loan induced trading by mutual funds by comparing the holdings of funds that have the discretion to underweight the lent stocks to funds that do not have this discretion.

The identification relies on the assumptions that (1) index funds do not deviate from index weights, and that (2) similar funds – as measured by their investment objective, index replication status, and total net assets – only differ in the fact that some funds lend while others do not. In short, I assume that similar funds have access to similar information, and that the lending is relatively exogenous at the fund level. Since stock lending happens through a lending agent (internal or external) it is reasonable to assume that the allocation of a loan is relatively random for funds for any given lending agent.

I run the following regression:

$$\begin{aligned}\Delta w_{f,s,t} = &\sum_{k=-8}^{8} \beta_k \, loan_{f,s,t+k} + \beta_9 \, loan_{f,s,t\geq 9} \\ &+ \sum_{k=-8}^{8} \gamma_k \, loan_{f,s,t+k} \, Active_f + \beta_9 \, loan_{f,s,t\geq 9} \, Active_f + \epsilon_{f,s,t},\end{aligned} \tag{3}$$

where the dummy $loan_{f,s,t}$ is equal to one when stock $s$ is on loan by fund $f$ at time $t$, and the $Active_f$ dummy is equal to one if fund $f$ is an active fund. The coefficients $\beta_k$ on the leads and lags of the $loan_{f,s,t}$ dummy give the event-time variation in $\Delta w_{f,s,t}$. This is the baseline result for passive funds' rebalancing of the stocks that are borrowed at $t = 0$. The coefficients $\gamma_k$ on the interaction of the $loan_{f,s,t}$ and $Active_f$ dummies show the trading done by active funds when compared to passive funds. The sum of $\beta_k$ and $\gamma_k$ thus shows the total effect for active funds' rebalancing in time $k$.

The dependent variable measures the difference in portfolio weight between a lender fund and the average holding of funds in its peer group. The interaction between the leads and lags of the *loan* dummy with the *Active* dummy captures any difference in trading by active lenders with respect to passive funds. The null hypotheses are that passive funds do not trade based on the information they gain from loans, and that there is no difference between passive funds and active funds in the quarters that follow a stock loan.

In the baseline specification, I include stock×quarter fixed effects. In subsequent specifications I additionally include fund×stock; fund×quarter; and fund×quarter and IOC×quarter fixed effects. The stock×quarter fixed effects absorb much unobserved fluctuation and take into account time-varying stock effects such as short interest or stock-specific transitional effects that could affect mutual funds' holdings of the stock. One such factor could be index adjustments or inclusions/deletions, that might impact mutual funds' holdings of the stock. It is important to note that including this fixed effect does not change the coefficients' magnitude or statistical significance.

Table 2 presents the results for the regression. For brevity, I omit coefficients for leads exceeding four periods and lags exceeding six periods. The baseline coefficients (that measure trading by full-replication passive funds) are all close to zero and statistically insignificant. On the other hand, the interaction coefficients for active funds are negative

and highly significant in the two quarters that follow an observed loan. Since other information within the funds can reasonably be expected to be the same for similar funds, this differences-in-differences can be interpreted to indicate trading due to lending. Figure 1 presents the aggregate effects for active and passive funds.[19] The coefficients are statistically zero for passive funds, whereas they are negative and statistically significant for active funds in the five quarters following a loan. This indicates that active funds reduce their holdings of the stocks they lend after the loan when compared to similar funds.

Figure 2b presents the cumulative deviation from the peer group average holding for passive and active funds. The trend for both fund types is flat in the pre-lending period, while it drops sharply for active funds after a stock is borrowed. The cumulative deviation in holdings in the event window is about 2.2% for active funds, and the change occurs in the two quarters following stock loans. For passive funds, although there is an indication of a declining trend after the loan, the deviation from the group average holding becomes statistically significant at the 5% level only five quarters after a loan.

In (unreported) robustness checks, I perform the same analysis using fixed-effects estimation instead of the differencing technique as defined in specification 3 to avoid the overestimation bias concerns raised in Gormley and Matsa (2014).

[TABLE 2 HERE]

A concern is that stock borrowing might coincide with another factor that leads to a subsequent reduction in holdings. One such factor could be an exogenous increase in a fund's position in a stock, which makes the fund more likely to lend the stock (as the fund now has a larger supply of the stock). The fund would then reduce its holdings in the

[19]The total effect for passive funds is equal to the baseline coefficient, whereas for active funds it is the sum of the baseline coefficient and the marginal effect for active funds.

stock to return to its "target allocation." In this case, we should observe an increase and a subsequent corresponding decrease in holdings relative to the mean. Indeed, there is a small statistically significant increase in holdings prior to lending. This can, potentially, be attributed to an accumulation effect where a fund does not become a viable lender until it has accumulated a sufficient level of holdings. The decrease relative to the group average holding is considerably larger after the loan, as can be seen from the cumulative effects in Figure 2b. This contradicts the story of a reversal to the mean.

Another concern is that active funds are simply reacting to high short interest, and that lending is just correlated with this. This concern is, however, mitigated in two ways. First, the quasi difference-in-differences regression method address this, as short interest should be available to the same extent to similar funds, regardless of whether they are lending securities or not. If the effects were due to short interest, the diff-in-diff methodology should not show any significant coefficients. Second, the stock×quarter fixed effects in all regression specifications should eliminate any time-varying effects for stocks, such as changes in short interest.

To further understand the mechanism behind the trading and to see whether this arises from information, I perform a variety of sample splits, where I again regress $\Delta w_{f,s,t}$ on leads and lags of the lending dummy for the different subsamples. In short, I test whether funds react more to stock borrowing when information is scarce and when borrowing is likely to provide additional information to the lender than when lenders are likely to have more information from other sources. I split the panel in two according to portfolio weight, short interest, market capitalization, S&P 500 index membership, investment grade debt rating, and fund total net assets.

The results from these regressions are presented in Table 3. We see that funds react more aggressively when the borrowed stock has a high portfolio weight. Larger positions have a higher impact on fund returns, and fund managers may, therefore, be more sensitive

to new information about the stocks and more readily adjust the positions, especially in order to avoid losses. The results for short interest show that the level of short interest has little impact on the reaction to the borrowing information. We also see that funds rebalance more heavily away from stocks with high market capitalization and an investment grade rating. This may indicate that fund managers react to information presenting a contrarian view on the borrowed stocks. On the other hand, S&P 500 membership, here proxying for media and analyst attention, has little impact on active funds' reaction to stock borrowing. Finally, smaller funds react more aggressively to new information. This may be due to either smaller absolute position sizes (that are easier to trade), or that smaller funds have less access to other information such as analyst reports.

[TABLE 3 HERE]

The negative and significant coefficient in the interaction of the active lending dummy one quarter after the loan indicates that portfolio managers do, indeed, react to lending more when short interest is higher. This can be interpreted as an attention effect: fund managers may react to short selling, but lending draws their attention to it.

### 5.2 Stock returns

In this section, I show that funds have a strong incentive to trade the securities that they lend, i.e., the information they gain is valuable on average.

First, I test whether a stock loan predicts negative returns in an event study setting. Using both raw and risk-adjusted returns, I plot average returns of stocks going forward from an observed loan by a mutual fund, splitting the stock observations by fund type. In the first test, I use every observed fund-stock-quarter loan observation as an event. This assigns more weight to stocks that are more heavily on loan, and reflects the

average post-loan returns for stocks lent by funds of each type. In the second test, I remove duplicate stock-quarter observations from the data. This essentially assigns equal weight to each stock-loan observation. In the third test, I only use the first fund-stock observation within 4 quarters, i.e., I remove continued loans from the sample and only focus on when a fund first starts lending a stock.

The results are summarised in Figure 3 and Table 4. The aim is to display the forward-looking returns of stocks when a fund first starts lending those stocks. In each panel, the stock lending by mutual funds predicts future negative returns. Panels (a) and (b) show the average post-loan cumulative returns for stocks. Panels (c) and (d) show the return paths for loan events with equal weight assigned to each stock-quarter loan observation, i.e., without overweighting stock-quarter events where multiple funds lend the stock. Panels (e) and (f) display the return paths for the first stock loan event for a fund within four calendar quarters, i.e., where loans present for more than one consecutive quarter are omitted.

For active funds, there is little difference between different subsamples: a stock loan predicts future negative returns of about 10% in the next four quarters. For passive funds, the difference between the full sample and non-duplicate sample (panels (b) and (d)) shows that stocks with truly negative returns are over-represented in the borrowing, as cumulative returns stay negative in panel (b), whereas there is a reversal in panel (d) where duplicate events at the stock-quarter level are dropped.

The first fund-stock loan observations (panels (e) and (f)) display more negative cumulative returns than loans on average. This indicates that the first loan observation – when short sellers first start borrowing/short selling – is the most informative of future returns.

[TABLE 4 HERE]

Next, I test whether more rebalancing by lender funds leads to faster price convergence. I do this by splitting the events into two groups according to the change in the number of shares held by lender funds the three quarters following a loan. I run this test on the number of shares instead of the portfolio weight, as declining prices post-lending would mechanically decrease the portfolio weight of the stocks even if the number of shares remained constant (or even increased). Figure 4 and the last regression specification in panels (a) and (b) of Table 5 summarise the results. The stock-loan events where funds reduce their holdings more (panel (a)) show a much faster convergence to fundamental value: prices reach their bottom after only about two quarters, as opposed to the roughly six quarters for stocks that experience less rebalancing by active funds. This is also an indication that trading by active funds speeds up price convergence induced by short selling, which might contribute to improving price efficiency. It is important to note that the effect is also consistent with the funds trading more aggressively on stocks where the borrowing provides more reliable information.

Passive funds, on the other hand, do not significantly rebalance following stock borrowing, as seen in Section 5.1. This is also reflected in the sample split on rebalancing in panel (b) of Table 5: in the bottom group for change in the number of shares, cumulative returns are not statistically significant from zero after 8 quarters. The group with the highest increase in shares held, on the other hand, experiences large significant negative cumulative returns. This likely arises from reverse causality: index funds follow the index weights, so decreasing prices will force them to increase the number of shares they hold in order to maintain their portfolio weights.

[TABLE 5 HERE]

The remaining columns in table 5 present sample split results on stock returns. I split the stock loan events in two according to proxies for the stocks' information environment

as in Section 5.1. The group with low short interest, low market capitalization, and no investment grade debt rating experience much larger negative returns than stocks in the high groups. S&P 500 index membership (and the higher media and analyst attention it proxies for) predicts higher forward looking returns for both active and passive funds, suggesting that stocks with less attention have less efficient prices. This is consistent with the hypothesis that short sellers bring information to the markets.

### 5.3 Trading ability and lending fees

The final hypotheses states that funds that trade or are able to trade on the information they gain from securities loans charge lower lending fees, and thus compensate the borrowers for the information.

I regress the lending fee proxy from equation 2 on a dummy for passive funds funds:

$$\widehat{lendingfee}_{f,t} = \beta_1 Passive_f + issuer_{ft} + \epsilon_{ft} \tag{4}$$

The coefficient $\beta_1$ shows if and how passive funds, on average, earn fees that are different from those of active funds. I include a fund issuer fixed effect $issuer_{ft}$ to take into account differences in lending strategies between fund issuers.[20] As a result, the coefficients $\beta_1$ and $\beta_2$ capture the "passive fund" effect *within* an issuer, while neutralising any issuer-level effects on lending fees.

Panel (a) in Table 6 presents the results. The results show that passive funds earn about 2.5% higher lending fees than active funds.

One concern could be that passive funds take on more risk in their lending programs in order to boost returns. One way of doing this would be by placing lower collateral

[20] As mentioned in the Introduction and Section 2, fund issuers have different lending strategies that can aim to e.g., maximise the lending lending revenues by lending as much as possible, or at maximising the loan-level lending fee.

requirements, and thereby exposing the investors in the fund to the risk that the borrower does not return the security if its price increases. To test this, I use the same model as in regression 4, and regress excess collateral on the ETF and Sampling dummies and their interaction. The results are presented in panel (b) of Table 6. We see that the coefficients are very close to 0, and are not statistically significant in any specification.

[TABLE 6 HERE]

# 6 Additional evidence

## 6.1 Gains from trading

From sections 5.1 and 5.2, we see that active funds reduce their holdings of stocks that they lend, and that the prices of these stocks decrease subsequent to lending. From here it can be inferred that funds gain from selling the stocks that are borrowed by avoiding capital losses on them. However, the typical stock on loan by an active fund has a portfolio weight of only about 0.58%, so capturing rebalancing-induced gains at the fund level is difficult due to the small magnitude.[21]

Instead of focusing on fund-level returns, another way to measure the value of lender funds' information is to calculate how much they benefit from rebalancing their portfolio away from the stock. More precisely, I can compute the magnitude of avoided losses for lender funds at the position level by using the amount of rebalancing relative to peer funds from Section 5.1 and the returns of stocks on loan from Section 5.2.

I use cumulative rebalancing for each period $t$ $\sum_{k=0}^{t} \Delta w_{f,s,k}$, and multiply by the return of the stock $r_{s,t}$ in the corresponding quarter to get the per-period gain (relative to peer

[21] For example, a fund that reduces an average position in a stock by 50%, and avoids losses of 30% on that, would only gain about 9 basis points at the fund level.

funds): $gain_{f,s,t} = r_{s,t} \times \sum_{k=0}^{t} \Delta w_{f,s,k}$. I cumulate this to find the cumulative gains for active funds from the rebalancing: $cumulative\ gain_{f,s,t} = \sum_{k=0}^{t} gain_{f,s,t}$. The values are presented in Table 7. I find that active funds avoid losses of about 11 basis points of portfolio value over the first 8 quarters following a loan for each stock loan position relative to similar peer funds. The effect is small at the fund level, but amounts to roughly 18% of the average position size of a stock on loan (0.106/0.58).

[TABLE 7 HERE]

This in itself shows that the lending-induced trading is both informed and profitable.

### 6.2 Market participation

Passive funds have stable and transparent portfolios, and unlike active funds have little discretion in choosing their investment allocations. Anecdotally, short sellers may prefer them as lenders, as they cannot trade on the information revealed by the borrowing. To this end, I show that passive funds are more likely to participate in the lending market than active funds. This is consistent with the preference for passive funds.

I regress the lending dummy (equal to 1 if the fund lends securities, 0 otherwise) on an ETF dummy in order to compare the two fund types. I control for various portfolio characteristics, as well as time and fund issuer fixed effects. The results are presented in panel (a) of Table 8a. Specification (1) shows that passive funds are, on average, about 16% more likely to lend securities than active funds. Controlling for fund size and management fee, this effect rises to over 23% (specification (2)). In specifications (5)-(8), the ETF dummy measures the within-issuer effect of being a passive fund: indeed, the coefficient is higher than for passive funds on average. This may indicate that fund issuers prefer lending securities through their passive funds instead of through their active funds. This is consistent with the results in Section 5.1, where I show that active

funds sell their holdings of the stocks they lend relative to similar non-lender funds. Fund issuers may prefer to lend from their passive funds, and thus be able to both extract information from borrowers while still being able to trade through their active funds.

[TABLE 8 HERE]

Finally, I study lending by U.S. mutual funds at the intensive margin. This gives us a better understanding of the lending strategies of mutual funds. I regress the value of loans as a share of total assets on an ETF dummy and various controls in the same regression specifications as in Panel (a) of Table 8. Again, in specifications (1)-(4), I show that passive funds lend a larger share of their portfolios than active funds: on average, passive funds lend about 2.5 times more of their portfolio by value than active funds. However, the inclusion of issuer×quarter fixed effects changes the sign of the coefficient, and renders it negative and significant in specifications (7) and (8). The change when measuring the effect within-issuer instead of as a fund type average indicates, once more, that there are significant issuer level differences in lending strategy.

[TABLE 8 HERE]

# 7 Conclusion

Using a unique novel dataset on securities lending by U.S. mutual funds, I show that a large proportion of U.S. mutual funds lend securities, and that this lending provides funds with not only additional revenue in the form of lending fees, but also valuable information through the lending mechanism. Funds that have greater portfolio allocation discretion – namely active funds – reallocate their portfolios away from stocks that are

borrowed from them. Passive funds do not rebalance their portfolios before or after lending a stock, as they have little incentive to deviate from index weights given that they are evaluated mainly on their tracking error: holding all the component securities of an index in the index weights minimises the pre-fee tracking error.

I also show that stock borrowing predicts future returns for the stocks that are borrowed, and that rebalancing away from those stocks avoids losses of about 18% of the value of the position for the lender funds when compared to similar non-lenders.

Finally, I find that passive funds gain considerably higher lending revenues than active funds, and that this effect remains when controlling for a variety of portfolio-level characteristics such as short interest and portfolio size. I also show that there is no difference in the collateral requirements between the different fund types, indicating that passive funds do not trade off higher lending fees against lower collateral requirements.

The evidence is consistent with the hypothesis that active funds "buy" information from short sellers by charging them lower lending fees, and then use the acquired information to rebalance their portfolios. These findings shed light on the securities lending and borrowing market as a whole, as well as the securities lending practices of U.S. mutual funds. The results are also of interest to the mutual fund literature, and information acquisition in the financial markets.

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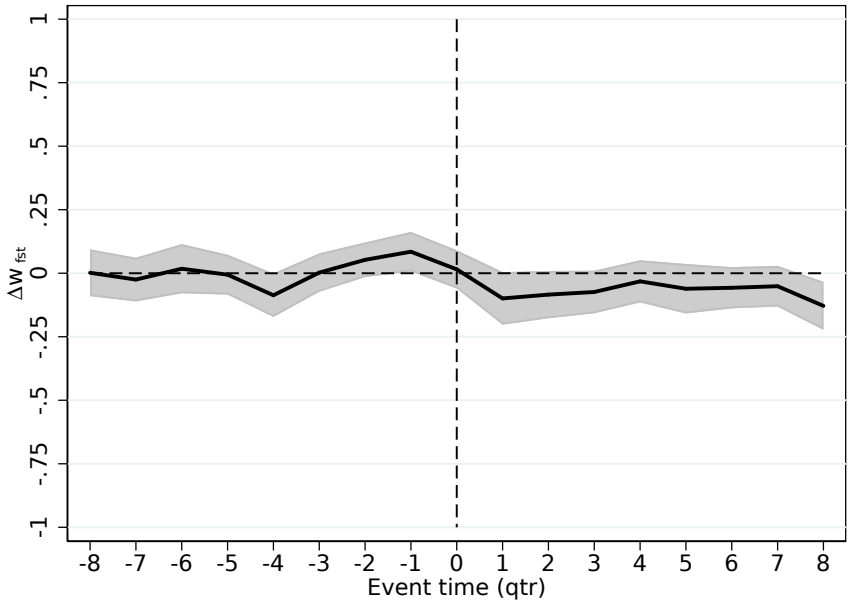
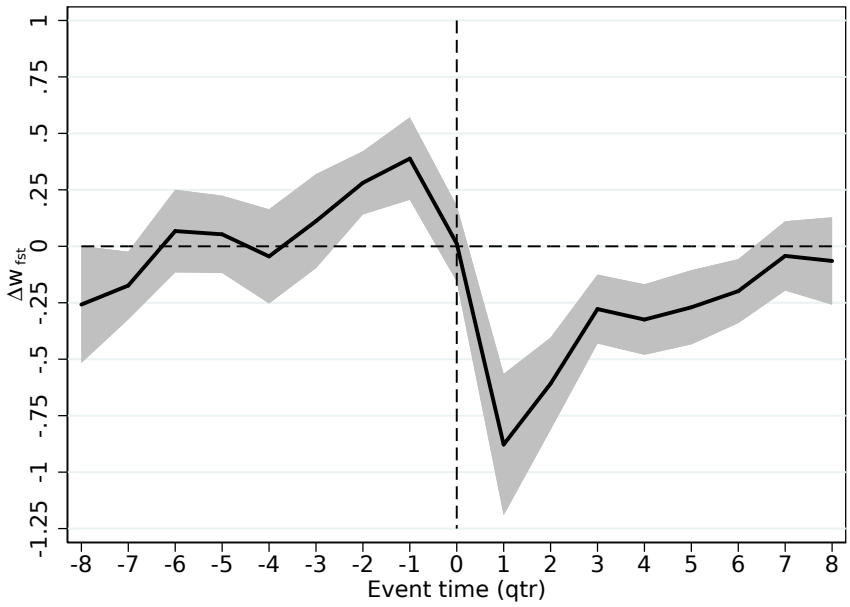


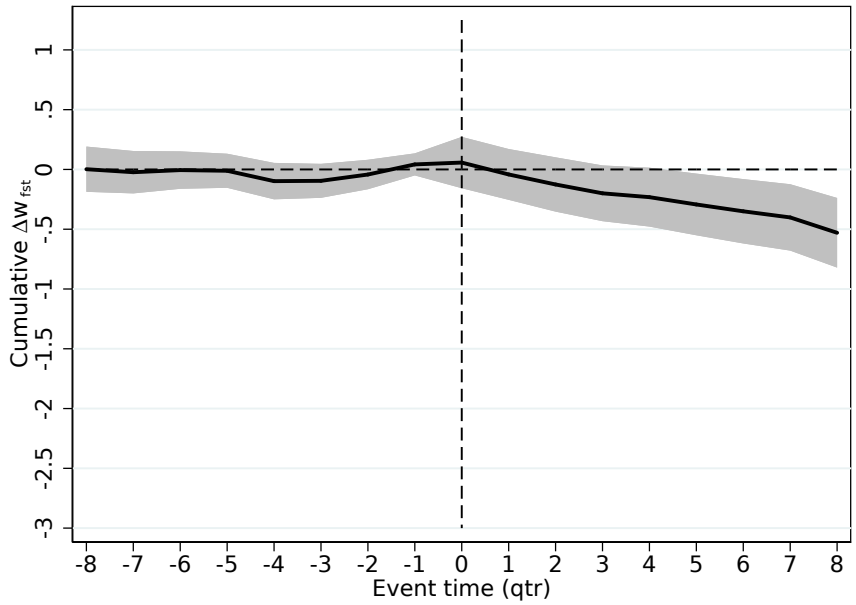

(a) Full-replication passive funds



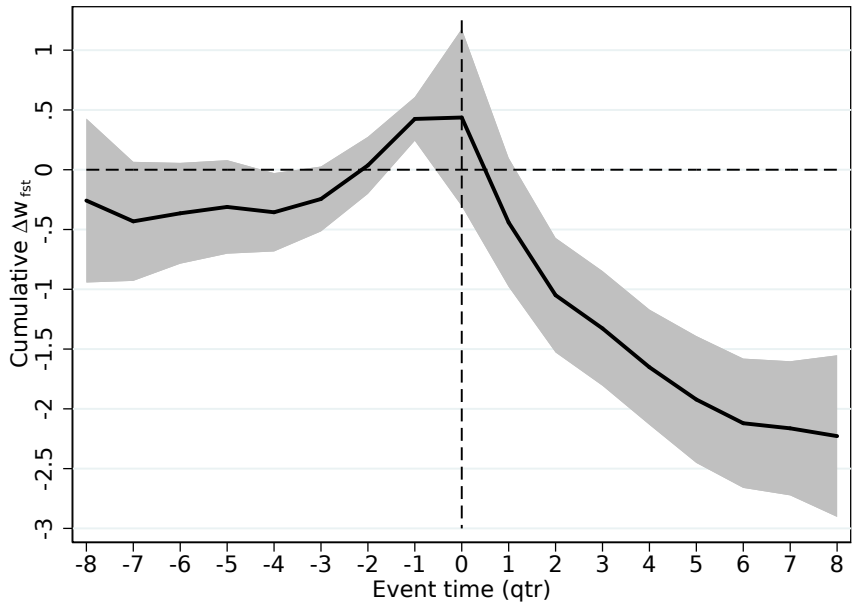

(b) Active funds

Figure 1: Trading – total effects

I regress the deviation from an group-average stock holding for each fund on leads and lags of a stock loan dummy. Figure 1 shows the total effect for passive and active funds. The vertical axis shows deviation from the average holding, and the horizontal axis measures quarters relative to a stock loan.



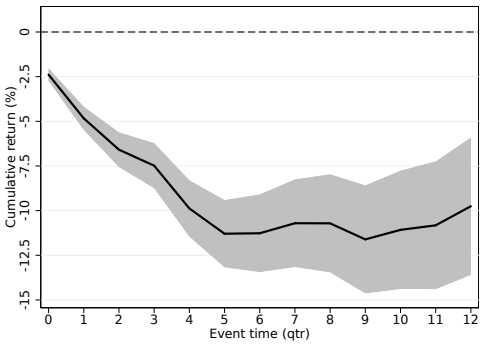

(a) Passive funds



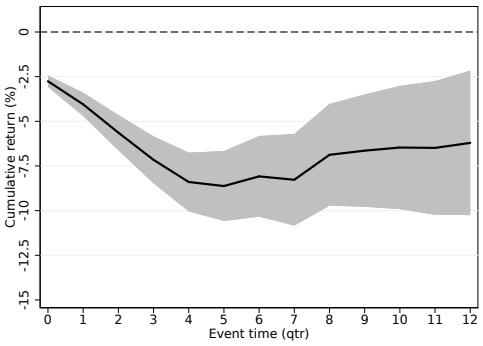

(b) Active funds

Figure 2: Trading – cumulative rebalancing

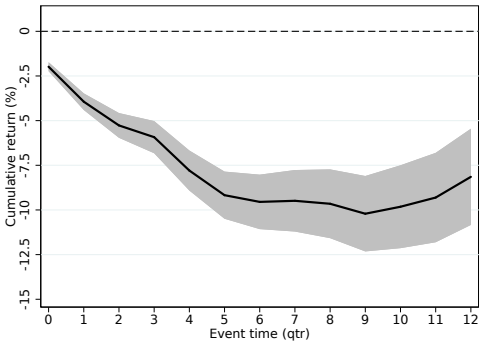
The figure plots the cumulative deviation in portfolio weight from an average of similar funds. The coefficients shown here are the cumulative sum of the coefficients from Figure 1.



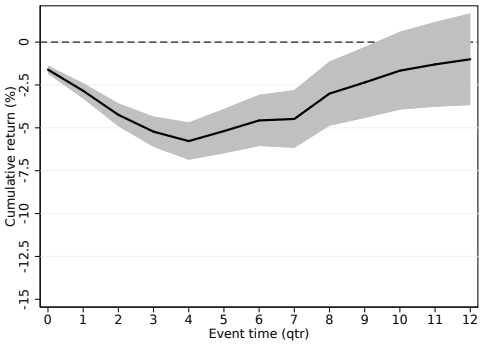

(a) Returns on loan stocks – Active funds.



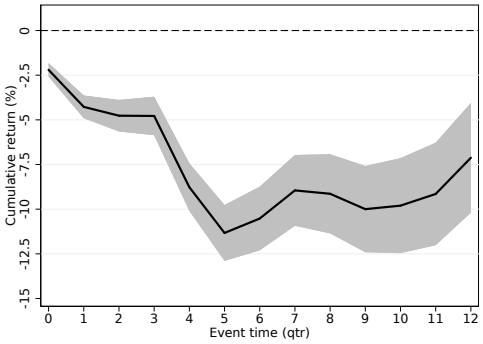

(b) Returns on loan stocks – Passive funds.



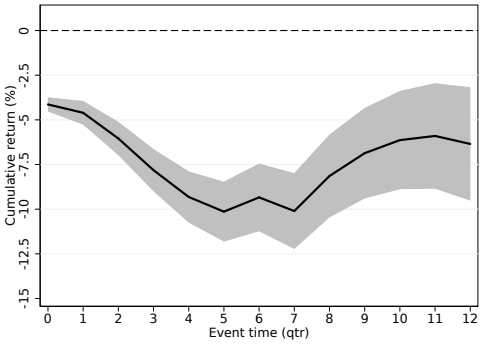

(c) Returns on loan stocks – Active funds (no duplicate events).




(d) Returns on loan stocks – Passive funds (no duplicate events).



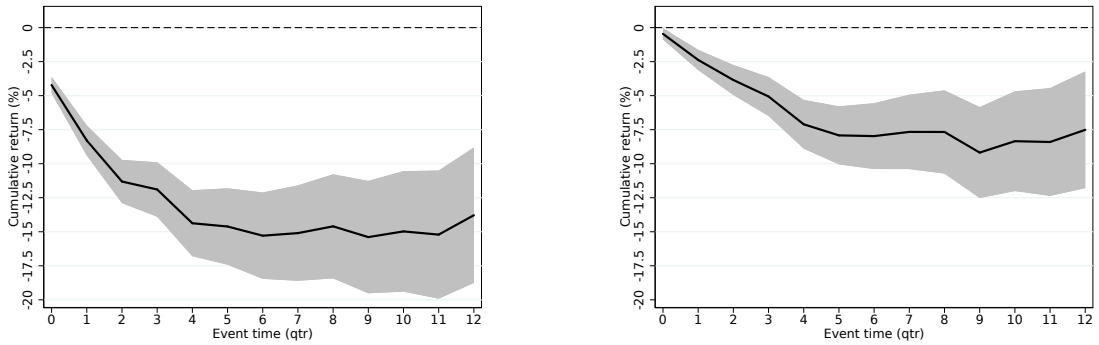

(e) Returns on loan stocks – Active funds (1st loan).




(f) Returns on loan stocks – Passive funds (1st loan).

Figure 3: Stock returns after loans

In this figure, I run an event study on the forward-looking returns of stocks on loan by mutual funds. Panels (a) and (b) depict the average raw returns for stocks on loan by active funds and ETFs respectively. Panels (c) and (d) depict the forward-looking returns of stocks on loan by active and passive funds, focusing on unique loans. In the two panels, I remove duplicate observations, and thereby give all observed loans an equal weight, as opposed to panels (a) and (b) where stocks that are on loan by multiple funds have a higher weight. In panels (e) and (f), I only look at the first loan observation by a fund within four calendar quarters, and thus drop repeat loans by funds.




(a) Returns on stocks with high sales.

(b) Returns on stocks with low sales.

Figure 4: Stock returns and rebalancing

In this figure, I focus on stock loans by active funds. I perform a forward-looking event study on the returns of stocks on loan by active funds, splitting all loan observations according to the rebalancing activity in the stock in the two calendar quarters following an observed loan. While not causal, the result is consistent with the idea that active fund trading contributes to pushing down stock prices to their fundamental level. The difference between panels (a) and (b) shows that the stocks that active funds trade more away from (where the rebalancing is more negative), decrease faster than the stocks where active funds trade less aggressively.

Table 1: Summary statistics on securities lending by investment funds.

| | Active | | Passive | | (Passive - Active) | |
|---|---|---|---|---|---|---|
| | mean | sd | mean | sd | b | t |
| NAV (M-USD) | 5480.97 | 11517.58 | 2575.34 | 8780.25 | -2905.63*** | (-20.84) |
| Lending fee | 1.08 | 5.15 | 2.06 | 4.71 | 0.98*** | (6.31) |
| Lending yield | 0.01 | 0.02 | 0.02 | 0.04 | 0.01*** | (8.03) |
| Overcollateralization | 4.80 | 6.83 | 4.40 | 5.98 | -0.41* | (-2.36) |
| Lend intensity: $N\_L/N\_H$ | 7.57 | 13.77 | 23.97 | 39.83 | 16.40*** | (31.29) |
| Lending intensity: VoL/TS | 23.83 | 29.07 | 30.40 | 34.89 | 6.57*** | (10.77) |
| Avg. position (pct) | 1.00 | 1.40 | 1.63 | 2.40 | 0.63*** | (22.70) |
| Avg. position in loans (pct) | 0.58 | 0.80 | 0.91 | 1.74 | 0.33*** | (12.50) |
| Collateral/NAV | 1.22 | 2.92 | 3.63 | 6.11 | 2.41*** | (38.30) |
| Collateral/NAV for lenders | 2.62 | 3.83 | 5.73 | 6.89 | 3.12*** | (32.20) |
| VOL/NAV | 0.92 | 2.34 | 2.65 | 5.38 | 1.73*** | (25.27) |
| VOL/NAV for lenders | 2.00 | 3.13 | 5.15 | 6.63 | 3.15*** | (25.82) |
| Loan Avg.Shortint. | 13.15 | 6.22 | 11.33 | 6.49 | -1.82*** | (-14.00) |
| Loan Avg.Bid-Ask | 0.16 | 0.18 | 0.13 | 0.15 | -0.03*** | (-8.76) |
| Loan Avg.Hi-Lo | 4.03 | 1.84 | 3.71 | 1.90 | -0.32*** | (-8.44) |
| Loan Avg.Mcap. | 6281.39 | 14593.14 | 6553.39 | 12951.81 | 272.00 | (0.95) |
| Observations | 10138 | | 12128 | | 22266 | |

This table presents summary statistics on Active and Passive funds in the SEC Edgar lending fund sample. All variables except Net asset Value and Loan Avg.Mcap. are in percentage points.

Table 2: Portfolio rebalancing around stock lending

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Passive | | | | |
| -4 | -0.00** | -0.00 | 0.00 | 0.00 |
| | (-1.99) | (-0.79) | (1.02) | (0.84) |
| -3 | 0.00 | 0.00 | 0.00* | 0.00 |
| | (0.06) | (1.26) | (1.70) | (1.06) |
| -2 | 0.00 | 0.00** | 0.00** | 0.00* |
| | (1.52) | (2.32) | (2.37) | (1.90) |
| -1 | 0.00** | 0.00** | 0.00** | 0.00** |
| | (2.14) | (2.33) | (2.30) | (2.00) |
| 0 | 0.00 | -0.00 | -0.00 | -0.00 |
| | (0.40) | (-0.35) | (-1.03) | (-1.05) |
| 1 | -0.00* | -0.00 | -0.00*** | -0.00*** |
| | (-1.88) | (-1.23) | (-2.91) | (-3.71) |
| 2 | -0.00* | -0.00 | -0.00*** | -0.00*** |
| | (-1.77) | (-0.89) | (-3.35) | (-3.58) |
| 3 | -0.00* | -0.00 | -0.00 | -0.00 |
| | (-1.73) | (-0.87) | (-1.48) | (-1.28) |
| 4 | -0.00 | 0.00** | -0.00 | -0.00 |
| | (-0.76) | (2.41) | (-0.69) | (-1.31) |
| 5 | -0.00 | -0.00 | 0.00 | 0.00 |
| | (-1.23) | (-0.00) | (0.49) | (0.24) |
| 6 | -0.00 | 0.00 | -0.00** | -0.00* |
| | (-1.38) | (1.30) | (-1.99) | (-1.77) |
| Active | | | | |
| -4 | 0.00 | 0.00 | 0.00 | 0.00* |
| | (0.43) | (0.22) | (1.61) | (1.75) |
| -3 | 0.00 | 0.00 | 0.00** | 0.00** |
| | (1.08) | (0.97) | (2.46) | (2.50) |
| -2 | 0.00*** | 0.00*** | 0.00*** | 0.00*** |
| | (2.76) | (2.83) | (2.71) | (2.68) |
| -1 | 0.00** | 0.00** | 0.01*** | 0.01*** |
| | (2.25) | (2.53) | (4.18) | (3.97) |
| 0 | -0.00 | 0.00 | -0.00 | -0.00 |
| | (-0.04) | (0.20) | (-0.05) | (-0.08) |
| 1 | -0.01*** | -0.01*** | -0.00*** | -0.01*** |
| | (-4.67) | (-3.80) | (-3.57) | (-3.28) |
| 2 | -0.01*** | -0.00*** | -0.00* | -0.00** |
| | (-4.64) | (-3.51) | (-1.67) | (-2.22) |
| 3 | -0.00** | -0.00 | -0.00 | -0.00* |
| | (-2.29) | (-1.25) | (-1.60) | (-1.93) |
| 4 | -0.00*** | -0.00*** | -0.00* | -0.00* |
| | (-3.28) | (-3.54) | (-1.68) | (-1.66) |
| 5 | -0.00** | -0.00** | -0.00* | -0.00* |
| | (-2.16) | (-2.12) | (-1.82) | (-1.91) |
| 6 | -0.00* | -0.00** | -0.00 | -0.00* |
| | (-1.78) | (-2.22) | (-1.26) | (-1.79) |
| Stock × Quarter FE | Yes | Yes | Yes | Yes |
| Stock × Fund | No | Yes | No | No |
| Fund × Quarter FE | No | No | Yes | Yes |
| IOC × quarter | No | No | No | Yes |
| Observations | 33508879 | 32916920 | 33497052 | 30550455 |
| Adjusted $R^2$ | -0.005 | 0.048 | 0.270 | 0.258 |

The dependent variable $\Delta w_{f,s,t}$ measures the difference in portfolio weight between a fund and the fund group average, computed for active and passive funds in each Investment Objective Code and Total Asset group. The leads and lags of the lending dummy measure the deviation from the group average portfolio weight for the stock in event time relative to an observed stock loan. Each specification includes stock × quarter fixed effects. Specifications (3), (4), (5) additionally include fund×stock, fund×quarter and fund×quarter and IOC×quarter fixed effects, respectively. For brevity, the table only reports leads up to four quarters and lags up to six quarters. The regression specification has leads and lags up to eight quarters. Standard errors are clustered at the stock and fund level.

Table 3: Cross-sectional variation in trading

| | Portfolio weight | | Short interest | | Past returns | | Market capitalization | | S&P 500 member | | Investment grade | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low | High | Low | High | Low | High | Low | High | No | Yes | No | Yes |
| Passive | | | | | | | | | | | | |
| -2 | -0.001** | 0.003* | 0.002 | 0.000 | -0.000 | 0.001 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.001 |
| | (-2.31) | (1.85) | (0.59) | (0.47) | (-0.14) | (0.70) | (0.25) | (0.01) | (0.66) | (0.45) | (0.34) | (1.12) |
| -1 | -0.000 | 0.002 | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.002 | 0.000 | 0.002 | -0.002 | 0.001* |
| | (-1.11) | (1.20) | (0.43) | (1.11) | (0.22) | (1.11) | (1.16) | (0.78) | (0.49) | (0.72) | (-0.60) | (1.67) |
| 0 | -0.000 | -0.002 | 0.001 | 0.000 | 0.000 | 0.000 | -0.000 | 0.000 | -0.000 | -0.000 | 0.001 | 0.001 |
| | (-0.49) | (-1.41) | (0.22) | (0.11) | (0.13) | (0.03) | (-0.43) | (0.08) | (-0.18) | (-0.15) | (0.25) | (1.11) |
| 1 | -0.000 | -0.004** | -0.000 | -0.001 | -0.000 | -0.001 | -0.001 | -0.004* | -0.001 | -0.003 | -0.003 | -0.001* |
| | (-0.70) | (-2.51) | (-0.14) | (-1.56) | (-0.27) | (-1.60) | (-1.35) | (-1.80) | (-0.67) | (-1.33) | (-1.07) | (-1.75) |
| 2 | -0.000 | -0.003 | -0.001 | -0.001 | -0.000 | -0.001 | -0.001* | -0.000 | -0.001 | -0.001 | 0.002 | -0.002*** |
| | (-0.68) | (-1.58) | (-0.30) | (-1.12) | (-0.13) | (-1.17) | (-1.71) | (-0.19) | (-1.34) | (-0.46) | (0.52) | (-2.64) |
| 3 | -0.001 | -0.002 | -0.002 | -0.001 | -0.000 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.002 | -0.000 |
| | (-1.33) | (-1.18) | (-0.70) | (-0.72) | (-0.51) | (-0.87) | (-0.89) | (-0.48) | (-0.71) | (-0.32) | (-0.58) | (-0.38) |
| 4 | -0.000 | -0.002 | -0.000 | -0.000 | 0.000 | -0.000 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | 0.000 |
| | (-1.22) | (-1.08) | (-0.02) | (-0.43) | (0.44) | (-0.42) | (-0.60) | (-0.33) | (-0.17) | (-0.22) | (-0.11) | (0.14) |
| Active | | | | | | | | | | | | |
| -2 | 0.003*** | 0.004 | -0.001 | 0.003** | 0.000 | 0.003** | 0.003*** | 0.001 | 0.002 | 0.003 | -0.003 | 0.002* |
| | (4.69) | (1.33) | (-0.36) | (2.48) | (0.48) | (2.18) | (2.67) | (0.27) | (1.58) | (0.87) | (-0.38) | (1.81) |
| -1 | 0.002*** | 0.011*** | 0.002 | 0.003*** | 0.000 | 0.004*** | 0.002** | 0.001 | 0.004*** | 0.004 | 0.011* | 0.002** |
| | (4.13) | (3.97) | (0.57) | (2.87) | (0.09) | (3.15) | (2.22) | (0.34) | (3.19) | (1.13) | (1.69) | (2.12) |
| 0 | 0.001*** | 0.003 | -0.000 | 0.000 | -0.000 | 0.000 | -0.000 | -0.005 | 0.001 | 0.001 | -0.003 | -0.000 |
| | (3.11) | (1.04) | (-0.06) | (0.08) | (-0.10) | (0.18) | (-0.22) | (-1.42) | (0.62) | (0.39) | (-0.43) | (-0.34) |
| 1 | -0.001** | -0.023*** | -0.006* | -0.008*** | -0.001 | -0.010*** | -0.005*** | -0.006* | -0.008*** | -0.013*** | -0.018** | -0.006*** |
| | (-2.48) | (-8.59) | (-1.69) | (-7.42) | (-1.27) | (-7.59) | (-5.65) | (-1.84) | (-6.23) | (-3.80) | (-2.57) | (-5.54) |
| 2 | -0.000 | -0.015*** | -0.005 | -0.005*** | -0.001 | -0.007*** | -0.004*** | -0.004 | -0.006*** | -0.009** | -0.015** | -0.004*** |
| | (-0.46) | (-5.01) | (-1.24) | (-4.56) | (-0.70) | (-4.88) | (-3.64) | (-1.14) | (-4.17) | (-2.36) | (-2.04) | (-3.35) |
| 3 | 0.001 | -0.006* | -0.001 | -0.002* | 0.000 | -0.003** | -0.002 | -0.008** | -0.002 | -0.009** | 0.004 | -0.003** |
| | (1.17) | (-1.90) | (-0.13) | (-1.77) | (0.36) | (-1.96) | (-1.53) | (-2.37) | (-1.38) | (-2.29) | (0.48) | (-2.31) |
| 4 | -0.000 | -0.008** | -0.002 | -0.003** | -0.001 | -0.004** | -0.002* | -0.002 | -0.003* | -0.008* | 0.000 | -0.004*** |
| | (-0.13) | (-2.34) | (-0.41) | (-2.41) | (-0.72) | (-2.44) | (-1.67) | (-0.47) | (-1.66) | (-1.94) | (0.04) | (-2.68) |
| Observations | 16230296 | 17245635 | 8853818 | 24379642 | 3427370 | 29806090 | 14705419 | 8618054 | 14930078 | 11700568 | 6309442 | 15470526 |
| Adjusted $R^2$ | 0.118 | 0.002 | -0.010 | -0.003 | -0.030 | -0.002 | -0.006 | 0.001 | -0.008 | 0.000 | -0.028 | -0.012 |

The dependent variable $\Delta w_{f,s,t}$ measures the difference in portfolio weights between a fund and the fund group average, computed for active and passive funds in each Investment Objective Code and Total Asset group. The leads and lags of the lending dummy measure the deviation from the group average portfolio weight for the stock in event time relative to and observed stock loan. This table presents results from sample split regressions, where I divide the sample in high and low information groups, with the aim of testing whether lender funds react to stock borrowing more when information is scarce or if the borrowing might bring in information that is not yet incorporated in prices. I split the data in two groups according to portfolio weight, short interest, market capitalization, S&P 500 index membership, investment grade debt rating, and fund net assets. Each specification includes stock × quarter fixed effects. For brevity, the table only reports leads from two periods before the event up to four periods after. The regression specification has leads and lags up to eight quarters.

Table 4: Stock returns after borrowing from mutual funds

| | (1) | | (2) | | (3) | | (4) | |
|---|---|---|---|---|---|---|---|---|
| | Active | Passive | Active | Passive | Active | Passive | Active | Passive |
| 0 | -0.02*** | -0.03*** | -0.02*** | -0.02*** | -0.02*** | -0.02*** | -0.02*** | -0.04*** |
| | (-13.72) | (-16.75) | (-8.27) | (-2.96) | (-15.51) | (-13.68) | (-11.47) | (-20.73) |
| 1 | -0.02*** | -0.01*** | -0.02*** | -0.01 | -0.02*** | -0.01*** | -0.02*** | -0.00** |
| | (-13.03) | (-7.02) | (-8.76) | (-1.23) | (-14.77) | (-9.68) | (-10.37) | (-2.41) |
| 2 | -0.02*** | -0.02*** | -0.02*** | -0.01 | -0.01*** | -0.01*** | -0.00** | -0.01*** |
| | (-9.10) | (-8.48) | (-5.99) | (-1.63) | (-9.71) | (-10.96) | (-2.33) | (-6.87) |
| 3 | -0.01*** | -0.02*** | -0.01*** | -0.01 | -0.01*** | -0.01*** | -0.00 | -0.02*** |
| | (-4.83) | (-8.10) | (-3.12) | (-1.63) | (-4.91) | (-7.58) | (-0.07) | (-8.57) |
| 4 | -0.02*** | -0.01*** | -0.02*** | -0.01 | -0.02*** | -0.01*** | -0.04*** | -0.01*** |
| | (-12.09) | (-6.59) | (-8.33) | (-1.33) | (-13.33) | (-4.32) | (-17.41) | (-6.88) |
| 5 | -0.01*** | -0.00 | -0.01*** | 0.00 | -0.01*** | 0.01*** | -0.03*** | -0.01*** |
| | (-6.96) | (-1.20) | (-5.29) | (0.04) | (-10.25) | (4.47) | (-11.43) | (-3.71) |
| 6 | 0.00 | 0.01*** | 0.00 | 0.01 | -0.00*** | 0.01*** | 0.01*** | 0.01*** |
| | (0.13) | (2.90) | (0.47) | (1.13) | (-2.74) | (4.80) | (3.78) | (3.82) |
| 7 | 0.01*** | -0.00 | 0.01** | 0.00 | 0.00 | 0.00 | 0.02*** | -0.01*** |
| | (2.82) | (-0.98) | (2.52) | (0.08) | (0.44) | (0.66) | (7.39) | (-3.66) |
| 8 | -0.00 | 0.01*** | 0.00 | 0.02** | -0.00 | 0.01*** | -0.00 | 0.02*** |
| | (-0.03) | (7.32) | (0.33) | (2.44) | (-1.17) | (11.25) | (-0.83) | (9.01) |
| 9 | -0.01*** | 0.00 | -0.01*** | 0.00 | -0.01*** | 0.01*** | -0.01*** | 0.01*** |
| | (-4.46) | (1.18) | (-3.22) | (0.71) | (-3.94) | (4.84) | (-3.81) | (5.37) |
| 10 | 0.01** | 0.00 | 0.01** | 0.00 | 0.00*** | 0.01*** | 0.00 | 0.01*** |
| | (2.49) | (0.87) | (2.55) | (0.64) | (2.59) | (5.01) | (0.83) | (3.25) |
| 11 | 0.00 | -0.00 | 0.00 | 0.00 | 0.01*** | 0.00*** | 0.01*** | 0.00 |
| | (1.28) | (-0.11) | (1.35) | (0.33) | (3.59) | (2.65) | (2.92) | (1.14) |
| 12 | 0.01*** | 0.00 | 0.01*** | 0.01 | 0.01*** | 0.00** | 0.02*** | -0.00** |
| | (5.05) | (1.34) | (4.71) | (0.80) | (7.78) | (2.08) | (8.24) | (-1.98) |
| Shortinterest | | | -0.01 | -0.03 | | | | |
| | | | (-0.54) | (-0.36) | | | | |
| Observations | 1846603 | 2680589 | 1846603 | 2680589 | 683272 | 705692 | 859730 | 895517 |
| Adjusted $R^2$ | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 | 0.001 | 0.003 | 0.003 |

This table presents the results from event study regressions on the stocks borrowed from active and passive mutual funds. The aim of the event study is to show that stock borrowing from mutual funds contains information, and that funds can as a result profitably trade the stocks that are borrowed without relying on other information. The dependent variable is quarterly stock returns. Specification (1) includes all observed stock loans. Specification (2) only retains non-duplicate observations at the stock-quarter level, i.e., equal-weights all stock loans. Specification (3) retains first loan observations at the fund-stock level, and drops all stock loans that occur within 4 quarters of a previous stock loan observation. Standard errors are clustered at the stock level.

Table 5: Cross-sectional variation in stock returns

(a) Active funds

| | Short interest | | Market capitalization | | S&P 500 member | | Investment grade | | Change in shares | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Low | High | Low | High | No | Yes | No | Yes | Low | High |
| 0 | -0.03*** | -0.02*** | -0.06*** | -0.01*** | -0.00** | 0.00 | -0.03*** | -0.00 | -0.04*** | -0.00** |
| | (-7.04) | (-11.28) | (-15.25) | (-5.18) | (-2.42) | (0.63) | (-11.91) | (-0.70) | (-13.69) | (-2.15) |
| 1 | -0.03*** | -0.02*** | -0.06*** | -0.01*** | -0.01*** | 0.02*** | -0.03*** | 0.01** | -0.04*** | -0.02*** |
| | (-6.49) | (-11.05) | (-15.53) | (-4.91) | (-5.21) | (3.83) | (-12.34) | (2.22) | (-12.07) | (-8.11) |
| 2 | -0.02*** | -0.02*** | -0.06*** | -0.00 | 0.00 | 0.02*** | -0.02*** | 0.00 | -0.03*** | -0.01*** |
| | (-4.60) | (-7.83) | (-13.29) | (-0.31) | (0.17) | (5.34) | (-8.66) | (1.51) | (-8.80) | (-5.83) |
| 3 | -0.01*** | -0.01*** | -0.04*** | 0.00* | -0.00 | 0.02*** | -0.01*** | 0.02*** | -0.01* | -0.01*** |
| | (-3.39) | (-3.85) | (-9.61) | (1.88) | (-0.57) | (6.69) | (-5.57) | (5.75) | (-1.74) | (-4.73) |
| 4 | -0.02*** | -0.02*** | -0.06*** | -0.01*** | -0.01*** | 0.00 | -0.03*** | -0.00* | -0.02*** | -0.02*** |
| | (-4.60) | (-11.07) | (-12.53) | (-5.22) | (-4.79) | (1.21) | (-12.90) | (-1.71) | (-7.24) | (-7.54) |
| Observations | 305548 | 1535110 | 504371 | 1336287 | 1309308 | 196421 | 1002273 | 234552 | 723756 | 867497 |
| Adjusted $R^2$ | 0.002 | 0.002 | 0.008 | 0.001 | 0.001 | 0.008 | 0.004 | 0.005 | 0.004 | 0.001 |

(b) Passive funds

| | Short interest | | Market capitalization | | S&P 500 member | | Investment grade | | Change in shares | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Low | High | Low | High | No | Yes | No | Yes | Low | High |
| 0 | -0.03*** | -0.03*** | -0.06*** | -0.02*** | -0.01*** | -0.00 | -0.03*** | -0.00 | -0.03*** | -0.03*** |
| | (-6.71) | (-14.85) | (-17.95) | (-10.28) | (-7.88) | (-0.27) | (-15.37) | (-0.09) | (-13.03) | (-11.38) |
| 1 | -0.03*** | -0.01*** | -0.06*** | 0.00 | -0.00** | 0.01** | -0.01*** | 0.01*** | -0.00 | -0.02*** |
| | (-4.94) | (-5.34) | (-14.08) | (0.73) | (-2.31) | (2.29) | (-5.12) | (3.91) | (-0.74) | (-8.74) |
| 2 | -0.02*** | -0.02*** | -0.07*** | -0.00 | -0.01** | 0.01*** | -0.02*** | 0.01*** | 0.01*** | -0.03*** |
| | (-3.55) | (-7.71) | (-13.81) | (-1.13) | (-2.50) | (2.69) | (-7.52) | (4.19) | (4.60) | (-10.91) |
| 3 | -0.02*** | -0.01*** | -0.07*** | -0.00 | -0.01*** | 0.01** | -0.02*** | 0.01*** | 0.00 | -0.03*** |
| | (-4.18) | (-7.15) | (-13.73) | (-0.35) | (-3.51) | (2.18) | (-8.83) | (4.94) | (1.00) | (-10.05) |
| 4 | -0.02*** | -0.01*** | -0.05*** | -0.00 | -0.01*** | 0.01*** | -0.02*** | 0.01*** | -0.00 | -0.02*** |
| | (-3.40) | (-5.78) | (-9.83) | (-0.91) | (-2.63) | (2.77) | (-7.67) | (5.41) | (-0.93) | (-6.92) |
| Observations | 309284 | 2362231 | 569770 | 2101745 | 2003980 | 318322 | 1349954 | 337991 | 996437 | 1560044 |
| Adjusted $R^2$ | 0.002 | 0.002 | 0.010 | 0.002 | 0.001 | 0.006 | 0.003 | 0.013 | 0.002 | 0.003 |

This table presents cross sectional variation in the returns of borrowed stocks. I split stocks in two groups according to their information environment according to their short interest, market capitalization, S&P 500 index membership, and investment grade debt rating by Standard & Poors, and perform the same event study regression as in specification (1) in Table 4. Additionally, I split the sample according to the change in number of shares held by each fund type in order to proxy for the trading activity by funds. The dependent variable is quarterly stock return of the borrowed stocks. For brevity, the table only reports event time up to four quarters after the event. Standard errors are clustered at the stock level.

Table 6: Lending fees and collaterals

| | (1) Lendingfee | (2) Lendingfee | (3) Lendingfee | (4) Lendingfee | (5) Overcollateral | (6) Overcollateral | (7) Overcollateral | (8) Overcollateral |
|---|---|---|---|---|---|---|---|---|
| Passive | 2.669*** | 2.616*** | 2.892*** | 2.272*** | -0.478 | -0.480 | -0.311 | -0.183 |
| | (8.00) | (8.71) | (9.40) | (7.23) | (-1.64) | (-1.60) | (-0.98) | (-0.62) |
| ln(NAV) | | -0.077** | | -0.050 | | -0.299*** | | -0.218*** |
| | | (-2.26) | | (-1.32) | | (-6.99) | | (-5.07) |
| Lending intensity: VoL/TS | | | -0.007*** | -0.004 | | | -0.011*** | -0.012*** |
| | | | (-2.71) | (-1.58) | | | (-3.52) | (-3.82) |
| Loan ln(Shortint.) | | | | 0.330*** | | | | -0.956*** |
| | | | | (2.94) | | | | (-7.70) |
| Loan ln(Mkt cap) | | | | -0.616*** | | | | -1.221*** |
| | | | | (-9.85) | | | | (-17.34) |
| Lend intensity: $N\_L/N\_H$ | | | | -0.009*** | | | | -0.002 |
| | | | | (-2.99) | | | | (-0.67) |
| Observations | 4207 | 4191 | 3928 | 3325 | 6135 | 6107 | 5675 | 4755 |
| Adjusted $R^2$ | 0.143 | 0.326 | 0.333 | 0.414 | 0.079 | 0.097 | 0.095 | 0.171 |

The dependent variable in columns (1)-(4) is the lending fee proxy computed according to Equation 2. The dependent variable in columns (5)-(8) is overcollateralization. The control variables are log total net assets, log average market capitalization of the stocks on loan, and log average short interest of the stocks on loan. I also include two measures of lending intensity in the regressions: the share of stocks in the portfolio at least partially on loan, and the share of total holdings of loan stocks that is lent. Each specification includes a fund issuer fixed effect to address heterogeneity in lending strategy between fund issuers.

Table 7: Gains from rebalancing – Active funds

| Event time | Cumulative rebalancing (%) | Stock return (%) | Cumulative gain (bp) |
|---|---|---|---|
| 0 | 0.4 | -2.4 | -0.9 |
| 1 | -0.5 | -2.4 | 0.2 |
| 2 | -1.1 | -1.8 | 2.1 |
| 3 | -1.3 | -0.1 | 3.3 |
| 4 | -1.6 | -2.4 | 7.2 |
| 5 | -1.9 | -1.4 | 9.9 |
| 6 | -2.1 | 0.0 | 9.8 |
| 7 | -2.1 | 0.6 | 8.6 |
| 8 | -2.1 | 0.0 | 10.6 |

This table computes returns to lending-induced rebalancing, using the results from Sections 5.1 and 5.2. The returns are computed as the cumulative rebalancing from event time 0 to time $t$ multiplied by the stock return in quarter $t$ and cumulated over time. The cumulative gain from rebalancing measures the profit from rebalancing the position relative to similar non-lender funds that do not rebalance: for two funds that hold the same stock, this measures how much better the lender fund does when it rebalances away from the stock relative to the competitor fund. In short, lender funds avoid about 10.6 basis points of losses of portfolio value in the position. This amounts to about 18% of the value of the position (average position size is about 0.58%).

Table 8: Lending market participation

(a) Lending market participation – Extensive margin

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Passive | 0.155*** | 0.235*** | 0.002 | 0.091*** | 0.347*** | 0.378*** | 0.072*** | 0.106*** |
| | (23.90) | (36.10) | (0.27) | (12.78) | (25.52) | (28.55) | (5.22) | (7.77) |
| ln(NAV) | | 0.058*** | | 0.061*** | | 0.051*** | | 0.041*** |
| | | (42.55) | | (39.36) | | (37.32) | | (28.03) |
| Mgmt fee | | 0.054*** | | 0.021*** | | 0.056*** | | 0.024*** |
| | | (13.31) | | (5.08) | | (15.09) | | (6.67) |
| Portf. ln(Shortint.) | | | 0.049*** | 0.044*** | | | 0.083*** | 0.081*** |
| | | | (14.72) | (11.28) | | | (29.21) | (23.27) |
| Portf. ln(Mkt cap) | | | 0.020*** | 0.008 | | | -0.004*** | 0.001 |
| | | | (10.00) | (1.02) | | | (-2.63) | (0.13) |
| Portf. ln(Dollar volume) | | | | -0.005 | | | | -0.015* |
| | | | | (-0.52) | | | | (-1.75) |
| Constant | 0.478*** | 0.055*** | 0.409*** | 0.181* | | | | |
| | (100.40) | (5.20) | (20.53) | (1.66) | | | | |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Issuer × Quarter FE | No | No | No | No | Yes | Yes | Yes | Yes |
| Observations | 22266 | 22086 | 18725 | 18565 | 22266 | 22086 | 18725 | 18565 |
| Adjusted $R^2$ | 0.076 | 0.158 | 0.077 | 0.150 | 0.264 | 0.318 | 0.360 | 0.389 |

(b) Lending market participation – Intensive margin

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Passive | 3.207*** | 2.378*** | 2.663*** | 1.949*** | -0.196 | -0.249 | -0.643*** | -0.817*** |
| | (21.36) | (14.25) | (18.66) | (12.28) | (-0.84) | (-1.03) | (-3.00) | (-3.65) |
| ln(NAV) | | -0.538*** | | -0.514*** | | -0.107*** | | -0.101*** |
| | | (-16.28) | | (-15.94) | | (-3.24) | | (-3.20) |
| Mgmt fee | | 1.733*** | | 1.181*** | | 0.124 | | -0.444 |
| | | (6.20) | | (4.29) | | (0.43) | | (-1.59) |
| Portf. ln(Shortint.) | | | 1.434*** | 1.662*** | | | 1.765*** | 1.826*** |
| | | | (19.12) | (17.60) | | | (27.07) | (21.49) |
| Portf. ln(Mkt cap) | | | -1.028*** | -0.660*** | | | -0.834*** | -0.721*** |
| | | | (-26.40) | (-3.98) | | | (-24.46) | (-4.70) |
| Portf. ln(Dollar volume) | | | | -0.273 | | | | -0.128 |
| | | | | (-1.34) | | | | (-0.68) |
| Constant | 1.959*** | 5.587*** | 11.044*** | 15.823*** | | | | |
| | (16.82) | (16.88) | (26.38) | (7.16) | | | | |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Issuer × Quarter FE | No | No | No | No | Yes | Yes | Yes | Yes |
| Observations | 6487 | 6487 | 6344 | 6342 | 6487 | 6487 | 6344 | 6342 |
| Adjusted $R^2$ | 0.094 | 0.140 | 0.219 | 0.255 | 0.315 | 0.316 | 0.432 | 0.433 |

The dependent variable in panel (a) is a dummy that is equal to 1 if a fund lends securities, and 0 otherwise. In panel (b), the dependent variable is the proportion of assets on loan. The two variables measure lending at the extensive margin and the intensive margin. Specifications (1-4) include quarter fixed effects, and specifications (5)-(8) include quarter and fund issuer fixed effects. The aim of the quarter fixed effects is to capture unobserved time-varying lending market fluctuations, while the issuer fixed effects addresses fund-issuer level differences in lending strategy.

# Appendix

## A Variables

| Variable | Description | Data source |
|---|---|---|
| $passive_{f,t}$ | Passive fund dummy variable | SEC and CRSP |
| $nav_{f,t}$ | Net asset value at quarter end | SEC (N-Q, N-CSR) and CRSP |
| $loanvalue_{f,t}$ | Value on loan: dollar value of outstanding securities loans at the quarter end | SEC: N-Q, N-CSR |
| $collateral_{f,t}$ | Collateral: dollar value of collateral held at quarter end | SEC: N-Q & N-CSR |
| $income_{f,t}$ | Dollar value of securities lending income earned in the quarter of half-year period | SEC: N-CSR |
| $collateralshare_{f,t}$ | Share of collateral of total net assets. $collateralshare_{f,t} = collateral_{f,t}/nav_{f,t}$ | SEC: N-Q, N-CSR |
| $lendshare_{f,t}$ | Share of net assets on loan. $lendshare_{f,t} = loanvalue_{f,t}/nav_{f,t}$ | SEC: N-Q & N-CSR |
| $overcollateral_{f,t}$ | Overcollateralization at quarter end. $overcollateral_{f,t} = collateral_{f,t}/loanvalue_{f,t} - 1$ | SEC: N-Q, N-CSR |
| $\widehat{lendingfee}_{f,t}$ | Proxy for average lending fee earned by lender funds. $\frac{lending\ income_{f,t} - col_{f,t} * r_{MMF,t}}{loanvalue_{f,t}} \times \frac{2}{q_{f,t}} \times 2 + \gamma_{it}$ | SEC: N-Q, N-CSR |
| $colyield_{f,t}$ | Yield on collateral. $colyield_{f,t} = income_{f,t}/collateral_{f,t} - 1$ | SEC: N-Q, N-CSR |
| $lendyield_{f,t}$ | Yield on lending. $lendyield_{f,t} = income_{f,t}/nav_{f,t} - 1$ | SEC: N-Q, N-CSR |
| $numonloan_{f,t}$ | Number of individual stocks on loan at quarter end. | SEC: N-Q, N-CSR |
| $numintensity_{f,t}$ | $numintensity_{f,t} = numonloan_{f,t}/(Number\ of\ securities\ in\ portfolio)_{f,t}$ | SEC: N-Q, N-CSR |
| $loanintensity_{f,t}$ | $loanintensity_{f,t} = loanvalue_{f,t}/(Total\ holding\ of\ stocks\ on\ loan_{f,t}$ | SEC: N-Q, N-CSR |
| $lending_{f,t}$ | Dummy variable indicating that $collateral_{f,t}$ or $loanvalue_{f,t}$ is greater than zero. | SEC: N-Q, N-CSR |
| $MIC_f$ | Morningstar Investment Category. Describes the investment objective of the fund. | Morningstar |
| $IOC_f$ | CRSP Investment Objective Code | CRSP |
| $active_{f,t}$ | Indicator variable set to 1 if the fund is not an ETF | CRSP |
| $SP500_{s,t}$ | Member of the S&P 500 index | Compustat |
| $Invgrade_{s,t}$ | Investment grade rating by Standard & Poors | Compustat |
| $\widehat{weight}_{f,s,t}$ | Fund-category and net asset tercile level average holding for each stock. | CRSP |
| $\Delta w_{i,j.t}$ | Fund-level over/underweighting in a stock. $deviation_{i,j,t} = weight_{i,j,t} - widehatweight_{i,j,t}$ | CRSP |