When pessimism doesn't pay off: Determinants and implications of stock recalls in the short selling market

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Abstract

Using a comprehensive dataset on securities lending, we investigate the timing of stock recalls and their implications for short selling strategies. We document that institutional lenders are more likely to recall (and then sell) shares right before the stock price declines. Mutual funds that rely on private information and those with better historical performance time recalls more accurately. The timing of recalls imposes direct costs on short sellers, who are unable to maintain their full positions until optimal maturity. We estimate that during an information event, such as an earnings announcement, a perfectly informed short seller loses on average about 20% of his first-best profits to recalls. Overall, our results highlight an important limitation to trading on pessimistic information: an investor with an early reliable signal is unable to realize the full benefits of his information advantage.

Key words: short selling, stock recall, mutual funds

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1. Introduction

A large body of the finance literature is dedicated to short selling, a type of trade in which an investor first borrows a security from a broker and then sells it in the open market. Many short selling studies examine constraints faced by stock borrowers and their impact on asset prices (e.g., Miller (1977), Bris, Goetzmann, and Zhu (2007), Saffi and Sigurdsson (2011), Kaplan, Moskowitz, and Sensoy (2013)), while others focus on the behavior of short sellers and their information advantage (e.g., Asquith, Pathak, and Ritter (2005), Diether, Werner, and Lee (2009), Engelberg, Reed, and Ringgenberg (2011)). Very little is known about how short sellers themselves are affected by the actions of stock lenders and, more specifically, by the information characteristics of these lenders and their trading decisions.

This paper aims to bridge the gap between the constraints and the information literature by studying *stock recalls* and their relationship to stock returns and lenders' characteristics. When an owner of a stock lends shares to a short seller, he preserves the right to recall these shares at any time and force the borrower to buy the stock back in the open market.[2] A short seller therefore faces a recall risk of having to liquidate his position *at a suboptimal time*.

The main idea of this study can summarized in the following example. In the second week of November 2014 Interactive Brokers issued a series of recall notices to its clients (see Appendix 2) forcing them to close out their short positions in the GoPro stock. Between that date and the middle of March 2015 the GoPro stock price has declined by almost 50% from $79.15 to $40.13. In theory, a reliable signal on the firm's fundamentals received by an investor at the beginning of October (when GoPro was trading at its peak valuation of $90) should have generated substantial gains in the form of a highly profitable short portfolio. In reality, such a portfolio could not have been held in its entirety until March 2015 because of the wave of recalls that started when lenders realized the poor prospects of GoPro and began recalling shares and disposing of them in order to avoid losses in their own long positions.

In this paper we formulate and answer the following questions. What is an appropriate methodology to measure stock recall activity? How do recalls relate to future stock returns? In particular, do recalls help predict price declines and, if so, what are the horizons at which such declines are the strongest? How do recalls relate to the lenders' characteristics (especially to those characteristics that likely reflect lender sophistication and access to information)? Finally, how much would an informed short seller lose due to the recall pressure, conditional on the existence of a profitable investment opportunity?

[2] Forced buy-ins are often performed by a broker. See Appendix 1 for details on the buy-in and close-out procedure.

Despite the practical importance of stock recalls,[3] very little academic research exists on the subject. The problem is due, in part, to poor data availability and, in part, to a popular argument that stock-specific short sale constraints are not tight enough to prevent arbitrage and distort fair prices (e.g., Kaplan, Moskowitz, and Sensoy (2013)). A recent paper by Engelberg, Reed, and Ringgenberg (2015) makes significant advances in this research area by investigating how future risks faced by short sellers affect their ex ante arbitrage activity. The authors use a similar dataset and consider measures of variability of lending fees and stock utilization to proxy for the fee and recall risk. Their main finding is that higher lending risks deter short selling arbitrage and cause stock overvaluation. However, their study falls short of explaining what causes recalls, when they are likely to occur, their relationship to the stock ownership structure, and especially their effect on the profitability of short selling strategies. In contrast, a recent paper by Prado, Saffi, and Sturgess (2015) investigates the relationship between ownership concentration, the degree of activity of funds holding the stock, and some salient characteristics of the lending and stock market, such as the lending supply and the idiosyncratic volatility. The authors conclude that stocks with more concentrated and less passive ownership have higher shorting costs, which constrain arbitrageurs and delay the correction of mispricing. However, this study does not directly investigate recalls or attempt to answer the questions we pose.

While these two papers are most closely related to our research agenda, many other studies explore the connection between short sale constraints and the stock market (Jones and Lamont (2002), Geczy, Musto, and Reed (2002), Ofek, Richardson, and Whitelaw (2004), Bris, Goetzmann, and Zhu (2007), Cohen, Diether and Malloy (2007), Saffi and Sigurdsson (2011)).

Our paper is distinct from this large body of literature along several important dimensions. First, like Engelberg et al. (2015), we focus on the *forward-looking* costs of shorting rather than the *direct* costs at the time of the position initiation. Second, we provide the first empirical measurement of the recall intensity for a given stock-period and examine the relationship of this recall intensity to short- and long-term future returns. Unlike the traditional line of inquiry that focuses on *institutional frictions* in the lending market that arise due to regulatory constraints, market-wide liquidity shocks, and investment mandate restrictions, we explore the *information properties* of a specific, yet indirect, short selling cost - future recalls. Importantly, this cost is *time-sensitive in nature*, since information received by both lenders and short sellers can be both positive or negative. To illustrate, in the GoPro example above the recalls likely occurred because the stock price was expected to decline; no significant recalls were registered in the first half of 2014 when the stock price was rising. In contrast, the identification methodologies in the traditional short sale constraint literature are based on *cross-sectional* measurements, such as stock

[3] Recall risk is routinely mentioned as one of the important short selling costs by brokers and educators alike, e.g. http://www.investopedia.com/university/shortselling/shortselling3.asp

liquidity, institutional ownership, or stock-specific lending fees (some exceptions include, e.g., Cohen et al. (2007)). Finally, the main goal of our study is to document and quantify the effect of a negative *spillover of information* in the fund management industry on the short selling market. Even though some of our findings can have implications for the ex ante price efficiency and liquidity, this paper is only remotely related to the literature on limits of arbitrage.

We preview the structure of our analysis and the key results as follows. First, we construct several measures of recall intensity using a rich and relatively novel dataset provided by Markit Securities Finance. For each stock-quarter, our recall intensity measure quantifies the relative magnitude of the recall pressure faced by short sellers, normalized between 0 and 1. Second, we relate the recall intensity to changes in positions of mutual funds holding the stock and observe a strong positive relationship between recalls and funds' selling. Third, we investigate the link between recalls and future stock returns and find a robust negative relationship: high recall intensity periods are followed by significantly lower returns, but mostly at short horizons (3 months). We explore the connection between recalls and the characteristics of the holding funds and document that recalls are more informative about future stock returns if the stock is held by funds that do not trade on public information signals, have better performance record, and experience higher portfolio turnover. Finally, we consider earnings announcements - salient information events - and estimate that recalls reduce the event-time first-best profits of an informed short seller by about one-fifth (the graphical evidence is provided in Figure 1).

Identifying stock recalls has been a long-standing challenge for researchers for the following reasons. The first issue is that of data availability. Publicly observable variables, such as short interest and loan fees, could not capture the dynamics of lendable inventory and shares on loan, especially at a high frequency. The dataset used in this study contains daily data on the quantity of shares on loan and lendable, number of shares returned from loan, as well as the number of shares withdrawn from or added to the lendable pool, among others.

The second issue is that of endogeneity. It is not clear how many of the shares returned from loan were recalled and how many were returned by short sellers who voluntarily closed their positions. To separate the two effects, we note a key difference between the forced and voluntary return of stock. When lenders recall shares, these shares are taken out from both the lent set (number of shares on loan) and the lendable set (number of shares supplied to brokers by the lending institutions). In contrast, there is no clear reason why voluntarily returned shares would be immediately transferred back to the lenders' portfolios as opposed to staying in the brokers' lendable set. Our measurement of recall intensity is based on the assumption that during high recall periods, the lent and the lendable both decrease, as brokers start recalling shares when the lendable pool starts to shrink.[4] More precisely, we measure the degree of variation in the reduction in lent that is explainable by the reduction in lendable. While we acknowledge that the lent (effectively, the short interest) is an equilibrium variable driven by both demand for and supply of stock, we are specifically interested in those situations when the lent is forced down by the lendable constraint. In each quarter, we regress the quantity of shares returned by short sellers on the quantity of shares withdrawn by the lenders[5] and retain the R-square of this regression. This measure is conveniently limited to the (0, 1) range and is high in periods of active recalls, when the declining short interest is likely forced.

Our first test relates recall intensity to future stock returns both in the regression and in the portfolio specifications. We find a significant negative relationship between recall intensity and future returns. In particular, a portfolio long in the highest quintile and short in the lowest quintile of recall intensity in a measurement quarter held over the following three (six) months, delivers a negative four-factor alpha of -3.71% (-3.19%) on an annualized basis. The regression results are similar: conditional on a variety of stock characteristics (such as size, illiquidity, book-to-market, and others), an increase in recall intensity of 0.5 reduces the next month's stock return by around 0.27%-0.31%, or 3.22%-3.70% on an annualized basis. This result also serves to validate our methodology on measuring recalls; indeed, if the tight relationship between declining lendable and lent were driven by a flagging demand from short sellers rather than the diminishing supply, one would expect the high R-square quarters to be followed by periods of stronger stock performance.

Next, we provide evidence on the trading of institutional investors who held the stock at the beginning of the high recall intensity period. This analysis is motivated by the fact that institutional investors are the dominant lenders of equity: among all stock and company characteristics, institutional ownership is the largest single determinant of the share supply with a t-statistic of over 30. We focus on a subset of institutions, namely mutual funds, for which we observe portfolio holdings and a variety of other data suitable to the needs of this study. We compute a set of variables that proxy for quarterly changes in stock positions of the mutual funds holding the stock, such as the percentage change in the number of shares held and the change in weight of the stock in a fund's portfolio. Even though we do not observe how much stock each fund supplies, as long as the supplying funds recall and sell shares during the observation quarter, our tests will detect a relationship between the recalls and the overall fund trading. In the vast majority of specifications, we find that recalls are strongly associated with an increase

[4] In Section 2, we describe this mechanism in greater detail and explain why our recall intensity measures are unlikely to be driven by either reverse causality or omitted variables. We also conduct several verification tests that confirm the validity of our measurement methodology.

[5] For consistency of exposition, we will refer to stock that is returned to the lendable pool by short sellers closing their positions as "returned" (from loan) and to stock that is transferred by brokers back to the portfolios of original owners as "withdrawn" (from the lendable pool).

in fund selling. For example, as the recall intensity increases by 0.5, the percentage change of the weight of the stock in an average fund's portfolio decreases by 2.77%, or about 21% of its unconditional mean.

Next, we investigate which types of funds time their recalls more accurately. In other words, we study how the predictability of recalls for future returns varies with the characteristics of the holding funds. First, we compute a set of fund characteristics that proxy for managerial expertise, likelihood of receiving a private information signal, and general trading frequency. We consider such measures as fund size, portfolio concentration and turnover, fund abnormal returns over the previous 3 years, and the Kasperczyk and Seru (2007) measure of a fund's reliance on public information, called RPI.[6] Since our analysis is conducted at the stock level, we aggregate these variables for each stock-quarter by calculating the weighted average of the respective variable across all the funds that held the stock at the beginning of that quarter (the weights are proportional to the share positions of the funds in the stock). We pre-sort stocks into bins by a respective fund characteristic and examine the long-short returns to our recall strategy within each bin. We find strong evidence that most of the return predictability is concentrated in stocks that are held by funds with better past performance and funds that do not rely on public information. For example, the annualized 4-factor alpha of the portfolio long in the top and short in the bottom quintile of recall intensity which is held for six months after the formation is a significant 4.06% in the high fund-performance bin (insignificant 0.96% in the low fund-performance bin) and is a significant 4.25% in the low fund-RPI bin (insignificant 1.45% in the high fund-RPI bin). We also find moderate evidence that lower holdings concentration and higher portfolio turnover of the holding funds makes timely recalls more likely.

Our analysis concludes with an estimation of the effects of recalls on the short selling profits around an information event. We focus on earnings announcements, since their timing is known in advance, they are unlikely to be contaminated by governance issues (unlike, e.g., M&A events), and they are frequent enough to provide us with a rich set of observations. We consider three versions of a short selling strategy, all initiated one month prior to the event month: the pure (first-best) strategy where the short seller faces no recalls and pays no fees, the strategy whose returns are adjusted for lending fees but not for recalls, and the strategy that is based on a portfolio which is gradually depleted by recalls. We compare the returns to these strategies for different bins sorted by the magnitude of an earnings announcement surprise and document that in the presence of clear investment opportunities (the bin with the most negative announcements), the recall-adjusted strategy delivers an event-time (60-day) return of 6.98%,

[6] For each fund-quarter, Kasperczyk and Seru regress the fund's change in holdings in a stock on the lagged changes in the mean analyst recommendation for that stock (proxy for public information) and report the R-square.

compared to 8.65% earned by the fee-adjusted strategy and 8.91% earned by the first-best strategy.[7] In contrast, the returns to the three strategies are virtually identical when no investment opportunities exist for short sellers (the middle bin containing neutral surprises).

To the best of our knowledge, this is the first study that traces the relationship between actions and characteristics of stock owners, recalls of shares in the lending market, and equity returns. We add to the classical literature on short sale constraints (Jones and Lamont (2002), Geczy, Musto, and Reed (2002), Ofek, Richardson, and Whitelaw (2004), Bris, Goetzmann, and Zhu (2007), Cohen, Diether and Malloy (2007), Saffi and Sigurdsson (2011), Kaplan, Moskowitz, and Sensoy (2013)) by examining the issues of maintaining a short position until optimal maturity rather than the costs of establishing such a position. We also contribute to the nascent literature on recall risk (Engelberg, Reed, and Ringgenberg (2015)) and to the growing literature on the relationship between short selling and stock ownership (Nagel (2005), Prado, Saffi, and Sturgess (2015), Evans, Ferreira, and Prado (2015)). In particular, we document that the timing of recalls undercuts short sellers' profits and show how mutual fund sophistication affects this timing.

Our paper also provides some insights for the information asymmetry literature (e.g., Kyle (1985), Admati and Pfleiderer (1988)). Conventionally, stocks with high information asymmetry are believed to be difficult to arbitrage, largely due to the adverse selection risks. Our analysis suggests that the opposite can be true when short sellers assume the arbitraging role. If the arbitraging short seller anticipates that the lending institution will soon receive the same negative signal about the firm, recall the shares, and front-run his profits, there are few incentives to short the stock in the first place. However, for stocks with *high* information asymmetry, the short seller's information advantage is protected until the time when all private information becomes public and the stock price drops. In this latter scenario, higher arbitrage profits should attract competitive short sellers and reduce the ex ante overvaluation of the security.

The rest of the paper is organized as follows. Section 2 describes the data, explains the construction of variables, and reports the results of the validation tests. Section 3 investigates the relationship between recall intensity and future stock returns. Section 4 relates recall intensity to mutual funds' characteristics and examines the effect of recalls on the short selling profits around earnings announcements. Section 5 presents several robustness tests. A brief conclusion follows.

[7] The real costs imposed by recalls on short sellers are likely to be higher than the ones estimated here because i) short sellers are more likely to receive signals for stocks for which lenders will later also receive signals (i.e., short sellers' stock selection is not independent of the recall probability), and ii) our measurement only captures recalls initiated by lenders but fails to detect cases when a broker recalls shares from one client for the benefit of other clients.

2. Data Description, Variables, and Preliminary Tests

2.1 Sample Construction and Data

Our analysis makes use of a relatively novel dataset provided by Markit Securities Finance - a financial information group headquartered in the UK. Markit collects information from custodians and prime brokers that lend and borrow securities and is the leading supplier of securities lending data in the world. The database tracks lending and borrowing activity across all global market sectors and contains information on over 30,000 equities worldwide. We restrict our analysis to the U.S. common stock (CRSP share code 10 or 11) and to those stock-months for which at least 10 daily observations are available. In practice, this confines the dataset to the time period between the early 2007 and the middle of 2013, for which Markit supplies observations at daily frequency.

For each security-date, the database reports several key variables that describe the state of the lending market:

Total Demand Quantity - number of shares of the security currently on loan

BO Inventory Quantity - number of shares of current inventory available from Beneficial Owners (lenders). This number includes shares on loan as well as shares available for lending

VWAF - annualized value-weighted average lending fee for all open trades (equal to the difference between the risk-free rate and the rebate rate)

BO Inventory Value Concentration Ratio - A Herfindahl concentration index of inventory shares across lenders (i.e., a small value indicates a large number of lenders and 1 indicates a single lender with all the inventory).

Broker Demand Value Concentration Ratio - A Herfindahl concentration index of broker demand shares (a small value indicates a large number of active brokers and 1 indicates a single active broker).

Characteristics of the lending market are generally constructed as normalized ratios. Accordingly, we define the following variables:

Fraction of shares lendable is calculated as the ratio of the number of shares in the lending pool (*BO Inventory Quantity*) and the number of shares outstanding.

Fraction of shares on loan is calculated as the ratio of the number of shares currently on loan (*Total Demand Quantity*) and the number of shares outstanding.

Utilization ratio is defined as the ratio of the number of shares on loan to the number of shares lendable and *availability ratio* is defined as the number of shares lendable less the number of shares on loan divided by the number of shares outstanding. Utilization shows which fraction of the stock supplied by lenders has been lent out, while availability captures the fraction of the outstanding shares that is available for borrowing to short sellers looking to establish new positions. To ensure an error-free dataset, we eliminate a small number of observations where either the availability or the utilization ratio falls outside of the (0,1) interval.

Table 1, Panel A reports some summary statistics on the lending market characteristics calculated at monthly frequency (all the state variables are taken as of the end of a calendar month). For an average stock in our sample, 17.4% of its outstanding shares are in the lending pool, although for a sizeable number of stocks there are virtually no shares available to borrow (10th percentile is 0.61%). The average unconditional utilization ratio is close to 24% but spikes to over 60% for the top 10 percentiles. Consistent with this pattern, availability drops close to 0 for the low percentiles from its average value of 13.6%. In most cases, the lending market is not overly concentrated (with an average lender concentration of 27.5% and a broker concentration of 36.1%) but the concentration increases significantly in the right tail of the distribution.

In Panel B of Table 1, we examine the correlation of the lending market characteristics with each other and with some common stock characteristics. For each stock-month, the stock characteristics are computed as follows: institutional ownership is the number of shares held by all reporting institutions in the CDA Spectrum database at the end of the latest calendar quarter divided by the number of shares outstanding, volatility of returns in the standard deviation of the last 12 months' stock returns, company age is the number of years that elapsed since the stock became publicly traded until the observation month, Amihud illiquidity rank is the percentile rank (from 1 (most liquid) to 100 (least liquid)) of the Amihud illiquidity measure over the entire set of firms in the CRSP universe estimated over the latest calendar quarter, book-to-market ratio is the ratio of the company's book value of equity to its market capitalization and company size is the natural log of the company's market capitalization expressed in thousands of USD.

As expected, the quantity of both lendable and lent shares correlates negatively with the market concentration: a larger number of lenders and brokers is associated with an easier access to stock. The size of the lendable pool is strongly related to the stock's institutional ownership (correlation of 0.852). This is not surprising since most of the beneficial owners are institutional investors who adopt stock lending programs. Finally, there appears to be a relationship between the lending market and the stock market liquidity, as evidenced by the negative correlation between lendable fraction and Amihud illiquidity (-0.619) and the positive correlation between lendable fraction and company size (0.516). The lent fraction has similar, albeit weaker, correlations with illiquidity and size (-0.351 and 0.198, respectively), possibly because lending market liquidity is only one of the many factors that influence the actual short interest.

2.2 Measures of Recall Intensity

Our general goal is to determine how much of the stock in a given quarter was subject to recalls by brokers. It is impossible to measure such an effect directly (e.g., by considering the reduction in the number of shares on loan), since shares can be returned by short sellers for many reasons, most of them unrelated to actions of brokers or beneficial owners of the stock. We note, however, that when recalls do happen both the lendable and the lent quantity should be affected in a specific way. When shares are recalled, they exit both the lent and the lendable set. This pattern is based on the assumption that recalls are initiated by lenders and are carried out by brokers, so that when the shares are returned from loan, they are passed on to the original lender with little or no delay. Brokers generally do not recall shares unless they are subject to the pressure of a shrinking lending pool. In Appendix 1 we provide a description of the procedure and conditions for stock recalls as outlined in the Interactive Brokers client guide.

To capture recalls, we need to identify periods when the return of shares from loan was forced by the diminishing supply of lendable shares. In line with this logic, we set to construct a variable that measures how much of the reduction in the number of shares on loan was driven by the reduction in the number of shares in the lendable pool. We construct such a variable for each stock-quarter by calculating the R-square of the following regression run over daily observations:

reduction in shares on loan of stock i on day t = reduction in shares lendable of stock i on day t

This measure captures the percentage of variation in the lent (an equilibrium variable of the short selling market) that is explained by the lendable (a supply constraint). The added advantage of such a measure is that is constrained between 0 and 1 and is convenient to interpret. At times of active recalls, the reductions in loaned shares should co-move strongly with the reductions in lendable shares, resulting in a high R-square.

With such an identification, one should be concerned with alternative explanations that might result in a high R-square in the absence of recalls. Let us consider the two common types of endogeneity: reverse causality and omitted variable. Is it possible that when short sellers start to *voluntarily* close their positions and return shares (increasing the left-hand side variable), the lenders will begin withdrawing these shares from the market (increasing the right-hand side variable)? There is little economic reason to believe so. When shares are returned voluntarily, we should not observe a tight relationship between the reduction in lent and in lending (hence our R-square will be low), since lenders do not have a clear motive to immediately withdraw such shares from the pool. Rather, keeping these shares with the broker makes it easier to find a new borrower and avoid foregoing loan income.

This argument becomes even more apparent when we consider a common (and often unobservable) omitted variable - an information signal. Suppose that the market receives an optimistic signal about the company's valuation. In response to such a signal, short sellers rush to close their short positions and the number of shares on loan goes down (the stock return predictability of short interest has been widely documented). At the same time, the owners of the stock would want to increase their stakes in the firm rather than withdraw the lendable shares and sell them. In this scenario, the lendable pool is likely to increase, or at least stay constant, rather than diminish.

To compute recall intensity, we require reliable proxies for the reduction in the number of shares on loan and the number of shares lendable. In order to ensure the robustness of our results to different assumptions and data limitations, we consider several such proxies and calculate three measures of recall intensity. Below we discuss the relevant features of the dataset and then proceed with the description of the measure construction.

In addition to the key variables mentioned in the previous sub-section, Markit reports several variables that describe changes in the lendable pool and the loaned set. The following variables capture an expansion of the observable lendable pool and the set of shares on loan, respectively:

BO Inventory Quantity Add (*BO On Loan Quantity Add*) captures the quantity of inventory (shares on loan) for the Beneficial Owners existing in the database who did not hold stock in the previous period but now do (who did not lend the stock but now do).

BO Inventory Quantity New (*BO On Loan Quantity New*) captures the quantity of inventory brought to the market by the new Beneficial Owners entering the dataset (shares on loan lent out by the new Beneficial Owners).

BO Inventory Quantity Increase (*BO On Loan Quantity Increase*) captures the change in the quantity of inventory (shares on loan) for existing Beneficial Owners who have increased the quantity of inventory (shares on loan) from a previous non-zero position.

Similarly, the following variables capture reductions in the number of lendable (lent) shares:

BO Inventory Quantity Removed (*BO On Loan Quantity Removed*) captures the quantity of inventory (shares on loan) removed by Beneficial Owners exiting the dataset.

BO Inventory Quantity Decrease (*BO On Loan Quantity Decrease*) captures the change in the quantity of inventory (shares on loan) of existing Beneficial Owners who have decreased this quantity.

We use these data items to construct our first measure of recall intensity, called *recall1*. We compute the number of shares returned as the sum of shares removed from loan by beneficial owners and the decrease in the number of shares previously on loan (*BO On Loan Quantity Removed* + *BO On Loan Quantity Decrease*). Similarly, the number of shares withdrawn is the sum of shares removed from inventory and the decrease in the number of shares previously in inventory (*BO Inventory Quantity Removed* + *BO Inventory Quantity Decrease*). *Recall1* is then computed for each stock-quarter as the R-square of the regression above but only for those regressions that can be estimated over 10 or more valid observations.

For our second measure of recall intensity *recall2*, we consider *net* reductions in lend and lendable, rather than just the number of shares removed or decreased. In a frictionless lending market, any quantity removed or decreased will not be binding as long as there is enough inflow of new shares to compensate for those reductions. It is true that the lending market is not frictionless and that it is difficult for borrowers to switch brokers and for brokers to locate an alternative provider of stock. However, to account for possible mitigating effects of the newly arriving stock, we consider an alternative definition of the recall intensity. We compute the number of shares returned as the difference between the number of on-loan shares removed or decreased and the number of on-loan shares added or increased ([*BO On Loan Quantity Removed* + *BO On Loan Quantity Decrease*] - [*BO On Loan Quantity Add* + *BO On Loan Quantity New* + *BO On Loan Quantity Increase*]). The number of shares withdrawn is the difference between the number of inventory shares removed or decreased and the number of inventory shares added or increased ([*BO Inventory Quantity Removed* + *BO Inventory Quantity Decrease*] - [*BO Inventory Quantity Add* + *BO Inventory Quantity New* + *BO Inventory Quantity Increase*]). Both for the shares removed and withdrawn only positive values are used in the regression; if there are fewer than 10 valid observations in the stock-quarter, *recall2* is set to missing.

Unfortunately, the data on the change variables is less reliable than on the static variables, such as the quantity of shares currently on loan and lendable. For example, it is sometimes the case in the dataset that either lendable or lent goes down but there are no associated quantities decreased or removed reported. To account for possible data errors, we compute our final measure of recall intensity *recall3*. For this measure, the number of shares returned is -1 times the net change in the number of shares on loan (*ΔTotal Demand Quantity*), while the number of shares withdrawn is -1 times the net change in the number of shares in inventory (*ΔBO Inventory Quantity*). Both for the shares removed and withdrawn, only positive values are used in the regression. In other words, we use the absolute value of the net change in the number of shares on loan (shares lendable) if this change is negative and ignore the observation if this change is positive. If there are fewer than 10 valid observations in the stock-quarter, *recall3* is set to missing.

Table 2 reports summary statistics on the recall measures and their correlations with the stock characteristics. The mean values for the recall variables range from 10% to 15%. *Recall2* and *recall3* appear to capture similar effects (both are most accurate when there are few frictions in the market), as evidenced by their similar summary statistics and a high correlation (0.911). *Recall1* has uniformly lower values but is strongly positively correlated with the other two measures. It is interesting that correlations between recalls and stock characteristics are not high, even though larger companies and liquid stocks tend to experience recalls somewhat less frequently. This lack of definitive relationships is probably not surprising. While stock characteristics are stable in time, recall events happen irregularly and are likely driven by information sets, opinions and liquidity needs of lenders, all of which fluctuate through time. The low correlations also present some convenience for our empirical tests: the relationship between recalls and stock returns will be robust to the inclusion of various controls in the regression.

2.3 Changes in funds' positions during recalls

The analysis in this sub-section serves dual purpose. First, we establish the main motivating evidence of this study: that higher recalls are associated with more active selling of the stock by the holding funds. Second, we show that this relationship holds only if the recall measures are constructed from the correlations of *reductions* and *withdrawals* of shares (as the logic of the previous sub-section dictates) and does not hold if we consider placebo measures based on the correlations between *additions* to the lendable and lent sets.

One of the main reasons why stock owners recall shares is to sell them. To the extent that our recall measures are accurate, we should observe a negative relationship between recall intensity and changes in stock positions of the holding institutions. Our first test focuses on such changes and helps validate our measurement methodology as well as quantify the lender sell-out effect.

For each stock-quarter, we consider all the mutual funds from the CDA spectrum database that report a non-zero long position in the stock at the beginning of the quarter. For a given fund and stock, we define two measures of a change in position over the quarter based either on the number of shares held or the weight of the stock in the fund's equity portfolio:

$$\% \ change \ in \ shares = \frac{numshares_{ijT} - numshares_{ijT-1/2}}{numshares_{ijT-1/2}}$$

$$\% \ change \ in \ weight = \frac{weight_{ijT} - weight_{ijT\text{-}1/2}}{weight_{ijT\text{-}1/2}}$$

where i indexes stocks, j indexes funds and T indexes quarters. $numshares_{ijT\text{-}1/2}$ ($weight_{ijT\text{-}1/2}$) is defined as the average of $numshares_{ij}$ ($weight_{ij}$) at T and T-1.[8]

Next, we compute the simple or the weighted average of these change measures across all the funds that held the stock at the beginning of the quarter. In the calculation of the weighted average, the weight of each fund is proportional to the size of that fund's equity portfolio. These calculations result in four stock-level variables that capture an average fund's change in position in that stock over a given quarter. Finally we proceed to test the following regression specification run at quarterly frequency:

$$change \ in \ position_{iT} = \beta recall_{iT} + \mathbf{\Gamma} \times \mathbf{CONTROLS_{iT}} + \alpha_T + \varepsilon_{iT} \qquad (1)$$

where i indexes stocks, T indexes quarters and **CONTROLS** is a vector of control variables that includes size, book-to-market ratio, illiquidity, company age, stock return volatility, and institutional ownership (these stocks characteristics are defined as in Section 2). All the regressions include time fixed effects to account for market-wide flows in and out of the money management industry and estimate standard errors clustered at the stock level to allow for the serial correlation in the funds' trading preferences.

The results of this analysis are reported in Table 3, Panel A. In general, higher recall intensity is associated with a larger negative change in position of the holding funds. The results are statistically significant at the 1% level, except for the weighted average of the percentage change in shares, which is insignificant for *recall1* and *recall2*. The economic effects can be interpreted by comparing a coefficient on a recall measure to the respective unconditional mean of the change-in-position variable. For example, as *recall1* increases by 0.5, the average percentage change in weight decreases by 2.77%, or about 21% of its unconditional mean.

These results should be interpreted with caution. The evidence does not indicate that overall mutual fund ownership of the stock goes down during high recall periods but only that those funds that held the

[8] These measures are simply the standardized versions of the percentage change in either the number of shares held or the portfolio weight. By computing the change relative to the average between the old and the new value (rather than just the old value), we avoid extreme outlier observations resulting from small or zero old positions. The measures are also conveniently constrained and are easy to interpret: they are equal to 1 (-1) in all cases where the fund increased (decreased) its ownership of the stock from 0 (some positive position) to some positive position (0). Our results are identical if we consider raw percentage changes but winsorize them at the top and bottom 1% to eliminate outliers.

stock at the beginning of the quarter are likely to reduce their positions in this stock, possibly by selling it to other funds as well as individuals. Accordingly, this sub-section does not provide reliable evidence on the debate about trading sophistication or an information advantage of institutional and individual investors. However, the documented results are consistent with the argument that owners sell the recalled shares or, differently put, that recalls are informative about the direction and magnitude of the trades of the holding funds. We will investigate this argument further in the sections to follow.

In Panel B of Table 3 we run the same analysis as in Panel A but use a different set of independent variables. In particular, we consider three placebo measures which are defined analogously to the recall measures but are based on the increases rather than decreases in the number of shares lendable and lent. For example, we define *placebo2* as the R-square of the following regression

increase in shares on loan of stock i on day t = increase in shares lendable of stock i on day t

where the increase in the number of shares in the on-loan set is computed as ([*BO On Loan Quantity Add + BO On Loan Quantity New + BO On Loan Quantity Increase*] - ([*BO On Loan Quantity Removed + BO On Loan Quantity Decrease*]) and the increase in the number of shares in the lendable pool is computed as [*BO Inventory Quantity Add + BO Inventory Quantity New + BO Inventory Quantity Increase*] - [*BO Inventory Quantity Removed + BO Inventory Quantity Decrease*]). The regression is run across all the positive values of such increases, as opposed to the regression used in the construction of *recall2*, which was run across all the positive values of the *decreases*.

To the extent that our recall measures are driven by noise, unknown data issues, or general liquidity characteristics of a stock that are likely to affect reductions and additions of shares in the lending market equally, we should expect to observe a similar relationship between the placebo variables and the fund trading measures. However, the results in Panel B are markedly different from those in Panel A. *Placebo1* is strongly *positively* related to the changes in funds' positions in the stock whereas the coefficients on *placebo2* and *placebo3* are uniformly insignificant

2.4 Recalls around mutual fund distress

To further verify the validity of our measures, we consider an exogenous shock to lenders' liquidity which is unlikely to be related to stock fundamentals or to short sellers' information and demand. Specifically, we aim to relate quarterly outflows from mutual funds that hold a given stock to the recall intensity of that stock in the respective quarter. Funds facing outflows need to liquidate their positions and it is likely that some of the stocks that were previously loaned out by such distressed funds will be recalled. Of course, this effect is unlikely to be economically strong because funds can sell off some of the stocks which they didn't lend or they can withdraw available shares from the lending pool without forcing short sellers to buy back. However, to the extent that our measurement of recalls is correct, we should expect a consistent positive association between holding funds' distress and the recall intensity.

At the beginning of each quarter we consider all the funds that held a given stock. For each of such funds we compute the following variables in the quarter of interest (the data on fund cash flows is obtained from the Morningstar Direct while the equity TNA is computed as the sum of dollar values of all equity positions reported by the fund in CDA):

flow - the net cash flow into the fund over the quarter divided by the fund's equity Total Net Assets (TNA) at the beginning of the quarter (this variable is positive if inflows exceed outflows);

negflow - a dummy equal to 1 if *flow* is negative and 0 if *flow* is positive;

distress - a dummy equal to 1 if *flow* is below -5% and 0 if *flow* is above -5%.

Because our analysis is run over the stock sample, we aggregate these fund-level variables to the stock level by computing their weighted averages across all the holding funds. In this aggregation, the weights are proportional to the share position held by a given fund in the stock. For example, if a certain fund holds 90% of shares in the stock[9] and faces outflows of -6%, while the other funds' flows are zero, the stock-level *flow* variable will be computed as -6%*0.9 + 0%*0.1 = -5.4% and the stock-level *distress* variable will be computed as 1*0.9 + 0*0.1 = 0.9.

To relate fund flows to recall intensity we run the following regression

$$recall_{iT} = \beta(flow\ or\ distress\ variable)_{iT} + \mathbf{\Gamma \times CONTROLS_{iT}} + \alpha_T + \varepsilon_{iT} \quad (2)$$

In line with our main empirical design, we employ the same set of control variables (defined in Section 2), include time fixed effects, and cluster standard errors at the stock level.

The results of this estimation are reported in Table 4. First of all, we note that the relationship between the basic *flow* measure and the recalls is not significant. This is hardly surprising because most fund flows are positive, and as long as they remain positive, a reduction in flows should not cause a liquidity event which would necessitate recalls. However, coefficients on both *negflow* and *distress* are significant (at the 1% level in 5 out of 6 specifications). This evidence suggests that negative flows force funds to liquidate some of their positions, thus putting supply pressure on the previously loaned securities in the lending market. Because the range of variation of the main right-hand side variables is between 0

[9] Relative to the pool of shares held by all funds. The weights sum up to 1.

and 1, the interpretation of the economic effects is easy. If, hypothetically, all the holding funds experienced negative net flows in a particular quarter, the recall intensity for each stock held by such funds would increase by 0.91% - 1.85%. Despite the apparent low economic significance of these numbers, it is worth mentioning that this effect is the average across *all the stocks* held by funds with negative flows. In practice, this means that some stocks will experience severe recall pressure while others would not be affected at all.

The result in this subsection does not contribute evidence to our general information-based argument that stock is likely to be recalled before short sellers are able to cash out on their positions. Instead, it should only be interpreted as the validation of the constructed recall measures: when recalls are expected to occur (when lending funds need liquidity), our measures show that they are indeed more likely.

3. Recall Intensity and Stock Returns

In this section we examine the relationship between the recall intensity and future stock returns. If stock owners recall shares when they receive a reliable pessimistic signal about the firm's valuations, periods of high recall activity should be followed by lower stock returns. We investigate this relationship applying both the regression and the portfolio methodology. Regression analysis allows us to control for a variety of stock characteristics related to stock returns and evaluate the statistical significance of the effects. Portfolio analysis represents a replicable trading strategy and makes it convenient to interpret the economic magnitudes of abnormal returns.

For each stock-month observation in our sample, we identify the last calendar quarter that does not contain the observation month and calculate the recall measures and various control variables over or as of the end of that quarter. For example, *amihudillrank* is the percentile rank of the stock's Amihud illiquidity calculated from daily stock returns in that quarter and size is the natural log of the company's market capitalization (in thousands of dollars) on the last trading day of the quarter. Next, we estimate the following regression specification:

$$return_{it} = \beta recall_{iT-1} + \Gamma \times \mathbf{CONTROLS_{iT-1}} + \alpha_{T-1} + \varepsilon_{it} \qquad (3)$$

where i indexes stocks, t (T) indexes months (quarters) and **CONTROLS** is a vector of control variables described in the previous section. All the regressions include time fixed effects to account for market fluctuations and estimate standard errors clustered at the stock level to allow for the uncontrolled-for component of the return persistence. In addition to the main dependent variable – stock return in month t – we also consider returns in month t+1 and month t+2.

The results of this analysis are reported in Table 5. We observe a robust and significant negative relationship between the recall intensity and future stock returns across all the measures. The results are stronger for *recall2* and *recall3*, where most of the coefficients are significant at the 1% level. The returns are monthly and are expressed in percentage points. To interpret the coefficients, consider two stocks for which the second recall measure differs by 0.5 (half the possible range). Their monthly return following the measurement quarter will differ by -0.27% (= -0.5359*0.5) or -3.19% on an annualized basis.

It is possible that the relationship between recalls and stock returns is non-linear. Moreover, some of the return predictability can be explained by the exposure of stocks to factors. To account for these effects, we complement our regressions with the portfolio analysis. At the end of each quarter, we sort stocks into five equally weighted portfolios ordered from the lowest recall intensity portfolio (1) to the highest (5). In addition, we consider the portfolio long in the top quintile and short in the bottom quintile. Each of the portfolios is held for 3, 6 or 12 months and then rebalanced. The monthly excess returns from such trading strategies are regressed on the four factors (MKT, SMB, HML and the Carhart momentum factor) and the intercept (alpha) is retained.

Table 6 reports these 4-factor alphas and their t-statistics for each portfolio and each holding horizon. The bottom row shows the average number of stocks featuring in the long-short portfolio over the entire history of observations. The results indicate that the long-short portfolio delivers consistent negative returns which are robustly significant for all three measures at the three-month horizon and are borderline significant for the longer horizons. The economic magnitudes are also sizable. For *recall1*, the short-horizon monthly alpha is -0.3092% (or -3.65% on an annualized basis), while for *recall2* and *recall3* the alphas are -0.2705% and -0.2838%, respectively (-3.20% and -3.35% on an annualized basis).

Two other patterns emerge upon the inspection of the results. First, the effect is stronger over shorter holding horizons (by a factor of 1.5 for *recall1* and a factor of 2 for *recall2* and *recall3*). This result is consistent with the idea that reliable information signals are mostly short-lived and require quick execution of the trade to ensure highest profits. Therefore, institutions holding stocks that are about to decline are likely to initiate quick recalls in order to sell these investments in a timely manner. Our approach does not allow us to explore daily horizons, since we can only measure the average recall pressure over the entire quarter. However, we observe that the effect is still present in the three months after the high-recall quarter, suggesting that it might be even stronger in shorter periods. Second, the long-short alphas are largely driven by the highest recall portfolio 5. The difference in alphas between portfolio 4 and portfolio 5 is greater than that between any other two adjacent portfolios. Moreover, the alpha of portfolio 5 is negative itself while those of the other portfolios are all positive. This result indicates that the effect of recalls on stock returns (or, better put, the degree of stock return predictability that can be inferred from observing recalls) is largely concentrated in the highest recall quintile.

Overall, the analysis in this section reveals a negative relationship between recall intensity and future stock returns. A plausible interpretation of this result is that holding institutions recall shares in order to sell them when they receive a negative valuation signal. The next section investigates this effect in greater detail.

4. Holding Funds' Characteristics and Event-Time Analysis

4.1 Relationship to fund characteristics

In this sub-section, we examine the relationship between recalls and the characteristics of the mutual funds with long positions in the stock. We acknowledge that not all the holding funds adopt lending programs and contribute stock to the lendable pool. As a result, the estimates in our tests are likely to understate the true effects of fund characteristics on the recall intensity.

For this analysis, we adopt the following general methodology. First, for each fund-quarter we obtain a fund characteristic from the Morningstar Direct database or compute a characteristic using the data from Morningstar or the CRSP Mutual Fund Dataset. We are generally interested in variables that proxy for a fund's access to information, investment success and trading activism. In line with these objectives, we define the following variables:

fundsize is the natural log of the fund's total net assets in thousands of USD at the end of the quarter;

numholdings is the number of equity holdings in the fund's portfolio;

portconc is the Herfindahl concentration index of equity holdings in the fund's portfolio;

turnover is the latest annual turnover of the fund's portfolio reported in Morningstar;

abngrossret is the average (over the last 3 years) difference between the fund's quarterly gross return and the return predicted by the four-factor model estimated over the entire history of the fund's return observations (one can think about this variable as a measure of the fund's past investment success);

RPIshares (*RPIweight*) is the Kasperczyk and Seru (2007) measure of a fund's reliance on public information estimated as the R-square of the regression of the fund's change in holdings, as proxied by the percentage change in shares (portfolio weight), on the lagged changes in the mean analyst recommendation. Both variables are only defined for fund-quarters with at least 10 non-missing observations (for which both the change-in-holding variable and the lagged changes in the mean recommendation can be computed).

Because we conduct our analysis at the stock level, we aggregate these fund characteristics to the stock level by computing the weighted averages of these variables across all the funds holding the stock at the beginning of the observation quarter. In this aggregation, the weights are proportional to the number of shares of the stock held by a respective fund: if a fund has a large position in the stock, its characteristics will affect the lending market of that stock more prominently.

Table 7 shows some summary statistics on the stock-level measures obtained from the respective fund characteristics. In Panel A the weighted average is computed across the actual values of these characteristics while in Panel B it is computed over their decile ranks (from 1 to 10) to ease the comparison. Not surprisingly, larger funds (with higher TNA and more holdings) weigh more strongly in the aggregation (mean decile of 8.17 and 8.01, respectively). Most funds hold diversified portfolios (average portfolio concentration decile is 3.19) and do not follow public analysts too closely (average RPI decile is 3.63-3.65).

Next, we proceed to test how the predictability of the recall intensity, as captured by the alphas of the long-short portfolios constructed in Section 3, varies with the holding fund characteristics. In other words, does the informativeness of recalls depend on the type of lenders and how?

In each quarter, we pre-sort stocks into two bins (low (below the median) and high (above the median)) by a given characteristic of the mutual funds holding the stock. Within each bin, we further sort stocks into five equally weighted portfolios arranged from the lowest recall intensity portfolio (1) to the highest (5) and consider the portfolio long in the top quintile and short in the bottom quintile. The results of this analysis are reported in Table 8.

First, we observe strong evidence that recalls are more informative if the holding funds have better past performance and rely less on public information. The differences in long-short alphas between the low and the high bins are economically sizable and are consistent across the horizons and the measures of recall intensity. For example, the annualized 4-factor alpha of the portfolio long in the top and short in the bottom quintile of recall intensity which is held for six months after the formation is a significant 4.06%in the high fund-performance bin (insignificant 0.96% in the low fund-performance bin) and is a significant 4.25% in the low fund-RPI bin (insignificant 1.45% in the high fund-RPI bin).[10]

The patterns for the other fund characteristics are somewhat less evident. Fund size does not have a significant effect on recall informativeness while lower concentration and higher turnover makes timely recalls more likely.

Overall, the results in this section are consistent with the argument that funds tend to initiate recalls for information reasons and then sell the recalled shares to avoid investment losses. This evidence

[10] These numbers are computed from the monthly alphas reported in Table 8 for measure *recall1* as follows: $(1+0.3323\%)^{12} - 1 = 4.06\%$; $(1+0.0797\%)^{12} - 1 = 0.96\%$; $(1+0.3477\%)^{12} - 1 = 4.25\%$; $(1+0.1204\%)^{12} - 1 = 1.45\%$

complements the conclusions from the earlier section that recall events are predictive of negative future stock returns.

4.2 The effect of recalls on short selling profits around earnings announcements

The effect of information (or, more precisely, information signals of different market participants), is the backbone of this study's main argument. In this subsection we advance our evidence by focusing on salient information events - earnings announcements.

There are several advantages of using earnings announcements to study the effects of recalls on short selling:

- the timing of an earnings announcement is known in advance, so that both the traders and the econometrician know when the information is (will be) revealed;

- there are generally no confounding issues related to firm management and governance (e.g., unlike around merger announcements when shares can be recalled to influence the outcome of a corporate decision);

- the stock return around an earnings announcement can be used to proxy for the magnitude of an investment opportunity (albeit, this is the investment opportunity for a perfectly informed investor, aka the "first-best profits").

In this sub-section we seek to compare different versions of the short selling profits for different ex post outcomes of the earnings announcement event.[11] Specifically, we want to provide answers to the following questions:

- how much can a short seller earn during an information event in the absence of any frictions (no fees and no recalls)?

- how much can a short seller earn when his profits are adjusted for the lending fees but not for recalls?

- how much can a short seller earn "in reality" (when his profits are affected by both the lending fees and the recalls)?

To answer these questions we proceed as follows. First, in each month we consider all stocks that are expected to announce earnings the following month. We sort these stocks into five bins by the size of

[11] The analysis conducted here is different from the portfolio tests elsewhere in the paper. In this sub-section, "trading strategies" condition on information that is not publically known at the time when the positions are initiated. Hence we refer to them as pseudo-strategies or pseudo-portfolios.

their future earnings announcement return, defined as the three-day cumulative return after the earnings announcement in excess of the CRSP value-weighted index. Next, for each bin we consider the following three pseudo trading strategies.

1) For our first strategy, we short sell all the stocks in the bin assigning equal weight to each stock. The profits earned by each stock on day *t* is equal to the return on that stock during (0, *t*) taken with the opposite sign plus the daily risk-free rate. The risk-free rate component reflects the investment of the cash received from selling the stock in the risk-free asset. The proxy for the risk-free rate is based on the daily dataset from the Kenneth French's website.

2) Our second strategy is a variant of the first strategy in which we deduct the daily lending fee from the risk-free rate. Because the risk-free rate is generally low in our sample period, this correction often results in a negative rebate.

3) To build our third strategy, we modify the second strategy as follows. On each day *t* for each stock we compute a proxy for the recall pressure as

$$-1 * \min\,[(\Delta \text{ shares on loan})_t\,,\, (\Delta \text{ shares lendable})_t\,]\,/\,(\text{shares on loan})_{t-1}$$

where only negative values of the change variables are considered (the recall pressure is set to 0 if either of these changes is not negative).

The recall pressure proxies for the portion of the position that must be closed on day *t*. We therefore adjust the short position in the stock as follows

$$(\text{position in the stock})_t = (\text{position in the stock})_{t-1} * (1 - \text{recall pressure})_t$$

In other words, the recalled portion of the stock is dropped from the portfolio and the cash associated with its original sale can no longer earn the risk-free rate. We never reduce the position to below zero: if the position in the stock has been depleted by day *t*, we apply no further reduction.

Next, we compute the cumulative returns for each of the three strategies at different holding horizons ranging from day 0 to day 90 and display the average and the median values of these cumulative returns (taken across event months) in Figure 1. Figure 1A displays returns to the strategies inside the lowest bin, which comprises stocks with the lowest (most negative) earnings announcement returns. For comparison, Figure 1B displays returns to the strategies inside the middle bin, which is largely populated by stocks with slightly positive (but close to zero) earnings announcement returns.

The results of this analysis can be summarized as follows. By the end of the earnings announcement month, when all the events are over, the first-best strategy that shorts stocks from the bottom quintile delivers an average (median) return of 8.91% (6.47%). The strategy adjusting for lending fees delivers an average (median) return of 8.65% (6.22%) and the one that is affected by recalls earns an average (median) return of 6.98% (5.21%). The average recall-driven decline in profits relative to the first best can thus be estimated as (8.91 - 6.98) / 8.91 = 21.7%. In contrast, the returns on all three strategies are almost identical in the middle quintile, where no investment opportunities for short selling are available.

Two important qualifications are in order.

The analysis in this sub-section is valid for a *perfectly informed* short seller in the following sense: the short seller can reliably identify the bottom quintile of stocks that will perform most poorly during the upcoming earnings announcement (but he need not be able to know their actual event-time returns or even their ranking within the quintile). A real short seller's information signal i) is unlikely to be perfect and ii) can plausibly correlate with the future signal received by the lenders. These considerations imply that the recalls will have a bigger impact on the real short seller's profits than on the perfectly informed short seller's profits estimated here. Indeed, if short sellers mostly invest in stocks for which lenders will also soon start receiving pessimistic signals, recalls will do more damage to the short sellers' profitability.

The measurement methodology proposed in this study can only capture recalls initiated by lenders. However, brokers can sometimes recall shares from one client group in order to make them available for another client group. Such intra-broker recalls would further reduce profits of a short seller with an early information advantage.

5. Robustness tests

5.1 Alternative definitions of recall intensity

What if the impact of a recall on short interest is not immediate? In other words, what if there is a continued effect of the diminishing lendable pool on the loaned share quantity that lasts more than a day? To account for such a possibility, we re-estimate our recall measures as the R-squares from the regressions that include two lagged values of the *reduction in shares lendable*. Specifically, the right-hand side of each regression contains the number of shares withdrawn from the lending pool on day *t*, the number of shares withdrawn on the day of the last non-missing observation before day *t* and the number of shares withdrawn on the day of the second-to-last non-missing observation before day *t*.

We denote the resulting recall intensity measures *recall4*, *recall5* and *recall6*. Table 9 shows the output of our main analysis for these alternative measures. Both in the regression (Panel A) and the portfolio (Panel B) analysis we continue to observe a consistent negative relationship between recalls and future stock returns. The regression coefficients and the portfolio long-short returns for *recall4* fall short of statistical significance, likely to data availability problems in estimating this measure with lagged values of the reduction in lendable. However, the results for the other two measures become stronger after the inclusion of the lags in the estimation procedure.

5.2 Eliminating time periods around the financial crisis

In our next robustness check we re-estimate our main tests outside the time period around the global financial crisis of 2008. In particular, we eliminate four quarters from the second half of 2008 and the first half of 2009. It is unclear ex ante how the financial crisis should affect the recall intensity and its correlation with subsequent stock performance. After all, our measurements and tests are designed to be sensitive to stock-specific information as opposed to economy-wide liquidity events and market crashes. Yet, it is possible that short sellers' positions established in anticipation of severe declines in stock valuations were followed by extensive recalls, as lending funds realized imminent losses and struggled for liquidity. It is also possible that in the immediate aftermath of the crisis, regulatory short sale constraints and institutional reluctance to lend shares impeded short selling, thus reducing both the original short sale bets and their subsequent recalls.

Table 10 reports the results of the analysis conducted outside of the financial crisis period. The regressions (in Panel A) continue to show a strong negative relationship between stocks recalls and future returns. Only two specifications lose statistical significance relative to the baseline results in Table 5, while the economic significance of the coefficients diminishes by only about 20% across all specifications. The results in the portfolio analysis (in Panel B) are less unequivocal. The long-short portfolios continue to show consistent negative alphas comparable to those from Table 5, Panel B. However, in about half of the specifications these alphas are borderline insignificant. In interpreting these results, we must acknowledge that the portfolio analysis run over a short sample period is a very conservative test, since a small number of observations often depresses statistical significance even in the presence of sizable economic effects. The loss of 12 months from the estimation period is likely responsible for the patchy pattern of statistical significance in the bottom row of Table 10, Panel B.

6. Conclusion

In this paper we propose a methodology for measuring the intensity of share recalls in a given stock and time period and validate its accuracy. We relate recall intensity to future stock performance and document a strong negative relationship: greater recall intensity is associated with more negative future returns. At the same time, we observe a positive relationship between recalls and sales of the stock by mutual funds. In addition, more expertly run funds with better past performance and an access to non-public information time their recalls more accurately. This collective evidence indicates that lenders who receive private information signals about weakening firm fundamentals respond by recalling the respective stock and divesting it from their portfolios, effectively front-running the short sellers. Such activity undermines the profitability of short selling strategies. In particular, an informed short seller, facing a clear investment opportunity before a negative earnings announcement, would lose about one-fifth of his profits to upcoming recalls.

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Table 1. Sample summary statistics

This table reports key summary statistics on the lending market characteristics and the correlation of the lending market and stock characteristics at monthly frequency. For each stock, fraction of shares lendable (fraction of shares on loan) is calculated as the ratio of the number of shares in the lending pool (number of shares on loan) and the number of shares outstanding at the end of the month. Utilization ratio is defined as the ratio of the number of shares on loan to the number of shares lendable. Availability ratio is defined as the number of hares lendable less the number of shares on loan divided by the number of shares outstanding. Concentration across beneficial owners (brokers) is defined as the Herfindahl concentration measure computed over the number of lendable shares provided by all beneficial owners (brokers). Fee is the weighted average lending fee of all the outstanding share loans on Markit at the end of the month (equal to the difference between the risk-free rate and the weighted average rebate rate). The stock characteristics are computed as follows: institutional ownership is the number of shares held by all reporting institutions at the end of the previous calendar quarter relative to the number of shares outstanding, volatility of returns in the standard deviation of the last 12 months' stock returns, company age is the number of years that elapsed since the stock became publicly traded until the observation month, Amihud illiquidity rank is the percentile rank (from 1 (most liquid) to 100 (least liquid)) of the Amihud illiquidity measure over the entire set of firms in the CRSP universe in the previous quarter, book-to-market ratio is the ratio of the company's book value of equity to its market capitalization at the end of the month and company size is the natural log of the company's end-of-month market capitalization expressed in 000 of USD.

Panel A. Lending market characteristics

	mean	10p	25p	median	75p	90p
Fraction of shares lendable	17.35%	0.61%	5.64%	18.41%	27.95%	34.24%
Fraction of shares on loan	3.81%	0.02%	0.23%	1.61%	4.57%	9.68%
Utilization ratio	23.76%	0.82%	4.46%	13.38%	33.02%	63.24%
Availability ratio	13.60%	0.27%	3.94%	13.66%	23.22%	29.60%
Concentration (B. O.)	27.45%	12.03%	14.07%	18.03%	30.10%	61.88%
Concentration (brokers)	36.10%	12.81%	16.49%	24.78%	47.01%	92.21%
Fee	1.62%	0.25%	0.38%	0.39%	0.50%	3.50%

Panel B. Correlation of lending market and stock characteristics

	Fraction of shares lendable	Fraction of shares on loan	Conc. (B. O.)	Conc. (brokers)	Fee	Institutional ownership	Volatility of returns	Company age (years)	Amihud illiquidity rank	Book-to-market ratio	Company size
Fraction of shares lendable	1.000	0.494	-0.550	-0.602	-0.364	0.852	0.006	0.213	-0.619	-0.063	0.516
Fraction of shares on loan	0.494	1.000	-0.300	-0.405	0.011	0.459	0.042	-0.034	-0.351	-0.050	0.198
Concentration (beneficial owners)	-0.550	-0.300	1.000	0.523	0.260	-0.553	-0.014	-0.133	0.510	0.098	-0.474
Concentration (brokers)	-0.602	-0.405	0.523	1.000	0.246	-0.582	-0.045	-0.097	0.512	0.102	-0.485
Fee	-0.364	0.011	0.260	0.246	1.000	-0.372	0.021	-0.142	0.214	0.012	-0.245
Institutional ownership	0.852	0.459	-0.553	-0.582	-0.372	1.000	0.004	0.130	-0.674	-0.082	0.578
Volatility of returns	0.006	0.042	-0.014	-0.045	0.021	0.004	1.000	-0.051	0.041	0.012	-0.063
Company age (years)	0.213	-0.034	-0.133	-0.097	-0.142	0.130	-0.051	1.000	-0.271	-0.019	0.318
Amihud illiquidity rank	-0.619	-0.351	0.510	0.512	0.214	-0.674	0.041	-0.271	1.000	0.134	-0.917
Book-to-market ratio	-0.063	-0.050	0.098	0.102	0.012	-0.082	0.012	-0.019	0.134	1.000	-0.162
Company size	0.516	0.198	-0.474	-0.485	-0.245	0.578	-0.063	0.318	-0.917	-0.162	1.000

Table 2. Recall intensity measures

This table shows summary statistics on the recall intensity measures and the correlations of these measures with the stock characteristics. The stock characteristics are defined as in Table 1. For each stock-quarter, a recall intensity measure is constructed as the R-square of the regression of the number of shares returned from loan on that day on the number of shares withdrawn from the lending pool on that day. At least 10 daily non-missing observations are required to compute the R-square. Different measures are based on different proxies for the number of shares returned and withdrawn.

For *recall1*, the number of shares returned is the sum of shares removed from loan by beneficial owners and the decrease in the number of shares previously on loan (BOOnLoanQuantityRemoved + BOOnLoanQuantityDecrease), while the number of shares withdrawn is the sum of shares removed from inventory and the decrease in the number of shares previously in inventory (BOInvQuantityRemoved + BOInvQuantityDecrease).

For *recall2*, the number of shares returned is the difference between the number of on-loan shares removed or decreased and the number of on-loan shares added or increased ([BOOnLoanQuantityRemoved + BOOnLoanQuantityDecrease] - [BOOnLoanQuantityAdd + BOOnLoanQuantityNew + BOOnLoanQuantityIncrease]), while he number of shares withdrawn is the difference between the number of inventory shares removed or decreased and the number of inventory shares added or increased ([BOInvQuantityRemoved + BOInvQuantityDecrease] - [BOInvQuantityAdd + BOInvQuantityNew + BOInvQuantityIncrease]). Both for the shares removed and withdrawn, only positive values are used in the regression.

For *recall3*, the number of shares returned is -1 times the net change in the number of shares on loan, while the number of shares withdrawn is -1 times the net change in the number of shares in inventory. Both for the shares removed and withdrawn, only positive values are used in the regression.

Panel A. Summary statistics

	mean	10p	25p	median	75p	90p
recall1	0.103	0.000	0.002	0.015	0.096	0.364
recall2	0.156	0.001	0.010	0.045	0.182	0.555
recall3	0.145	0.001	0.010	0.044	0.169	0.489

Panel B. Correlation with stock market characteristics

	recall1	*recall2*	*recall3*	Institutional ownership	Volatility of returns	Company age (years)	Amihud illiquidity rank	Book-to-market ratio	Company size
recall1	1.000	0.726	0.629	0.018	0.007	-0.070	-0.053	-0.025	0.005
recall2	0.726	1.000	0.911	-0.058	0.000	-0.074	0.038	-0.032	-0.061
recall3	0.629	0.911	1.000	-0.080	0.017	-0.074	0.056	-0.024	-0.075
Institutional ownership	0.018	-0.058	-0.080	1.000	-0.065	0.141	-0.655	-0.089	0.580
Volatility of returns	0.007	0.000	0.017	-0.065	1.000	-0.173	0.214	0.046	-0.281
Company age (years)	-0.070	-0.074	-0.074	0.141	-0.173	1.000	-0.273	-0.019	0.317
Amihud illiquidity rank	-0.053	0.038	0.056	-0.655	0.214	-0.273	1.000	0.139	-0.908
Book-to-market ratio	-0.025	-0.032	-0.024	-0.089	0.046	-0.019	0.139	1.000	-0.162
Company size	0.005	-0.061	-0.075	0.580	-0.281	0.317	-0.908	-0.162	1.000

Table 3. Changes in stock positions of holding institutions around recalls

Panel A of this table shows the relationship between changes in positions by funds holding the stock and the recall intensity in a given quarter. The recall intensity measures are defined as in Table 2. The change-in-position variables in the first four columns of each pane are constructed as follows. First, for every fund-quarter-stock, we compute a change-in-position measure that is fund- and stock- specific. Then, we compute the simple or the weighted average of this measure across all the funds that held the stock at the beginning of the quarter (in the weighted average, the weights that are proportional to a fund portfolio size). The underlying fund-stock-specific change measures are based either on the percentage change in the number of shares held or the weight of the stock in the fund portfolio. Both of these are normalized to lie between -1 (for complete sells) and 1 (for new buys). Panel B shows the same analysis for placebo measures that are defined analogously to the actual recall measures but are based on the number of shares added to the lent and lendable sets (as opposed to the shares returned and withdrawn). Control variables are measured at the beginning of the quarter and are defined as in Table 1. T-statistics are based on standard errors clustered at the stock level and are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

Panel A. Actual recall measures

	Dependent variable			
Indep. variables	*avg % change in shares*	*avg % change in weight*	*wavg % change in shares*	*wavg % change in weight*
recall1	-0.0309*** (-6.82)	-0.0553*** (-11.95)	-0.0078 (-1.64)	-0.0330*** (-7.01)
size	0.0299*** (22.13)	0.0278*** (22.23)	0.0200*** (14.03)	0.0192*** (14.65)
BtoM	-0.0001 (-0.05)	-0.0027** (-2.38)	-0.0004 (-0.25)	-0.0046*** (-3.34)
amihudill rank	0.0029*** (30.75)	0.0026*** (29.54)	0.0017*** (16.95)	0.0016*** (17.09)
volatility	-0.0013*** (-7.44)	-0.0009*** (-6.84)	-0.0008*** (-5.64)	-0.0003*** (-2.90)
ageyears	0.0002*** (4.88)	0.0003*** (6.98)	-0.0002*** (-4.53)	-0.0001** (-2.13)
inst. own.	0.0005 (0.12)	0.0104** (2.51)	0.0054 (1.30)	0.0119*** (2.72)
Time F.E.	YES	YES	YES	YES
Num. obs.	84,197	83,306	84,197	83,306
Adj R-sq	0.0909	0.0756	0.0281	0.0332

	Dependent variable			
Indep. variables	*avg % change in shares*	*avg % change in weight*	*wavg % change in shares*	*wavg % change in weight*
recall2	-0.0114*** (-3.64)	-0.0157*** (-4.76)	-0.0023 (-0.68)	-0.0067** (-1.98)
size	0.0271*** (21.13)	0.0303*** (22.51)	0.0121*** (9.62)	0.0178*** (13.22)
BtoM	-0.0024* (-1.67)	-0.0031** (-2.22)	-0.0028* (-1.65)	-0.0048*** (-2.83)
amihudill rank	0.0028*** (30.99)	0.0028*** (28.46)	0.0015*** (15.43)	0.0016*** (15.98)
volatility	-0.0013*** (-6.34)	-0.0010*** (-6.02)	-0.0007*** (-5.57)	-0.0003*** (-2.66)
ageyears	0.0003*** (5.77)	0.0003*** (6.30)	-0.0001** (-1.96)	0.0000 (-0.96)
inst. own.	0.0031 (0.77)	0.0216*** (4.83)	-0.0050 (-1.18)	0.0138*** (2.89)
Time F.E.	YES	YES	YES	YES
Num. obs.	69,094	68,628	69,094	68,628
Adj R-sq	0.0995	0.0712	0.0395	0.0328

	Dependent variable			
Indep. variables	*avg % change in shares*	*avg % change in weight*	*wavg % change in shares*	*wavg % change in weight*
recall3	-0.0180*** (-6.13)	-0.0207*** (-6.47)	-0.0087*** (-2.72)	-0.0104*** (-3.14)
size	0.0269*** (21.14)	0.0303*** (22.65)	0.0118*** (9.41)	0.0178*** (13.19)
BtoM	-0.0024* (-1.65)	-0.0031** (-2.21)	-0.0028 (-1.64)	-0.0048*** (-2.81)
amihudill rank	0.0028*** (31.10)	0.0028*** (28.67)	0.0014*** (15.34)	0.0016*** (16.03)
volatility	-0.0013*** (-6.34)	-0.0010*** (-5.99)	-0.0007*** (-5.58)	-0.0003*** (-2.69)
ageyears	0.0003*** (5.85)	0.0003*** (6.35)	-0.0001* (-1.78)	0.0000 (-0.79)
inst. own.	0.0028 (0.70)	0.0218*** (4.88)	-0.0061 (-1.45)	0.0133*** (2.78)
Time F.E.	YES	YES	YES	YES
Num. obs.	68,887	68,427	68,887	68,427
Adj R-sq	0.1002	0.0718	0.0403	0.0333

Panel B. Placebo measures

Indep. variables	Dependent variable: *avg % change in shares*	*avg % change in weight*	*wavg % change in shares*	*wavg % change in weight*
placebo1	0.0237*** (5.89)	0.0166*** (3.98)	0.0249*** (5.50)	0.0167*** (3.64)
size	0.0305*** (22.88)	0.0294*** (23.36)	0.0198*** (14.30)	0.0202*** (15.38)
BtoM	-0.0001 (-0.06)	-0.0025** (-2.22)	-0.0004 (-0.27)	-0.0044*** (-3.26)
amihudill rank	0.0029*** (32.19)	0.0028*** (31.34)	0.0017*** (17.62)	0.0017*** (18.28)
volatility	-0.0013*** (-7.49)	-0.0009*** (-7.08)	-0.0008*** (-5.65)	-0.0004*** (-3.16)
ageyears	0.0003*** (5.71)	0.0004*** (7.74)	-0.0002*** (-3.90)	-0.0001 (-1.51)
inst. own.	-0.0001 (-0.03)	0.0106*** (2.58)	0.0043 (1.05)	0.0117*** (2.70)
Time F.E.	YES	YES	YES	YES
Num. obs.	84,234	83,357	84,234	83,357
Adj R-sq	0.0915	0.0732	0.0287	0.0324

Indep. variables	Dependent variable: *avg % change in shares*	*avg % change in weight*	*wavg % change in shares*	*wavg % change in weight*
placebo2	0.0015 (0.65)	0.0002 (0.09)	0.0029 (1.12)	0.0024 (0.77)
size	0.0234*** (21.53)	0.0288*** (22.87)	0.0077*** (7.16)	0.0157*** (12.35)
BtoM	-0.0027* (-1.73)	-0.0025 (-1.57)	-0.0027 (-1.49)	-0.0034** (-1.98)
amihudill rank	0.0028*** (34.71)	0.0030*** (32.51)	0.0013*** (15.98)	0.0018*** (18.23)
volatility	-0.0009*** (-5.76)	-0.0007*** (-5.20)	-0.0002*** (-2.59)	0.0000 (0.16)
ageyears	0.0002*** (6.32)	0.0003*** (6.39)	-0.0001*** (-2.79)	-0.0001 (-1.30)
inst. own.	-0.0049 (-1.39)	0.0087** (2.08)	-0.0169*** (-4.71)	-0.0039 (-0.88)
Time F.E.	YES	YES	YES	YES
Num. obs.	66,600	66,417	66,600	66,417
Adj R-sq	0.1390	0.0824	0.0638	0.0400

Indep. variables	Dependent variable: *avg % change in shares*	*avg % change in weight*	*wavg % change in shares*	*wavg % change in weight*
placebo3	-0.0002 (-0.11)	-0.0003 (-0.11)	0.0009 (0.37)	0.0018 (0.57)
size	0.0235*** (21.77)	0.0287*** (22.99)	0.0077*** (7.27)	0.0156*** (12.41)
BtoM	-0.0033** (-2.44)	-0.0027* (-1.76)	-0.0033** (-2.17)	-0.0035** (-2.10)
amihudill rank	0.0028*** (34.85)	0.0030*** (32.62)	0.0013*** (16.18)	0.0018*** (18.39)
volatility	-0.0009*** (-5.72)	-0.0007*** (-5.12)	-0.0002** (-2.20)	0.0000 (0.32)
ageyears	0.0002*** (6.42)	0.0003*** (6.54)	-0.0001*** (-2.68)	0.0000 (-1.15)
inst. own.	-0.0053 (-1.53)	0.0082* (1.95)	-0.0175*** (-4.90)	-0.0045 (-1.02)
Time F.E.	YES	YES	YES	YES
Num. obs.	66,496	66,315	66,496	66,315
Adj R-sq	0.1396	0.0821	0.0654	0.0404

Table 4. Recall intensity and mutual fund distress

This table shows the relationship between measures of mutual funds' distress and the recall intensity. For each stock-quarter, we consider all mutual funds that held a non-zero position in the stock at the beginning of the quarter. For each fund, we calculate three variables that proxy for the outflow activity in that fund over the quarter (data is provided by Morningstar):

flow is defined as the net cash flow into the fund over the quarter divided by the fund's equity TNA at the beginning of the quarter
negflow is defined as 1 if *flow* is negative and 0 if *flow* is positive
distress is defined as 1 if *flow* is less than -5% and 0 if *flow* is higher than -5%

For each of these variables, we calculate its stock-level analogue by computing the weighted-average value of the variable across all the funds that held the stock. In this aggregation, the weights are proportional to the number of shares of the stock held by a respective fund. Control variables are measured at the beginning of the quarter and are defined as in Table 1. T-statistics are based on standard errors clustered at the stock level and are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

	Dependent variable		
Independent variables	*recall1*	*recall2*	*recall3*
flow	0.0000 (0.15)	-0.0002 (-1.42)	-0.0001 (-1.34)
size	-0.0302*** (-23.44)	-0.0212*** (-13.79)	-0.0186*** (-12.33)
BtoM	-0.0046*** (-4.44)	-0.0035*** (-3.36)	-0.0034*** (-3.20)
amihudill rank	-0.0024*** (-25.66)	-0.0012*** (-10.49)	-0.0011*** (-9.22)
volatility	0.0006*** (4.69)	0.0005*** (3.13)	0.0005*** (3.27)
ageyears	-0.0004*** (-7.59)	-0.0003*** (-5.49)	-0.0003*** (-5.21)
inst. own.	-0.0231*** (-5.44)	-0.0333*** (-6.38)	-0.0363*** (-7.02)
Time F.E.	YES	YES	YES
Num. obs.	66,978	59,863	59,784
Adj R-sq	0.3318	0.2788	0.1306

	Dependent variable		
Independent variables	*recall1*	*recall2*	*recall3*
negflow	0.0185*** (8.04)	0.0121*** (4.16)	0.0091*** (3.17)
size	-0.0299*** (-23.27)	-0.0210*** (-13.68)	-0.0185*** (-12.25)
BtoM	-0.0047*** (-4.55)	-0.0036*** (-3.43)	-0.0034*** (-3.25)
amihudill rank	-0.0023*** (-25.42)	-0.0012*** (-10.35)	-0.0010*** (-9.12)
volatility	0.0006*** (4.69)	0.0005*** (3.13)	0.0005*** (3.27)
ageyears	-0.0004*** (-7.44)	-0.0003*** (-5.44)	-0.0003*** (-5.17)
inst. own.	-0.0242*** (-5.69)	-0.0335*** (-6.44)	-0.0365*** (-7.06)
Time F.E.	YES	YES	YES
Num. obs.	66,978	59,863	59,784
Adj R-sq	0.3329	0.2790	0.1308

	Dependent variable		
Independent variables	*recall1*	*recall2*	*recall3*
distress	0.0193*** (7.01)	0.0090*** (2.62)	0.0067* (1.92)
size	-0.0298*** (-23.26)	-0.0211*** (-13.73)	-0.0185*** (-12.30)
BtoM	-0.0045*** (-4.36)	-0.0035*** (-3.31)	-0.0033*** (-3.16)
amihudill rank	-0.0023*** (-25.48)	-0.0012*** (-10.45)	-0.0010*** (-9.20)
volatility	0.0006*** (4.65)	0.0005*** (3.11)	0.0005*** (3.26)
ageyears	-0.0004*** (-7.42)	-0.0003*** (-5.45)	-0.0003*** (-5.18)
inst. own.	-0.0232*** (-5.48)	-0.0329*** (-6.33)	-0.0360*** (-6.97)
Time F.E.	YES	YES	YES
Num. obs.	66,978	59,863	59,784
Adj R-sq	0.3326	0.2788	0.1306

Table 5. Stock performance following recalls, regression analysis

This table shows the regressions of monthly stock returns on the recall intensity measures (defined as in Table 2). For each stock-month observation, we consider the recall intensity as of the last quarter not containing the observation month t. All the control variables (described in Table 1) are also computed as of the end of that quarter. The second and the third column in each pane show the regressions for the return over months t+1 and t+2, respectively, relative to the observation month t. Control variables are measured at the beginning of the quarter and are defined as in Table 1. T-statistics are based on standard errors clustered at the stock level and are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

	Dependent variable		
Independent variables	*Return in month t*	*Return in month t+1*	*Return in month t+2*
recall1	-0.5359***	-0.4823**	-0.3503*
	(-2.64)	(-2.44)	(-1.69)
size	-0.2056***	-0.0871*	-0.1092**
	(-3.88)	(-1.82)	(-2.19)
BtoM	0.2368***	0.1071*	0.0339
	(3.00)	(1.77)	(0.41)
amihudillrank	-0.0017	0.0068**	0.0068**
	(-0.45)	(1.96)	(2.05)
volatility	0.0252***	0.0213***	0.0171***
	(4.39)	(4.14)	(3.51)
ageyears	0.0060***	0.0051***	0.0048***
	(4.19)	(3.60)	(3.40)
instownership	1.2936***	1.4645***	1.5652***
	(8.70)	(10.11)	(10.51)
Time F.E.	YES	YES	YES
Num. obs.	266,447	261,690	256,960
Adj R-sq	0.1539	0.1542	0.1552

	Dependent variable		
Independent variables	*Return in month t*	*Return in month t+1*	*Return in month t+2*
recall2	-0.5370***	-0.3804**	-0.4612***
	(-3.24)	(-2.39)	(-2.75)
size	-0.0663	0.0257	-0.0196
	(-1.16)	(0.50)	(-0.37)
BtoM	0.2242**	0.0769	0.0146
	(2.19)	(1.17)	(0.15)
amihudillrank	0.0085**	0.0155***	0.0145***
	(2.14)	(4.11)	(3.91)
volatility	0.0306***	0.0233***	0.0192***
	(4.15)	(3.61)	(3.41)
ageyears	0.0044***	0.0033**	0.0037**
	(2.97)	(2.31)	(2.53)
instownership	1.2658***	1.4329***	1.5115***
	(7.50)	(8.77)	(9.27)
Time F.E.	YES	YES	YES
Num. obs.	219,442	215,592	211,762
Adj R-sq	0.1794	0.1785	0.1802

	Dependent variable		
Independent variables	*Return in month t*	*Return in month t+1*	*Return in month t+2*
recall3	-0.6165***	-0.4614***	-0.5132***
	(-3.77)	(-2.94)	(-3.12)
size	-0.0571	0.0402	-0.0163
	(-1.00)	(0.77)	(-0.30)
BtoM	0.2124**	0.0833	0.0230
	(2.06)	(1.24)	(0.23)
amihudillrank	0.0093**	0.0165***	0.0146***
	(2.35)	(4.35)	(3.90)
volatility	0.0298***	0.0236***	0.0196***
	(4.09)	(3.66)	(3.46)
ageyears	0.0045***	0.0032**	0.0037**
	(3.00)	(2.22)	(2.52)
instownership	1.2972***	1.4598***	1.5023***
	(7.67)	(8.89)	(9.19)
Time F.E.	YES	YES	YES
Num. obs.	218,550	214,742	210,955
Adj R-sq	0.1805	0.1795	0.181

Table 6. Stock performance following recalls, portfolio analysis

This table shows the performance of portfolios built on the recall intensity measures. For each company-quarter we calculate the recall intensity and sort stocks into five equally weighted portfolios arranged from the lowest recall intensity portfolio (1) to the highest (5). In addition, we consider the portfolio long in the top quintile and short in the bottom quintile. Each of the portfolios is held for 3, 6 or 12 months and then rebalanced. The table reports monthly 4-factor alphas and their t-statistics for each portfolio and each holding horizon. The bottom row shows the average number of stocks featuring in the long-short portfolio over the sample period between 2007 to 2013. T-statistics are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

recall1	Holding horizon			*recall2*	Holding horizon			*recall3*	Holding horizon		
	3 months	6 months	12 months		3 months	6 months	12 months		3 months	6 months	12 months
1 (low)	0.2530 (1.43)	0.2205 (1.29)	0.2315 (1.43)	1 (low)	0.1278 (1.35)	0.0942 (1.05)	0.1754** (2.13)	1 (low)	0.1255 (1.32)	0.0846 (0.95)	0.1665** (2.07)
2	0.1275 (0.79)	0.1239 (0.79)	0.1661 (1.11)	2	0.2277** (2.58)	0.2142** (2.50)	0.1703** (2.19)	2	0.2372*** (2.78)	0.2425*** (2.86)	0.1943** (2.48)
3	0.1778* (1.67)	0.1866* (1.91)	0.1740* (1.83)	3	0.1824** (2.33)	0.2129*** (2.97)	0.2009*** (2.95)	3	0.1656** (2.05)	0.2021*** (2.73)	0.1983*** (2.90)
4	0.0621 (0.59)	0.0962 (1.11)	0.1172 (1.46)	4	0.1494 (1.60)	0.1528* (1.82)	0.1847** (2.22)	4	0.1436 (1.54)	0.1519* (1.80)	0.1753** (2.12)
5 (high)	-0.0562 (-0.43)	-0.0452 (-0.38)	0.0238 (0.21)	5 (high)	-0.1427 (-1.26)	-0.0276 (-0.26)	0.0552 (0.53)	5 (high)	-0.1583 (-1.40)	-0.0418 (-0.40)	0.0495 (0.47)
5-1	-0.3092** (-1.99)	-0.2657** (-2.14)	-0.2077* (-1.97)	5-1	-0.2705** (-2.53)	-0.1219 (-1.46)	-0.1202* (-1.73)	5-1	-0.2838*** (-2.66)	-0.1264 (-1.52)	-0.1170* (-1.70)
Avg stocks in L-S portfolio	1599.44	1580.24	1544.26	Avg stocks in L-S portfolio	1234.52	1221.48	1197.12	Avg stocks in L-S portfolio	1228.29	1215.44	1191.18

Table 7. Holding funds' characteristics aggregated to stock level

This table shows summary statistics on fund characteristics aggregated to the stock level. For each stock quarter, we consider all mutual funds that held a non-zero position in the stock at the beginning of the quarter. For a given fund characteristic, we aggregate it to the stock level by either i) computing the weighted-average value of this characteristic across all the funds that held the stock, or ii) calculating the decile rank of this characteristic across all the funds in the sample and then computing the weighted-average. In this aggregation, the weights are proportional to the number of shares of the stock held by each fund. The left (right) pane shows summary statistics on the actual (decile-rank) aggregated fund characteristics.

The underlying fund characteristics are defined as follows:
fundsize is the natural log of the fund's total net assets in 000 of USD
numholdings is the number of equity holdings in the fund's portfolio
portconc is the Herfindahl concentration index of equity holdings in the fund's portfolio
turnover is the latest annual turnover of the fund's portfolio reported in Morningstar
abngrossret is the average (over the last 3 years) difference between the fund's quarterly gross return and the return predicted by the four-factor model estimated over the entire history of the fund's return observations
RPIshares (*RPIweight*) is the Kasperczyk and Seru (2007) measure of a fund's reliance on public information estimated as the R-square of the regression of the fund's change in holdings, as proxied by the percentage change in shares (portfolio weight), on the lagged changes in the mean analyst recommendation. Both variables are only defined for fund-quarters with at least 10 non-missing observations (for which both the change-in-holding variable and the lagged changes in the mean recommendation can be computed).

	mean	10p	median	90p
fundsize	13.79	12.08	13.90	15.40
numholdings	520.42	87.05	219.12	1598.82
portconc	1.42%	0.21%	1.22%	2.35%
turnover	72.18%	12.58%	29.11%	63.45%
abngrossret	0.14%	-0.19%	0.11%	0.53%
RPIshares	4.78%	0.76%	3.84%	9.12%
RPIweight	4.91%	0.72%	3.96%	9.47%

	mean	10p	median	90p
fundsize_decile	8.17	5.80	8.73	9.72
numholdings_decile	8.01	5.32	8.36	10.00
portconc_decile	3.19	1.00	2.81	6.06
turnover_decile	4.50	1.92	4.26	7.67
abngrossret_decile	6.09	3.34	6.12	8.72
RPIshares_decile	3.65	1.01	3.57	6.12
RPIweight_decile	3.63	1.00	3.56	6.11

Table 8. Holding funds' characteristics and informativeness of recalls

This table shows the profitability of long-short portfolios built on the recall intensity within a particular bin of stocks. Each quarter, we pre-sort stocks into two bins (LOW (below the median) and HIGH (above the median)) by a given characteristic of the mutual funds holding the stock. These characteristics are defined in Table 6. Within each bin, we further sort stocks into five equally weighted portfolios arranged from the lowest recall intensity portfolio (1) to the highest (5) and consider the portfolio long in the top quintile and short in the bottom quintile. Each of the portfolios is held for 3, 6 or 12 months and then rebalanced. The table reports monthly 4-factor alphas and their t-statistics for each long-short portfolio and each holding horizon. T-statistics are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

		Size (log of TNA)		Portfolio concentration		Portfolio turnover		Past performance (abn. gross return)		Reliance on pub. info (share-based measure)		Reliance on pub. info (weight-based measure)	
Recall measure	Holding horizon	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
recall1	3 months	-0.2588 (-1.38)	-0.3630** (-2.05)	-0.5109** (-2.63)	-0.0619 (-0.39)	-0.1786 (-0.97)	-0.3731** (-2.23)	-0.2575 (-1.51)	-0.2842 (-1.65)	-0.4800** (-2.42)	-0.0934 (-0.59)	-0.5015** (-2.60)	-0.1435 (-0.88)
	6 months	-0.1320 (-0.89)	-0.3096** (-2.04)	-0.3207** (-2.14)	-0.0923 (-0.69)	-0.1607 (-1.05)	-0.2227 (-1.58)	-0.0797 (-0.59)	-0.3323** (-2.21)	-0.3477** (-2.27)	-0.1204 (-1.02)	-0.3751** (-2.38)	-0.0715 (-0.55)
	12 months	-0.1716 (-1.25)	-0.1718 (-1.45)	-0.2799** (-2.10)	-0.0282 (-0.25)	-0.0998 (-0.75)	-0.1810 (-1.59)	-0.1125 (-0.96)	-0.2024 (-1.61)	-0.2628* (-1.93)	-0.0558 (-0.55)	-0.3182** (-2.25)	-0.0011 (-0.01)
recall2	3 months	-0.2844** (-2.10)	-0.2113 (-1.47)	-0.3398* (-1.75)	-0.1408 (-1.23)	-0.2299 (-1.28)	-0.2332* (-1.94)	0.0281 (0.18)	-0.3967*** (-3.23)	-0.3510 (-1.63)	-0.1546 (-1.30)	-0.3243 (-1.54)	-0.0898 (-0.97)
	6 months	-0.0476 (-0.41)	-0.0868 (-0.84)	-0.0967 (-0.68)	-0.0212 (-0.26)	-0.0330 (-0.26)	-0.0753 (-0.77)	0.0869 (0.69)	-0.1919* (-1.94)	-0.1496 (-1.01)	0.0011 (0.01)	-0.1216 (-0.75)	0.0042 (0.06)
	12 months	-0.0632 (-0.67)	-0.0977 (-1.29)	-0.1301 (-1.34)	-0.0291 (-0.38)	-0.0275 (-0.29)	-0.1326* (-1.84)	-0.0344 (-0.35)	-0.1232* (-1.72)	-0.1504 (-1.44)	-0.0286 (-0.41)	-0.2152* (-1.86)	0.0272 (0.44)
recall3	3 months	-0.2684* (-1.93)	-0.2424* (-1.72)	-0.3760* (-1.92)	-0.1212 (-1.04)	-0.2121 (-1.13)	-0.2975** (-2.51)	-0.0523 (-0.34)	-0.3804*** (-3.04)	-0.3859* (-1.73)	-0.1623 (-1.38)	-0.3555* (-1.67)	-0.1233 (-1.28)
	6 months	-0.0784 (-0.68)	-0.0711 (-0.71)	-0.1276 (-0.95)	0.0020 (0.02)	-0.0248 (-0.19)	-0.1163 (-1.19)	0.0447 (0.36)	-0.1864* (-1.90)	-0.1835 (-1.28)	-0.0063 (-0.08)	-0.1377 (-0.89)	-0.0064 (-0.09)
	12 months	-0.0817 (-0.87)	-0.0755 (-1.00)	-0.1475 (-1.55)	-0.0020 (-0.03)	-0.0016 (-0.02)	-0.1376** (-1.99)	-0.0475 (-0.51)	-0.1062 (-1.44)	-0.1539 (-1.50)	-0.0256 (-0.38)	-0.1979* (-1.74)	0.0383 (0.59)

Table 9. Stock performance following recalls, alternative measures of recall intensity

This table shows the relationship between alternative recall intensity measures and future stock returns. A given recall intensity measure is constructed as the R-square of the regression of the number of shares returned from loan on that day on the number of shares withdrawn from the lending pool on that day, the number of shares withdrawn from the lending pool on the day of the last non-missing observation and the number of shares withdrawn from the lending pool on the day of the second-to-last non-missing observation. Different proxies for the number of shares returned and withdrawn are described in Table 2.

Panel A. Regression analysis

This panel shows the results of the replication of the regression analysis (described in Table 5) for alternative recall intensity measures. T-statistics are based on standard errors clustered at the stock level and are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

Independent variables	Dependent variable: *Return in month t*	*Return in month t+1*	*Return in month t+2*
recall4	-0.3306*	-0.1816	-0.2279
	(-1.76)	(-0.98)	(-1.22)
size	-0.1941***	-0.0733	-0.1028**
	(-3.67)	(-1.53)	(-2.07)
BtoM	0.2374***	0.1079*	0.0331
	(3.01)	(1.78)	(0.40)
amihudillrank	-0.0008	0.0078**	0.0073**
	(-0.23)	(2.26)	(2.20)
volatility	0.0251***	0.0210***	0.0169***
	(4.37)	(4.10)	(3.48)
ageyears	0.0060***	0.0050***	0.0048***
	(4.20)	(3.60)	(3.37)
instownership	1.3120***	1.4869***	1.5729***
	(8.81)	(10.25)	(10.56)
Time F.E.	YES	YES	YES
Num. obs.	266,453	261,695	256,964
Adj R-sq	0.1542	0.1543	0.1553

Independent variables	Dependent variable: *Return in month t*	*Return in month t+1*	*Return in month t+2*
recall5	-0.3945***	-0.5011***	-0.5874***
	(-3.73)	(-4.70)	(-5.30)
size	-0.0401	0.0475	-0.0035
	(-0.68)	(0.88)	(-0.07)
BtoM	0.2274**	0.0881	-0.0194
	(2.10)	(1.31)	(-0.19)
amihudillrank	0.0101**	0.0176***	0.0159***
	(2.38)	(4.37)	(4.10)
volatility	0.0365***	0.0263***	0.0169***
	(5.14)	(3.91)	(2.79)
ageyears	0.0042***	0.0035**	0.0040**
	(2.61)	(2.27)	(2.51)
instownership	1.2124***	1.4580***	1.5456***
	(6.70)	(8.42)	(9.23)
Time F.E.	YES	YES	YES
Num. obs.	194,458	191,158	187,866
Adj R-sq	0.1785	0.1779	0.1856

Independent variables	Dependent variable: *Return in month t*	*Return in month t+1*	*Return in month t+2*
recall6	-0.3973***	-0.5227***	-0.5760***
	(-3.70)	(-4.87)	(-5.14)
size	-0.0428	0.0433	-0.0095
	(-0.72)	(0.79)	(-0.18)
BtoM	0.2328**	0.0944	-0.0157
	(2.13)	(1.40)	(-0.15)
amihudillrank	0.0100**	0.0171***	0.0157***
	(2.35)	(4.24)	(4.04)
volatility	0.0359***	0.0261***	0.0171***
	(5.07)	(3.89)	(2.83)
ageyears	0.0042***	0.0036**	0.0042***
	(2.61)	(2.28)	(2.64)
instownership	1.1803***	1.4134***	1.5020***
	(6.47)	(8.05)	(8.86)
Time F.E.	YES	YES	YES
Num. obs.	192,637	189,355	186,085
Adj R-sq	0.1794	0.1783	0.1861

Panel B. Portfolio analysis

This panel shows the results of the replication of the portfolio analysis (described in Table 6) for alternative recall intensity measures. T-statistics are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

recall4	Holding horizon		
	3 months	6 months	12 months
1 (low)	0.1833 (0.93)	0.1788 (0.91)	0.2096 (1.09)
2	0.1409 (1.14)	0.1388 (1.17)	0.2024* (1.82)
3	0.1616* (1.69)	0.1686* (1.93)	0.1267 (1.48)
4	0.0787 (0.72)	0.0977 (1.09)	0.1053 (1.29)
5 (high)	-0.0138 (-0.10)	-0.0134 (-0.10)	0.0629 (0.50)
5-1	-0.1970 (-1.23)	-0.1922 (-1.42)	-0.1467 (-1.20)
Avg stocks in L-S portfolio	1590.11	1569.34	1531.74

recall5	Holding horizon		
	3 months	6 months	12 months
1 (low)	0.2656** (2.48)	0.3179*** (3.73)	0.2496*** (2.86)
2	0.3136*** (3.41)	0.2682*** (3.21)	0.2391*** (2.95)
3	0.1987** (2.09)	0.1759* (1.90)	0.1966** (2.29)
4	-0.0186 (-0.22)	0.0176 (0.21)	0.0948 (1.25)
5 (high)	-0.0639 (-0.44)	-0.0147 (-0.12)	0.0481 (0.40)
5-1	-0.3295** (-2.23)	-0.3326*** (-3.02)	-0.2015** (-2.23)
Avg stocks in L-S portfolio	1093.13	1080.93	1059.81

recall6	Holding horizon		
	3 months	6 months	12 months
1 (low)	0.2754** (2.61)	0.3208*** (3.66)	0.2582*** (2.87)
2	0.2945*** (3.10)	0.2512*** (3.01)	0.2319*** (2.93)
3	0.2202** (2.33)	0.2048** (2.17)	0.2132** (2.51)
4	-0.0339 (-0.40)	0.0171 (0.21)	0.0851 (1.13)
5 (high)	-0.0480 (-0.33)	-0.0083 (-0.07)	0.0491 (0.40)
5-1	-0.3235** (-2.22)	-0.3291*** (-3.05)	-0.2091** (-2.30)
Avg stocks in L-S portfolio	1082.26	1069.62	1046.33

Table 10. Stock performance following recalls, financial crisis period dropped

This table replicates Table 5 and Table 6 over the subsample of time periods outside the one-year period between July 2008 and June 2009 ("crisis period").

Panel A. Regression analysis

This panel shows the results of the replication of the regression analysis (described in Table 5) for all the quarters outside of the crisis period. T-statistics are based on standard errors clustered at the stock level and are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

	Dependent variable		
Independent variables	*Return in month t*	*Return in month t+1*	*Return in month t+2*
recall1	-0.4146* (-1.81)	-0.1919 (-0.80)	-0.5375** (-2.25)
size	-0.1049** (-2.12)	0.0400 (0.83)	0.0625 (1.28)
BtoM	0.2577*** (3.86)	0.2098*** (3.45)	0.0461 (0.76)
amihudillrank	-0.0031 (-0.87)	0.0061* (1.71)	0.0094*** (2.61)
volatility	-0.0030 (-0.56)	0.0020 (0.41)	-0.0032 (-0.67)
ageyears	0.0050*** (3.28)	0.0048*** (3.16)	0.0054*** (3.43)
instownership	0.7014*** (4.61)	0.6952*** (4.51)	0.5946*** (3.78)
Time F.E.	YES	YES	YES
Num. obs.	214,221	209,950	205,572
Adj R-sq	0.1342	0.1604	0.17

	Dependent variable		
Independent variables	*Return in month t*	*Return in month t+1*	*Return in month t+2*
recall2	-0.4047** (-2.35)	-0.2115 (-1.21)	-0.5535*** (-3.16)
size	0.0209 (0.42)	0.0674 (1.38)	0.0932* (1.84)
BtoM	0.1157 (1.56)	0.0741 (1.08)	-0.0969 (-1.44)
amihudillrank	0.0073** (1.98)	0.0101*** (2.69)	0.0137*** (3.50)
volatility	0.0009 (0.14)	0.0015 (0.27)	-0.0029 (-0.53)
ageyears	0.0034** (2.20)	0.0043*** (2.72)	0.0053*** (3.29)
instownership	0.7902*** (4.79)	0.6227*** (3.70)	0.4941*** (2.85)
Time F.E.	YES	YES	YES
Num. obs.	177,150	173,628	170,029
Adj R-sq	0.1598	0.1871	0.1985

	Dependent variable		
Independent variables	*Return in month t*	*Return in month t+1*	*Return in month t+2*
recall3	-0.5104*** (-3.06)	-0.3357** (-1.97)	-0.6091*** (-3.54)
size	0.0360 (0.74)	0.0871* (1.80)	0.1022** (2.05)
BtoM	0.0991 (1.36)	0.0546 (0.81)	-0.1048 (-1.55)
amihudillrank	0.0084** (2.31)	0.0115*** (3.11)	0.0142*** (3.66)
volatility	-0.0004 (-0.06)	0.0014 (0.25)	-0.0031 (-0.56)
ageyears	0.0033** (2.17)	0.0041*** (2.59)	0.0052*** (3.22)
instownership	0.8268*** (5.03)	0.6498*** (3.87)	0.4848*** (2.80)
Time F.E.	YES	YES	YES
Num. obs.	176,542	173,060	169,502
Adj R-sq	0.1613	0.1888	0.1999

Panel B. Portfolio analysis

This panel shows the results of the replication of the portfolio analysis (described in Table 6) for all the quarters outside of the crisis period. T-statistics are reported in parentheses. * (**, ***) indicates the significance of the coefficient at the 10% (5%, 1%) level.

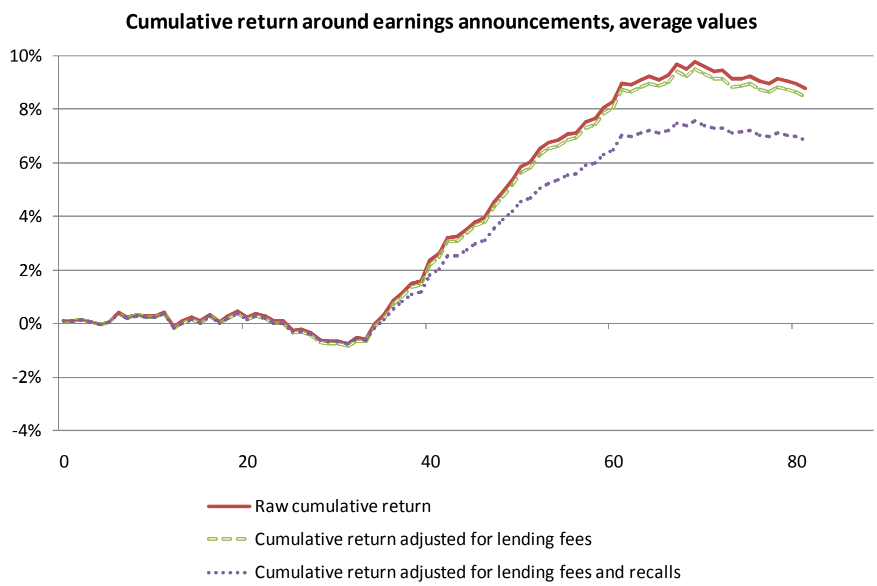
recall1	Holding horizon		
	3 months	6 months	12 months
1 (low)	-0.0183 (-0.11)	-0.1010 (-0.61)	0.1566 (0.83)
2	-0.0378 (-0.25)	-0.0639 (-0.42)	0.1666 (1.01)
3	0.0835 (0.88)	0.0286 (0.30)	0.2064* (1.89)
4	-0.0692 (-0.71)	-0.0780 (-0.95)	0.0401 (0.47)
5 (high)	-0.2222* (-1.80)	-0.2552** (-2.13)	-0.0231 (-0.18)
5-1	-0.2040 (-1.26)	-0.1543 (-1.12)	-0.1796 (-1.34)
Avg stocks in L-S portfolio	1609.75	1589.44	1552.66

recall2	Holding horizon		
	3 months	6 months	12 months
1 (low)	-0.0186 (-0.23)	-0.0882 (-1.06)	0.1960* (1.97)
2	0.0699 (0.94)	0.1045 (1.09)	0.1374 (1.61)
3	0.0979 (1.28)	0.0859 (1.14)	0.1531* (1.94)
4	0.1062 (1.20)	0.0477 (0.59)	0.2129** (2.31)
5 (high)	-0.2783** (-2.56)	-0.1987* (-1.94)	0.0162 (0.13)
5-1	-0.2597** (-2.28)	-0.1105 (-1.14)	-0.1799* (-1.98)
Avg stocks in L-S portfolio	1246.67	1230.08	1201.54

recall3	Holding horizon		
	3 months	6 months	12 months
1 (low)	-0.0137 (-0.17)	-0.0910 (-1.16)	0.1908** (2.01)
2	0.0852 (1.14)	0.1279 (1.28)	0.1442 (1.61)
3	0.0741 (0.96)	0.0709 (0.93)	0.1546* (1.90)
4	0.0835 (0.90)	0.0249 (0.29)	0.1908** (2.05)
5 (high)	-0.2793** (-2.59)	-0.1904* (-1.87)	0.0330 (0.27)
5-1	-0.2656** (-2.40)	-0.0995 (-1.03)	-0.1578* (-1.74)
Avg stocks in L-S portfolio	1241.43	1224.88	1197.01

Figure 1. Pure and recall-adjusted profits to short portfolios held over earnings announcements
In the month preceding the earnings announcement month we sort stocks into five bins by the size of the upcoming earnings announcement surprise (measured as the three-day stock return after the announcement in excess of the market index). For each of these five bins at each of the following 90 days, we compute i) pure short selling profits, ii) short selling profits adjusted for lending fees, and iii) short selling profits adjusted for lending fees and stock recalls. Figures below show average or median (across event months) cumulative returns for each strategy as a function of the holding horizon (in days).

Figure 1A. The bottom quintile (most negative surprises)



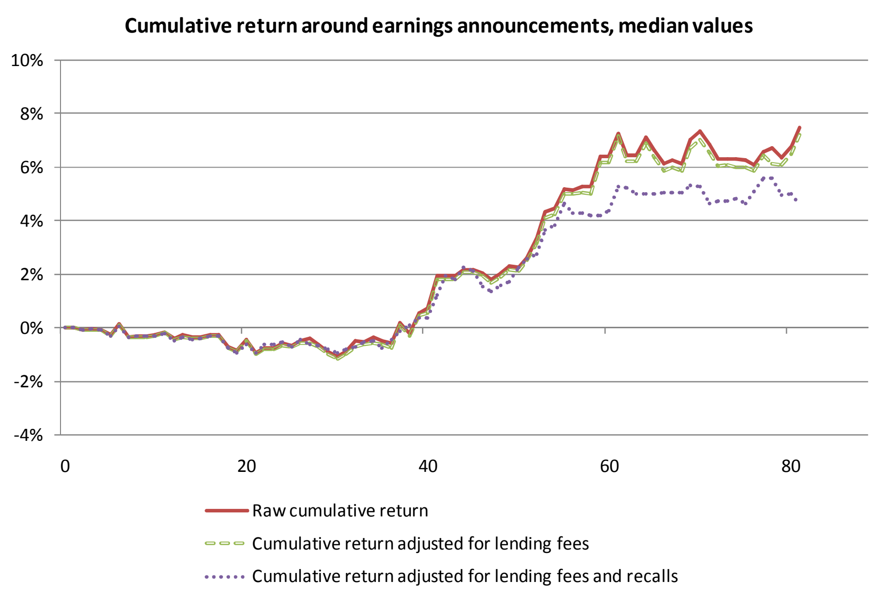
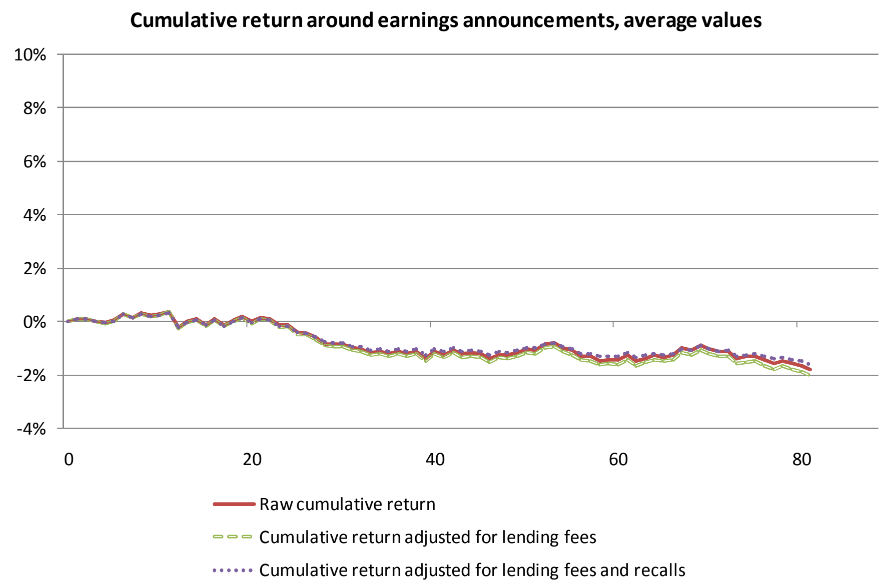
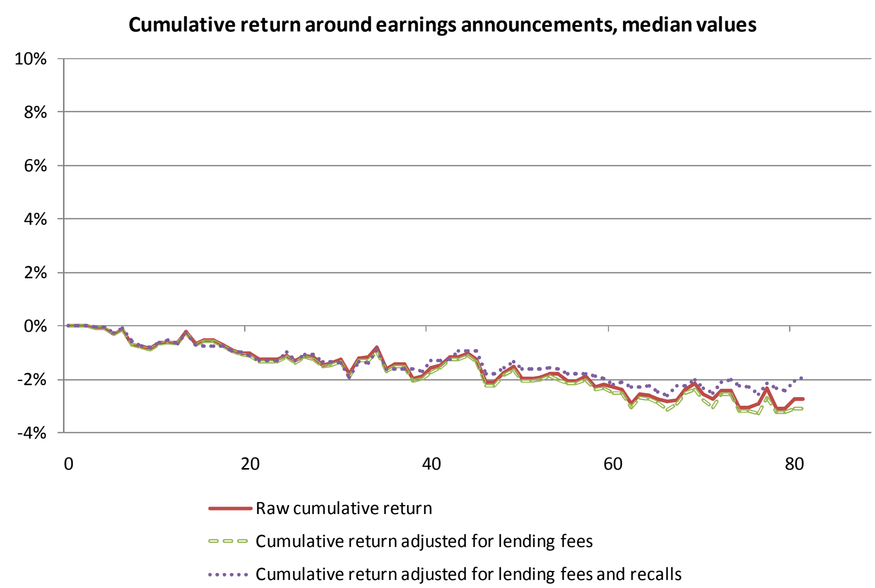


Figure 1B. The middle quintile (neutral surprises)





Appendix 1. Description of the forced closure of short positions at Interactive Brokers (IB)

Overview of Short Stock Buy-Ins & Close-Outs

Customers holding short stock positions are at risk of having these positions bought-in and closed out by IB oftentimes with little or no advance notice. This is a risk which is inherent to short selling and generally outside the control of the customer. It is also subject to regulatory rules which dictate the timeframes by which brokers must act.

While similar in their effect, the term buy-in refers to an action taken by a third party with a close-out being one taken by IB. These actions typically result from one of three events:

1. The shares required to be delivered when a short sale settles cannot be borrowed;
2. The shares which were borrowed and delivered at settlement are later recalled; or
3. A fail to deliver with the clearinghouse occurs.

An overview of each of these three events and their considerations is provided below.

Overview of Buy-in/Close-out Events

1. ***Short Sale Settlement*** – when stock is sold short, the broker must arrange for the shares to be borrowed at settlement, which in the case of U.S. securities is the third business day following the date of the trade (T+3). Prior to executing the short sale, the broker must make a good faith determination that shares will likely be available to borrow when needed and this is accomplished by verifying their current availability. Note that absent a pre-borrow arrangement, there is no assurance that shares available to borrow on the date of trade will remain available to borrow 3 days thereafter and the short sale is subject to forced close-out if they are not. The processing timeline for determination of close-out is as follows:

T+3 (all times in ET)
14:30 - If IB is unable to borrow shares to meet settlement, a communication will be sent, on a best efforts basis, notifying the customer of the potential close-out. Customer will have until 16:00 to close out the short position(s) on their own to avoid forced close-out. If at any time IB is able to borrow shares, an attempt will be made to communicate that information to the customer.

15:15 – a follow-up communication will be sent, on a best efforts basis, in the event the customer has not closed out the short position(s) and IB has not borrowed shares. Customer will still have until 16:00 to close out the short position(s) to avoid forced close-out.

16:00 – Customer no longer has ability to close out the short position for the purpose of preventing close-out. Note that for the purposes of determining whether a short position exists and close-out is required, IB will consider the net of all trades transacted up until 16:00, including any new short sales.

16:50 – Customer will be sent, on a best efforts basis, a communication informing them that if IB was unable to borrow shares by close of business on T+3 and that a final attempt will be made up until 09:00 on T+4.

T+4
09:00 – If IB is unable to borrow shares by 09:00, close-out will commence upon the market open at 09:30. The close-out will be reflected within the TWS trades window at an indicative price.

09:30 – IB initiates close-out using one of the permissible methods deemed most appropriate given the size and nature of the position(s). This may include market orders, marketable limit orders and volume weighted average price orders (VWAP). The indicative price reflected within the TWS trades window will be updated with the actual price upon completion of the close-out.

2. ***Loan Recall*** – Once a short sale has settled (i.e., stock borrowed), the lender of the shares reserves the right to request their return at any time. Should a recall occur, IB will attempt to replace the previously borrowed shares with those from another lender. If shares cannot be borrowed, the lender reserves the right to issue a formal recall which allows for a buy-in to take place 3 business days after issuance in the event IB doesn't return the recalled stock. While the issuance of this formal recall provides the lender the option to buy-in, the proportion of recall notices that actually result in a buy-in are low (typically due to favorable loan activity over the subsequent 3 day period). Given the volume of formal recalls which we receive but are not later acted upon, IB does not provide customers with advance warning of these recall notices.
In the event the recall does result in buy-in, the lender executes the buy-in transaction and notifies IB of the execution prices. IB, in turn, allocates the buy-in to customers based upon their settled short stock position and unsettled trades are not considered when determining liability. Recall buy-ins are viewable within the TWS trades window once posted to the account with notifications sent, on a best efforts basis, by approximately 17:30 EST.

3. ***Fail to Deliver*** – a fail to deliver occurs when a broker has a net short settlement obligation with the clearinghouse and does not have the shares available within its own inventory or cannot borrow them from another broker in order to meet the delivery obligation. The fail results from sale transactions, and is not limited to short sales, but rather may result from the closing sale of a long position carried on margin and eligible to be loaned to another customer.

In the case of U.S. stocks, brokers are obligated to attend to the fail position by no later than the start of regular trading hours on the following settlement day. This can be accomplished through securities purchases or borrowing, however, in the event those transactions are insufficient to satisfy the delivery obligation, IB will close-out customers holding short positions using either a market order, marketable limit order, or variable weighted average price (VWAP) order.

Important Note: Clients should be aware that based on the manner in which IB is required to execute a close-out and a third party allowed to execute a buy-in, significant differences between the price at which the transaction was executed and the prior day's close may result. These differences may be especially pronounced in the case of illiquid securities. Clients should be aware of these risks and manage their portfolio accordingly.

Appendix 2. Buy-In and Close-Out notice issued by Interactive Brokers (November 14th 2014, GoPro Inc. regular shares)

SHORT STOCK POSITION BOUGHT IN

This alert is to inform you that due to a recall IB is unable meet your settlement delivery obligations for the short stock position(s) listed below for account UXXXX819. As current SEC regulations require that all transactions be settled on the standard settlement date, these short stock positions have been bought-in. While IB makes every effort to give advanced notice of a possible buy-in, due to the time frame of this fail, in this instance we were unable to do so. The positions listed below have been bought-in:

GPRO (10 shares)

Please note, IB will be unable to make further attempts to locate the shares for the above position. This notification will serve as a final buy-in notification.

Please click here for additional information on the buy-in process.

Interactive Brokers Customer Service