Borrowing Fees and Expected Stock Returns[†]

Kaitlin Simpson Hendrix‡, Gavin Crabb‡

Abstract

Borrowing fees set in the securities lending market contain reliable information about the cross section of short-term expected stock returns. Using securities lending data for 14 developed and emerging markets from 2011 to 2018, we find that stocks with high borrowing fees tend to underperform their peers over the short term. Moreover, stocks that remain expensive to borrow continue to underperform, but persistence of high borrowing fees is not systematically predictable. While the information in borrowing fees is fast decaying, it can still be efficiently incorporated into real-world equity portfolios.

Introduction

Securities lending involves the owner of a security (the lender) temporarily transferring ownership of the security to an investor (the borrower) in return for compensation. Such transactions are collateralized and allow the lender to maintain full economic exposure to the loaned security. Traditionally, the value added from securities lending comes from the revenue generated from the fees that lenders receive from borrowers. In this paper, we examine the informational content embedded in securities lending markets by testing the relation between borrowing fees and subsequent stock performance. Our results show that market participants may be able to further enhance their investment outcomes by using information from prices in securities lending markets to identify short-term cross-sectional differences in expected stock returns.

Using data from 14 global securities lending markets for 2011 to 2018, we find that stocks with high borrowing fees tend to reliably underperform stocks not on loan over the next several days and that this relation is more pronounced among small caps. We also examine the persistence and predictability of high borrowing fees. We find that, while the relative magnitude and utilization of borrowing fees contain some information about the likelihood that high fees will persist, their predictive power is not sufficient to reliably identify which high-fee stocks will remain in that group over time. Based on these findings, we outline how investors can efficiently incorporate information from securities lending markets into a daily investment process.

Our analysis relies on the rich dynamics of the global securities lending markets, which are highly competitive with many market participants both on the supply and demand sides. The supply of loans comes from institutions or firms that own stocks and operate securities lending programs. The demand comes from investors who pay to take temporary ownership of a stock. As of December 31, 2018, the value of equities on loan globally reached approximately $800 billion. On-loan securities came from a pool of $9.6 trillion in global lendable stocks made available by institutional lenders with lending programs.[1]

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[1] "Securities Lending Market Report," International Securities Lending Association, 10th Edition – March 2019. Figures originally reported in euros and converted to US dollars using EUR/USD exchange rate of 1.1482 as of 12/31/18.

The intense competition among many market participants in the securities lending market should make prices in that market (i.e., borrowing fees) quickly incorporate new information and market expectations. Because borrowers are often short sellers who exercise a bearish view on a stock's price by selling the stock now with the intention of buying it back later following an anticipated price decline, it is plausible that borrowing prices in global securities lending markets contain information about short-term differences in future stock returns. Indeed, our analysis provides compelling evidence supporting this hypothesis.

Our paper contributes to the literature that explores different aspects of the securities lending market. This literature is broadly organized in three areas. The first one focuses on the general structure of the securities lending market and determinants of supply and demand for borrowing over time. For example, D'Avolio (2002) describes the market for borrowing and lending US equities, focusing on lending prices, supply, and demand. The author also presents a model for how the securities lending market reaches equilibrium, where short sellers' costs equal the market-clearing loan fee and short interest represents the market-clearing loan balance. Duffie *et al.* (2002) present a multiperiod model exploring the process by which borrowers and lenders determine lending fees and short interest in a dynamic economy and the impact on stock valuation.

The second strand of the literature focuses on the impact of short-sale constraints, commonly associated with constrained activity in securities lending markets, on price efficiency. Theoretical models often link increased short-sale constraints with reduced price efficiency. For example, Miller (1977) concludes that short-sale constraints cause prices to be biased upward because pessimistic investors are kept out of the market. Diamond and Verrecchia (1987) argue that short-sale constraints may reduce trading by informed participants, decreasing the rate at which private information becomes observable to the public through trading. These predictions are generally confirmed by empirical studies. Kahraman and Pachare (2018) examine rule amendments in US securities markets that increased the frequency of public disclosure of short-interest positions and conclude that more frequent disclosures of short positions allow for the incorporation of short sellers' information into prices more efficiently. Prado *et al.* (2016) find that higher short-sale constraints result in delayed incorporation of investor opinions into stock prices, based on US loan-level data. Using global lending data from 2004 through 2008, Saffi and Sigurdsson (2011) find that stocks with higher short-sale constraints, as measured by lower lending supply, have lower price efficiency, as indicated, for example, by a higher correlation between stock returns and lagged market returns.

The third strand of the securities lending literature examines the informational content of the securities lending market for subsequent security returns. Because many investors who borrow stocks do so to sell them short, a number of studies focus on the relation between short-selling activity and stock returns. Aitken *et al.* (1998) focus on intraday activity using security-level short-sale transaction data made available in real-time for stocks on the Australian Stock Exchange from 1994 through 1996. The authors observe that, in a market environment in which short sales are transparent within minutes of execution, stock prices decline immediately following short sales. Examining US data from 1999 through 2003, Cohen *et al.* (2007) find an increase in demand for

shorting, as measured by an increase in the price of loans and quantity of shares on loan, is associated with lower stock returns over the subsequent month. Boehmer *et al.* (2008) document a negative cross-sectional relation between recent shorting activity and subsequent stock returns in the US: the quintile of stocks that are most heavily shorted underperform the most lightly shorted quintile in the next month. Jones and Lamont (2002) study a unique dataset of NYSE-listed stocks from 1926 to 1933 whose loan prices were determined in a centralized stock loan market floor in the NYSE, referred to as the "loan crowd," and printed daily in the *Wall Street Journal*. The authors find that stock prices fall after a stock enters the loan crowd and that higher shorting demand and higher shorting fees are associated with lower subsequent returns.

We contribute to this strand of the literature by examining the cross-sectional relation between borrowing fees and subsequent stock returns using a large global dataset from 2011 to 2018. Analyzing securities lending data from both developed and emerging markets allows us to test whether the link between borrowing fees and future short-term stock returns is pervasive across different markets and regions.

The remainder of this paper is organized as follows. The next section describes the methodology and data used in this study. Section 2 contains our main empirical results on the cross-sectional relation between high borrowing fees and subsequent stock returns. Section 3 examines the persistence of high borrowing fees. Section 4 discusses investment implications.

1. Data

1.1 Lending Data

The lending data are sourced from a proprietary database maintained by Dimensional Fund Advisors that contains the global lending activity of Dimensional's US mutual funds. This analysis examines 14 developed and emerging markets through December 2018: Australia, Canada, China, France, Germany, Hong Kong, Japan, Korea, Singapore, Taiwan, and the US from January 2011; Sweden from January 2012; and Malaysia and Turkey beginning in 2013, when data become available. The time periods and regions are determined by the existence of active lending markets around the world and our desire to have broad coverage of stocks on loan in the markets we examine. Lending data may be limited in some regions due to country-specific lending market characteristics that make local lenders, as opposed to US lenders, more attractive to local borrowers. For example, the cross section of loans made from Dimensional's US mutual funds to borrowers in the UK tends to be small because these mutual funds accept only US dollars or US Treasuries as loan collateral, yet most of the borrowing in the UK is collateralized with British sterling or equities.[2] Further, several countries that were not included in this analysis did not have, for example, established lending markets until fairly recently, thus limiting the cross section of lending data historically.

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[2] For example, ISLA reports that as of June 30, 2019, 43% of lending collateral in Europe was held in equities, 10% in corporate bonds, 46% in government bonds, and 1% in other. "Securities Lending Market Report," International Securities Lending Association, 11th Edition – September 2019.

To examine the informational content of borrowing fees, we try to focus on borrowing activity most likely related to short selling. Borrowing activity could be motivated by other reasons as well, such as dividend payments, rights offerings, and tender offers. Such corporate actions might trigger changes in borrowing fees unrelated to short-term return expectations. Fees are also likely to be uninformative about short-term expected returns if local market regulations do not require an investor to borrow a stock before short selling it—a practice referred to as naked short selling. Below, we outline the methodology we use to mitigate the impact of these issues on our analysis.

1.2 Covered vs. Naked Short Selling

The practice of borrowing a stock before short selling is referred to as covered short selling. In contrast, if a short seller does not borrow the stock before short selling, this is called naked short selling. All else equal, if a short seller is not obligated to borrow a stock before shorting it, they have less incentive to borrow and incur the related costs. Hence, we require that naked short selling is either prohibited or penalized in the countries included in this analysis. We also require that covered short selling be permitted in all markets of interest during our sample period. If short selling is banned temporarily in a given market, we exclude that market over the period of the ban.[3]

1.3 Dividend-Related Lending Activity

We focus on markets that are unlikely to be affected by the cross-border practice of lending securities around dividend payments to minimize the tax impact of withholding taxes on dividends. Across most of the countries examined, dividend-related transactions are not applicable because either dividend tax withholding is not applied,[4] withholding tax rates or tax treaties make the practice moot,[5] or market regulations make the practice impossible or unpopular.[6]

Historically, dividend-related transactions have been most common in Europe.[7] However, recent legislation along with increasing public rejection of the practice have resulted in a general decline in such transactions in the European countries included in the analysis: France, Germany, and Sweden.[8] Still, to avoid the impact of potential dividend-related trades on the analysis, we exclude securities for the 15 days before and after the record date for dividend payments in France, Germany, and Sweden.[9]

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[3]   Markets impacted by temporary bans on short selling or the allowance of naked short selling were excluded from the analysis during such periods: Korea held a ban on short selling financial stocks from 2008 until November 2013, while also temporarily restricting all short selling from August through November 2011. We therefore exclude Korea from the analysis prior to December 2011 and exclude financial stocks in Korea until November 2013. France banned short selling in financial stocks from August 12, 2011, through February 13, 2012; financial stocks in France are excluded prior to February 14, 2012. Sweden allowed naked short selling prior to November 2012 and is therefore only included from December 2012 forward.

[4]   Dividend withholding tax is not applied in Hong Kong, Malaysia, or Singapore. Worldwide tax summaries from PwC.

[5]   US-based shareholders face a reduced dividend tax withholding rate in Canada under tax treaties. In China, Japan, and Turkey, non-residents generally face the same, or in some cases lower, dividend tax withholding rate as residents. Worldwide tax summaries from PwC.

[6]   For example, in Australia, non-residents and residents face different withholding tax rates; however, the market for borrowing dividend-paying stocks is generally fragmented across residents and non-residents. This is due to the practice of franking credits, whereby residents can receive a rebate for tax paid on dividends that have been paid out of after-tax company profits.

[7]   "Securities lending; Spring break," *The Economist*, May 11, 2013. Also, for example, McDonald (2001) evaluates tax arbitrage in Germany. See also Christoffersen, Geczy, Musto, and Reed (2005) for discussion of dividend tax arbitrage and securities lending.

[8]   For example, the German Investment Tax Act became effective January 1, 2018, effectively eliminating the opportunity for traditional dividend arbitrage transactions.

[9]   This exclusion does not materially affect our main results. Our approach is consistent with Saffi and Sigurdsson (2011), who examine lending supply on price efficiency in global markets and exclude transactions that are within three weeks of ex-dividend date.

1.4 Borrowing Fees

When a security is loaned, the borrower must put up collateral that can be in the form of cash or securities. When a borrower puts up cash collateral, the lender can generate a return from reinvesting the cash. The lender earns revenue from the spread between the return from investing the borrower's cash collateral and the payment to compensate the borrower for posting collateral (also referred to as the rebate rate). When a borrower puts up non-cash collateral, e.g., Treasuries, the lender does not earn revenue from reinvestment and instead the borrower pays the lender an agreed-upon fee. Theoretically, the fee should be equal to the lender's reference rate minus the rebate rate on an otherwise identical cash collateral loan. Indeed, we see this relation in our data between cash collateral and non-cash collateral loans outstanding in the same security on the same day.

In this analysis, we include all loans in a given market regardless of collateral type. To make cash and non-cash collateral loans comparable, we calculate a fee for cash collateral loans based on the relation described above: fee = reference rate – rebate rate. Because the US mutual funds in our analysis require USD-denominated collateral, we follow the standard pricing convention in the securities lending market and use the daily effective federal funds rate through February 2016 and, later, the overnight bank funding rate (OBFR), as the reference rate. Both rates are provided by the Federal Reserve. Thus, fee = federal funds rate (or OBFR) – rebate rate.

Each day, we may observe multiple outstanding loans for the same security. We compute a weighted average fee for each security each day using the number of shares in each loan as weights. Fees are reported on an annualized basis.

We primarily focus on stocks that are relatively more expensive to borrow. In the US securities lending market, a stock is generally considered to be expensive, or have a high fee, if its borrowing fee exceeds 20 basis points (bps). However, this is not the case outside the US due to differences in supply and demand and variation in regulation across countries, among other factors. For example, the borrowing fee in many emerging markets generally exceeds 1%–3%, or 100–300 bps, before it may be considered high. We therefore define "high fee" stocks within each country each day.

Table 1 and **Table 2** present a summary of the lending activity we observe across countries for large cap stocks and small cap stocks, respectively.[10] Small cap stocks are defined every month as the 10% of market capitalization of stocks with the lowest market capitalization within the US, the smallest 12.5% of market capitalization within developed markets outside the US, and the smallest 15% of market capitalization within emerging markets.[11] We report the time series averages of daily cross-sectional statistics for all stocks on loan within each size group in each country.

Fees vary widely by country, but generally high borrowing fees are more prevalent among small cap stocks than among large cap stocks across all regions. Comparing **Table 1** and **Table 2**, we also

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[10] Stocks are grouped by the country to which they have exposure, as opposed to the country in which they trade. For example, companies incorporated in mainland China that are traded on the Hong Kong Stock Exchange are grouped with China.

[11] Theory suggests and research has shown that small cap stocks with the highest relative price and lowest profitability have historically underperformed the rest of the small cap market. Dimensional incorporates this information into its investment process by excluding those stocks from its eligible investment universe. As a result, the small cap stocks with highest relative price and lowest profitability are generally not part of the global lending activity of Dimensional's US mutual funds and are therefore excluded from this analysis. See, for example, Fama and French (2006) and Novy-Marx (2013).

find that there are many more stocks on loan in the small cap universe, the average fee among small cap stocks is higher, and the dispersion in fees across small cap stocks is wider.

Within small cap stocks, the average annualized fee varies across regions from a high of 6.93% in Turkey to a low of 0.37% in the US. By comparison, the highest average fee among large cap stocks is 3.21% in Malaysia, and the lowest average fee is 0.15%, again in the US.

Fee dispersion, as illustrated by the 25th, 50th, and 75th percentiles of the fee distribution, varies across countries. The widest dispersion among small caps is observed in France, where borrowing fees range from 0.74% on average at the 25th percentile to 7.02% at the 75th percentile. The narrowest dispersion in small caps is in the US, ranging from 0.10% at the 25th percentile up to 0.17% at the 75th percentile. There tends to be less intra-country variation in fees within large caps, where the widest range goes from 0.45% at the 25th percentile to 3.36% at the 75th percentile in Turkey. As within small caps, the narrowest fee dispersion among large caps occurs in the US, where the 25th and the 75th percentile fees are 0.10% and 0.11%, respectively.

2. Information in Borrowing Fees

To examine the information content of borrowing fees for short-term expected stock returns, we focus on small cap stocks. As shown earlier, the small cap universe exhibits wider cross-sectional dispersion in borrowing fees, allowing for more meaningful portfolio sorts. Additionally, we observe more instances of high-fee stocks within the small cap universe.[12]

In line with prior analysis,[13] small cap stocks on loan in the US with an annualized fee greater than or equal to 20 bps are classified as "high fee," while those with an annualized fee below 20 bps are classified as "low fee." In each small cap market outside the US, we identify low-fee securities as those on loan with a fee below the 50th percentile fee and high-fee securities as those on loan with a fee greater than or equal to the 50th percentile fee. The 50th percentile fee is calculated daily in each country, with the low-fee and high-fee stocks each making up half of the market capitalization of small cap stocks on loan.

To analyze returns on day t, we form three portfolios each day based on whether the security is on loan and, if on loan, whether it has a high or low fee. This classification is based on lending activity on the prior trading day, day t–1. In addition to this one-day look-back approach, we also form portfolios using two alternative look-back periods: three trading days and five trading days. For the three-day period, securities in the low-fee bucket on all three days from t–1 through t–3 are placed in the low-fee portfolio; securities in the high-fee bucket on all three days are placed in the high-fee portfolio; securities not on loan for all three days are placed in the not-on-loan portfolio; all other securities are excluded from the three-day look-back portfolios formed on that day. An analogous

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[12] This observation is consistent with Duffie, Gârleanu, and Pedersen (2002). The authors model the relation between lending fees and expected returns and find that higher lending fees are associated with lower expected returns, with a larger effect within small cap stocks and in cases where dispersion in fees is greater.
[13] See "An Update on US Small Cap Securities Lending Exclusion" (Dimensional Fund Advisors white paper, 2015).

methodology is employed for the five-day look-back period. Requiring that a stock is in the same bucket for more than one day results in a slight loss of coverage as lending activity changes each day. For example, **Table 3** shows that the average number of "high-fee" names falls from 1,442 for the one-day look-back period to 1,389 for the three-day look-back period and 1,350 for the five-day period.

Next, we examine the daily market cap-weighted return to securities in each of these portfolios on day t.[14] We examine returns in individual countries as well as across all countries, again weighting securities by their market capitalization. Average returns are annualized by multiplying the average daily return by 252 trading days.

2.1 Performance of Small Caps with High Borrowing Fees

In **Table 3**, we see that stocks on loan with a high fee meaningfully underperform both stocks on loan with a low fee and stocks not on loan. Across small cap stocks not on loan, the average annualized return is 8.76% over the full period in all countries. The average annualized return to small cap stocks on loan with a low fee is 5 bps lower: 8.71%. Stocks on loan with a high fee have much lower returns, on average returning –9 bps annualized, which is 8.85% per year lower than stocks not on loan. This difference is statistically reliable, with a t-statistic of –4.58. We observe the same pattern for the average returns to portfolios using three-day and five-day look-back periods.

Calendar-year results for the different groups of stocks sorted using the one-day look-back period are presented in **Table 4**. The underperformance of stocks on loan with a high fee relative to not-on-loan stocks is persistent across the years in the sample period. Across all countries in every year from 2011 through 2018, high-fee stocks on average underperform not-on-loan stocks.

Country-level results for the one-day look-back window are presented in **Table 5**. In all countries, small cap high-fee stocks underperform small cap stocks not on loan, and the underperformance ranges from under 3% annualized in Germany and Turkey to greater than 10% annualized in Canada, France, Singapore, and the US. While the t-statistics of the return differences are relatively low in a few countries with smaller cross sections, they are greater than 2 in absolute value in most countries, indicating a reliable underperformance of stocks on loan with a high fee. Results for the three-day and five-day periods are consistent and can be found in the Appendix.

In addition to next-day returns, we also examine average portfolio returns over the week following portfolio sorts on borrowing fee. **Table 6** illustrates that, for the one-day look-back portfolio sorts, high-fee stocks not only underperform stocks not on loan on the next day but also continue to meaningfully underperform in the week following portfolio sorts. The magnitude of annualized average underperformance is similar: 8.85% on the next day after sorting vs. 8.84% over the remainder of the next week. The return difference is statistically reliable over both periods, with t-statistics greater than 4 in absolute value.

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[14] Securities are weighted by free-float market capitalization in USD at the end of the formation day. Returns are daily returns in USD. Market capitalization and return data from Bloomberg L.P.

2.2 Persistence of Underperformance

A natural question that follows is how long does the underperformance of high-fee stocks last? Examining the returns of stocks for up to one year after they are identified as high fee, we find that the underperformance persists only for stocks that stay high fee over this one-year period.

For every day t from 2011 through 2017, we sort stocks based on fee on day t and the fee one year in the future on day t+252. This means that we are forming portfolios with information not known at time t, but it is useful to illustrate the value of this information if one were able to predict fee persistence. We focus on three non-overlapping buckets of stocks: (1) stocks not on loan on day t; (2) stocks on loan with a high fee on day t and also on loan with a high fee on day t+252; (3) stocks on loan with a high fee on day t and *not* on loan with a high fee on day t+252 (that is, the stock is either no longer on loan or on loan with a low fee).[15]

Figure 1 presents the average daily return of the two high-fee groups of stocks relative to the not-on-loan group for the one year following portfolio formation. The dark lines represent the average daily excess returns, while the shaded area represents two standard errors around the daily excess mean. The stocks on loan with a high fee both at the beginning and the end of the one-year period perform much worse on average than those no longer high fee at the end of the year. Moreover, the underperformance remains reliable over the entire year. In contrast, stocks that are high fee at portfolio formation but are no longer high fee one year later perform in line with stocks not on loan to begin with. This evidence suggests that underperformance of expensive-to-borrow stocks is driven by the subset of stocks with persistently high fees over longer periods.

Overall, we see that stocks that remain high fee tend to persist in underperformance, while high-fee stocks that migrate out of that category tend to perform in line with stocks not on loan. Therefore, it is important to ask: how likely is it that a high-fee stock will remain high fee?

2.3 Fee Migration

Table 7 shows the migration matrices of low-fee and high-fee stocks on loan over the subsequent five, 20, 120, and 252 trading days from 2011 through 2017. We examine the percentage of market capitalization of each group of stocks that remain in the same category, switch categories, are no longer on loan, or leave the eligible universe over subsequent periods, and then average across all overlapping periods.

On average, 92% of small cap stocks on loan with a high fee are in the same category five days later. The percentage of stocks that remain high fee falls over longer time horizons from 82% over 20 trading days, to 61% over 120 days, and 49% over one year. That is, one year after we assign small cap stocks to high- and low-fee categories, only half of high-fee stocks remain in their starting category, on average.

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[15] We find that stocks that are high fee on day t+252 also spend a higher percentage of days on loan with a high fee from day t+1 through day t+252. More on this in Section 3.

3. Identifying Stocks That Stay High Fee

Can we systematically identify high-fee stocks that stay high fee over the next year, which have been shown to drive the overall underperformance of high-fee stocks? If so, one could potentially improve the expected returns of a small cap strategy by selling these worst-performing stocks. However, given the relatively high turnover among stocks with high borrowing fees, the precision of such identification needs to be sufficiently high in order to overcome the hurdle of high turnover and costs.

The relative magnitude of current fee and borrowing utilization, as measured by shares on loan scaled by shares outstanding, are likely to contain information about future fees. This is consistent with a number of academic studies. For example, Engelberg *et al.* (2018) show that fee, utilization, as well as variance around both fee and utilization can help predict the likelihood of future fee increases and loan recalls. Saffi and Sigurdsson (2011) find that stocks with lower lending supply tend to have higher fees. Kecskes *et al.* (2013) study information from short sellers in the bond market, using utilization as their primary measure.

Given the emphasis on fee and utilization in the literature, we repeat the migration analysis for high-fee stocks conditional on these variables. In particular, we examine whether small cap stocks with the highest fees and with high utilization are more likely to stay high fee. Outside the US, the highest-fee stocks we focus on are the top fee decile, or those stocks with a fee greater than or equal to the 90th percentile fee within a given country each day. Within the US, we focus on stocks with fees greater than 100 bps. High utilization is defined as utilization greater than the 75th percentile utilization within each country each day.

As seen in column (f) of **Table 8**, over the period 2011 through 2017, small cap stocks in the top fee decile and with a high utilization are more likely to also have a high fee over the subsequent five days, one month, six months, or one year than other high-fee stocks. However, the increase is modest, and overall, the likelihood is still relatively low over a one-year horizon. Indeed, only 67% of stocks in the top fee decile with high utilization still have a high fee after 252 days. This percentage declines further to 54% for stocks in the top fee decile but without high utilization, and 46% for stocks with a fee above the median but below the 90th percentile.

We further examine the information in current fee and utilization about the likelihood of staying high fee through a probit model. On each day t from January 2011 through December 2017, we identify small cap stocks that are high fee using the same fee thresholds as before (20 bps in the US and 50th percentile outside the US). Within this universe, we estimate the probability of being high fee again on day t+252 using a probit model based on two key loan characteristics: the percentile fee rank and utilization on day t. We also include a dummy variable equal to 1 if the stock was also high fee on day t-1 and 0 otherwise. In addition, we control for firm characteristics associated with the cross-sectional differences in long-term expected stock returns: log market capitalization, relative price, as measured by book-to-market, and profitability, as measured by operating

profitability.[16] Since we use pooled data to run the analysis, it is likely that the errors are correlated over time for a given stock and across stocks on a given day. To address this potential issue, we report standard errors clustered by date and stock.

As shown in **Table 9**, percentile fee rank and utilization have reliably positive coefficients, as indicated by t-statistics greater than two. That means high-fee stocks with relatively higher fees and high utilization on day t are more likely to stay high fee on day t+252. A stock being high fee on day t–1, as indicated by the dummy variable high fee (t–1), also indicates a higher likelihood that the stock will be high fee on day t+252. In addition, high-fee stocks with lower market capitalization, higher relative price, and lower profitability have a higher likelihood of staying high fee in one year.[17]

The pseudo R-squared value from the probit regression, however, indicates that these variables explain only 3.6% of the variation in the likelihood of a stock remaining high fee on day t+252. The low predictive power suggests that we cannot systematically determine which high-fee stocks will remain high fee over time with high precision. This model assesses point-to-point high-fee persistence; stocks are even less likely to stay high fee consistently throughout the entire year.

Given the overall high turnover associated with high-fee stocks and the lack of predictability for the persistence of high fee, it is likely that incorporating the information from borrowing fees into investment decisions can contribute meaningfully to turnover and costs if not done thoughtfully. This concern is further exacerbated by the fact that most high-fee stocks are small cap stocks that tend to have higher trading costs. For example, consider a daily rebalanced small cap strategy that sells stocks when they are high fee and buys them back when they no longer meet the high-fee threshold. In this example, if a stock is high fee on day t–1, it is excluded from the small cap strategy on day t and the market cap weight from the excluded stocks is distributed pro rata to other non-excluded holdings. We estimate daily turnover as the total change in market cap weight across all stocks between trading days, after adjusting for change in market cap weight due to price changes, and average across all days from 2011 through 2018. The average estimated increase in turnover in such a strategy, compared to a small cap strategy that does not incorporate information from borrowing prices, is approximately 4.6% per day, or 1,153% per year. If the same strategy applies a higher threshold for exclusion and excludes only those stocks in the top fee decile and with high utilization, the strategy may still be forced to turn over an additional 47 bps per day, or 120% per year.[18] This analysis indicates that, while there is reliable information in borrowing fees about subsequent stock returns, incorporating this information into a strategy through daily selling of high-fee stocks and buying of low-fee stocks may be costly. An alternative, more cost-effective approach may be to exclude from purchase stocks with the highest fee.

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[16] Profitability is defined as operating income before depreciation and amortization minus interest expense divided by book equity.

[17] As an extension of this model, we also estimate a fractional probit to examine the predictive power of fee and utilization for the percentage of days that a stock is high fee over the subsequent year. Results of the fractional probit are consistent with results of the probit as presented in Table 9, with similar coefficients, t-statistics, and pseudo R-squared values.

[18] In the US, thresholds are 20 bps and 100 bps, instead of 50th percentile and 90th percentile, respectively. High utilization indicates utilization, as measured by shares on loan/shares outstanding, is greater than the 75th percentile within each country each day. Simulated small cap strategy applies market capitalization weight and is rebalanced monthly to hold the smallest 10% of stocks in the US, smallest 12.5% of stocks in developed markets ex US, and smallest 15% of stocks in emerging markets. See Data Descriptions Appendix.

4. Conclusion

Our study provides compelling evidence that small cap stocks with high borrowing fees tend to reliably underperform other small cap stocks over the short term. We also find that there is high turnover associated with high-fee stocks and that the underperformance of high-fee stocks is mainly driven by those that stay high fee over time. While a higher borrowing fee and utilization tend to be associated with a greater likelihood of a stock staying high fee over time, their predictive power is too weak to be useful in practice.

To incorporate these research insights into a robust investment process, we need to carefully balance the tradeoffs among expected return, revenue from lending activities, diversification, turnover, and trading costs. For example, seeking to sell small cap stocks when their borrowing fees are high and buy them back when fees drop may incur high turnover and costs. Moreover, such an approach would forgo completely the high lending revenue from high-fee stocks and reduce diversification. Given these considerations, an efficient approach may be to temporarily refrain from purchasing the most expensive-to-borrow small cap stocks. Implementing this approach in a daily investment process can efficiently incorporate the short-term information in the latest securities lending fees and enhance investment outcomes in a low opportunity cost manner.

Tables

TABLE 1

Lending Data by Country: Daily Averages Across Large Cap Stocks

JANUARY 2011–DECEMBER 2018

Country	Number of Stocks	Average Fee %	Fee (%) at the:		
			25th Percentile	50th Percentile	75th Percentile
Australia	25	0.40	0.23	0.26	0.43
Canada	46	0.91	0.22	0.30	0.52
China	49	1.21	0.26	0.56	2.06
Germany	6	1.22	0.19	0.26	0.53
France	6	0.91	0.19	0.28	0.55
Hong Kong	14	1.09	0.27	0.43	1.25
Japan	104	0.53	0.23	0.25	0.38
Korea	62	1.15	0.28	0.63	1.93
Malaysia	28	3.21	2.63	3.39	4.65
Sweden	8	1.69	0.27	0.45	1.46
Singapore	10	1.04	0.27	0.54	1.43
Turkey	14	1.60	0.45	1.26	3.36
Taiwan	64	1.65	0.95	2.02	3.62
US	482	0.15	0.10	0.10	0.11

Notes: Fees presented are annualized. We compute the loan-weighted average fee for each stock each day, based on which we compute the 25th, 50th, and 75th percentiles of the distribution of loan fees across stocks, along with the market cap-weighted average fee each day in each country. These values are then averaged across all days. See Data Descriptions Appendix.

TABLE 2

Lending Data by Country: Daily Averages Across Small Cap Stocks

JANUARY 2011–DECEMBER 2018

Country	Number of Stocks	Average Fee %	Fee (%) at the:		
			25th Percentile	50th Percentile	75th Percentile
Australia	144	1.22	0.40	1.11	3.26
Canada	144	1.45	0.32	1.03	3.55
China	171	2.59	0.93	2.41	4.40
Germany	44	2.22	0.55	2.40	5.68
France	36	2.49	0.74	3.15	7.02
Hong Kong	64	2.25	0.82	2.11	4.19
Japan	456	1.33	0.36	1.18	3.01
Korea	432	4.19	3.34	4.57	6.12
Malaysia	73	5.30	4.34	5.00	5.99
Sweden	33	2.49	0.46	2.76	5.78
Singapore	54	3.16	1.80	3.50	5.48
Turkey	49	6.93	5.64	6.77	8.26
Taiwan	393	4.15	3.03	4.10	5.34
US	1,124	0.37	0.10	0.11	0.17

Notes: Fees presented are annualized. We compute the loan-weighted average fee for each stock each day, based on which we compute the 25th, 50th, and 75th percentiles of the distribution of loan fees across stocks, along with the market cap weighted average fee each day in each country. These values are then averaged across all days. See Data Descriptions Appendix

TABLE 3

Returns to Small Cap Stocks in All Countries

JANUARY 2011–DECEMBER 2018

Portfolio	Portfolios Formed with One-Day Look-Back Period				
	Average Return (%)	Relative to Not on Loan (%)	Number of Stocks	Average Fee (%)	Deviation of Fee
Not on Loan	8.76		2,201		
On Loan, Low Fee	8.71	-0.04	1,414	0.41	1.09
On Loan, High Fee	-0.09	-8.85	1,442	3.30	4.54
t-stat, on loan high fee–not on loan		*-4.58*			

Portfolio	Portfolios Formed with Three-Day Look-Back Period				
	Average Return (%)	Relative to Not on Loan (%)	Number of Stocks	Average Fee (%)	Deviation of Fee
Not on Loan	8.45		2,142		
On Loan, Low Fee	8.36	-0.09	1,345	0.42	1.09
On Loan, High Fee	-0.05	-8.51	1,389	3.39	4.52
t-stat, on loan high fee–not on loan		*-4.34*			

Portfolio	Portfolios Formed with Five-Day Look-Back Period				
	Average Return (%)	Relative to Not on Loan (%)	Number of Stocks	Average Fee (%)	Deviation of Fee
Not on Loan	8.26		2,091		
On Loan, Low Fee	7.86	-0.40	1,293	0.42	1.09
On Loan, High Fee	-0.62	-8.88	1,350	3.45	4.50
t-stat, on loan high fee–not on loan		*-4.48*			

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates that a stock is on loan with a fee below 50th percentile fee. In the US, high fee indicates that a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates that a stock is on loan with a fee below 20 bps. Weighted average fee and standard deviation of fee are computed each day for each group of stocks and averaged across all days. Average fee is weighted by daily market cap within each group of stocks. Annualized return for each group is calculated as the market cap-weighted average return for each day, averaged across all days and multiplied by 252 trading days. Days with fewer than three small cap stocks on loan in a given country are excluded for that country. See Data Descriptions Appendix. Past performance is no guarantee of future results.

TABLE 4

Small Cap Portfolios Formed Over One-Day Look-Back Period

RESULTS BY YEAR

Portfolio	Average Daily Return * 252, by Year (%)							
	2011	2012	2013	2014	2015	2016	2017	2018
Not on Loan	-3.00	18.21	26.72	1.33	5.53	14.64	22.82	-16.83
On Loan, Low Fee	-1.55	19.00	29.21	4.37	-3.96	22.10	13.34	-13.13
On Loan, High Fee	-19.87	11.59	15.43	-9.32	-8.77	11.28	18.49	-20.02
	Average Daily Return * 252, Relative to Not on Loan (%)							
On Loan, High Fee	-16.87	-6.62	-11.29	-10.65	-14.31	-3.36	-4.34	-3.20

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates a stock is on loan with a fee below 50th percentile fee. In the US, high fee indicates a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates a stock is on loan with a fee below 20 bps. Values reported are time series averages of daily return for each group of stocks. We compute the market cap-weighted average return for each group each day, and then average across all days and multiply by 252 trading days. Days with fewer than three small cap stocks on loan are excluded for that country. See Data Descriptions Appendix. Past performance is no guarantee of future results.

TABLE 5

Returns to Small Cap Stocks by Country

JANUARY 2011–DECEMBER 2018

Country	Portfolio	Portfolios Formed with One-Day Look-Back Period				
		Average Daily Return * 252		Average Number of Stocks	Weighted Average Fee (%)	Standard Deviation of Fee
		Average Return (%)	Relative to Not on Loan (%)			
Australia	Not on Loan	5.86		100		
	On Loan, Low Fee	-0.01	-5.87	39	0.29	0.08
	On Loan, High Fee	0.59	-5.27	105	2.05	2.27
	t-stat, on loan high fee - not on loan		*-1.80*			
Canada	Not on Loan	5.89		132		
	On Loan, Low Fee	1.36	-4.53	39	0.25	0.07
	On Loan, High Fee	-4.21	-10.11	105	2.34	4.88
	t-stat, on loan high fee - not on loan		*-3.07*			
China	Not on Loan	3.83		151		
	On Loan, Low Fee	2.34	-1.48	62	0.65	0.44
	On Loan, High Fee	-1.93	-5.76	108	4.46	2.53
	t-stat, on loan high fee - not on loan		*-2.01*			
France	Not on Loan	9.56		77		
	On Loan, Low Fee	2.11	-7.45	7	0.35	0.24
	On Loan, High Fee	-1.04	-10.60	29	4.02	5.92
	t-stat, on loan high fee - not on loan		*-2.03*			
Germany	Not on Loan	12.07		79		
	On Loan, Low Fee	12.05	-0.02	10	0.35	0.18
	On Loan, High Fee	9.17	-2.90	34	3.61	4.43
	t-stat, on loan high fee - not on loan		*-0.71*			
Hong Kong	Not on Loan	0.38		140		
	On Loan, Low Fee	2.22	1.84	20	0.60	0.32
	On Loan, High Fee	-8.72	-9.11	43	3.68	2.52
	t-stat, on loan high fee - not on loan		*-2.40*			
Japan	Not on Loan	10.56		797		
	On Loan, Low Fee	8.27	-2.29	117	0.26	0.08
	On Loan, High Fee	5.69	-4.86	339	2.22	2.32
	t-stat, on loan high fee - not on loan		*-2.38*			
Korea	Not on Loan	8.84		98		
	On Loan, Low Fee	7.93	-0.91	157	2.25	1.01
	On Loan, High Fee	2.86	-5.98	274	6.06	2.00
	t-stat, on loan high fee - not on loan		*-1.52*			
Malaysia	Not on Loan	-2.54		72		
	On Loan, Low Fee	-3.30	-0.77	29	3.81	0.87
	On Loan, High Fee	-10.06	-7.52	49	6.03	1.29
	t-stat, on loan high fee - not on loan		*-2.05*			
Singapore	Not on Loan	5.97		58		
	On Loan, Low Fee	-4.30	-10.28	17	1.26	0.64
	On Loan, High Fee	-7.90	-13.87	37	4.88	2.57
	t-stat, on loan high fee - not on loan		*-3.41*			
Sweden	Not on Loan	14.11		58		
	On Loan, Low Fee	17.92	3.81	8	0.30	0.12
	On Loan, High Fee	10.75	-3.35	25	4.12	4.76
	t-stat, on loan high fee - not on loan		*-0.71*			
Taiwan	Not on Loan	8.73		112		
	On Loan, Low Fee	3.75	-4.98	158	2.68	0.58
	On Loan, High Fee	0.12	-8.61	237	5.42	1.59
	t-stat, on loan high fee - not on loan		*-3.31*			
Turkey	Not on Loan	-7.93		17		
	On Loan, Low Fee	-12.35	-4.42	12	4.47	1.43
	On Loan, High Fee	-9.11	-1.18	36	8.54	2.64
	t-stat, on loan high fee - not on loan		*-0.21*			
US	Not on Loan	14.28		568		
	On Loan, Low Fee	10.13	-4.15	902	0.10	0.02
	On Loan, High Fee	2.72	-11.56	219	2.39	8.62
	t-stat, on loan high fee - not on loan		*-3.58*			

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates that a stock is on loan with a fee below 50th percentile fee. In the US, high fee indicates that a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates that a stock is on loan with a fee below 20 bps. Weighted average fee and standard deviation of fee are computed each day for each group of stocks and averaged across all days. Average fee is weighted by daily market cap within each group of stocks. Annualized return for each group is calculated as the market cap-weighted average return for each day, averaged across all days and multiplied by 252 trading days. Days with fewer than three small cap stocks on loan in a given country are excluded for that country. See Data Descriptions Appendix. Past performance is no guarantee of future results.

TABLE 6

Returns to Small Cap Stocks over Different Horizons

JANUARY 2011–DECEMBER 2018

Portfolio	Average Daily Return * 252 (%)		Average Return Relative to Not on Loan (%)		Daily Average Number of Stocks	Weighted Average Fee
	On Day t+1	On Days t+2 to t+5	On Day t+1	On Days t+2 to t+5		
Not on loan	8.76	9.50			2,201	
On Loan, Low Fee	8.71	8.65	-0.04	-0.84	1,414	0.41
On Loan, High Fee	-0.09	0.66	-8.85	-8.84	1,442	3.30
t-stat, on loan high fee - not on loan			*-4.58*	*-5.57*		

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates that a stock is on loan with a fee below 50th percentile fee. In the US, high fee indicates that a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates that a stock is on loan with a fee below 20 bps. Weighted average fee is computed each day for each group of stocks and averaged across all days. Average fee is weighted by daily market cap within each group of stocks. Annualized return for each group is calculated as the market cap-weighted average return for each day or each day from t+2 to t+5, averaged across all days and multiplied by 252 trading days. Days with fewer than three small cap stocks on loan in a given country are excluded for that country. T-statistics are corrected for overlapping days. See Data Descriptions Appendix. Past performance is no guarantee of future results.

TABLE 7

Fee Migration: Small Cap Stocks in All Countries

2011–2017

	Not on Loan	Low Fee	High Fee	Missing
Portfolio on Day t	Portfolio on Day t+5			
Low Fee	4%	93%	2%	1%
High Fee	3%	4%	92%	1%
Portfolio on Day t	Portfolio on Day t+20			
Low Fee	9%	85%	4%	3%
High Fee	7%	8%	82%	4%
Portfolio on Day t	Portfolio on Day t+120			
Low Fee	17%	67%	8%	8%
High Fee	14%	15%	61%	10%
Portfolio on Day t	Portfolio on Day t+252			
Low Fee	20%	58%	10%	12%
High Fee	17%	19%	49%	15%

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates a stock is on loan with a fee below the 50th percentile fee. In the US, high fee indicates a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates a stock is on loan with fee below 20 bps. Data shown are the average percent of market capitalization within each group, computed daily and averaged across all days, with overlapping periods. Missing securities have dropped out of the eligible small cap universe. See Data Descriptions Appendix.

TABLE 8

Transition Matrix: Small Cap Stocks in All Countries

2011–2017

	Not on Loan or Low Fee	High Fee, Below Top Fee Decile	Top Fee Decile, Not High Utilization	Top Fee Decile + High Utilization	Missing	Stay High Fee
	(a)	(b)	(c)	(d)	(e)	(f)=(b)+(c)+(d)
Portfolio on Day t	*Portfolio on Day t+5*					
High Fee, Below Top Fee Decile	8%	89%	1%	1%	1%	91%
Top Fee Decile, Not High Utilization	5%	6%	84%	3%	2%	94%
Top Fee Decile + High Utilization	2%	5%	6%	87%	1%	97%
Portfolio on Day t	*Portfolio on Day t+20*					
High Fee, Below Top Fee Decile	17%	76%	2%	2%	3%	80%
Top Fee Decile, Not High Utilization	10%	12%	68%	5%	5%	85%
Top Fee Decile + High Utilization	3%	9%	9%	75%	4%	93%
Portfolio on Day t	*Portfolio on Day t+120*					
High Fee, Below Top Fee Decile	33%	51%	3%	4%	9%	58%
Top Fee Decile, Not High Utilization	18%	22%	37%	8%	15%	66%
Top Fee Decile + High Utilization	6%	24%	10%	46%	13%	80%
Portfolio on Day t	*Portfolio on Day t+252*					
High Fee, Below Top Fee Decile	41%	39%	3%	4%	13%	46%
Top Fee Decile, Not High Utilization	24%	25%	22%	7%	23%	54%
Top Fee Decile + High Utilization	13%	29%	8%	29%	20%	67%

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates a stock is on loan with a fee below the 50th percentile fee. In the US, high fee indicates a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates a stock is on loan with fee below 20 bps. Data shown are the average percentage of market capitalization within each group, computed daily and averaged across all days, with overlapping periods. Missing securities have dropped out of the eligible small cap universe. See Data Descriptions Appendix.

TABLE 9

Probability of Being High Fee on Day t+252 Conditional on Being High Fee on Day t: Probit Estimation

JANUARY 2011–DECEMBER 2017

Independent Variables	Slope Coefficient	t-Statistic
High Fee (t–1)	0.30	5.35
Percentile Fee Rank (t)	0.78	9.15
Utilization (t)	32.32	12.90
Log(market cap) (t)	-0.18	-12.98
Book-to-Market (t)	-0.13	-7.74
Profitability (t)	0.00	-0.37
Constant	2.90	9.90
Observations	1,999,528	
pseudo R2	3.59%	

Notes: Profitability is measured as operating income before depreciation and amortization less interest expense, scaled by book equity. Size, relative price, and profitability as of day t. High Fee indicates fee is greater than the 50th percentile fee by market capitalization within each country each day, or greater than 20 bps in the US. See Data Descriptions Appendix.

Figures

Excess Daily Return Relative to Not-on-Loan Stocks from Day t+1 to Day t+252, +/- 2 Standard Errors: Small Cap Stocks, All Countries

The figure presents the average daily return of the two high-fee groups of stocks relative to the not-on-loan group for the one year following portfolio formation. The dark lines represent the average daily excess returns, while the shaded area represents two standard errors around the daily excess mean. The stocks on loan with a high fee both at the beginning and the end of the one-year period perform much worse on average than those that are no longer high fee at the end of the year. Moreover, the underperformance remains reliable over the entire year. In contrast, stocks that are high fee at portfolio formation but are no longer high fee one year later perform in line with stocks not on loan to begin with. This evidence suggests that underperformance of expensive-to-borrow stocks is driven by the subset of stocks with persistently high fees over longer periods.

PANEL A: HIGH FEE + DOES NOT STAY HIGH FEE, 2011–2017
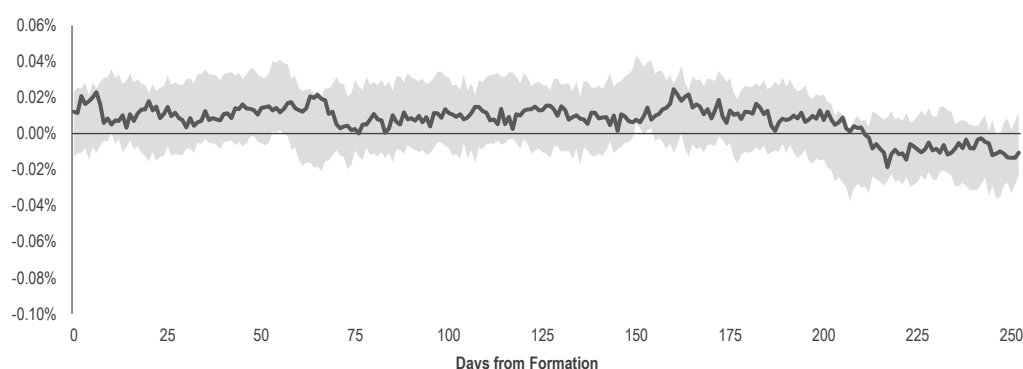
PANEL B: HIGH FEE + STAYS HIGH FEE, 2011–2017
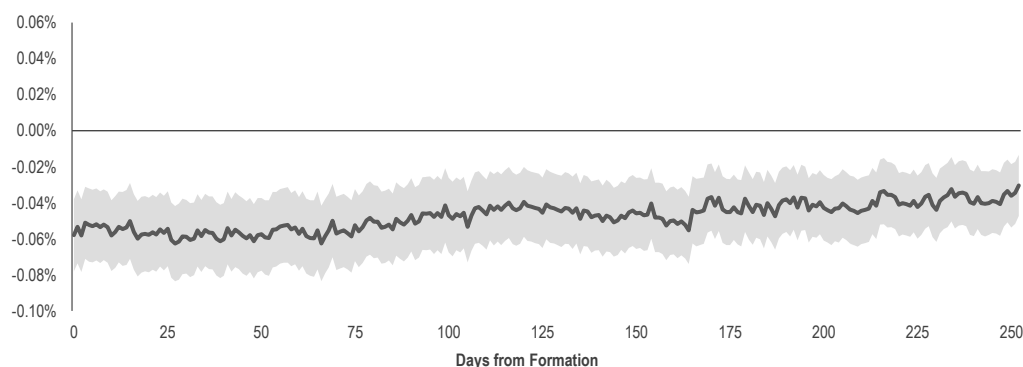
Notes: Light grey lines indicate two standard errors from the mean for each category. Outside the US, high fee indicates a security on loan with a fee above the 50th percentile fee of small caps on day t; stays high fee indicates a security on loan with a fee above the 50th percentile fee on day t+252; does not stay high fee indicates a security not on loan with a fee above 50th percentile on day t+252. An analogous methodology is used for US small cap stocks, where high fee is defined as a fee greater than or equal to 20 bps. Returns are value weighted by prior-day market capitalization across all countries by event date and group and then equally weighted across event dates. Days with fewer than three securities in a group are excluded. Securities no longer in the universe on day t+252 are excluded. The sample includes 1,302,716 stock-day observations in the high fee, stays high fee group; 724,607 stock-day observations in the high fee, does not stay high fee group; and 3,906,972 stock-day observations are in the not on loan group. See Data Descriptions Appendix. Past performance is no guarantee of future results.

Appendix

Appendix 1: Small Cap Stocks Examined at Country Level

MULTIPLE LOOK BACK WINDOWS, 2011–2018

Region	Portfolio	Daily Average Number of Stocks in Portfolio Formed Over Previous			Average Daily Return * 252 (%) Relative to Not-on-Loan Portfolio of Portfolio Formed Over Previous		
		One Day	Three Days	Five Days	One Day	Three Days	Five Days
Australia	Not on Loan	100	98	96	5.86	5.55	5.49
	On Loan, Below 50th Perc Fee	39	36	35	-5.87	-5.63	-5.22
	On Loan, Above or Equal to 50th Perc Fee	105	101	98	-5.27	-5.50	-5.42
	t-stat, on loan above or equal to 50th perc - not on loan				*-1.80*	*-1.83*	*-1.78*
Canada	Not on Loan	132	129	126	5.89	5.72	5.58
	On Loan, Below 50th Perc Fee	39	36	34	-4.53	-1.06	0.02
	On Loan, Above or Equal to 50th Perc Fee	105	100	96	-10.11	-11.35	-11.47
	t-stat, on loan above or equal to 50th perc - not on loan				*-3.07*	*-3.32*	*-3.25*
China	Not on Loan	151	148	145	3.83	3.57	3.45
	On Loan, Below 50th Perc Fee	62	60	58	-1.48	-0.95	-0.59
	On Loan, Above or Equal to 50th Perc Fee	108	105	103	-5.76	-5.49	-5.43
	t-stat, on loan above or equal to 50th perc - not on loan				*-2.01*	*-1.89*	*-1.84*
France	Not on Loan	77	75	74	9.56	9.58	9.31
	On Loan, Below 50th Perc Fee	7	6	6	-7.45	-11.71	-7.97
	On Loan, Above or Equal to 50th Perc Fee	29	27	26	-10.60	-8.22	-8.73
	t-stat, on loan above or equal to 50th perc - not on loan				*-2.03*	*-1.53*	*-1.59*
Germany	Not on Loan	79	77	75	12.07	11.84	11.42
	On Loan, Below 50th Perc Fee	10	9	8	-0.02	1.25	0.08
	On Loan, Above or Equal to 50th Perc Fee	34	33	31	-2.90	-2.88	-5.31
	t-stat, on loan above or equal to 50th perc - not on loan				*-0.71*	*-0.68*	*-1.21*
Hong Kong	Not on Loan	140	138	136	0.38	0.23	0.25
	On Loan, Below 50th Perc Fee	20	19	18	1.84	2.89	3.17
	On Loan, Above or Equal to 50th Perc Fee	43	41	40	-9.11	-6.98	-8.50
	t-stat, on loan above or equal to 50th perc - not on loan				*-2.40*	*-1.81*	*-2.18*
Japan	Not on Loan	797	787	777	10.56	10.57	10.34
	On Loan, Below 50th Perc Fee	117	108	102	-2.29	-2.98	-2.66
	On Loan, Above or Equal to 50th Perc Fee	339	327	317	-4.86	-4.12	-3.74
	t-stat, on loan above or equal to 50th perc - not on loan				*-2.38*	*-1.97*	*-1.75*
Korea	Not on Loan	98	96	93	8.84	8.26	8.12
	On Loan, Below 50th Perc Fee	157	153	150	-0.91	-1.27	-0.94
	On Loan, Above or Equal to 50th Perc Fee	274	269	264	-5.98	-5.99	-5.94
	t-stat, on loan above or equal to 50th perc - not on loan				*-1.52*	*-1.49*	*-1.47*
Malaysia	Not on Loan	72	71	70	-2.54	-2.47	-2.48
	On Loan, Below 50th Perc Fee	29	28	28	-0.77	-0.16	0.84
	On Loan, Above or Equal to 50th Perc Fee	49	48	48	-7.52	-7.20	-7.56
	t-stat, on loan above or equal to 50th perc - not on loan				*-2.05*	*-1.96*	*-2.04*
Singapore	Not on Loan	58	57	56	5.97	5.75	6.56
	On Loan, Below 50th Perc Fee	17	16	15	-10.28	-9.36	-10.41
	On Loan, Above or Equal to 50th Perc Fee	37	35	34	-13.87	-13.48	-14.33
	t-stat, on loan above or equal to 50th perc - not on loan				*-3.41*	*-3.28*	*-3.46*
Sweden	Not on Loan	58	57	55	14.11	13.68	13.78
	On Loan, Below 50th Perc Fee	8	7	7	3.81	6.30	5.62
	On Loan, Above or Equal to 50th Perc Fee	25	24	23	-3.35	-1.55	-0.21
	t-stat, on loan above or equal to 50th perc - not on loan				*-0.71*	*-0.31*	*-0.04*
Taiwan	Not on Loan	112	110	108	8.73	8.27	8.35
	On Loan, Below 50th Perc Fee	158	155	153	-4.98	-4.29	-4.89
	On Loan, Above or Equal to 50th Perc Fee	237	233	230	-8.61	-7.84	-8.78
	t-stat, on loan above or equal to 50th perc - not on loan				*-3.31*	*-2.99*	*-3.27*
Turkey	Not on Loan	17	17	16	-7.93	-6.40	-8.25
	On Loan, Below 50th Perc Fee	12	11	11	-4.42	-5.97	-2.94
	On Loan, Above or Equal to 50th Perc Fee	36	35	34	-1.18	-2.67	-2.19
	t-stat, on loan above or equal to 50th perc - not on loan				*-0.21*	*-0.47*	*-0.38*
US	Not on Loan	568	536	511	14.28	13.66	13.91
	On Loan, Fee Below 15 bps	902	859	825	-4.15	-4.04	-4.72
	On Loan, Fee Above or Equal to 20 bps	219	202	194	-11.56	-11.05	-11.85
	t-stat, on loan above or equal to 20bps - not on loan				*-3.58*	*-3.33*	*-3.51*

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates that a stock is on loan with a fee below 50th percentile fee. In the US, high fee indicates that a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates that a stock is on loan with a fee below 20 bps. Annualized return for each group is calculated as the market cap-weighted average return for each day, averaged across all days and multiplied by 252 trading days. Days with fewer than three small cap stocks on loan in a given country are excluded for that country. Past performance is no guarantee of future results.

Appendix 2: Performance of Large Cap Stocks and All Cap Stocks with High Borrowing Fees

We examine the pattern in average returns for portfolios sorted on borrowing fees across the large cap universe and all cap universe. Because we have the largest cross section of loan data within small caps and greater dispersion in observed fees within the small universe, we sort large cap stocks and all cap stocks on the 50th percentile fee of the small cap universe. Results for portfolios formed using a one-day look-back period for both large caps and all caps are presented below. Among large cap stocks, stocks on loan with a high fee on average underperform stocks not on loan by 7.44% on an annualized basis, with a t-statistic of –2.56. Results are similar among all cap stocks, though slightly stronger due to the inclusion of small caps: high-fee stocks underperform on average stocks not on loan by 8.50% annualized, with a t-statistic of –3.31. Portfolios formed using three-day and five-day look-back periods, and portfolios formed on the 50th percentile fee of the all cap universe, produce similar results and are omitted for brevity.

RETURNS TO ALL COUNTRIES, PORTFOLIOS FORMED WITH ONE-DAY LOOK-BACK PERIOD, JANUARY 2011–DECEMBER 2018

| | Large Cap Stocks | | | | |
| | Average Daily Return * 252: | | Average Number of Stocks | Weighted Average Fee (%) | Standard Deviation of Fee |
Portfolio	Average Return (%)	Relative to Not on Loan (%)			
Not on Loan	10.27		990		
On Loan, Low Fee	8.57	-1.70	685	0.21	0.68
On Loan, High Fee	2.82	-7.44	139	2.14	3.90
t-stat, on loan high fee - not on loan		*-2.56*			

| | All Cap Stocks | | | | |
| | Average Daily Return * 252: | | Average Number of Stocks | Weighted Average Fee (%) | Standard Deviation of Fee |
Portfolio	Average Return (%)	Relative to Not on Loan (%)			
Not on Loan	10.14		3,191		
On Loan, Low Fee	8.58	-1.56	2,100	0.23	1.00
On Loan, High Fee	1.64	-8.50	1,581	2.61	4.53
t-stat, on loan high fee - not on loan		*-3.31*			

Notes: Outside the US, high fee indicates that a stock is on loan with a fee greater than or equal to the 50th percentile fee by market capitalization within a given country each day; low fee indicates that a stock is on loan with a fee below 50th percentile fee. In the US, high fee indicates that a stock is on loan with a fee greater than or equal to 20 bps; low fee indicates that a stock is on loan with a fee below 20 bps. Weighted average fee and standard deviation of fee are computed each day for each group of stocks and averaged across all days. Average fee is weighted by daily market cap within each group of stocks. Annualized return for each group is calculated as the market cap weighted average return for each day, averaged across all days and multiplied by 252 trading days. Days with fewer than three small cap stocks on loan in a given country are excluded for that country. Past performance is no guarantee of future results.

Appendix 3: Data Descriptions

Loan data are from Dimensional. Data include daily loan-level price and quantity for securities on loan from Dimensional's US-domiciled equity mutual funds.

Stock data are from Bloomberg L.P. The eligible universe includes all firms in relevant regions. REITs are excluded from the universe. In addition, to be included in the international analyses, stocks need to meet certain minimum market capitalization and liquidity requirements. Unless otherwise specified, we use the following definitions and methodologies. Small cap is defined as approximately the bottom 10%, 12.5%, and 15% in US, developed ex US, and emerging markets, respectively. Stocks are sorted monthly. Countries are grouped by country of exposure. China indicates stocks that are based in China but may trade in Hong Kong.

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