Price Efficiency and Short Selling *

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ABSTRACT

This paper studies how characteristics of the equity lending markets affect price efficiency and the distribution of returns, using lending supply and loan fees as proxies for short-sale constraints. The data is collected from several custodians from January 2004 to December 2008, covering more than 10,000 stocks from 26 countries. Our main findings are as follows. First, lending supply has a significant impact on efficiency and on the distribution of returns. Stocks with limited lending supply and high loan fees are associated with low price efficiency. Second, lending supply is also associated with more extreme price fluctuations. We find that an increase in lending supply leads to both a decrease in price efficiency and in skewness and a higher frequency of extreme negative returns.

Keywords: Short-sales constraints, market efficiency, equity lending markets, extreme returns.

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Introduction

The financial markets crisis that begun in late 2007 brought back a long standing issue: what is the impact of short-selling constraints on financial markets? Do they make markets more or less efficient? After Lehman Brothers' bankruptcy in September 2008, regulators around the world have altered short-selling regulations, restricting or even prohibiting the short selling of particular stocks, like the Securities & Exchange Commission (SEC) in the US and the Financial Services Authority (FSA) in the UK. In the emergency order enacting the short-selling restrictions, the SEC recognized the usefulness of short-selling for market liquidity and price efficiency, but it also stated:[1]

> "*In these unusual and extraordinary circumstances, we have concluded that, to prevent substantial disruption in the securities markets, temporarily prohibiting any person from effecting a short sale in the publicly traded securities of certain financial firms, (...), is in the public interest and for the protection of investors to maintain or restore fair and orderly securities markets. This emergency action should prevent short selling from being used to drive down the share prices of issuers even where there is no fundamental basis for a price decline other than general market conditions.*" Securities Exchange Act Release No. 34-58952 (September 18th, 2008)

This paper studies whether short-sale constraints affect price efficiency and the characteristics of stock returns distribution around the world, where efficiency being defined as the degree to which prices reflect all available information, both timely and accurately. We use unique data on the equity lending market, comprised by lending supply postings and loan transactions between January 2004 and December 2008. This information is supplied on a daily basis by several custodians and prime brokers that lend and borrow securities. Our sample covers 12,621 stocks in 26 countries and has information on more than 90% of global stocks by market capitalization. This is, to the best of our knowledge, the most comprehensive international data set on equity lending used in academic research.

Our main findings are as follows. First, lending supply has a large impact on efficiency and on the distribution of returns. Stocks with limited lending supply and high loan fees are associated with low

[1]The release can be found at `http://www.sec.gov/rules/other/2008/34-58592.pdf`

price efficiency. More importantly, *increases* in lending supply cause increases in price efficiency. Second, lending supply is also associated with more extreme price fluctuations, both positive and negative.

We also conduct additional analysis using quarterly US stock data between 2004 and 2008, obtaining similar conclusions to the panel of global stocks. We find that increases in lending supply increase the frequency of extreme negative returns and reduce the frequency of extreme positive ones. These findings support regulatory concerns that short-selling can increase the frequency of crashes at the stock level; however regulators should be aware of the negative impact that these restrictions have on price efficiency. We show that the lending supply contains information above and beyond that contained in loan fees, constituting an important variable to explain price efficiency and the stock return distribution on its own. Our paper also contributes to the literature by providing a comprehensive overview of international stock lending markets and the determinants of lending supply and loan fees.

For each stock and for each week in our sample, we compute two measures of short-sale constraints: the lending supply of shares and the loan fee. Whenever an investor wishes to short a particular firm, she first needs to locate shares to borrow to deliver them to the buyer. Thus, a low lending supply indicates that short-sales constraints are binding more tightly, as the investor has to bear higher searching costs to locate the shares [Duffie, Garleanu, and Pedersen (2002)]. Furthermore, even when the borrower finds them, she has to compensate the lender with a loan fee. The higher is this fee, the tighter short-sales constraints will also be. However, an increase in the fee (i.e. the price of shorting) could be due to either (1) an increase in the demand for shares, related to private information or (2) a decrease in the supply available for lending. Thus, higher loan fees accompanied by a larger lending supply of shares do not necessarily imply that short-sale constraints are tighter. As shown by Cohen, Diether, and Malloy (2007), loan fees are not a sufficient statistic and it is important to differentiate between shorting demand and shorting supply whenever testing for the impact of short-sales constraints.

Our analysis proceeds as follows. We estimate panel regressions to explain cross-sectional differences in price efficiency using lending supply and loan fees as proxies for short-sale constraints. Our dependent variables are the following: the correlation between contemporaneous stock returns and lagged market returns, and the first-order autocorrelation of stock returns [Bris, Goetzmann, and Zhu (2007)]. Then, we consider the three measures of stock price delay used by Hou and Moskowitz (2005).

We estimate a regression of weekly stock returns on the contemporaneous returns of a world index, a domestic index and four lags of the domestic index. We then re-estimate this equation imposing the constraint that coefficients of lagged domestic returns are zero. The first delay measure (D1) compares the difference in R^2s from these two regressions, with higher values of D1 implying that a stock takes longer to incorporate new market information. Similar variations of the delay measure yield the same result: low lending supply and high loan fees are associated with smaller efficiency of stock prices.

A third measure of efficiency is the R^2 of a market model regression. Morck, Yeung, and Yu (2000), Durnev, Morck, and Yeung (2004), and Li, Morck, Yang, and Yeung (2004) have shown that *low* R^2s levels are generally associated with better governance and financial development, supporting its recent use as a proxy for efficiency. Our results, however, show that stocks with higher lending supply and lower loan fees tend to have *higher* R^2s, consistent with evidence by Kelly (2005), Hou, Peng, and Xiong (2006) and Teoh, Yang, and Zhang (2006). Bris, Goetzmann, and Zhu (2007) cleverly advocate using the difference from the co-movement between a firm's returns and the market depending on the sign of market returns (i.e. Down R^2s minus Up R^2). Regardless of whether short-sales constraints are associated with higher or smaller levels of idiosyncratic risk, their insight is that the difference in R^2s should decrease with fewer constraints, with prices on bad market-news days becoming relatively more efficient than those in good market-news ones. Using this more robust measure, our proxies of short-sales constraints support this conclusion.

We also compute various characteristics of the distribution of stock returns to test whether short-sale constraints increase the likelihood of extreme price fluctuation: the skewness and kurtosis of weekly stock returns, the frequency of large negative returns, and the frequency of large positive returns. The frequency of large negative returns is computed as the proportion of returns that are two standard deviations below the previous year's average. We find that high lending supply and small loan fees are associated with smaller skewness and kurtosis, and a higher frequency of extreme returns. Our results also show that increases in lending supply lead to more frequent extreme negative returns.

All these effects are economically large and allow us to conclude that short-sale constraints hinder price efficiency, but have the effect of reducing extreme negative price changes. The conclusions are robust to OECD-membership, and to controls for firm size, free float, leverage, liquidity and to whether a firm cross-lists its shares in the US or the UK. Furthermore, results remain similar when we constrain the sample to US firms and add stock turnover, momentum, book-to-market, exposure to market-risk, and Amihud (2002)'s ILLIQ as additional control variables.

The rest of the paper is divided in the following way. Section I contains a review of the literature. Section II describes our hypotheses and the measures of price efficiency. Section III describes the data and the construction of our measures of short-sale constraints. Section IV reports our empirical results. Finally, section V concludes.

I. Literature Review

It is generally accepted that short-sale constraints affect the efficiency of security prices [e.g. Miller (1977), Diamond and Verrecchia (1987), Duffie, Garleanu, and Pedersen (2002) and Bai, Chang, and Wang (2006)]. The main conclusion is that prices may no longer incorporate all available information, whenever agents have heterogeneous beliefs but are prevented from fully reflecting their beliefs on prices. Miller (1977) argues that short-sale constraints keep pessimistic investors out of the market, causing prices to be biased upwards because they only reflect the valuations of the more optimistic investors who trade. Diamond and Verrecchia (1987) develop a model in which short-sale constraints eliminate some informative trades. Prices are not biased upwards, but become less efficient when restrictions are in place, as they reduce the speed of adjustment to private information. Duffie, Garleanu, and Pedersen (2002) develop a model in which search costs and bargaining over loan fees generate endogenous short-selling constraints and affect asset prices. In our case, the lending supply of shares could be interpreted as a proxy for the cost of searching. In a recent paper, Bai, Chang, and Wang (2006) show that short-sale constraints can actually lower asset prices and make them more volatile. This happens because the loss in the informativeness of prices due to fewer informed investors increases the amount of risk borne by uninformed investors, who require lower prices as compensation to bear extra risk. Thus, regardless of whether short-sale constraints have positive or negative impact on prices, these papers imply that these constraints reduce the informational efficiency of prices, i.e. they no longer reflect all available information.

Empirical evidence of the impact of short-sale constraints on price efficiency is mostly concentrated on US stocks. High short interest (i.e., high number of stocks sold short as a fraction of total shares outstanding) is generally interpreted as evidence of short-sale constraints and many papers show that stocks with high short interest exhibit lower subsequent returns.[2] D'Avolio (2002) describes the market for borrowing and shows that the cost of short-selling a stock is high exactly at times when investor disagreement is also high, indicating that prices will not fully reflect negative information. Similarly, Reed (2003) studies rebate rates in the equity lending market as a proxy for short-sale constraints and shows that stock prices are slower to incorporate information when loan fees are high. However, most of these papers rely on indirect measures of short-sale constraints or a very restricted sample of lending data. An important benefit of our measures is that they can avoid these shortcomings.

For instance, high short interest might be due to increased borrowing demand reflecting investors' negative views about the stock that are unrelated to short-sale constraints, or be due to a fall in the supply of shares available for lending resulting in short-sale constraints. We estimate short-sales constraints by using both the lending supply and the loan fee. Furthermore, most of the previous studies that use loan fees are based on data from a single custodian (an exception is Kolasinski, Reed, and Ringgenberg (2008)). Individual custodians provide various services to prime brokers and might have different pricing strategies. Thus, data from a single custodian may not be representative of the average lending price. The average firm in our data has information provided by 10 custodians and therefore enable us to compute representative estimates of the average loan fee.

International evidence on the relationship between short-sale constraints and price efficiency is rare due to the difficulty in obtaining good data for short-sale constraints, especially at the security level. One exception is Bris, Goetzmann, and Zhu (2007), who use regulatory information on whether short-selling is prohibited or practiced in 46 different countries. They conclude that stock prices in countries with constraints are less efficient than those where investors are allowed to short stocks. Our proxies for short-sales constraints are of a different nature and contain information about how individual firms, rather than countries, are affected. Chang, Cheng, and Yu (2006) focus on regulatory restrictions to short-sell individual stocks in Hong Kong and find that constraints tend to cause overvaluation and

[2] See, for example, Figlewski and Webb (1993), Desai, Ramesh, Thiagarajan, and Balachandran (2002), Asquith, Pathak, and Ritter (2004), Diether, Lee, and Werner (2005), Boehmer, Jones, and Zhang (2006), Boehmne, Danielsen, and Sorescu (2006) and Cohen, Diether, and Malloy (2007)

this effect is more dramatic for stocks with wide dispersion of investor opinions. We contribute to the literature on price efficiency in international markets by showing (i) that the negative relationship between short-sale constraints and stock price efficiency is pervasive across global stocks and (ii) that equity lending supply is an important driver of differences in price efficiency.

II. Hypotheses and Measures of Price Efficiency

Our main hypothesis is that short-sale constraints decrease the informational content in stock prices, based on the theoretical work by Miller (1977), Diamond and Verrecchia (1987), Duffie, Garleanu, and Pedersen (2002) and Bai, Chang, and Wang (2006). In order to test it we construct novel measures of short-sale constraints and use them to explain various proxies for efficiency that have been proposed by the literature.

The first measure of price efficiency is the cross-correlation between current stock returns and lagged domestic market returns and first-order autocorrelation of stock returns [Bris, Goetzmann, and Zhu (2007)]. In a given year, we define $\rho^{Cross} = Corr(r_{i,t},\, r_{m,t-1})$ i.e., the correlation between weekly stock returns at time t and domestic value-weighted market returns at time $t-1$. We also compute $\rho^{Auto} = Corr(r_{i,t},\, r_{m,t-1})$ to investigate the impact of past firm-specific news on current returns. However, these measures do not capture any correlation that $r_{i,t}$ and $r_{m,t-1}$ might have with other omitted variables, like the contemporaneous market return.

Addressing the concerns above we use a second set of price efficiency measures based on Hou and Moskowitz (2005). The idea behind them is that if investors cannot fully incorporate information in today's stock prices, they will defer their actions such that this information only gradually feeds into prices. The price response delay is measured from a market model regression extended with lagged returns of a domestic market index. The larger is the explanatory power of these lags, the higher is the delay in responding to information. For each stock and year, we estimate a regression of the return in week t on the value-weighted domestic index return and its lagged values up to four weeks ago plus the world index return:

$$r_{i,t} = \alpha_i + \beta_i * r_{m,t} + \sum_{n=1}^{4} \delta_i(-n) * r_{m,t-n} + \gamma_i * r_{W,t} + \varepsilon_{i,t}, \qquad (1)$$

where $r_{i,t}$ represents returns of stock i in week t, $r_{m,t-n}$ the corresponding value-weighted domestic market return in week t and $r_{W,t}$ represents the returns of the value-weighted world index in week t. All returns are expressed in terms of the domestic currency. We focus on the impact of domestic market news and only use lags of the domestic index.

The first delay measure (D1) compares the fraction of variability in stock returns that is due to lagged market returns, by comparing the R^2 from the regression above with the one when coefficients on lagged market returns ($\delta_i(-n)$) are constrained to be zero.

$$D1_i = 1 - \frac{R^2_{\delta_i^{(-n)}=0,\forall n\in[1,4]}}{R^2}. \tag{2}$$

The larger is this measure, the greater is the variation in stock returns captured by lagged market returns, implying a higher price delay in responding to market information. However, D1 does not take into account the precision or magnitude of lagged market returns coefficients. Therefore, we also compute two additional delay measures:

$$D2_i = \frac{\sum_{n=1}^{4} |\delta_i(-n)|}{|\beta_i| + \sum_{n=1}^{4} |\delta_i(-n)|} \tag{3}$$

$$D3_i = \frac{\sum_{n=1}^{4} |\delta_i(-n)|/se\left(\delta_i(-n)\right)}{|\beta_i|/se\left(\beta_i\right) + \sum_{n=1}^{4} |\delta_i(-n)|/se\left(\delta_i(-n)\right)}, \tag{4}$$

where $se(.)$ denotes the standard error of the estimated coefficient. These measures measure the magnitude of the lagged coefficients relative to the magnitude of all market return's coefficients. We use the absolute values of each coefficient regardless of their estimated signs, since price efficiency is smaller as these measures deviate from zero. Hou and Moskowitz (2005) report that most coefficients estimated in their sample are either zero or positive for the portfolios they construct. They also state that results are the same when they use the absolute value of coefficients instead. In our case, it is crucial that absolute values are used to compute the delay measures.

A third type of price efficiency measure, which has gained support in recent years, is the R^2 of a market model regression. Morck, Yeung, and Yu (2000) document that stocks in poorer economies have less idiosyncratic risk (i.e., higher R^2) than stocks in rich countries and show how measures of property rights can explain this difference, conjecturing that stronger property rights result in relatively more firm-specific variation in stock prices. Jin and Myers (2006) suggest that country differences in R^2s are caused by lack of transparency, which limits the ability of outside investors to monitor firm insiders. Their interpretation is that more opaqueness shifts firm-specific risk from outsiders to insiders, increasing R^2s. The results that lower R^2s are associated with better governance and higher transparency is also found by Bris, Goetzmann, and Zhu (2007). They construct a dummy variable, based on market regulatory information and interviews with government officials, indicating whether short-selling is allowed and practiced in a given country in a given year. They show that countries where short sales are allowed and practiced have lower R^2 levels and a smaller difference in R^2s between bad-news and good-news weeks that those in which short-selling is forbidden or not practiced. Contradictory evidence to this result can be found in Kelly (2005). He shows that US firms with low R^2s tend to have tighter short-sale constraints (measured by changes in the breadth of institutional ownership proposed by Chen, Hong, and Stein (2002)). Another finding is that firms with higher bid-ask spreads, sensitivity to past market returns and liquidity also have lower R^2s. Given this evidence that relates low R^2s with stocks that seem to be less rather than more efficient, it is still an open question whether high or low R^2s indicate price efficiency.

Shedding more light on the debate about the correct sign of the relationship between short-sales constraints and R^2 levels, Bris, Goetzmann, and Zhu (2007) propose using the difference in the co-movement between a firm's returns and the market, depending on the sign of the market return. They estimate separate R^2s of market-model regressions using only negative market-return weeks (Down R^2) and, similarly, the R^2 for positive market-return weeks (Up R^2), computing their difference. Regardless of whether short-sales constraints are associated with higher or smaller levels of idiosyncratic risk, their insight is that the difference in R^2s should decrease with fewer short-selling constraints, and prices during bad market-news days become relatively more efficient than those in good market-news ones.

Although most researchers would agree that relaxing short-sale constraints increases the speed upon which prices reflect information, it is still relevant from a policy perspective to test whether relaxing them makes extreme negative price fluctuations more likely. The regulatory constraints imposed across the world following the Lehman Brothers collapse are a clear indication of this. We use four measures to investigate these claims: skewness, kurtosis, and the frequency of extreme negative and positive returns.

Negative skewness means that the left tail of the return distribution becomes fatter. Diamond and Verrecchia (1987) hypothesize that short-sale constraints should make returns less negatively skewed. Hong and Stein (2003) argue that short-sale constraints are positively related to skewness through the following mechanism: if constraints are relaxed, more pessimistic investors re-enter markets to trade on their beliefs, increasing the likelihood of negative returns. Our hypothesis is that whenever short-selling is easier, prices reflect bad news more quickly, increasing the likelihood of observing large negative returns. We compute skewness using two different return measures. First, we take weekly returns and compute their skewness for each firm-year in the sample. Second, we estimate a market-model equation with the domestic and the world index returns as factors and compute the skewness of the residuals generated by this regression.

Short-selling has been blamed as a contributing factor to many crashes in the past, from the 1929 market crash, to the Black Monday in 1987 [for further analysis refer to Lamont (2003)], the 1997 Asian crises, and the latest 2008 crisis. Thus, research on whether the frequency of extreme negative returns decreases with short-selling constraints is an important issue to regulators. To examine how these constraints affect the magnitude and likelihood of crises, we compute kurtosis and the frequency of weekly returns that are two standard deviations below (and also above) the average for the previous year. Combining the regression results of skewness, kurtosis, frequency of extreme negative and extreme positive returns allow us to disentangle which part of the distribution of returns (i.e., extreme negative or extreme positive), if any, is being affected by short-sale constraints.

A concern that must be addressed is the causality of the relationship. Our main hypothesis is that inefficiency is caused by more stringent short-sales constraints. However, it is not possible to rule out the reverse order of causality, i.e., it can be the case that inefficient stocks drive investors away from the lending market, reducing lending supply and increasing loan fees. We attempt to mitigate these fears using first-order lags of our short-selling proxies, and by estimating regressions using first-differences of all variables involved. Our findings are unaltered and reinforce our claim that price efficiency is reduced when investors face tighter short-sale constraints.

III. Data Description

This section describes the data used to test our hypotheses. We start by describing our stock lending data and our measures of short-sale constraints, followed by the returns data collected to estimate the price efficiency measures and the variables used to control for other factors which might affect the results.

A. Stock lending data

The lending data come from Dataexplorers Ltd., which collects this information from a significant number of the largest custodians in the securities lending industry.[3] The same data was previously used by Saffi and Sigurdsson (2008) to study price efficiency and short-selling constraints of international stocks. The data comprise security-level information on the value of shares available for lending and lending transactions from January 2004 to December 2008.[4] Figure 1 shows the evolution of the data set coverage over time. As of December 2008, there are $15 trillion in stocks available to borrow, out of which $3 trillion are actually lent out. This corresponds to an utilization level (i.e., amount lent out divided by amount available to borrow) around 17%.

[Figure 1 about here]

A.1. Lending Supply

Equity supply postings contain the dollar value of shares available for lending for a given day (or week if before January 2007). We define lending supply for security i as the fraction of lending supply

[3]This includes ABN Amro, Mellon, and State Street among others, which we cannot name due to a confidentiality agreement. The total number of suppliers is about 10 for each firm.

[4]The data is available at a weekly frequency between 2005 and 2006 and at a daily frequency afterwards.

relative to its market capitalization:

$$\text{Lending Supply}_{i,t} = \left(\frac{\text{Value of Shares Supplied}_{i,t}}{\text{Market Capitalization}_{i,t}} \right), \tag{5}$$

where i denotes stock and t stands the date.

Figure 2 displays an histogram with the distribution of supply as a fraction of firm capitalization. There is great variation in lending supply across firms, although these stocks do not have any regulatory constraints on being sold short. About 25% of firms have less than 2% of their market capitalization available to borrow, which could be caused either by a small lending supply or by small free float.

[Figure 2 about here]

Because our regressions are based on price efficiency measures computed at the yearly frequency, we use averages of weekly measures of lending supply and loan fees within a year. Finally, we winsorize the lending supply at 0.5% to limit the effect of outliers on our results.

The data provide a direct estimate of the stock lending supply, regardless of whether they are loaned out or not. In Cohen, Diether, and Malloy (2007), short interest (i.e. the percentage of total shares on loan) is coupled with loan fees as proxies to detect shocks to supply and demand. Our data allow us to directly measure the impact of the securities lending industry's supply side on stock price efficiency and on return distribution.

A.2. Loan Fee

We also have access to loan transactions with information on the loan fee, the borrowed amount and the currency used. Fees can be divided into two parts depending on the type of collateral used. If borrowers pledge cash - the dominant form in the US - then the loan fee is defined as the difference between the risk-free interest rate and the rate paid for the collateral. If instead the transaction uses other securities - like US Treasuries - as collateral, the fee is directly negotiated between the borrower and the lender.

This can be expressed by the following equation:

$$\text{Loan fee}_{n,i,t} = \begin{cases} \text{Fee}_{n,i,t} & \text{if non-cash collateral} \\ \text{Riskfree rate}_t - \text{Rebate rate}_{n,i,t} & \text{if cash collateral} \end{cases}, \tag{6}$$

where n denotes transaction, i stands for security and t denotes the date in which the transaction appears in the dataset. Loans can further be divided into two categories: open-term and fixed-term. Open-term loans are renegotiated every day, but fixed-term ones have predefined clauses and maturities. The overnight risk-free rate for the collateral currency is used for open-term loans. The Fed Open rate is used for loans with cash collateral denominated in US dollars and the Euro Overnight Index average (EONIA) is used for loans denominated in Euros. The risk-free rate proxy for other currencies is the overnight rate at London Interbank market (LIBOR) and local money market rates for smaller currencies. Linear interpolation of LIBOR rates is used for fixed-term loans in accordance with conventions in the securities lending industry.

The loan fee is weighted by loan amount using the following equation:

$$\text{Loan Fee}_{i,t} = \sum_{n=1}^{N_{i,t}} \left[\frac{\text{Loan amount}_{n,i,t}}{\sum_{n=1}^{N_{i,t}} \text{Loan amount}_{n,i,t}} \cdot \text{Loan Fee}_{n,i,t} \right], \tag{7}$$

where n denotes transaction, i stands for security, t denotes the week in which the transaction appears in the dataset and $N_{i,t}$ is the total number of outstanding transactions for security i in week t. Value weighting is used to limit the influence of small and expensive transactions on the average loan fee estimate.[5]

Figure 3 plots the distribution of average value-weighted annualized loan fees. The figure shows that fee levels are highly skewed, with the majority (75%) being very cheap to borrow and costing below 60 bps per year. These stocks are often referred by practitioners as “general collateral”. However, about 20% of observations are above 100 bps, which are referred to as “specials” by practitioners. Furthermore, in 5% of the cases the loan fee reaches levels above 400 bps.

[5]Unreported results show a negative relationship between loan fee and transaction size.

[Figure 3 about here]

We also need to control for the transfer of stock ownership during dividend-payment periods to investors with favorable dividend tax legislation. This widespread practice in the securities lending industry is a very common reason for lending stock [e.g. McDonald (2001), Rydqvist and Dai (2005) and Christoffersen, Geczy, and Musto (2006)], generally referred to as “tax-arbitrage”. The gains from this type of transactions are shared through an increase in loan fees. Thus, fees during these periods are not representative of a general lending price for a given security. Figure 4 shows both the increased loan fees and loan utilization around ex-dividend dates for dividend-paying stocks. The average increase in fees is close to 50%, with fees going from an average of 75 bps observed six weeks before to 105 bps on the ex-dividend week. Utilization (loaned out divided by lending supply) almost triples, going from 7% to 18% of lending supply. We control for this tax-arbitrage effect by excluding all transactions that are less than three weeks away from the week dividends are paid from our loan fee estimates.

Another use of equity lending is for vote trading, i.e., borrowing shares to use their voting rights during corporate votes. Although our data aggregate loans intended to short-selling and those used for vote trading, the evidence that the average price charged for these votes is zero [Christoffersen, Geczy, Musto, and Reed (2007)] makes us believe that our results are unaffected, especially in light of the yearly frequencies used to compute averages.

[Figure 4 about here]

A.3. Determinants of Lending Supply, Borrowing Fees and Utilization

Table I contains descriptive statistics for the stock lending database. The number of stocks covered by the data set is representative of the world market both as a percentage of market capitalization and as a percentage of the number of stocks. For example, the supply data covers more than 93% (78%) of the market capitalization of the US (UK) stock market. More than 84% of the total number of firms listed on Datastream are covered in our sample, with a bias towards large firms. When we examine the statistics of firms with lending transactions, there is a negligible decrease in coverage as measured by market capitalization (it falls from 91% to 87%) and a moderate one measured by the number of firms (falling from 87% to 77%). The average proportion of shares lent out in the US is about 9% of market capitalization, but with a high standard deviation of 13%. The average (value-weighted) loan fee charged to borrow US shares is close to 68 basis points per year, but this fee is very volatile in the cross-section, having a 161 basis points standard deviation. US stocks in our sample have a larger lending supply and are more expensive to borrow than those used by D'Avolio (2002), who uses data by a single custodian from April 2000 to September 2001. This difference directly reflects the growth of the equity lending market, with the inclusion of smaller firms in the pool of available securities.

[Table I about here]

In order to shed more light on how our main explanatory variables are related to firm and country characteristics we show a multivariate analysis in Table II with country fixed-effects. Firms that cross-list abroad, have higher book-to-market ratios, and lower liquidity tend to have higher lending supply. Smaller loan fees are associated with small capitalization and low book-to-market firms. Also, low liquidity is associated with higher loan fees just for the larger sample without the book-to-market ratio as an explanatory variable.

[Table II about here]

We also include ownership data from Datastream to further investigate how our proxies for short-sales constraints are related to stock ownership [Nagel (2005)]. Each variable shows the proportion of the firm owned by a different class of shareholders. First, we find that employee/family ownership has a negative effect on supply.[6] For example Vanco, a UK based technology company, is largely owned by its employees and has only 6.1% of market capitalization available for lending compared to 21.6% for the UK market as a whole. Employees keep their stock holdings in private accounts that are generally not big enough to be included in security lending programs. Additionally, even if they have large holdings these investors won't lend shares to avoid losing voting power and provide shares for speculative short-selling. We also find that long-term holdings of investment companies are associated with higher supply. This is logical, since investment companies often have the infrastructure to lend

[6] Datastream aggregates holdings by family owners and firm employees under the same variable (NOSHEM).

out securities and generally try to earn extra basis points by doing so. This category includes many investors who are unable or unwilling to short-sell (e.g. passive index funds or long-only mutual funds) and that can generate extra gains by lending stocks in their portfolios, making them prime providers of shares for lending [D'Avolio (2002)]. None of the ownership variables' coefficients are statistically significant in the loan fees regressions, suggesting that they would be good instruments for identifying supply and demand.

B. Other Variables

Stock returns, market capitalization, free float, book-to-market ratios, currency and interest rates from Datastream. Accounting data are only available for a subset of firms and thus, we perform the analysis on samples with and without accounting-based controls. We construct dummy variables to control for cross-listing from various sources. Information on American Depositary Receipts (ADRs) comes from the Bank of New York and JP Morgan's web sites and from CRSP tapes. Information on Global Depositary Receipts (GDRs) is taken from the London Stock Exchange website. We also construct a subset of US stocks using quarterly CRSP/Compustat data for further robustness controls using a more detailed set of firm controls. For this sub-sample we compute average stock turnover, Amihud (2002)'s ILLIQ measure, leverage (defined as total book debt divided by total book debt plus total book equity), systematic risk (defined as the beta from regressing daily firm returns on the CRSP VW index), the Book-to-Market ratio (defined as total book equity divided by market capitalization), and Momentum (defined as the average return on the two previous quarters).

In Table III, we present summary statistics for the measures of price efficiency and other variables of interest for our analysis. Panel A shows results for the smaller sample of firms with free float and book-to-market information data, while Panel B repeats the calculations using all available firms. The average yearly R^2 in our larger sample equals 25% a year, which is similar to the values documented by Campbell, Lettau, Malkiel, and Xu (2001) for US-based stocks. The average correlation between contemporaneous weekly returns and lagged market returns is -0.02%. Stock returns are skewed to the right, with mean skewness equal to -0.09, similar to Bris, Goetzmann, and Zhu (2007). The percentage of weekly returns two standard deviations below (above) the previous year's average is around 6%

(5%). These are bigger than the 2.28% expected from a normal distribution and reflect the fatter tails observed in empirical data. Overall, our summary statistics match the patterns documented in the literature.

[Table III about here]

Table IV shows the characteristics of stocks sorted by lending supply. Firms with higher supply tend to have smaller and less volatile fees. The only noticeable difference from the number of weeks with supply information across deciles (shown under Column $\#_{Sup}$) is that firms with higher supply do have a higher number of weeks with lending transactions. Loan utilization (shares lent out divided by lending supply) is generally stable across most deciles apart from the first one. This means that once a stock is relatively unconstrained, loan utilization do not depend much on lending supply.[7] Firms with higher lending supply firms also tend have larger stock market capitalization, and more likely to have shares cross-listed outside their home countries. Finally, firms in the lowest decile of lending supply have higher average annualized returns (13.94%) than those in the top decile (11.68%), but also display much higher standard deviations of (86.09% vs. 53.66%).

[Table IV about here]

IV. Empirical Results

We estimate regressions using yearly data with firm fixed-effects and corrected for heteroscedasticity using robust standard errors clustered by firms. All variables are standardized such that each variable has zero mean and unit standard deviation for each country-year. This standardization controls for country and year-specific variation, such as those related to differences in corporate governance regimes [Morck, Yeung, and Yu (2000)] and opaqueness [Jin and Myers (2006)]. The standardization allows to evaluate each coefficient as the response to a unit standard deviation shock of a particular explanatory variable.

We add a dummy variable to control for securities that have ADRs or GDRs traded outside the domestic market, based on evidence that cross-listing makes prices more efficient [Doidge, Karolyi,

[7] We thank an anonymous referee for highlighting this point.

Lins, Miller, and Stulz (2005)].[8] Our main sample has controls for book-to-market ratios, free float and market capitalization. Liquidity effects are controlled via the proportion of zero-return weeks in a given year, similar to Bekaert, Harvey, and Lundblad (2005). Firms with zero-returns are likely to not have been traded, which proxy for liquidity. After describing our base specification results, we also perform different tests to evaluate the robustness of our conclusions to regressions using first-differences, OECD country-membership, loan utilization instead of loan fees, and to using a subset of US firms using CRSP data.

A. Price Efficiency Measures

We start by examining whether our proxies for short-sale constraints are related to the different measures of price efficiency. We first employ the absolute value of the cross-correlation of stock returns proposed by Bris, Goetzmann, and Zhu (2007) and run panel-data regressions using lending supply and the loan fee as explanatory variables. The cross-correlation is defined as the correlation between contemporaneous stock returns and lagged market returns. Because absolute value of the correlation is bounded between -1 and 1, we apply the following transformation: $\ln[(1+\rho)/(1-\rho)]$ and use the result as a proxy for efficiency. We find results that firms with larger supply and lower loan fees have smaller cross-correlations. The results in column 1 of Panel A in Table V imply that a one standard deviation increase in lending supply reduces the cross-correlation by 0.072 standard deviations, being statistically significant at the 1% level. Loan fees have an opposite and smaller effect but are not statistically significant. The impact of cross-listing has a positive coefficient in Panels A and B. Thus, we don't find support for the claim that it improves efficiency using cross-correlation. In column 2, we re-estimate the same specifications using the first-order autocorrelation as our dependent variable. Lending supply coefficients are also negative but not statistically significant, while loan fees are positive and significant only in Panel B.

[Table V about here]

[8] The dummy variable is dynamic such that it only takes a value of one on the year following the initial cross-listing.

However, the correlation measures might be a biased measure of efficiency since they do not control for the correlation of contemporaneous stock returns and lagged domestic index returns with omitted variables. We address this concern by looking at price delay measures (Hou and Moskowitz (2005)) that account for this possibility. These measures (D1, D2 and D3) compare the usefulness of domestic market index lagged returns to explain stock returns and do not suffer from the problems that affect the correlation measures. Using them as measures of price efficiency, we find that a higher lending supply is associated with less price delay, but do not obtain significant results for loan fees.

As predicted, the results in columns three to five of Table V show that D1, D2 and D3 are negatively related to lending supply. For example, the coefficient for lending supply in column 4 of Panel A means that a one standard deviation increase in lending supply is associated with a 0.09 standard deviation decrease in D2. Loan fees parameters are positive for all measures, but only statistically significant for D1. Firms with low book-to-market, high market capitalization and liquidity are also associated with less price delay. We would expect smaller price delays to be associated with cross-listing if firms that cross-list their shares internationally benefit locally from the better disclosure and transparency environments. We support this hypothesis for D2 (-0.998 coefficient) and D3 (-1.028) in Panel A, but do not find any significant parameters in Panel B.

We now repeat the analysis looking at how the proportion of idiosyncratic risk relative to total risk is related to short-sale constraints. We transform the dependent variable using $\ln[R^2/(1-R^2)]$ to avoid any statistical complications caused by R^2s being bounded between 0 and 1. Results in column six of Table V show that stocks with higher lending supply and lower loan fees have higher R^2s. The average R^2 is 0.15 for firms in the bottom lending supply decile and 0.35 for firms in the top decile. In Panel A, the estimated impact of a one standard deviation increase in lending supply equals 0.04 standard deviation. We also obtain a negative relationship between R^2s and loan fees, with a -0.07 estimated coefficient. Additionally, firms with higher liquidity, market capitalization and lower B/M have higher R^2.

All these results point to *high* R^2s as a proxy of price efficiency, but this is at odds with results at country-level shown in Bris, Goetzmann, and Zhu (2007). They find that R^2 levels are higher in countries where short-selling is prohibited or not practiced, but smaller in those with more liquid securities.

Our findings are similar to those in Kelly (2005), who shows that US firms with low R^2s are associated with higher transaction costs, sensitivity to past market returns and liquidity. He also uses the change in breadth of institutional ownership [Chen, Hong, and Stein (2002)] as a proxy for short-sale constraints and find that firms with more binding constraints have lower R^2s. Furthermore, Hou, Peng, and Xiong (2006) and Teoh, Yang, and Zhang (2006) show that financial anomalies are more pronounced in firms with lower R^2s.

We also present results using the alternative measures proposed by Bris, Goetzmann, and Zhu (2007), who compute separate R^2s of market-model regressions using only bad market-return weeks (Down R^2) and, the R^2 for good market-return weeks (Up R^2) and then compute the difference (R^2_{Diff}). Regardless of the direction of the relationship between short sale constraints and R^2s, the difference in R^2 between good and bad market-return weeks should decrease with fewer short-selling constraints. For R^2_{Diff} we do not find a statistically significant relationship between R^2 measures and short-selling proxies.

B. Stock Return Distribution and Regulatory Concerns

Regulators are generally concerned that relaxing short-sale constraints may increase the probability of crashes. The widespread use of short-selling by hedge-funds and their huge impact on daily trading volume has generated questions about the fairness and legality of this type of trade [see for example the article at Forbes.com (2006)]. We investigate this claim by showing in Table VI how our proxies for short-selling constraints affect four characteristics of distribution of returns: skewness, kurtosis, and the frequency of extreme negative and extreme positive returns at the stock level.

The average skewness of firms in the lower lending supply decile is 0.15, while equal to -0.1 in the top decile. In most regressions we obtain negative coefficients for lending supply (e.g. -0.038 in column 1 of Panel A) and positive (0.05) for loan fees. They are statistically significant at the 5% level in most specifications. These results are in line with those found by Bris, Goetzmann, and Zhu (2007) for international market indices and Chang, Cheng, and Yu (2006) in Hong Kong's stock market. Skewness also decreases with book-to-market (0.281 coefficient in column 1 of Panel A), liquidity (0.062 found for the zero-return weeks variable), free float (0.036) and market capitalization (0.100). These results are similar regardless of whether we compute the skewness of raw returns or based on residuals generated from a market-model equation to remove the impact of systematic market fluctuations. Using our proxies allow us to show that the link between skewness and short-sale constraints also exists at the stock level across different countries.

[Table VI about here]

We can also examine kurtosis to test whether short-sales constraints are associated with "thicker" tails of the distribution of returns, implying a higher frequency of extreme returns. In columns three and four of Table VI we estimate the relationship between short sale constraints and kurtosis using as dependent variables both raw stock returns and residuals from a market-model regression. We find that higher lending supply and low loan fees are associated with smaller kurtosis, meaning that stocks with fewer short-sales constraints are associated with more extreme returns. A one standard deviation increase in lending supply and loan fees leads to, respectively, a -0.043 and 0.046 standard deviation increase in Kurtosis in Panel A. Lower book-to-market, liquidity and market capitalization are also associated with smaller kurtosis.

Although the results for skewness and kurtosis are consistent with the idea that short-sales constraints might affect the frequency and magnitude of crashes, they are not a sufficient condition. The association between lending supply and skewness might be due to an increase in the relative proportion of modest negative returns relative to positive returns or, instead, from an increase in the frequency of extreme negative returns relative to ones near the average. We disentangle this by examining the proportion of weekly returns in a given year that are two standard deviations below (Extreme Down) or above (Extreme Up) the previous year's average, showing results in the last two columns of Panel A in Table VI. Although we do not find any explanatory power for loan fees, we obtain a positive and statistically significant relationship between the frequency of extreme returns and lending supply. A one standard deviation increase is associated with a 0.107 standard deviation increase in the frequency of extreme negative returns. We also find evidence that crashes are less likely for stocks with smaller liquidity, market capitalization and book-to-market ratios.

Overall, our results find that higher lending supply is associated with a higher frequency of extreme returns. If lending supply is a good proxy for short-selling constraints, combining the results above with those found for price efficiency measures establish the trade-off that regulators should evaluate when imposing restrictions on short-selling. While these constraints are associated with smaller price fluctuations, they also decrease price efficiency.

C. *Causality and Time-Series Properties*

Although our findings show that lending supply is a good proxy for short-selling constraints and that is related to price efficiency, the previous section does not tackle the casuality of the relationship. For example, this would mean that inefficient stocks drive investors away from the lending market, reducing lending supply and increasing loan fees. Additionally, none of the regressions in the previous section use the time-series variation in equity lending variables. The interesting result for academics and practitioners alike is whether *changes* in lending supply (and loan fees) are associated with *changes* in price efficiency and price fluctuations. We investigate this by computing the first differences of our normalized variables and re-estimating our models, presenting results in Table VII. Using yearly differences still miss within-year variation in the equity lending market variables, but we are still able to obtain significant results. Later, we also report results regressions with US data using quarterly differences, obtaining similar conclusions.

In Panel A we report results for the price efficiency measures. First, increases in lending supply decrease price efficiency for most efficiency measures. For example, we find that both the cross-correlation (coefficient equal to -0.118 in column 1) and the first-order autocorrelation (-0.076 in column 2) decrease when lending supply increases. The D2 and D3 delay measures also support this claim (parameters are significant at the 1% level). However, we do not obtain statistically significant results for D1 and R^2-based measures, although they all have the correct signs. Second, changes in loan fees are not statistically related to changes in price efficiency measures (apart from the R^2).

In Panel B we can see how yearly changes in lending supply and loan fees affect the distribution of stock returns. Our results show that an increase in lending supply is associated with more negative skewness (estimated parameter equal to -0.06) and a higher frequency of extreme negative and positive returns (parameters respectively equal to 0.149 and 0.105), but it does not seem to affect kurtosis.

On the other hand, the only statistically significant impact due to changes in loan fees is to increase kurtosis. Overall, an yearly increase in lending supply lead to increases in the frequency of extreme returns.[9]

[Table VII about here]

D. Additional Robustness Tests

This section describes the various robustness tests we conduct to evaluate the sensitivity of our conclusions to different assumptions. First, we replace loan fees with a measure of stock lending utilization by dividing the total amount lent by the total lending supply of shares available. In Table VIII we report results for the lending supply and utilization parameters (the control variables are the same as in previous tables). We see that lending supply is still significant for all variables but R^2_{Diff}, with the same conclusions as in our main sample. The explanatory power of Utilization is low for most variables. Although statistically significant for cross-correlation, D2 and D3, they are not robust across the other price efficiency measures seen in Panel A. Utilization has statistically significant parameters for skewness and extreme positive returns, but not for the other characteristics of stock returns shown in Panel B. These results can be explained by the fact that stocks with high utilization aren't necessarily short-sale constrained, but are in high demand from investors. This is similar to the econometric problems that arise when short interest, a measure of short-selling demand, is used as a proxy for short-sale constraints.

[Table VIII about here]

Lastly, the country fixed-effects we use as controls in our main regressions do not account for different slopes across countries. We test this possibility by adding interactions of lending supply, loan fees and market capitalization with a dummy variable that controls for OECD membership which proxy for the level of financial development. Out of the twenty-six countries, eight are not members of the OECD (China, Hong Kong, Israel, Mexico, Singapore, South Africa and South Korea) but comprise

[9]We have also estimated regressions using lending supply and loan fees lagged one year, the results we obtain are qualitatively the same as those found with first-differences. These results are available upon request.

only about 5% of the observations. We can see that the impact of lending supply comes mainly from OECD countries. The F-tests on whether OECD / non-OECD parameters are equal to each other reject the null for all efficiency measures. The joint test of the hypothesis that supply parameters are equal to zero is also rejected for all variables at the 1% level (apart for R^2_{Diff} that is marginally significant with a p-value of 10%). The lack of significance of loan fee parameters is most likely due to multicollinearity, as the joint hypothesis test that both parameters are equal to zero is rejected for all efficiency measures. As for market capitalization, there does not seem to be any major economic difference between OECD and non-OECD countries, with firm capitalization being associated with higher efficiency as found for the main sample.

[Table IX about here]

E. Regressions for US Firms with Additional Controls

Given the size and importance of the US stock market in global financial markets, it is important to check our results' robustness for US firms. Using CRSP and Compustat quarterly data, we compute stock turnover, Amihud (2002)'s ILLIQ, leverage, market beta, and momentum (the total return in the previous six months) for each firm.[10] This new data set has 2,225 firms with 17,928 firm-quarter observations from January 2005 to June 2008. The higher frequency also allows to detect fluctuations in lending supply and loan fees much faster than using yearly data, which is likely to also increase the statistical power of our tests.

In Table XI we report the impact of lending supply and loan fees on characteristics of US stocks return distribution using an extended set of control variables, both for levels (Panel A) and using first-differences (Panel B). In Panel A, we see that higher lending supply and smaller loan fees are associated with smaller skewness (coefficients equal to -0.16 and 0.04 using excess skewness, both statistically significant at the 1% level). Larger loan fees are associated with higher kurtosis and abnormal kurtosis (coefficients are equal to, respectively, -0.057 and -0.071 and statistically significant at the 1% level), in line with the idea that when it is more expensive to borrow shares, there is less short-selling and

[10]Option trading is reflected in the equity lending market since option sellers will often hedge their exposure. Thus, it hasn't been completely ignored in previous regressions.

less negative price pressure. When we look at the frequency of extreme returns, we find that a higher lending supply is associated with more extreme positive returns, but not statistically related to fewer extreme positive returns. This is consistent with the idea proposed by Miller (1977) that short-selling allows for the impounding of negative information into prices, preventing over optimistic agents from inflating prices. Furthermore, larger stock turnover, smaller market betas is strongly associated with more negative skewness, higher kurtosis and extreme positive and negative returns frequencies, in line with Chen, Hong, and Stein (2001).

[Table XI about here]

In the first-differences regressions shown in Panel B we find that an increase in lending supply between quarters decreases skewness, increases the frequency of extreme negative returns, but not the frequency of extreme positive returns. For example, a one standard deviation increase in lending supply causes a 0.095 standard deviations increase in the frequency of extreme negative returns and a 0.075 fall in the frequency of positive returns, shifting the probability mass of the stock return distribution to the right. Surprisingly, we do not find any explanatory power for changes in loan fees. Overall, the evidence shown throughout the paper points out to a statistically significant impact of lending supply on the frequency and magnitude of price fluctuations. Although regulators should be aware that price efficiency is likely reduced when short-selling is constrained, it also seems that these constraints have an impact in reducing large price changes.

V. Conclusion

Using a unique data set with weekly stock lending transactions across 26 countries, this paper estimates the impact of short-sale constraints on measures of price efficiency and on characteristics of the return distribution. We find strong evidence to support the hypotheses implied by Diamond and Verrecchia (1987), Duffie, Garleanu, and Pedersen (2002) and Bai, Chang, and Wang (2006) that equity lending supply, and to a lesser extent loan fees, are associated with less price efficiency. We also provide a comprehensive overview of stock lending markets across the world and show how lending supply and loan fees are related to firm characteristics, showing the impact of equity lending supply on stock price efficiency and on the distribution of stock returns.

We estimate panel regressions to explain cross-sectional differences in price efficiency. Stocks with limited lending supply and high loan fees have longer delays in responding to market-wide shocks. Relaxing shorting restrictions is associated with an increase in the speed by which information is incorporated into prices. Large and more liquid firms also tend to have more efficient prices, while those with higher leverage and low book-to-market ratios tend to be less efficient.

We look at changes in the distribution of stock returns based on four measures: the skewness and kurtosis of weekly stock returns, and the frequency of large negative and large positive returns. We find that increases in lending supply leads to more negative skewness and to a higher frequency of extreme negative returns. These findings are in support of the regulatory view that shorting restrictions may decrease the frequency of crashes at the stock level, but we also stress the decrease in price efficiency associated with such a move. The conclusions are robust to controls for firm size, free float and liquidity. We encourage regulators to increase the transparency of equity lending market, specially by providing investors with information on the lending supply of shares.

Table I: Stock lending markets around the world

This table shows summary statistics divided by country for firms present in Datastream on December 19th, 2008. Market cap is the sum of market capitalization in USD billions and Stocks reports the number of stocks taken from Datastream. In the "Stocks with lending supply" panel, these firms are matched to equity lending data. MC(%) shows the percentage of firms with lending supply data as a fraction of domestic market capitalization, while Stocks(%) as a fraction of the total number of firms in a given country. Avg. supply and St. dev. denote, respectively, the average lending supply relative to total shares outstanding and the standard deviation for a given year. The "Stocks with lending transactions" panel contains summary statistics for firms with recorded lending transactions. We report annual means and standard deviations for the amount of shares lent (as % of market capitalization) and the size-weighted loan fee.

	Market		Stocks with lending supply				Stocks with lending transactions					
Country	Market cap	Stocks	MC(%)	Stocks(%)	Avg. supply	St.dev.	MC(%)	Stocks(%)	On loan(%)	St.dev.	Fee	σ(Fee)
AUSTRALIA	698	407	87	80	15.62	16.51	87	74	6.42	9.88	132	159
AUSTRIA	104	53	100	98	10.75	11.41	98	87	3.11	3.94	82	108
BELGIUM	190	78	72	88	6.94	8.77	72	81	1.99	4.09	106	116
CANADA	1,138	882	81	68	23.62	21.12	76	59	8.08	14.32	104	116
DENMARK	131	87	74	84	6.56	7.86	68	76	2.52	4.13	180	155
FINLAND	154	91	97	95	8.59	10.00	96	90	2.57	3.45	171	194
FRANCE	1,484	350	98	92	6.59	9.44	97	79	3.71	5.86	126	135
GERMANY	1,212	443	96	87	9.27	12.05	91	74	4.72	8.87	108	139
HONG KONG	898	261	94	86	6.96	6.84	93	75	1.61	2.26	154	157
ISRAEL	28	43	90	91	9.02	14.30	90	77	1.82	3.32	110	108
ITALY	678	247	82	89	4.96	5.76	82	81	2.18	3.40	134	117
JAPAN	3,267	2,093	96	95	4.49	5.77	95	87	1.53	3.07	157	142
MEXICO	205	45	87	87	7.99	8.03	87	89	1.50	5.06	212	82
NETHERLANDS	576	107	69	68	13.95	13.32	69	66	4.12	5.50	89	131
NEW ZEALAND	18	33	96	94	5.15	5.93	94	76	1.98	4.12	119	102
NORWAY	135	110	95	85	11.92	15.34	93	75	6.28	9.92	146	133
PORTUGAL	54	27	96	81	4.28	3.56	96	81	1.87	1.82	135	137
SINGAPORE	178	140	69	85	6.81	8.57	65	75	1.52	2.17	185	158
SOUTH AFRICA	198	63	89	79	6.03	5.41	82	67	1.80	4.33	49	26
SOUTH KOREA	403	170	99	96	4.76	4.97	92	83	1.01	1.19	216	153
SPAIN	664	108	88	84	4.78	5.19	87	81	2.48	2.59	213	195
SWEDEN	281	187	98	93	8.95	9.76	97	90	2.77	4.37	97	77
SWITZERLAND	852	231	94	89	13.02	11.93	93	84	2.91	5.66	50	85
THAILAND	94	56	82	89	2.55	2.18	69	71	0.46	0.89	251	140
UNITED KINGDOM	1,838	1,001	78	76	21.63	19.27	76	67	5.74	10.84	112	130
UNITED STATES	11,621	5,308	93	81	23.56	20.43	88	78	8.91	13.02	68	161
WORLD	27,097	12,621	91	84	15.77	18.20	87	77	5.75	10.60	107	153

Table II
Determinants of Lending Supply and Loan Fees

The table estimates lending supply and loan fees as a function of firm characteristics between 2004 and 2008. Each firm-year must have at least 50 weekly return observations and less than 10 weeks with zero returns and belong to a country with at least 16 companies. Ln(Supply) is the log of yearly average lending supply relative to market capitalization, while Loan Fee is the average yearly loan fee computed from available loan transactions. Explanatory variables are: "ADR or GDR" is a dummy variable equal to one if the firm has ADRs or GDRs issued abroad, the log of the book-to-market ratio, the log of market capitalization Zero-return weeks is the proportion of zero-return weeks in a given year. Ownership variables and price data are obtained from Datastream and measure, respectively, holdings by employees & family owners, government stakes, investment firm investments, and direct holdings of pension funds. The panel regressions are estimated using fixed country-year effects with robust (Huber/White/sandwich) standard errors clustered at the firm level. T-statistics are reported in brackets and significance levels are indicated as follows: **=significant at the 5% percent level; +=significant at the 1% level.

	Mean	St.dev.	Ln(Supply)		Borrowing Fee	
			(i)	(ii)	(i)	(ii)
ADR or GDR	0.07	0.26	0.388	0.588	-0.135	-0.189
			[0.205]**	[0.254]**	[0.105]	[0.160]
Ln(B/M)	-0.65	0.71	0.131		-0.070	
			[0.021]+		[0.024]+	
Ln(Market Cap.)	-0.34	1.61	0.365	0.274	-0.403	-0.368
			[0.023]+	[0.014]+	[0.027]+	[0.019]+
Zero-return weeks	0.00	0.01	-1.483	-1.762	0.274	0.762
			[0.408]+	[0.333]+	[0.544]	[0.452]*
Ownership Measures(%)						
Employees & Family	7.60	15.74	-0.004		0.000	
			[0.001]+		[0.001]	
Government	0.54	5.15	0.001		0.000	
			[0.002]		[0.002]	
Invest. companies	10.52	16.02	0.003		0.001	
			[0.001]+		[0.001]	
Pension funds	0.66	2.50	0.017		0.003	
			[0.004]+		[0.005]	
Mean(Dependent)			0.04	0.04	1.09	1.08
StDev(Dependent)			0.05	0.05	1.36	1.34
Observations			27,499	43,173	27,504	43,287
Number of companies			7,987	12,329	7,988	12,376
R^2			0.28	0.10	0.11	0.10
Country-year fixed effects			Yes	Yes	Yes	Yes

Table III
Stock market characteristics around the world

The table shows summary statistics based on yearly values between 2004 and 2008 using Datastream price data. Each firm must have at least 50 weekly return observations, less than 10 zero-return observations and more than 5 lending observations in a given year. Furthermore, each country must have more than 15 firms in a given year. Panel A contains firms for which accounting data from Compustat Global is available, while Panel B relaxes this requirement and uses all available data. The R^2 comes from a regression of weekly stock returns on the domestic index and a world index. Cross-correlation is the correlation between contemporaneous weekly stock returns and lagged domestic market returns. D1, D2 and D3 are proxies for price delay proposed by Hou and Moskowitz (2005). The frequency of extreme negative (positive) returns is computed as the fraction of return below (above) two standard deviations from the previous year's average. Supply(% mc) is the average lending supply relative to market capitalization, while Loan Fee is the average yearly fee computed from available loan transactions winsorized at 0.5%. "ADR or GDR" is a dummy variable equal to one if the firm has ADRs or GDRs issued abroad, and Zero-return weeks is the proportion of zero-return weeks in a given year.

	Obs.	Mean	Median	St.dev.	Min.	Max
PANEL A: Small sample (firms with B/M and Free Float data)						
R^2	13,882	0.27	0.25	0.18	0.00	0.93
Cross-correlation	13,882	-0.03	-0.03	0.15	-0.54	0.67
D1	13,882	0.28	0.21	0.23	-1.80	1.00
D2	13,882	0.54	0.51	0.21	0.04	1.00
D3	13,882	0.66	0.67	0.18	0.09	1.00
Skewness of raw returns	13,882	-0.08	-0.06	0.94	-6.64	6.70
Skewness of abnormal returns	13,882	0.05	0.07	0.99	-6.45	6.86
Kurtosis of raw returns	13,882	2.40	1.25	3.91	-1	47
Kurtosis of abnormal returns	13,882	2.47	1.27	3.95	-1	49
Freq. extreme negative returns	11,584	0.06	0.04	0.07	0.00	0.90
Freq. extreme positive returns	11,584	0.05	0.04	0.05	0.00	1.00
Supply(% mc)	13,882	0.06	0.04	0.06	0.00	0.62
Loan fee (% p.a.)	13,882	0.68	0.18	1.14	-0.11	8.19
ADR or GDR dummy	13,882	0.05	0.00	0.21	0.00	1.00
B/M	13,882	-0.75	-0.67	0.68	-2.87	4.61
Market cap (USD billions)	11,579	3.36	0.69	11.98	0	293
Zero-return weeks (%)	13,882	0.01	0.00	0.02	0.00	0.17
PANEL B: Large sample (firms without accounting data)						
R^2	27,771	0.25	0.22	0.17	0.00	0.93
Cross-correlation	27,771	-0.02	-0.02	0.15	-0.54	0.67
D1	27,771	0.30	0.23	0.24	-1.80	1.00
D2	27,771	0.56	0.54	0.21	0.04	1.00
D3	27,771	0.68	0.69	0.18	0.09	1.00
Skewness of raw returns	27,771	-0.09	-0.05	1.03	-6.98	7.20
Skewness of abnormal returns	27,771	0.03	0.08	1.05	-6.99	6.86
Kurtosis of raw returns	27,771	2.71	1.36	4.45	-1	52
Kurtosis of abnormal returns	27,771	2.73	1.38	4.37	-1	50
Freq. extreme negative returns	23,596	0.06	0.04	0.07	0.00	0.92
Freq. extreme positive returns	23,596	0.05	0.04	0.05	0.00	1.00
Supply(% mc)	27,771	0.06	0.04	0.06	0.00	0.93
Implied fee (% p.a.)	27,770	0.83	0.19	1.38	-0.11	8.19
ADR or GDR dummy	27,771	0.04	0.00	0.19	0.00	1.00
B/M	27,771	3.40	0.51	14.31	0.00	465.41
Market cap (USD billions)	27,771	3.40	0.51	14.31	0.00	465.41
Zero-return weeks (%)	27,771	0.01	0.00	0.02	0.00	0.18

Table IV: Descriptive Statics - Stocks sorted on Lending Supply

The table shows characteristics of portfolios sorted on lending supply deciles based on yearly averages between 2004 and 2008 using Datastream price data. Each firm must have at least 50 weekly return observations, less than 10 zero return observations and at least 6 lending observations in a given year to be included. Furthermore, each country must have more than 16 firms in a given year. Obs. gives the number of firm-year observations included in each portfolio. μ_{Supply} reports the average weekly lending supply as a fraction of market capitalization. μ_{Fee} reports average loan fee winsorized at 0.5%, while σ_{Fee} the standard deviation for each decile. Columns N_S and N_L show, respectively, the average number of weeks with lending supply and lending transactions. Util. reports average dollar value of lending transactions scaled by available supply. μ_{ret} and σ_{ret} report annualized mean weekly returns and standard deviations. Size(bi) shows the average market capitalization in billions of US dollars. D_{Cross} shows the proportion of stocks with an ADR or GDR outside their parent country.

Decile	Obs.	μ_{Supply}	μ_{Fee}	σ_{Fee}	N_S	N_L	Util.	μ_{ret}	σ_{ret}	Size (bi)	D_{Cross}
1	2,776	0.00	0.63	1.98	41	27	0.30	13.94	86.09	0.68	0.68
2	2,776	0.01	0.57	1.66	43	32	0.22	15.03	79.84	1.19	1.19
3	2,779	0.02	0.50	1.65	42	35	0.21	13.76	80.05	1.11	1.11
4	2,777	0.03	0.40	1.29	42	36	0.21	12.85	79.68	1.44	1.44
5	2,777	0.05	0.34	1.23	42	37	0.21	12.26	82.56	1.76	1.76
6	2,778	0.06	0.28	1.00	41	38	0.22	10.99	67.15	3.31	3.31
7	2,778	0.08	0.24	0.78	40	38	0.20	10.75	68.08	8.01	8.01
8	2,778	0.09	0.19	0.60	39	37	0.18	10.66	59.26	8.02	8.02
9	2,777	0.11	0.19	0.68	40	39	0.20	10.99	56.90	4.72	4.72
10	2,775	0.15	0.19	0.70	40	39	0.21	11.68	53.66	3.73	3.73
Total	27,771	0.06	0.35	1.38	41	36	0.22	12.29	72.45	3.40	3.40

Table V
Equity Lending Market & Price Efficiency Measures

The table uses lending supply and loan fees to explain price efficiency measures from 2004 to 2008 using Datastream price data. Each firm-year has at least 50 weekly return observations and less than 10 weeks with zero-returns. A country must have more than 15 companies to be included in the sample. All variables are normalized to have zero mean and unit standard deviation in a given country-year. We use seven alternative dependent variables: ρ^{Cross} denotes the cross-correlation between firm returns and lagged domestic index returns and ρ^{Auto} is the first-order correlation of stock returns. D1, D2 and D3 are proxies of price delay proposed by Hou and Moskowitz (2005). R^2 is estimated by regressing weekly stock returns on domestic market and world market indices, transformed by ln[x/(1-x)]. R^2_{Diff} is based on splitting the sample between negative and positive local-market return weeks and computing the difference in R^2. The explanatory variables in Panel A are: Supply is the lending supply as a fraction of market capitalization, Fee is the average loan fee, "ADR or GDR" is a dummy variable equal to one if the firm has ADRs or GDRs issued abroad, the book-to-market ratio, the free float reported by Datastream, market capitalization, and the proportion of zero-return weeks in a given year. Panel B shows results without Ln(Book to Market) and Free Float as controls. The panel regressions are estimated using fixed-effects with robust standard errors clustered at the firm level. Standard deviations are reported in brackets and significance levels are as follows: **= 5% percent level; += 1% level.

Panel A: Main Sample

	ρ^{Cross}	ρ^{Auto}	D1	D2	D3	R^2	R^2_{Diff}
Supply	-0.072	-0.017	-0.047	-0.077	-0.080	0.040	-0.020
	[0.022]$^{+}$	[0.020]	[0.019]**	[0.022]$^{+}$	[0.022]$^{+}$	[0.018]**	[0.023]
Fee	0.001	0.014	0.031	0.006	0.002	-0.070	0.001
	[0.019]	[0.020]	[0.019]$^{+}$	[0.018]	[0.017]	[0.016]$^{+}$	[0.020]
ADR or GDR	1.180	0.052	-0.689	-0.998	-1.028	0.403	0.127
	[0.335]$^{+}$	[1.052]	[0.834]	[0.172]$^{+}$	[0.147]$^{+}$	[0.544]	[0.621]
B/M	0.004	-0.029	0.000	-0.075	-0.075	-0.043	0.046
	[0.021]	[0.021]	[0.019]	[0.019]$^{+}$	[0.018]$^{+}$	[0.017]**	[0.023]**
Free Float	0.015	0.022	0.020	0.012	0.015	-0.028	0.013
	[0.014]	[0.014]	[0.012]	[0.013]	[0.013]	[0.012]**	[0.015]
Market Cap.	-0.242	0.017	-0.570	-0.363	-0.379	0.572	0.015
	[0.043]$^{+}$	[0.043]	[0.041]$^{+}$	[0.039]$^{+}$	[0.039]$^{+}$	[0.037]$^{+}$	[0.045]
Zero-return weeks	0.024	-0.014	0.049	0.034	0.034	-0.067	0.010
	[0.017]	[0.017]	[0.016]$^{+}$	[0.016]**	[0.016]**	[0.015]$^{+}$	[0.018]
Constant	-0.089	-0.041	0.044	0.011	0.011	-0.016	-0.036
	[0.017]$^{+}$	[0.050]	[0.040]	[0.009]	[0.008]	[0.026]	[0.030]
Obs.	13,984	13,984	13,984	13,984	13,984	13,984	13,984
Firms	4,420	4,420	4,420	4,420	4,420	4,420	4,420
R^2	0.01	0.00	0.05	0.02	0.02	0.07	0.00

Panel B: Sample without Free Float & B/M Data

	ρ^{Cross}	ρ^{Auto}	D1	D2	D3	R^2	R^2_{Diff}
Supply	-0.058	-0.010	-0.028	-0.045	-0.045	0.026	-0.005
	[0.017]$^{+}$	[0.013]	[0.012]**	[0.015]$^{+}$	[0.016]$^{+}$	[0.011]**	[0.013]
Fee	0.014	0.039	0.033	0.004	0.003	-0.060	-0.030
	[0.012]	[0.012]$^{+}$	[0.012]$^{+}$	[0.011]	[0.011]	[0.011]$^{+}$	[0.013]**
ADR or GDR	0.790	-0.119	-0.578	-0.434	-0.457	0.129	-0.151
	[0.321]**	[0.603]	[0.481]	[0.411]	[0.416]	[0.387]	[0.383]
Market Cap.	-0.241	0.075	-0.511	-0.259	-0.267	0.555	-0.064
	[0.027]$^{+}$	[0.027]$^{+}$	[0.027]$^{+}$	[0.026]$^{+}$	[0.026]$^{+}$	[0.025]$^{+}$	[0.027]**
Zero-return weeks	0.003	-0.025	0.045	0.011	0.011	-0.066	0.003
	[0.010]	[0.010]**	[0.010]$^{+}$	[0.009]	[0.009]	[0.009]$^{+}$	[0.011]
Constant	-0.026	0.004	0.030	0.019	0.020	-0.015	0.007
	[0.012]**	[0.022]	[0.018]$^{+}$	[0.015]	[0.015]	[0.014]	[0.014]
Obs.	27,771	27,771	27,771	27,771	27,771	27,771	27,771
Firms	8,366	8,366	8,366	8,366	8,366	8,366	8,366
R^2	0.01	0.00	0.04	0.01	0.01	0.06	0.00

Table VI
Equity Lending Market & Characteristics of Stock Return Distribution

The table uses lending supply and loan fees to explain characteristics of stock returns distribution from 2004 to 2008 using Datastream price data. Each firm-year has at least 50 weekly return observations and less than 10 weeks with zero-returns. A country must have more than 15 companies to be included in the sample. All variables are normalized to have zero mean and unit standard deviation in a given country-year. We use six alternative dependent variables: Skewness and Kurtosis are computed from weekly stock returns. Exc(Skewness) and Exc(Kurtosis) are based on the residuals of a domestic-market model regression. Extreme Down (Extreme Up) is the the fraction of returns below (above) two standard deviations from the previous year's average. The explanatory variables in Panel A are: Supply is the lending supply as a fraction of market capitalization, Fee is the average loan fee, "ADR or GDR" is a dummy variable equal to one if the firm has ADRs or GDRs issued abroad, the book-to-market ratio, the free float reported by Datastream, market capitalization, and the proportion of zero-return weeks in a given year. Panel B shows results without Ln(Book to Market) and Free Float as controls. The panel regressions are estimated using fixed-effects with robust standard errors clustered at the firm level. Standard deviations are reported in brackets and significance levels are as follows: **= 5% percent level; += 1% level.

Panel A: Main Sample

	Skewness	Exc(Skewness)	Kurtosis	Exc(Kurtosis)	Extreme Down	Extreme Up
Supply	-0.038	-0.044	-0.043	-0.042	0.100	0.111
	[0.024]	[0.024]**	[0.021]**	[0.021]**	[0.028]+	[0.027]+
Fee	0.050	0.036	0.046	0.049	-0.008	0.021
	[0.020]**	[0.020]**	[0.019]**	[0.018]+	[0.023]	[0.023]
ADR or GDR	-0.531	0.257	0.568	0.096	0.000	0.000
	[0.141]+	[0.437]	[0.634]	[0.037]**	[0.000]	[0.000]
B/M	0.281	0.293	-0.125	-0.124	-0.457	0.202
	[0.025]+	[0.025]+	[0.025]+	[0.024]+	[0.030]+	[0.035]+
Free Float	0.036	0.037	0.008	0.001	0.004	0.026
	[0.014]**	[0.014]+	[0.014]	[0.014]	[0.017]	[0.018]
Market Cap.	0.100	0.144	-0.086	-0.048	-0.492	-0.454
	[0.046]**	[0.044]+	[0.043]**	[0.042]	[0.067]+	[0.069]+
Zero-return weeks	0.062	0.082	0.148	0.134	-0.080	-0.079
	[0.023]+	[0.022]+	[0.027]+	[0.026]+	[0.020]+	[0.019]+
Constant	0.042	-0.012	-0.052	-0.020	0.087	0.068
	[0.008]+	[0.021]	[0.031]**	[0.005]+	[0.008]+	[0.008]+
Obs.	13,984	13,984	13,984	13,984	11,663	11,663
Firms	4,420	4,420	4,420	4,420	3,987	3,987
R^2	0.03	0.03	0.02	0.01	0.05	0.03

Panel B: Sample without Free Float & B/M Data

	Skewness	Exc(Skewness)	Kurtosis	Exc(Kurtosis)	Extreme Down	Extreme Up
Supply	-0.032	-0.043	-0.044	-0.033	0.107	0.036
	[0.013]**	[0.015]+	[0.017]**	[0.015]**	[0.026]+	[0.022]**
Fee	0.026	0.017	0.032	0.036	-0.012	0.010
	[0.014]**	[0.014]	[0.014]**	[0.014]**	[0.015]	[0.015]
ADR or GDR	-0.411	0.135	0.497	0.539	0.000	0.000
	[0.186]**	[0.229]	[0.354]	[0.288]**	[0.000]	[0.000]
Market Cap.	-0.123	-0.101	-0.001	0.049	0.051	-0.499
	[0.029]+	[0.030]+	[0.030]	[0.029]**	[0.047]	[0.041]+
Zero-return weeks	0.050	0.051	0.082	0.076	-0.065	-0.061
	[0.013]+	[0.012]+	[0.015]+	[0.014]+	[0.014]+	[0.014]+
Constant	0.019	-0.003	-0.019	-0.020	-0.003	-0.002
	[0.007]+	[0.008]	[0.013]	[0.011]**	[0.001]+	[0.001]+
Obs.	27,771	27,771	27,771	27,771	23,587	23,587
Firms	8,366	8,366	8,366	8,366	7,879	7,879
R^2	0.00	0.00	0.01	0.00	0.01	0.01

Table VII: Robustness Tests: First Differences Regressions

The table uses yearly changes in lending supply and loan fees to explain yearly changes in price efficiency measures characteristics of stock returns distribution. Price data come from Datastream between 2004 and 2008. Each firm-year has at least 50 weekly return observations and less than 10 weeks with zero-returns. A country must have more than 15 companies to be included in the sample. All variables are normalized to have zero mean and unit standard deviation in a given country-year, the first-differences are computed. The explanatory variables are: Supply is the lending supply as a fraction of market capitalization, Fee is the average loan fee, the book-to-market ratio, free float reported by Datastream, market capitalization, and the proportion of zero-return weeks in a given year. Panel A displays results for price efficiency measures: ρ^{Cross} denotes the cross-correlation between firm returns and lagged domestic index returns and ρ^{Auto} is the first-order correlation of stock returns. D1, D2 and D3 are proxies of price delay proposed by Hou and Moskowitz (2005). R^2 is estimated by regressing weekly stock returns on domestic market and world market indices, transformed by ln[x/(1-x)]. R^2_{Diff} is based on splitting the sample between negative and positive local-market return weeks and computing the difference in R^2. Panel B reports results for characteristics of the stock return distribution: Skewness and Kurtosis are computed from weekly stock returns. Exc(Skewness) and Exc(Kurtosis) are based on the residuals of a domestic and world index market regression. Extreme Down (Extreme Up) is the the fraction of returns below (above) two standard deviations from the previous year's average.The panel regressions are estimated using fixed-effects with robust standard errors clustered at the firm level. Standard deviations are reported in brackets and significance levels are as follows: **= 5% percent level; += 1% level.

	Panel A: Price Efficiency Measures							Panel B: Stock Price Distribution					
	ρ^{Cross}	ρ^{Auto}	D1	D2	D3	R^2	R^2_{Diff}	Skew	Exc(Skew)	Kurt	Exc(Kurt)	Down	Up
Supply	-0.118	-0.076	-0.032	-0.073	-0.069	0.031	-0.015	-0.060	-0.049	-0.013	-0.041	0.149	0.105
	[0.039]$^{+}$	[0.037]**	[0.030]	[0.034]**	[0.034]**	[0.026]	[0.036]	[0.036]$^{+}$	[0.038]	[0.035]	[0.036]	[0.057]$^{+}$	[0.055]*
Fee	0.054	0.013	0.048	0.003	0.001	-0.079	0.007	0.031	0.036	0.064	0.071	-0.055	-0.017
	[0.033]	[0.035]	[0.030]	[0.028]	[0.027]	[0.024]$^{+}$	[0.037]	[0.032]	[0.032]	[0.030]**	[0.030]**	[0.045]	[0.048]
B/M	-0.037	-0.081	-0.027	-0.142	-0.140	-0.026	0.020	0.500	0.547	-0.196	-0.198	-0.807	0.326
	[0.032]	[0.036]**	[0.033]	[0.032]$^{+}$	[0.031]$^{+}$	[0.029]	[0.036]	[0.040]$^{+}$	[0.040]$^{+}$	[0.039]$^{+}$	[0.039]$^{+}$	[0.060]$^{+}$	[0.060]$^{+}$
Free Float	-0.015	-0.003	0.074	0.033	0.037	-0.062	0.020	0.043	0.053	0.012	0.009	-0.011	0.026
	[0.020]	[0.021]	[0.018]$^{+}$	[0.020]	[0.020]$^{+}$	[0.016]$^{+}$	[0.024]	[0.020]**	[0.020]**	[0.019]	[0.019]	[0.026]	[0.028]
Market Cap.	-0.184	-0.009	-0.753	-0.385	-0.402	0.790	0.130	-0.193	-0.012	-0.248	-0.199	-0.026	0.031
	[0.074]**	[0.075]	[0.067]$^{+}$	[0.070]$^{+}$	[0.070]$^{+}$	[0.059]$^{+}$	[0.076]$^{+}$	[0.074]$^{+}$	[0.076]	[0.063]$^{+}$	[0.065]$^{+}$	[0.159]	[0.149]
Zero-return weeks	-0.010	-0.023	0.007	0.006	0.007	-0.045	0.035	0.037	0.053	0.113	0.103	-0.097	-0.119
	[0.026]	[0.024]	[0.025]	[0.023]	[0.022]	[0.020]**	[0.028]	[0.029]	[0.028]$^{+}$	[0.026]$^{+}$	[0.026]$^{+}$	[0.033]$^{+}$	[0.032]$^{+}$
Constant	-0.012	0.028	0.007	-0.013	-0.015	-0.020	-0.010	0.065	0.046	0.059	0.073	0.006	0.028
	[0.005]$^{+}$	[0.005]$^{+}$	[0.004]$^{+}$	[0.004]$^{+}$	[0.004]$^{+}$	[0.004]$^{+}$	[0.005]**	[0.004]$^{+}$	[0.005]$^{+}$	[0.004]$^{+}$	[0.004]$^{+}$	[0.002]$^{+}$	[0.002]$^{+}$
Obs.	9,394	9,394	9,394	9,394	9,394	9,394	9,394	9,394	9,394	9,394	9,394	7,529	7,529
Firms	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,121	3,121
R^2	0.00	0.00	0.04	0.01	0.01	0.05	0.00	0.05	0.05	0.02	0.01	0.07	0.02

Table VIII
Robustness Test: Lending Supply & Utilization

The table uses lending supply and loan utilization to explain price efficiency measures and characteristics of stock return distribution from 2004 to 2008 using Datastream price data. Supply is lending supply as a fraction of market capitalization and Utilization is shares loaned out divided by lending supply. Each firm-year has at least 50 weekly return observations and less than 10 weeks with zero-returns. A country must have more than 15 companies to be included in the sample. All variables are normalized to have zero mean and unit standard deviation in a given country-year. In Panel A we display results for price efficiency measures: ρ^{Cross} denotes the cross-correlation between firm returns and lagged domestic index returns and ρ^{Auto} is the first-order correlation of stock returns. D1, D2 and D3 are proxies of price delay proposed by Hou and Moskowitz (2005). R^2 is estimated by regressing weekly stock returns on domestic market and world market indices, transformed by ln[x/(1-x)]. R^2_{Diff} is based on splitting the sample between negative and positive local-market return weeks and computing the difference in R^2. In Panel B we display results for characteristics of the distribution of stock return: Skewness and Kurtosis are computed from weekly stock returns. Exc(Skewness) and Exc(Kurtosis) are based on the residuals of a domestic-market model regression. Extreme Down (Extreme Up) is the the fraction of returns below (above) two standard deviations from the previous year's average. We omit coefficients of other control variables to preserve space. These omitted variables are: a dummy variable equal to one if the firm has ADRs or GDRs issued abroad, the book-to-market ratio, the free float reported by Datastream, market capitalization and the proportion of zero-return weeks in a given year. The panel regressions are estimated using fixed-effects with robust standard errors clustered at the firm level. Standard deviations are reported in brackets and significance levels are as follows: **= 5% percent level; += 1% level.

Panel A: Price Efficiency Measures

	ρ^{Cross}	ρ^{Auto}	D1	D2	D3	R^2	R^2_{Diff}
Supply	-0.077	-0.021	-0.051	-0.078	-0.081	0.042	-0.018
	[0.022]$^{+}$	[0.021]	[0.020]**	[0.022]$^{+}$	[0.023]$^{+}$	[0.018]**	[0.023]
Utilization	-0.037	0.010	-0.024	-0.057	-0.059	-0.004	0.022
	[0.016]**	[0.016]	[0.014]	[0.015]$^{+}$	[0.014]$^{+}$	[0.014]	[0.017]
Obs.	13,793	13,793	13,793	13,793	13,793	13,793	13,793
Firms	4,406	4,406	4,406	4,406	4,406	4,406	4,406
R^2	0.03	0.00	0.16	0.09	0.09	0.24	0.00

Panel B: Distribution of Stock Returns

	Skewness	Exc(Skewness)	Kurtosis	Exc(Kurtosis)	Extreme Down	Extreme Up
Supply	-0.037	-0.043	-0.048	-0.045	0.090	0.106
	[0.023]	[0.023]**	[0.022]**	[0.022]**	[0.028]$^{+}$	[0.028]$^{+}$
Utilization	0.034	0.017	0.023	0.027	-0.004	0.078
	[0.018]**	[0.017]	[0.020]	[0.018]	[0.020]	[0.021]$^{+}$
Obs.	13,793	13,793	13,793	13,793	11,477	11,477
Firms	4,406	4,406	4,406	4,406	3,974	3,974
R^2	0.00	0.00	0.02	0.01	0.00	0.01

Table IX
Robustness Test: Differential impact between OECD and non-OECD countries

The table uses lending supply and loan fees to explain price efficiency measures, testing for differential impact between OECD and non-OECD members from 2004 to 2008 with Datastream price data. D_{OECD} equals 1 if a country belongs to the OECD and 0 otherwise. Supply is the lending supply as a fraction of market capitalization, Fee is the average loan fee, and Market cap is market capitalization. Each firm-year has at least 50 weekly return observations and less than 10 weeks with zero-returns. A country must have more than 15 companies to be included in the sample. All variables are normalized to have zero mean and unit standard deviation in a given country-year. The dependent variables are: ρ^{Cross} denotes the cross-correlation between firm returns and lagged domestic index returns and ρ^{Auto} is the first-order correlation of stock returns. D1, D2 and D3 are proxies of price delay proposed by Hou and Moskowitz (2005). R^2 is estimated by regressing weekly stock returns on domestic market and world market indices, transformed by ln[x/(1-x)]. R^2_{Diff} is based on splitting the sample between negative and positive local-market return weeks and computing the difference in R^2. We omit coefficients of other control variables to preserve space. These omitted variables are: "ADR or GDR" is a dummy variable equal to one if the firm has ADRs or GDRs issued abroad, the book-to-market ratio, the free float reported by Datastream, market capitalization, and the proportion of zero-return weeks in a given year. The panel regressions are estimated using fixed-effects with robust standard errors clustered at the firm level. Standard deviations are reported in brackets and significance levels are as follows: **= 5% percent level; += 1% level. We also report p-values of tests of equality between coefficients and their respective products with the OECD dummy and joint tests of significance of OECD and non-OECD parameters.

	ρ^{Cross}	ρ^{Auto}	D1	D2	D3	R^2	R^2_{Diff}
D_{OECD}	-0.033	-0.016	0.025	-0.016	-0.020	-0.014	-0.071
	[0.028]	[0.028]	[0.029]	[0.031]	[0.030]	[0.030]	$[0.027]^{+}$
Supply	-0.114	-0.172	-0.020	0.006	0.006	0.034	-0.032
	$[0.028]^{+}$	$[0.030]^{+}$	[0.030]	[0.032]	[0.032]	[0.028]	[0.029]
$D_{OECD} * Ln(Supply)$	0.037	0.224	-0.097	-0.116	-0.114	0.073	0.011
	[0.031]	$[0.032]^{+}$	$[0.032]^{+}$	$[0.034]^{+}$	$[0.035]^{+}$	$[0.030]^{**}$	[0.031]
Fee	-0.014	0.003	-0.051	-0.048	-0.051	0.031	0.019
	[0.031]	[0.031]	[0.036]	[0.033]	[0.033]	[0.030]	[0.030]
$D_{OECD} * Fee$	0.040	0.086	0.087	0.075	0.077	-0.091	-0.007
	[0.033]	$[0.034]^{**}$	$[0.038]^{**}$	$[0.035]^{**}$	$[0.034]^{**}$	$[0.032]^{+}$	[0.033]
Market Cap.	-0.125	-0.108	-0.335	-0.389	-0.397	0.442	-0.071
	$[0.032]^{+}$	$[0.029]^{+}$	$[0.032]^{+}$	$[0.034]^{+}$	$[0.035]^{+}$	$[0.034]^{+}$	$[0.031]^{**}$
$D_{OECD} * Ln$(Market cap)	-0.042	0.079	-0.037	0.098	0.093	0.011	0.018
	[0.033]	$[0.031]^{**}$	[0.034]	$[0.036]^{+}$	$[0.037]^{**}$	[0.036]	[0.032]
Obs.	13,984	13,984	13,984	13,984	13,984	13,984	13,984
Firms	4,420	4,420	4,420	4,420	4,420	4,420	4,420
R^2	0.05	0.02	0.19	0.12	0.12	0.27	0.01
F test: Equality of Ln(Supply)	0.00	0.00	0.00	0.00	0.00	0.00	0.06
F test: Supply params=0	0.00	0.00	0.00	0.00	0.00	0.00	0.10
F test: Equality of Fee	0.03	0.00	0.00	0.02	0.02	0.00	0.38
F test: Fee params=0	0.09	0.00	0.01	0.02	0.02	0.00	0.56
F test: Equality of Mkt. Cap.	0.00	0.02	0.00	0.00	0.00	0.00	0.00
F test: Mkt. Cap. params=0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table X

Equity Lending Market Quintiles and Extreme Negative Returns in US Markets

The table shows normalized measures of extreme returns using quarterly CRSP stock data from January 2005 to June 2008. Firms are grouped into portfolios sorted first on equity lending supply and then, within each quintile, sorted by loan fee quintiles. Lending Supply is measured as a fraction of market capitalization and Loan Fee is the average loan fee. A firm is included only if it has stock lending information for at least 10 days on a given quarter. Extreme negative returns are measured as the proportion of daily returns in a given quarter that are two standard deviations below the mean of the previous quarter. Variables are standardized such that they have zero mean and unit standard deviation in each quarter. In Panel A we show averages for levels, while in Panel B we use the difference between two consecutive quarters. The High-Low column reports the difference between top and bottom quintiles. A "+" denotes that the difference is statistically significant at the 1% level, , *=significant at the 5% percent level, **=significant at the 10% level.

Panel A: Normalized Extreme Negative Returns

Loan	Lending Supply						
Fee	Low	2	3	4	High	Total	High-Low
Low	0.14	-0.03	-0.08	-0.04	-0.08	-0.01	-0.22^{+}
2	0.10	0.00	-0.05	-0.10	-0.03	-0.02	-0.13^{+}
3	0.09	0.04	0.01	-0.05	-0.05	0.01	-0.15^{+}
4	0.08	0.00	-0.03	-0.01	-0.03	0.00	-0.11^{+}
High	0.04	-0.02	0.02	0.04	0.04	0.02	0.00
Total	0.09	0.00	-0.03	-0.03	-0.03	0.00	-0.12*
High-Low	-0.10^{+}	0.01	0.10^{+}	0.09^{+}	0.12^{+}	0.04^{+}	

Panel B: Quarterly First Differences in Normalized Extreme Negative Returns

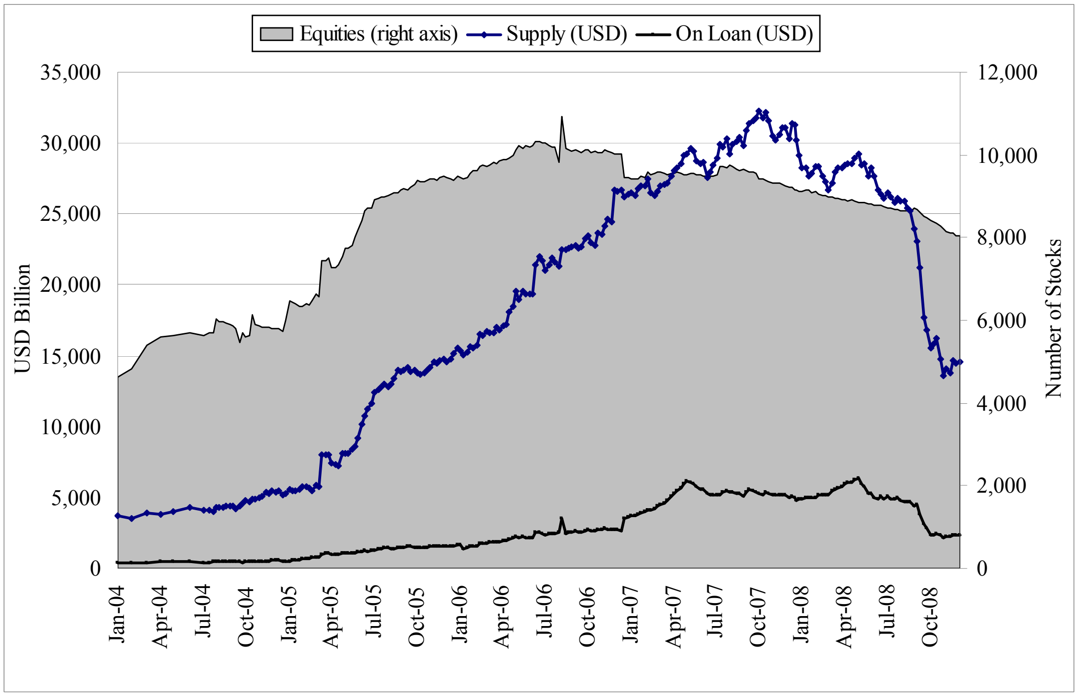
Loan	Lending Supply						
Fees	Low	2	3	4	High	Total	High-Low
Low	0.11	-0.05	-0.07	-0.11	-0.12	-0.04	-0.23^{+}
2	0.16	0.05	-0.06	-0.08	-0.11	-0.02	-0.27^{+}
3	0.20	0.04	-0.02	-0.11	-0.13	0.00	-0.33^{+}
4	0.19	0.08	-0.02	-0.05	-0.11	0.02	-0.30^{+}
High	0.16	0.06	0.01	0.02	-0.03	0.05	-0.20^{+}
Total	-0.16	-0.01	0.01	0.02	0.07	-0.01	0.23^{+}
High-Low	0.06**	0.11	0.08	0.13	0.09^{+}	0.09*	

Table XI: US Equity Lending Market & Characteristics of Stock Return Distribution

The table shows normalized measures of extreme returns using quarterly CRSP stock data from January 2005 to June 2008. Firms are grouped into portfolios sorted first on equity lending supply and then, within each quintile, sorted by loan fee quintiles. Supply is measured as a fraction of market capitalization and Fee is the average loan fee in a quarter. A firm is only included if it has equity lending data for at least 10 days in a given quarter. All variables are normalized to have zero mean and unit standard deviation in a given country-year. Skew and Kurt are, respectively, the skewness and kurtosis coefficients of daily stock returns within a quarter. Exc(Skew) and Exc(Kurt) are computed on the residuals of a domestic-market model regression. Down (or Up) is the the fraction of returns below (or above) two standard deviations from the previous year's average. The explanatory variables used are: Market Capitalization, ILLIQ is Amihud (2002)'s illiquidity measure, Leverage is tota book debt divided by firm value, β_{Mkt} is the beta from a market-model regression, B/M the book-to-market ratio, and Mom. is the previous two quarters' cumulative return. Panel A displays results using all variables in levels, while Panel B uses first-differences of dependent and explanatory variables. The panel regressions are estimated using fixed-effects with robust standard errors clustered at the firm level. Standard deviations are reported in brackets and significance levels are as follows: **= 5% percent level; += 1% level.

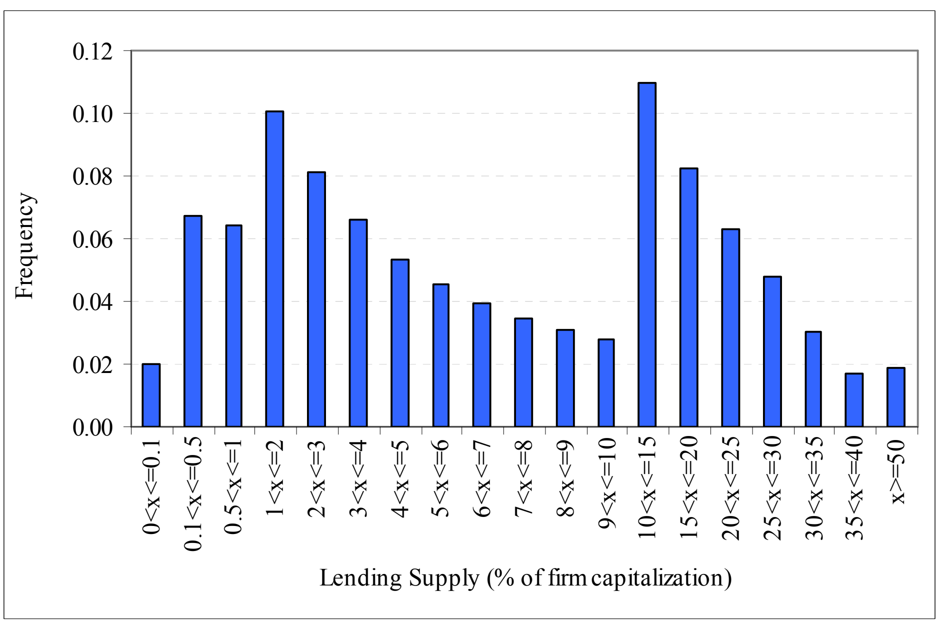
	Panel A: Levels						**Panel B: Differences**					
	Skew	Exc(Skew)	Kurt	Exc(Kurt)	Down	Up	Skew	Exc(Skew)	Kurt	Exc(Kurt)	Down	Up
Supply	-0.161	-0.167	-0.003	0.031	0.020	-0.133	-0.233	-0.243	0.009	0.031	0.095	-0.075
	[0.018]$^{+}$	[0.018]$^{+}$	[0.019]	[0.019]	[0.015]	[0.014]$^{+}$	[0.036]$^{+}$	[0.036]$^{+}$	[0.034]	[0.034]	[0.031]$^{+}$	[0.034]**
Fee	0.040	0.038	-0.057	-0.071	-0.038	-0.014	0.005	0.001	-0.001	-0.005	0.022	-0.001
	[0.017]**	[0.016]**	[0.020]$^{+}$	[0.019]$^{+}$	[0.017]**	[0.012]	[0.032]	[0.030]	[0.031]	[0.029]	[0.036]	[0.034]
Market Cap.	-0.015	-0.014	0.019	0.038	0.010	-0.022	0.009	-0.013	0.044	0.034	-0.031	-0.008
	[0.020]	[0.020]	[0.030]	[0.028]	[0.030]	[0.032]	[0.020]	[0.024]	[0.015]$^{+}$	[0.017]**	[0.029]	[0.026]
Turnover	-0.067	-0.088	0.344	0.330	0.146	0.162	-0.173	-0.197	0.692	0.646	0.518	0.515
	[0.030]**	[0.029]$^{+}$	[0.042]$^{+}$	[0.041]$^{+}$	[0.034]$^{+}$	[0.012]$^{+}$	[0.040]$^{+}$	[0.037]$^{+}$	[0.051]$^{+}$	[0.048]$^{+}$	[0.033]$^{+}$	[0.027]$^{+}$
ILLIQ	0.010	0.008	-0.034	-0.032	0.041	0.034	-0.019	-0.019	-0.014	-0.017	0.061	0.037
	[0.010]	[0.009]	[0.009]$^{+}$	[0.007]$^{+}$	[0.016]$^{+}$	[0.013]$^{+}$	[0.015]	[0.013]	[0.011]	[0.010]$^{+}$	[0.025]**	[0.024]
Leverage	-0.065	-0.073	0.011	0.004	0.063	0.009	-0.247	-0.266	0.016	0.020	0.143	-0.014
	[0.023]$^{+}$	[0.023]$^{+}$	[0.022]	[0.021]	[0.020]$^{+}$	[0.023]	[0.053]$^{+}$	[0.052]$^{+}$	[0.043]	[0.044]	[0.053]$^{+}$	[0.055]
β_{Mkt}	0.042	0.043	-0.049	-0.051	0.090	0.122	0.051	0.056	-0.023	-0.033	0.156	0.178
	[0.011]$^{+}$	[0.010]$^{+}$	[0.011]$^{+}$	[0.010]$^{+}$	[0.009]$^{+}$	[0.009]$^{+}$	[0.014]$^{+}$	[0.013]$^{+}$	[0.013]$^{+}$	[0.012]$^{+}$	[0.013]$^{+}$	[0.012]$^{+}$
B/M	-0.363	-0.381	0.085	0.072	0.253	-0.121	-0.847	-0.847	0.212	0.194	0.470	-0.415
	[0.023]$^{+}$	[0.022]$^{+}$	[0.021]$^{+}$	[0.020]$^{+}$	[0.021]$^{+}$	[0.018]$^{+}$	[0.050]$^{+}$	[0.048]$^{+}$	[0.044]$^{+}$	[0.042]$^{+}$	[0.041]$^{+}$	[0.039]$^{+}$
Momentum	-0.147	-0.137	-0.046	-0.042	0.172	-0.143	-0.328	-0.329	0.012	0.010	0.244	-0.270
	[0.012]$^{+}$	[0.012]$^{+}$	[0.012]$^{+}$	[0.012]$^{+}$	[0.015]$^{+}$	[0.008]$^{+}$	[0.021]$^{+}$	[0.021]$^{+}$	[0.014]	[0.013]	[0.018]$^{+}$	[0.016]$^{+}$
Constant	-0.001	0.001	-0.019	-0.016	-0.024	-0.020	0.023	0.022	0.007	0.010	-0.021	-0.021
	[0.002]	[0.002]	[0.002]$^{+}$	[0.002]$^{+}$	[0.001]$^{+}$	[0.001]$^{+}$	[0.002]$^{+}$	[0.002]$^{+}$	[0.002]$^{+}$	[0.002]$^{+}$	[0.002]$^{+}$	[0.002]$^{+}$
Obs.	22,503	22,503	22,503	22,503	22,503	22,503	17,928	17,928	17,928	17,928	17,928	17,928
Firms	2,430	2,430	2,430	2,430	2,430	2,430	2,225	2,225	2,225	2,225	2,225	2,225
R^2	0.04	0.04	0.05	0.05	0.05	0.04	0.11	0.10	0.09	0.08	0.10	0.10

Figure 1. Equity Lending Market Database Coverage



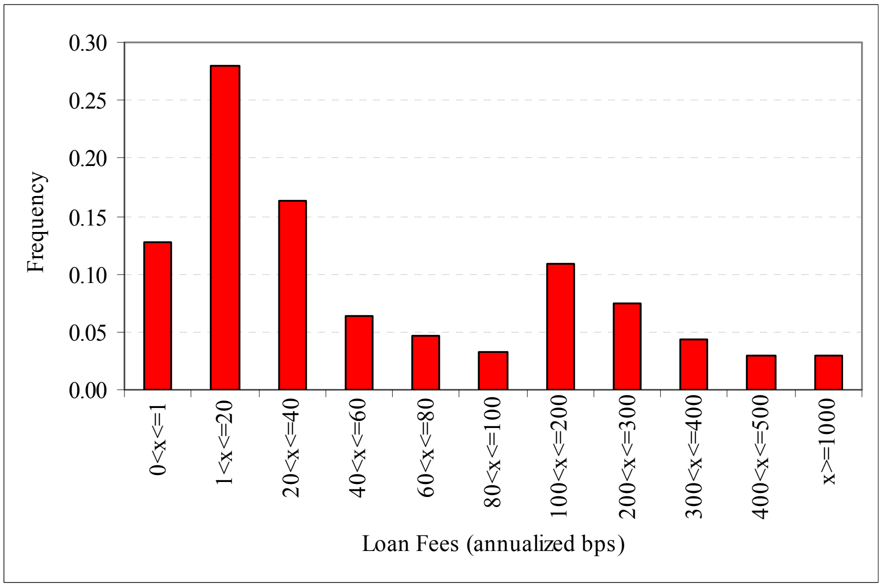
The figure shows aggregate figures of the global equity lending market from January 2004 to December 2008. The right axis displays the number of different stocks and the left axis the total lending supply (Supply) and the total value of shares on loan (On Loan) in billions of US dollars.

Figure 2. Distribution of Lending Supply (% of Firm Capitalization)



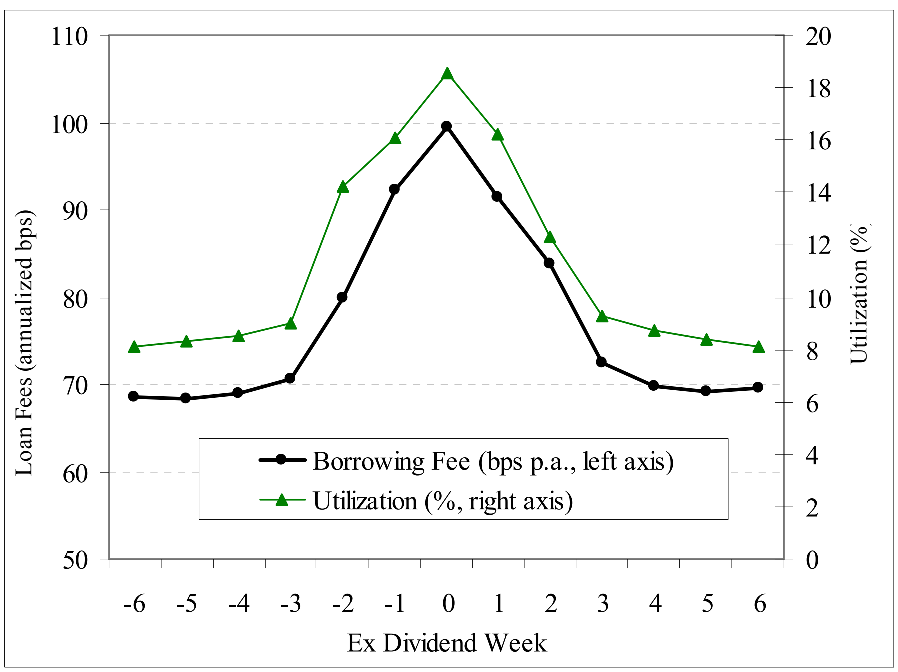
The figure contains the distribution of supply as a percentage of firm size between January 2004 and December 2008. The vertical axis contains the frequency of firms with average weekly lending supply in each interval reported in the horizontal axis.

Figure 3. Distribution of Loan Fees



This figure contains the distribution of average weekly value-weighted loan fees in basis points per year between January 2004 and December 2008. The vertical axis contains the frequency of firms with loan fees in each interval reported in the horizontal axis.

Figure 4. Loan Fees and Loan Utilization around Dividend Payments



This figure shows loan fees and lending volume around dividend payments. For each firm in the period between January 2004 and December 2008, we compute the average loan fee and lending utilization on a six-week period around the ex-dividend dates. Ex-dividend dates and stocks are taken from Datastream.

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