Department of Economics- FEA/USP

Testing the Effects of Short-Selling Restrictions on Asset Prices

RODRIGO DE-LOSSO
ALAN DE GENARO
BRUNO GIOVANNETTI

WORKING PAPER SERIES Nº 2012-18

DEPARTMENT OF ECONOMICS, FEA-USP
WORKING PAPER Nº 2012-18

Testing the Effects of Short-Selling Restrictions on Asset Prices

Rodrigo De-Losso (delosso@usp.br),

Alan De Genaro (adario@bvmf.com.br),

Bruno C. Giovannetti (bcg@usp.br)

Abstract:

Testing the effects of short-selling restrictions on asset prices is challenging: shifts in stock lending supply usually are not observed directly. This paper takes advantage of a unique dataset that contains actual shifts in the lending supply curve for several stocks on the Brazilian market. The dataset comprises daily information from January 2009 to July 2011 from the whole stock lending market in Brazil. We find that short-selling restrictions generate overpricing and that this effect increases with greater dispersion of investor opinion, consistent with a number of theoretical studies.

Keywords: asset prices, short-selling restrictions, stock lending

JEL Codes: G01, G10, G12

Testing the Effects of Short-Selling Restrictions on Asset Prices

Rodrigo De-Losso* Alan De Genaro† Bruno Giovannetti‡

August 23, 2012

Testing the effects of short-selling restrictions on asset prices is challenging: shifts in stock lending supply usually are not observed directly. This paper takes advantage of a unique dataset that contains actual shifts in the lending supply curve for several stocks on the Brazilian market. The dataset comprises daily information from January 2009 to July 2011 from the whole stock lending market in Brazil. We find that short-selling restrictions generate overpricing and that this effect increases with greater dispersion of investor opinion, consistent with a number of theoretical studies.

*Department of Economics, University of Sao Paulo. E-mail: delosso@usp.br
†BMF&Bovespa: adario@bvmf.com.br
‡Department of Economics, University of Sao Paulo. E-mail: bcg@usp.br

This paper studies empirically the impact of short-selling restrictions on asset prices. Its main contribution is the use of a unique data set on stock lending activity, which contains direct information on the supply curve of the stock-lending market in Brazil. Stock lending in Brazil is centralized, with lending deals being made directly through an electronic system. When lenders place offers into the system, one can observe actual shifts in the lending supply curve for the securities. This is a crucial component in testing the effects of short-sale restrictions on stock prices.

In general, if an investor wants to short-sell a security, he has to borrow it in advance. Therefore, movements of the stock's lending supply curve are usually taken as a proxy for movements of short-selling restrictions. Based on this idea, a recent literature has been studying the effects of lending supply curve movements on security prices. Cohen, Diether, and Malloy (2007) and Kaplan, Moskowitz, and Sensoy (2011) are important examples.

There are two empirical challenges at the heart of this literature. First, it is hard to observe actual shifts in lending supply. Usually, researchers have historical information related to the equilibrium of the market, that is, fees and quantities of closed deals. Hence, it is not easy for the econometrician to separate shifts in lending demand from shifts in lending supply and to subsequently estimate their respective effects on stock prices. Second, given the decentralized aspect of the lending markets analyzed in other studies, where loan transactions are usually completed over-the-counter, the available information is often related only to a subset of the overall lending activity of the stocks under analysis.

The present paper contributes to this literature in both of those dimensions. First, with our data set, one can observe actual shifts in the lending supply curves of a number of stocks. Moreover, the data set provides daily information on the entire lending market in Brazil from January 2009 to July 2011. As a result, we can advance the empirical discussion on the effects that short-selling constraints may have on asset prices.

We obtain robust results that support the overpricing hypothesis of Miller (1977). Miller is the first one to theorize that short-sale constraints should lead to overpricing. According to him, overpricing will occur if both (i) investors are restricted to owning zero shares when they actually want to hold a negative quantity of them, that is, there are short-sale constraints, and (ii) the demand curve of the security is downward sloping, that is, there is divergence of investor opinion about the value of the security. Our empirical results confirm that conditions (i) and (ii) are both necessary and sufficient for overpricing to occur, concordant with Miller's (1977) prediction.

We regress short-run future returns (1- to 4-week ahead) on actual shifts in lending supply and on a usual proxy for dispersion of opinion, namely, past volatility of returns. First, we find that when lending supply increases, short-run future returns decrease. Second, we find that such an effect depends on the degree of dispersion of opinions. The higher the volatility of past returns, that is, the greater the dispersion of opinion, the greater the effect of lending supply on prices. Finally, our results indicate that when divergence of opinion is very low, shifts in lending supply curves have no effects on prices.

We observe significant shifts in the lending supply curves over time and across stocks. For many stocks there exist weeks with no lending offers placed into the electronic trading platform, a clear situation of tight short-selling restriction. In other weeks, however, the same stocks present large numbers of lending offers at reasonable rates, that is, low restrictions on short selling. Such a dynamic produces a good environment for the identification of the effects under analysis.

The study of the effects that short-selling can have on stock markets has been a hot topic among investors, regulators, and researchers. As a reaction to the financial crisis of 2007-2009 and to the European crisis of 2011-2012, many stock exchange regulators around the world imposed bans or constraints on short sales. Since the impact of short selling is still a very controversial issue among researchers, those actions have intensified the debate.

From a theoretical perspective, the overpricing hypothesis was controversial for a long period. As mentioned earlier, Miller (1977) was the first author to predict the overpricing result. Harrison and Kreps (1978) also confirm that short-sale restrictions along with divergence of opinion should generate overpricing. Diamond and Verrecchia (1987), however, argue that overpricing would not survive in a specific environment with rational expectations. According to them, if market participants adjusted their pricing rules to take into account that short-selling restrictions sideline bearish investors, hence assuming complete arbitrage by rational investors, there would be no effect on prices. This result put the overpricing hypothesis under suspicion for a while.

More recently, Miller's (1977) result has been receiving greater appreciation. New theories have been incorporating Miller's insight into refined models and their conclusions have been consistent with the overpricing result. In Duffie, Gârleanu, and Pedersen's (2002) model, short sellers search for stock owners and pay a lending fee. The lending fee, acting as a dividend, increases the stock's price. Scheinkman and Xiong (2003) present a continuous-time equilibrium model in which overconfidence generates disagreements among agents regarding asset fundamentals. Under short-sale constraints, they show that agents pay prices that exceed their own valuation of future dividends because they believe that in the future they will find a buyer willing to pay even more, just as in Harrison and Kreps (1978) model. This leads to a significant bubble component in asset prices. The overpricing effect is also produced by the model of Chen, Hong and Stein (2002) under differences of opinion and short-sale constraints.

Empirically, even more than theoretically, the effects of short-sale restrictions have been mixed. According to Kaplan, Moskowitz, and Sensoy (2011), this should occur because of the challenge of measuring short-sale constraints. Some articles use direct measures of the cost of shorting, such as the loan fee, as a proxy for short-sale constraints (Geczy, Musto, and Reed (2002), Jones and Lamont (2002), and Ofek, Richardson, and Whitelaw (2004)). Others (see Desai, *et al.* (2002)) use the ratio between the number of shares sold short and the total number of outstanding shares, also known as short interest, to measure short-sale constaints. The problem is that both of these quantities vary with the demand for short-selling. Indeed, loan fees and short interests are determined in equilibrium.

Kaplan, Moskowitz, and Sensoy (2011) address the endogeneity of the usual empirical measures of short-selling restrictions by exogenously increasing the lending supply of some stocks. They perform an experiment increasing the lending supply using stocks owned by a large money manager. They find that returns to stocks randomly made available for lending are no different from those randomly withheld during the lending or recall periods. They also find no differences in volatility, bid-ask spread, or skewness changes for stocks randomly lent versus withheld.

Cohen, Diether, and Malloy (2007) use private data on both loan fees and short interests for some stocks to separately identify shifts to shorting demand and shorting supply. They proceed as follows. For a given security, in months when the average loan fee decreased but the total loan quantity increased compared to the previous month, they say that the lending supply must have shifted to the right. On the other hand, when the average loan fee increased but the loan quantity decreased, the lending supply must have shifted to the left. Using this strategy, they construct dummy variables that track tightening and loosening movements in the short-selling restriction for each security. Supply shifts to the left (right) indicate tightening (loosening) of short-selling sale constraints. Then, by running panel regressions they find that shifts in the lending supply have no significant effects on future returns, in line with Kaplan, Moskowitz, and Sensoy's (2011) results.

Although both papers just cited address the endogeneity of the usual measures of short-selling restrictions, their identification strategies are not free of flaws. The experiment of Kaplan, Moskowitz, and Sensoy (2011) can be problematic since, most of the time, short-selling restrictions are not binding (see D'Avolio 2002). Hence, if the increase in lending supply that they prodiced occurred in periods of slack restrictions, it is not surprising that they found no effects. The short time span of their experiment also may be a concern. While the second phase covered 4 months in 2009, the first phase lasted only 13 days in 2008.

An issue with the regressions in Cohen, Diether, and Malloy (2007) is that their method is able to identify only a small part of the supply shifts that may have occurred during their sample period. For example, if both supply and demand shifted to the right in a given month with a larger shift in demand, they would observe higher loan fee and quantity and, hence, would not identify the shift of the loan supply at all. Besides, their strategy does not differentiate between large and small shifts in lending supply, which can be a problem if the effects are increasing with the size of the shifts.

Our baseline analysis uses panel data regression to determine, for a given security, the effect of a shift in its lending supply curve in predicting its short-run return (1-, 2-, 3-, and 4-week ahead). This is in the same method used by Cohen, Diether, and Malloy (2007). However, our regressions differ from theirs because our unique data set allows us to use actual shifts in the lending supply curve of each security to predict returns (instead of their dummy variables).

Our results in favor of the overpricing hypothesis are consistent with a number of previous empirical studies. Aitken, *et. al.* (1998), Desai, *et al.* (2002), Angel, Christophe, and Ferri (2003), and Diether, Lee, and Werner (2006) present statistically significant subsequent underperformance for heavily shorted firms. Boheme, Danielsen, and Sorescu (2006), using rebate rates and short interest as proxies for short sale constraints, find evidence of significant overvaluation for stocks that are subject to Miller's (1977) conditions. Jones and Lamont (2002) introduce a unique data set that details shorting costs for NYSE stocks from 1926 to 1933, when the cost of shorting certain NYSE stocks was set in a centralized stock loan market on the floor of NYSE. They find that stocks that are expensive to short have high valuations and low subsequent long-run returns, consistent with the overpricing hypothesis. Chang, Cheng and Yu (2007) also find that short-sale constraints tend to cause stock overvaluation and that the overvaluation effect is more dramatic for individual stocks for which wider dispersion of investor opinion exists. They analyze the price effects following the addition of individual stocks to a list of designated securities that can be sold short on the Hong Kong stock market.

However, all the works in the previous paragraph use as proxies for short-selling restrictions variables that are not purely related to short-selling supply and can be affected by the demand side of the lending market. Since we use actual shifts in the lending supply curve on the right-hand side of our regressions in the present paper, we produce a relevant contribution to this branch of literature.

The rest of the paper is divided as follows. Section I describes the Brazilian stock lending market and presents our data set. Section II develops the empirical analysis. Section III concludes.

I. STOCK LENDING IN BRAZIL

In this section, we present information relevant to the securities lending market in Brazil. We chose Brazilian data due to its unique market microstructure: all lending transactions are centralized and cleared through the Brazilian Exchange (BM&FBOVESPA)[1]. A centralized facility for securities lending transactions offers a unique environment for testing the effects of short selling restrictions, as we discuss below.

Regulation of the securities lending market in Brazil is determined by the Brazilian Securities Commission (CVM) and by the Brazilian Monetary Council (CMN). All transactions are mediated by BM&FBOVESPA's brokers which are responsible for bringing together opposite interests in the market place – stocks' borrowers and lenders. Any security listed on the exchange is eligible for lending.

The stock lending market in Brazil has become increasingly strong over the last 10 years, as reported in Table 1. Lending securities currently is a common practice among Brazilian market participants. In 2011, more than US$ 400 billion in stocks were lent in more than 1.4 million deals, representing about one-third of market capitalization of about US$ 1.2 trillion.

1. BM&FBOVESPA is the fourth largest exchange in the word in terms of market capitalization. This exchange has a vertically integrated business model with a trade platform and clearing for equities, derivatives and cash market for currency, government and private bonds.

These transactions involved an average of 290 companies per month. In that same year, the lenders were individuals in 40%, foreign investors in 35%, and mutual funds in 25% of the deals. On the borrowing side, 70% of transactions were with mutual funds, 25% with foreign investors, and 5% with individuals.

[Table 1 about here]

BM&FBOVESPA provides a platform where brokers can register offers from their clients directly through an electronic system called BTC. Lenders place shares for loan directly into the system, where borrowers can electronically hit the offers. Even though it is also possible for borrowers to place loan bids into the system, this is not usual. More than 99% of the offers placed into BTC come from lenders.

Additionally, BTC allows cross-orders, where both sides are simultaneously inserted into the system by the same broker. These are transactions that were closed in advance on the over-the-counter market. To comply with Brazilian regulations, brokers must enter all deals of this kind into BTC, identifying the parties, the lending fee and amount, and all other relevant information of the deal.

In sum, securities lending transactions can be executed either through borrowers hitting lenders' orders on the screen, or as result of over-the-counter transaction, which according to Brazilian regulation must be cleared by BM&FBOVESPA. In either case, the BTC saves the information for every deal. As a result, the BTC data set contains historical (order by order) information on the entire securities lending market in Brazil on a daily frequency.

Notice, however, that the saved information related to the over-the-counter market is distinct in a crucial dimension from the saved information related to the electronic market. If a deal is closed over-the-counter, the broker saves into the system only the information related to the equilibrium of the market, that is, fees and quantities of closed deals (where supply and demand agreed with each other). Instead, when lenders place shares for loan directly into the system, the BTC saves the clean information related to the supply side of the market.

With the information contained in the BTC, it is possible to see how often a given stock is negotiated over-the-counter vis-à-vis electronically. Considering the period from January 2009 to July 2011, Figure 1 presents, stock by stock, the ratio between the volume of loans negotiated over-the-counter and the total volume (the sum of the volume negotiated over-the-counter and the volume electronically negotiated through BTC). The y-axis then indicates the importance of the over-the-counter market for the lending operations of a given stock. Any stock that had one or more lending offers during the period is reported in Figure 1.

[Figure 1 about here]

Given that, for the securities with the y-axis equal to 1 in Figure 1, the BTC has no direct information related to their loan supply, since their loans are always negotiated over-the-counter and all that is recorded are quantities and prices of equilibrium. For all other securities, at least some information on the actual lending supply is recorded by system. Importantly, a larger portion of the supply side of a security's lending market can be observed as the y-axis value of the security decreases.

We claim that if a stock is located below the 30%-dashed line in Figure 1, we observe a significant part of the supply side of its lending market. Indeed, for such stocks, more than 70% of the lending deals (in volume) occur through the electronic system. There are 273 stocks in this group. However, many of these stocks are not suitable for our empirical purpose. Crucially, we want to work with securities that are traded with a reasonable frequency. Hence, we focus our analysis on stocks below the 30% line traded at least once a week from January 2009 to July 2011. We denote this group of stocks by "LEL (liquid and electronically lent) group". The number of stocks in the LEL group is 44 and they are listed in Table 2.[2]

How are the stocks in the LEL group different from the liquid stocks that are mostly borrowed and lent in the over-the-counter market? To investigate this, we create the "LLOTC (liquid and lent over-the-counter) group", which contains the stocks that are located above the 70% horizontal dashed line in Figure 1 and were traded at least once a week during the study interval. There are 113 stocks in this group. We then compare the LEL and LLOTC

2. The 30% line is an arbitrary cut-off. Hence, we also present the main results of the paper for another more restrictive threshold (15%). There are 30 liquid stocks below the 15% threshold. As we see in the next section, the results are robust.

groups by (i) size of the firms, (ii) two measures of liquidity, (iii) the proportion of the number of shares offered for lending to the number of outstanding shares, and (iv) lending rate. We compute these measures for each month of the studied period. Size is computed as the group average market capitalization (in millions of US$) of the firms in each month. The first measure of liquidity is the monthly average of the daily ratio between the number of stocks that were negotiated on that day and the number of stocks in the group. It indicates the proportion of the stocks in each group that are traded every day, on average. The second measure of liquidity is the average, in each group, of the stocks' monthly traded volume relative to their market capitalization. Even though two stocks may trade everyday, which is indicated by the first measure, one of the stocks may trade on average a larger proportion of its market capitalization, which is captured by the second measure. The proportion of the number of shares offered for lending to the number of outstanding shares is a measure of the size of the lending market for the stocks in each group. Finally, the lending rate is the group weighted average of the lending rates, that is, the rate of each order weighted by the size of the order in terms of number of shares. Table 3 reports the results.

[Table 3 about here]

According to Table 3, the LEL group is composed of smaller firms. In this group, the average size of a firm is US$ 583 million. In the LLOTC group, it is US$ 7.7 billion. It makes sense that the over-the-counter lending market concentrates its operations on larger firms, since these should generate higher lending volumes, and hence higher brokerage fees. This idea is corroborated by the fact that the lending market for the LEL group, the volume of offers in proportion to outstanding shares, is on average half the size as for the LLOTC group (0.58% and 1.32%, respectively). With respect to the average lending rates, the stocks in the LEL group are offered at 6.3% (per annum) on average, and the average rate for the LLOTC group is 1.9%. This difference also goes in the right direction. For instance, D'Avolio (2002) examines US stock lending from a large, institutional lending intermediary and finds that while stocks from large companies are lent at 1% on average, the mean lending rates for smaller firms are about 4.3%. With respect to the liquidity of the stocks, both group are similar in both dimensions investigated, frequency and relative volume of trading .[3]

A crucial aspect is how the lending supply for the stocks in the LEL group varies in time and across stocks. The goal of this paper is to study the effect of the movements in the supply curve of the securities lending market in the prices of the securities. Hence, large time and cross-sectional variations in the quantity of shares that are offered for lending are critical for the quality of the results. Figures 2 and 3 present, for each one of the 44 LEL stocks, the weekly evolution of the number of shares electronically offered for lending, relative to the number of shares outstanding, from January 2009 to July 2011. Lending offers that ask for

3. Another important difference we identified between the LEL and LLOTC groups is the composition of the lenders, since lender identification is also recorded in the BTC system. Lenders who use the electronic market are very different from those who negotiate over-the-counter. Among the lending orders electronically made, 83% came from individuals, 13% from investment clubs and 4% from mutual funds. Among the over-the-counter lending orders, 45% came from mutual funds, 32% came from individuals, and 22% from foreign investors.

high lending rates are excluded from the sample. We do that by ranking the offers for each stock according to their rates and excluding those belonging to the highest quintile. Hence, Figures 2 and 3 present only lending offers with "reasonable" rates, allowing the meaning of "reasonable" to vary across stocks.

[Figures 2 and 3 about here]

According to Figures 2 and 3, there is a significant variation in the quantity of securities offered for lending in both time and cross-sectional dimensions. Moreover, for many stocks, there are periods when no lending offers are placed in the BTC, a clear situation of tight short-selling restriction. Other periods show very low restrictions on short selling. Such characteristics of the data provide a good opportunity for testing the effects of short-selling restrictions on prices. We do that in the next section.

II. EMPIRICAL ANALYSIS

Our goal is to determine, for a given security, the effect of a shift of its lending supply curve in *predicting* its short-run future return (1-, 2-, 3- and 4-week ahead). Since investors have to borrow the securities in order short-sell them, shifts to the left in the lending supply curve are related to tighter restrictions for short-selling. We test two hypotheses:

- Hypothesis 1 (H1): An increase in the lending supply, that is, less restriction for short-selling, predicts negative returns in the next 1 to 4 weeks.

- Hypothesis 2 (H2): The higher the dispersion of opinion about the value of the stock, the stronger the effect described in H1. Moreover, if the dispersion of opinion is sufficiently low, the effect described in H1 disappears.

These are the same hypotheses tested by Boheme, Danielsen, and Sorescu (2006) and Chang, Cheng, and Yu (2007), for example, and they are consistent with some theoretical papers, such as Miller (1977), Harrison and Kreps (1978), and Chen, Hong, and Stein (2002). Good surveys on the theoretical and empirical aspects behind such hypotheses can be found in Miller (2004) and Lamont (2004).

We test H1 and H2 with basically the same econometric framework (panel regressions) used by Cohen, Diether, and Malloy (2007). There are two important differences. First, in our estimations we use actual shifts of the lending supply curve on the right-hand side of our model, instead of dummies variables as they do. The shifts go in both directions of increasing and decreasing the supply curve of lending. Second, we interact the shifts of the lending supply curve with a measure of dispersion of opinion.

With weekly observations, we estimate

$$r_{i,t+h} = \beta_1 q_{i,t} + \beta_2 disp_{i,t} + \beta_3 q_{i,t} \times disp_{i,t} + \beta_4 r_{i,t} + \alpha_t + \mu_i + \varepsilon_{i,t+h}, \tag{1}$$

where $h = 1, 2, 3$, and 4, and $r_{i,t+h}$ represents the risk-adjusted return of stock i for the period between week $t+1$ and week $t+h$ (inclusive). We compute the risk-adjusted returns as in Moskowitz and Grinblatt (1999) and Cohen, Diether, and Malloy (2007), subtracting from the stock return the return on the size/book-to-market matched portfolio.[4]

The explanatory variables in equation (1) are

- $q_{i,t}$: the number of shares offered for lending in week t relative to the number of shares outstanding for stock i. The number of shares offered for lending in week t is given by the sum of the daily lending offers that are placed in the electronic system with "reasonable" lending rates. That is, lending offers that ask for "high" lending rates are not included in $q_{i,t}$. As in the previous section, we define "high" lending rates on a stock-by-stock basis, by ranking the offers within each stock according to their rates and excluding those in the highest quintile. As a robustness check, we later run the same regression excluding the highest tercile instead.

- $disp_{i,t}$: a proxy for the dispersion of investor opinion on the stock i valuation at week t, which is computed as the variance of daily returns during the last 50 days of trading.

- $r_{i,t}$: the return in week t of stock i

- α_t: week fixed-effect (week dummies)

4. Given the smaller number of stocks in Brazil compared to the US, we compute a 3 by 3 matrix with size/book-to-market portfolios, instead of 5 by 5 as is usual for the US.

- μ_i: stock fixed-effect (stock dummies)

The variance of past daily returns is a usual proxy for the dispersion of investor opinion. As discussed by Boheme, Danielsen, and Sorescu (2006), numerous authors present theoretical models and empirical evidence correlating opinion dispersion with asset time-series volatility (see Shalen (1993) and Harris and Raviv (1993)). Analyst dispersion data, which would be a more direct measure of dispersion of opinion, are not available for the stocks we are studing. Such information is usually available only for large caps (see Danielsen and Sorescu (2001) and Diether, Malloy and Scherbina (2002)).

We control regression (1) for $r_{i,t}$ because shifts of the lending supply curve in week t may, in part, be correlated with the stock return in that same week. For instance, lenders may be encouraged to lend when stock prices are increasing. Hence, because of possible momentum and reversal effects, omitting $r_{i,t}$ could bias the estimation. Given the panel structure of the data, we can control the regression for common shocks across stocks through α_t, and for possible individual fixed-effects through μ_i.

In terms of the parameters in model (1), H1 and H2 suggest the following. If we estimate the model restricting $\beta_3 = 0$, H1 implies $\beta_1 < 0$. However, for the unrestricted model, H1 and H2 imply $\beta_1 + \beta_3 disp_{i,t} = 0$ for low values of $disp_{i,t}$, and $\beta_1 + \beta_3 disp_{i,t}$ decreasing in $disp_{i,t}$, i.e., $\beta_3 < 0$. We next test both hypotheses.

A RESULTS

Table 4 reports results from the estimation of model (1). We first use the 44 stocks (30% threshold) of the LEL group. The period is January 2009 to July 2011.

[Table 4 about here]

Columns 1, 3, 5, and 7 present the restricted estimates by imposing $\beta_3 = 0$. According to them, an increase in the stock lending supply predicts 1-, 2-, 3-, and 4-week ahead negative returns, consistent with H1. The effect is increasing in h. This indicates that if the lending supply increases at week t, short-sellers' trading activities continue to have impact on prices at least in the following 4 weeks either indirectly or directly. Indeed, a lending offer can remain active in the electronic system for a number of days, until it is totally hit (the expiration of the offer is defined by the lender at the moment he places it on the screen).

The sample average of q_t is 0.099%, while the sample maximum value is 4.8%. Hence, according to column 1, an average-size increase in the lending supply would generate a decrease in the stock price in the following week with magnitude of $-0.406 \times 0.099\% = -0.04\%$. The price decrease in the following 4 weeks, according to column 7, would be equal to $-1.473 \times 0.099\% = -0.15\%$.

The unrestricted estimates, which test H2, are presented in columns 2, 4, 6, and 8. According to columns 2, 6 and 8 the negative effect of q_t on returns will only occur if $disp_t > 0$. In other words, dispersion of opinion is a necessary condition for overpricing of short-sale constraints. This is exactly what H2 says. The conclusion from column 4 is similar: the negative effect of q_t on returns will occur only if $disp_t > \frac{2.408}{136.9} = 0.017$. This value is about the 10th percentile of the distribution of $disp$.

To compute the marginal effects under the unrestricted model, we re-estimate it by imposing $\beta_1 = 0$, given the lack of significance of β_1. The estimated values of β_3 are then -22.4, $-46.2, -60.1$, and -82.6, for 1-, 2-, 3-, and 4-week ahead, respectively, with all estimates significant at 1%. Hence, an average-sized increase in the lending supply (0.099%) would generate a decrease in stock prices in the following week with a magnitude of $-22.4 \times 0.099\% \times disp_t$. Evaluating this effect at the sample average for $disp_t$, we would have a negative return of $-22.4 \times 0.099\% \times 0.038 = -0.08\%$. By doing the same computation for the 4-week ahead return, we conclude that an average-sized increase in the lending supply during a period with an average-level dispersion of opinion would decrease stock prices by $-82.6 \times 0.099\% \times 0.038 = -0.31\%$.

The evidence in Table 4 strongly supports both H1 and H2. However, it is important to check the robustness of the results. We first re-estimate equation (1) computing q_t using an alternative definition for "high" lending rates. Instead of ranking the offers within each stock according to their rates and excluding the ones in the highest quintile, we now exclude the ones in the highest tercile. By doing so, we are excluding additional lending offers with higher lending rates. Table 5 presents the results.

[Table 5 about here]

As before, columns 1, 3, 5, and 7 present the restricted estimates by imposing $\beta_3 = 0$, and they are all consistent with H1. According to column 1, an average-sized increase in the lending supply would generate a decrease in stock prices in the following week by a magnitude of $-0.407 \times 0.099\% = -0.04\%$. The price decrease in the following 4 weeks, according to column 7, would be equal to $-1.242 \times 0.099\% = -0.12\%$. The figures are similar to those we obtained before.

To test H2 we turn to columns 2, 4, 6, and 8. The conclusion goes in the same direction as before. Negative effects of q_t on short-run returns will only occur when the dispersion of opinion ($disp_t$) is not too low. According to column 2, a necessary and sufficient condition for a negative effect of q_t on returns is $disp_t > 0$. For columns 4, 6, and 8, respectively, a higher q_t will depress prices if and only if $disp_t$ is higher than 0.019, 0.018 and 0.017. As mentioned before, those are low values for $disp_t$, about the 10th percentile of its distribution, since the sample average of $disp_t$ is 0.038.

Tables 4 and 5 were estimated using the 44 stocks of LEL group, that is, the stocks below the 30%-line in Figure 1 which, from January 2009 to July 2011, were traded at least once a week. The 30%-line indicates that 30% of the lending deals (in volume) are made over-the-counter or, in other words, that we observe the lending supply curve of a stock over the 30%-line for 70% of its lending deals. We could be more restrictive with respect to such a parameter and estimate model (1) using only the stocks that, for instance, more than 85% of the lent volume are closed through the electronic system. In this case, we would use the stocks below a 15% threshold in Figure 1 which were traded every week. There are 29 stocks that meet such a criterion. For these stocks, we can certainly observe a very significant part of their supply curves. Table 6 presents the results of model (1) using these 29 stocks, computing q_t by ranking the offers for each stock according to their rates and excluding the ones in the highest quintile.

[Table 6 about here]

The results are fairly robust. According to columns 1, 3, 5, and 7, hypothesis H1 holds empirically. The 1-week ahead effect on the risk-adjusted return of an average-sized increase in the lending supply is $-0.413 \times 0.099\% = -0.04\%$. For the 4-week forecast, the effect is $-1.685 \times 0.099\% = -0.17\%$. Columns 2, 4, 6, and 8 are once again consistent with H2. Column 2, 6, and 8 indicate that a necessary and sufficient condition for a negative effect of q_t on returns is $disp_t > 0$. According to column 4, a higher q_t will depress prices if and only if $disp_t$ is higher than 0.018.

Finally, in Tables 7, 8 and 9, we reproduce Tables 4, 5 and 6, respectively, using raw returns on the left-hand side of (1) instead of risk-adjusted returns. The results still confirm H1 and H2, although the effects are slightly smaller.

[Tables 7, 8, and 9 about here]

In columns 1, 3, 5 and 7 of Table 7 (which uses the 44 stocks of the LEL group and the highest-quintile rule for q_t), we see strong evidence in favor of H1. However, the effects of q_t on non-risk-adjusted returns are slightly smaller. According to column 1, an average-sized increase in the lending supply would generate a decrease in the stock price in the following week equal to $-0.269 \times 0.099\% = -0.03\%$. The price decrease in the following 4 weeks, according to column 7, would be equal to $-1.002 \times 0.099\% = -0.09\%$. Although β_3 is not statistically significant in column 2, H2 continues to be supported by results in columns 4, 6, and 8. Columns 6 and 8 indicate that a negative effect of q_t on returns will occur if and only if $disp_t > 0$. According to column 4, a higher q_t will depress prices if and only if $disp_t$ is higher than 0.018. Tables 8 and 9 produce very similar results.

Importantly, the lending supply shifts that we observe are not exogenously determined and the econometrician cannot observe the information set available to the stock lender at the moment he decides how many stocks he will offer for loan. However, the decision mechanism of stock lenders is clear. It is reasonable to assume that lenders increase the amount they wish to lend when they think the stock will perform well in the near future. Analogously, they lend less when they expect low returns. Hence, the unobservable variables in the lender's information set that are in the error term of the regressions, that is, the ones that are related to short-run future returns, should positively correlate with shifts in lending supply. Therefore, the estimated negative effects of stock lending supply on short-run future returns should possibly be taken as a lower bound for the populational values in absolute terms.

III. CONCLUSION

The study of the effects that short-selling can have on stock markets has been a hot topic among investors, regulators, and researchers. As a reaction to the financial crisis of 2007-2009 and to the European crisis of 2011-2012, many stock exchange regulators around the world imposed bans or constraints on short sales. Since the impact of short selling is still a very controversial issue among researchers, those actions have intensified the debate.

To the best of our knowledge, this is the first study that uses empirical data that contain actual shifts in the supply curve of the lending market. Indeed, our data set permits the direct daily observation of lending offers for a number of stocks, thanks to the centralized lending electronic system run by BM&FBOVESPA. Moreover, the stock lending supply curves that we observe suffer considerable variations over time and cross-sectionally. In particular, there are periods with no new lending offer. Such variations are ideal to test theories on short-selling restriction and make our tests rather reliable.

We test two hypotheses, namely, (i) short-selling restrictions causes stock overpricing, and (ii) such effect is increasing in the dispersion of opinion among investors. The hypotheses are in line with a number of theoretical models such as Miller's (1977). Our evidence supports both hypotheses.

References

Aitken, M., Frino, A., McCorry, M., and Swan, P. (1998). Short sales are almost instantaneously bad news: Evidence from the Australian Stock Exchange. **Journal of Finance**, vol. 53, p.p. 2205–2223.

Angel, J., Christophe, S., and Ferri, M. (2003). A close look at short selling on Nasdaq, **Financial Analysts Journal,** vol. 59, p.p. 66–74.

Bai, Y., Chang, E., and Wang, J. (2006). Asset Prices Under Short-sale Constraints. Working paper, MIT Sloan School of Management.

Beber, A., and Pagano, M. (2011). Short-Selling Bans Around the World: Evidence from the 2007-09 Crisis. **Journal of Finance**, forthcoming.

Boehme, R., Danielsen, B., and Sorescu, S. (2006) Short-Sale Constraints, Differences of Opinion, and Overvaluation. **Journal of Financial and Quantitative Analysis**, vol. 41, issue 2, p.p. 455-487.

Chang, E., Cheng, J., and Yu, Y. (2007). Short-Sales Constraints and Price Discovery: Evidence from the Hong Kong Market. **Journal of Finance**, vol. 62, p.p. 2097–2122.

Chen, J., Hong, H., and Stein, J. (2002) Breadth of Ownership and Stock Returns. **Journal of Financial Economics**, vol. 66, p.p. 171-205.

Cohen, L., Diether, K., and Malloy, C. (2007). Supply and Demand Shifits in the Shorting Market. **The Journal of Finance**, vol. 62, n.º 5, p.p. 2061-2096.

D'Avolio, G. (2002). The market for borrowing stock,. **Journal of Financial Economics** 66, 271- 306.

Danielsen, B. and Sorescu, S. (2001) Why do Option Introductions Depress Stock Prices? An Empirical Study of Diminishing Short Sale Constraints. **Journal of Financial and Quantitative Analysis**, vol. 36, n.o 4, p.p. 451-484.

Desai, H., Ramesh, K., Thiagarajan, R., and Balachandran, V. (2002) An Investigation of the Informational Role of Short Interest in the NASDAQ Market. **Journal of Finance**, p.p. 2263-2287.

Diamond, D., and Verrecchia, R. (1987) Constraints on short-selling and asset price adjustment to private information. **Journal of Financial Economics**, vol. 18, n.o 2, p.p. 277-311.

Diether, K., Lee, K., and Werner, I. (2005) Can short-sellers predict returns? Daily evidence. Working paper, Ohio State University.

Diether, K., Malloy, C., and Scherbina, A. (2002) Differences of Opinion and the Cross-Section of Stock Returns. **The Journal of Finance**, vol. 57, no. 5, p.p. 2113-2141.

Duffie, D., Gârleanu, N. and Pedersen, L. (2002) Securities Lending, Shorting and Pricing. **Journal of Financial Economics**, vol. 66, n.o (2-3), p.p. 307-339.

Geczy, C., Musto, D., and Reed, A. (2002) **Journal of Financial Economics**, vol. 66, issue 2-3, p.p. 241-269.

Moskowitz, T. and Grinblatt, M. (1999) Do Industries Explain Momentum? **The Journal of Finance**, vol. 54. n.o 04, p.p. 1249-1290.

Harris, M. and Raviv, A. (1993) Differences of opinion make a horse race. **Review of Financial Studies**, vol. 6, n.o 3, p.p. 473-506.

Harrison, J. and Kreps, D. (1978) Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations. **The Quarterly Journal of Economics**, vol. 92, n.o 2, p.p. 323-336.

Hong, H. and Stein, J. (2003) Differences of opinion, short-sales constraints, and market crashes. **Review of Financial Studies**, vol. 16, p.p. 487-525.

Jones, C. and Lamont, O. (2002) Short-sale Constraints and Stock Returns. **Journal of Financial Economics**, vol. 66, n.os 2-3, p.p. 2007-239.

Kaplan, S., Moskowitz, T., and Sensoy, B. (2011) The Effects of Stock Lending on Security Prices: An experiment. University of Chicago Booth School of Business and NBER

Lamont, O. (2004) Go Down Fighting: Short Seller vs. Firms. Yale ICF Working Paper no. 04-20. Available at SSRN: http://ssrn.com/abstract=566901

Miller, E. (1977) Risk, Uncertainty, and Divergence of Opinion. **The Journal of Finance**, vol. 32, no. 4, pp. 1151-1168.

Miller, E. (1977) Implications of Short Selling and Divergence of Opinion for Investment Strategy *in* FABOZZI, Frank J. **Short Selling: strategies, risk, and rewards.** New York: Wiley.

Ofek, E., Richardson, M., and Whitelaw, R. (2004) Limited Arbitrage and Short Sale Restriction: evidence from the options markets. **Journal of Financial Economics**, vol. 74, p.p. 305-342.

Scheinkman, J. and Xiong, W. (2003) Overconfidence and Speculative Bubbles. **Journal of Political Economy**, vol. 11, n.o 61, p.p. 1183-1219.

Shalen, C. (1993) Volume, volatility, and the dispersion of beliefs. **Review of Financial Studies**, vol. 6, n.o 2, p.p. 405-434.

Appendix: Tables and Figures

year	volume (in millions of US$)	volume (in % of total market cap.)	number of deals	securities lent
2000	$1,560	1%	2,530	30
2001	$2,790	2%	11,953	60
2002	$2,428	2%	22,486	68
2003	$4,374	2%	39,044	74
2004	$8,903	3%	78,729	116
2005	$24,664	5%	166,494	135
2006	$50,496	7%	271,210	156
2007	$142,106	11%	568,592	220
2008	$174,568	13%	627,414	251
2009	$137,483	19%	711,987	241
2010	$265,892	24%	971,558	261
2011	$436,302	32%	1,417,787	298

Table 1: This table reports the evolution of the securities lending market in Brazil from 2000 to 2011. The second column presents the total volume negotiated in lending deals in millions of dollars. The third column reports the total volume negotiated in lending deals as a fraction of the total market capitalization. The fourth column presents the total number of lending deals in each year. The last column shows the number of securities with at least one lending deal in each year.

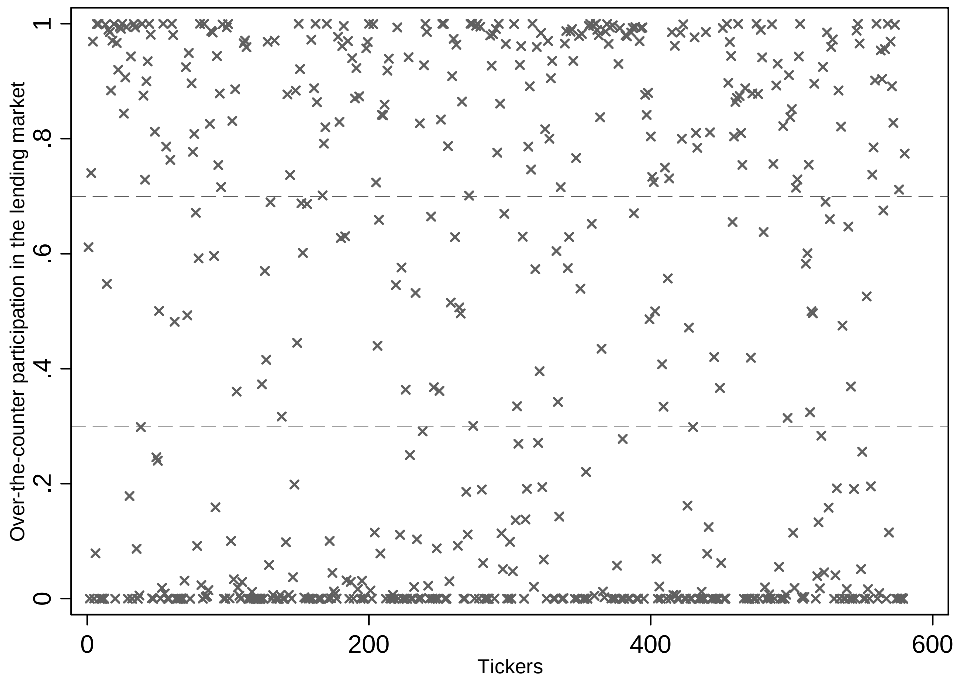

Figure 1: This figure presents, stock by stock, the ratio between the volume of loans negotiated over-the-counter and the total volume (the sum of the volume negotiated over-the-counter and the volume electronically negotiated through BTC). Period: January 2009 to July 2011.

	ticker	firm name	firm sector	y-axis value in Figure 1
1	BAZA3	Banco da Amazonia S/A	Financials	30%
2	BEES3	Banestes S/A Banco Estado Espirito Santo	Financials	25%
3	BMIN4	Bco Mercantil de Investimentos S/A	Financials	0%
4	BMTO4	Brasmotor S/A	Industrial goods and services	0%
5	CBMA4	Cobrasma S/A	Industrial goods and services	2%
6	CCIM3	Camargo Correa Desenv. Imobiliario S/A	Construction	3%
7	CMIG3	Cia Energ Minas Gerais - Cemig	Utilities	10%
8	COCE5	Companhia Energetica do Ceara - Coelce	Utilities	20%
9	CTNM4	Cia Tecidos Norte de Minas - Coteminas	Industrial goods and services	5%
10	EMAE4	Emae-Empresa Metropolitana de Aguas e Energia S/A	Utilities	0%
11	EURO11	Fundo de Investimento Imobiliario Europar	Real Estate	0%
12	EZTC3	Ez Tec Empreend. e Participacoes S/A	Construction	25%
13	FHER3	Fertilizantes Heringer S/A	Industrial goods and services	29%
14	FJTA4	Forjas Taurus S/A	Industrial goods and services	2%
15	FRAS4	Fras-Le S/A	Industrial goods and services	9%
16	GPCP3	GPC Participacoes S/A	Diverse	0%
17	GPIV11	Gp Investments, Ltd.	Financials	19%
18	GRND3	Grendene S/A	Industrial goods and services	11%
19	HBOR3	Helbor Empreendimentos S/A	Construction	19%
20	HETA4	Hercules S/A - Fabrica de Talheres	Industrial goods and services	0%
21	IENG3	Inepar Energia S/A	Utilities	11%
22	IENG5	Inepar Energia S/A	Utilities	5%
23	INEP3	Inepar S/A Ind e Construcoes	Industrial goods and services	14%
24	INET3	Inepar Telecomunicacoes S/A	Telecomunication	27%
25	ITSA3	Itausa - Investimentos Itau S/A	Financials	19%
26	JBDU3	Inds J. B. Duarte S/A	Industrial goods and services	2%
27	JFEN3	Joao Fortes Engenharia S/A	Construction	27%
28	KEPL3	Kepler Weber S/A	Industrial goods and services	19%
29	MGEL4	Mangels Industrial S/A	Industrial goods and services	0%
30	MLFT4	Jereissati Participações S/A	Diverse	1%
31	MNPR3	Minupar Participacoes S/A	Industrial goods and services	1%
32	MTIG4	Metalgrafica Iguacu S/A	Industrial goods and services	6%
33	MYPK3	Iochpe-Maxion S/A	Industrial goods and services	28%
34	PRVI3	Companhia Providencia Ind e Comercio	Industrial goods and services	1%
35	PTBL3	Portobello S/A	Industrial goods and services	1%
36	RCSL4	Recrusul S/A	Industrial goods and services	30%
37	RHDS3	M&G Poliester S/A	Industrial goods and services	8%
38	RSIP4	Rasip Agro Pastoril S/A	Food	0%
39	SNSY5	Sansuy S/A Industria de Plasticos.	Industrial goods and services	2%
40	SULT4	Construtora Sultepa S/A	Construction	0%
41	TCNO4	Tecnosolo Engenharia S/A	Construction	2%
42	TOYB3	Tec Toy S/A	Industrial goods and services	4%
43	TOYB4	Tec Toy S/A	Industrial goods and services	19%
44	UNIP6	Unipar- Uniao de Inds. Petroquimicas S/A	Industrial goods and services	20%

Table 2: List of firms in the LEL group, that is, the liquid firms (negotiated at least once a week) which are mostly lent in the electronic market (that is, located below the 30% horizontal line in Figure 1). Period: January 2009 to July 2011.

	size		liquidity 1		liquidity 2		lending market size		lending rate	
	LEL	LLOTC	LEL	LLOTC	LEL	LLOTC	LEL	LLOTC	LEL	LLOTC
Jan-09	425	4938	95%	99%	5%	6%	0.05%	0.76%	6.63%	2.04%
Feb-09	390	5075	94%	99%	3%	6%	0.15%	0.67%	2.78%	1.79%
Mar-09	403	5057	94%	99%	5%	8%	0.25%	0.91%	6.56%	1.61%
Apr-09	427	5667	97%	100%	4%	9%	0.37%	0.86%	6.58%	1.86%
May-09	468	6222	98%	100%	8%	9%	0.35%	0.85%	4.56%	1.85%
Jun-09	492	6333	97%	100%	4%	8%	0.27%	0.99%	6.70%	1.29%
Jul-09	495	6333	97%	100%	7%	9%	0.29%	0.89%	6.46%	1.60%
Aug-09	531	6778	99%	100%	7%	9%	0.60%	1.67%	4.76%	1.61%
Sep-09	554	7111	98%	100%	5%	8%	0.78%	1.04%	6.10%	1.63%
Oct-09	586	7722	99%	100%	10%	10%	0.66%	1.19%	6.53%	1.73%
Nov-09	592	8000	98%	100%	5%	8%	0.47%	0.87%	6.82%	1.89%
Dec-09	640	8222	99%	100%	5%	11%	0.60%	1.20%	4.74%	1.99%
Jan-10	631	8333	100%	100%	21%	8%	0.54%	0.93%	6.68%	1.79%
Feb-10	645	8000	99%	100%	15%	8%	0.52%	0.91%	6.69%	1.70%
Mar-10	648	8278	99%	100%	20%	8%	0.68%	1.45%	6.79%	2.01%
Apr-10	616	8333	99%	100%	8%	7%	0.69%	1.19%	6.75%	1.96%
May-10	574	7500	99%	100%	6%	8%	0.59%	1.77%	5.07%	2.34%
Jun-10	584	7556	98%	100%	6%	7%	0.16%	1.19%	6.41%	2.19%
Jul-10	617	7722	97%	100%	12%	7%	0.66%	1.21%	6.70%	1.99%
Aug-10	615	8000	100%	100%	10%	8%	0.65%	1.58%	6.64%	2.02%
Sep-10	622	8278	99%	100%	9%	7%	0.64%	1.28%	6.80%	2.26%
Oct-10	671	9167	99%	100%	8%	8%	0.31%	1.21%	6.83%	1.94%
Nov-10	673	9167	99%	100%	7%	8%	0.73%	1.64%	6.48%	1.97%
Dec-10	667	9000	99%	100%	4%	7%	0.81%	1.60%	6.83%	2.10%
Jan-11	678	9167	99%	100%	6%	7%	0.31%	1.52%	6.74%	1.86%
Feb-11	634	8833	97%	100%	4%	8%	0.39%	1.38%	7.05%	1.42%
Mar-11	637	8944	97%	100%	4%	8%	0.39%	1.83%	6.93%	2.02%
Apr-11	660	9000	98%	100%	6%	7%	0.45%	1.44%	6.54%	2.41%
May-11	642	8500	98%	100%	7%	8%	0.37%	2.09%	6.60%	2.00%
Jun-11	640	8333	98%	100%	9%	7%	0.40%	1.78%	6.81%	2.31%
Jul-11	628	8167	98%	100%	19%	7%	0.32%	1.77%	6.96%	1.92%
mean	583	7669	98%	100%	8%	8%	0.47%	1.28%	6.31%	1.91%

The LEL (LLOTC) group contains the stocks that have more than 70% of their lending deals, in volume, negotiated in the eletronic (over-the-counter) market. Both groups contain only liquid stocks (stocks that were negotiated at least once a week). The period of analysis is January 2009 to July 2011. "Size" is the group average market capitalization of the firms (in millions of US$); "liquidity 1" is the monthly average of the daily ratio between the number of stocks that were negotiated on that day and the number of stocks in the group; "liquidity 2" is the montly average of the number of shares traded relative to the number of shares outstanding; "lending market size" is the group average of the ratio between the number of shares offered for lending in that month for a given stock and its number of shares outstanding; "lending rate" is the group weighted average of the lending rates (the rate of each order is weighted by the size of the order in terms of number of shares).

Table 3: Comparing the LEL and the LLOTC groups.

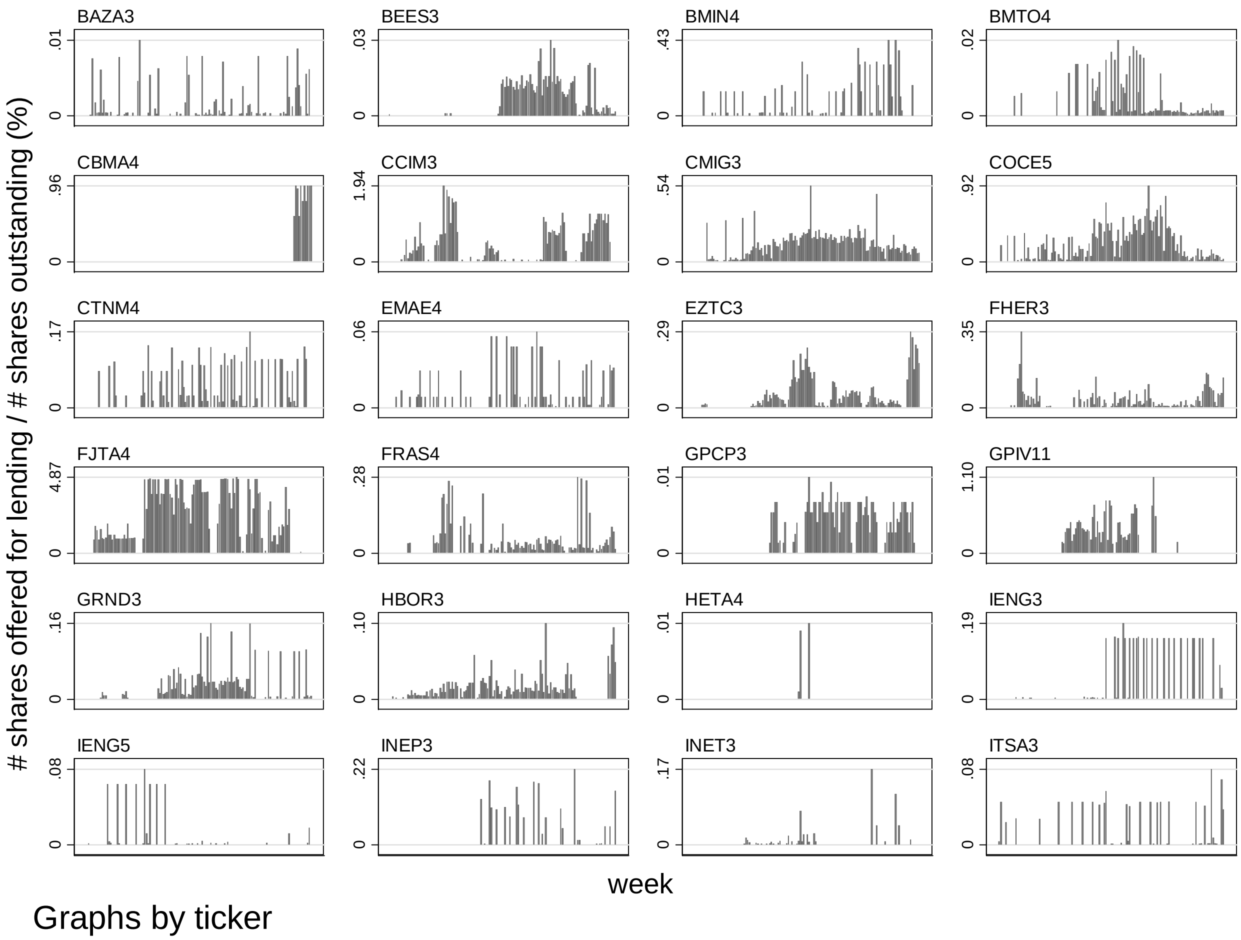

Figure 2: Each plot refers to a stock in the LEL group (stocks 1 to 24, in alphabetical order). The y-axis is the relation between the number of stocks offered for lending in a given week and the number of outstanding shares of the firm (in %). Each bar refers to a week from January 2009 to July 2011.

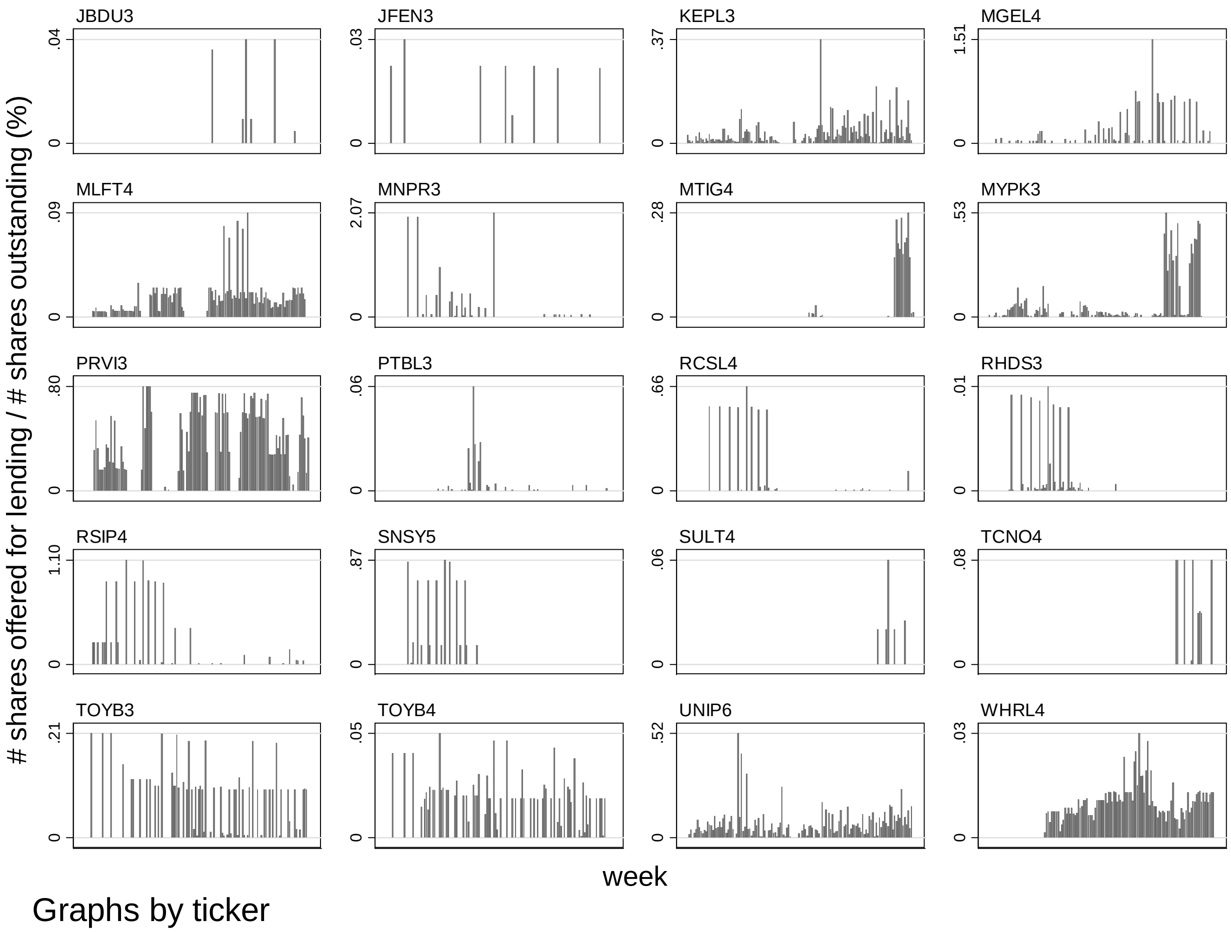

Figure 3: Each plot refers to a stock in the LEL group (stocks 25 to 44, in alphabetical order). The y-axis is the relation between the number of stocks offered for lending in a given week and the number of outstanding shares of the firm (in %). Each bar refers to a week from January 2009 to July 2011.

	ret_{t+1}		$ret_{t+1,t+2}$		$ret_{t+1,t+3}$		$ret_{t+1,t+4}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
q_t	-0.406**	0.696	-0.696***	2.408**	-1.028***	2.280	-1.473***	2.720
	(0.156)	(0.609)	(0.241)	(0.899)	(0.357)	(1.467)	(0.523)	(1.764)
$disp_t$		-0.0548		-0.0838		-0.157		-0.200
		(0.126)		(0.185)		(0.264)		(0.346)
q_t x $disp_t$		-48.68*		-136.9***		-146.1**		-185.1**
		(25.97)		(42.99)		(70.14)		(84.52)
ret_t	-0.187***	-0.186***	-0.170***	-0.169***	-0.186***	-0.184***	-0.207***	-0.204***
	(0.0322)	(0.0317)	(0.0339)	(0.0340)	(0.0390)	(0.0400)	(0.0267)	(0.0267)
constant	0.0676**	0.0735*	0.100***	0.109***	-0.0407	-0.0237	-0.0434	-0.0218
	(0.0331)	(0.0368)	(0.0215)	(0.0277)	(0.0577)	(0.0609)	(0.0887)	(0.0900)
obs	5855	5855	5855	5855	5855	5855	5855	5855
R^2	0.072	0.073	0.065	0.067	0.076	0.078	0.088	0.090

Notes: This table reports results from panel regressions with the **44 stocks (30% threshold)** of the LEL group at a weekly frequency. The period is January 2009 to July 2011. The dependent variables are 1-, 2-, 3-, and 4-week ahead **risk-adjusted** returns. The explanatory variables are: (I) q_t, the number of shares offered for lending in week *t*, relative to the number of shares outstanding. To compute q_t, we do not consider the lending offers with high lending rates. These are defined in a stock by stock basis: for each stock we rank the lending offers according to their rates and divide them in **5 quantiles**; the offers in the last quantile (the ones with the highest rates) are then dropped for each stock. (II) $disp_t$, a proxy for the dispersion of investors opinion on the stock valuation, which is computed as the variance of daily returns during the last 50 days of trading. (IV) q_t x $disp_t$, the product of q_t and $disp_t$. (IV) ret_t, stock return in week *t*. The regressions are controlled for week dummies and stock fixed effects. Since returns are overlapping (but for ret_{t+1}), the standard errors are corrected for serial correlation by clustering the observations by stocks.

Table 4

	ret_{t+1}		$ret_{t+1,t+2}$		$ret_{t+1,t+3}$		$ret_{t+1,t+4}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
q_t	-0.407**	0.699	-0.653**	2.908***	-0.910**	3.015*	-1.242**	3.831**
	(0.163)	(0.640)	(0.259)	(0.998)	(0.372)	(1.592)	(0.499)	(1.891)
$disp_t$		-0.0553		-0.0843		-0.157		-0.200
		(0.126)		(0.185)		(0.264)		(0.346)
q_t x $disp_t$		-47.62*		-153.2***		-168.9**		-218.3**
		(27.15)		(46.23)		(74.79)		(89.59)
ret_t	-0.187***	-0.186***	-0.170***	-0.169***	-0.186***	-0.184***	-0.207***	-0.203***
	(0.0322)	(0.0317)	(0.0339)	(0.0340)	(0.0390)	(0.0400)	(0.0267)	(0.0268)
constant	0.0676**	0.0734*	0.0999***	0.109***	-0.0409	-0.0244	-0.0438	-0.0228
	(0.0331)	(0.0368)	(0.0216)	(0.0280)	(0.0577)	(0.0608)	(0.0887)	(0.0899)
obs	5855	5855	5855	5855	5855	5855	5855	5855
R^2	0.072	0.073	0.065	0.067	0.075	0.078	0.087	0.090

Notes: This table reports results from panel regressions with the **44 stocks (30% threshold)** of the LEL group at a weekly frequency. The period is January 2009 to July 2011. The dependent variables are 1-, 2-, 3-, and 4-week ahead **risk-adjusted** returns. The explanatory variables are: (I) q_t, the number of shares offered for lending in week *t,* relative to the number of shares outstanding. To compute q_t, we do not consider the lending offers with high lending rates. These are defined in a stock by stock basis: for each stock we rank the lending offers according to their rates and divide them into **3 quantiles**; the offers in the last quantile (the ones with the highest rates) are then dropped for each stock. (II) $disp_t$, a proxy for the dispersion of investors opinion on the stock valuation, which is computed as the variance of daily returns during the last 50 days of trading. (IV) q_t x $disp_t$, the product of q_t and $disp_t$. (IV) ret_t, stock return in week *t.* The regressions are controlled for week dummies and stock fixed effects. Since returns are overlapping (but for ret_{t+1}), the standard errors are corrected for serial correlation by clustering the observations by stocks.

Table 5

	ret_{t+1}		$ret_{t+1,t+2}$		$ret_{t+1,t+3}$		$ret_{t+1,t+4}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
q_t	-0.413***	0.779	-0.775***	2.607**	-1.167***	2.652	-1.685***	3.128
	(0.144)	(0.605)	(0.261)	(1.041)	(0.396)	(1.595)	(0.568)	(1.897)
$disp_t$		-0.0888		-0.120		-0.197		-0.233
		(0.173)		(0.253)		(0.357)		(0.469)
q_t x $disp_t$		-52.52*		-148.8***		-168.1**		-211.8**
		(27.04)		(49.58)		(76.16)		(90.08)
ret_t	-0.192***	-0.190***	-0.176***	-0.174***	-0.191***	-0.187***	-0.227***	-0.223***
	(0.0392)	(0.0388)	(0.0392)	(0.0397)	(0.0406)	(0.0422)	(0.0281)	(0.0286)
constant	0.104***	0.117***	0.0953***	0.113**	-0.0930	-0.0635	-0.117	-0.0817
	(0.0139)	(0.0278)	(0.0334)	(0.0485)	(0.0594)	(0.0789)	(0.101)	(0.119)
obs	3859	3859	3859	3859	3859	3859	3859	3859
R^2	0.083	0.084	0.068	0.071	0.076	0.079	0.090	0.094

Notes: This table reports results from panel regressions with the **29 stocks (15% threshold)** of the LEL group at a weekly frequency. The period is January 2009 to July 2011. The dependent variables are 1-, 2-, 3-, and 4-week ahead **risk-adjusted** returns. The explanatory variables are: (I) q_t, the number of shares offered for lending in week *t,* relative to the number of shares outstanding. To compute q_t, we do not consider the lending offers with high lending rates. These are defined in a stock by stock basis: for each stock we rank the lending offers according to their rates and divide them in **5 quantiles**; the offers in the last quantile (the ones with the highest rates) are then dropped for each stock. (II) $disp_t$, a proxy for the dispersion of investors opinion on the stock valuation, which is computed as the variance of daily returns during the last 50 days of trading. (IV) q_t x $disp_t$, the product of q_t and $disp_t$. (IV) ret_t, stock return in week *t.* The regressions are controlled for week dummies and stock fixed effects. Since returns are overlapping (but for ret_{t+1}), the standard errors are corrected for serial correlation by clustering the observations by stocks.

Table 6

	ret_{t+1}		$ret_{t+1,t+2}$		$ret_{t+1,t+3}$		$ret_{t+1,t+4}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
q_t	-0.269**	0.381	-0.516**	2.076**	-0.746**	2.088	-1.022**	2.469
	(0.115)	(0.724)	(0.219)	(0.872)	(0.315)	(1.424)	(0.428)	(1.690)
$disp_t$		-0.0646		-0.0870		-0.172		-0.237
		(0.140)		(0.210)		(0.294)		(0.385)
q_t x $disp_t$		-28.76		-114.4***		-125.2*		-154.2*
		(32.24)		(40.83)		(65.43)		(76.87)
ret_t	-0.195***	-0.193***	-0.176***	-0.174***	-0.196***	-0.192***	-0.209***	-0.205***
	(0.0314)	(0.0308)	(0.0323)	(0.0324)	(0.0352)	(0.0364)	(0.0269)	(0.0265)
constant	0.0351	0.0420	0.00232	0.0118	-0.102	-0.0831	-0.130	-0.105
	(0.0377)	(0.0422)	(0.0318)	(0.0372)	(0.0607)	(0.0640)	(0.0952)	(0.0961)
obs	5855	5855	5855	5855	5855	5855	5855	5855
R^2	0.160	0.161	0.204	0.206	0.239	0.241	0.271	0.273

Notes: This table reports results from panel regressions with the **44 stocks (30% threshold)** of the LEL group at a weekly frequency. The period is January 2009 to July 2011. The dependent variables are 1-, 2-, 3-, and 4-week ahead returns (**not adjusted for risk**). The explanatory variables are: (I) q_t, the number of shares offered for lending in week *t,* relative to the number of shares outstanding. To compute q_t, we do not consider the lending offers with high lending rates. These are defined in a stock by stock basis: for each stock we rank the lending offers according to their rates and divide them in **5 quantiles**; the offers in the last quantile (the ones with the highest rates) are then dropped for each stock. (II) $disp_t$, a proxy for the dispersion of investors opinion on the stock valuation, which is computed as the variance of daily returns during the last 50 days of trading. (IV) q_t x $disp_t$, the product of q_t and $disp_t$. (IV) ret_t, stock return in week *t.* The regressions are controlled for week dummies and stock fixed effects. Since returns are overlapping (but for ret_{t+1}), the standard errors are corrected for serial correlation by clustering the observations by stocks.

Table 7

	ret_{t+1}		$ret_{t+1,t+2}$		$ret_{t+1,t+3}$		$ret_{t+1,t+4}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
q_t	-0.258*	0.391	-0.466**	2.640***	-0.617**	2.949**	-0.792**	3.665**
	(0.140)	(0.674)	(0.217)	(0.843)	(0.292)	(1.349)	(0.347)	(1.565)
$disp_t$		-0.0649		-0.0872		-0.172		-0.236
		(0.140)		(0.210)		(0.294)		(0.385)
q_t x $disp_t$		-28.00		-133.6***		-153.5**		-191.9**
		(30.56)		(39.57)		(64.15)		(75.35)
ret_t	-0.195***	-0.193***	-0.176***	-0.174***	-0.195***	-0.192***	-0.209***	-0.205***
	(0.0314)	(0.0308)	(0.0323)	(0.0325)	(0.0353)	(0.0365)	(0.0270)	(0.0266)
constant	0.0350	0.0418	0.00219	0.0113	-0.102	-0.0837	-0.130	-0.105
	(0.0377)	(0.0422)	(0.0318)	(0.0374)	(0.0606)	(0.0640)	(0.0952)	(0.0961)
obs	5855	5855	5855	5855	5855	5855	5855	5855
R^2	0.160	0.161	0.204	0.206	0.239	0.241	0.271	0.273

Notes: This table reports results from panel regressions with the **44 stocks (30% threshold)** of the LEL group at a weekly frequency. The period is January 2009 to July 2011. The dependent variables are 1-, 2-, 3-, and 4-week ahead returns (**not adjusted for risk**). The explanatory variables are: (I) q_t, the number of shares offered for lending in week *t,* relative to the number of shares outstanding. To compute q_t, we do not consider the lending offers with high lending rates. These are defined in a stock by stock basis: for each stock we rank the lending offers according to their rates and divide them into **3 quantiles**; the offers in the last quantile (the ones with the highest rates) are then dropped for each stock. (II) $disp_t$, a proxy for the dispersion of investors opinion on the stock valuation, which is computed as the variance of daily returns during the last 50 days of trading. (IV) q_t x $disp_t$, the product of q_t and $disp_t$. (IV) ret_t, stock return in week *t.* The regressions are controlled for week dummies and stock fixed effects. Since returns are overlapping (but for ret_{t+1}), the standard errors are corrected for serial correlation by clustering the observations by stocks.

Table 8

	ret_{t+1}		$ret_{t+1,t+2}$		$ret_{t+1,t+3}$		$ret_{t+1,t+4}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
q_t	-0.273**	0.472	-0.594**	2.252**	-0.883**	2.309	-1.233**	2.666
	(0.115)	(0.689)	(0.248)	(1.030)	(0.366)	(1.604)	(0.491)	(1.899)
$disp_t$		-0.116		-0.146		-0.243		-0.304
		(0.191)		(0.281)		(0.390)		(0.509)
q_t x $disp_t$		-32.93		-125.2**		-140.6*		-171.8*
		(31.68)		(47.93)		(72.89)		(84.56)
ret_t	-0.204***	-0.201***	-0.185***	-0.182***	-0.208***	-0.203***	-0.234***	-0.228***
	(0.0394)	(0.0388)	(0.0388)	(0.0393)	(0.0384)	(0.0402)	(0.0307)	(0.0304)
constant	0.0755***	0.0927***	-0.000654	0.0211	-0.166***	-0.130*	-0.223**	-0.177
	(0.0186)	(0.0326)	(0.0495)	(0.0632)	(0.0478)	(0.0735)	(0.0891)	(0.112)
obs	3859	3859	3859	3859	3859	3859	3859	3859
R^2	0.166	0.167	0.202	0.204	0.236	0.239	0.271	0.274

Notes: This table reports results from panel regressions with the **29 stocks (15% threshold)** of the LEL group at a weekly frequency. The period is January 2009 to July 2011. The dependent variables are 1-, 2-, 3-, and 4-week ahead returns (**not adjusted for risk**). The explanatory variables are: (I) q_t, the number of shares offered for lending in week *t*, relative to the number of shares outstanding. To compute q_t, we do not consider the lending offers with high lending rates. These are defined in a stock by stock basis: for each stock we rank the lending offers according to their rates and divide them in **5 quantiles**; the offers in the last quantile (the ones with the highest rates) are then dropped for each stock. (II) $disp_t$, a proxy for the dispersion of investors opinion on the stock valuation, which is computed as the variance of daily returns during the last 50 days of trading. (IV) q_t x $disp_t$, the product of q_t and $disp_t$. (IV) ret_t, stock return in week *t*. The regressions are controlled for week dummies and stock fixed effects. Since returns are overlapping (but for ret_{t+1}), the standard errors are corrected for serial correlation by clustering the observations by stocks.

Table 9