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In short supply: Short-sellers and stock returns ☆

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ABSTRACT

We examine the economic determinants of short-sale supply, and its consequences for future stock returns. Lendable supply increases with expected borrowing costs and decreases with financial statement constructs that indicate overvaluation. Although rising loan fees help ease supply constraints, we find shares are still least available when they are most attractive to short sellers. Using a number of firm characteristics, we derive useful instruments for real-time loan supply and demand conditions in the lending market. Further, we show that (1) when lendable supply is binding (non-binding), short-sale supply (demand) is the main predictor of future stock returns, (2) abnormal returns to the short-side of nine well-known market anomalies are attributable solely to "special" stocks, and (3) loan fees significantly reduce the profitability of the short side and several of these anomalies cease to be profitable. Overall our evidence highlights the central role played by the supply of lendable shares in equity price formation and returns prediction.
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1. Introduction

This study examines the economic determinants of the supply of readily lendable shares, and the consequences of binding supply constraints for future stock returns. Theoretical work on constrained arbitrage (e.g. Miller, 1977; Duffie, 1996; Blocher et al., 2013) has long emphasized the importance of lending market constraints to price discovery for the underlying security. By increasing the cost of trading for short-sellers, lending market constraints serve as a "censoring" mechanism that prevents negative news from becoming fully incorporated into stock prices. If short-sellers are on average informed traders, as a large literature suggests (see Section 2), theories of constrained arbitrage predict that firms facing binding short-sale constraints will on average be over-priced, and will experience correspondingly lower returns in the future.

A key empirical challenge in testing these theories is identifying precisely when a stock is facing binding short-sale constraints. Most prior studies that examine the link between short-selling and market efficiency have used relatively rough proxies for demand and supply conditions in the equity lending market. Although shares actually borrowed has been

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studied extensively, relatively little evidence exists on the supply of lendable shares. In this study, we use a uniquely expansive dataset from Markit Data Explorer (DXL) to capture real-time loan market conditions (i.e., pricing, supply, and demand) for a large cross-section of firms.[1] Using these data, we empirically evaluate factors that affect the expected cost of borrowing, as well as the supply of lendable shares. We then examine the consequences of these lending market conditions for equity prices and future returns.

Our analysis produces a number of new findings on the economic determinants of lendable supply. First, we show that lendable supply increases with expected borrowing costs and decreases with financial statement constructs that predict overvaluation.[2] This evidence is consistent with short-sellers actively trading on a variety of financial-analysis-related variables, leading to higher borrow costs and lower supply slack for firms that appear overvalued. Second, our evidence shows that the suppliers of lendable shares (primarily institutions) tend to withdraw from the loan market when these financial indicators point to overvaluation. Third, we show that although higher loan fees tend to ease supply constraints, on balance lendable shares are still least available when stocks are most attractive to short sellers. Taken together, these results demonstrate that sophisticated investors (short sellers and institutional lenders) seem to view these financial analysis constructs as indications of overvaluation. These results also suggest that supply constraints in the lending market are quite pervasive, and can be a serious impediment to pricing efficiency in the stock market.

Next, we conduct a series of tests to further calibrate the economic consequences of these supply constraints. The central economic intuition behind these analyses is straightforward. The short interest ratio (*SIR*, the ratio of shares shorted to shares outstanding) is only an appropriate measure of short-seller demand when supply is unconstrained. Once supply becomes a binding constraint, *SIR* no longer reflects short-seller demand. In fact, for constrained stocks, the *SIR* is an equilibrium outcome of demand, supply, and borrowing costs. We use our detailed data to compute a measure of "specialness" that captures the extent to which short-sale constraints are binding for each firm-month observation. Special (hard-to-borrow) stocks are those that currently face a binding short-sale constraint; General Collateral (GC; or easy-to-borrow) firms are those that do not.[3]

Our results show that the ability of various short-sale metrics to predict future stock returns increases sharply once these variables are conditioned on "specialness". For example, we find that the predictive power of SIR for returns more than doubles when conditioned on whether a firm is facing binding constraints. Prior studies have documented a *mean* effect, whereby "special" (hard-to-borrow) stocks earn lower future returns (e.g., D'Avolio, 2002; Blocher et al., 2013). To our knowledge, ours is the first study to feature "specialness" as a conditioning variable, and to document a strong *interaction* effect.[4] In addition, we find that when lendable supply is binding (non-binding), short-sale supply (demand) is the main predictor of future stock returns. Once again, this evidence is consistent with our central intuition on the need to identify the degree of supply slack.

Using a two-stage estimation approach, we also model firms' expected borrowing costs and supply of lendable shares as functions of various firm characteristics. Our results show that it is possible to develop useful instruments for expected borrow costs and expected supply, even when real-time lending market data are not available. Using these instruments as proxies in place of actual borrow costs and supply constraints, we find they have forecasting power for future stock returns that are almost as high as those attained with the actual lending market variables. These results suggest a technique for future researchers without access to our data to control for lending market conditions using a set of widely-available firm characteristics.[5]

Finally, we examine the effect of supply-side constraints on returns to the short side of various asset-pricing anomalies identified by prior studies. If the apparent overvaluation identified by these trading strategies persists because of short sale constraints, returns to the short side should be concentrated in "special" stocks. Our results support this prediction. While not all the stocks identified by the short side of these strategies are constrained, negative short side returns are only significant for special stocks; "General Collateral" (GC) stocks do not underperform.

After we incorporate loan fee estimates, the short side returns to these strategies are halved, and the returns to several of the anomalies become insignificant. Interestingly, among the short-side stocks, we find no significant difference between the general collateral and special subsamples in terms of total shares demanded. Yet we find a dramatic difference in terms

[1] Our Markit Data Explorer (DXL) dataset spans 114 months (July 2004–December 2013). DXL's data are collected from a consortium of more than 100 institutional lenders, who collectively represent the largest pool of loanable equity inventory in the world. We are aware of four other studies that also use some version of DXL data (Saffi and Sigurdsson, 2011; Prado, forthcoming; Aggarwal et al., 2015). We discuss them in more detail in Section 2.

[2] We examine nine financial-statement based measures that prior literature has linked to pricing anomalies: Gross Profit, Asset Growth, Investments, NOA, Accruals, Payout%, Quarterly Earnings, the Ohlson *O*-Score, and the Beneish *M*-Score. These variables are described in greater detail in Section 4.

[3] We measure "specialness" using DXL's Daily Cost of Borrowing Score (*DCBS*). *DCBS* ranges from 1 to 10, with 10 being the most difficult to borrow stocks. We define GC as stocks with *DCBS* values of 1 or 2 (average annualized loan fees below 100 basis points), and *Special* as stocks with *DCBS* values of 3 or more. Based on these cut-offs, 86% (14%) of all firm-months are GC (Special). Our findings are insensitive to reasonable cut-off perturbations.

[4] Specifically, we posit, and show, that a well-specified model for future returns requires a piece-wise linear fit in which the sensitivity of future returns to various short-selling metrics (e.g. borrow costs, demand, and supply) is *conditional* on whether the supply constraint is currently binding. These findings highlight the importance of conditioning on the supply constraint when seeking to explaining future stock returns with short-sale data.

[5] Contrary to Reed (this issue), our two-stage method does not separately model "supply" and "demand". Rather, in the first stage we model "expected borrow costs", and in the second-stage we use the estimated borrow costs to compute "expected supply." Because the explanatory variables used in both stages are all widely-available, our models provide a way to control for lending market conditions when researchers do not have Markit data. Table 7 illustrates the usefulness of this approach in that the Probability of Special Status (***PrSpecial***) from the model is highly predictive of future returns, and an excellent complement to ***SIR*** in that capacity.

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