

# Is the Short-Sales Constraint Really Significant in the Presence of a Centralized Lendable Stock Market?

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## Abstract

This study examines whether short-sales constraint is really significant in the presence of a centralized lendable stock market. Compared to other countries of the world, the lendable stock market in Japan is centrally controlled, which motivated us to examine whether this feature has any impact on short-sales constraint or not. We provide evidence that short-sale constraint, as measured by high cost of borrowing, high demand for short-sale, and low institutional ownership, is not generally significant in Japan. Only 5.3% of lendable stocks, featured as large capitalized, and value stocks, are found to have borrowing fees of more than 1% per annum. Cost of borrowing is also found to continue to be high at least for seven trading days. Although the conventional recall risk is not observed under a centralized trading system, an excess short position over supply of lendable stocks is only found to have a temporary impact on borrowing cost, new stock borrowing, and return of stocks. We also examine future return behavior of short-sales constrained stocks to test Miller's (1977) overvaluation hypothesis. However, we do not find evidence of underperformance of stocks facing short-sales constraint. Overall, our results support the conjecture of Kolasinski et al. (2013) that a centralized lending market reduces short-sale constraints and improves efficiency of the market.

**Keywords:** Stock borrowing, short selling, centralized trading system, overvaluation, and market efficiency.

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## 1. Introduction

Frictionless short-sale is a precondition for ensuring pricing efficiency in the stock market. One of the reasons why finance researchers believe market inefficiency, to some extent, is because short-sale constraints impede the reflection of new information properly. Even though the distortion of stock prices under short-sale constraint is supported by many rational finance theories, there is a lack of credible evidence on whether the market is really short-sales constraint or not. The lack of credible evidence on short-sales constraint comes from institutional features of the market and limitations of data. In most of the countries of the world, short-sale is conducted by individual custodian banks. Although total demand for short-sale can be found by accumulating individual demand from custodian banks, actual cost of borrowing stocks is difficult to get at least for three reasons. First, lack of market-wide data impedes understanding of complete schedule of demand and supply (Kolasinski et al. 2013), second, uniform pricing of borrowing fees could not be possible as borrowing fees could be linked with other services provided to brokers (Saffi and Sigurdsson, 2011), and third, cost of borrowing could be higher in a non-centralized market because of higher search frictions. Under these circumstances, we examined whether short-sales constraint is really significant in the presence of a centralized lending market. Market for borrowing stocks in Japan provides a unique opportunity to conduct our study since the market is centrally controlled by Japan Securities Finance Company (JSF). In addition to this, we also examine several other issues that could contribute to short-sales constraint in Japan. First, whether institutional and regulatory features bind short-sales, second, nature of recall risk in the presence of a centralized lending market, and third, whether stocks facing short-sale constraints underperform subsequently.

We provide a number of new empirical evidence on the market for borrowing stocks in Japan. First, short-sale is not generally strictly binding in Japan; cost of borrowing is low, demand for short-sale is also low and institutional ownership is high. Second, 5.3% of lendable stocks have high borrowing fee of more than 1% per annum. These stocks are usually featured with value stocks, large capitalized stocks and stocks with low trading volume. Third, high borrowing fee continues to be high at least for next 7 days but reduces gradually over this period. Fourth, cost of borrowing is found to be affected largely by the demand for borrowing stocks. Fifth, large capitalized and value stocks are often found to have higher short position compared to the supply of lendable stocks. Sixth, recall risk, a situation when lenders recall stocks, is not observed in the centralized lending market even when aggregate short position exceeds supply of lendable stocks. Seventh, stocks facing short-sales constraint, measured by high cost of borrowing, high short interest ratio (SIR) and low institutional ownership (IO), do not significantly underperform subsequently. Regression models also show that the relationship between short-sales constraint and subsequent stock returns is not significantly negative.

We contribute to the existing literature on short-sale constraints in at least three ways. First, to the best of our knowledge, this is the first study providing evidence of short-sales constraint in the presence of a centralized lending market that provides a uniform cost of borrowing stocks using a complete scenario of the demand for borrowing stocks and supply of lendable stocks. Second, we provide evidence of short-sales constraint and associated features using daily data, which provides an opportunity to understand daily movement of borrowing fees, demand for borrowing stocks and supply of lendable stocks. Moreover, use of daily data is useful to study short term trading strategies. Previous studies mostly used a short period of monthly data from few custodian banks. Use of monthly data fails to capture daily movement of cost of borrowing stocks and to study short term trading strategies (Diether et al. 2009). Moreover, it is also possible that some short-sale transactions could be unaccounted when short sellers cover their position quickly. Diether (2008) provided evidence that almost half of the securities lending contract closes out in two weeks. Third, we provide evidence on the behavior of stocks having more demand for borrowing stocks than supply of lendable stocks in a centralized lending market.

## 2. Literature Review

Several theories and hypotheses have been developed to provide theoretical foundation on how short-sale affects pricing of securities and efficiency of the market. Miller (1977), Diamond and Verrecchia (1987), Bai, Chang and Wang (2006), and Hong and Stein (2003) develop theoretical models

about pricing behavior and efficiency of short-sale constrained stocks. There have many empirical studies to examine conjectures made by these theoretical models. Several empirical studies document that short-sale constraint as measured by high short interest leads to lower future returns (Asquith and Meulbroek, 1995; Desai et al. 2002; Asquith et al. 2005; Takahashi, 2010). Short-sale constrained stocks are not only found to produce lower future returns but also aggravate when investors' divergence of opinion is high (Boehme et al. 2006; Blocher et al. 2013). Using direct cost of short-sale as a measure for short-sale constraints, Beneish et al. (2015), Jones and Lamont (2002), D'Avolio (2002), Geczy et al. (2002), and Ofek, et al. (2004) show that stocks with substantially higher costs have lower subsequent returns.

Several studies examined pricing efficiency of short-sale constrained stocks. Using monthly short interest data, Desai et al. (2002) and Asquith et al. (2005) report that short sellers improve informational efficiency. Using lending fee data, Reed (2007) report that short-sale constraint reduces informational efficiency of stock prices in the USA. Bris et al. (2007) conclude that information is reflected in prices quickly in the countries where short-sale is not constrained. Using low lending supply as a measure of short-sale constraints, Saffi and Sigurdsson (2011) report that informational efficiency is lower for short-sale constrained stocks. Using shorting flow data, Boehmer et al. (2008) and Diether et al. (2009) argue that short sellers help to correct overvaluation and increase the informational efficiency of stock prices. Isaka (2007) also provide similar evidence for Japan that short-sale constraint reduces speed of adjustment of negative information on stock prices.

### **3. Data and methodology**

To examine the market for borrowing stocks, we included all stocks listed in the TSE and JASDAQ. We collected daily data on stock borrowing fee, amount of stock borrowing, and amount of lendable stocks from the JSF. Data on trading value, price to book ratio, number of shares outstanding, market value of equity, institutional ownership and stock prices are collected from Nikkei NEEDS database. Sample period of our study ranges from 12<sup>th</sup> November, 2015 to 11<sup>th</sup> May, 2016.

Using daily dataset, we provided empirical facts about the equity lending and borrowing markets following the methodology of D'Avolio (2002). To examine determinants of borrowing costs, we used OLS regression models using stock features such as IO, Size, P/B, TV, and NOS as explanatory variables and actual cost of borrowing (COB) as dependent variable. We also used a logit regression model where probability of being special as dependent variable is proxied by a dummy variable that assume the value 1 for special stocks and 0 for GC stocks. Stock features such as IO, Size, P/B, TV, and NOS are used as explanatory variables. We also used OLS regression model to observe the determinants of the supply of lendable stocks. In the model, we used supply of lendable stocks as a dependent variable and IO, size, P/B, and TV as independent variables. Finally, we examined future returns behavior of short-sale constrained stocks. At the beginning of each trading day, we organized stocks according to short-sale constraint variables such as specialness of stocks, high short interest and low institutional ownership and observe their returns for the next 7 days. We compared future returns of short-sale constrained and unconstrained stocks by calculating t values of mean differences and later, we examined the relationship by using regression equations.

### **4. Empirical findings**

#### **4.1. Empirical evidence on market for borrowing stocks**

We provide empirical facts about market for borrowing and lending stocks. Number of lendable stocks is found to be 3601 with a low inter-month variation. Actual stock borrowing per day is used as a proxy for the number of stocks sold short per day. On average, only 1294 stocks are sold-short each day with a low inter month variation. Among 1294 stocks sold short, 274 stocks have positive borrowing fee of which most are very negligible. Number of stocks exceeding annual cost of borrowing of 1% is 190, which is only 5.30% of lendable stocks. Empirical evidence on short-sale discloses that very few stocks actually have high cost of borrowing, making stocks short-sale constraints.

We measured flow based and stock short interest ratio, cost of borrowing and institutional ownership to measure short-sales constraint. Daily average of flow based and stock based SIR is found to be 0.005% 0.08% respectively. Average cost of borrowing is found to be 0.0021% with a median value of 0.0011%. Institutional ownership of shorted and non-shorter stocks is 45.42% and 47.78% respectively. Descriptive statistics of key short-sale variables show that short-sale is not strictly binding in Japan. To examine cost of borrowing stocks more closely, we organized stocks into 4 categories (>0.5%, >1%, >5%, and >10% per annum) of borrowing cost. Results show that, on average, only 34 (0.94%) stocks have more borrowing cost than 10%, 61 (1.69%) stocks have more borrowing cost than 5%, 190 (5.28%) stocks have more borrowing cost than 1% and 263 (7.30%) stocks more borrowing cost than 0.5%.

We also investigated features associated with stocks classified based on the borrowing costs; the term 'special' is used for high borrowing cost stocks and 'general collateral (GC)' for low borrowing cost stocks. Results show that special stocks have significantly higher borrowing cost than GC stocks. Special stocks are also featured with more stocks sold short, higher trading volume, higher market capitalization, and lower P/B ratio and lower yield, higher P/E ratio, lower P/sales ratio, higher P/CF ratio, and higher IO.

We also examine daily trend of borrowing cost to understand how long high borrowing cost continues before it begins to fall. All stocks are ranked in descending order in the event day and classified in to special and GC. Daily cost of borrowing of special and GC stocks is observed for the next 7 trading days. We found a clear decreasing trend of borrowing cost for special stocks indicating that high borrowing cost started decreasing from the next trading day and continue to decrease for next 7 days. However, borrowing cost remains significantly higher than GC stocks even after 7 days. We also used OLS and logit regression models to examine determinants of borrowing cost using SIR, size, value, IO, trading volume, and NOS as explanatory variables. OLS regression shows that demand for borrowing stocks measured by SIR is the most important factor affecting borrowing costs. Institutional ownership and size are also found to affect borrowing costs positively while trading volume and number of outstanding stocks are found to affect borrowing costs negatively. Coefficients of logit regression show that institutional ownership affect borrowing cost positively.

#### 4.2. Behavior of stocks facing recall risk

Lenders of stocks have the right to recall stocks at any time they want if they find that continuing with existing contract is unprofitable. Such a situation could arise if supplier of lendable stocks, Japan Securities Finance Company (JSF), cannot meet demand for borrowing stocks by the supply of lendable stocks. Although the evidence of recalling stocks is sometimes evident in the USA, it is virtually non-evident in Japan due to the existence of a centralized lending market. To examine the phenomena empirically, we measured the mismatch between demand for borrowing stocks and supply of lendable stocks and observe the behaviour of new borrowing and repayment of borrowed stocks. We expect to observe an increase in borrowing cost but do not expect to have much effect on repayment of stocks and decrease in new borrowing in a centralized lending market.

In support of our conjecture, we observe an increase in borrowing fee, a small decline in new borrowing of stocks, and a small increase in return of borrowed stocks after mismatch takes place. However, the declining trend of new borrowing, increasing trend of returned stocks and decreasing trend of borrowed stocks' balance are found to be more in the first day that gradually eases over next few days. We argue that the decrease in new stock borrowing could due to the higher borrowing fees observed after mismatch situation. When short sellers need to compete with the optimistic investors in the market, a situation called 'short squeeze' is created pushing stock price further. In the short squeeze situation, some short sellers could close out their position anticipating higher stock prices in the future. This could be an explanation for initial increase in return of borrowed stocks after mismatch situation. Although we observe a decrease in new stock borrowing and increase in return of stocks, balance of new stock borrowing remains almost the same suggesting that JSF successfully manages the temporary mismatch between demand for borrowing stocks and supply of lendable stocks. Since JSF is connected with a large number of institutional investors, it can borrow stocks from some pessimist institutional investors even in the short squeeze situation. Our arguments also explain why recall risk is higher in a country where short-

sale is controlled by individual custodian banks. It is possible that individual custodian banks do not have access to all institutional investors that reduces the possibility to find a pessimist supplier in the short squeeze situation leading to higher risk for recalling stocks. When a mismatch situation is anticipated, a custodian bank usually recalls stocks in the USA (D'Avolio, 2002) but in the similar situation, JSF borrows stocks from outside institutional investors to fill the gap. As a result, rather than recalling stocks, a temporary increase in borrowing cost is more observed in the mismatch situation in Japan.

#### 4.3. What determines supply of lendable stocks?

We examined determinants of supply of lendable stocks because it affects cost of borrowing. We find determinants of supply of lendable stocks by using an OLS regression where supply of lendable stock scaled by number of outstanding share is used as a dependent variable and stock features such as institutional ownership, size, value, and trading volume are used as explanatory variables. As supply of lendable stock comes primarily from institutional investors, we hypothesize a positive relationship between supply of lendable stock and institutional ownership. Results show that institutional ownership influences supply of lendable stocks significantly alone and even after controlling stock features. Moreover, large capitalized stocks and growth stocks are found to affect supply of lendable stocks positively. However, we do not find evidence that trading volume affect supply of lendable stocks.

#### 4.4. Short-sale constraint and stock returns behaviour

Returns behaviour of stocks facing short-sale constraint has been studied intensively in empirical finance. Several theories predict return behavior of stocks facing short-sale constraint. Although Diamond and Verrechia (1987) do not predict any specific behavior of return facing short-sale constraint, Miller (1977) conjectures that short-sale constrained stocks are overpriced that underperform subsequently. Following Miller's (1977) hypothesis, higher return on the event day and lower returns in the following days for short-sale constraint stocks should be observed. We provide evidence return behavior of short-sales constraint stocks measured by high borrowing costs, high SIR. And low IO. All stocks are ranked in descending order in the event day and classified in to short-sales constrained and non-constrained stocks. We denote short-sales constrained stocks as those that have annual cost of borrowing of more than 1%, stocks in the top decile of SIR, and stocks in the lowest decile of IO. Return behavior of short-sales constrained stocks is observed in the event day and the next 7 trading days. Results provide evidence that short-sale constrained stocks have higher returns in the event day but underperform subsequently compared to non-constrained stocks. However, difference of returns between short-sale constrained and non-constrained in the following 7 trading days is not statistically significant. Results suggest that stock market is informationally efficient. We argue that a centralized lending market reduces short-sales constraint that, in turn, facilitates reflection of both optimists and pessimists in stock prices quickly. As a result, short-sales constraint stocks are not found to be overvalued.

### 5. Conclusion

This study examines whether short-sales constraint is really significant in the presence of a centralized lending market. The centralized trading system in Japan provides an opportunity to observe how costs, demand and supply of borrowing stocks behave in a market where search friction is low. Moreover, use of daily dataset enables us to provide evidence of daily movement of demand, supply and costs of borrowing stocks. Using daily dataset under a centralized lending market, we studied institutional and regulatory features of the equity borrowing market, empirical facts about market for borrowing stocks, determinants of borrowing costs, recall risk and subsequent behavior of new stock borrowing and return of borrowed stocks. We also studied future return behavior of short-sale constrained stocks. Our results show that short-sale is not strictly binding in Japan; only 0.94% stocks have annual borrowing cost more than 10% and 5.3% stocks have annual borrowing cost more than 1%. Other measures of short-sale constraint such as SIR and IO also indicate a less constrained market for borrowing stocks in Japan. Stock borrowing costs, which are found to continue to be high at least for seven days, are mostly found to be affected by the demand for borrowing stocks. We also found that probability of being special is higher for

large capitalized stocks and value stocks. Investors' divergence of opinion as an explanation of high borrowing cost is only partially supported in our study. On the other hand, supporting previous findings, supply of lendable stocks is found to be affected by institutional ownership of stocks even after controlling stock features. We found that sometimes demand for borrowing stocks exceeds supply of lendable stocks producing recall risks for the short seller. In this situation, cost of borrowing is found to increase, new stock borrowing is found to squeeze to a small scale and stock repayment is found to increase compared to the stocks not facing excess demand. However, we argue that in a centralized lending market, JSF manages the mismatch quite efficiently. As a result, we observe that increase in borrowing costs, decrease in new stock borrowing and increase in return of stocks ease subsequently.

We examined return behavior of short-sale constrained stocks measured by three different methods such as specialness of stocks, high short interest ratio, and low institutional ownership. We provide evidence that short-sale constrained stocks are not significantly overpriced and do not significantly underperform subsequently compared to the least constrained stocks. The negative relationship between short-sale constraint variables and subsequent stocks returns are not found to be significant in regression analysis as well. Overall, our results support the assumption of Kolasinski et al. (2013) that a centralized trading system reduces short-sales constraint and improves efficiency of the market.

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