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Hard to Borrow vs. Easy to Borrow: Insights from Japan's Centralized Lendable Stock Market

Mostafa Saidur Rahim Khan

School of Economics, Hiroshima University, Higashi Hiroshima 739-8525, Japan; khan@hiroshima-u.ac.jp

Abstract: This study examines stock borrowing costs in Japan's centralized lendable stock market, focusing on differences between 'hard-to-borrow' and 'easy-to-borrow' stocks over six months of daily data. This study employs a comprehensive methodology to examine metrics such as the short interest ratio, borrowing costs, institutional ownership, price-to-book value ratio, and new stock borrowing patterns. Regression models are utilized to explore the relationships between these factors and borrowing costs. The findings reveal that 'hard-to-borrow' stocks are associated with higher short interest ratios, borrowing costs, price-to-book ratios, and turnover but exhibit lower institutional ownership compared to 'easy-to-borrow' stocks. Notably, institutional ownership negatively correlates with borrowing costs across both categories, while the short interest ratio positively correlates with borrowing costs only for 'hard-to-borrow' stocks. Contrary to expectations, 'hard-to-borrow' stocks do not underperform despite elevated borrowing expenses, suggesting that these costs do not deter short selling activities in the Japanese market. The findings of this study offer key implications for investors and regulators. For investors, understanding the factors influencing borrowing costs aids in optimizing short-selling strategies. For regulators, the results highlight the role of centralized lendable stock markets in enhancing pricing efficiency without hindering trading activities.

Keywords: short sales; stock borrowing costs; centralized stock lending; overvaluation; pricing efficiency

1. Introduction

Existing studies underscore the pivotal role of stock borrowing costs in constraining short-selling practices, particularly in decentralized lendable stock markets. In such markets, high borrowing costs, coupled with frictions like inconsistent stock availability and search costs, significantly hinder short selling, thereby impacting the efficient incorporation of negative information into stock prices and ultimately influencing stock market efficiency (Khan, 2024; Beneish et al., 2015; Nagel, 2005; D'Avolio, 2002; Geczy et al., 2002; Jones & Lamont, 2002; Reed, 2001). Short selling, when unrestricted, plays a critical role in ensuring efficient markets by enabling the timely incorporation of negative information into stock prices (Figlewski, 1981; Asquith & Meulbroek, 1995; Hong & Stein, 2003). Conversely, constraints on short selling, driven by high borrowing costs, hinder this process, often leading to temporary overvaluation (Schultz, 2024). This delay in price correction can result in the prolonged underperformance of constrained stocks. Compounding this issue, the failure to understand and anticipate high stock borrowing costs places short sellers in a challenging position. Without reliable information on borrowing costs, short sellers struggle to make informed decisions, further exacerbating inefficiencies in the market. This interplay between borrowing costs, decision-making, and market efficiency demands closer examination.

The challenges of understanding borrowing costs are particularly pronounced in non-centralized lendable stock markets, such as those in the United States and several other developed countries. In these markets, the determination of consistent and reliable stock borrowing costs is fraught with difficulties for several reasons. First, the absence of comprehensive market-wide data limits the development of a robust supply–demand framework, as highlighted by Kolasinski et al. (2013). Second, the intertwining of stock borrowing fees with other brokerage services complicates the accurate pricing of borrowing costs, as noted by Saffi and Sigurdsson (2011). Finally, search frictions, arising from the decentralized nature of these markets, further inflate borrowing costs, as discussed by Jones and Lamont (2002). These challenges collectively hinder short sellers' ability to access accurate cost information, increasing the risks and uncertainties associated with short selling.

In contrast, Japan's centralized lendable stock market offers a unique structure that addresses many of these challenges. Within this system, borrowing costs are determined by a central authority based on daily borrowing demand and the availability of lendable stocks. This centralized approach eliminates the search frictions common in decentralized systems, as brokers can access a consistent supply of stocks at uniform costs. However, while this structure simplifies the mechanics of borrowing, it presents a new challenge for short sellers. Borrowing orders must be submitted without prior knowledge of actual borrowing fees, as these fees are determined only after orders are processed by the central authority. This lack of transparency adds a layer of risk for short sellers, who must anticipate borrowing fees to develop effective strategies (Huszár & Prado, 2019). The inability to accurately estimate costs can discourage short selling, potentially impacting market efficiency.

Japan's stock lending and borrowing system, administered by the Japan Securities Finance Company (JSFC), dates back to 1951 and is distinct from most other countries. The JSFC functions as the central authority overseeing the interconnected system of securities firms and institutional lenders. When demand for lendable stocks exceeds supply, securities firms borrow stocks from the JSFC on behalf of short sellers. Conversely, when supply outpaces demand, securities firms deposit excess stocks with the JSFC. The JSFC manages discrepancies between borrowing demands and lendable stock inventory—referred to as 'over-lent issues'—through special measures. These include negotiations with institutional investors to acquire additional stocks. In such cases, institutional investors often charge a premium for lending stocks, which the JSFC passes on to borrowers as a premium fee, known as shinakashi-ryo, in addition to the basic lending fee (kashikabu-ryo).

The JSFC establishes specific criteria for applying these premiums, typically capping them at 0.20% per day. However, in exceptional circumstances, premiums may exceed this cap. Notably, borrowing fees in this centralized system are uniformly applied to all borrowers, ensuring consistency. While this structure provides a clear framework for stock lending, it also introduces a dilemma for short sellers. The inability to know borrowing costs upfront complicates their decision-making processes, adding risk and uncertainty. This issue is particularly pronounced in situations involving high borrowing costs, which can constrain short-selling activity and, consequently, market efficiency.

Understanding the implications of high borrowing costs and their role in restricting short sales is critical for evaluating market efficiency. In non-centralized markets, the lack of a uniform borrowing cost complicates the identification of a threshold at which costs become restrictive. Divergent perceptions among short sellers regarding the potential gains from short selling further obscure this issue. For instance, D'Avolio (2002) used an arbitrary benchmark of 1% per annum to define high borrowing costs. In contrast, Japan's centralized system provides a unique opportunity to establish a more precise threshold. The maximum allowable premium of 0.20% per day serves as a clear lower bound, while higher premiums charged under exceptional circumstances offer an upper bound. This

structure allows for a more rigorous examination of borrowing costs and their effects on short-selling behavior.

Despite the critical role of premiums on lendable securities in determining borrowing costs, there is a notable lack of studies on the characteristics associated with stock borrowing costs in Japan. This gap is significant, as the unique centralized structure of Japan's market offers valuable insights into the dynamics of borrowing costs and their impact on market efficiency. To address this gap, this study investigates the determinants and implications of stock borrowing costs in Japan's centralized lendable stock market. Specifically, it explores the relationship between borrowing costs and key variables, including the cost of borrowing (COB), short interest ratio (SIR), institutional ownership (IO), turnover (TO), market capitalization (size), price-to-book ratio (PB), and new stock borrowing (NSB). This study compares hard-to-borrow and easy-to-borrow stocks, analyzing trends in borrowing costs, determinants of high and low costs, and subsequent stock performance.

This research offers several novel contributions. First, it provides a comprehensive analysis of borrowing cost characteristics within a centralized stock lending system, addressing a significant gap in the literature. Unlike prior studies, which predominantly focus on decentralized markets, this study leverages the unique structure of Japan's market to establish clear thresholds for high borrowing costs and to investigate their implications. Second, it examines the impact of borrowing costs on short-selling activity and market efficiency, with a specific focus on the role of premiums such as shinakashi-ryo. Unlike findings from decentralized markets, where high borrowing costs are shown to constrain short selling and reduce market efficiency, this study provides new evidence that higher borrowing costs in a centralized market do not significantly constrain short selling or lead to the underperformance of hard-to-borrow stocks. This insight challenges traditional assumptions and demonstrates that centralized systems can mitigate the adverse effects of borrowing costs. Finally, by analyzing the subsequent performance of hard-to-borrow stocks, this study offers a nuanced understanding of the relationship between borrowing costs and market efficiency, contributing both theoretical and empirical advancements to the existing research framework.

The rest of this paper is organized as follows. Section 2 provides a literature review, Section 3 describes the data and the methods, Section 4 provides empirical results, and Section 5 concludes.

2. Literature Review

Research on short-sale constraints has primarily focused on the demand and supply dynamics within markets. Short interest, representing demand, and institutional shareholding, symbolizing supply, have been extensively studied as indicators of these constraints. While these variables provide valuable insights, the cost of borrowing stocks—a direct and critical measure of short-sale constraints—has received comparatively less attention in the literature. This lack of focus is largely due to the unavailability of reliable data, particularly in non-centralized lendable stock markets. In such markets, decentralized and opaque systems hinder the systematic collection of borrowing cost data, leaving significant gaps in understanding the role of borrowing costs in short-sale constraints.

D'Avolio's (2002) seminal work marked a turning point by emphasizing the importance of stock borrowing costs. Using an 18-month dataset from a major institutional lending intermediary, D'Avolio found that while most stocks were easy to short, a subset faced significant constraints due to high borrowing costs. Constrained stocks exhibited subsequent underperformance, underscoring that short-sale constraints inhibit the efficient incorporation of negative information into stock prices. However, D'Avolio did not establish a definitive threshold for 'constraining' borrowing costs, using an arbitrary benchmark

of 1% per annum. This limitation highlights a broader gap in the literature: the absence of universally recognized thresholds complicates comparative analyses across markets.

Expanding on this foundation, Geczy et al. (2002) analyzed one year of equity loan data from a custodian bank, identifying stocks in the early stages of IPOs, acquirers' stocks, and those with low book-to-market ratios (BV/MV) as particularly challenging to short due to high loan fees. These findings provided crucial insights into how stock-specific attributes influence borrowing costs. Similarly, Jones and Lamont (2002) examined short-sale constraints during 1926–1933, a period when borrowing costs were centrally determined at the New York Stock Exchange. Their analysis revealed that high borrowing costs often aligned with increased demand for short selling, and constrained stocks exhibited subsequent low returns, reinforcing the connection between short-sale constraints and overpricing.

Recent studies have enriched the understanding of these dynamics. Schultz (2024) conducted a comprehensive analysis of borrowing costs spanning nearly a century, from 1926 to 2023. His findings confirmed that stocks with higher borrowing fees consistently underperform those with lower fees, highlighting the enduring impact of borrowing costs on stock returns. Similarly, Khan (2024) reviewed the multifaceted relationship between short-sale constraints and stock returns, identifying varying evidence on the overvaluation hypothesis. They argued that this divergence is due to differences in market conditions, short-selling motives, and structural variations between centralized and decentralized markets. This systematic review emphasized the need for innovative measures to assess short-sale constraints beyond traditional proxies, further underlining gaps in the current literature.

Blocher et al. (2013) demonstrated that hard-to-borrow stocks were overpriced and exhibited diminished subsequent returns, a finding echoed in Beneish et al.'s (2015) work. Covering a larger sample period, Beneish et al. revealed that despite increases in the supply of lendable stocks at higher borrowing costs, scarcity persisted due to high demand, leading to underperformance among constrained stocks. Duong et al. (2017) added to this discourse by showing that elevated stock lending fees significantly lowered future stock returns, underscoring the predictive power of borrowing costs.

In Japan, studies have predominantly used the short interest ratio to measure short-sale constraints. Takahashi (2010), using a flow-based measure, found that less heavily shorted stocks outperformed heavily shorted ones, suggesting that constraints influence returns. Lee and Ko (2014) offered a contrasting view, arguing that high short interest did not consistently lead to lower future returns, highlighting a nuanced relationship between short interest and performance. Isaka (2007), using lending fees as a proxy, showed that short-sale constraints slowed the incorporation of negative information into stock prices, illustrating the unique role of borrowing costs in Japan's centralized market.

Notably, Dusaniwsky (2024) analyzed contemporary data, showing that most short interest is concentrated in general collateral stocks with low borrowing fees, while a small fraction faces borrowing costs exceeding 1%. These findings reaffirm the critical role of borrowing costs in short-selling activity, with constrained stocks often reflecting the interplay of supply and demand.

Despite this growing body of literature, significant gaps remain. Most studies focus on decentralized markets, where borrowing costs vary across brokers and are influenced by market-specific factors. Japan's centralized market offers a unique setting where borrowing costs are uniformly determined by a central authority, providing a clear framework for analyzing short-sale constraints. The maximum allowable premium of 0.20% per day offers an objective threshold for high borrowing costs, which is difficult to establish in decentralized markets. Furthermore, while recent studies like Schultz (2024) and Khan (2024) emphasize the broader implications of borrowing costs, they did not examine the specific characteristics of centralized markets like Japan's.

3. Data and Methods

3.1. Data

To explore the attributes of stock borrowing costs, this study encompasses all stocks listed on the Tokyo Stock Exchange (TSE) and JASDAQ, excluding REITs and ETFs. Data on daily stock borrowing fees, borrowed stock volumes, and lendable stock quantities were sourced from the Japan Securities Finance Co. (JSFC), Tokyo, Japan. Complementing this, the Nikkei NEEDS database provides comprehensive data on trading value, price-to-book ratios, outstanding share quantities, the market value of equity, institutional ownership, and stock prices. While the database supplies daily information on trading value, price-to-book ratios, outstanding share quantities, market value of equity, and stock prices, institutional ownership data are reported semi-annually. To address this, semi-annual institutional ownership data were converted into daily figures under the assumption of a stable ownership structure during the interim period. Furthermore, the Nikkei NEEDS database includes detailed ownership information for the top 30 stockholders, covering approximately 60% to 70% of total stock ownership.

This study's sample period spans from 12 November 2015 to 11 May 2016, yielding a total of 420,665 observations. The selection of this specific period was guided by both regulatory stability and data availability. This timeframe falls within a stable regulatory environment, as evidenced by the relaxation of price restriction rules in 2013 and the absence of major regulatory changes affecting the demand and supply of borrowing stocks until July 2016 (Osaki, 2013; Khan et al., 2019). In comparison, other periods in Japan's stock market history were marked by significant regulatory interventions such as price restrictions, a ban on naked short selling, reporting rules, margin requirements, and temporary restrictions on short selling. Considering these factors, the 2015–2016 period provided a stable regulatory environment, free from the disruptions caused by such interventions. This stability allowed us to focus on borrowing cost dynamics without the confounding influence of regulatory changes. While a similarly stable period was observed before the COVID-19 pandemic, data availability constrained our ability to study that period. The database we used did not provide relevant daily information for that timeframe, offering only monthly data instead. Given the importance of daily data for capturing short-term dynamics in borrowing costs and short-selling behavior, this specific timeframe was deemed the most suitable for this study.

Using daily stock borrowing costs in this research provides significant advantages over prior studies, which primarily relied on monthly data. Monthly figures are unable to capture the day-to-day fluctuations in short-sale constraints and associated short-term trading strategies (Diether et al., 2009). This limitation is particularly significant given that nearly half of all short-sale trading contracts are closed within two weeks (Diether, 2008). By utilizing daily data, this study offers a more granular and accurate analysis of the dynamics underlying stock borrowing costs and their implications for trading behaviors.

3.2. Variables

The differentiation between high and low borrowing costs is determined by the maximum premium on lendable stocks. Stocks with a daily borrowing cost equal to or exceeding 0.20% are categorized as high-borrowing-cost stocks (hard-to-borrow stocks), while those with a daily borrowing cost below 0.20% are classified as low-borrowing-cost stocks (easy-to-borrow stocks). To examine the characteristics of these two groups, several variables are utilized in the analysis.

The cost of borrowing (COB) is the daily premium required for borrowing shares, serving as the primary criterion for stock categorization. The short interest ratio (SIR), which represents the ratio of short interest to total outstanding shares, measures the level of short-selling activity relative to the stock's availability. Another key variable is institutional

ownership (IO), defined as the percentage of shares held by institutional investors. Due to the unavailability of daily data, semi-annual institutional ownership data were interpolated into daily values. This interpolation was based on the assumption of a stable ownership structure within the reporting periods, an approach consistent with established practices in temporal disaggregation (Chipman & Lapham, 1995; Schmidt, 1986). While this assumption aligns with the relatively low volatility of institutional holdings over short-to-medium time horizons, the possibility of short-term fluctuations in ownership is acknowledged.

Stock liquidity and trading activity are assessed using the turnover (TO) metric, calculated as the trading volume divided by the total outstanding shares. The size of a stock, measured by its market capitalization (the product of stock price and outstanding shares), reflects the firm's overall market presence. The price-to-book (P/B) ratio offers insights into market valuation by comparing the stock's market price to its book value per share. Lastly, Net Stock Borrowing (NSB) captures the difference between the quantity of borrowed shares and lendable shares, indicating net borrowing demand relative to stock availability.

Together, these variables provide a robust framework for distinguishing the features of hard-to-borrow and easy-to-borrow stocks, facilitating a detailed exploration of their market behavior, valuation, liquidity, and trading patterns.

3.3. Descriptive Statistics

Table 1 shows the descriptive statistics of the primary variables used in this study, highlighting their central tendencies and variability across a dataset of 420,665 observations. The cost of borrowing (COB) has a mean value of 0.0016, indicating that the average borrowing cost is relatively low. However, the standard deviation of 0.0747 shows considerable variability, with some instances of extraordinarily high borrowing costs, as evidenced by the maximum value of 38.4615. This wide range, from a minimum of 0.0000 to such a high maximum, underscores the diverse borrowing conditions in the market.

Table 1. Descriptive statistics.

Variables	Mean	Standard Deviation	Max	Min	Obs.
COB	0.0016	0.0747	0.0000	38.4615	420,665
SIR	0.0772	0.3035	0.0000	9.4182	420,665
IO	46.8756	18.5252	0.0000	100.0000	420,665
TO	0.0068	0.0402	0.0000	5.1895	420,665
Size (JPY million)	176,486	856,565	386	26,636,204	420,665
P/B ratio	2.1510	7.8248	0.1549	433.8882	420,665
NSB	5079	59,558	0.0000	9,831,200	420,665

Notes: Table 1 shows the descriptive statistics of the main variables of this study. COB, SIR, and IO are shown in percentage format.

The short interest ratio (SIR) averages 0.0772, suggesting that short interest constitutes about 7.7% of shares outstanding on average. A standard deviation of 0.3035 indicates notable variability, with some stocks showing no short interest (minimum of 0.0000) and others reaching a high of 9.4182, reflecting intense short-selling activity. Institutional ownership (IO) averages 46.88%, demonstrating significant involvement of institutional investors in the sampled stocks. However, this variable also exhibits variability, with ownership ranging from 0.0000 (no institutional holdings) to 100.0000 (fully institutionally owned), as indicated by a standard deviation of 18.5252.

Turnover (TO), representing trading activity, has a low mean of 0.0068, suggesting limited trading frequency for most stocks. The standard deviation of 0.0402 reveals that while some stocks are infrequently traded (minimum of 0.0000), others exhibit high trading activity, as shown by the maximum turnover of 5.1895. Similarly, the size (market capitalization)

of firms, measured in JPY million, displays substantial disparity. While the mean market capitalization is JPY 176,486 million, the large standard deviation of JPY 856,565 million reflects the presence of both small firms (minimum size of JPY 386 million) and massive corporations (maximum size of JPY 26,636,204 million).

The price-to-book (P/B) ratio has a mean of 2.1510, indicating that stocks generally trade at about twice their book value. However, the high standard deviation of 7.8248 and the wide range, from a minimum of 0.1549 to a maximum of 433.8882, highlight significant variation in valuation multiples, with some stocks commanding extremely high premiums. Lastly, new stock borrowing (NSB) averages 5079 borrowings, indicating moderate activity overall. Yet, the standard deviation of 59,558 and the range from 0.0000 to 9,831,200 underscore substantial heterogeneity, with some stocks experiencing little or no borrowing activity and others showing extremely high levels.

In summary, the descriptive statistics reveal substantial diversity in borrowing costs, short interest, institutional ownership, trading activity, market capitalization, valuation multiples, and borrowing activity. This variability is crucial for exploring how these factors influence short-sale constraints and their broader impact on market efficiency.

3.4. Methods

This study employs a range of statistical tools to examine the characteristics of stock borrowing costs and their determining factors. Initially, a mean comparison test was conducted to identify differences between hard-to-borrow and easy-to-borrow stocks. As outlined earlier, stocks with a daily borrowing cost exceeding 0.20% were classified as hard-to-borrow, while those with costs below this threshold were categorized as easy-to-borrow. This classification provided a foundational framework for comparing key attributes across the two groups.

To explore the factors influencing stock borrowing costs, Ordinary Least Squares (OLS) regression and logit regression models were employed. These complementary approaches addressed distinct aspects of the research questions. The OLS regression model analyzed the relationship between borrowing costs and explanatory variables within a continuous framework. In this model, the dependent variable was the cost of borrowing (COB), expressed as the daily borrowing fee as a percentage of the borrowed stock's value. Explanatory variables included the short interest ratio (SIR), institutional ownership (IO), size (measured by market capitalization), price-to-book (P/B) ratio, and turnover (TO). This approach provided insights into how these factors influence borrowing costs across the sample.

The logit regression model, on the other hand, examined the likelihood of encountering high borrowing costs based on a binary classification. The dependent variable was a dummy variable, assigned a value of 1 for stocks classified as having high borrowing costs (daily borrowing cost equal to or exceeding 0.20%) and 0 for stocks with low borrowing costs (below 0.20%). The same set of explanatory variables—SIR, IO, size, P/B ratio, and TO—was included to determine the factors contributing to a higher probability of encountering high borrowing costs. This model provided a probabilistic interpretation of the determinants. The regression equations are specified as follows:

$$COB = \alpha + \beta_1 SIR + \beta_2 IO + \beta_3 Size + \beta_4 P/B + \beta_5 TO + \varepsilon \tag{1}$$

$$
\begin{aligned}
&\text{Probability of having high borrowing costs } (0 = \text{low borrowing costs}, 1 \\
&\quad = \text{high borrowing costs}) \\
&= \alpha + \beta_1 SIR + \beta_2 IO + \beta_3 Size + \beta_4 P/B + \beta_5 TO + \varepsilon
\end{aligned}
\tag{2}
$$

Finally, this study investigates whether high borrowing costs restrict short sales by analyzing the subsequent performance of hard-to-borrow stocks relative to easy-to-borrow

stocks over a 15-day timeframe. The hypothesis is that hard-to-borrow stocks, which incur elevated borrowing costs, are more likely to underperform subsequently due to delayed incorporation of negative information into stock prices. Elevated borrowing costs are presumed to deter short sellers, reducing the market's efficiency in price correction. Conversely, easy-to-borrow stocks, with lower borrowing costs, are expected to allow more efficient short-selling activity, resulting in quicker price adjustments. This analysis provides additional insights into the market dynamics associated with stock borrowing costs.

4. Results and Discussion

4.1. Features of Stock Borrowing Costs

This study employs the premium charged on lendable stocks as a proxy for stock borrowing costs. Stocks with no borrowing fees typically exhibit lower demand relative to supply, resulting in minimal borrowing costs. Even when premiums are applied, most stocks maintain relatively low borrowing costs unless subjected to the maximum premium. Accordingly, this study hypothesizes that stocks fall into the hard-to-borrow category only when charged the maximum borrowing fee. Table 2 summarizes the characteristics of hard-to-borrow and easy-to-borrow stocks in Japan, highlighting key differences between these two categories.

Table 2. Features of hard-to-borrow and easy-to-borrow stocks.

Variables	Hard-To-Borrow Stocks	Easy-To-Borrow Stocks	Differences
COB	0.7805	0.0007	0.7799 (9.23) ***
SIR	0.3092	0.0042	0.3049 (5.27) ***
IO	43.1386	46.8766	−3.7380 (−1.99) **
TO	0.0846	0.0057	0.0789 (2.59) **
Size	103,974	175,619	−71,645 (−1.23)
P/B ratio	2.7710	2.1292	0.6417 (2.87) ***
NSB	65,408	5059	60,349 (4.43) ***

Notes: The values in parentheses represent the corresponding *t*-statistics. Indicators **, and *** denote statistical significance at levels of 5%, and 1%, respectively.

The analysis reveals that while the number of over-lent stocks is notably high, only a small subset incurs the maximum premium. Naturally, borrowing costs for hard-to-borrow stocks are significantly higher than those for easy-to-borrow stocks. Furthermore, the results show a significantly higher short interest ratio (SIR) among hard-to-borrow stocks compared to easy-to-borrow stocks. This elevated SIR indicates heightened demand for short sales, necessitating that the Japan Securities Finance Company (JSFC) procure stocks from external institutional investors at maximum premium rates.

The findings also reveal that hard-to-borrow stocks exhibit lower institutional ownership (IO) and higher turnover (TO) than their easy-to-borrow counterparts. Lower institutional ownership aligns with scenarios where institutions charge maximum premiums due to a limited supply of lendable stocks. Additionally, the higher turnover observed in hard-to-borrow stocks supports the hypothesis that divergent opinions among market participants drive borrowing costs upward. These findings corroborate the assertion by D'Avolio (2002) that divergence of opinion is a significant factor contributing to short-sale constraints.

Interestingly, this study finds no significant difference in size (market capitalization) between hard-to-borrow and easy-to-borrow stocks. However, hard-to-borrow stocks exhibit a significantly higher price-to-book (P/B) ratio. This observation is consistent with prior research, such as Geczy et al. (2002) and D'Avolio (2002), which suggests that hard-to-borrow stocks are often growth stocks targeted by short sellers in anticipation of future price corrections. Finally, the volume of new stock borrowing (NSB) is significantly higher for

hard-to-borrow stocks than for easy-to-borrow stocks, indicating robust demand for short selling despite the higher associated costs.

The results presented in Table 2 provide empirical support for these findings, illustrating the key attributes that differentiate hard-to-borrow stocks from easy-to-borrow stocks.

The relationship between higher borrowing costs and increased demand for stock borrowing, as demonstrated in Table 2, may not fully capture the complete scenario due to a key limitation: Japanese short sellers are often unaware of borrowing costs when placing stock borrowing orders. The apparent positive relationship holds significance only if short sellers remain willing to borrow stocks despite encountering these higher borrowing costs.

To investigate this issue further, the trajectory of borrowing costs and new stock borrowings was analyzed before and after lendable stocks incurred the maximum premium on borrowing fees. Table 3 presents this trend. For each trading day, hard-to-borrow stocks were identified, and borrowing costs and new stock borrowings were tracked over a 19-day window, which included 3 trading days preceding the ranking day and 15 trading days following it.

Table 3. Trends in stock borrowing costs and new stock borrowings.

Day	−3	−2	−1	0	1	2	3
COB	0.3251	0.4290	0.5192	0.8078	0.4011	0.3627	0.3221
NSB	34,394	26,791	34,924	72,911	32,765	18,605	17,255
Day	**4**	**5**	**6**	**7**	**8**	**9**	**10**
COB	0.2429	0.1792	0.1790	0.1486	0.1393	0.1440	0.1417
NSB	21,967	18,401	17,985	14,800	16,288	14,466	13,857
Day	**11**	**12**	**13**	**14**	**15**		
COB	0.1548	0.1341	0.1242	0.1098	0.0658		
NSB	12,295	11,440	9851	9145	11,428		

The results indicate that hard-to-borrow stocks experienced rising borrowing costs in the days leading up to the ranking day, with costs peaking on the ranking day itself. These elevated borrowing costs exceeded the maximum premium threshold but exhibited a declining trend from the fourth trading day post-ranking day onward. By the fifth trading day, borrowing costs fell below the maximum premium threshold and continued to decline for the remainder of the observation period. The phenomenon of borrowing costs surpassing the maximum premium threshold suggests that the Japan Securities Finance Company (JSFC) faced extraordinary circumstances requiring it to acquire hard-to-borrow stocks, leading institutional investors to charge premiums beyond the allowable limit.

Additionally, new stock borrowings showed an upward trajectory, peaking on the ranking day. Borrowings on this day were significantly higher than on any other trading day in the observation period. However, immediately following the ranking day, new stock borrowings declined, indicating that exceptionally high borrowing costs deterred short sellers from further borrowing. While new stock borrowings remained positive and relatively high immediately after the ranking day, they steadily declined throughout the remainder of the observation period.

This trend in borrowing costs and new stock borrowings suggests that, despite encountering high borrowing costs, short sellers continued to borrow stocks, albeit at diminishing levels. Moreover, the trend highlights that the JSFC managed to sustain the stock supply even during peak borrowing demand, with no evidence of stock recalls from existing borrowers. These findings underline the resilience of the borrowing system and the adaptability of market participants in the face of elevated borrowing costs.

4.2. Determinants of High and Low Borrowing Costs

One of the key advantages of a centralized lendable stock market is its ability to provide a comprehensive schedule of both borrowing demands and the availability of lendable stocks—a feature that is infeasible in a decentralized market (Kolasinski et al., 2013). Considering the differences in attributes between hard-to-borrow and easy-to-borrow stocks, investigating the determinants of borrowing costs for these two categories becomes essential. Table 4 presents the results of the Ordinary Least Squares (OLS) and logit regression models, shedding light on the factors driving high and low borrowing costs. The OLS and logit models exhibit strong explanatory power, with the R^2 values for the OLS models and pseudo R^2 for the logit model. The highly significant F statistics for OLS and LR Chi square for the logit model show excellent model fit. Multicollinearity is minimal, as evidenced by the VIF values, all below the standard threshold of 10. Autocorrelation does not appear to be a significant issue, with Durbin–Watson statistics close to the ideal value of 2.

Table 4. The determinants of borrowing costs of hard-to-borrow and easy-to-borrow stocks.

Variables	OLS (Hard-To-Borrow Stocks)	OLS (Easy-To-Borrow Stocks)	Logit
SIR	−0.1659 (−0.73)	0.1272 (6.05) ***	393,999.3000 (3.07) ***
IO	−0.0002 (−3.32) ***	−0.0001 (−3.50) ***	1.1190 (2.56) ***
Size	0.0013 (1.52)	0.0000 (−1.27)	−7.9720 (−2.41) **
P/B	−0.0001 (−0.32)	0.0000 (0.08)	−3.3940 (−1.47)
TO	0.0065 (1.52)	−0.0005 (−1.44)	193.4050 (0.62)
Constant	−0.0132 (−0.71)	0.0053 (3.71) ***	153.3280 (2.24) **
R2	0.1449	0.5047	
F	2.71 **	23.03 ***	
Pseudo R2			0.9351
LR Chi2			260.75 ***
Log likelihood			−9.0529
Observation	420,665	420,665	420,665
VIF	1.86	1.84	1.79
D-W statistic	1.90	2.15	

Notes: The values in parentheses indicate the *t*-statistics. **, and *** denote statistical significance at levels of 5%, and 1%, respectively.

The OLS regression results for hard-to-borrow stocks reveal a significant negative association between institutional ownership (IO) and borrowing costs. This finding is intuitive, as low institutional ownership often leads to reduced availability of lendable stock, thereby driving up borrowing costs. External institutional owners are likely to impose premiums on lending fees during periods of stock scarcity. Interestingly, the analysis indicates that the short interest ratio (SIR) does not exhibit a significant relationship with high borrowing costs. While a high SIR signals increased borrowing demand, borrowing costs appear unaffected as long as the Japan Securities Finance Company (JSFC) ensures a steady supply of lendable stocks. Borrowing costs seem to escalate only when the supply of lendable stocks from institutional sources becomes constrained. Furthermore, the results suggest that stock size, price-to-book (P/B) ratio, and turnover do not have significant associations with high borrowing costs.

For easy-to-borrow stocks, the OLS regression results show a positive relationship between the SIR and borrowing costs, alongside a negative relationship between IO and borrowing costs. The positive association between the SIR and borrowing costs is noteworthy, particularly given the lack of a significant link between the SIR and high borrowing costs. This suggests that the SIR generally correlates positively with borrowing costs due to an imbalance between demand for and supply of lendable stocks. However, when lendable

stock scarcity becomes extreme, institutional owners may impose maximum premiums, resulting in disproportionately high borrowing costs. Thus, high borrowing costs appear to be primarily driven by supply-side constraints. The observed negative relationship between borrowing costs and IO is consistent with prior findings in the literature (D'Avolio, 2002).

The logit regression results provide additional insights into the determinants of high borrowing costs. They reveal that both the SIR and IO increase the likelihood of imposing higher borrowing fees, while stock size reduces this likelihood. The positive impact of IO on high borrowing costs, as indicated by the logit model, contrasts with the OLS regression findings. Nevertheless, the evidence that smaller stocks are more prone to incurring higher borrowing costs aligns with previous studies (D'Avolio, 2002). This suggests that size-related constraints in the lending market may exacerbate borrowing costs for smaller stocks.

Overall, the combined results from the OLS and logit models highlight the interplay of demand-side factors (such as the SIR) and supply-side constraints (such as IO) in shaping borrowing costs. While the SIR reflects borrowing demand, IO predominantly captures supply dynamics, with institutional owners playing a pivotal role in determining borrowing costs during periods of stock scarcity.

4.3. Return Behavior of Hard-To-Borrow and Easy-To-Borrow Stocks

Previous studies have consistently demonstrated that stocks constrained by short-sale restrictions, unable to fully incorporate negative information into their prices, tend to become overvalued and subsequently underperform, particularly in a decentralized lendable stock market (Miller, 1977; Harrison & Kreps, 1978; Diamond & Verrecchia, 1987; Asquith et al., 2005; Desai et al., 2002; D'Avolio, 2002; Chen et al., 2002; Takahashi, 2010; Kolasinski et al., 2013; Beneish et al., 2015). Despite differences in the methodologies used to measure short-sale constraints, the recurring finding of subsequent underperformance among constrained stocks remains consistent across the literature.

In this study, high stock borrowing costs are used as a proxy for short-sale constraints to examine the future return behavior of hard-to-borrow and easy-to-borrow stocks. Stocks are classified daily into these categories, allowing the analysis of their subsequent returns over a 15-trading-day window. The results, presented in Table 5, reveal a noteworthy observation: the future returns of hard-to-borrow stocks do not consistently underperform compared to easy-to-borrow stocks. Contrary to expectations, in many instances, the returns of hard-to-borrow stocks outperform those of easy-to-borrow stocks. This unexpected pattern, despite hard-to-borrow stocks incurring the highest possible borrowing costs, challenges the traditional assumption of clear underperformance among short-sale-constrained stocks in a decentralized lendable stock market.

Table 5. The future return behavior of hard-to-borrow and easy-to-borrow stocks.

	1	2	3	4	5	6	7	8
Hard-to-borrow stocks	0.872	0.019	0.125	0.010	0.400	−0.051	−0.087	0.896
Easy-to-borrow stocks	−0.053	0.025	0.166	−0.026	0.108	0.067	0.068	0.048
Difference	−0.924 (−1.45)	0.006 (0.01)	0.040 (0.08)	−0.035 (−0.08)	−0.293 (−0.71)	0.117 (0.25)	0.155 (0.45)	−0.848 (−1.55)
	9	10	11	12	13	14	15	
Hard-to-borrow stocks	0.121	0.098	0.032	0.654	0.394	0.497	−0.013	
Easy-to-borrow stocks	0.089	−0.002	−0.114	−0.031	0.019	−0.046	−0.023	
Difference	−0.032 (−0.07)	−0.099 (−0.24)	−0.147 (−0.37)	−0.686 (−1.59)	−0.374 (−0.76)	−0.544 (−1.16)	−0.011 (−0.02)	

Notes: The values within parentheses correspond to the *t*-statistics.

This finding raises the argument that in a centralized lendable stock market, where short sellers lack prior knowledge of borrowing costs, these costs may not serve as a significant deterrent to short sales. Moreover, the awareness among short sellers of the maximum allowable borrowing cost limit could lead them to disregard these maximum premiums as binding constraints. Additionally, the continued supply of stocks by the Japan Securities Finance Company (JSFC), even during periods of heightened demand that exceeds the inventory of lendable stocks, further complicates the identification of clear short-sale constraints within the Japanese centralized lendable stock market.

5. Conclusions

Understanding stock borrowing costs is important in analyzing the limitations and dynamics of short sales. This study investigates the characteristics of stock borrowing costs in Japan's centralized lendable stock market, using comprehensive data from the JSFC and the Nikkei NEEDS database over a six-month period. The findings highlight significant distinctions between hard-to-borrow and easy-to-borrow stocks, particularly in terms of the SIR, COB, IO, P/B ratio, and NSB. Hard-to-borrow stocks exhibit a higher SIR, COB, P/B ratio, and TO, but lower IO compared to easy-to-borrow stocks.

The regression analysis reveals a negative relationship between IO and stock borrowing costs, with the determinants varying between high- and low-borrowing-cost stocks. The SIR is positively associated with low borrowing costs but has no significant correlation with high borrowing costs. This finding suggests that high borrowing costs are primarily driven by maximum premiums imposed by external institutional investors—key suppliers of lendable stocks—during exceptional circumstances. Despite heightened short interest, the JSFC's ability to maintain a steady supply of lendable stocks minimizes the impact of demand spikes on borrowing costs. Importantly, this study demonstrates that higher borrowing costs do not significantly constrain short sales. Contrary to expectations, hard-to-borrow stocks do not consistently underperform relative to easy-to-borrow stocks in subsequent periods. The JSFC's effective stock supply mechanism alleviates upward pressure on borrowing costs, fostering an environment where stock prices can efficiently reflect available information.

The findings of this study have practical implications for policymakers and market regulators. The centralized lendable stock market model in Japan reduces short-selling constraints and supports price efficiency by ensuring a smooth supply of lendable stocks. Policymakers seeking to enhance market transparency and efficiency could consider implementing similar structures, tailored to their specific market conditions. For smaller or mid-sized markets, a fully centralized system may be feasible, while larger markets could explore phased or pilot approaches. Successful implementation would require regulatory harmonization, collaboration among stakeholders, and the development of a robust digital platform for real-time stock lending and borrowing. By reducing borrowing cost frictions and fostering a more accessible lending environment, such reforms could enhance short-selling activity, improve price discovery, and promote market stability globally.

While this study provides valuable insights into the dynamics of stock borrowing costs within Japan's centralized lendable stock market, it is not without limitations. First, the analysis is constrained by the relatively short six-month observation period and the lack of more recent data, which may limit the generalizability of the findings to broader or evolving market contexts. Second, the regression model used to determine borrowing costs is based on stock-specific features such as the SIR, IO, TO, size, and P/B ratio. Although the nature of the model reduces the likelihood of reverse causality, potential endogeneity arising from market-wide factors (e.g., demand shocks or policy effects) cannot be entirely ruled out. The absence of instrumental variable methods to control for endogeneity is noted as a limitation.

Third, institutional ownership (IO) data, reported semi-annually, were interpolated into daily values based on the assumption of a stable shareholding structure within the reporting period. While this approach is consistent with established practices, it may not fully account for short-term fluctuations in ownership, potentially introducing some imprecision in the analysis. Finally, this study focuses exclusively on Japan, and its results may not fully capture the nuances of decentralized markets or markets with differing regulatory structures. Future research could address these limitations by expanding the dataset to include longer timeframes, data from various market sectors, or data from different markets, thereby validating the findings across diverse sectoral, economic, and regulatory environments. Additionally, further exploration could investigate the influence of variables such as market sentiment and macroeconomic conditions on stock borrowing costs. Analyzing the impact of centralized lendable stock markets on other aspects of market efficiency, such as volatility and liquidity, could also provide a more comprehensive understanding of their broader implications for financial markets. Moreover, integrating machine learning techniques, such as clustering models or support vector machines, could uncover non-linear patterns or latent groupings in stock borrowing costs and short-selling dynamics, offering valuable insights to complement the interpretability of traditional econometric models.

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