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Short-sale Ban Lift and Market Efficiency: Evidence from Korean Market

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Seoul National University
Finance Major

Hyunjun Jeong

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Dongbeom Choi

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Graduate School of Business
Seoul National University
Finance Major

Hyunjun Jeong

Confirming the master's thesis written by
Hyunjun Jeong
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Chair	서경원	(Seal)
Vice Chair	박소정	(Seal)
Examiner	최동범	(Seal)

Abstract

Short-sale Ban Lift and Market Efficiency: Evidence from Korean Market

Hyunjun Jeong
College of Business Administration
The Graduate School
Seoul National University

On March 16, 2020, the Korean Financial Services Commission temporarily banned short selling on all stocks due to the outbreak of COVID-19. Thereafter on May 3, 2021, the short selling ban was lifted only for the largest 200 companies in KOSPI market and the largest 150 companies in KOSDAQ market. This paper focuses on the short selling ban lift and examines the ban lift's effect on market liquidity, volatility, and stock price in Korean market. By conducting differences-in-differences regression with a matched control group, I find that short selling tends to increase liquidity and lower volatility. I also find that short sales constraint leads to stock overvaluation.

Keywords : short-selling, liquidity, volatility, stock overvaluation, COVID-19
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1. Introduction

The impact of short sales on capital markets is a contentious topic, as regulations surrounding short selling differ significantly across countries and capital markets. While short selling has been a prevalent practice in global financial markets for many years, its influence on market efficiency (e.g., market liquidity, volatility, and pricing efficiency) continues to pique the interest of financial researchers.

When there are constraints on short sales, the prices of securities tend to be more optimistic compared to the average opinion of potential investors, resulting in an upward bias (Miller, 1977). This contention about stock overvaluation is grounded on two conditions: (1) Short selling of a security is either prohibited or accompanied by significant expenses, and (2) investors have divergent beliefs or information regarding the value of the security. The underlying idea is quite straightforward. When short sales are not available, pessimistic investors are unable to participate in the market, causing negative information to be inadequately reflected in prices. As a result, enthusiastic buyers are able to drive prices higher than what average investors consider fair. This argument carries significant implications for market efficiency theories, as price discovery is one of the fundamental functions of capital markets.

Diamond and Verrecchia (1987) present an alternative viewpoint by examining how constraints on short selling affect stock prices within a framework of rational expectations. They demonstrate that when a stock is subject to short-sales constraints, its price adjusts more slowly to negative information compared to positive information. However, they argue that in a rational market, investors will recognize the existence of these constraints and adjust their beliefs accordingly, leading to no systematic overpricing of securities. Unlike Miller (1977) and other optimism models, Diamond and Verrecchia's (1987) study aligns more closely with the efficient market theory. They introduce a risk-neutral market maker who is assumed to have complete knowledge of the economic environment and the ability to update their beliefs using Bayesian inference within the short period between consecutive trades.

The existing empirical evidence predominantly favors the theoretical perspective that placing constraints on short sales impedes the process of price discovery. In other

words, short selling is crucial in a sense that it facilitates market liquidity and prevents overvaluation of stock prices. For example, Boehmer et al. (2013) show that bid-ask spreads and price ranges increase when shorting ban was imposed to the U.S. financial stocks in 2008, but stock prices are not affected significantly. Chang et al. (2007) find that short-sales constraints tend to cause stock overvaluation in Hong Kong market and stock price volatility becomes higher when short sales are allowed.

Song (2021) discusses the effect of shorting ban lift in Korean market by analyzing the cross-sectional change in Amihud illiquidity ratio and standard deviation of stock returns for a short period of two months around the ban expiration date. In contrast, I conduct difference-in-difference panel regressions using various liquidity and volatility measures with a longer sample period of two years. In addition, I analyze the difference in distribution characteristics between the ban period and the postban period, which enriches the empirical results in Korean market.

This paper is organized as follows. Section 2 provides a detailed timeline of events related to the start and the end of the shorting ban during the COVID-19 period in Korean market. Section 3 discusses the data and methodology I use in this paper. Specifically, Section 3.1 describes the data, including daily KOSPI and KOSDAQ data on short sales, as well as the matching procedures. Section 3.2 discusses the methodology I use, particularly the difference-in-difference panel regression models with firm and time fixed effects, and the event study on cumulative abnormal returns around the shorting ban expiration. Section 4 presents empirical results with analysis of the effects on market liquidity, stock price volatility, and overpricing. Section 5 concludes.

2. Timeline of Events

On February 28, 2020, due to the spread of COVID-19, the KOSPI[1] index in the Korean stock market experienced a sharp decline, falling below 2000 points. In

[1] KOSPI (acronym of Korea Composite Stock Price Index) is a stock market index tracking the stock performance of representative companies listed on the Korea Exchange.

response, the Korean Financial Services Commission (FSC) imposed a six-month ban on short-selling of all stocks listed on the Korea Exchange (KRX) on March 16, 2020, in order to bring stability to the stock market hit by the outbreak of COVID-19. The shorting ban covers stocks, ETFs, ELWs, equity warrants, and beneficiary certificates that are listed on the KOSPI, KOSDAQ[2] and KONEX[3] markets of the KRX. Exceptions from the ban are granted to market makers and liquidity providers. On August 27, 2020, however, the FSC extended the short selling ban for an additional six months after reviewing the market conditions, and they extended the ban period once again on February 3, 2021, due to latent concerns about COVID-19.

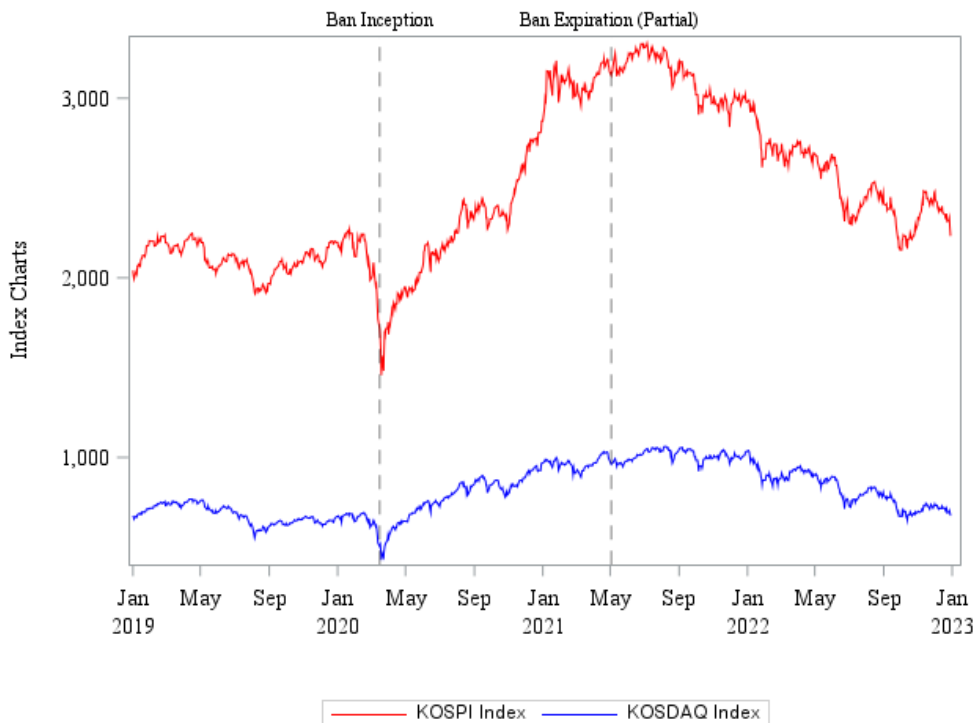

Figure 1. KOSPI index and KOSDAQ index. This figure plots the KOSPI index and the KOSDAQ index from January 1, 2019, to December 31, 2022. The vertical dashed lines depict the date when the short selling ban was declared in Korea (March 16, 2020) and the date when the short selling ban was partially lifted for KOSPI 200 and KOSDAQ 150 stocks (May 3, 2021).

[2] KOSDAQ (acronym of Korean Securities Dealers Automated Quotations) is a stock exchange for small and medium-sized enterprises (SMEs) and venture companies.
[3] KONEX (acronym of Korea New Exchange) is a stock exchange exclusively for startups prior to listing on KOSDAQ.

Finally, about 14 months after the ban inception, the FSC decided to lift the shorting ban for the largest 200 firms listed on the main KOSPI market and 150 firms listed on the secondary KOSDAQ market on May 3, 2021. However, short sales ban on the remaining stocks on the KOSPI and KOSDAQ markets is still in place.

3. Data and Methodology

3.1 Data

This study mainly covers the period from May 2, 2020, through May 1, 2022. The initial sample includes all KOSPI and KOSDAQ stocks whose data are available during the sample period. I obtain daily stock return, closing price, highest price, lowest price, trading volume, and market capitalization of individual stocks from DataGuide. Closing bid prices and ask prices are collected from Datastream.

To be included in the sample, stocks must be listed on the KOSPI or KOSDAQ from December 31, 2019, through May 1, 2022, since I create a matched sample based on the market value on December 31, 2019. I retain only common stocks, excluding securities such as preferred shares, SPACs, ETFs, ETNs, and REITs. I also exclude firms that are listed or delisted during the sample period, and stocks that are under 1,000 KRW.

After applying these filters, there are 162 stocks out of the original KOSPI 200 stocks and 125 stocks out of the original KOSDAQ 150 stocks subject to the shorting ban expiration. Accordingly, I create a matched control sample of 287 stocks for which shorting was still prohibited. These stocks are matched by listing exchange, and market cap at the end of 2019. For each stock subject to the lift of short-sales ban, I choose a banned stock that is listed on the same exchange and has a similar market cap. Thus, a total of 287 common stocks from KOSPI 200 and KOSDAQ 150, and 287 matched stocks are included in the overall sample.

Table 1 provides details on summary statistics of the overall sample and the matched control group. Panel A, Panel B, and Panel C present results for the full sample, KOSPI subsample, and KOSDAQ subsample, respectively. Although I manage to create each control group by matching the market capitalization, market

value is still distinguishable between the treatment group and the matched control group. This is because KOSPI 200 and KOSDAQ 150 are the largest stocks listed on the KOSPI and KOSDAQ market, which account for nearly 70% of the total market value. It is demanding to construct a perfect match for these stocks. However, market cap and trading volume are included in the set of control variables in regression tests, which ensure that main results are not influenced by the differences in these stock characteristics between two groups.

3.2 Methodology

In Section 4.1 and 4.2, I describe the effects of the shorting ban lift on liquidity and volatility via difference-in-difference panel regression with firm fixed effects and time fixed effects. I compare the 287 sample stocks from KOSPI 200 and KOSDAQ 150 to the 287 matched control stocks for which shorting is still prohibited.

My panel regression analyses incorporate all 287×2=574 stocks in the sample. I estimate the following panel regression model with firm and time fixed effects:

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 D_{post} + \beta_2 D_{treatment} + \beta_3 D_{post} D_{treatment} + \beta_4 X_{it} + \varepsilon_{it} \quad (1)$$

where Y_{it} is the dependent variables for liquidity and volatility measures. On the right-hand side, firm and time fixed effects are present, and D_{post} is a dummy variable equals one if and only if the shorting ban is lifted for the stock i on day t. $D_{treatment}$ is a dummy variable equals one if and only if the stock i belongs to KOSPI 200 or KOSDAQ 150. X_{it} represents other control variables: log of market cap, log of trading volume, turnover ratio, and log of closing price.

Thus, this strategy is to identify the effect of the ban lift on dependent variables Y (i.e., liquidity and volatility) by comparing KOSPI 200, KOSDAQ 150 stocks to the matched control stocks using a differences-in-differences methodology.

In Section 4.3, I test the overvaluation hypothesis by comparing stock prices before and after event dates. I apply the measures of abnormal returns (ARs) and cumulative abnormal returns (CARs) around events dates following Brown and Warner (1985).

ARs and CARs are calculated based on the ordinary least squares (OLS) market model, defined as

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \tag{2}$$

and

$$CAR_i(t_1, t_2) = \sum_{t_1}^{t_2} AR_{it} \tag{3}$$

where R_{it} is stock i's return on day t, and R_{mt} is the value-weighted average return of all the stocks traded on KOSPI and KOSDAQ on day t. $\hat{\alpha}_i$ and $\hat{\beta}_i$ are estimates of the intercept and slope coefficients in the OLS market model when stock i's daily return, R_{it}, is regressed on the daily market return, R_{mt}, in an estimation window of (-280, -31).

Therefore, AR_{it} is the abnormal return based on the OLS market model for stock i on day t, and $CAR_i(t_1, t_2)$ is the cumulative abnormal return for event window (t_1, t_2). A 250-day estimation window of (-280, -31) is applied in this paper.

Table 1

Descriptive statistics around the short-selling ban expiration

This table reports summary statistics of KOSPI 200, KOSDAQ 150 stocks and the matched control groups. The short selling ban was partially lifted for KOSPI 200 and KOSDAQ 150 stocks on May 3, 2021. Ban period is from May 2, 2020, to May 2, 2021. Postban period is from May 3, 2021, to May 1, 2022. 162 stocks of KOSPI 200 and 125 stocks of KOSDAQ 150 are included in the sample after the data selection. The full sample consists of 287 stocks subject to the short selling ban expiration and 287 matched control stocks in which shorting is still prohibited. The control groups are matched by the same listing exchange, and similar market capitalization based on December 31, 2019.

	Panel A: Full sample				*Panel B: KOSPI*				*Panel C: KOSDAQ*			
	KOSPI 200 and KOSDAQ 150		Control group		KOSPI 200		Control group		KOSDAQ 150		Control group	
	Ban	Postban	Ban	Postban	Ban	Postban	Ban	Postban	Ban	Postban	Ban	Postban
Number of stocks	287	287	287	287	162	162	162	162	125	125	125	125
Number of days	260	260	260	260	260	260	260	260	260	260	260	260
Market cap (KRW in billions)	5,443	6,280	451	502	8,759	10,110	516	597	1,108	1,274	368	378
Short volume (KRW in millions)	38	1,644	3	53	54	2,216	4	32	22	897	2	81
Trading volume (KRW in millions)	44,562	34,257	8,591	5,447	57,909	44,287	8,135	5,902	27,114	21,148	9,182	4,856
Short sale ratio (%)	0.13	6.29	0.13	1.16	0.18	6.37	0.19	0.86	0.07	6.19	0.07	1.57
Price range (%)	4.05	3.49	4.01	3.45	3.60	3.06	3.76	3.23	4.64	4.06	4.33	3.74
Square of daily return (%)	8.44	6.24	9.63	7.01	7.98	5.24	7.66	5.53	11.79	9.33	9.45	7.16
Bid-ask spread (%)	0.22	0.21	0.27	0.28	0.23	0.22	0.28	0.28	0.21	0.20	0.26	0.27
Amihud illiquidity ratio	0.28	0.25	1.30	1.71	0.21	0.19	1.57	1.75	0.38	0.34	0.94	1.67

4. Main Results

4.1 Effects on market liquidity

Does short selling tend to improve or worsen liquidity? In this section, I use the short selling expiration event to investigate this question. I focus on two liquidity measures: quoted bid-ask spread and Amihud illiquidity ratio. First, I calculate the quoted bid-ask spread of stock i on day t using the following formula:

$$Spread_{it} = \frac{(Ask_{it} - Bid_{it})}{M_{it}} \tag{4}$$

where Ask_{it} is the closing ask price of stock i on day t, Bid_{it} is the closing bid price of stock i on day t, and M_{it} is the mean of Ask_{it} and Bid_{it}. To reduce the effect of data errors and outliers, I exclude all $Spread_{it}$ that are greater than 60%[4] of the quote midpoint.

Next, I calculate the Amihud illiquidity raito of stock i on day t using the following formula:

$$Amihud_{it} = \frac{1}{D} \cdot \sum_{t=1}^{D} \frac{|R_{it}|}{Volume_{it}} \cdot 10^9 \tag{5}$$

where D is the number of days for which data are available for stock i during a given period. R_{it} is the return of stock i on day t, $Volume_{it}$ is respective daily volume in KRW.

Note that bid-ask spread and Amihud illiquidity ratio are commonly used liquidity measures: The wider the quoted bid-ask spread, the less liquid the stock; The higher the Amihud illiquidity ratio, the less liquid the stock.

Panel A of Table 1 shows that during the shorting ban period, average quoted bid-ask spreads are 0.22% for KOSPI 200 and KOSDAQ 150 stocks and 0.27% for the matched control group. While the shorting ban is lifted for KOSPI 200 and

[4] In Korean market, the daily price limits for individual stocks are set at 30% above and below the previous day's closing price since June 15, 2015.

KOSDAQ 150 stocks, these market quality measures diverge consequently. Average quoted spreads widen to 0.28% for the control stocks but narrow to 0.21% for the KOSPI 200 and KOSDAQ 150 stocks. Since the difference-in-difference panel regressions employ firm and time fixed effects as well as other control variables, therefore general market effects are eliminated, and the change in liquidity is identified by comparing otherwise similar treatment and control group of stocks on a given day.

Table 2

The effect of short-selling ban expiration on liquidity

This table reports how the short selling ban expiration affects market liquidity. Dependent variables include quoted bid-ask spread, and Amihud illiquidity ratio. The ban expiration dummy (D_post) equals one if and only if the date is after May 3, 2021, and zero otherwise. The treatment dummy (D_treatment) equals one if and only if the stock belongs to KOSPI 200 or KOSDAQ 150, and zero otherwise. t-statistics are presented in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, using standard errors clustered on firm and date.

	Bid-ask spread		Amihud illiquidity ratio	
	(1)	(2)	(3)	(4)
D_{post}	0.004	-0.047 ***	0.089	-0.270
	(1.00)	(-4.48)	(0.73)	(-1.12)
$D_{post} \times D_{treatment}$	-0.004	-0.005	-0.219 **	-0.266 **
	(-0.65)	(-0.97)	(-1.99)	(-2.46)
Market cap	0.008	0.028	-0.066	0.299
	(0.41)	(1.49)	(-0.35)	(1.08)
Trading volume	-0.011 ***	-0.013 ***	-0.771 ***	-0.819 ***
	(-8.09)	(-9.46)	(-6.01)	(-5.79)
Turnover ratio	0.0004 **	0.001 ***	0.070 ***	0.071 ***
	(2.55)	(3.10)	(4.64)	(4.58)
Price	-0.064 ***	-0.066 ***	0.176	0.209
	(-3.53)	(-3.55)	(1.17)	(1.33)
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
Observations	296,039	296,039	296,039	296,039
adj. R^2	0.022	0.038	0.044	0.058

Table 2 shows the results of the full sample panel regressions on liquidity with firm and time fixed effects. Column 1 and 3 report the results of liquidity measures with firm fixed effects, and column 2 and 4 report the results with both firm and time fixed effects. In column 1 and 2, the interaction terms of dummy variables are negative but not statistically significant, implying that the lift of shorting ban is not associated with a decrease in quoted bid-ask spreads. In column 3 and 4, however, the interaction terms of dummy variables are negative and significant at the 5% level, implying that the lift of shorting ban is associated with a decrease in Amihud illiquidity ratio. All else equal, in column 4, Amihud illiquidity ratio for affected stocks decreases by an average of -0.266 after the ban lift, and this effect is significant at the 5% level.

The insignificant results of the quoted bid-ask spread might arise from the use of low-frequency liquidity measure, as it is possible that low-frequency measures may miss some relevant facets of liquidity that the high-frequency measures capture.

Overall, it seems quite clear that market liquidity measured by Amihud illiquidity ratio is improved for all stocks subject to the shorting ban expiration. This makes sense, as the shorting ban temporarily restricted informed traders that would have provided massive liquidity via shorting. After relaxing the shorting ban for KOSPI 200 and KOSDAQ 150, these informal market makers would provide considerable liquidity to the whole market.

4.2 Effects on stock price volatility

The lift of shorting ban is also associated with a significant decrease in price volatility. In this section, I examine how the short selling ban expiration affects stock price volatility. Specifically, I focus on two volatility measures: price range and squared return. First, I calculate the price range of stock i on day t using the following formula:

$$Range_{it} = \frac{(High_{it} - Low_{it})}{P_{it}} \tag{6}$$

where $High_{it}$ is the highest price of stock i on day t, Low_{it} is the lowest price of stock i on day t, and P_{it} is the closing price of stock i on day t. To reduce

the effect of data errors and outliers, I exclude all $Range_{it}$ that are greater than 60%[5] of the previous closing price.

Next, I calculate the squared return of stock i on day t using the following formula:

$$Squared\ return_{it} = (R_{it})^2 \quad (7)$$

where R_{it} is the return of stock i on day t.

Note that price range and squared return are straightforward volatility measures: The wider the price range, the more volatile the stock; The higher the squared return, the more volatile the stock.

Panel A of Table 1 shows that during the ban period, average daily price ranges are 4.05% for KOSPI 200 and KOSDAQ 150 stocks versus 4.01% for the matched control stocks. The descriptive statistics show that both groups of stocks experience a large decrease in daily price range during the postban period (an average of 3.49% for treatment group versus 3.45% for control group).

Table 3 shows the results of the full sample panel regressions on volatility with firm and time fixed effects. Column 1 and 3 report the results of volatility measures with firm fixed effects, and column 2 and 4 report the results with both firm and time fixed effects. In column 1 and 2, the interaction terms of dummy variables are negative and significant at the 1% level, implying that the lift of shorting ban is strongly associated with a decrease in price range. The shorting ban expiration is associated with an additional -0.26% decrease in price range (t =-4.62) for KOSPI 200 and KOSDAQ 150 stocks, compared with the matched control stocks.

Similarly, in column 3 and 4, the interaction terms of dummy variables are negative and significant at the 1% level as well. It shows that the expiration of shorting ban is associated with a decrease in squared return. Daily squared returns of KOSPI 200 and KOSDAQ 150 stocks experience an excess decrease of -1.257% (t =-3.24), compared with the matched control stocks.

Decreased volatility during the postban period could be due to the improvement

[5] In Korean market, the daily price limits for individual stocks are set at 30% above and below the previous day's closing price since June 15, 2015.

in market liquidity, or it could just simply reflect the less disturbance in the fundamentals after the resumption of short selling.

Table 3

The effect of short-selling ban expiration on volatility

This table reports how the short selling ban expiration affects stock price volatility. Dependent variables include price range, and squared return. The ban expiration dummy (D_post) equals one if and only if the date is after May 3, 2021, and zero otherwise. The treatment dummy (D_treatment) equals one if and only if the stock belongs to KOSPI 200 or KOSDAQ 150, and zero otherwise. t-statistics are presented in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, using standard errors clustered on firm and date.

	Price range		Squared return	
	(1)	(2)	(3)	(4)
D_{post}	0.006 ***	0.004 **	4.124 ***	4.381 ***
	(12.49)	(3.06)	(11.37)	(3.21)
$D_{post} \times D_{treatment}$	-0.002 ***	-0.003 ***	-1.031 ***	-1.257 ***
	(-3.53)	(-4.62)	(-2.67)	(-3.24)
Market cap	-0.018 ***	-0.016 ***	-9.505 ***	-9.789 ***
	(-7.18)	(-6.76)	(-4.23)	(-4.49)
Trading volume	0.017 ***	0.017 ***	6.794 ***	7.047 ***
	(50.35)	(48.15)	(17.70)	(17.30)
Turnover ratio	0.002 ***	0.002 ***	2.574 ***	2.549 ***
	(11.01)	(10.89)	(11.89)	(11.79)
Price	-0.009 ***	-0.007 ***	-4.232 **	-2.890
	(-3.73)	(-3.15)	(-2.09)	(-1.55)
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
Observations	296,039	296,039	296,039	296,039
adj. R^2	0.540	0.604	0.267	0.286

4.3 Event study for overvaluation hypothesis

In Table 4, the cross-sectional means of ARs and CARs for different event windows around the ban lift event are reported. It presents 21 average daily ARs surrounding the event date of short selling ban expiration based on the OLS market model. The average abnormal return on the shorting ban expiration date for the full sample is -0.962% under a significance level of 1%. In addition, the average

abnormal returns on the ban expiration date for KOSPI and KOSDAQ subsamples are -0.641%, -1.378%, respectively. KOSDAQ 150 stocks seem to have experienced a more significant shock somehow.

Panel A shows that at least four of the mean daily ARs in the 10 trading days following the event date remain negative. Two of the negative mean ARs are significant at the 1% level. Panel B shows that at least five of the mean daily ARs in the 10 trading days following the event date remain negative. And three of the negative mean ARs are significant at the 1% level. Panel C shows that at least six of the mean daily ARs in the 10 trading days following the event date remain negative. Three of the negative mean ARs are significant at the 1% level. In general, all affected stocks suffer a negative shock right after the ban lift, but the negative effect is notably long-lasting for KOSDAQ stocks.

In Table 5, cumulative daily abnormal returns surrounding the short selling ban expiration date are reported. In Panel A, the cumulative abnormal return of the full sample from day 0 through day 4 (-1.06%) is significantly different from zero at the 1% level (t-value = -2.97). In Panel B, the cumulative abnormal return of the KOSPI subsample from day 0 through day 3 (-2.08%) is significantly different from zero at the 1% level (t-value = -4.89). In Panel C, the cumulative abnormal return of the KOSDAQ subsample from day 0 through day 10 (-1.93%) is significantly different from zero at the 1% level (t-value = -2.05).

The cumulative abnormal returns are significantly negative at least for the first 3 days right after the lift of the short-selling ban. It implies that shot sales facilitate the reflection of negative information on stock prices, and thus support the hypothesis that short-sales constraints lead to overvaluation in Korean stock market.

Table 4

Daily abnormal returns(%) around the short-selling ban expiration

This table reports abnormal returns based on the OLS market model around the short selling ban expiration. The short selling ban for all stocks was implemented on March 16, 2020. After 14 months, the short selling ban was partially lifted for KOSPI 200 and KOSDAQ 150 stocks on May 3, 2021, denoted as day 0. Only KOSPI 200 and KOSDAQ 150 stocks can be sold short from the event day. Abnormal return is measured by the difference between the actual return and the expected return based on the market model. For the market model, an estimation window of (-280,- 31) is applied. t-statistics are presented in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Panel A: Full sample				*Panel B: KOSPI*				*Panel C: KOSDAQ*			
	KOSPI 200 and KOSDAQ 150		Control group		KOSPI 200		Control group		KOSDAQ 150		Control group	
Days	AR	t-stat	AR	t-stat	AR	t-stat	AR	t-stat	AR	t-stat	AR	t-stat
-10	0.665 ***	(4.47)	0.192	(1.20)	0.257 **	(2.04)	0.494 ***	(2.55)	1.193 ***	(4.06)	-0.200	(-0.76)
-9	0.206	(1.44)	0.553 ***	(3.36)	0.652 ***	(3.78)	0.708 ***	(4.21)	-0.370	(-1.59)	0.351	(1.14)
-8	0.406 ***	(3.25)	0.889 ***	(5.15)	0.186	(1.16)	1.076 ***	(3.88)	0.692 ***	(3.53)	0.646 ***	(3.91)
-7	0.307 **	(2.03)	0.489 ***	(2.90)	0.377 **	(2.05)	0.702 ***	(2.89)	0.216	(0.85)	0.212	(0.94)
-6	-0.220	(-1.29)	0.198	(1.38)	-0.058	(-0.29)	0.276	(1.30)	-0.430	(-1.46)	0.097	(0.53)
-5	0.123	(0.82)	-0.097	(-0.54)	0.231	(1.28)	0.156	(0.73)	-0.016	(-0.06)	-0.426	(-1.40)
-4	-0.010	(-0.06)	-0.016	(-0.12)	0.491 **	(2.23)	0.128	(0.74)	-0.660 ***	(-2.63)	-0.203	(-1.03)
-3	-0.535 ***	(-3.23)	-0.487 ***	(-2.88)	0.299	(1.44)	-0.577 ***	(-4.21)	-1.616 ***	(-6.84)	-0.371	(-1.07)
-2	-0.444 ***	(-2.90)	0.074	(0.51)	-0.020	(-0.10)	0.269	(1.31)	-0.992 ***	(-4.41)	-0.180	(-0.94)
-1	0.228	(1.51)	0.167	(1.21)	0.282	(1.36)	0.147	(0.78)	0.159	(0.71)	0.192	(0.95)
0	-0.962 ***	(-5.16)	-0.357 *	(-1.81)	-0.641 ***	(-2.63)	-0.035	(-0.16)	-1.378 ***	(-4.81)	-0.773 **	(-2.25)
1	-0.508 ***	(-3.83)	-0.430 ***	(-2.96)	-0.701 ***	(-4.15)	-0.601 ***	(-3.62)	-0.258	(-1.22)	-0.207	(-0.81)
2	-0.546 ***	(-4.11)	-0.462 ***	(-3.18)	-0.738 ***	(-4.37)	-0.631 ***	(-3.80)	-0.296	(-1.41)	-0.243	(-0.95)
3	0.489 ***	(2.91)	0.497 ***	(3.38)	1.512 ***	(7.34)	0.868 ***	(4.48)	-0.835 ***	(-3.63)	0.016	(0.07)
4	0.462 ***	(3.51)	0.545 ***	(2.83)	0.561 ***	(3.61)	0.986 ***	(4.10)	0.332	(1.47)	-0.027	(-0.09)
5	0.360 **	(2.32)	0.332 **	(1.97)	0.673 ***	(3.21)	0.701 ***	(3.27)	-0.045	(-0.20)	-0.147	(-0.56)
6	0.435 **	(2.39)	0.848 ***	(5.62)	1.329 ***	(5.32)	1.300 ***	(5.99)	-0.724 ***	(-3.22)	0.262	(1.37)
7	0.143	(0.86)	-0.393 ***	(-2.55)	-0.066	(-0.30)	-0.486 ***	(-2.76)	0.414 *	(1.64)	-0.271	(-1.00)
8	-0.105	(-0.61)	0.139	(0.91)	0.465 **	(2.01)	0.208	(0.96)	-0.844 ***	(-3.49)	0.049	(0.23)
9	-0.137	(-0.84)	-0.181	(-1.14)	-1.094 ***	(-5.92)	-0.154	(-0.65)	1.104 ***	(4.50)	-0.217	(-1.11)
10	0.257	(1.29)	0.177	(0.80)	-0.008	(-0.03)	-0.267	(-0.92)	0.600 *	(1.77)	0.752 **	(2.24)

Table 5

Cumulative daily abnormal returns(%) around the short-selling ban expiration

This table reports cumulative abnormal returns for different time windows after the short selling ban expiration. The short selling ban for all stocks was implemented on March 16, 2020. After 14 months, the short selling ban was partially lifted for KOSPI 200 and KOSDAQ 150 stocks on May 3, 2021, denoted as day 0. Only KOSPI 200 and KOSDAQ 150 stocks can be sold short from the event day. Cumulative abnormal return is measured by the sum of abnormal returns over a given time window. For the market model, an estimation window of (-280,- 31) is applied. t-statistics are presented in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Event Windows	(Day 0)	(0, 1)	(0, 2)	(0, 3)	(0, 4)	(0, 5)	(0, 6)	(0, 7)	(0, 8)	(0, 9)	(0, 10)
Panel A: Full sample											
KOSPI 200 + KOSDAQ 150	-0.96 ***	-1.47 ***	-2.02 ***	-1.53 ***	-1.06 ***	-0.70 *	-0.27	-0.13	-0.23	-0.37	-0.11
	(-5.16)	(-6.57)	(-6.36)	(-4.43)	(-2.97)	(-1.82)	(-0.56)	(-0.25)	(-0.42)	(-0.69)	(-0.20)
Control group	-0.36 *	-0.79 ***	-1.25 ***	-0.75 **	-0.21	0.13	0.97 **	0.58	0.72	0.54	0.72
	(-1.81)	(-3.52)	(-3.88)	(-2.10)	(-0.53)	(0.31)	(2.02)	(1.13)	(1.30)	(0.99)	(1.15)
Panel B: KOSPI											
KOSPI 200	-0.64 ***	-1.34 ***	-2.08 ***	-0.57	-0.01	0.67	2.00 ***	1.93 ***	2.39 ***	1.30 *	1.29 *
	(-2.63)	(-4.43)	(-4.89)	(-1.27)	(-0.02)	(1.38)	(3.33)	(2.88)	(3.45)	(1.88)	(1.90)
Control group	-0.04	-0.64 **	-1.27 ***	-0.4	0.59	1.29 **	2.59 ***	2.10 ***	2.31 ***	2.16 ***	1.89 ***
	(-0.16)	(-2.27)	(-3.14)	(-0.90)	(1.21)	(2.39)	(4.01)	(3.08)	(3.08)	(2.97)	(2.28)
Panel C: KOSDAQ											
KOSDAQ 150	-1.38 ***	-1.64 ***	-1.93 ***	-2.77 ***	-2.44 ***	-2.48 ***	-3.20 ***	-2.79 ***	-3.63 ***	-2.53 ***	-1.93 **
	(-4.81)	(-4.93)	(-4.05)	(-5.32)	(-4.33)	(-4.15)	(-4.52)	(-3.77)	(-4.54)	(-3.22)	(-2.05)
Control group	-0.77 **	-0.98 ***	-1.22 **	-1.21 **	-1.23 **	-1.38 **	-1.12	-1.39 *	-1.34 *	-1.56 **	-0.81 **
	(-2.25)	(-2.70)	(-2.34)	(-2.06)	(-1.97)	(-2.26)	(-1.63)	(-1.85)	(-1.71)	(-1.98)	(-0.88)

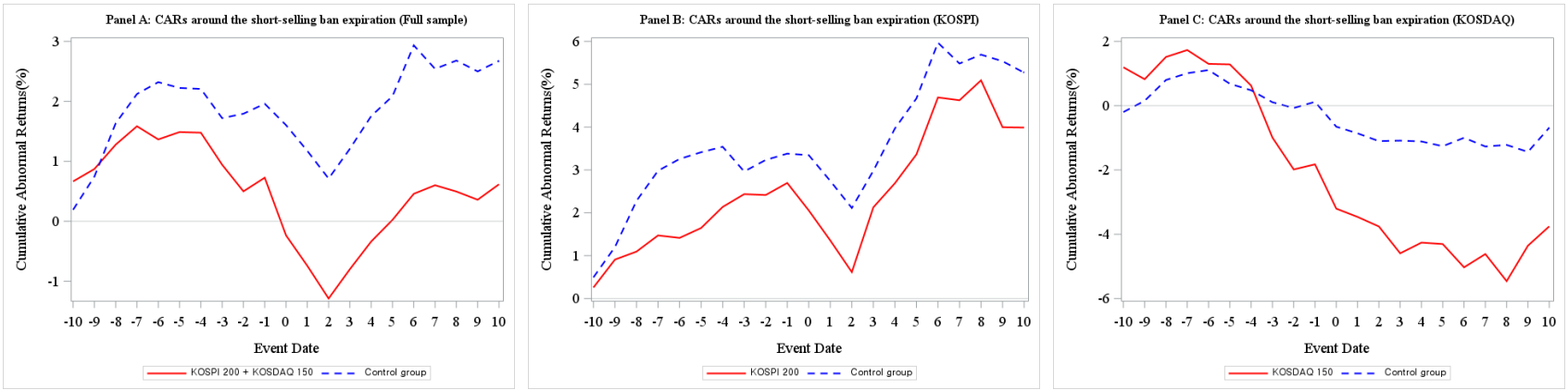

Figure 2. Cumulative abnormal returns around the short-selling ban expiration. This figure plots cumulative abnormal returns of KOSPI 200, KOSDAQ 150 and matched control groups around the short selling ban expiration (May 3, 2021). The full sample consists of 287 common stocks that are subject to the shorting ban expiration (162 KOSPI stocks and 125 KOSDAQ stocks) versus a set of 287 matched control stocks for which shorting is still prohibited. The solid (dashed) line represents treatment (control) groups.

Figure 2 provides an explicit view of the trend in cumulative abnormal returns by plotting mean CARs based on the OLS market model from day -10 through day 10 relative to the event day. A postevent decreasing trend is evident at least for the first three days after day 0.

Panel A shows that cumulative abnormal returns of KOSPI 200 and KOSDAQ 150 stocks decrease significantly compared with the matched control group. While the cumulative abnormal returns of the control group remain positive from day -10 to day 10, the cumulative abnormal returns of KOSPI 200 and KOSDAQ 150 stocks turn into negative from day 0 to day 5.

Panel B shows that cumulative abnormal returns of KOSPI 200 stocks decrease drastically right after the lift of short selling ban. However, the cumulative abnormal returns of KOSPI 200 stocks and the control group remain positive from day -10 to day 10.

Panel C shows that cumulative abnormal returns of KOSDAQ 150 stocks decrease more remarkably compared with the matched control group. The spread widens from day -4, and the cumulative abnormal returns of KOSDAQ 150 stocks become negative from day -3 to day -10.

4.4 Effects on distribution characteristics

In Table 6, I report the cross-sectional mean values of mean, volatility, and skewness of stock daily returns around the short-selling ban expiration. The paired t-statistics are reported to examine whether the differences between estimated values before and after the short selling ban expiration are significantly different from zero.

It is interesting to note that when short sales of individual stocks are allowed, the coefficient of skewness of raw returns becomes less positive. In Panel A, the average skewness of raw returns of the full sample during the ban period is 0.808, but it falls to 0.528 after the ban expiration. The t-statistic is 5.69, implying a decrease in skewness at the 1% level of significance when shorting ban is lifted.

The results are similar within the KOSPI and KOSDAQ subsamples. In Panel B, the average skewness of raw returns of the KOSPI subsample during the ban period is 0.833, but it falls to 0.436 after the ban expiration. The t-statistic is 6.07, implying

a significant decrease in skewness after the resumption of short selling. In Panel C, the average skewness of raw returns of the KOSDAQ subsample during the ban period is 0.775, but it falls to 0.648 after the ban expiration. The t-statistic is 1.72, implying a decrease in skewness at the 10% significance level during the postban period. Results from the KOSDAQ subsample is slightly weaker than the results from the full sample. However, these findings are not consistent with Hong and Stein's (2003) argument.

In Table 6, t-statistics show that the standard deviations of raw returns decrease notably when stocks are allowed to be sold short. In Panel A, the standard deviation of raw returns of the full sample is 2.977 during the ban period, but decreases to 2.519 after the ban expiration. The difference is statistically significant with the t-statistic of 6.49.

The results are similar within the KOSPI and KOSDAQ subsamples. In Panel B, the standard deviation of raw returns of the KOSPI subsample is 2.711 during the shorting ban period, but decreases to 2.211 after the ban expiration. The difference is statistically significant with the t-statistic of 6.49. In Panel C, the standard deviation of raw returns of the KOSDAQ subsample is 3.325 before but 2.921 after the shorting ban lift. The difference is statistically significant with the t-statistic of 3.62.

This evidence suggests that relaxing short-sales constraints tends to decrease the stock price volatility, implying that short sales might play an important role in stabilizing the entire stock market.

Table 6

Difference in distribution characteristics of daily stock returns before and after the ban expiration

This table reports the distribution of daily stock returns before and after the short selling ban expiration. The short selling ban was lifted partially for KOSPI 200 and KOSDAQ 150 stocks on May 3, 2021. Ban period is from May 2, 2020, to May 2, 2021. Postban period is from May 3, 2021, to May 1, 2022. t-statistics are presented in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Raw Returns	Ban (Before)	Postban (After)	Difference (Before minus After)	t-stat
Panel A: Full sample				
Mean	0.243	0.054	0.190 ***	(13.82)
Standard deviation	2.977	2.519	0.458 ***	(6.49)
Skewness	0.808	0.528	0.280 ***	(5.69)
Panel B: KOSPI				
Mean	0.234	0.024	0.210 ***	(12.72)
Standard deviation	2.711	2.211	0.499 ***	(6.49)
Skewness	0.833	0.436	0.397 ***	(6.07)
Panel C: KOSDAQ				
Mean	0.255	0.092	0.163 ***	(7.17)
Standard deviation	3.325	2.921	0.403 ***	(3.62)
Skewness	0.775	0.648	0.127 *	(1.72)

5. Conclusions

In this paper I examine the shorting ban lift's effect on market liquidity, stock price volatility, and price discovery in Korean market.

To test the first hypothesis that short sales tend to improve market liquidity and lower volatility, I create a control group by matching the same listing exchange with similar market cap, and conduct difference-in-difference panel regressions with firm and time fixed effects. I find that stocks subject to the ban expiration enjoyed a significant improvement in liquidity, as measured by quoted bid-ask spread and Amihud illiquidity ratio. They also enjoyed a decline in volatility, as measured by price range and squared return. This evidence is consistent with Diamond and Verrecchia's (1987) argument that short-sales constraints eliminate some informative trades and reduce market liquidity in the short run.

To test the second hypothesis that short-sales constraints might cause stock prices to become overpriced, I compare abnormal returns and cumulative abnormal returns around the partial shorting ban expiration date in Korean market. By conducting an event study, I find that lifting the short selling ban leads to an extraordinary decline in cumulative abnormal returns. This lends support to the second hypothesis and aligns with Miller's (1977) arguments that constraints on short selling can hinder the reflection of negative information into stock prices and cause overvaluation.

Furthermore, I compare the distribution characteristics of stock returns before and after the shorting ban expiration. The results suggest that short sales make stock returns less positively skewed, and less volatile when short sales are practiced in Korean market.

In conclusion, this paper complements existing literature on short selling by providing the empirical results of short sales' effect on market liquidity, volatility, and price discovery in Korean market. Additional evidence is also found on how resumption of short selling influences the distribution characteristics of stock returns. Further discussions by analyzing high-frequency liquidity or volatility measures will enrich relevant studies in this area.

References

Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. Journal of Financial Markets, 5(1):31–56.

Anderson, E. W., Ghysels, E., and Juergens, J. L. (2005). Do heterogeneous beliefs matter for asset pricing? Review of Financial Studies, 18(3):875–924.

Beber, A., and M. Pagano. (2013). Short selling bans around the world: Evidence from the 2007–09 crisis. Journal of Finance 68:343–81.

Boehme, R. D., Danielsen, B. R., and Sorescu, S. M. (2006). Short-sale constraints, differences of opinion, and overvaluation. Journal of Financial and Quantitative Analysis, 41(02):455– 487.

Boehmer, E., and J. Wu. (2013). Short selling and the price discovery process. Review of Financial Studies 26: 287–322.

Boehmer, E. Jones, C. and Zhang, X. (2013). Shackling Short Sellers: The 2008 Shorting Ban. The Review of Financial Studies, Vol. 26, No. 6, pp. 1363-1400.

Brown, S. and Warner, J. (1985). Using daily stock returns the case of event studies. Journal of Financial Economics.

Chang, E. Cheng, J. and Yu, Y. (2007). Short-Sales Constraints and Price Discovery: Evidence from the Hong Kong Market. The Journal of Finance, Vol. 62, No. 5, pp. 2097-2121.

Choe, H. and Lee, H. J. (2012). Short Sales Restriction versus Short Sales Prohibition: Different Effects on Market Efficiency. Asian Review of Financial Research, Vol. 25 No. 2.

Chung, K. and Zhang, H. (2014). A simple approximation of intraday spreads using daily data, Journal of Financial Markets 17, 94–120.

Diamond, D. W., and R. E.. Verrecchia. (1987). Constraints on short-selling and asset price adjustment to private information, Journal of Financial Economics 18, 277-311.

Diether, K. B., K. Lee, and I. M. Werner. (2009). It's SHO time! Short-sale price tests and market quality. Journal of Finance 64:37–73.

Hong, H. and Stein, J. C. (2003). Differences of opinion, short-sales constraints, and market crashes. Review of Financial Studies, 16(2):487–525.

Miller, E. M. (1977). Risk, uncertainty, and divergence of opinion. Journal of Finance, 32(4):1151–68.

Song, M. K. (2021). Debates on short selling and relevant policy recommendations. Korea Institute of Finance (KIF) Research Paper Vol. 2021-05.

국문 초록

공매도 금지 해제 조치가 주식시장에 미치는 영향
– 한국 시장에서의 실증 연구 –

서울대학교 대학원
경영학과 재무금융전공
정현준

2020년 3월 16일, 금융위원회는 코로나19의 확산으로 인해 모든 주식에 대한 일시적 공매도 금지 조치를 시행하였다. 이후 2021년 5월 3일, 코스피 200과 코스닥 150의 구성 종목에 한해 공매도 금지 조치가 해제되었다. 본 논문은 공매도 금지 조치의 해제에 초점을 두어 공매도 재개가 한국 주식시장의 유동성, 변동성, 주가에 미치는 영향을 살펴본다. 대조군 주식을 이용하여 이중차분법으로 회귀 분석을 수행한 결과, 공매도 재개는 유동성을 증가시키고 변동성을 낮추는 경향이 있음을 보인다. 또한 공매도 금지 조치가 주가의 과대평가를 초래하는 것을 발견하였다.

주요어: 공매도, 유동성, 변동성, 주가 과대평가, 코로나19
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