The impact of short selling on the volatility and liquidity of stock markets: evidence from Hong Kong market

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Abstract

The debate among various market participants on the short-selling of securities continues today. Opponents of short-selling argue that it disrupts orderly markets by causing panic selling, high volatility, and market crashes. So this paper investigates what the impact of short selling on the volatility and liquidity of the Hong Kong stock market is, and the results indicate that short selling volumes do not Granger-cause market volatility, but volatility Granger-cause short selling volumes. Moreover Granger causality tests show that there is a bi-directional causality relationship between short selling volumes and market liquidity.

Keywords: Short Sales; Volatility; Liquidity

1. Introduction

A short sale is a sale of a security that the seller does not own or any sale that is consummated by the delivery of a security borrowed by the seller. Although short selling is currently legal in more and more countries, selling short can be expensive due to all kinds of short sale constraints, including various costs and risks of shorting, as well as institutional restrictions. Opponents of short-selling argue that it disrupts orderly markets by causing panic selling, high volatility, and market crashes. While supporters of short-selling argue that it increases information efficiency and liquidity of stock markets, and improves the risk sharing mechanism of economic system.

The debate among various market participants on the short-selling of securities continues today. One of the most debatable issues concerns whether or not short selling exerts an unfavorable effect on the volatility and liquidity of stock markets. In an attempt to answer this issue, this paper investigates the relationship between short selling and the stock market volatility and liquidity using Granger causality tests in the context of the Hong Kong stock market. The main contributions of our study are as follows. First, most of the previous studies have focused only on U.S. stock markets which employ specialists or market makers who have an affirmative obligation to maintain a fair and orderly market. Many other stock markets such as the Hong Kong stock market which is the research object of our study, however, are operated by electronic order matching auction systems without market makers. Such difference in market microstructure could give us an appropriate environment to investigate the different impact of market microstructure on short selling. Second, most of the available empirical studies have examined the impact of short selling at the individual stock level which may differ significantly from the market-wide level.

From the viewpoint of stock market regulation, government regulators could be interested in the effect of short selling at an aggregated stock market level rather than at an individual stock level. Therefore, differing from most of the previous research, our study attempts to investigate how short selling impacts the aggregate market volatility and liquidity. Perhaps closest to our analysis is the work by Liao and Yang (2005). They also investigate the impact of short selling on the volatility and liquidity of the Hong Kong stock market at an aggregated market level but use monthly data, our data frequency, sample period, research methods, measurement of market volatility and liquidity are all different from theirs.

2. Literature Review

Academic literature on short selling has had a renaissance from the 1970s.

As to the impact of short selling on market volatility, most of the previous empirical studies have shown evidences that short selling do not increase the volatility of stock market. For example, by examining the fill rate of short-sale orders, Angel (1997) concludes that the Up-tick Rule impedes short-selling activity, and it is not short-sale orders but ordinary orders make the market more volatile. The Chase Manhattan Bank and the ASTEC Consulting Group (2000) shows that the short selling interests on NYSE and the stock index of NYSE have similar trend of movement from 1990 to 1999. A series of papers by Liao (see Liao and Zhang (2005), Liao and Yang (2005a, 2005b), Wu and Liao (2007), etc.) investigate the relationship between market volatility and short sales in Hongkong and Taiwan stock markets based on the cointegration and Granger causality tests, and the results suggest that short sales play an important role in buffering stock volatility instead of aggravating it. Bris, Goetz-

mann and Zhu (2004) also finds that the non-shortable index is more volatile than the shortable index using the data from 47 countries. Moreover, Charoenrook and Daouk (2005) investigates the history and current practice of short-selling in 111 countries, and they find that when short-selling is possible, aggregate stock returns are less volatile, and the feasibility of short-selling has no relation to the probability of a market crash.

As to the impact of short selling on market liquidity, the empirical evidences are ambiguous. Woolridge and Dickinson (1994) finds a positive correlation between short interest changes and stock returns in U.S market. From their results, they conclude that short sellers provide liquidity to the market by shorting into bullish markets and reducing short positions in bearish markets. Charoenrook and Daouk (2005) uses turnover as a proxy for liquidity, and finds that there is greater liquidity when short-selling is possible. Gao, Hao and Ma (2006) investigate the short selling in Hongkong Stock Exchange, and finds that removing the short-sale constraints increased the liquidity of low priced stocks but not high priced ones. Cai and Xia (2006) finds that the trading of underlying stocks become less active and the information asymmetry among the investors aggravates after the lift of short sales constraints in the Hong Kong stock market, but they fail to find any evidence indicating that the lift of short sales constraints seriously destabilizes the market.

3. Short Selling in Hong Kong Stock Market

In January 1994, the Hong Kong Stock Exchange (HKEx) introduced a pilot scheme for regulated short selling. Under this scheme, 17 securities were eligible for short selling with up-tick rule. The up-tick rule was repealed in March 1996,

and then reinstated on September 7, 1998, following the 1997 Asian financial crisis. Moreover, the list of designated securities for short selling is revised on a quarterly basis by HKEx, based on liquidity and market capitalization.

4. Empirical Study

4.1. Data Description and Variable Computation

This study uses the data of short selling and trading volumes from the website of HKEx and the data of Hang Seng index (HSI) from Bloomberg. Because daily short selling data have been reported on the website of HKEx only since February 2004, this study covers the period from February 2nd, 2004 to July 31st, 2007.

The computations of the variables used in this study are as follows:

(1)　　Measures of short selling

We use daily short selling volumes (SS, unit: million shares) as the measurement of short selling trading in HKEx.

(2)　　Measures of volatility

We use the daily volatility of HSI to reflect the volatility of the market.

$$Volatility_t = \frac{P_t^H - P_t^L}{\left(P_t^H + P_t^L\right)/2}$$

$Volatility_t$ is the volatility of HSI on day t, P_t^H and P_t^L are the highest and lowest price of HSI on day t respectively.

(3)　　Measures of liquidity

Amihud and Mendelson (1991) points out that an asset is liquid if it can be bought or sold at the current market price quickly and at low cost. Liquidity is an elusive concept. It is not observed directly but rather has a number of aspects that cannot be captured in a single measure. Kyle (1985) argues that market liquidity refers to several different elements of transactions costs, including tightness, depth, and resiliency. Harris (1990) argues that four dimensions of liquidity can be identified: width, depth, immediacy,

and resiliency. A widely used proxy for measure of liquidity in recent empirical studies is an illiquidity measure employed by Amihud (2002), which is the daily ratio of absolute stock return to its dollar volume, averaged over some period. Following Amihud (2002), we construct an illiquidity measure to reflect the market liquidity indirectly, which is computed as follows:

$$Illiquid_t = \frac{|R_t|}{V_t} = \frac{\left|\ln\left(P_t\right) - \ln\left(P_{t-1}\right)\right|}{V_t}$$

$Illiquid_t$ is the measure of market illiquidity on day t. It can be interpreted as the daily price response associated with one dollar of trading volume, thus serving as a rough measure of price impact. R_t is the return of HSI on day t, P_t and P_{t-1} are close prices of HSI on day t and day t-1 respectively, V_t is the trading volume of the market (unit: HK$ trillion) on day t.

Descriptive statistics of variables above are summarized in Table 1, and the correlation matrix is presented in Table 2.

Table 1 Descriptive statistics

Variables	Mean	Std. Dev.	Max	Min
SS	125.49	102.00	855.12	14.23
Volatility	0.0010	0.0046	0.0394	0.0029
Illiquid	0.2941	0.3014	2.0910	0.0004

Table 2 Correlation matrix

	SS	Volatility	Illiquid
SS	1.0000	0.1828	-0.2110
Volatility	0.1828	1.0000	0.4492
Illiquid	-0.2110	0.4492	1.0000

4.2. Stationary Test

To begin with, a stationary test on the three data series is done using the Augmented Dickey Fuller (ADF) test procedure. Table 3 shows that all the variables are stationary at a conventional level of significance.

Table 3 ADF tests results

Variables	(c,t,p)	ADF	AIC	Conclusion
SS	(c,t,4)	-5.72***	10.84	Stationary
Volatility	(c,0,5)	-7.69***	-8.05	Stationary
Illiquid	(c,0,5)	-6.64***	0.25	stationary

Note: 1. (c,t,p) is the model specification of ADF test, where c, t, p means intercept, trend and lag length, respectively.
2. *** denotes significant at the 1% level.

4.3. Granger Causality Tests

In order to investigate further the relationship between short selling and the stock market volatility and liquidity, the widely used causality tests first employed by Granger (1969) are performed here. The notion of Granger causality is based on a criterion of incremental forecasting value. A variable X is said to "Granger cause" another variable Y, if "Y can be better predicted from the past of X and Y together than the past of Y alone, other relevant information being used in the prediction". To determine appropriate lag lengths for the lag polynomial, we have considered three different criteria for specifying the lag length at the same time, which are FPE (Final Prediction Error), AIC (Akaike info criterion) and SC (Schwarz criterion). The results of Granger causality tests for the short selling /volatility /liquidity relationship are presented in table 4.

Panel A in Table 4 shows evidences of unidirectional causality from market volatility to short selling volumes. That is, short selling volumes do not Granger-cause market volatility. Even if there is abnormal volatility of market, it is not caused by short selling volumes.

Panel B in Table 4 shows that there is a bi-directional causality relationship between the short selling volumes and market liquidity.

Table 4 Results of Granger causality tests

Null Hypothesis	Lag Length	F-statistics
Panel A: Granger causality tests for the short selling / market volatility relationship		
SS does not cause Volatility	4	0.5921
Volatility does not cause SS	4	5.6339***
Panel B: Granger causality tests for the short selling / market liquidity relationship		
SS does not cause Illiquid	4	6.0838***
Illiquid does not cause SS	4	2.3653*

Note: *, **, *** denotes significant at the 10%, 5%, 1% level, respectively.

4.4. Impulse Response Function

Sims (1980) puts forth the concept of an impulse response to explore the dynamics of an error shock in the system on the future predicted economic variable.

Figure 1 shows that the market volatility has nearly no responses to the innovation of short selling volumes, but the short selling volumes respond quickly and positively to the innovation of market volatility. Therefore, from the results of Granger causality tests and the figures of impulse response function, we can conclude that short selling volumes do not Granger-cause market volatility, but market volatility Granger-causes short selling volumes. With the increase of market volatility, short selling volumes increase too. To sum up, we find no evidence that short selling will make the market more volatile.

Figure 2 shows that the market illiquidity indicator responds negatively to the innovation of short selling volumes from period 2, and the short selling volumes respond positively to the innovation of market illiquidity at first and then turn to negative response from period 3. Therefore, we can conclude that there is a bi-directional causality between short selling volumes and market liquidity. With the increase of short selling volumes, market liquidity increase too. And with the decrease of market liquidity, the short selling volumes increase at first and then decrease later. To sum up, when short selling is possible, there is greater liquidity of market.
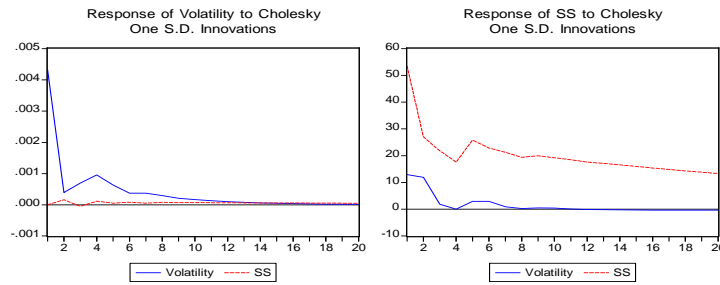
Fig. 1 Figures of impulse response function for short selling and market volatility
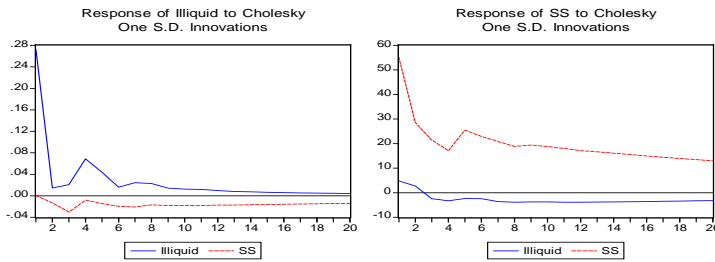

Fig. 2 Figures of impulse response function for short selling and market illiquidity

4.5. Empirical Results Analysis

In a word, the empirical results above indicate that when short selling is possible, aggregate stock returns are less volatile and there is greater liquidity of market. It is might because that with the short sales restriction, when there are severe imbalances between stock supply and demand, the market will fluctuate dramatically. However, short selling mechanism can increase the elasticity of stock supply. For example, when a stock price is too high to be reasonable, some rational investors will undoubtedly short selling this stock, and therefore there is an obviously increase in stock supply in the market. On the one hand, it will relieve the severe imbalances of supply and demand for this stock. On the other hand, it will reveal the higher priced signal of this stock to other investors, and make the price return to reasonable at the end. Furthermore, when

the bubble of higher priced stock bursts, the short sellers will repurchase the stock, which has been short sold, to close their short positions. On the one hand, it will increase the demand of this stock, and the price of it. On the other hand, it will reveal the lower priced signal of this stock to other investors, and then make the price reasonable at the end. It is by this mechanism that short selling can make the market more stable and liquid.

5. Conclusion and Policy Implication

In recent years, with the development of stock markets, short selling has become an important component of basic stock trading system. Currently, short selling is feasible in most of the developed markets, and from 1990s the number of emerging markets allowing short selling has also increased substantially. But there are still many countries where

short selling is not allowed legally or feasible in practice, mainly because the policy makers in these countries worry about the unfavourable effects of short selling on the volatility and liquidity of stock markets. However, the empirical findings of this paper reveal that when short selling is possible, aggregate stock returns are less volatile and there is greater liquidity. It gives regulators policy implication that short selling is not a destabilizing activity, but an acceptable form of trading to supply liquidity even in the absence of market makers.

As to China, short selling has been allowed officially in August 1st, 2006, but as we know, policy does not necessarily translate into practice. Until now, we still can not sell short in practice. As to liquidity of stock market, although the turnover rates of stock trading in Shanghai and Shenzhen Stock Exchanges are relatively high, if we examine from the perspective of product design, micro structure and market participators, the liquidity of our stock market is relatively lower than that of other country's. Just as pointed out in a research report of Shanghai Stock Exchange published on November 22nd, 2006, high turnover rates of stock trading do not necessarily mean high liquidity of market. Moreover, this report argues that the relatively low liquidity of Chinese stock market is mainly due to the imperfection of market structure and trading system, and some other factors of institution and regulation restrictions.

To sum up, a lot of empirical studies have found that removal of short sales constraints will reduce the volatility and increase the liquidity of the market, and short selling is important to the price discovery function of stock market and the development of financial derivatives. Therefore, although everything has two sides, short selling may have some unfavorable impact on the development of market, as long as we can increase the

information transparency and regulation effectiveness, lifting short selling restriction will have more advantages than disadvantages. Moreover, in the process of establishing short selling system, we should consider seriously our special financial structure, development level of market and regulation ability, and adopt the most suitable short selling rules.

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