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Can price limits help when the price is falling? Evidence from transactions data on the Shanghai Stock Exchange ☆

Woon K. WONG [a,*], Bo LIU [b], Yong ZENG [b]

[a] Investment Management Research Unit, Cardiff Business School, Aberconway Building, Colum Drive, Cardiff, CF10 3EU, United Kingdom
[b] School of Management and Economics, University of Electronic Science and Technology of China, No. 4, Section 2, North Jianshe Road, Chengdu 610054, Sichuan, P.R. China

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ABSTRACT

We use transactions data to explore the magnet effects of price limit rules on the Shanghai Stock Exchange (SHSE). When limit hits are imminent, stock prices are found to approach the price limits at faster rates, with higher trading intensity and larger price variation, supporting the magnet effect hypothesis of Subrahmanyam [Subrahmanyam, A., 1994. Circuit breakers and market volatility: A theoretical perspective. Journal of Finance, 49, 237–254.]. Moreover, when stock prices approach the floor limits, we observe lower than normal market conditions' trading volume and trade size but a wider spread. The panic selling psychology of individual investors for fear of illiquidity and the strategic trading decisions of discretionary traders during periods prior to price limit hits at the floors are conjectured as possible explanations for the observed price behaviors. Post-limit-hit analysis reveals evidence of delayed price discovery at the ceiling limit but price reversal at the floor.

1. Introduction

The design and evaluation of the market mechanism, especially the circuit breakers, is a core issue in the study of financial market microstructure and has attracted much attention from academics and practitioners alike. In particular, the price limit rules have been applied to many securities markets as a type of circuit breaker for individual securities. For example, both the Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE) have limit bounds of ± 10% imposed on the fluctuations of stock prices from their previous day's closing prices. Other markets that impose similar limit bounds are, for example, Austria (5%), France (7%), Greece (4–8%), Korea (15%), Malaysia (30%) and Taiwan (7%).

In essene, the price limit rule is designed to provide a cooling off period and hence prevent excessive price movements. However, much theoretical and empirical research suggests, on the contrary, that it has four adverse effects. The first one is the volatility spillover effect documented by Kuhn, Kurserk and Locke (1991), Kim and Rhee (1997) and Kim (2001). It suggests that price limits will increase the volatility on the subsequent trading days since the limits prevent concurrent immediate corrections in the order imbalance. The delayed price discovery effect documented by Fama (1989), Lehmann (1989) and Lee, Ready and Seguin (1994) is the second adverse effect. Because limit bounds prevent prices from reaching the new equilibrium level, information

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* Corresponding author. Tel.: +44 29 20875079; fax: +44 29 20874419.
E-mail address: wongwk3@cardiff.ac.uk (W.K. Wong).

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revelation and price discovery are delayed. Thirdly, the trading interference effect documented by Fama (1989), Lehmann (1989) and Lee et al. (1994) suggest that price limits can interfere with trading activity by causing illiquidity. The extant literature on these three effects on the China stock markets is mixed. While Mu, Liu and Wu (2004) and Chen and Long (2003) find evidence of them using daily data, Wu and Xu (2002) reject them.

The fourth one, the magnet effect documented by Subrahmanyam (1994) and Cho, Russell, Tiao and Tsay (2003) refers to the phenomenon that the price limit acts as a magnet and further pulls the price even closer to the limit amidst high trading intensity and price volatility.[1] Such a phenomenon occurs when the traders, for fear of illiquidity and position lock caused by imminent price limit hits, are eager to protect themselves through aggressive trading, thereby inducing large price variation and heavy trading volume. Since the magnet effect is essentially a phenomenon that takes place at the intraday level, its study helps both investors and regulators to understand the mechanisms of how the market structure and the investors' trading behavior affect the price discovery process (O'Hara, 1995; Madhavan, 2000; Biais, Glosten & Spatt, 2005). For this reason, the magnet effect has been widely studied (e.g., Subrahmanyam, 1994, 1997; Kim and Rhee, 1997; Cho et al., 2003; Goldstein and Kavajecz, 2004; Chan, Kim & Rhee, 2005; Du, Liu & Rhee, 2005; Fernandes and Rocha, 2007; Wong, Chang & Tu, 2008).

While the evidence of the magnet effect is weak in the futures markets,[2] research on stock markets tends to find significant evidence of the magnet effect. For example, Chan et al. (2005) study the transactions data and limit order book from the Kuala Lumpur Stock Exchange. They find that price limits actually delay information revelation and worsen order imbalances, indicating the existence of the magnet effect. Du et al. (2005) use the transactions and order data of the Korea Stock Exchange and find that a narrower price limit features a stronger magnet effect and the ceiling provides a stronger magnet effect than the floor. For the Taiwan Stock Exchange, Cho et al. (2003) find statistically and economically significant magnet effects and Wong et al. (2008) reveal that the phenomenon is caused by individual investors.

One objective of our paper is to explore the intraday dynamics of the ceiling and floor magnet effects using transactions data from the SHSE in China. Our motivation for the study of magnet effects in the Chinese stock markets is twofold. First, Chinese stock markets have drawn a lot of attention from the world for their fast growth and China's economic development in recent years (see, e.g., Huang and Song, 2006; Girardin and Liu, 2007). Yet, trading on the SHSE is dominated by individual investors: according to the Chinese Securities Depository & Clearing Co. Ltd., 99.5% of the 68.8 million domestic investor accounts in 2002 were held by individual investors. Second, unlike most stock exchanges in the Asia–Pacific region, short selling is absolutely prohibited in the SHSE. Comerton-Forde and Rydge (2006) study the market design of the major stock exchanges of Australia, Hong Kong, Jakarta, Korea, Malaysia, Shanghai, Singapore, Taiwan, Thailand and Tokyo.[3] Out of these exchanges in the region, Bursa Malaysia is the only other stock exchange where short selling is disallowed; the authority is currently considering lifting the ban. Moreover, no stock index futures or other similar derivative instruments for holding short positions exist in the SHSE. While this rules out the risk of speculative selling that would cause excessive stock price volatility, it also means that investors in China have no means to hedge themselves against downside risk. Therefore, it is interesting to find out empirically if price limit rules do provide welfare for the investors (who are mostly individuals) in China.

The research methodology employed in this paper is similar to those of Du et al. (2005) and Wong et al. (2008). Specifically, we first examine the intraday dynamics of 5-min price returns, and return volatility and frequency of trades during the periods prior to limit hits. Consistent with the predictions of Subrahmanyam (1994), stock prices are found to approach limit bounds at faster rates with increased volatility and higher frequency of trades half an hour prior to the limit hits. Since Monte Carlo simulations show that stock prices approach the price limits at a seemingly quadratic rate of increasing speeds, we need to adjust for the sampling characteristics which arise from the fact that we are studying stocks with imminent limit hits half an hour later. Therefore, in order to confirm that stock prices do approach the limit bounds at faster rates, we subtract from the true pre-hit returns (at ±10% levels) the effects of quasi limit hits hypothetically set at ±6% levels and then carry out formal statistical tests. The empirical results show that there is at least a positive rate of magnetic pulls towards the limit bounds when the price limit hits are imminent.

In addition to the stylized magnet effects, our study also finds interesting asymmetry between ceiling and floor magnet effects. In particular, when the stock prices approach the floor limits, there is evidence that the bid-ask spreads are wider, trading volume is lower and trade size is smaller than they would have been during normal market conditions. This is in contrast to earlier literature such as Kim and Rhee (1997), who find that results for ceiling-hit and floor-hit events are qualitatively similar on the Tokyo Stock Exchange. To explain the above phenomenon, we first notice that Chinese stock markets are purely order driven with no market makers, short sale is strictly prohibited and the market for stock index futures or other similar derivative instruments does not exist. The implication is that the investors in China can have only long positions but have no means of hedging the downside risks of their equity portfolios.

Next, the study by Goldstein and Kavajecz (2004) on the trading behaviors of NYSE market participants during the turbulent October 1997 provides clues for us to explain the above findings of asymmetry between ceiling and floor limits.[4] Goldstein and Kavajecz find that, during this period of extreme market movements, the costs of supplying liquidity through an electronic limit

[1] The paper by Subrahmanyam (1994) provides an important theoretical study of the possible adverse effects of price limit as a form of circuit breaker. His two-period model indicates that as investors sub-optimally advance trades in time for fear of illiquidity when prices hit the limit bounds, the price variability, the trading volume and the probability of hitting the limits increase as prices approach the limits.

[2] Relevant literature includes, for example, Arak and Cook (1997), Berkman and Steenbeek (1998), Hall and Korfman (2001) and Fernandes and Rocha (2007).

[3] See also Bris, Goetzmann and Zhu (2007) for a world comparison.

[4] During the turbulent October 1997, the market-wide 'circuit breaker' provision of NYSE Rule 80B was triggered for the first time in the NYSE since the rule was adopted in 1988.