The Impact of Large Shareholders' Lock-up Expiration on Stock Prices: An Empirical Study Based on the STAR Market

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Abstract: *This study investigates the impact of large shareholders' lock-up expiration on stock prices in the STAR Market. Using an event study methodology, we analyze stock price dynamics surrounding lock-up expiration events. Our findings indicate that stock prices tend to decline prior to expiration due to investor anticipation of potential sell-offs but subsequently experience a recovery, suggesting that the market gradually absorbs the impact. Moreover, industry and firm size heterogeneity significantly influence market reactions. This study provides insights for investors managing risks around lock-up expiration events and contributes to a deeper understanding of market efficiency.*

Keywords: *Lock-up Expiration, Stock Price Volatility, Market Reaction, Event Study, Market Efficiency*

1. Introduction

The expiration of large shareholders' lock-up periods allows previously restricted shares to enter the market, potentially affecting stock prices due to increased supply. Conventional wisdom suggests that such events generate bearish signals; however, empirical evidence presents a more nuanced picture. While increased liquidity might lead to positive stock price reactions, concerns over potential sell-offs can trigger short-term price declines.

Given the STAR Market's focus on technology-driven enterprises and its registration-based IPO system, lock-up expiration may have a more pronounced effect than in other markets. This study employs an event study methodology to examine investor behavior and market responses to these events, providing implications for market stability and investment strategies.

2. Literature review

Research on stock price reactions to lock-up expiration events has yielded mixed results. Some studies argue that the increased supply of shares exerts downward pressure on stock prices, while others suggest that improved market liquidity may counteract the negative effects. Recent studies highlight the importance of firm-specific factors, market conditions, and investor sentiment in shaping post-expiration price behavior (Chen & Wang, 2020; Liu et al., 2022) [3] [5].

For instance, Liu et al. (2022) found that firms with strong fundamentals tend to experience milder price drops upon lock-up expiration, as investors interpret the event as a sign of long-term stability rather than a precursor to sell-offs [5]. Similarly, Qian et al. (2023) documented that the impact of lock-up expirations is more pronounced in firms with lower institutional ownership, suggesting that market participants respond more cautiously when retail investors dominate trading activity [7].

Additionally, the event study methodology, widely applied in financial research, has been instrumental in analyzing stock price adjustments following corporate events (Fama et al., 1969; MacKinlay, 1997) [1] [2]. The market-adjusted return model is commonly used to estimate expected returns and detect abnormal returns around key events (Brown & Warner, 1985; Campbell et al., 1997) [4] [6].

Research on the STAR Market remains limited, particularly regarding the impact of lock-up expiration on stock price volatility. However, emerging studies suggest that the unique regulatory environment and high volatility associated with the market may amplify the effects of lock-up

expirations. This study seeks to expand on existing research by providing empirical insights specific to the STAR Market.

3. Research Design

3.1 Data Sources and Processing

This study utilizes stock data from the STAR Market, covering the period from January 1, 2021, to September 30, 2023. Lock-up expiration dates and volumes were obtained from the Wind database, while stock returns and market indices were sourced from the GTA database.

Data filtering criteria include excluding stocks where unlocked shares account for less than 1% of total equity and removing stocks with prolonged suspensions. The event window spans from 10 days before to 30 days after lock-up expiration, while the estimation window covers 30 trading days before the event window.

3.2 Variable Definition

Abnormal Return(AR_{it}): The impact of the lock-up expiration event on stock prices is examined by regressing individual stock returns against market returns during the estimation window. The estimated coefficients (α_i and β_i) are then used to calculate the difference between the expected return and the actual stock return during the event window:

$$AR_{it} = R_{it} - \widetilde{\alpha_i} - \widetilde{\beta_i} R_{mt} \tag{1}$$

Average Abnormal Return(ARR_t): Since individual stock abnormal returns at different time points in the event window cannot represent overall market reactions, the cross-sectional average abnormal return is computed as:

$$ARR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{it} \tag{2}$$

Cumulative Abnormal Return（CAR_{it}): To analyze the trend of abnormal returns over time, the cumulative abnormal return is calculated by summing abnormal returns over the event window:

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

Cumulative Average Abnormal Return(CARRt): To evaluate the aggregate effect of unlocking events, the cumulative average abnormal return is computed as:

$$CARR(t_1, t_2) = \sum_{t-t_1}^{t_2} AAR_t \tag{4}$$

3.3 Model Specification

To estimate expected returns, the market-adjusted return model is applied:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \tag{5}$$

$$E[e_{it}] = 0, Var[e_{it}] = \sigma^2 e_{it} \tag{6}$$

where R_{it} represents individual stock returns, R_{mt} is the market return, and e_{it} denotes the error term(Brown & Warner, 1985; Campbell et al., 1997). Statistical significance tests determine whether lock-up expiration leads to meaningful stock price adjustments(Fama et al., 1969; MacKinlay, 1997).

4. Empirical Research

4.1 Descriptive Statistics

From January 2021 to September 2023, the STAR Market saw restricted shares released by 618, 787, and 717 listed companies, respectively. The total number of restricted shares released was 24.11 billion, 30.08 billion, and 36.32 billion shares, with market values of 1080.65 billion yuan, 1189.10 billion yuan, and 1111.83 billion yuan, respectively. These figures highlight the significant scale of restricted shares released during the study period.

Our sample includes 149 companies that experienced restricted shares release events. The abnormal returns (AR) and average cumulative abnormal returns (CAR) of these companies were analyzed within the event window of [-10, 30] days. The results show that abnormal returns fluctuated around zero during the restricted shares release period, with a range of (-0.1620948%, 0.2139618%). The minimum abnormal return of -0.1620948% occurred ten days before the release by "688599" Tianhe Photovoltaic, while the maximum abnormal return of 0.2139618% occurred one day before the release by "688020" Fangbang Shares.
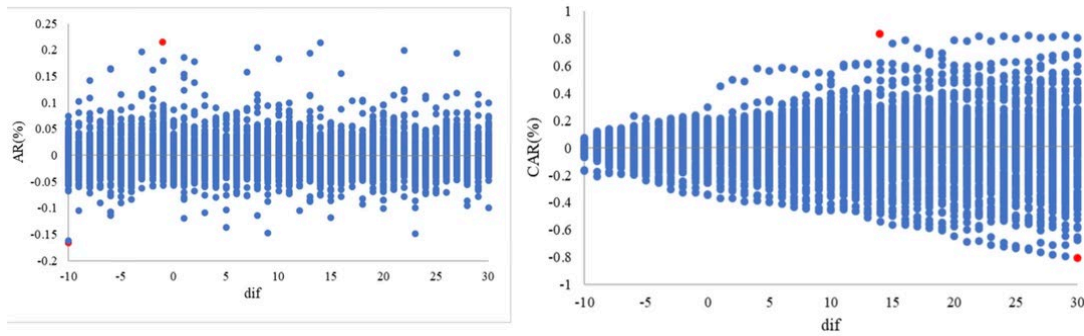

Figure 1: AR and CAR Scatter Plots of 149 Listed Companies within the Event Window [-10, 30].

As illustrated in Figure 1, the scatter plots of abnormal returns (AR) and average cumulative abnormal returns (CAR) for the 149 listed companies within the event window [−10,30] days reveal that CAR gradually accumulates over time during the restricted shares release period. The minimum average cumulative abnormal return of -0.8108798% occurred thirty days after the release by "688389" Pumen Technology, while the maximum average cumulative abnormal return of 0.829128% occurred fourteen days after the release by "688368" Jingfeng Mingyuan. These observations suggest that market reactions to restricted shares release events vary significantly across companies.

4.2 Empirical Analysis of the Impact of Restricted Shares Release on Stock Prices

4.2.1 Changes in Average Abnormal Returns (ARRt)

We calculated the average abnormal returns (ARRt) within the event window [-10, 30] days around the restricted shares release. The results indicate that average abnormal returns were negative in the days leading up to the release, suggesting that nvestors anticipated stock price declines and adjusted their positions accordingly. However, in the days immediately following the release, average abnormal returns became positive, indicating a recovery in stock prices.

Table 1: Average Abnormal Returns and Test Results Before and After the Release of Restricted Shares.

Event Window (dif)	AAR_t	t - test	Event Window (dif)	AAR_t	t - test
-10	-0.00493 *	-1.821	11	0.00201	0.804
-9	-0.00474 **	-2.160	12	-0.00246	-1.171
-8	-0.00440 *	-1.696	13	0.00324	1.128
-7	0.00128	0.610	14	-0.00293	-1.129
-6	0.00354	1.160	15	-0.00539 **	-2.449
-5	-0.00269	-1.070	16	-0.00044	-0.195
-4	-0.00514 **	-2.225	17	-0.00336 *	-1.773
-3	0.00339	1.316	18	-0.00276	-1.299
-2	0.00642 **	2.490	19	0.00327	1.490
-1	0.00926 ***	3.017	20	-0.00278	-1.001
0	-0.00062	-0.289	21	-0.00056	-0.250
1	0.00517	1.543	22	0.00471 *	1.746
2	0.00264	1.034	23	-0.00755 ***	-2.872
3	-0.00021	-0.086	24	-0.00584 ***	-2.630
4	0.00050	0.208	25	-0.00262	-1.272
5	-0.00220	-0.944	26	0.00387 *	1.713
6	0.00218	0.901	27	0.00296	1.196
7	0.00235	0.901	28	-0.00191	-0.846
8	0.00490 *	1.664	29	-0.00210	-0.989
9	-0.00168	-0.725	30	0.00226	1.065
10	0.00347	1.318			

***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 1 presents the average abnormal returns (AARt) and their statistical significance levels across

the event window. Negative returns dominate in the days leading up to the release, while positive returns emerge shortly after the event.

4.2.2 Changes in Average Cumulative Abnormal Returns (CARRt)

The average cumulative abnormal returns (CARRt) provide a clearer picture of the overall market reaction to restricted shares release events. Our analysis shows that CARRt declined significantly in the days leading up to the release, reaching a nadir three days before the event. However, CARRt began to recover shortly after the release, indicating that the negative market sentiment dissipated over time.

Table 2 illustrates the cumulative effect of restricted shares release on stock prices, showing a significant decline in CARRt before the event and a gradual recovery afterward.

Table 2: Average Cumulative Abnormal Returns and Test Results Before and After the Release of Restricted Shares.

Event Window (dif)	CARR$_t$	t - value
[-10,-9]	-0.00493**	-2.279
[-10,-8]	-0.00967***	-2.663
[-10,-7]	-0.01407***	-2.809
[-10,-6]	-0.01279***	-2.781
[-10,-5]	-0.00925***	-2.721
[-10,-4]	-0.01194***	-2.693
[-10,-3]	-0.01709***	-2.644
[-10,-2]	-0.01369**	-2.549
[-10,-1]	-0.00727**	-2.405
[-10,-0]	0.00198**	-2.247
[-10,1]	0.00137**	-2.077
[-10,5]	0.00726	-1.417
[-10,10]	0.01847	-0.777
[-10,15]	0.01294	-0.321
[-10,20]	0.00687	-0.031
[-10,25]	-0.00498	0.118
[-10,30]	0.00010	0.180

***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

4.3 Heterogeneity Analysis

4.3.1 Industry Heterogeneity

We classified the sample companies into 15 industries based on the Shenwan Industry Classification. The results show that industries such as communications and electronics exhibited positive market reactions after the release of restricted shares, while power equipment and medical biology showed negative reactions. This suggests that industry - specific factors significantly influence market responses.

4.3.2 Scale Heterogeneity

We divided the sample companies into three market value scales: large (>=50 billion yuan), medium (10-50 billion yuan), and small (<=10 billion yuan). The results indicate that large - cap companies experienced a more pronounced negative impact, while mid - cap companies showed a quicker recovery. Small - cap companies exhibited mixed results.

Table 3 highlights the varying impacts of restricted shares release across different market value scales, with large-cap companies showing the most significant negative effects.

Table 3: AWeighted Average Cumulative Abnormal Returns (CARRt) for Different Market Value Scales.

Market Value Scale (billion yuan)	Sample Size	Minimum (%)	Maximum (%)	Mean (%)	Variance
Large (>=500)	7	-0.0594	0.0534	-0.0031	0.0194
Medium (100-500 billion yuan)	43	-0.0828	0.0982	0.0014	0.0202
Small (<=100)	99	-0.1089	0.1181	-0.00004	0.0232

5. Conclusions

Our analysis reveals that average cumulative abnormal returns (CARRt) are negative before the release of restricted shares, reflecting negative market sentiment. However, after the release event,

CARRt shows an upward trend with fluctuations, indicating that investors adjust their strategies, leading to a gradual recovery in stock prices. The market effect of the release dissipates over time, and stock price fluctuations return to normal levels. These findings suggest that investors should closely monitor market reactions before and after the release of restricted shares. Additionally, they should consider industry and firm size differences when tailoring their strategies. Investors need to remain adaptable to market changes and adjust their portfolios flexibly to mitigate risks and optimize returns.

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