

Case Study Using Processing Services for Stock Order Data - Analysis on Special Quotes

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Analytical Example

In order to maintain price continuity, Tokyo Stock Exchange, Inc. (TSE) has a mechanism for indicating special quotes when a trade cannot be executed without a major price change in order to hold immediate matching of orders and prevent sharp price fluctuations. This is designed in order to attract counter orders by indicating that there are orders that exceed a certain price range from the last execution price. TSE has two mechanisms to control sharp price fluctuations: special quotes, as described above, and sequential trade quotes, which control sharp stock price fluctuations that cannot be controlled by special quotes while allowing executions. Now, let us analyze when and for how long special quotes are indicated.

First, we analyzed when special quotes were indicated: a total of 48,669 special quotes were

indicated for the top 500 highest-capitalization issues between January 2019 and December 2022¹. If a special quote is indicated multiple times in one day, it is counted as if there were multiple quotes. Since there were 973 trading days during this analysis period (although some were indicated multiple times in one day), this means that special quotes were indicated approximately 10% of the time.

Table 1 shows a tally of when special quotes were indicated. Most (95%) special quotes were indicated at 9:00, which is the opening time for the morning session. The second highest number of special quotes were indicated at 12:30, the opening time for the afternoon session. Other times at which special quotes were indicated were at the top and bottom of the hour, for example at 13:00, 14:00, and 13:30. This seems to have happened after corporations made announcements regarding matters such as earnings.

Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency
9:00	46,628	14:59	21	9:04	13	9:10	11
12:30	931	13:30	19	12:31	13	11:00	10
13:00	41	9:03	17	12:32	12	13:02	10
14:00	38	9:02	15	9:05	12	9:08	9
9:01	34	14:20	14	9:07	12	14:30	8

Table 1: Timetable of Display of Special Quotes

Next, let us look at duration. Table 2 shows the total duration for which special quotes were available. The most frequent duration was 180 seconds, or 3 minutes, at which point the special quotes were renewed. Other frequent durations were 360, 540, 720, and 900 seconds, corresponding to the times at which the special quotes were renewed. Conversely, there were many situations in which special quotes were removed in less than 10 seconds. For example, the second most frequent duration was 0 seconds, which indicates that in those circumstances special quotes were removed immediately after being displayed. Other durations ranging from 1 to 15 seconds are shown in Table 2.

Duration	Frequency	Duration	Frequency	Duration	Frequency	Duration	Frequency
180 sec	26,355	2 sec	408	15 sec	160	900 sec	144
0 sec	3,300	179 sec	381	6 sec	156	300 sec	140
360 sec	3,211	3 sec	372	4 sec	153	176 sec	138
1 sec	1,181	5 sec	366	173 sec	149	174 sec	134
540 sec	800	720 sec	334	7 sec	144	60 sec	130

Table 2: Duration of Special Quotes

¹ There is no distinction between special quotes and sequential trade quotes in this analysis. Also, when a special quote is momentarily removed, it is often shown again. Therefore, when a new special quote appeared within one minute of being removed, it was treated as though it had continuously been displayed.

Tables 1 and 2 show that approximately 55% of special quotes were indicated at the time of opening and were removed after three minutes, while approximately 7% were removed after six minutes. Approximately 15% were removed within 15 seconds.

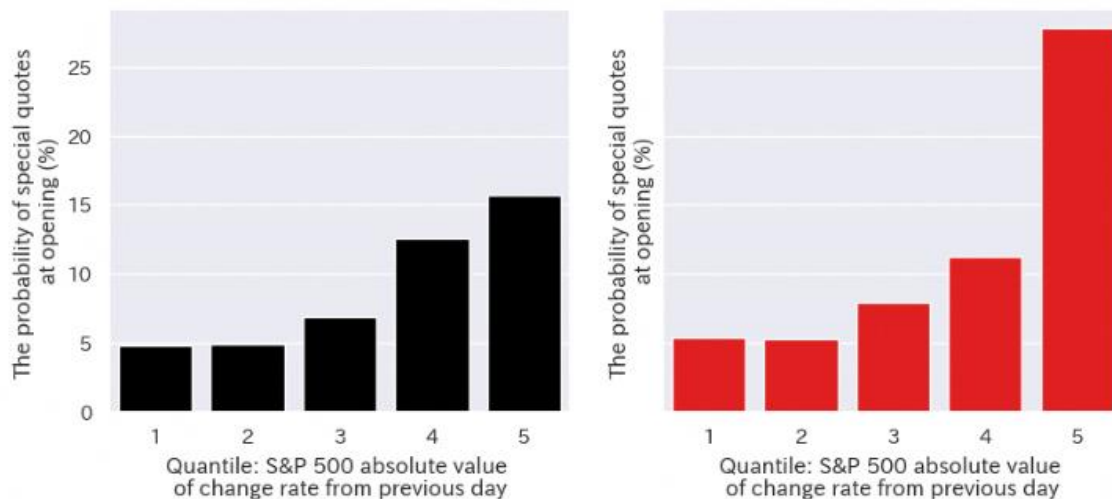
So, for what types of issues are these special quotes most likely to be indicated?

Here we would like to test a hypothesis that special quotes may be indicated due to a change in the market after the end of trading on the previous day.

Therefore, we analyzed the relationship between the change rate at the end of trading on the previous day for S&P 500 and the probability of special quotes being given. We divided the cases into five quintiles according to the absolute value of the change rate from the previous day for S&P 500 for positive and negative change rates, respectively. We calculated the percentage of issues for which a special quote was indicated at the opening of each day and the average probability of a special quote after calculation in each quintile. Figure 1 shows (a) the positive rate of change from the previous day for S&P 500 and (b) the negative rate of change from the previous day for S&P 500. The larger the value of the quintile, the greater the rate of change for S&P 500 (a greater increase for (a) and a greater decrease for (b)).

Figure 1. Probability of special quote based on the absolute value of change rate from the previous day for S&P 500

(a) S&P 500 Change Rate from Previous Day > 0 (b) S&P 500 Change Rate from Previous Day < 0

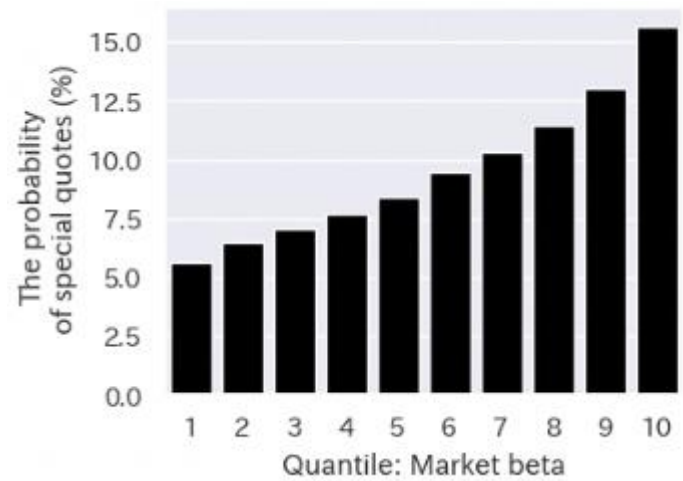


As a result, the greater the rate of change for S&P 500 from the previous day, the more likely it was that special quotes were indicated.

In addition, to see how quickly each issue reacts to changes in the market, we conducted a similar analysis using market beta. We assumed that high market beta issues would be more likely to react quickly to market fluctuations, and as a result, special quotes would be more likely. Therefore, we divided the data into 10 quintiles according to market beta and calculated the probability of special quotes. This is illustrated in a graph in Figure 2, which shows that the higher the market beta, the more

likely that a special quote was indicated, and the lower the market beta, the less likely that a special quote was indicated.

Figure 2: The probability of special quotes by the level of market beta



This report focused on special quotes as an analytical example of stock price data from day sessions. Most of the special quotes were indicated immediately after the opening. Half of the special quotes indicated at the opening were removed after three minutes, and 15% were removed within 15 seconds. Special quotes were more likely when the U.S. market moved significantly overnight and for higher beta issues.

A detailed analysis of the difference between when special quotes are indicated and the subsequent changes in stock prices is expected to provide further insight into the mechanism of stock price formation.

Data used in this analysis

This analysis is based on processed data from the processing service for stock order data provided by MTEC and JPX Market Innovation & Research, Inc. (JPXI).

The service provides data from FLEX Full data which is the historical information of Tick data provided by JPXI, processed into data often used for analysis of price formation and liquidity during trading hours (market microstructure).

This facilitates data processing and analysis by extracting the data necessary for analysis and converting it to CSV format.

The processing menu is as follows:

	Item	Provision of service
A	Limit order book	Per stock

B	Bid ask spread	Daily
C	Micro price	Daily
D	Volume curve	Daily
E	Contracted volumes by price	Daily
F	VWAP	Daily
G	Price volatility	Daily
H	Micro price volatility	Daily
I	Order count, contract count, and cancellation count	Daily
J	Special quote	Daily
K	Effective spread, adverse selection cost, and realized spread	Daily
L	Order imbalance	Daily

For further details of this service, please refer to the following link.

<https://www.jpx.co.jp/english/markets/paid-info-equities/historical/04.html>

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