Analyzing Impact of COVID-19 Pandemic on Global Stock Prices

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From 1982 to 2010, he worked at an electric company in Japan in charge of databases and Web-based systems for industrial use.

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Outlines

1. Introduction
2. Approach
3. Comparison of Stock Indexes by Price Ratio
4. Comparison by Average and Standard deviation
5. Statistics around lowest price day
6. Proposal of Signal of Trend Reversal
7. Conclusions

1. Introduction

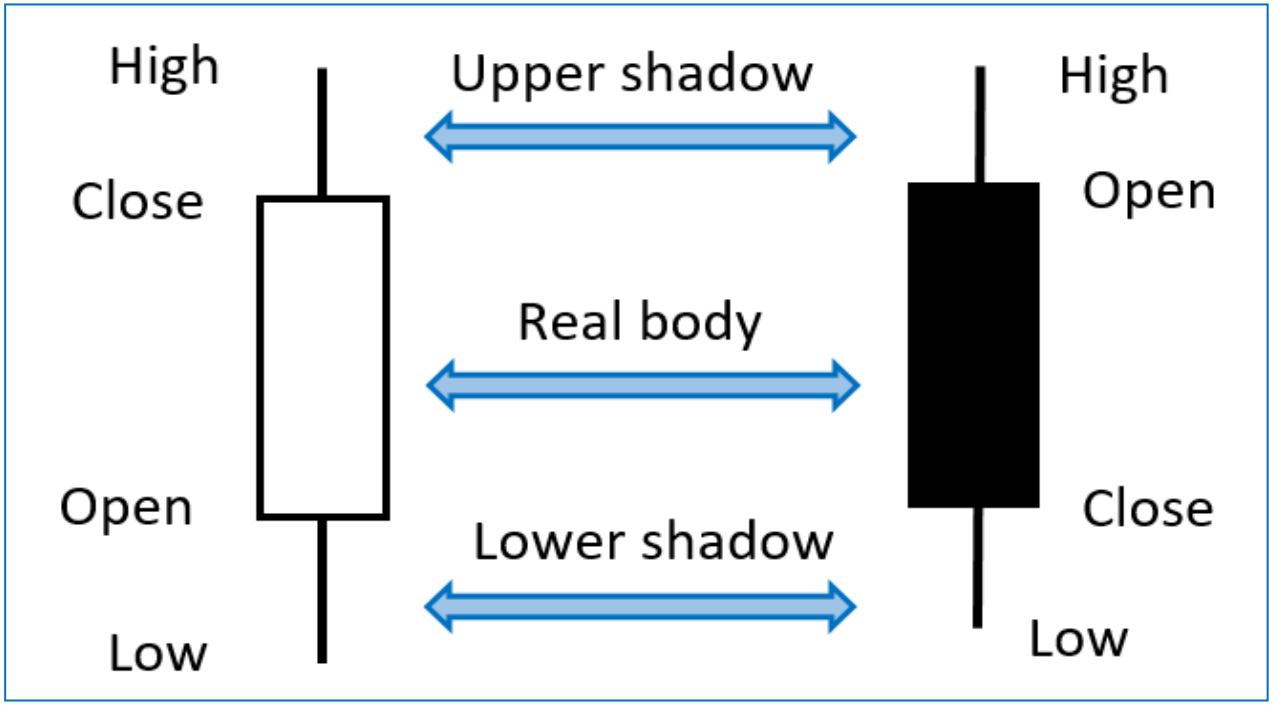
- The spread of COVID-19 is making a serious impact on the world economy.
- We come up with examining impacts on global tock prices how serious they are.

Contributions

- To statistically compare degrees of impact on the U.S., European, and Asian markets for 245 trading days before and after the COVID-19 pandemic
- To propose an indicator to predict trend reversal, and show how well it predicts the reversal by some experimental results

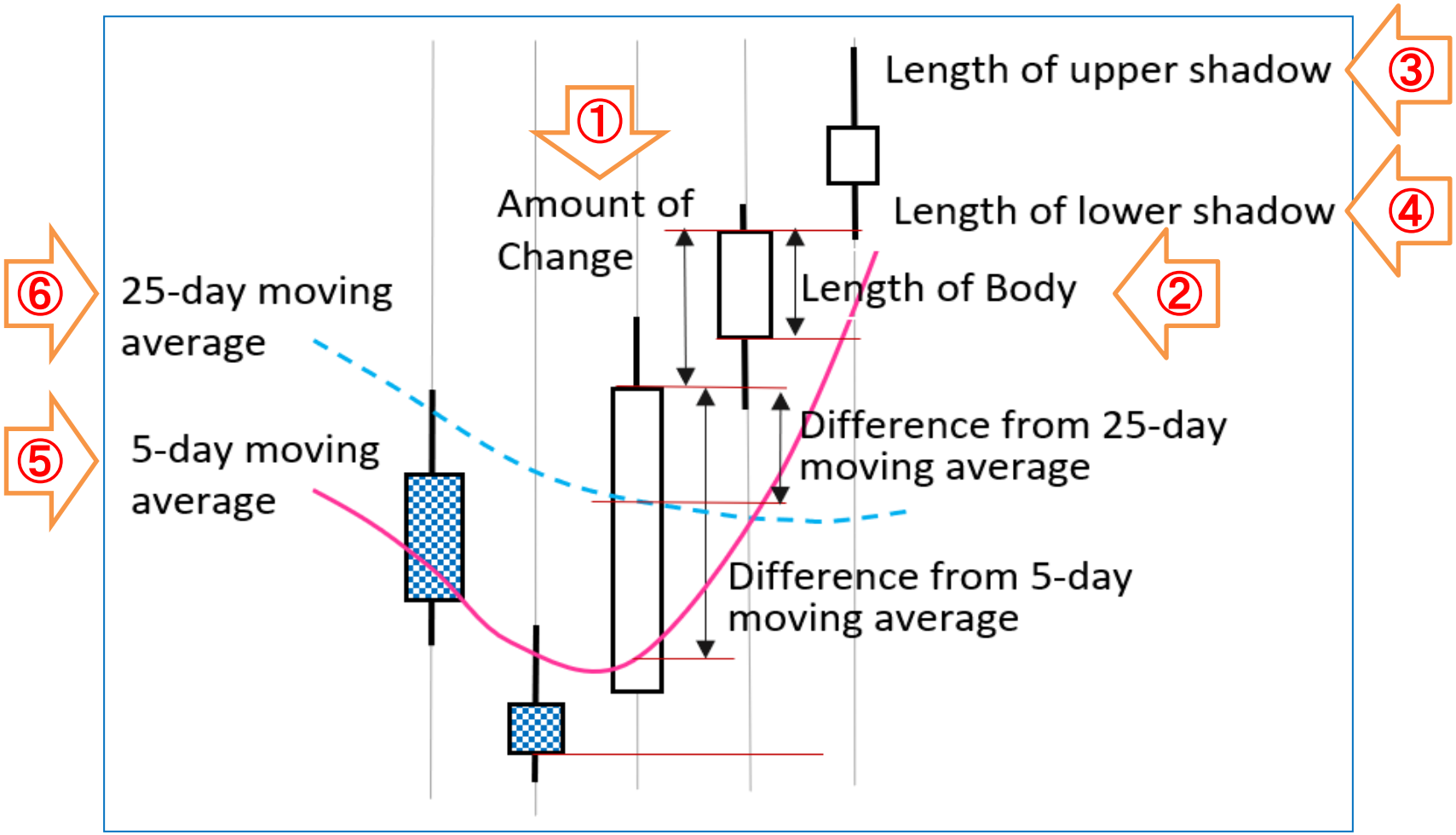
2. Approach

- Candlestick chart is a kind of a bar chart defined by **opening**, **closing, high**, and **low**, and prices.
- A hollow candlestick shows uptrend **(Bullish)**.
- A filled candlestick shows downtrend (**Bearish**).

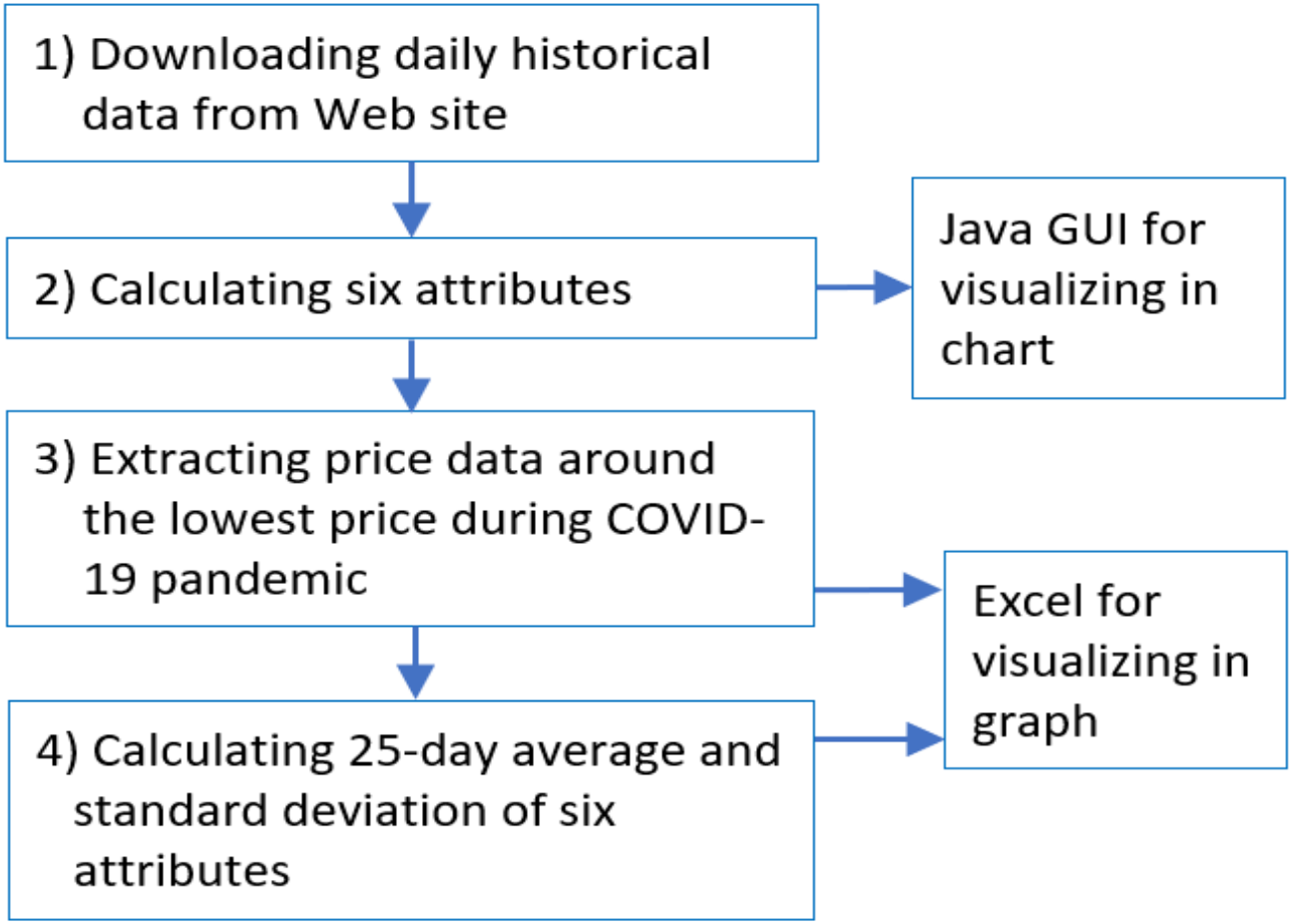


(A) **Bullish** candlestick (B) **Bearish** candlestick

- The following six attributes are examined in this study.
- They are historically used to model price patterns in candlestick charting.

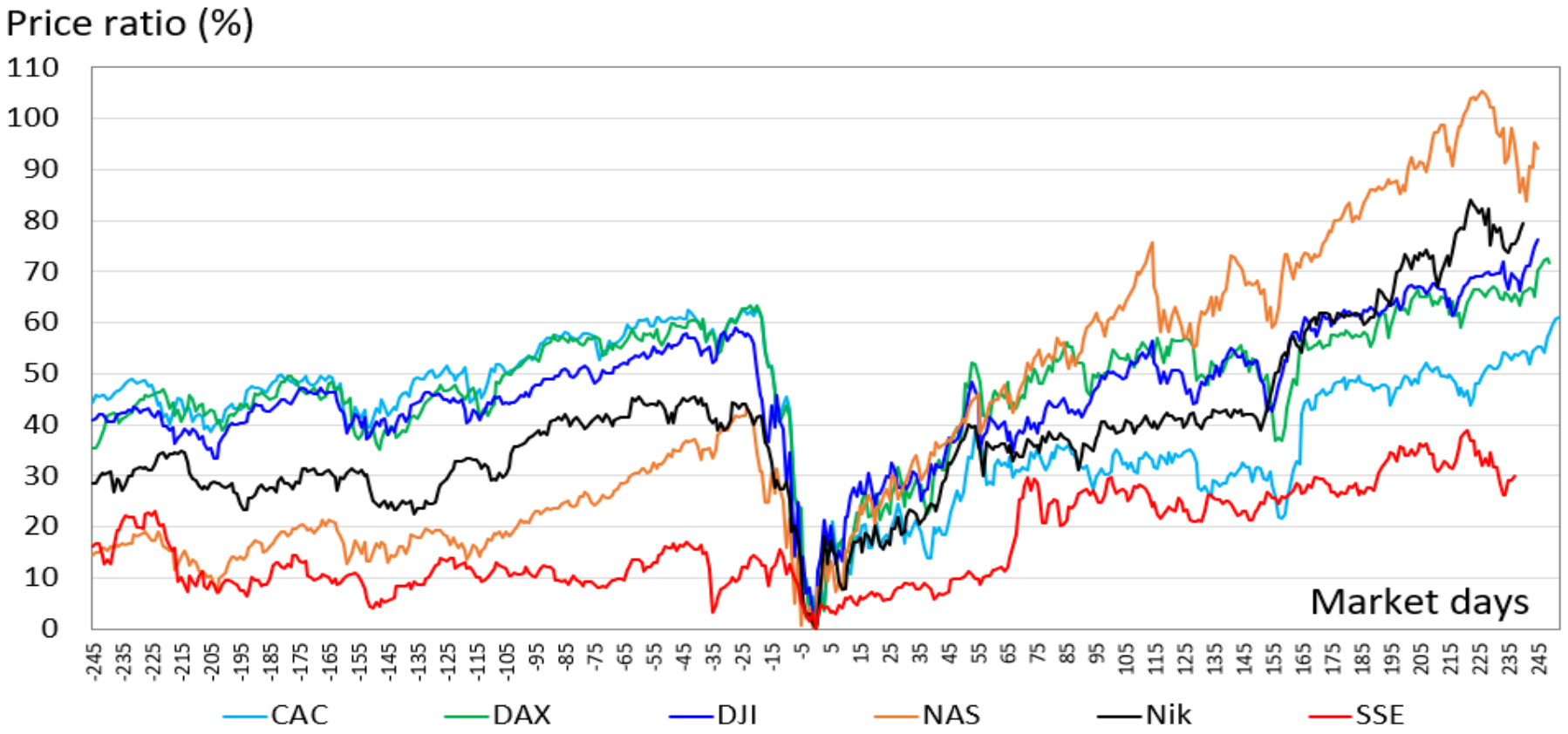


- We have developed several Java programs for the study.
  - E.g., to find the lowest price caused by the COVID-19 pandemic and extract price data around it, to visualize extracted data in candlestick chart, etc.
- Excel is also used to show results in graphs.



3. Comparison of Stock Indexes by Price Ratio

- The slide shows a graph of the price ratio of the six markets' stock indexes for approximately 490 days, as of Mar. 12, 2021.
- The prices are normalized by the he lowest closing price recorded in Mar. 2020.

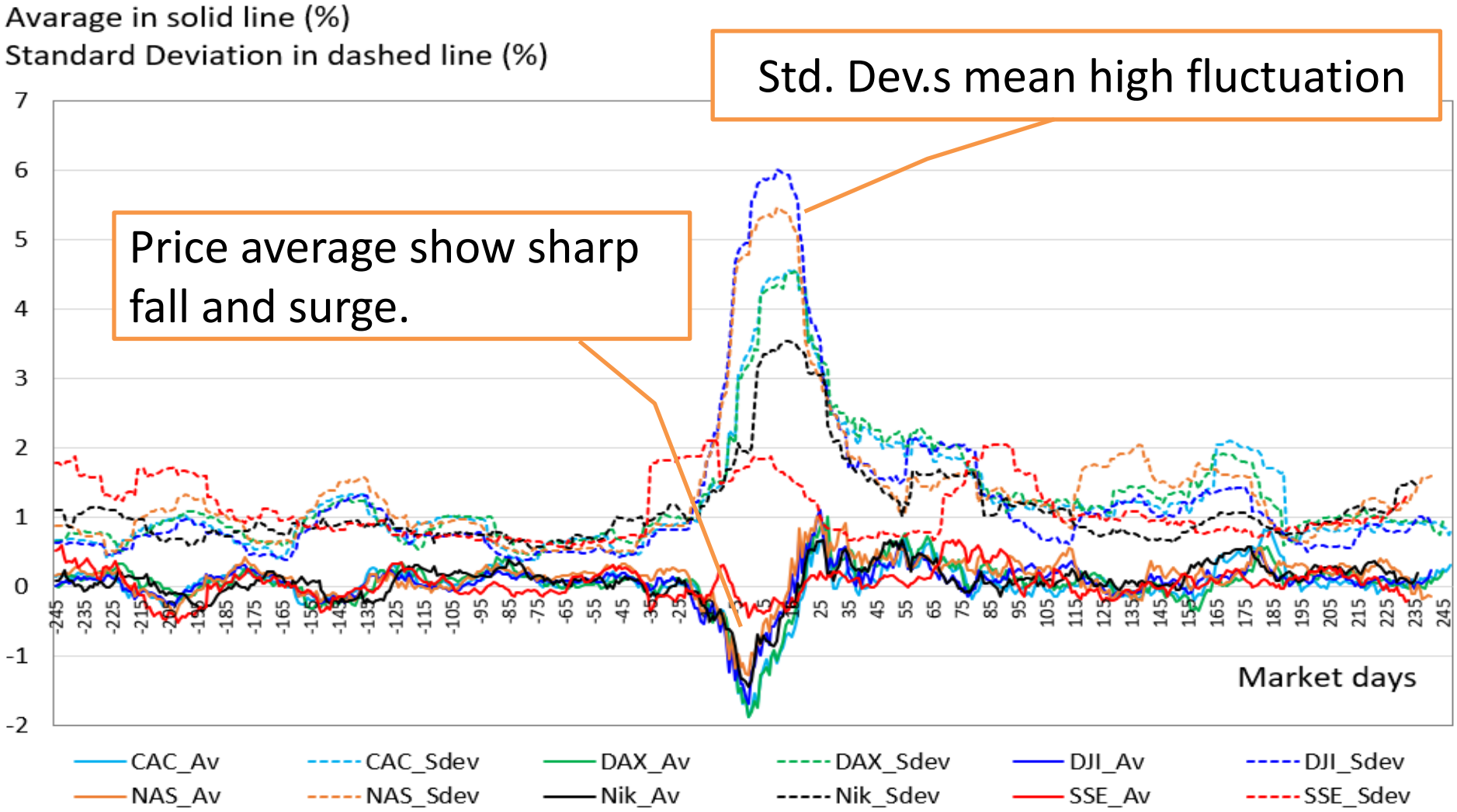


- The table shows impacts, i.e., degree of plunge and recovery, on stock prices in the six markets.
- NASDAQ achieves the finest recovery of 62.36% rise.
- The slowest recovery is recorded –1.73% in CAC.

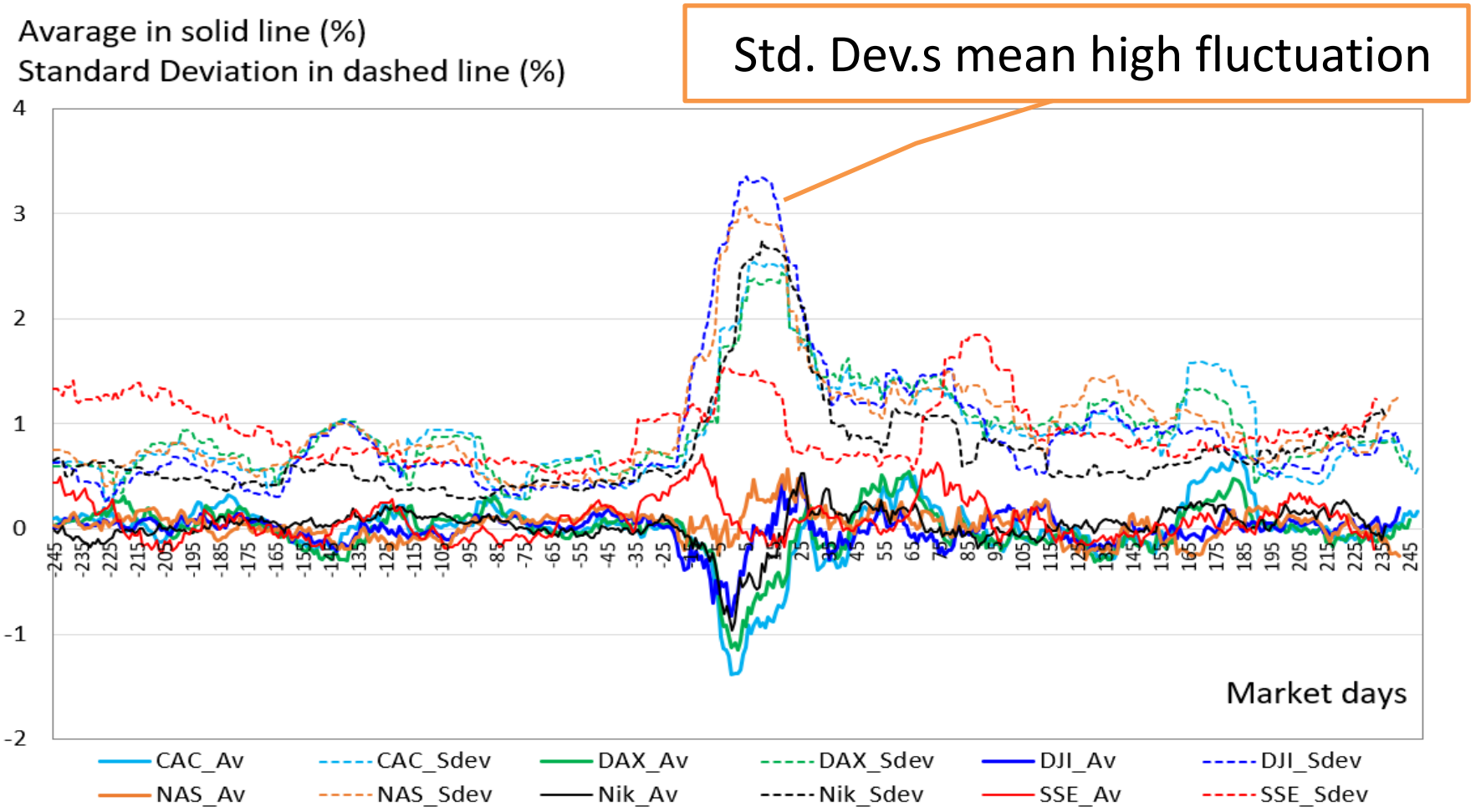
	Day of lowest price	Highest price of pre-corona (%)	Highest price of post-corona (%)	Recovery (%)
CAC40(France)	Mar. 18	62.76	61.03	-1.73
DAX(Germany)	Mar. 18	63.34	72.59	9.25
DowJones(U.S.)	Mar. 23	58.95	76.3	17.35
NASDAQ(U.S.)	Mar. 23	43.09	105.45	62.36
Nikkei(Japan)	Mar. 19	45.49	84.06	38.57
SSEC(China)	Mar. 23	22.95	38.94	15.99

4. Comparison by Average and Standard deviation

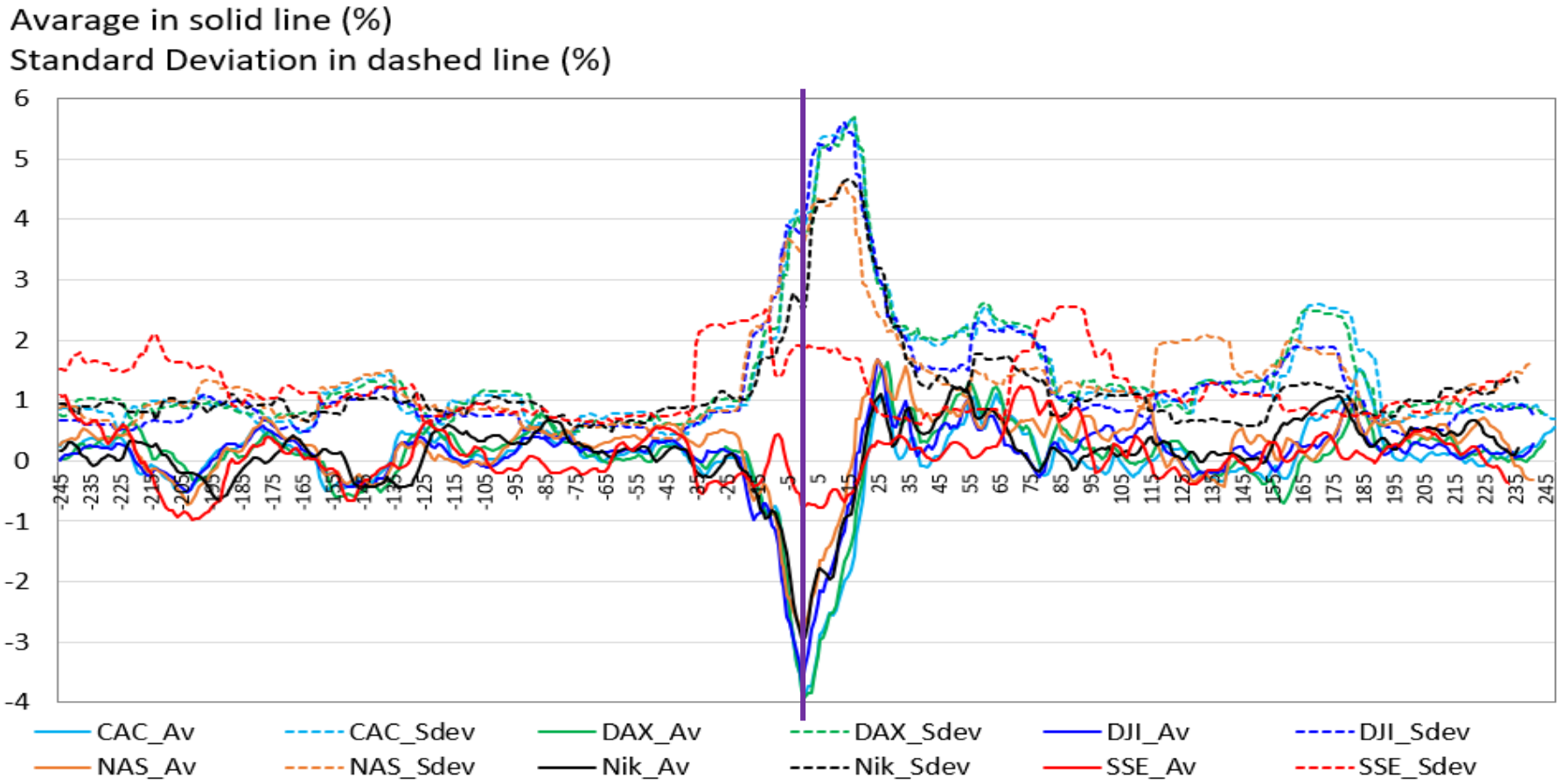
The slide shows a graph of the 25-day moving averages and standard deviations of the price changes of each stock market.



The slide shows a graph of the 25-day moving averages and standard deviations of the candlestick body lengths of each stock market.

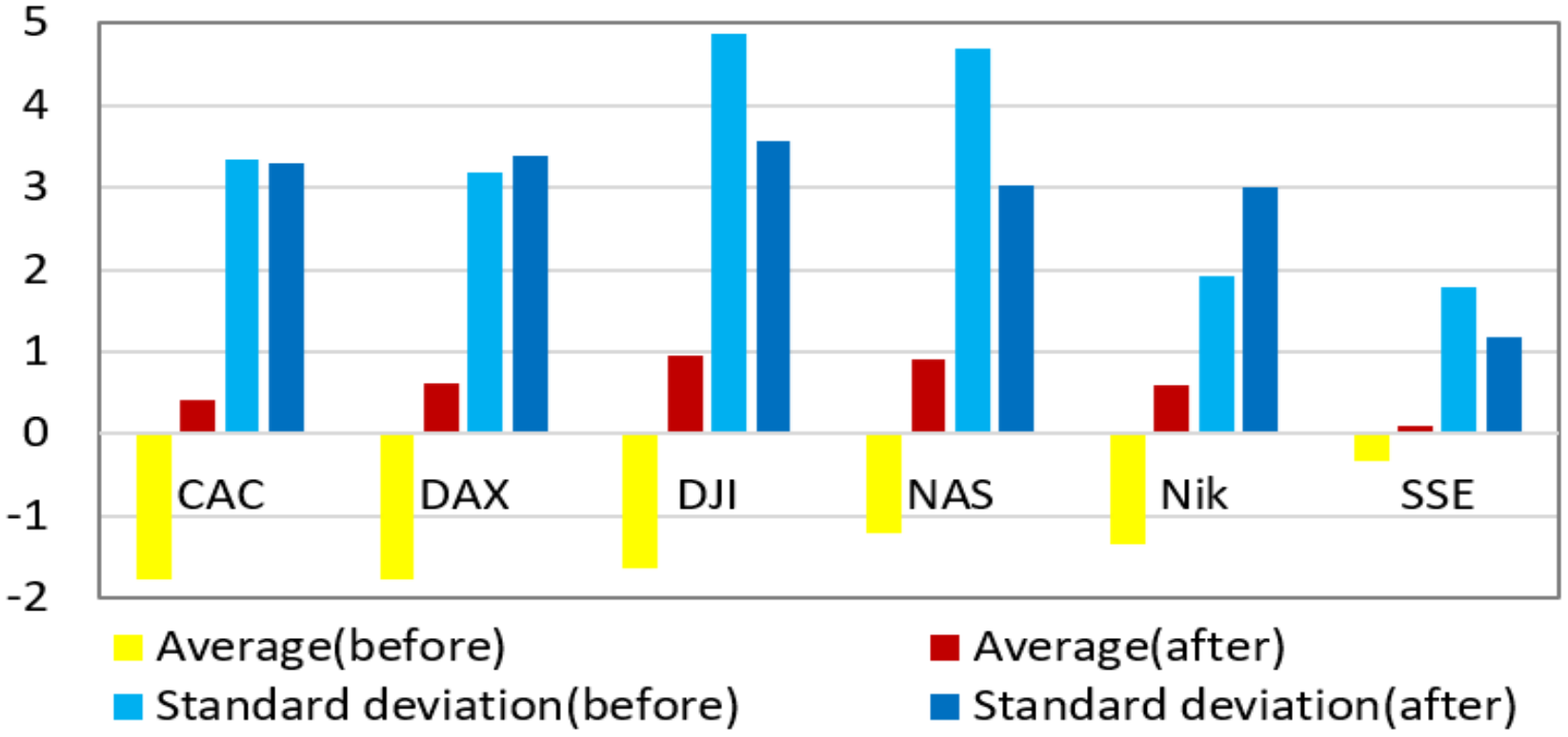


- We get most interesting result on the average of "difference between a stock price and 5-day moving average."
- The averages of five markets change the direction on just the day when the stock price bottoms out.
- This is an important finding and details are discussed later.

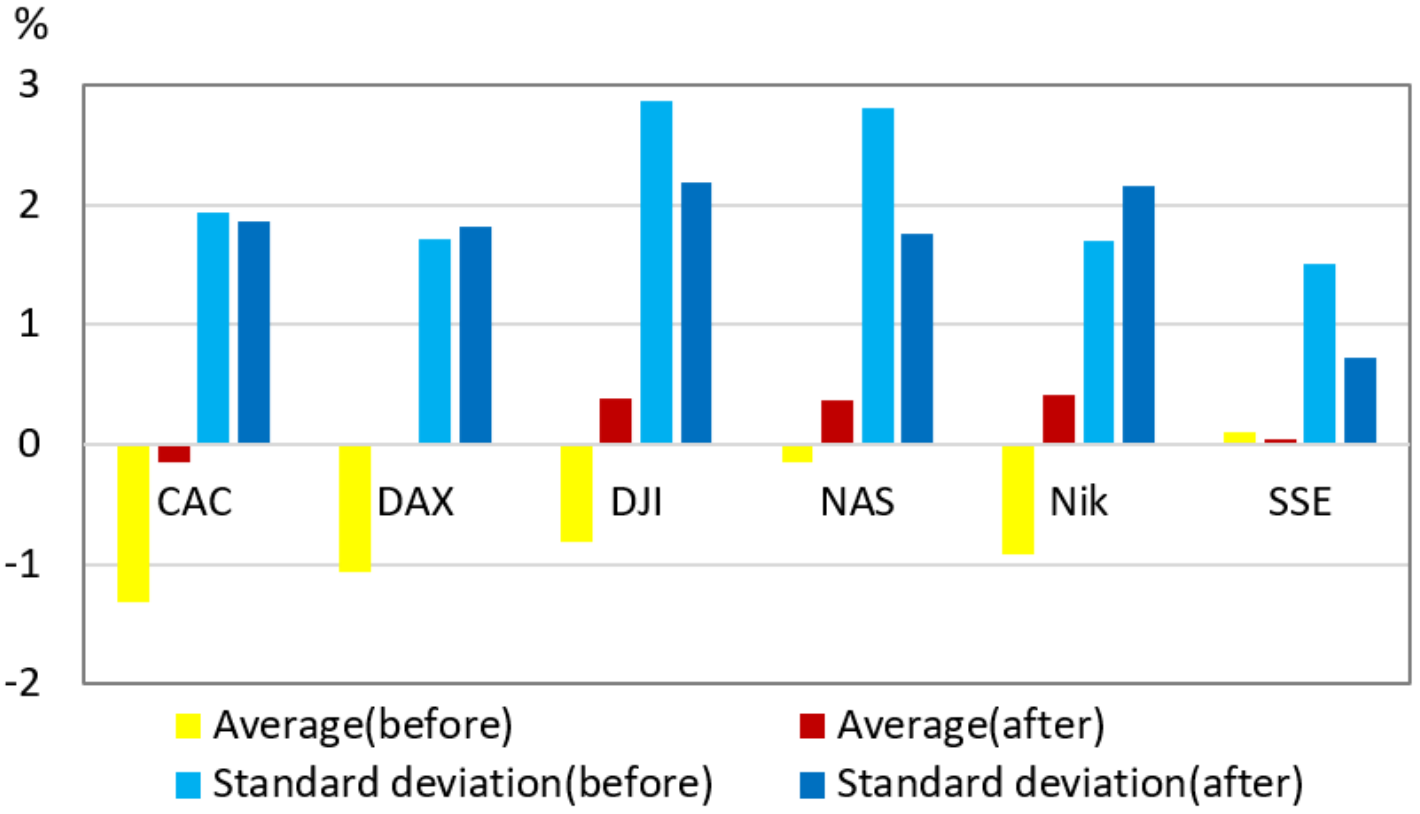


5. Statistics around lowest price day

- The slide shows the average and standard deviation of the stock price change.
- All averages are negative 25 days before the lowest price day and positive after the day.
- The standard deviations notably decreased in Dow and NASDAQ, suggesting stabilization of trading.



- The slide shows the average and standard deviation of the stock candlestick body lengths.
- The averages of candlestick body lengths reverse the trend from negative to positive before and after the lowest price day in Dow, NASDAQ and Nikkei markets.
- The standard deviations notably decreased in Dow and NASDAQ.



6. Proposal of Signal of Trend Reversal

- We propose an indicator to signal chance of trading.
- It is calculated by the two formulas below.

25-day average of "difference between a stock price and 5-day moving average"

$$\mathrm{CPAvg}(n, 25, 5) = \frac{1}{25}\sum_{j=n}^{j=n+24}\left\{CPr(j) - \frac{1}{5}\sum_{k=j}^{k=j+4} CPr(k)\right\}$$

5-day average of "difference between a stock price and 5-day moving average"

$$\mathrm{CPAvg}(n, 5, 5) = \frac{1}{5}\sum_{j=n}^{j=n+4}\left\{CPr(j) - \frac{1}{5}\sum_{k=j}^{k=j+4} CPr(k)\right\}$$

The two lines do not crossover on Mar. 5, indicating "dead cat bounce,"

CPAvg (n, 25, 5)

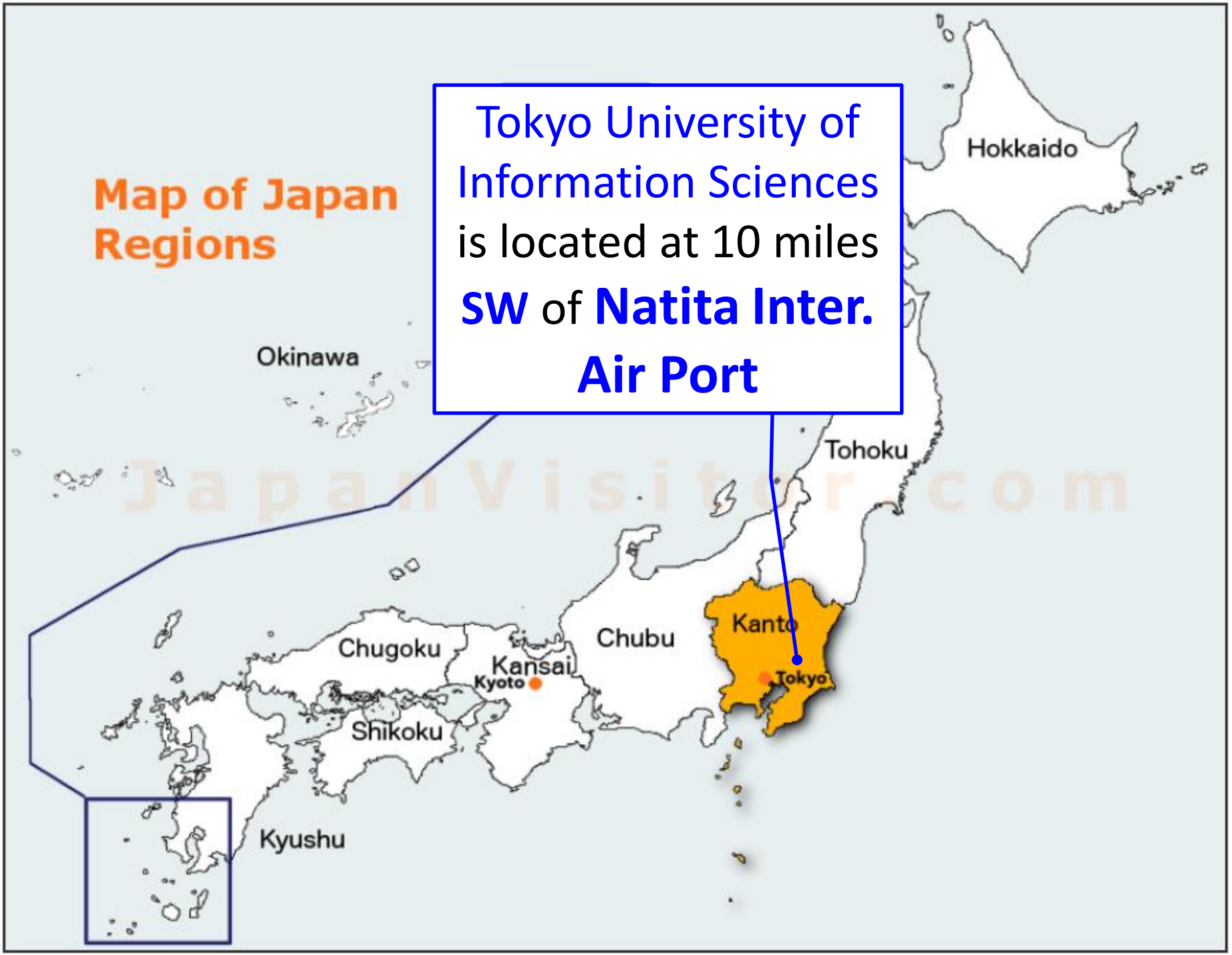
CPAvg (n, 5, 5)

Two average lines go across up on Mar. 19, sending **buy signal**.

Conclusion

- Generally, thanks to the timely implementation of monetary measures of each country, all stock indexes under study keep rising after the lowest price recorded in Mar. 2020.
- We propose an indicator that is calculated from "the difference between a stock price and 5-day moving average."
- The proposed indicator forecasts short-term trends properly with a short time lag, at least as far as the stock price plunge caused by COVID-19 is concerned.
- We are planning comparative studies with well-known indicators including MACD (Moving Average Convergence Divergence) and ADX (Average Directional Index)

Appendix


Map of Japan Regions
Tokyo University of Information Sciences is located at 10 miles SW of Natita Inter. Air Port
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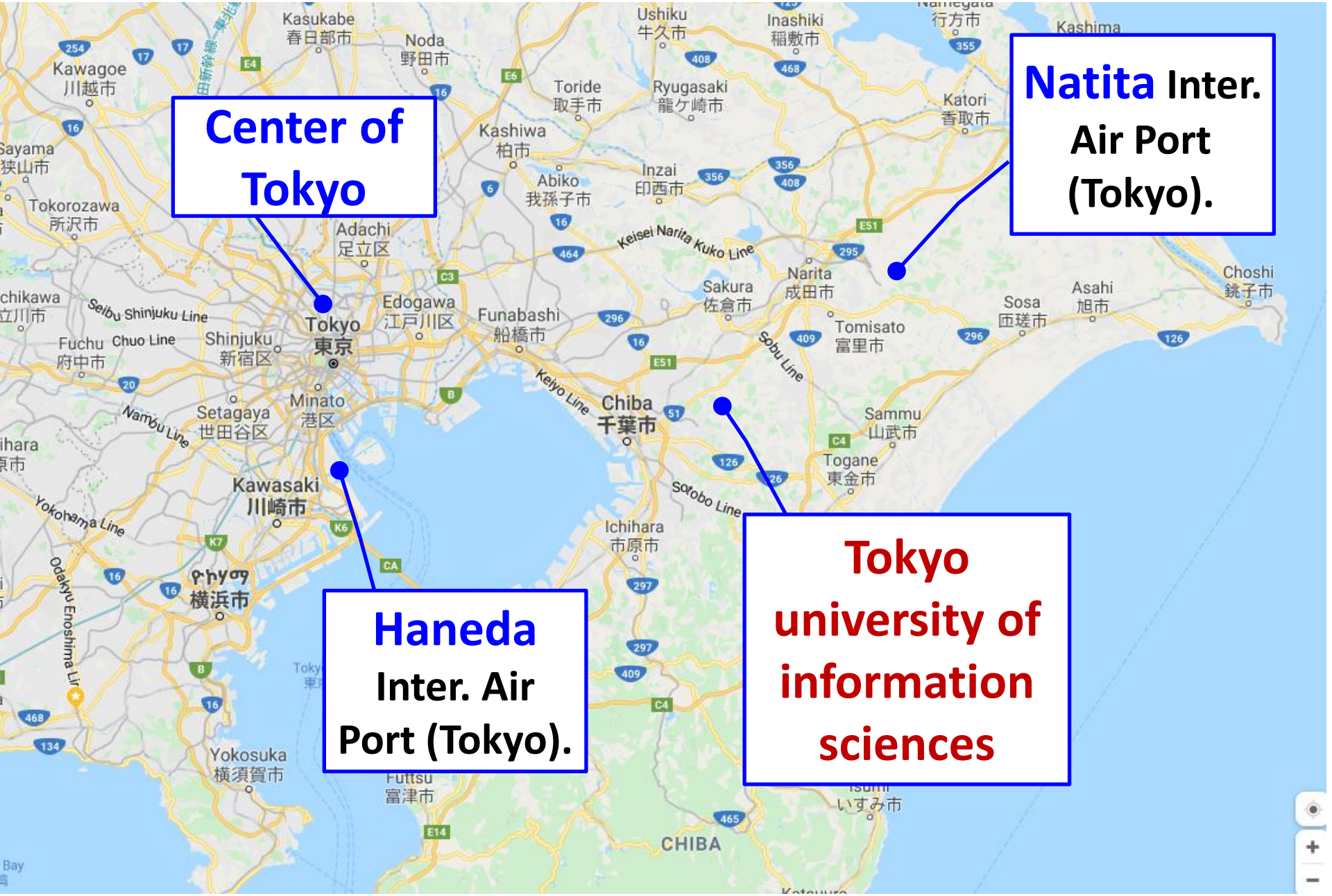
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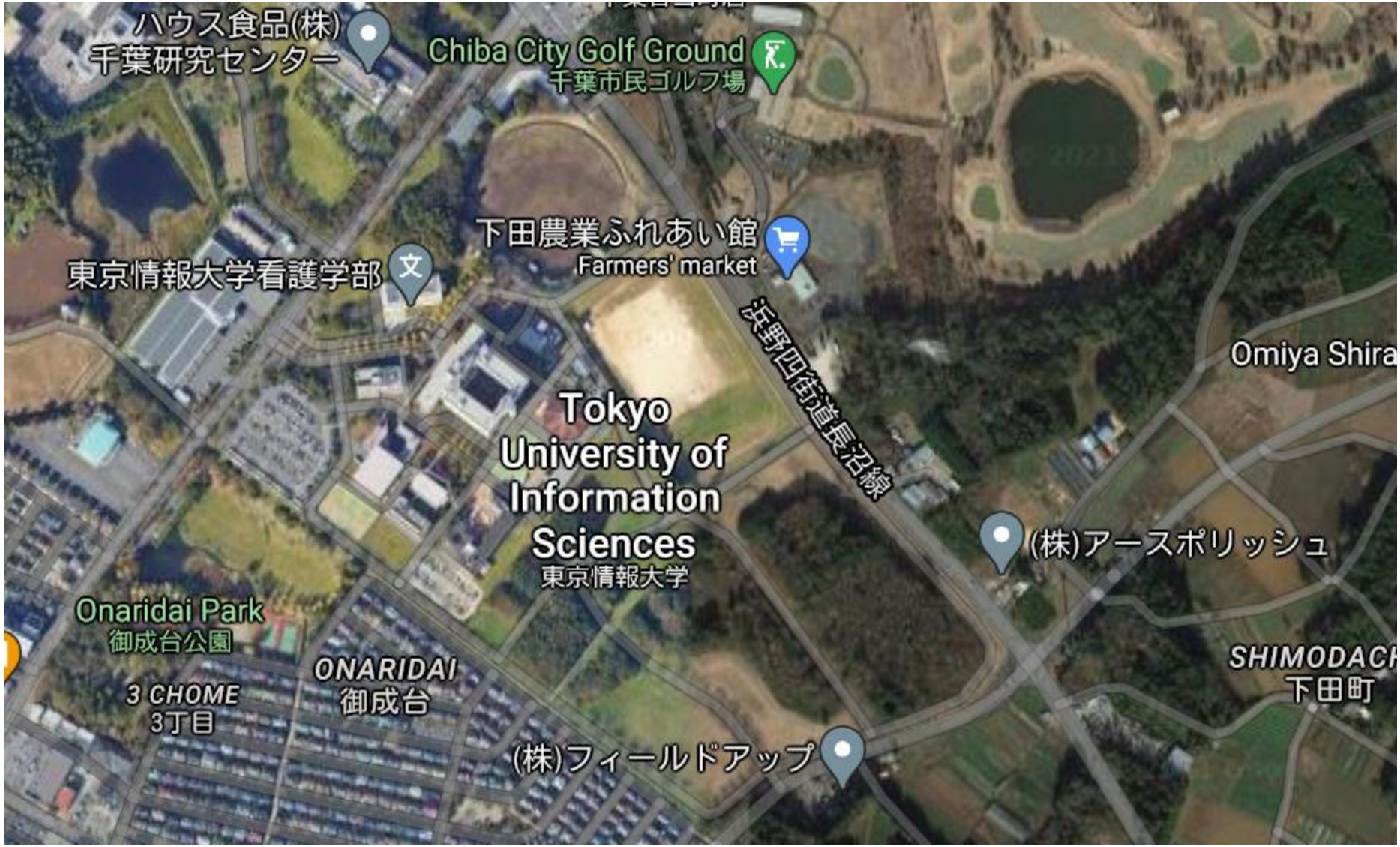
Google Map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