



## How and What Influences from COVID-19 Have Impacted Stock Prices and Exchange Rates? the Case of Japan

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### Abstract

*This study reports the empirical analyzes of the COVID-19 on stock prices and exchange rates of Japan. Newly confirmed cases and death cases have significantly positive impacts on Japanese stock prices. One reason is that Japanese stock prices recently move together with U.S. stock prices. Under this situation, the U.S. could recover from the damage of COVID-19 ahead of other countries and its stock prices have increased hugely, so the effects on Japanese stock prices have been quite large. The rising of the U.S. stock prices have had a big influence so as to deny the adverse effects by COVID-19 in Japan. The other reason is that although the stock prices of tourism, food service, and so on were damaged in Japan, other industry stock prices have been increasing. The coefficients of declaration of the state of emergency/anti-infection measures are positive which denotes that the stock market may have taken the measure favorably. However, they are positive, but they are also insignificant. For the exchange rates, the newly confirmed case is significant and positive which means that it promotes depreciation of the Japanese Yen. It seems natural because if the situation of COVID-19 becomes serious, market participants consider investment in Japan as risky. Finally, both of the cases of confirmed cases and death cases of COVID-19 are negatively and significantly related with the flow of people. The coefficient of declaration of the state of emergency/anti-infection measures is negative, however, they are not significant to the flow of people.*

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## 1. Introduction

From the year 2020, COVID-19 has hit the world tremendously and there is no prospect of a solution in many countries. Japan is not an exception. Many precious lives have been lost, and the world economy has been damaged. This study analyzes the effects on stock prices and exchange rates in Japan. Japan has not taken drastic measures such as 'lockdown' and so on to prevent COVID-19 spreading. Instead, reducing the flow of people and promoting vaccination are the major measures to prevent the spread of COVID-19. Prime Minister Suga has requested that people share the basic prevention measures including refraining from going out throughout society again and again. Japanese government took 'declaration of the state of emergency, and 'anti-infection measures' several times. Along with the impending medical system (bed utilization, number of critically ill patients, and so on), newly confirmed cases and death cases of the COVID-19 has been reported daily in every district. The numbers have been receiving much attention and the attention has been higher than the government's declaration. The negative impact on restaurants and the travel industry is serious in Japan, however, aside from this problem, this phenomenon is noteworthy and should be analyzed.

This report is organized as follows. Following this section, existing studies are reviewed in section 2. Section 3 describes the empirical methods which analyze the relationship between the newly confirmed cases/death cases and stock prices/exchange rates in Japan. The empirical results are presented and analyzed in section 4. Based on these analyses, additional analyses which examines the flow of people are performed in section 5. Finally, this report ends with a brief summary.

## 2. Existing Studies

For stock markets, a lot of studies have been presented recently. [Amar, Néjib, and Nihel \(2021\)](#) showed that Chinese stock market index had no impacts on the other stock price indices during the COVID-19 crisis, however, the European stock index had impacts on the other markets. [Chakrabarti, Jawed, and Sarkhel \(2021\)](#) found that COVID-19 has caused spread to the global stock markets. [Harjoto, Rossi, Lee, and Sergi \(2021\)](#) indicated that COVID-19 led to a negative shock to the global equity markets, especially in emerging countries' markets. [Kartal, Kiliç Depren, and Depren \(2021\)](#) also suggested negative impacts on stock prices.

[Liu, Wang, He, and Wang \(2020\)](#) found that both Chinese and Asian stock prices had decreased. [Liu, Huynh, and Dai \(2021\)](#) showed that when the bad sentiment was high, the stock markets crash risk are more influenced. [Aggarwal and Jha \(2020\)](#) suggested that COVID-19 had effects on some of the sectors of the Indian equity markets. [Mishra and Mishra \(2021\)](#) indicated that the stock market indices in some Asian countries have been affected by the reporting of the number of COVID-19 confirmed cases and death cases, stock market returns, market volatility, oil prices, inflation rate, and interest rates. [Aslam, Mhti, and Ferreira \(2020\)](#) suggested that there was a multifractality in European equity markets when the COVID-19 occurred. [Brueckner and Vespignani \(2021\)](#) found that COVID-19 infections in Australia had a significant positive effect on the movements of the equity market employing impulse response functions. [Insaidoo, Arthur, Amoako, and Andoh \(2021\)](#) revealed that when the COVID-19 pandemic occurred, an increase in the Ghana equity returns volatility was caused. [Collins and Acta \(2020\)](#) demonstrated that Dow Jones Industrial Average showed a reduction in mean stock prices during the COVID-19 period, on the other hands, Chinese Stock Exchange Composite Index showed an increase in mean stock prices. [Hazem et al. \(2021\)](#) showed that the COVID-19 incidents had a negative impact on equity movement significantly, moreover, the U.S. lockdown and interest rate changes are the most affected by the G8 equity transactions, followed by Germany, France and the UK. [Abu et al. \(2021\)](#) found that the number of confirmed cases of COVID-19 had a negative impact on stock market, however, the number of deaths had a positive one in the long-term. [Nwosa \(2021\)](#) indicated that COVID-19 had negative impacts on oil price, exchange rate and stock market performance in Nigeria. [Takyi and Bentum-Ennin \(2021\)](#) showed that 10 African economies have had their equity markets adversely affected by COVID-19, whereas the three African countries did not show any significant impacts. As these, there has been a lot of studies for many countries, however, this study focuses on Japanese stock and foreign exchange markets. [Anth and Christopher \(2021\)](#) showed that COVID-19 pre-lockdown period had a negative impact on Vietnam's stock markets, however, the lockdown period had a positive impact on the stock market.

Sector-focused analyses have been performed. [He, Sun, Zhang, and Li \(2020\)](#) found that transportation, mining, electricity & heating, and environment industries have been negatively affected by COVID-19; however, manufacturing, information technology, education and health-care industries have remained stable in the pandemic. [Salisu and Vo \(2020\)](#) showed that news about health became a good predictor of equity returns since the beginning of the COVID-19. [Yong-Ming, Jais, and Chan \(2020\)](#) showed that higher numbers of COVID-19 cases in Malaysia promoted negative impact on the KLCI index and all sectorial indices, except for the Real Estate Investment Fund (REIT). [Faheem, Francisca, Mariana, Paulo, and Mughal \(2021\)](#) demonstrated that the degree of multifractality changes in the different time periods, moreover, the behavior of these stock markets changed from persistent to anti-persistent ones. [Gurmeet and Muneer \(2021\)](#) suggested that there was a significant impact of COVID-19 on world stock markets, however, the impact is varied for developed and emerging countries. [Shen and Zhang \(2021\)](#) found that go-outside stocks have a negative impact on the event date and the cumulative abnormal return, and stay-at-home stocks have not shown negative return. [Izzeldin, Sivaprasad, Muradoglu, and Pappas \(2021\)](#) suggested that the health care and consumer services sectors of the equity markets were the most affected by the pandemic. [Mdaghri, Abdessamad, Thanh, and Oubdi \(2021\)](#) indicate that the stock market liquidity was correlated with the growth in the confirmed number of cases and deaths and stock market index. [Gylych, Terhembra, Usman, and Yua \(2020\)](#) employed GARCH model and revealed that COVID-19 increased volatility and distorts the relationship between inflation and stock market returns. [Dong-Jin \(2021\)](#) revealed that when the stock return is in the low volatility trend, the probability of changing to the high volatility one in the next day promotes because of the number of cumulative transactions. [Julia and Lansink \(2021\)](#) showed that stock markets have moved with an increased volatility. Manufacturers of fertilizers and agrochemicals as well as food distributors show particularly high volatilities during the pandemic.

[Sharif, Aloui, and Yarovaya \(2020\)](#) said the COVID-19 risk is understood differently over the short and the long-run. [Yu \(2020\)](#) showed that the movements of most equity market indices were independent of COVID-19 during the pre-bottom period. However, this phenomenon faded away after stock markets bottomed out. [Ahmad, Kutan, and Gupta \(2021\)](#) revealed that the impact of COVID-19 on the black swan events can be confirmed in March 2020, the stock market investors had little investment chances except for a few sectors. [Caporale, Gil-Alana, and Poza \(2021\)](#) found that there was no impact from COVID-19 on the continuity of equity indices. Contrary to these studies, this paper analyzes the case of very short-term. [Mohamed, Zaied, Cheikh, Lahouel, and Bouzgarrou \(2021\)](#) found that the shocks to the U.S. and Chinese stock markets have asymmetric impacts on the correlation between the two markets. [Rohitash and He \(2021\)](#) found that Bayesian neural networks provided predictions of stock prices despite high price volatility during the first

peak of the COVID-19 short and the long-run. Yu (2020) showed that the movements of most equity market indices were independent of Ahmad (2021) demonstrated that stock market returns showed a downwards trend as well as negative returns following the COVID-19 outbreak using event study analysis. Fiti, Ben-Ameur, and Louhichi (2021) showed that non-fundamental news, such as the number of deaths and other cases stemming from COVID-19 increased the stock market returns volatility and reduced the level of stock market liquidity, whereas fundamental macroeconomic news had not impacted the equity market. Harjoto, Rossi, and Paglia (2021) indicated that cases and deaths had impacts on equity returns and increased volatility especially, in the emerging economies' markets, while only cases of COVID-19 influenced stock returns, volatility, and trading volume in the developed economies' markets. Seungho and Lee (2021) found that the bad news had an impact on the current U.S. stock market much more than the good news. This study employs impacts of news on stock prices and exchange rates and the focus country is Japan.

Compared to the studies of stock prices, exchange rates have not been analyzed much. Alexandros and Theodoros (2020) found that Bayesian model could unveil the influence of the Covid-19 on the exchange rates, while the econometric models could not show this relationship. Njindan Iyke (2020) showed a channel made from exchange rate returns' predictability. Feng, Yang, Gong, and Chang (2021) indicated that an increase in COVID-19's confirmed cases does increase exchange rate volatility significantly. Mustafa, Abidin, Ahmad, and Ogundare (2021) found that COVID-19 had a significant impact on the unemployment rate, GDP, CPI, foreign exchange rate, and equity price in Malaysia. Narayan, Devpura, and Wang (2020) showed that COVID-19 had caused the depreciation of the Yen against the US dollar and brought profits from Japanese stocks' returns. Hoshikawa and Yoshimi (2021) found that a new spike of the COVID-19 increased stock price volatility and decreased foreign investors' holdings of domestic stocks, therefore caused the depreciation of the South Korean won. Njindan Iyke (2020) found that COVID-19 implies predictive ability over volatility than over returns for a one-day early prediction of exchange rates. Bhavesh and Prabheesh (2021) showed that the interest rate differentials increase the predictability of exchange rates in six BRIICS countries during the COVID-19 period. Willem (2021) found that the Korean economy is less exposed to appreciations than the French economy. Hua, Li, Liu, and Woo (2021) showed that stock market index tends to move along with Covid-19's local and non-local incidents, the measures of containment seem to increase stock market losses.

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As these, a lot of studies have been presented about the impact of COVID-19 on stock prices. However, there is little study to examine the Japanese case. The Japanese economy should have been significantly negatively affected by the new coronavirus, but stock prices are the highest in about 30 years. An analysis of this reason would be worthwhile. Also, compared with stock prices, the relationship between exchange rates and COVID-19 has not been analyzed fully including the cases of Japan. Moreover, it would be necessary to examine the effects of the pandemic on stock prices and exchange rates at the same time because both of the variables are sometimes related each other. There is a need to close the research gap. This study empirically analyzes the effect of Japanese government' announcements of significant policies on the stock market and foreign exchange market. It is structured as follows. Following this section, methods of empirical analyses are presented in section 3. Based on this section, the empirical results are analyzed in section 4. Finally, this study ends with a brief summary.

### 3. Methods of Empirical Analyses

First of all, data used in this study are checked. The statistical descriptions are in Table 1. Stock price is NIKKEI225's (Japanese major indexes of stock prices) average in a day of the opening of the market. Exchange rates are Yen/dollar exchange rate at 5 p.m. every day the market is open. Both data sets are from NIKKET TELECOM (Japanese newspaper company). Confirmed cases and death cases are COVID-19 related. Data are from NHK (Japan Broadcasting Corporation). All of the data are published daily.

**Table-1. Statistical description.**

	<b>Stock price</b>	<b>Exchange rate</b>	<b>Confirmed cases</b>	<b>Death cases</b>
Mean	25121.13	107.34	2418.19	29.64
Median	24215.25	107.49	1015.00	15.50
Maximum	30467.75	112.05	25868.00	216.00
Minimum	16552.63	102.10	0.00	0.00
Std. dev.	3509.23	2.26	4232.36	33.49
Skewness	-0.29	-0.17	3.53	1.53
Kurtosis	1.96	1.86	16.73	5.59
Jarque-Bera	23.38	23.29	3934.27	266.24
Probability	0.00	0.00	0.00	0.00
Observations	396	396	396	396

Regression analyses are conducted to examine the deterministic elements of stock prices and exchange rates. In both, explanatory variables are the number of COVID-19 confirmed cases, death cases, and declaration of the state of emergency/anti-infection measures.

#### 4. Results of the Empirical Analyses

This study reports the empirical analyzes of the COVID-19 on stock prices and exchange rates of Japan. At first each variable's correlation is reported in Table 2.

Table-2. Correlation among variables.

	Stock price	Exchange rate	Confirmed cases	Death cases	Declaration of the state of emergency/Anti-infection measures
Stock price	1.000	0.143	0.406	0.664	0.033
Exchange rate	0.143	1.000	0.196	0.074	0.035
Confirmed cases	0.406	0.196	1.000	0.279	0.013
Death cases	0.664	0.074	0.279	1.000	0.009
Declaration of the state of emergency/Anti-infection measures	0.033	0.035	0.013	0.009	1

It is interesting to note that stock price-confirmed cases, death cases, and Declaration of the state of emergency/anti-infection measures are all positive. Also, exchange rate-confirmed cases, death cases, and Declaration of the state of emergency/Anti-infection measures are all positive.

Moreover, regression analyses (Ordinary Least Squares) are conducted to examine the deterministic elements of Japanese stock prices and exchange rates of the Yen. The impact of the COVID-19 on financial markets is empirically examined. To conduct these, these estimations are regressed.

$$\text{Stock prices}_t = \alpha_0 + \alpha_1 \text{confirmed cases}_t + \alpha_2 \text{death cases}_t + \alpha_3 \text{Declaration of the state of emergency/Anti-infection measures}_t + \varepsilon_t \quad (1)$$

$$\text{Exchange rates}_t = \beta_0 + \beta_1 \text{confirmed cases}_t + \beta_2 \text{death cases}_t + \beta_3 \text{Declaration of the state of emergency/Anti-infection measures}_t + \varepsilon_t \quad (2)$$

In these Equations 1 and 2, Declaration of the state of emergency/Anti-infection measure are dummy variables, taking 1 (the day conducted) and 0 (the day not-conducted) respectively. Moreover, Difference of one week ago of confirmed cases and death cases are used for estimation because both numbers take similar trends on the same day of the week. Final term is the error term and t denotes time respectively. The results are in Table 3 and Table 4.

Table-3. Stock prices determination.

C	22772.16*** (131.049)	25041.80*** (137.518)
Confirmed cases	0.197*** (6.381)	
Difference one week ago of confirmed cases		0.351** (2.457)
Death cases	62.669*** (16.004)	
Difference of one week ago of death cases		-13.924 (-1.210)
Declaration of the state of emergency/Anti-infection measures	1276.55 (1.015)	786.015 (0.443)
F-statistic	128.370	2.368
Prob. (F-statistic)	0.000	0.070

It should be noted that both coefficients of confirmed cases and death cases are significantly positive. They have positive effects on stock prices. The results seem curious. One reason is that Japanese stock prices recently co-move with U.S. stock prices. The U.S. could recover from the damage of COVID-19 ahead of other countries. The U.S.'s stock prices have raised hugely, so the effects on Japanese stock prices are quite large. It had a big influence so as to deny adverse effects from COVID-19. The other reason is that although the stock prices of tourism, food service, and so on were seriously damaged, other stock prices (for example, manufacturing companies, such as car industry or IT related companies) have been rising. Consumption from staying at home has also been strong.

The coefficient of declaration of the state of emergency/anti-infection measures is positive. If it is positive, the stock market may have taken the measure favorably. It is positive, however, it is not significant. The

coefficient of difference of one week ago of death cases has different plus/minus and one coefficient is insignificant.

Table 4 is the case of exchange rates.

Table-4. Exchange rate determination.

C	107.319*** (698.940)	107.219*** (945.802)
Confirmed cases	0.0001*** (4.579)	
Difference one week ago of confirmed cases		0.0004*** (4.545)
Death cases	-0.009*** (-2.743)	
Difference of one week ago of death cases		-0.027*** (-3.857)
Declaration of the state of emergency/Anti-infection measures	0.702 (0.631)	0.417 (0.378)
F-statistic	7.986	10.289
Prob. (F-statistic)	0.000	0.000

The coefficient of the confirmed case is significant and positive. It is natural because if the situation of COVID-19 becomes serious, markets view investment in Japan as risky. In this case, Yen depreciates. Yen's depreciation (with the expectation of Yen's appreciation in the future) seems to be related to Japanese stock prices rising. Japanese stock pricing can also be accountable from this view. However, the number of death cases makes Japanese Yen appreciates. Finally, declaration of the state of emergency/anti-infection does not lead to the appreciation of the Yen.

### 5. What Should We Do?

Japan has not taken drastic measures such as 'lockdown' and so on yet to prevent COVID-19. Reducing the flow of people (including refraining from going out) and promoting vaccination are the major Japanese measures to prevent the spread of COVID-19.

So, the situation of crowded areas, like Shibuya, is analyzed empirically. More concretely, the flow of people is used for estimations. This analysis seems to be related to economic activities, such as stock prices and exchange rates, which this study focuses on. There is little studies to tackle this issue. Only Ayoub (2020) demonstrated that both the reported daily growth of Covid-19 confirmed cases along with the causing fear case related to news about death, impacted the Asian stock markets negatively, other variables such as oil price, gold price, exchange rates, and the U.S. stock market were deterministic elements of the Asian stock markets.

The flow of people is regressed by confirmed cases and death cases of COVID-19, and declaration of the state of emergency/anti-infection measures. Few studies have shown a relationship between human flow and the number of new confirmed cases. The case is Tokyo. As a flow of people, Shibuya is selected. This is a famous and popular spot where people, especially young people gather. The time is 10 p.m. the data is collected from Agoop (Japanese data analytics company). It calculates the number of people in 500 square meters by using smartphone's data. The results are in Table 5. Instead of the independent variables, stock prices and exchange rates in the Equations 1 and 2, the flow of people in Shibuya is used for estimation.

Table-5. The flow of people in crowded area.

\	51158.99*** (52.895)	50680.23*** (51.536)
Confirmed cases	-0.502*** (-2.731)	
Difference one week ago of confirmed cases		-0.435** (-2.380)
Death cases	-169.021*** (-7.154)	
Difference one week ago of ☹ death cases		-152.643*** (-6.347)
Declaration of the state of emergency/Anti-infection measures	-8350.97 (-1.087)	-9606.773 (-1.228)
F-statistic	25.698	20.351
Prob. (F-statistic)	0.000	0.000

It should be noted that both of the cases of confirmed cases and death cases are negatively and significantly related with the flow of people. The coefficient of declaration of the state of emergency/anti-infection measures is negative, however, they are not significant. Instead of declaration of the state of emergency/anti-infection measures, confirmed cases and death cases of the COVID-19 may cause behavior change in people. The effectiveness of such policies should be examined much more with scientific data.

## 6. Conclusion

By the spread of COVID-19, the world economy has been damaged and a lot of things, including precious lives, have also been lost. This study focused on the deterministic elements of stock prices and exchange rates in Japan. Both coefficients of confirmed cases and death cases are significantly positive. They have positive effects on stock prices against our expectations. The U.S.'s stock prices have raised hugely, so the effects on Japanese stock prices are quite large so as to deny adverse effects by COVID-19. The results may look strange. Some results seem to be against our expectations. However, the impact of bad COVID-19 related news which would have a negative impact on stock prices was less than the impact of the rise in the U.S. stock prices which would have a positive impact on Japanese stock prices. The positive impacts on Japanese stock prices may have outweighed the negative ones. Of course, some may prefer this phenomenon, but not entirely, and sometimes some policy action may be needed. The other reason is that although the stock prices of some industries were damaged, other stock prices have been increasing. Consumption from staying at home has been strong. The coefficient of declaration of the state of emergency/anti-infection measures is positive, however, it is not significant. For exchange rates, the coefficient of confirmed cases is significant and positive. The reason is that if the situation of COVID-19 becomes serious, markets view investments in Japan as risky. In this case, Yen depreciates. Yen's depreciation (with the expectation of Yen's appreciation in the future) seems to be related to Japanese stock price rising. The rising in Japanese stock prices can be explained from this view, which the rising prices have been caused by exchange rate depreciation of the Japanese Yen. Focusing on stock prices and stock prices at the same time, instead of separately would sometimes be necessary. Finally, declaration of the state of emergency/anti-infection does not lead to the appreciation of Yen. The coefficient of declaration of the state of emergency/anti-infection measures is negative, however, they are not significant. Instead of declaration of the state of emergency/anti-infection measures, confirmed cases and death cases of COVID-19 may cause people's behavior change. Such declarations and measures are effective to prevent the spreading of the COVID-19, however, people tend to use the information of confirmed cases and death cases. It may cause a problem if the increase in the number of confirmed cases affects the control of the flow of people instead of the policies. So such situations should be used sometimes more strategically. Scientific evidence to prove its relationship with the COVID-19 will be needed to promote the suppression of human flow. Of course, it goes without saying that it is important to convey the correct information.

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