The Effect of COVID-19 Vaccine Rollout on Stock Returns: An Event Study based on the Philippine Stock Market

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Abstract: An event study was conducted on the effect of the rollout of COVID-19 vaccine, administered by the Philippines' Department of Health and National Task Force Against COVID-19, on the Philippine stock market. This study covered 138 publicly listed firms in the Philippine stock exchange covering a period of five trading days before, at, and after March 1, 2021 and excluded companies with incomplete data during the estimation window of 6 to 110 trading days before the event. The cumulative average abnormal return was used to assess the impact of the event and a cross-sectional t-test was performed to determine statistical significance. The results of the study revealed that COVID-19 vaccine rollout has a significant, positive effect on the stock market a day before and on the day of the rollout. In addition, the results showed that the stock market reacted negatively 3-5 days before and 4-5 days after the rollout. Based on the efficient market hypothesis, current and future investors can be more confident in making investing decisions on companies listed in the Philippine Stock Exchange (PSE) even during the COVID-19 pandemic as the PSE exhibits semi-strong market efficiency and reveals properly valued stock information. Recommendations to future researchers were also included.

Key Words: COVID-19; vaccine; event study; abnormal return; stock market

1. INTRODUCTION

The outbreak of novel coronavirus 2019 (COVID-19) is probably one of the most widespread diseases in the 20th century. The World Health Organization (WHO) declared it as a global pandemic on March 11, 2020 and has caused financial and economic crises throughout the world (Fernandes, 2020). A study on the French, German, Italian, Spanish, UK, US, Chinese, Philippine, and Thai stock markets found that there were significant negative stock returns as the market reacts to the COVID-19 media coverage and pandemic declaration (Khanthavit, 2020). This was also confirmed in other studies that have analyzed COVID-19 impact on specific financial markets (Baker et al., 2020; He et al., 2020; Heyden & Heyden, 2021; Khan et al., 2020; Ramelli & Wagner, 2020; Topcu & Gulal, 2020).

In the Philippines, Jan 30, 2020 marked the first confirmed COVID-19 case, while the first death due to COVID-19 was on Feb 1, 2020. A wavelet analysis of ASEAN-5 equity market showed that the Philippine stock market reacted to the pandemic one to two months later than other ASEAN-5 countries (Kamaludin et al., 2021). In response, the national government placed Metro Manila on lockdown effective March 15, 2020.

National Task Force Against COVID-19 Chief Implementer and Vaccine Czar Secretary Carlito Galvez Jr. announced on January 11, 2021 Senate hearing that the COVID-19 vaccine rollout is to be expected during the third week or fourth week of February 2021. Presidential Spokesperson Harry Roque announced on February 25, 2021 the rollout to begin on March 1. The March 1 rollout was only confirmed on February 27 with the confirmed arrival of the vaccines on February 28 and March 1.

Thus, a significant milestone in relation to the response to COVID-19 in the Philippines is the government-led mini rollout of vaccine for healthcare workers which began on March 1, 2021 wherein Philippine General Hospital Director, Dr. Gerardo Legaspi, received the first shot of the vaccine among at least 756 frontline health workers (DOH, 2021 March 2). The result of this rollout will give the

government some benchmark information for the full-scale implementation of the National COVID-19 Vaccination Program by May and June (Department of Health [DOH], 2021 March 13). According to WHO Representative to the Philippines, Dr. Rabindra Abeyasinghe, "the addition of vaccines to the available tools in the country which, when used to scale, will contribute to gradual return to day-to-day activities and economic revival in the country" (DOH, 2021 March 4). Thus, this study determines whether the mini vaccine rollout has generated any difference, whether positive or negative, on the Philippine stock market.

1.1 Literature Review

Studies on the impact of certain events on financial markets, particularly the stock market, are common even before the COVID-19 pandemic happened. Syed and Bajwa (2018) found that earnings announcement significantly affected stock returns. A paper analyzing 383 new product announcements concluded that such event have a significant impact on share prices and found that there is a significant difference between the pre-event and post-event market reaction (Mann & Babbar, 2017). In a study of 100 firms listed in the US stock market, it was concluded that merger announcements have no significant impact on the stock prices (Adnan et al., 2016). Other studies have analyzed how the stock market reacts to general elections (Kabiru et al., 2015), the Brexit (Oehler et al., 2017), and drought (Feria-Domínguez et al., 2020).

In relation to COVID-19 event studies, particular events used were the declaration of COVID-19 as a pandemic, start of lockdown, and first death confirmation. The study of Khan et al. (2020) revealed that the confirmation of the pandemic's human-to-human transmissibility has a significant negative impact on the Shanghai stock market during the short event window of one week. Baker et al. (2020) confirmed that it was government restriction, rather than the outbreak of the pandemic, that had a significant impact on the stock market. This is consistent with the findings of a study on the US and European stock markets which concluded that announcements of first death due to COVID-19 and of country-specific fiscal policy significantly and negatively affected the stock market (Heyden & Heyden, 2021).

Eloriaga (2020) studied the effect of the government response to COVID-19 and concluded that the Philippine stock exchange index (PSEi) recovered sometime in April 2020 possibly due to fiscal assurances made by the government. A study conducted by Camba and Camba (2020) covering the period January 1 to June 30 of 2020 revealed that the PSEi was negatively affected by the COVID-19 daily infection at a significant level, although they clarified that the daily infection accounted for a minor portion in explaining fluctuations of the index. In another study of market volatilities in 11 countries, the Philippine equity market was found to have low volatility over the short-term but was found to be highly volatile in the long-term as a response to COVID-19 government intervention measures (Ibrahim et al., 2020).

Although most COVID-19 business studies relate to stock market reaction, only a few published studies concentrate on the stock exchange of an emerging market. One such study is that of Anh and Gan (2020) which concentrated on the impact of lockdown on daily stock returns of 723 listed firms in the Vietnam stock exchanges. For the Philippine stock market, only a few studies have been published as well (Camba & Camba, 2020; Eloriaga, 2020). In addition, most of the COVID-19 studies have concentrated on government intervention such as lockdown, and COVID-19 cases, but there has been no study to date, to the best of our knowledge, with regards vaccine rollout as the event basis for the said pandemic.

1.2 Objective of the study

This study aims to fill the gap by determining how the Philippine stock market reacted to the COVID-19 mini vaccine rollout. Specifically, this study determines whether the mini vaccine rollout has a significant difference on the cumulative average abnormal return in the Philippine Stock Exchange before, at, and after the start of the vaccine rollout.

This analysis would provide an indication of how the market views the vaccination program and would be helpful to current and potential investors when it comes to investing decisions during this COVID-19 pandemic. Academicians and researchers also benefit from this study by having an initial analysis on how an event such as vaccine rollout impacts the economy which is related to the sustainable development goal of decent work and economic growth.

2. METHODOLOGY

2.1 Event Study Method

This study used the event study method to assess the impact of the COVID-19 vaccine rollout on stock price changes. Particularly, we used the event study methodology developed by Fama et al. (1969) which involves observing whether stock prices display abnormal returns days before, at, and after the said event. A one sample two-tailed t-test was then conducted to determine statistical significance of the difference, with the null hypothesis, "The cumulative abnormal stock price returns of PSE-listed firms are not significant five days before, at, and five days after the COVID-19 vaccine rollout". This test was applied to the average of cumulative abnormal return, rather than to each stock. Ngwakwe (2020) similarly used the paired t-test of difference in mean stock values at 95% confidence interval to analyze stock value performance of select global stock indexes 50 days before and 50 days within the COVID-19 pandemic.

For this study, March 1, 2021 or the start of the COVID-19 vaccine rollout to health workers in the Philippines is identified as the event day, denoted by (0,0). The event window consists of the trading days under study. Based on data availability, the event window adopted is up to five trading days before and after the event (-5, +5). This study also used 105 trading days (-110 to -6) prior to the event as the estimation window in computing expected returns of the stock. Figure 1 below shows the estimation and event windows used in this study:

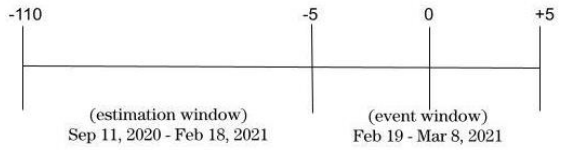

Figure 1. *Estimation and Event Windows*

The main variable used in this study is the cumulative average abnormal return ($CAAR_T$). This measures the aggregate impact of the event during the event window. Particularly, it is used to assess whether days surrounding the event day were affected. This was calculated using the market model which is the most commonly used model in recent event studies (Adnan et al., 2016; He et al., 2020; Heyden & Heyden, 2021; Xiong et al., 2020). Using Microsoft® Excel for Mac version 16.46 (2021), this study computed the variables and t-test as follows:

1. Calculated the expected return ($ER_{i,t}$) for each company for days surrounding the event using Equation 1.

$$ER_{i,t} = \beta 0_i + \beta 1_i R_{m,t} \qquad (1)$$

$ER_{i,t}$ is the expected return on stock i at time t based on the market return at time t, $R_{m,t}$. Using ordinary least squares regression for company's and PSEi's daily actual returns during the estimation window, the $\beta 0_i$ and $\beta 1_i$ coefficients of stock i of each company was determined. These were then used to calculate the daily expected return ($ER_{i,t}$) of each company during the event window.

2. Calculated the daily abnormal returns ($AR_{i,t}$) for each company by taking the difference between the actual returns ($R_{i,t}$) and expected returns ($ER_{i,t}$) for every trading day in the event window as shown in Equation 2. It is to be noted that $R_{m,t}$ is the actual return of the PSEi market at time/day t and is different from $R_{i,t}$ which is the actual return of company i at time/day t.

$$AR_{i,t} = R_{i,t} - ER_{i,t} \qquad (2)$$

3. Computed for cumulative abnormal return ($CAR_{i,T}$) for each company by adding the abnormal returns starting from event date (t=0) to day T. Refer to Equation 3.

$$CAR_{i,T} = \sum_{t=0}^{T} AR_{i,t} \qquad (3)$$

4. Computed for $CAAR_T$ by finding the average of cumulative abnormal returns of all stocks as shown in Equation 4.

$$CAAR_T = \frac{1}{n}\sum_{i=1}^{n} CAR_{i,T} \qquad (4)$$

5. Calculated for standard deviation of each $CAAR_T$ (SD_{CAAR_T}) using Equation 5.

$$SD_{CAAR_T} = \sqrt{\frac{\sum_{i=1}^{n}(CAR_{i,T} - CAAR_T)^2}{n-1}} \qquad (5)$$

6. Calculated the t-statistic for each $CAAR_T$ using

Equation 6.

$$t = \frac{CAAR_T}{SD_{CAAR_T}/\sqrt{n}} \quad (6)$$

The study used the t critical values of 1.65 at 90% confidence level, 1.96 at 95% confidence level, and 2.98 at 99% confidence level.

2.2 Population and sample size

The population of this study consists of 276 actively traded companies in the Philippine Stock Exchange (PSE) during the period covered. Considering that some companies have no data on stock prices during the estimation window, the final sample size used in the study was 138 which included companies from all PSE sectors such as financials, holding firms, industrial, mining and oil, property, services, SME and others. No further sampling was employed.

3. RESULTS AND DISCUSSION

The t-test results in Table 1 cover all stocks included in the test and disclose that the COVID-19 vaccine rollout has a significant difference on the abnormal returns during the pre-, at, and the post-event day emphasizing that there is a significant impact of the event on the abnormal returns.

Specifically, the difference in cumulative average abnormal return during event windows of +5 days, +4 days, -1 day, -3 days, -4 days, and -5 days are statistically significant at the level of $p < .01$ level of significance, while the event day itself and +3 days are statistically significant at the level of $p < .05$ and $p < .10$ levels of significance, respectively.

Moreover, except for the event day, -1 day, and -4 days which revealed positive t-test results, all other significant findings showed that there was a negative reaction on the market, as measured by cumulative average abnormal return, considering the vaccine rollout as the event.

Table 1

Results of t-test

Event window	CAAR	t-value
0, +5	-4.95%	-7.6202***
0, +4	-1.82%	-3.8174***
0, +3	-.76%	-1.8804*
0, +2	-.35%	-.7894
0, +1	.27%	.5348
0, 0	.60%	2.0440**
-1, 0	1.19%	3.1188***
-2, 0	-.52%	-1.1633
-3, 0	-1.86%	-3.8899***
-4, 0	-1.81%	3.3931***
-5, 0	-2.75%	-4.5577***

Note. *** denotes significance at $\alpha = .01$, ** denotes significance at $\alpha = .05$, and * denotes significance at $\alpha = .10$.

This study's results are similar to previous studies (Baker et al., 2020; Heyden & Heyden, 2021; Khan et al., 2020; Khanthavit, 2020) when it comes to having a significant negative market reaction to COVID-19 events. Specifically, the result of the study is consistent with the findings of Camba and Camba (2020) and Eloriaga (2020) which found that the market reacts immediately to government interventions.

Interestingly, the COVID-19 vaccine has a significant positive effect on stock returns a day before and on the day of the rollout but has a negative impact on the market 3-5 days before and 4-5 days afterwards. This supports the article of Dumlao-Abadilla (2021 March 26) that there was an increase in investor's confidence on the vaccine rollout following the decline in new COVID-19 cases for three days. However, this contradicts the study results of Kamaludin et al. (2020) and Ibrahim et al. (2020) which states that the Philippine stock market reaction is not immediate and is expected to be volatile in the long-run.

Considering that there are days in the event window which showed either a significant positive, significant negative, or no significant difference, the study results of Ngwakwe (2020) also revealed that the COVID-19 pandemic has different effects on the stock markets.

All of these results can be attributed to the efficient market hypothesis (EMH) which states that

an efficient market is where prices fully reflect all information and are therefore properly valued (Fama, 1960). In relation to the study, the findings suggest that the PSE has a semi-strong market efficiency as the stock prices fully and immediately reflect all public information. This can be interpreted as PSE stock prices being properly valued.

4. CONCLUSION AND RECOMMENDATIONS

This study results revealed that there is a significant difference on abnormal returns days before, at, and days after the vaccine rollout administered by the government.

For current and future investors, knowing that the PSE is a semi-strong efficient market with properly valued stock information will help them make more accurate investing decisions even during this time of COVID-19 pandemic.

For future researchers, it is recommended to consider a longer event window to determine the extent of the impact of the event. It might also be beneficial to extend the event to cover the period starting from the mini rollout in March 2021 until the expected mass rollout in May or June 2021. An industry analysis would also provide additional insights as to the effect of the vaccine rollout on a per industry level. Future study can also include firm-specific characteristics to confirm whether these would moderate the effect on stock returns.

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