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A Differential Analysis on Impact of COVID-19 Vaccine Rollout: The Case of the Philippines

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Abstract

The novel coronavirus 2019 (COVID-19) became a global health burden that severely impacted the well-being of the people and the global economy. One of the potential solutions to control its spread is through vaccination. Through its Department of Health and National Task Force against COVID-19, the Philippine government launched its vaccination program, which aims to assist in gradually returning people to their day-to-day activities and in reviving the economy. This study utilized event study methodology to determine whether cumulative average abnormal returns based on an estimation window of 105 trading days (-110 to -6) of 231 actively-traded non-holding firms in the Philippine Stock Exchange differ five trading days before and after the start of the vaccine rollout. The firms are then classified and analyzed according to their impact ranking (high, medium-high, medium, low-medium, and low) by the International Labor Organization, and one-way ANOVA was employed to compute for any statistical significance. The findings suggest a significant difference ($p<=.001$) between and among all impact ranking groups during the 11-day event window, emphasizing that the vaccine rollout as a catalyst occurrence brought significant differences in investor confidence in the stock market based on the firms' risk category.

Furthermore, a significant difference in cumulative abnormal returns can be attributed to two particular days: the day of vaccine rollout ($p=.0887$) and two days before ($p=.0871$). This aids management of sampled firms in developing appropriate management plans and strategies to boost their stock returns further. Future researchers are recommended to do a similar event study once a full-scale implementation of vaccine rollout is in place.

Keywords: *COVID-19, COVID-19 vaccine, vaccine rollout*

Introduction

In the 2020 study of Camba and Camba, COVID-19 daily infection was identified as a minor contributor to the Philippine Stock Exchange index's significant fluctuations. With the vaccine rollout started by the Philippine government last March 1, 2021, this study aims to determine whether the said vaccine rollout has generated any significant difference on the Philippine stock market five days before and five days after the rollout. This study would be significant to government, company management, investors and prospective investors, and future researchers.

COVID-19 and its Global Impact

The novel coronavirus 2019 (COVID-19) became a global health burden that severely impacted the well-being of the people and the global economy. Rita McGrath, who has written books on business disruption, mentioned that COVID-19 brought about changes to simple business activities such as in-person meetings and the assignment of desks to each employee working in the office; thus, there is a need for businesses to reevaluate their business models in order to maintain a sustainable competitive advantage (Amato, 2020). In particular, businesses should focus on short-term survival and shorter-term budgeting while experimenting with improvements and innovations in their products and processes.

Kuofie and Muhammad (2021) had the same observations as McGrath. They noted that the pandemic led to more virtual business transactions worldwide, making online videoconferencing platforms such as Zoom, Google Meet, and Cisco Webex as popular means of communication and reimagining work environment via co-working spaces, enterprise solutions, and work-from-home arrangements as alternatives. In an online survey to 79 business leaders done in August 2020, Kuofie and Muhammad found that: (1) Companies continue to enforce travel restrictions and promote virtual meetings and work-from-home arrangements, which greatly affected businesses that relied heavily on travel as their source of revenue; (2) Information technology, healthcare, and education sectors will maintain the same practices going into post-COVID-19 pandemic; and (3) Global businesses that will survive the pandemic will have improved performances post-pandemic.

Dube et al. (2021) also noted that the global aviation industry, a business heavily reliant on travel, was heavily affected by pandemics resulting in rating downgrades and the liquidation and bankruptcy of several airlines and airports. An analysis of both automobile and airline supply chains showed that COVID-19 has a significant impact on both sectors' supply chains in terms of time-to-recovery that might exceed one year and a financial impact of several hundreds of millions of dollars (Belhadi et al., 2021). The supply chain resilience level in these sectors depends on the digital transformation of their supply chain operations. With restricted business activities, Sattar et al. (2020) noted the presence of global financial uncertainty caused by COVID-19 based on a low predicted growth in global gross domestic product.

Dhar et al. (2020) regarded the devastating effect of the COVID-19 pandemic as more than the virus itself, with the economies freefalling, global businesses shutting down, stocks crashing, and unemployment rates increasing, thus influencing a new mindset and culture system. They also concluded that COVID-19 is a global pandemic that crossed international boundaries, impacted millions of human lives, shut down cities and states, and had a more significant impact on emerging economies, especially those in the Southeast Asian region.

Purwanto et al.'s 2020 case study of Indonesian companies revealed that the specific impact of COVID-19 on company operations include reduced import of raw materials, decreased sales, reduced production capacity, the decline in order demand, decreased sales turnover, difficulty in sending distribution of goods, and reduced working hours and salaries of employees. A study on the performance of two stock market indices in India concluded that although BSE Sensex stock market volatility increased during the COVID-19 period, the NSE Nifty stock market volatility was not significantly affected by the pandemic (Bora & Basistha, 2020).

Baker et al. (2020) found that there has been no previous infectious disease episode for the past 120 years that drove large daily stock market swings as high frequently as that of the stock market reaction to COVID-19. The study also revealed that the unprecedented stock market reaction to COVID-19 was driven by government restrictions on individual mobility, commercial activity, and voluntary social distancing. Related to this, Engelhardt et al. (2021) found that the effect of COVID-19 case announcements on stock market volatility is lower in countries exhibiting high trust in fellow citizens as well as in their government. Meanwhile, Sattar et al. (2020) found a significant negative impact of COVID-19 on global financial markets and that stock exchanges of developed economies had also reported adverse impacts on their stock indices.

COVID-19 and its Impact on Industries

Previous studies showed that the impact of COVID-19 differed from one industry to another. An analysis of Mazur et al.'s March 2020 stock market crash (2021) found that stocks of natural gas, food, healthcare, and software companies earn high positive returns, whereas those of petroleum, real estate, entertainment, and hospitality sectors decreased dramatically. An industry analysis of COVID-19 revealed that entertainment, restaurants, and tourism industries faced both demand and supply shocks; specific sectors like transport were output-constrained by demand shocks; and other sectors like manufacturing, mining, and services industries were constrained by supply shocks (del Rio-Chanona et al., 2020).

Baek et al. (2020) studied the impact of COVID-19 on the level of risk per industry in the US stock market and found that all total and idiosyncratic risks exhibit increases for all 30 industries. As to systematic risk measured by beta, Baek et al. revealed that defensive industries, such as telecommunications and utilities, experienced an increase in risk while aggressive industries, such as automobiles and business equipment, experienced a decline in risk. Using Chinese companies as the sample, Gu et al. (2020) also found that utilities and manufacturing companies had the most adverse impacts of the pandemic, while construction, information technology, and social services had positive impacts.

Xiong et al. (2020) noted that Chinese-listed companies classified under the industries vulnerable to the virus, such as transportation, food and beverage, retail, hotel, real estate, and construction industries, have more intense market reactions. Aside from hotels and residential services industries experiencing heavy losses due to COVID-19, He et al. (2020) also found that the pandemic has a significant effect on industry and commerce, culture and social industries, aviation, tourism, and other service industries, while it has a lesser impact on industries offering basic needs.

COVID-19 and the Philippines

In the Philippines, the first confirmed COVID-19 case was on January 30, 2020, while the first death due to COVID-19 was on February 1, 2020. In response, the national government instituted a national lockdown starting March 15, 2020.

At the onset of the COVID-19 pandemic in 2020, TESDA (2020) reported that the pandemic brought about significant disruptions in economic activities with the government-imposed community quarantines. However, it was also expected to contract by 9.8%, with a relatively weak private sector confidence and a weaker 2020 gross domestic product (Noble, 2020). To guide commerce and industry, TESDA also classified the sectors based on the impact

ranking provided by the International Labor Organization (ILO). In particular, wholesale and retail trade, manufacturing, real estate and renting activities, accommodation and food and personal services sectors are high-risk; transport and communication, tourism, and arts and entertainment and other services sectors are considered medium-high risk; mining, financial intermediation, and construction are medium risk; agriculture and agribusiness are low-medium risks, and utilities and social work are low risk.

COVID-19 and the Vaccine Rollout

More than a year into the pandemic and still grappling with economic uncertainties, countries across the globe are looking for alternative ways to mitigate the negative impact of COVID-19 aside from governments reintroducing lockdowns, and this had led to economies turning their attention to vaccines which might help restore some societal functions (Attwell et al., 2021).

On March 1, 2021, almost a year after the first national lockdown, the Philippine government started its vaccine rollout for at least 756 healthcare workers (Department of Health [DOH], 2021 March 2).

Methodology

This study made use of the event study methodology developed by Fama et al. (1969) using COVID-19 vaccine rollout as a significant catalyst occurrence. This involved observing whether stock prices display abnormal returns days before, at, and after the said event to assess the impact of the COVID-19 vaccine rollout on stock price based on the impact ranking levels of publicly-listed Philippine companies. We then conducted a one-way ANOVA to determine if there were significant differences in abnormal returns between and among the ILO impact ranking groups. The study's methodology is similar to the event study done by Saad et al. (2020), which tested the reaction of share price based on COVID-19 pandemic spreads in Malaysia by finding the abnormal return attributable to the particular event through return adjustments arising from market fluctuations. Aside from examining any changes in the share price based on its relation to an event, event study, as a statistical method, can also help analyze the impact of an event on a company, industry, sector, or overall market (Saad et al.).

In this study, March 1, 2021, or the start of the Philippine government's COVID-19 vaccine rollout to health workers, was identified as the event day, denoted by (0,0). The event window consists of the trading days under study. This study adopted the duration of the event window and estimation window of previous event studies (Adnan & Hossain, 2016; Khanthavit, 2020; Xiong et al., 2020). Based on data availability, the event window adopted is from February 19 to March 8, 2021, up to five trading days before and after the event (-5, +5). This study also used September 11, 2020, to February 18, 2021, or 110 trading days (-110 to -6) before the event as the estimation window in computing expected stock returns. Using Microsoft® Excel for Mac version 16.46 (2021), the detailed steps in conducting the study were as follows:

1. Calculated the expected return using the market model, denoted by $ER_{i,t}$, for each company for days surrounding the event using Equation 1.

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

Where $ER_{i,t}$ is the expected return on stock i at time t based on $R_{m,t}$, which is the market return at time t; $\beta 0_i$ and $\beta 1_i$ are coefficients of stock i estimated using ordinary least squares regression during the estimation 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.

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

3. Computed the cumulative abnormal return ($CAR_{i,t}$) for each company by adding the abnormal returns over the T days studied. See Equation 3.

$$CAR_{i,t} = \sum_{t=1}^{T} AR_{i,t} \qquad \text{(Eq. 3)}$$

4. Computed the cumulative average abnormal return ($CAAR_t$) by finding the average cumulative abnormal returns of all stocks per risk category as shown in Equation 4.

$$CAAR_t = \frac{1}{N} \sum_{i=1}^{N} CAR_{i,T} \qquad \text{(Eq. 4)}$$

5. Conducted one-way ANOVA testing on $CAAR_t$ based on the different impact ranking groups.

6. Conducted one-way ANOVA testing on $CAR_{i,t}$ based on the different impact ranking groups.

7. Conducted Bonferroni post-hoc correction tests for both steps 5 and 6.

For the population, this study used all companies listed in the Philippine Stock Exchange (PSE), except for 45 holding firms, as these are not directly related to the company's operating activities. Thus, from the total of 276 listed firms, this study's final sample consisted of 231 firms which were then reclassified based on the ILO impact ranking. Refer to Table 1 for the list.

Table 1
Classification of PSE Sectors and Subsectors based on ILO Impact Ranking

ILO impact ranking	*PSE sectors-subsectors*	*Count*	*Total*
High	Services – retail	7	66
	Services – hotel and leisure	5	
	Property	37	
	Industrial – chemicals	6	
	Industrial – electrical components and equipment	7	
	Industrial – other industrials	1	
	Small, medium, and emerging boards	3	
Medium-High	Services – casinos and gaming	9	51
	Services – education	4	
	Services – information technology	10	
	Services - media	6	
	Services – other services	7	
	Services - telecommunications	2	
	Services – transportation services	12	
	Small, medium, and emerging boards	1	
Medium	ETF-equity	1	70
	Financials - all	27	
	Industrial – construction, infrastructure, and allied services	13	
	Mining and oil - all	27	
	Small, medium, and emerging boards	2	
Low- Medium	Industrial – food, beverage, and tobacco	25	25
Low	Industrial – electricity, energy, power, and water	19	19
Total			231

Discussion of Results

The results of the one-way ANOVA based on $CAAR_t$ are shown in Table 2. At p-value of less than .05, we reject the null hypothesis that there is no significant difference between impact ranking groups.

Table 2
Results of one-way ANOVA based on CAAR

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.00810715	4	0.00202679	7.01293422	0.00014589	2.55717915
Within Groups	0.01445034	50	0.00028901			
Total	0.02255749	54				

Based on the Bonferroni post-hoc correction test, we found that the following pairs of impact ranking groups showed a significant difference in means: high and medium (p=.0024), high and low medium (p=.0013), high and low (p<.0001), and medium-high and low

(p=.0072). Most of these pairs included a high-impact ranking group which meant that this group's cumulative average abnormal returns differed significantly from another group.

Aside from the groups' $CAAR_t$, a one-way ANOVA based on $CAR_{i,t}$ was also performed to incorporate individual firm's cumulative abnormal return per day rather than a group average. The p-values per day in the event window can be seen in Table 3. With a p-value of less than .05, we failed to reject the null hypothesis that there is no significant difference between impact ranking groups for all days in the event window, although, at a 90% confidence interval, we reject the null hypothesis for event days 0,0 or actual vaccine rollout date (p=.0887) and two days before vaccine rollout or -2,0 (p=.0871).

Table 3
Results of one-way ANOVA based on CAR

Event Window	*P-values*
0, +5	.5325
0, +4	.5624
0, +3	.3345
0, +2	.6193
0, +1	.3834
0, 0	.0887*
-1, 0	.1335
-2, 0	.0871*
-3, 0	.1132
-4, 0	.4027
-5, 0	.4375

Note. *** p<.01, ** p<.05, and * p<.10.

Based on the Bonferroni post-hoc correction test, we found that only high and medium (p=.0022) for event day -2,0 had shown a significant difference in cumulative abnormal returns. This pair was also found to have a significant difference when using cumulative average abnormal returns.

Following the efficient market hypothesis, this study also found that the Philippine Stock Exchange (PSE) has a semi-strong market efficiency as the stock prices are appropriately valued and fully and immediately reflect all public information.

The significant difference in means for high-risk companies may have been due to a positive response to vaccination as a possible solution to government-imposed lockdowns, restricted activities, and other actions that hinder these companies from resuming their usual operations, specifically as the significant differences were attributable on the day of vaccine rollout and two days before the event. This is particularly true for those in retail, hotel, leisure, and most industrial sectors as Xiong et al. (2020) and He et al. (2020) both noted that these sectors had suffered heavy losses due to COVID-19.

In contrast, those companies under medium, low medium, and low impact ranking groups might have been affected by the increasing number of negative publicity surrounding the vaccine rollout, which included the Philippine government, particularly the Department of Health, calling out non-health workers to strictly follow the government's prioritization guidelines regarding vaccines (DOH, 2021 March 25). This also corroborated the survey results

of Attwell et al. (2021) that despite the negative consequences of the pandemic on individuals, businesses, and economies, most people are still undecided on whether to get vaccinated or not. Moreover, the gradual easing of quarantine guidelines as a result of the start of vaccine rollout might mean more outdoor activities and fewer stay-at-home meetings, as opposed to Kuofie and Muhammad's 2021 study, and therefore might have harmed companies offering basic needs such as utility companies.

To help these publicly-listed companies, regardless of impact ranking, the government should understand communities' concerns in terms of demand, acceptance, and willingness to follow government recommendations for a vaccination program (Seale et al., 2021), use messages of vaccine opponents on a social media platform to encourage those who are vaccine-hesitant (Bonnevie et al., 2021), and ensure a safe, effective, and fair implementation of the vaccine prioritization and distribution policies (Getz, 2020).

Conclusions

This study is an event study that analyzed the differences in share prices, measured in terms of the cumulative average abnormal returns, five days before, at, and five days after the vaccine rollout implemented by the Philippine government starting March 1, 2021, using data from non-holding companies listed in the PSE. It was found that regardless of whether the company is classified under high risk, medium-high risk, medium risk, low-medium risk, or low risk, the vaccine rollout as the event had caused a significant difference in the overall market reaction during the 11-day event window. This study's findings would be beneficial to the Philippine government and to company management on the appropriate strategies they could do to elicit a significant positive market reaction and ultimately improve the firm's financial performance. Specifically, the Philippine government can institute some policies to assist these publicly-listed companies. Company management should think of creative ways to re-establish their competitive advantage as the vaccine rollout translated to significant differences in market reaction. This study also helped the management determine investor confidence and develop appropriate strategies to improve their market condition further. Investors and prospective investors can also use this study's findings to determine which impact ranking groups differ in cumulative abnormal returns and, therefore, may help select their best investment given the updates on the vaccine rollout, as the PSE is considered as an efficient market.

Limitations and Recommendations for Future Research

This study only considered publicly-listed non-holding firms in the Philippines. Future researchers may wish to expand the scope to cover private firms and other economies and probably do a regional or global study to determine the differences in share prices resulting from the vaccine rollout. A methodology other than event study is also recommended. In particular, regression analysis may be done based on the daily stock prices and the COVID-19 cases since the vaccine rollout. Finally, it is also suggested to extend the period covered to include the full-scale implementation of the vaccine rollout in the Philippines.

References

Adnan, A. T. M., & Hossain, A. (2016). Impact of M&A announcement on acquiring and target firm's stock price: An event analysis approach. *International Journal of Finance and Accounting*, *5*(5), 228-232.

Amato, N. (2020, April 24). Strategic disruption: An expert's thoughts on moving forward. *Journal of Accountancy*, *4*, 1-4.

Attwell, K., Lake, J., Sneddon, J., Gerrans, P., Blyth, C., & Lee, J. (2021). Converting the maybes: Crucial for a successful COVID-19 vaccination strategy. *PLoS ONE*, *16*(1): e0245907.

Baek, S., Mohanty, S. K., & Glambosky, M. (2020). COVID-19 and stock market volatility: An industry-level analysis. *Finance Research Letters*, *37*, 101748.

Baker, S. R., Bloom, N., Davis, S. J., Kost, K., Sammon, M., & Viratyosin, T. (2020). The unusual stock market reaction to COVID-19. *The Review of Asset Pricing Studies*, *10*(4), 742-758.

Belhadi, A., Kamble, S., Jabbour, C. J. C., Gunasekaran, A., Ndubisi, N. O., & Venkatesh, M. (2021). Manufacturing and service supply chain resilience to the COVID-19 outbreak: Lessons learned from the automobile and airline industries. *Technological Forecasting and Social Change*, *163*, 120447.

Bonnevie, E., Gallagos-Jeffrey, A., Goldbarg, J., Byrd, B., & Smyser, J. (2021). Quantifying the rise of vaccine opposition on Twitter during the COVID-19 pandemic. *Journal of Communication in Healthcare, 14*(1), 12-19.

Bora, D., & Basistha, D. (2020). The outbreak of COVID-19 pandemic and its impact on stock market volatility: Evidence from a worst-affected economy. *Journal of Public Affairs*, e2623.

Camba, A. L., & Camba Jr, A. C. (2020). The effect of COVID-19 pandemic on the Philippine stock exchange, peso-dollar rate, and retail price of diesel. *The Journal of Asian Finance, Economics, and Business (JAFEB), 7*(10), 543-553.

del Rio-Chanona, R. M., Mealy, P., Pichler, A., Lafond, F., & Farmer, J. D. (2020). Supply and demand shocks in the COVID-19 pandemic: An industry and occupation perspective. *Oxford Review of Economic Policy*, *36*(Supplement_1), S94-S137.

Department of Health (2021, March 2). *DOH, NTF grateful to hospitals and vaccinees as PH inoculates 756 on first day of COVID-19 vaccine rollout*. https://doh.gov.ph/doh-press-release/doh-ntf-grateful-to-hospitals-and-vaccinees-as-ph-inoculates-756-on-first-day-of-covid-19-vaccine-rollout.

Department of Health (2021, March 25). *Follow prioritization and wait for your turn, govt will secure vaccines for all – DOH, NTF*. https://doh.gov.ph/doh-press-release/follow-prioritization-and-wait-for-your-turn-govt-will-secure-vaccines-for-all-doh-ntf.

Dhar, R., Jee, B., Pethusamy, K., Seethy, A., Kumar, A., Subhradip, K. (2020). The scars of COVID-19: Preparing for the collateral damages. *Asian Journal of Medical Sciences, 11*(6), 142-147.

Dube, K., Nhamo, G., & Chikodzi, D. (2021). COVID-19 pandemic and prospects for recovery of the global aviation industry. *Journal of Air Transport Management, 92*, 102022.

Engelhardt, N., Krause, M., Neukirchen, D., & Posch, P. N. (2021). Trust and stock market volatility during the COVID-19 crisis. *Finance Research Letters, 38*, 101873.

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review, 10*(1), 1-21.

Getz, K. (2020). Public trust and the 'last mile' for COVID-19 vaccines. *Applied Clinical Trials, 29*(12), 11-12.

Gu, X., Ying, S., Zhang, W., & Tao, Y. (2020) How do firms respond to COVID-19? First evidence from Suzhou, China. *Emerging Markets Finance and Trade, 56*(10), 2181-2197.

He, P., Niu, H., Sun, Z., & Li, T. (2020) Accounting index of COVID-19 impact on Chinese industries: A case study using big data portrait analysis. *Emerging Markets Finance and Trade, 56*(10), 2332-2349.

Khanthavit, A. (2020). World and national stock market reactions to COVID-19. *ABAC Journal, 40*(2).

Kuofie, M., & Muhammad, N. M. N. (2021). Leader perspectives on post-COVID-19 pandemic period: Global business focus. *International Journal of Health and Economic Development, 7*(1), 13-36.

Mazur, M., Dang, M., & Vega, M. (2021). COVID-19 and the March 2020 stock market crash. Evidence from S&P1500. *Finance Research Letters, 38*, 101690.

Noble, L. W. T. (2020, November 12). GDP seen contracting 9.8% this year, more BSP easing expected. *Business World*.

Purwanto, A., Fahlevi, M., Zuniawan, A., Puja Kusuma, R. D., Supriatna, H., & Maryani, E. (2020). The COVID-19 pandemic impact on industries performance: An explorative study of Indonesian companies. *Journal of Critical Reviews*, 1965-1972.

Saad, N. M., Mohamad, N. E. A., & Haniff, M. N. (2020). Relationship between share price and COVID cases among all sectors in main market of Bursa Malaysia. *Global Business and Management Research, 12*(4), 455-465.

Sattar, M. A., Arcilla, F. E., & Sattar, M. F. (2020). The response of financial market indices to COVID-19 pandemic. *Financial Studies, 24*(3), 83-92.

Seale, H., Heywood, A. E., Leask, J., Sheel, M., Durrheim, D. N., Bolsewicz, K., & Kaur, R. (2021). Examining Australian public perceptions and behaviors towards a future COVID-19 vaccine. *BMC Infectious Diseases, 21*(1), 1-9.

TESDA (2020). COVID-19's impact to the Philippine economic sectors: A TVET response. *TVET Brief: Industry Trends, 6*. https://tesda.gov.ph/uploads/file/tvet%20brief%202020/tvet%20brief%20issue%20no.%206_covid-19s%20-impact-to-economic-sectors.pdf.

Xiong, H., Wu, Z., Hou, F., & Zhang, J. (2020). Which firm-specific characteristics affect the market reaction of Chinese listed companies to the COVID-19 pandemic? *Emerging Markets Finance and Trade, 56*(10), 2231-2242.