



COVID-Vaccination and Performance in Five Global Stock Market Indexes

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Abstract: This paper analyses the response of stock markets to vaccine availability. The objective of this paper is to examine the differential effect of information about the arrival of COVID vaccine on the stock price performance of five main global stock market indexes. The paper relies on the prior theory of Efficient Market Hypotheses (EMH). Data on stock price performance, seven months before vaccine arrival, and seven months within the vaccination period were from Trading Economics stock indexes archives for five main market indexes namely (Dow Jones, Shanghai, S&P, FTSE, and EURONEXT). The data were analysed using the t-test of mean difference in stock prices before and during vaccine at 5% alpha level. Results for the five indexes analysis show that stock prices during the arrival of vaccine significantly outweigh the stock prices before vaccine arrival at p-values below 0.01. The mean stock price increases during vaccine arrival ranges from 7% to over 20% for the different indexes. The paper provides practical information for investors who need to know how sensitive the various indexes are to vaccine information. The paper also provides an avenue for future research to expand this initial research on vaccine effect on stock prices. Furthermore, the paper presents a veritable case study for economics and finance postgraduate students in the universities. This paper fills existing gap in knowledge by being the first to analyse the effect of COVID vaccine arrival on the stock price of five main global stock indexes and contributes by indicating that stock indexes are sensitive to vaccine production with diverse percentages of sensitivity.

Key words: Efficient Market Hypothesis; Stock Markets; Vaccines Arrival; DOW Jones; FTSE100; Euronext 100; Shanghai Composite Index; S&P 500

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1. Introduction

The efficient market hypothesis (EMH) in economics and finance holds that a configuration of macro-factors influence stock market prices, which include all

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information (Xu, 2021; Niroomand et. al, 2020). The era of COVID pandemic ushered a myriad of information into the stock markets. One information that stood out is the information about the arrival of COVID vaccine. Macroeconomic studies recognise the importance of good health to wider economic performance (Bloom & Canning, 2003) – both in business and in the public economy. Hence, whatever variable fosters good health becomes an important concept to understand how it plays out in the economic performance of stock markets and in general economy. The inception of vaccination with the COVID-19 global catastrophe is one of such variables that need consideration regarding how it has brought and impact on the stock market performance amidst the rattling in global stock markets orchestrated by the COVID-19 pandemic. However, there is yet no economic literature on the effect of the arrival of COVID vaccine on stock market reaction. A gap in knowledge exists in this respect, which requires current contribution given the importance of COVID-19 and the economic imperatives regarding the industrial production of the vaccines and importantly on how the stock market rewards the vaccine companies through their stock price performance.

COVID-19 brought new impacts on all kinds of business spanning developed and developing nations. Many stock markets experienced a negative effect with the advent of COVID-19, yet some stock markets were resilient and kept a growth performance such as the Chinese stock market (Xiong et. al, 2020). Since disease pandemics before and present have a connection with business financial and economic performance, it becomes important to analyse how the commencement of vaccination has affected stock markets around the world. This is under the premise of the economic thought that a healthy population is an active population that can conduct business and boost manufacturing and other economic activities (Zhao & Zhou, 2021; Beraldo, Montolio & Turati, 2009; Thompson, 2007; Hadian et. al. 2006). Therefore, with the absence of any current literature on vaccine arrival and stock market performance, this paper is novel as it contributes by initiating this new analysis with important implication for investors, pharmaceutical industry, and the stock exchange.

1.1. The Problem of Paper

The unprecedented emergence of COVID-19 with attendant sicknesses, deaths, and closures of economies around the world resulted in many global sell-off of risky stock of assets (European Central Bank, 2021; Economics Observatory, 2020). This phenomenon had an attendant contribution to poor performance in many global stock markets as investors tactfully avoided stock markets located in pandemic hit countries. Toward the middle of November 2020, news from Pharmaceutical companies began to raise hopes of possible imminent success in the development of COVID vaccines; this began to uplift hopes of vaccine deliveries in the near future.

Accordingly, forecasters spread the news of hopes of vaccine delivery by first quarter of 2021. With this positive news, stock markets began to witness some positive rebounding. Although some stock markets benefitted from the news of imminent vaccine, but the effect of the news on stock markets was not generally significant, however the news of vaccine boosted faith in risky assets and began to ease financial conditions once again (Economics Observatory, 2020; European Central Bank, 2021). This scenario depicts that stock markets were waiting for the actual arrival of vaccines – and vaccines did arrive at early 2021 in some advanced countries with commencement of vaccination. Some economic news has shed some early light about possible implication of vaccine arrival on stock markets, but this has not been analysed statistically in current research to check if the arrival and commencement of vaccination has caused any significant effect on stock market performance. Therefore, this paper fills this existing gap in stock market performance during COVID-19 vaccine arrival.

1.2. Objectives of Paper

Drawing from the foregoing problem of paper, the objective of this paper is to use data from five global stock market indexes to demonstrate how the COVID vaccination has had an effect on stock market performance. In addition, it aims to produce the ratio with which the vaccine arrival has had an effect on the stock price – positively or negatively on the major five stock market indexes in this paper. Hence, the paper uses key global stock indexes namely the China Shanghai Composite Stock Index, the Dow Jones Stock Index, the S&P500 Stock Index, the FTSE100 Stock Index, and the EURONEXT100

2. Theory and Literature Review

Previous researches present diverse evidence that news or perception of events outside of the stock market affects the performance of stock markets (CMBC, 2020; Niroomand, Metghalchi & Hajilee, 2020). Therefore, this paper draws support from the efficient market hypothesis (EMH) or theory, which indicates that stock market prices are conditioned by all available information, which makes it somewhat impossible to have a constant alpha or excess return to investment (Xu, 2021; Niroomand et. al, 2020). Relating the theory of EMH to COVID vaccine implication on stock, it becomes understandable why sporadic reactions in stock prices occurred toward the end of 2020 when the news of possible supply and commencement COVID vaccination filtered into the stock markets. For instance, the most COVID hit industries such the aviation industry had some stock price gains when the news of possible vaccine commencement became ubiquitous. For example, such gain was visible in the share performance of United Airlines, which report indicates it gained

additional 8.6% with Delta and American Airlines gaining 6% upward after Moderna Pharmaceutical Company announcement of vaccine. In addition, it was evident in the case of British Airlines Group, which witnessed an increase of 12.2% after Pfizer announcement of vaccine availability. These few examples give credence to the influence of information in the performance of stock markets, hence the efficient market theory, which holds that outside information can affect stock performance is the theory behind this paper.

Accordingly, relying on efficient market hypothesis, many researches have emerged that study the effect of information on the performance of stock markets. The literature presents different types of information and their effect on stock market performance; amongst others, the assortment of information that can affect stock market performance ranges from political events, health events, new product announcements, general economic events, job layoffs and corporate events (Lee, 1997; Maitra & Dey, 2012; Cyranoski, 2017; Hanvanich & Çavuşgil, 2001). Lee (1997) studied the primary comparison of job cutbacks in Japan and the United States of America and looks at equity price responses to job cutback announcements in each nation from 1990 to 1994. Lee employs Agency hypothesis and Aoki's hypothesis to examine contrasts within the administration structures of U.S. and Japanese firms and their implication for equity price responses. Results from their paper indicate that job cutback announcements trigger negative returns for both U.S. and Japanese companies. Particularly, job cutback announcements of U.S. firms show relationship with a negative 1.78 percent unusual return, whereas cutback declarations for Japanese firms relate with a negative 0.56 percent irregular return.

Basgoze, Yildiz and Metin (2016) examines the impacts of brand valuation announcements on stock returns of Turkish firms by utilizing the event study technique and risk-adjusted long-term portfolio returns. They analysed the stock-price impacts of 299 brand value declarations on the stock exchange price performance of the firms for the years of 2010–2014 by utilizing Brand performance listing in the turkey's 100 positionings as an information source. The results show that the companies, which appear in the Turkey Best 100 Brands list, gain positive anomalous returns 7 months after the declaration. Additionally, the companies, which had more noteworthy brand values relative to the past year, experienced significant positive anomalous returns within the 7-months period. Maitra and Dey (2012) examine the effect of dividend pronouncement on Indian Stock Market performance and found significant difference in share prices following dividend announcement. On health perspective and stock market, China's genomics company news of lunching into the Chinese Stock market made a big impact on the stock market (Cyranoski, 2017). In their research on international joint venture, Hanvanich and Çavuşgil (2001) examine the effect of global joint venture announcement on stock market. They find that international joint venture news affect the stock price of markets and that this effect may commence even some days before the

announcement is made, which means that if the news filters into the stock market even before official announcement, such news has the potential of influencing stock market performance.

Another study focussed on the effect of macroeconomic factors on the stock price of Iranian pharmaceutical industry. They find amongst others that information asymmetry between producers and users may affect the stock price (Heidari, Kahriz & Mohammadzadeh, 2019). However, the paper did not include announcement of new medicine development in their macro-economic variables. In a related study, Bansal (2010) examines stock market reward of new drug approval by the US FDA and found that the pharmaceutical companies receive stock market gains on the approval of new drugs by the US FDA. In addition to the foregoing, the advent of COVID-19 pandemic spurred myriad of researches that looks at diverse effect of COVID pandemic on the performance global stock exchanges. Some of the research found that stock markets have been reacting abnormally to COVID-19 (Baker et. al, 2020). During this COVID period, some stock markets have crashed (Mazur, Dang, Vega (2021); corona virus effect on SMMEs, Aderemi et al (2020); COVID-19 and stock market volatility (Gao et. al, 2021). There is currently no research on the effect of information on COVID vaccine arrival on the stock price performance in stock market indices. The absence of such research in the literature is the gap in knowledge, which this paper relies on to make a new contribution to knowledge by conducting the following analysis, which shows the differential effect of COVID vaccine announcement on the stock price performance of five main global stock indices. The following section presents the method, analysis, and implications of results.

3. Method

This paper uses secondary data on stock market performance from the archives of Fusion Media Investing.com (2021). The paper applies a quantitative approach and uses a statistical t-test of difference in stock market performance before COVID-vaccination and during the COVID-vaccination to check if there is a statistical significance difference in stock market performance, which arises because of COVID vaccine commencement. It makes use of stock market data from five major global stock markets namely the China Shanghai Composite Stock Index, the Dow Jones Stock Index, the S&P500 Stock Index, the FTSE100 Stock Index, and the EURONEXT100.

In this research, the paired t-test of differences in sample mean is from the following model:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s/\sqrt{n}}$$

The model notation representation are: \bar{x}_1 = the mean of first sample; \bar{x}_2
= the mean of second sample; s = the standard error and \sqrt{n}
= the square root of the sample size

Given that this paper analysed the performance of five stock indexes during the vaccination period, the following sections presents Table 1 to Table 5 with the results based on alpha (α) level of 0.05(5%).

3.1. Results: Covid-Vaccination Differential Effect on Stock Markets

Results from the t-test statistics of differential analysis in mean stock price (seven months before and within the arrival of COVID vaccine) confirm that the information about the arrival of vaccine has a significant and positive effect on stock price. This effect is visible in the statistical result of the five stock indexes (Dow Jones, Shanghai Composite Index, S & P, FTSE and EURONEXT) in Table 1 to Table 5. Table 1 present the result of Dow Stock Index with a p-value of 0.0001 on both the one tail and two tail tests. This is less than the alpha value of 0.05, which indicates that the Dow Jones stock price increase during the arrival of vaccine is significantly higher than stock price before vaccine arrival. Similarly, Table 2 presents the result of Shanghai Composite Index Stock price with a p-value of 0.005 on the one tail test and 0.01 the two-tail test. This p-value is less than the alpha value of 0.05, and this indicates that the Shanghai Composite Index Stock price increase during the arrival of vaccine is significantly higher than the stock price before the arrival of vaccine.

Table 3 shows the result of S&P500 Stock price indicating a p-value of less than 0.001 on both the one tail test and two-tail tests. Since this p-value is less than the alpha value of 0.05, this shows that the S&P500 Stock price increase during the arrival of vaccine is significantly higher than the stock price before the arrival of vaccine. This further shows that the S&P500 Index is sensitive to COVID vaccine information and signifies how jittery investors feel about the safety of their investments in the absence vaccine. Table 4 depicts the outcome of FTSE-100 Stock price with a p-value of 0.001 on both the one tail test and the two-tail tests respectively. This p-value is less than the research alpha value of 0.05. This signifies that the FTSE-100 Stock price increase during the arrival of vaccine is significantly higher than the stock price before the arrival of vaccine. This also shows the extent to which FTSE-100 Index is sensitive to COVID vaccine information and how investors feel about the safety of their investment in the absence of vaccine. Table 5 presents the result of EURONEXT100 Stock price with a p-value of 0.0001 on the one tail test and 0.0002 on the two-tail test. These p-values are both less than the research alpha value of 0.05. This signifies that the EURONEXT100 Stock price increase during the arrival of vaccine is significantly higher than the stock price

before the arrival of vaccine. This is indicative of the extent to which FTSE-100 Index is sensitive to COVID vaccine information and how the investors feel about the security of their investment in the absence of COVID vaccine. Figure 1 further confirms these results, which show a rise in the stock price trend from a lower slant before vaccine to a higher trend during vaccine. One of the striking results in Figure 1 is that Shanghai Composite Index shows the lowest mean stock price increase during vaccine. Reason being that Shanghai Index was the most resilient of stock Indexes before the arrival of vaccine – hence the increase in stock price was not much. However, the other four stock indexes, which were hard hit before the arrival of vaccine show greater percentage increase in stock price with the arrival of vaccine.

Table 1. Dow Stock Index: Market t-Test: Covid-Vaccination Differential Effect on Dow Jones Stock Market

	<i>During Vaccine</i>	<i>Before Vaccine</i>
Mean	61.77571429	46.85571429
Variance	26.15479524	31.37709524
Observations	7	7
P(T<=t) one-tail	0.000182136	
P(T<=t) two-tail	0.000364271	

Table 2. Shanghai Composite Index: t-Test: Covid-Vaccination Differential Effect on Shanghai Composite Index

	<i>During vaccine</i>	<i>Before Vaccine</i>
Mean	3515.955714	3285.395714
Variance	4503.113962	26329.9202
Observations	7	7
P(T<=t) one-tail	0.005218621	
P(T<=t) two-tail	0.010437242	

Table 3. S & P 500: t-Test: Covid-Vaccination Differential Effect on S&P 500 Stock Index

	<i>During vaccine</i>	<i>Before vaccine</i>
Mean	4078.658571	3411.768571
Variance	62384.12828	51618.97385
Observations	7	7
P(T<=t) one-tail	1.66291E-05	
P(T<=t) two-tail	3.32583E-05	

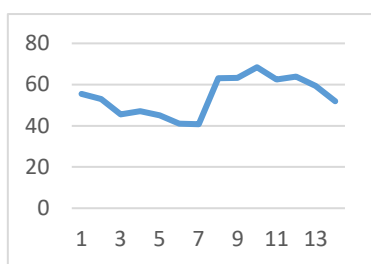
Table 4. FTSE-100: t-Test: Covid-Vaccination Differential Effect on FTSE-100 Stock Index

	<i>Duringvaccine</i>	<i>Beforevaccine</i>
Mean	6822.327143	6028.735714
Variance	82777.31129	85729.54843
Observations	7	7

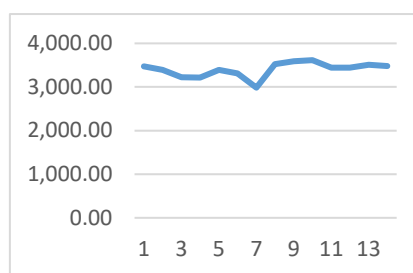
P(T<=t) one-tail	0.000799444	
P(T<=t) two-tail	0.001598889	

Table 5. EURONEXT100: t-Test: Covid-Vaccination Differential Effect on EURONEXT100 Stock Index

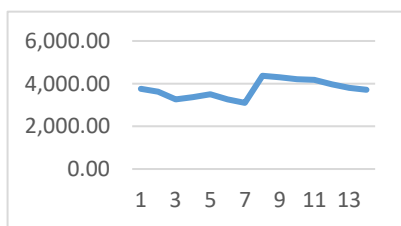
	<i>Duringvaccine</i>	<i>beforevaccine</i>
Mean	1201.612857	998.99
Variance	5128.70599	4681.032067
Observations	7	7
P(T<=t) one-tail	0.000139543	
P(T<=t) two-tail	0.000279086	



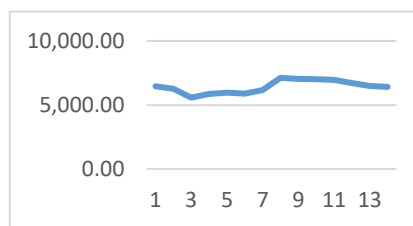
Dow Jones



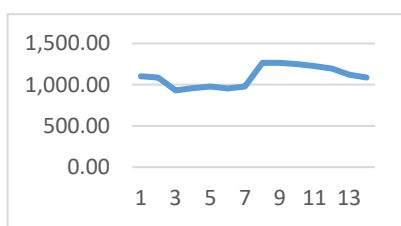
Shanghai Composite Index



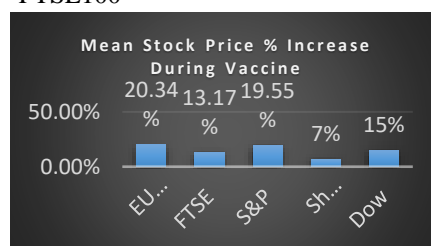
S&P 500



FTSE100



EURONEXT100



Comparison of Stock Indexes Mean Stock Price % Increase

Figure 1. Stock Price Performance before and During COVID Vaccine

3.2. Implications

The results provide implication on how resilient indexes may respond to the arrival of vaccine. As an example, Shanghai Index, which was one of the world's resilient stock Indexes before the arrival of vaccine reacted with little increase in stock price with the arrival of vaccine. Hence, the results imply that resilience to pandemic is important to protect the stock market from any abnormal shock that may arise from sudden information such as vaccine arrival. Practically, these findings provide useful information for investors who may need to know which index to invest based on the indexes' ratio of stock fluctuation before and after the arrival of vaccines. These findings provide opportunity for further research to study more stock indexes and to expand the period under study as the society gets deeper into the vaccination. This paper provides a good case study for post-graduate students in universities – especially in the economics, finance, and accounting disciplines.

3.3. Value (Contribution)

This paper is the first to analyse the effect of COVID vaccine arrival on the stock price of five main global stock indexes and contributes by indicating that stock indexes are sensitive to vaccine production and that investors feels safer with the arrival of vaccine. The paper also contributes by presenting an original charting of comparative ratio of stock price increase in the five difference stock indexes (Dow Jones, Shanghai, S&P, FTSE, and EURONEXT).

4. Conclusion

This paper relied on the efficient market hypothesis (EMH) to examine the effect of information concerning COVID-19 vaccine arrival on the stock price performance of five global stock market indexes (Dow Jones, Shanghai, S&P, FTSE, and EURONEXT). The paper also aimed to determine the ratio of increase in stock price during the arrival of vaccine. Information from the analysis indicates that the paper achieved both objectives as depicted in the preceding result sections, which show that the five market indexes in this paper experienced a significant stock price increase with the arrival of COVID-19 vaccines. Accordingly, the results show that stock indexes are sensitive to COVID-19 vaccine information. The increases in stock price signify that investors are concerned about the safety of their investments in the absence of COVID vaccine. Additionally, the results provide practical implication on how resilient market indexes may respond to the arrival of vaccine.

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