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# STOCK MARKET RESPONSE TO PFIZER AND BIONTECH'S SUCCESSFUL VACCINE DEVELOPMENT ANNOUNCEMENT: AN EVENT STUDY ANALYSIS IN THAILAND

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## Abstract

This study investigates the stock market in Thailand in response to Pfizer and BioNTech's announcement of successful vaccine development in phase III. The event study methodology analyzes such responses through cumulative abnormal returns of 28 sector indices. The result showed that the overall CAAR experienced significant cumulative abnormal returns during the announcement period. Agribusiness and personal care and pharmaceutical sector indices were found to be significantly negative. In contrast, property development, automobile, and healthcare service sector indices were significantly positive. In addition, cumulative abnormal returns exhibited insignificance for the post-announcement period. It is suggested that investors cannot make an abnormal return consistently because the market adjusted to its balances.

**Keywords:** CAAR, Pfizer, BioNTech, Vaccine Development Announcement, Sector Index

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## Introduction

The emergence of SARS-CoV-2 in late 2019 led to a global crisis, severely impacting stock markets and economies. Initially, Asian markets, including China's, faced downturns, but China's market rebounded as COVID-19 cases declined (Jabeen et al., 2022). Conversely, global markets suffered as infections spread, hitting the Thai stock market particularly hard, with a -13.5% year-to-date return for the SET Index by February 26, 2020. Efforts to expedite vaccine development included "Operation Warp Speed" in March 2020, with approximately 200 vaccine candidates and 15 in human trials (Brothers, 2020). Moderna and Pfizer, using mRNA technology, reported high efficacy rates, with Pfizer and BioNTech achieving about 95% in Phase III trials (Pfizer, 2020). According to Mullin (2020), This led to significant stock price fluctuations for both companies, reflecting potential commercial success and broader economic implications.

The discovery of COVID-19 vaccines brought hope for businesses and investors. Understanding the impact on the stock market and investor behavior is crucial. While many studies focus on the pandemic's financial effects, few examine vaccine announcements. This study aims to fill that gap by analyzing Thailand's stock market reactions to Pfizer and BioNTech's successful vaccine development.

## Literature Reviews

### Event Study

The Event Study is a financial theory that assesses how specific events impact companies' stock prices, focusing on stock returns and sometimes trading volumes and volatilities. Brown & Warner (1985) introduced this methodology to evaluate the economic effects of events such as the COVID-19 pandemic on stock markets. Ji et al. (2022) applied this method to study global stock indices, finding swift negative reactions to pandemic-related restrictions. Similarly, Singh et al. (2024) analyzed G-20 stock markets, observing significant negative cumulative abnormal returns as COVID-19 cases rose. Conversely, Amalia (2022) studied Indonesian tourism stocks, showing substantial negative abnormal returns post-COVID-19 onset. Nugraha et al. (2022) explored various Indonesian sectors, noting that while some sectors like manufacturing and consumer industries saw positive impacts, others such as mining and property remained unaffected by the pandemic announcement. Prucksakorn & Sukcharoensin (2021) suggested there was a contradiction in the direction of the cumulative average abnormal returns (CAAR) during the COVID-19 event. The results of the study showed that there was significant positive cumulative average abnormal returns (CAAR) but the second event was negative.

Several studies have explored how market dynamics respond to clinical trials and vaccine developments. Hartono (2021) demonstrated that each phase of COVID-19 vaccine development, especially the commencement of phase III trials, bolstered market performance and investor confidence, emphasizing the necessity of government policies to fully restore economic stability. Similarly, Chan et al. (2021) using ACWI data, comprising 23 developed and 27 emerging economies, noted positive market reactions during vaccine trial phases. Kewei & Yuanyuan (2020) examined 218 pharmaceutical firms, revealing significant positive stock returns following the initiation of COVID-19 vaccine trials. Conversely, Salisbury (2020) highlighted sectors like technology experiencing initial growth but later stabilizing. Trishana's (2022) study on global pharmaceutical firms found no significant market reaction differences before and after vaccine manufacturing announcements, indicating stable stock returns and trading volumes.

### Efficient Market and Related Research

The Efficient Market Hypothesis (EMH), which posits that stock prices reflect all available information (Borad, 2023), faced challenges during the COVID-19 pandemic. Studies by Endri et al. (2021) and Vasileiou (2021) demonstrated that market efficiency was compromised during this crisis, particularly in the US where information incorporation was neither timely nor

rational (Vasileiou, 2021). Ozkan (2021) similarly found deviations from market efficiency in both the US and UK stock markets during the pandemic, suggesting limitations of the EMH theory during such extraordinary events. However, Machmuddah et al. (2020) countered these findings, arguing that the EMH theory was supported by their event study, which showed initial negative impacts on the market followed by eventual stabilization over the long term.

### Rational Expectation Theory

Giglio et al. (2021) and Guerrero et al. (2021) examined investor beliefs and trading dynamics during the pandemic, with Giglio et al. (2021) noting increased short-term pessimism among investors following the market crash. Despite this pessimism, their long-term expectations for economic and stock market outcomes remained stable or even improved in some cases. Guerrero et al. (2021) argued that such behavior contradicts Rational Expectation models, suggesting that overly pessimistic investor sentiment during recessions could lead to reduced future returns and prolonged financial cycles. These studies underscore the relevance of psychological factors and behavioral finance theories in understanding stock market behavior during the COVID-19 pandemic.

### Behavioral Finance Theory

Virdikar & Kulkarni (2022) and Parveen et al. (2021) both found that the pandemic led to increased fear and uncertainty among investors, influencing their decisions. Virdikar and Kulkarni specifically highlighted the role of prospect theory, while Parveen et al. (2021) identified the influence of behavioral biases such as overconfidence and the disposition effect. Kiruba & Vasantha (2021) and Naseem et al. (2021) further emphasized the role of psychological factors, with Kiruba noting the impact of fear, risk perception, and herding behavior, and Naseem highlighted the negative relationship between investor psychology and stock market behavior. These studies showed the significant impact of the pandemic on investor behavior and the need for policymakers to consider these factors in crisis management strategies.

In summary, numerous studies have explored the stock market's reactions to COVID-19 and vaccine-related developments, revealing diverse market dynamics. Ji et al. (2022) and Singh et al. (2024) documented swift and negative global responses, driven by investor panic, while Amalia (2022) observed significant negative returns in the Indonesian tourism sector. Conversely, Nugraha et al. (2022) highlighted positive returns in specific sectors on the Indonesian Stock Exchange, indicating effective preventive measures. Oncu (2021) noted positive abnormal returns in biotech stocks during vaccine development efforts. However, Prucksakorn & Sukcharoensin (2021) reported contradictory market responses during COVID-19 events. Studies on vaccine milestones, including those by Hartono (2021), Chan et al. (2021), and Kewei & Yuanyuan (2020) highlighted positive market reactions, with exceptions noted by Salisbury (2020) in certain industries. The Efficient Market Hypothesis (EMH) faced challenges during the pandemic, as seen in studies by Endri et al. (2021) and Vasileiou (2021), although Machmuddah et al. (2020) argued for eventual market balance restoration. Rational Expectation Theory, emphasized by (Tardi, 2023), noted increased short-term pessimism but stable long-term expectations among investors during the pandemic. Meanwhile, Behavioral Finance Theory, explored by Virdikar & Kulkarni (2022) and Parveen et al. (2021), highlighted increased fear and uncertainty, underscoring the role of psychological factors in crisis management strategies.

### Hypotheses

The following hypotheses are formulated:

Hypothesis I:  $H_0: CAAR_{(event)} = 0$ ;  $H_1: CAAR_{(event)} \neq 0$

The hypothesis provided above is related to cumulative abnormal returns (CAAR) for a specific time window (-10 to +10) around the day of Pfizer and BioNTech's successful vaccine development announcement (9 November 2020) for 28 different indices.

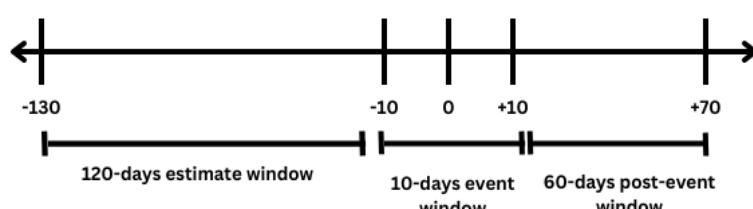
Hypothesis II:  $H_0: CAAR_{(post)} = 0$ ;  $H_1: CAAR_{(post)} \neq 0$

Hypothesis II is a statistical hypothesis that compares the cumulative abnormal return (CAAR) for a specified event window after an event date to zero. In this case, the event window is from +11 to +70 days after the event date accounts for 60 days.

The statistical analysis supports the null hypothesis if  $p\text{-value} > \alpha$ , it implies that there is insufficient evidence to reject the idea that the event had no impact on the stock's returns. The alternative hypothesis of  $p\text{-value} \leq \alpha$  suggests that there is evidence to reject the notion that the event had no impact, indicating that statistically significant abnormal returns were associated with the event. The value of  $\alpha$  represents the significance level chosen for the test with different levels of significance whereas, the  $\alpha$  value is 0.10, 0.05, or 0.01.

## Research Methodology

The data sample was gathered from SET (Stock Exchange of Thailand) using 28 sector indices including AGRI (Agribusiness), FOOD (Food & Beverage), FASHION (Fashion), HOME (Home & Office Products), PERSON (Personal Products & Pharmaceuticals), BANK (Banking), FIN (Finance & Securities), INSUR (Insurance), AUTO (Automotive), IMM (Industrial Materials & Machinery), PAPER (Paper & Printing Materials), PETRO (Petrochemicals & Chemicals), PKG (Packaging), STEEL (Steel & Metal Products), CONMAT (Construction material), CONS (Construction Services), PF&REITs (Property Fund & Real Estate Investment Trusts), PROP (Property Development), ENERG (Energy and Utility), MINE (Mining), COMM (Commerce), HELTH (Healthcare Services), MEDIA (Media & Publishing), PROF (Professional Services), TOURISM (Tourism & Leisure), TRANS (Transportation & Logistics, ETRON (Electronic Component) and ICT (Information & Communication Technology). The source of data in this research is mainly collected from the website of SETSMART.COM. The data gathered for the daily closing indices range from April 2020 to February 2021. This study used the data to compose an event study in the STATA program using the “estudy” module proposed by Pacicco et al. (2018). The event of this study is Pfizer and BioNTech's announcement of successful vaccine development in phase III which demonstrates to be 95% effective against COVID-19 as of 9 November 2020. The event period is described as follows:



**Figure 1** illustrates the estimate and event window

The data analysis in this research will be using an event study, a 10-day event window with a 120-day estimate window of data on the stock returns as studies proposed by (Nugraha et al., 2022; Oncu, 2021, Prucksakorn & Sukcharoensin (2021) and post-event window of 60-days window reference to Ji et al. (2022).

### Estimation Model and CAAR Hypothesis Testing

This paper uses a market model as Dodd & Warner (1983) and Brown & Warner (1985) to analyze the data that is the most frequently used expected return model. It builds on the actual returns of a reference market and the correlation of the firm's stock with the reference market. The abnormal return on a distinct day within the event window represents the difference between the actual stock return (Event Study Tool) and the risk-adjusted return model formula as shown:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t})$$

An abnormal rate of return can be calculated by deducting an expected rate of return from the actual rate of return in a specific period of the event window. The first step is to define the estimation period for the study which for this study is 120 days. The Estimation Model is calculated as follows:

Step 2 is to calculate the daily stock return (Nugraha et al., 2022):

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

$R_t$  = sector index return on t day,  $P_t$  = sector index closing price on t day,  $P_{t-1}$  = sector index closing price on t-1 day.

Step 3 is to calculate the expected return:

$$E(R)_{i,t} = \alpha_i + \beta_i R_{mt}$$

$E(R)_{i,t}$  = Expected return on sector index for day t

$\alpha_i$  = Intercept of the regression equation

$\beta_i$  = sector index's Beta value (slope)

$R_{mt}$  = Return of sector index for day t

Step 4 is to calculate the abnormal returns formula:

$$AR_{i,t} = R_{i,t} - E(R)_{i,t}$$

$AR_{i,t}$  = Abnormal return for day t

$R_{i,t}$  = Actual return on sector index for day t

$E(R)_{i,t}$  = Expected return on sector index for day t

Step 5 To measure the total impact of an event over a particular period (termed the event window), one can add up individual abnormal returns to create a cumulative abnormal return (Event Study Tool):

$$CAAR(t_0, t_1) = \sum_{t=t_0}^{t_1} AR_{it} ; t \in \{-10, 10\}$$

$CAAR(t_0, t_1)$  = Cumulative abnormal return,  $AR_{i,t}$  = Abnormal return for day t

Step 6 is hypothesis testing. A test statistic is a measure of the likelihood that the actual value of the parameter is not zero. Thus it measures some attribute of a sample by using statistical hypothesis testing. The larger the absolute value of t, the less likely that the actual value of the parameter could be zero

$$t_{CAAR} = \frac{CAAR_{it}}{(\sigma(CAAR_{it}))\sqrt{n}}$$

$t_{caar}$  is the test statistic of cumulative abnormal return;  $CAAR_{it}$  is the CAAR for each category;  $(\sigma(CAAR_{it}))$  is the standard deviation of the CAAR of the various acquiring firms and n is the number of observations.

## Research Results

### The Cumulative Abnormal Returns Result during the Event-Window

The result of the cumulative abnormal returns for 28 indices during the event window is shown in Table 1. During the event period, Pfizer and BioNTech's successful phase III vaccine development announcement led to significant market reactions across various sector indices. AGRI (Agribusiness) and PERSON (Personal Products & Pharmaceuticals) saw substantial negative abnormal returns of -28.49% and -30.04% respectively, significant at the 0.05 and 0.01 levels. Conversely, PROP (Property Development), AUTO (Automobile), and HELTH (Health Care Service) exhibited significant positive abnormal returns of 12.56%, 7.38%, and 9.08% respectively, significant at the 0.01, 0.10, and 0.05 levels.

**Table 1** The cumulative abnormal returns for 28 indices during the event window (-10,+10)

SECTOR INDEX	CAAR [-10,10]	SECTOR INDEX	CAAR [-10,10]	SECTOR INDEX	CAAR [-10,10]	SECTOR INDEX	CAAR [-10,10]	SECTOR INDEX	CAAR [-10,10]	SECTOR INDEX	CAAR [-10,10]
AGRI	-28.49%** (0.0224)	BANK	8.94% (0.2729)	PAPER	-12.26% (0.484)	CONS	-0.07% (0.9894)	COMM	-4.82% (0.156)	TRANS	2.40% (0.6727)
FOOD	-3.27% (0.3734)	FIN	-7.99% (0.1856)	PETRO	1.72% (-0.8239)	PF&REIT	3.17% (0.391)	HEALTH	9.08%** (0.0232)	ETRON	-25.16% (0.111)
FASHION	1.21% (0.6626)	INSUR	-5.55% (-0.3195)	PKG	-8.78% (-0.2269)	PROP	7.38%* (0.0666)	MEDIA	-2.46% (0.7319)	ICT	0.06% (0.9849)
HOME	-1.78% (0.7392)	AUTO	12.56%*** (0.0017)	STEEL	-7.91% (0.1455)	ENERG	2.04% (0.5701)	PROF	-5.32% (0.5758)	Ptf CAARs n 1 (28 se- curities)	-3.87%** (0.0312)
PERSON	-30.04%* (0.066)	IMM	-3.91% (0.6694)	CON- MAT	-2.31% (0.6404)	MINE	-10.43% (0.3648)	TOUR- ISM	-2.45% (0.7332)	CAAR group 1 (28 securities)	-3.66%** (0.0197)

The remaining 23 sector indices, including FOOD, FASHION, HOME, BANK, FIN, INSUR, IMM, PAPER, PETRO, PKG, STEEL, CONMAT, CONS, PF&REITs, ENERG, MINE, COMM, MEDIA, PROF, TOURISM, TRANS, ETRON, and ICT, showed statistically insignificant abnormal returns in response to the announcement. They exhibited both positive and negative cumulative abnormal returns of -3.27%, 1.21%, -1.78%, 8.94%, -7.99%, -5.55%, -3.91%, -12.26%, -4.82%, 1.72%, 8.78%, -2.46%, -7.91%, -5.32%, -2.31%, -2.45%, -0.07%, 2.40%, 3.17%, -25.16%, 0.06%, 2.04% and -10.43% respectively, with p-values of 0.156, 0.7319, 0.5758, and 0.7332.

The Agribusiness sector index (AGRI) showed a statistically significant negative cumulative abnormal return of -28.49% with a p-value of 0.0224, indicating significance at the 5% level. This rejection of the null hypothesis suggests that the abnormal returns during the event period were significantly different from zero. Business Today (2020) reported that on 11 November 2020, Investors are shifting funds from stocks that had previously outperformed during the COVID-19 period to those whose prices have not adjusted significantly, signaling an underperformance. For instance, According to the analysts, Veerawat Voraphojana, the Director of Securities Analysis at Finansia Syrus Securities, revealed that as vaccine campaigns reduced COVID-19 transmission rates, demand for PPE like latex gloves declined, affecting sectors that had thrived during the pandemic.

Analysts noted significant price declines in rubber stocks such as STA, TRUBB, and NER, attributed to reduced glove demand following Pfizer and BioNTech's announcements. Therefore, the demand for latex and rubber is expected to decrease as the demand for latex gloves is expected to decrease. Related to the Personal Products & Pharmaceuticals sector index (PERSON) showed a statistically significant negative cumulative abnormal returns of -30.04% with a p-value of 0.066, indicating significance at the 10% level which rejected the null hypothesis and implying that this sector is significantly affected by the announcement during the event window. Personal Products & pharmaceutical products essential for COVID-19 include rubber gloves, masks, alcohol gel, PPE virus protection suits, patient beds, and disinfectants. According to Econ Digest (2020), Thailand ranked second globally in potential rubber glove production for export, with exports reaching \$1,725.1 million in the first ten months of 2020, a 72% increase from the previous year. The surge was driven by heightened demand during the COVID-19 pandemic, particularly for medical gloves. However, following the vaccine announcement, stocks expected to perform well during the pandemic, like rubber producers, faced declines as investors adjusted their portfolios. For instance, STGT stock plummeted by 17.71% on November 10, 2020 (InfoQuestNews, 2020). Similarly, Malaysian glove producers like Top Glove, Hartalega, and Supermax experienced significant share price increases during the pandemic but saw declines post-vaccine news (Kumar, 2021). Analysts, including Kanyarat Kanchanawisut of SCB EIC (Kanchanawisut, 2021), highlighted ongoing challenges in managing raw material costs amid recovering automotive industry demand for latex, potentially impacting glove production costs.

On the other hand, the Automotive sector index (AUTO) demonstrated statistically significant positive cumulative abnormal returns of 12.56% with a p-value of 0.0017, indicating significance at the 1% level. This rejection of the null hypothesis suggests that the Automotive sector's returns were notably different from zero following the Pfizer-BioNTech COVID-19 vaccine's successful development and approval. The announcement spurred a surge in major automobile company stocks like General Motors, Ford, and Tesla, driven by expectations of economic recovery and increased consumer confidence (Cross, 2020; Tanne, 2020). The Property Development Sector Index (PROP) also showed a statistically significant positive cumulative abnormal return of 7.38% with a p-value of 0.0666, signifying significance at the 10% level. Kapar et al. (2022) highlighted the real estate development sector's resilience potential, particularly in response to the shift towards remote work. The rollout of vaccines offers optimism for a return to physical office spaces and increased commercial real estate demand as economic activity picks up (Cross, 2020; Mahase, 2020; Tanne, 2020; Mullin, 2020). The positive market response further reflects confidence in the vaccine's potential economic impact and its contribution to market stability (Cross, 2020). In addition, Health Care Services (HEALTH) showed a statistically significant positive cumulative abnormal return of 9.08% with a p-value of 0.0232, rejecting the null hypothesis at a 5% significance level. As vaccines became more available and campaigns progressed, investors adjusted earnings expectations for Thai healthcare companies involved in vaccine distribution and services. Serikarn Kritaniphat, cited by Phokkachai (2021), noted that while the pandemic initially slashed hospital profits by 57% in 2020, positive vaccine trial results from Pfizer, BioNTech, Moderna, Covovac, AstraZeneca, and Sputnik V sparked hope for global economic recovery and revived demand for medical services in Thailand, including health tourism.

The Portfolio CAARs (Ptf CAARs) and CAAR for the entire group of 28 securities both showed negative cumulative abnormal returns, signifying a general downturn during the specified event window. Both results are statistically significant with p-values less than 0.01. The overall portfolio and CAAR group results suggest a collective negative impact, with statistical significance at the 5% significance level aligned with Salisbury (2020). The COVID-19 pan-

demic has had a significant impact on stock market performance, with certain sectors experiencing more pronounced downturns and recoveries than others (Lin et al., 2022). Sectors such as health care, information technology, and telecommunication services have been relatively more pandemic-resistant, while others have been more severely affected (Liew & Puah, 2020). However, the announcement of an effective vaccine may prompt a rotation of investors out of pandemic winners and into sectors expected to benefit from the reopening of the economy, potentially leading to selling pressure on stocks in the former (Tashanova et al., 2020). Investors who have seen significant gains in stocks during the pandemic may choose to take profits following the vaccine announcement. This selling pressure can lead to short-term declines in stock prices. The result aligns with Behavioral finance theory Virdikar & Kulkarni (2022), Parveen et al. (2021), Kiruba & Vasantha (2021), and Naseem et al. (2021) which explains the observed abnormal returns by highlighting investors' psychological biases and emotional responses to uncertain events like the vaccine announcement.

Sectors like Property Development (PROP), Automobile (AUTO), and Healthcare Services (HEALTH) saw significant positive cumulative abnormal returns, while Agriculture (AGRI) and Personal Products & Pharmaceuticals (PERSON) experienced negative returns. This aligns with Machmuddah et al. (2020) who suggested the semi-strong form of the Efficient Market Hypothesis, where markets quickly adjust to new vaccine information, and the Rational Expectations Theory suggested by Giglio et al. (2021), where investors form expectations based on anticipated impacts. The positive returns indicate expected benefits, like increased demand or profitability, while negative returns suggest anticipated challenges. Overall, the results show diverse market reactions, with negative abnormal returns for Agribusiness and Personal sectors and positive returns for Property Development, Automotives, and Healthcare Services. Portfolio CAARs for the entire group also showed negative abnormal returns.

### **The Cumulative Abnormal Returns Result during the Post-Event-Window**

As shown in Table 2, all indices' cumulative abnormal returns after announcement periods of 60 days are not statistically significant. In the Agro & Food Industry (AGRO), the Agribusiness sector index (AGRI) and the Food & Beverages sector index (FOOD) showed cumulative abnormal returns (CAAR) of 4.48% and -4.40%, respectively, but neither was statistically significant. Similarly, in the Consumer Products Industry (CONSUMP), the Fashion sector (FASH), Home & Office Products sector (HOME), and Personal Products & Pharmaceuticals sector (PERSON) showed CAARs of -3.81%, -1.23%, and -19.91%, none of which were significant. In the Financial Business Industry (FINCIAL), the Banking (BANK), Finance & Securities (FIN), and Insurance (INSUR) sectors had CAARs of 7.31%, 8.44%, and -0.97%, respectively, with no statistical significance. The Industrial Industry (INDUS) showed CAARs of 1.25% for Automotive (AUTO), 19.65% for Industrial Materials & Machinery (IMM), 1.45% for Paper & Printing Materials (PAPER), 6.67% for Petrochemicals & Chemicals (PETRO), -10.17% for Steel (STEEL), and 11.83% for the Steel sector, none of which were statistically significant. In the Property and Construction industry (PROPCON), sectors showed mixed CAARs, all statistically insignificant. The Resources Industry (RESOURC) also displayed statistically insignificant CAARs. In the Services industry (SERVICE), Commerce (COMM) and other sectors had CAARs that were not statistically significant. The Technology industry (TECH) had CAARs of 18.16% for Electronic Components (ETRON) and -2.61% for Information and Communication Technology (ICT), both statistically insignificant.

**Table 2** The cumulative abnormal returns for 28 indices of 60 days in the post-event window

SECTOR INDEX	CAAR [11,70]	SECTOR INDEX	CAAR [11,70]	SECTOR INDEX	CAAR [11,70]	SECTOR INDEX	CAAR [11,70]	SECTOR INDEX	CAAR [11,70]	SECTOR INDEX	CAAR [11,70]
AGRI	4.48% (0.8433)	BANK	7.31% (0.6245)	PAPER	1.45% (0.9639)	CONS	-7.51% (0.4650)	COMM	-9.55% (0.1257)	TRANS	-8.61% (0.4091)
FOOD	-4.40% (0.5137)	FIN	8.44% (0.4449)	PETRO	6.67% (0.6378)	PF&REIT	-3.49% (0.6064)	HELTH	-3.46% (0.6337)	ETRON	18.16% (0.5290)
FASHION	-3.81% (0.4533)	INSUR	-0.97% (0.9244)	PKG	-10.17% (0.4449)	PROP	1.70% (0.8166)	MEDIA	-8.73% (0.5080)	ICT	-2.61% (0.6428)
HOME	-1.23% (0.9005)	AUTO	1.25% (0.8620)	STEEL	11.83% (0.2346)	ENERG	0.38% (0.9535)	PROF	1.33% (0.9391)	Ptf CAARs n 1 (28 securities)	0.14% (0.9648)
PERSON	-19.91% (0.6245)	IMM	19.65% (0.2438)	CONMAT	-4.26% (0.6396)	MINE	-18.61% (0.3784)	TOURISM	11.98% (0.3647)	CAAR group 1 (28 securities)	0.89% (0.7545)

Overall, portfolio CAARs of 0.14% and 0.89% were also insignificant, indicating no meaningful impact from the vaccine announcement across these sectors. The results align with Oanh (2022), who noted that despite the rollout of COVID-19 vaccines, public fear and mistrust persist, exacerbated by the emergence of the delta variant (Awijen et al., 2022). Fadda et al. (2020) emphasized that the typical years-long vaccine approval process contributes to vaccine confidence, but the rapid approval of COVID-19 vaccines has led to skepticism. Misinformation and active anti-vaccination movements, particularly in countries with high freedom of expression, further amplify vaccine hesitancy, with varying levels reported across regions (Latimer, 2020; Henley, 2020). Investor confidence in the stock market remains low despite increasing vaccination rates, as ongoing COVID-19 infections and deaths lead investors to favor safer assets like gold and foreign currencies (Oanh, 2022). The Efficient Markets Hypothesis (EMH) and studies by Trishana (2022) and Machmuddah et al. (2020) suggest no significant market reaction differences before and after vaccine announcements. Over the long term, markets tend to revert to equilibrium, indicating efficiency, especially in its semi-strong and strong forms. Short-term abnormal returns were significant around the Pfizer and BioNTech vaccine announcement but not over extended periods, supporting the EMH's notion that asset prices reflect all publicly available information. Rational Expectations Theory (RET) is also validated, as Giglio et al. (2021) found increased pessimism about short-term market and economic performance, while long-term expectations remained stable.

This aligns with EMH, suggesting that in efficient markets, asset prices reflect all information, making it difficult for investors to consistently achieve abnormal returns.

## Conclusion and Discussion

Table 3 presents a comparison of Cumulative Abnormal Return (CAAR) Analysis for Different Indices and Event Window. In the event window (-10,10), several indices showed significant abnormal returns. The AGRI and PERSON indices experienced significant negative returns, along with a portfolio of 28 securities (Ptf CAARs n 1) and a CAAR group of 28 securities. In contrast, the AUTO, PROP, and HELTH indices had significant positive returns. Conversely, during the event window (+11,+70), no indices showed significant negative or positive returns, indicating that the immediate impact was more pronounced than the longer-term effect.

**Table 3** Cumulative Abnormal Return (CAAR) Comparison Analysis for Different Indices and Event Window

<b>Indices with Significant CAAR</b>				
<b>Result</b>	<b>During Event Window (-10,10)</b>	<b>During</b>	<b>Post-event</b>	<b>Window</b>
		<b>(+11,+70)</b>		
Negative Index	AGRI, PERSON, Ptf CAARs n 1 (28 securities), CAAR group 1 (28 securities)	-		
Positive Index	AUTO, PROP, HELTH	-		
<b>Indices with Insignificant CAAR</b>				
<b>Result</b>	<b>During Event Window (-10,10)</b>	<b>During Event Window (+11,+70)</b>	<b>Post-even</b>	<b>Window</b>
Negative Index	FOOD, HOME, FIN, INSUR, IMM, PAPER, PKG, STEEL, CONMAT, CONS, MINE, COMM, MEDIA, PROF, TOURISM, ETRON	FOOD, FASHION, HOME, PERSON, INSUR, PKG, CONMAT, CONS, PF&REIT, MINE, COMM, HELTH, MEDIA, TRANS, ICT		
Positive Index	FASHION, BANK, PETRO, PF&REIT, ENERG, TRANS, ICT	AGRI, BANK, FIN, AUTO, IMM, PAPER, PETRO, STEEL, PROP, ENERG, PROF, TOURISM, ETRON, Ptf CAARs n 1 (28 indices), CAAR group 1 (28 indices)		

From this research, some sectors experienced significant negative cumulative abnormal returns (Agribusiness (AGRI) and Personal Products & Pharmaceuticals (PERSON)), while others observed positive cumulative abnormal returns (Property Development (PROP), Automotives (AUTO), and Healthcare Services (HELTH)). Factors such as the anticipated decrease in demand for certain products and the potential for improved profitability influenced the market reactions. The analysis of cumulative abnormal returns (CAAR) across various sectors provides valuable insights into the market reactions to COVID-19 vaccine announcements. The result of both positive and negative significant CAAR emphasizes the Efficient Hypothesis Market theory and Rational Expectations Theory whereas the market reflects all available information. The investor has an opportunity to obtain abnormal returns however, it is quickly eliminated through arbitrage and rational decision-making. The overall sector analysis reveals a general downturn during the specified event window, with statistically significant negative abnormal returns. Despite the potential for market stabilization, the uncertainty surrounding vaccine distribution, effectiveness, and virus mutations can still lead to market volatility fueled by investor's uncertainty about the pandemic. The lack of confidence among investors has

contributed to a decline in the stock market, with investors seeking a safer investment alternative which the result highlights the Behavioral Finance Theory.

Compared with 60 days after the event period, all indices' cumulative abnormal returns were not statistically significant which highlighted the complexity of market dynamics and the need for a thorough analysis to understand the underlying factors driving these movements which could also be explained by Efficient Market Theory (EMH) or Rational Expectations Theory (RET).

Furthermore, the findings align with existing research indicating widespread fear and mistrust regarding COVID-19 vaccines, fueled by misinformation and ongoing uncertainty about the pandemic's trajectory. This lack of confidence among investors has contributed to a decline in the stock market, with investors seeking safer investment alternatives.

For further study, it can investigate how markets incorporate new information during significant events or conduct comparative analyses across different markets or geographical regions to assess if reactions to vaccine announcements and other future events vary based on local economic conditions, healthcare infrastructure, or government responses which can highlight regional differences in market efficiency and investor behavior. Further research can also investigate into events related to the COVID-19 pandemic such as travel-ban lifting. It can also engage about potential strategies for mitigating risks and capitalizing on opportunities in future healthcare-related market events is essential, as it allows stakeholders to proactively address challenges and leverage emerging trends, ensuring resilience and growth in a rapidly evolving sector. Moreover, the researchers can use Buy-and-Hold Abnormal Returns (BHARs) as an alternative measure of abnormal returns, thereby strengthening the validity of the findings. This can provide a broader understanding of how different pandemic-related events influence market behavior and investor sentiment. Researchers can enhance the applicability of findings related to Efficient Market Theory (EMH), Rational Expectations Theory (RET), and Behavioral Finance Theory in explaining market responses to major events like successful COVID-19 vaccine development announcements. This deeper understanding can better guide investors and policymakers in navigating future market uncertainties effectively.

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