
EMPIRICAL STUDY ON EVENT STUDY MODEL ON BIOTECH STOCK MARKET

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ABSTRACT

Biotechnology today is used to develop and play an important role both in terms of the discovery of drug development that is a breath for the continuity of the pharmaceutical industry. The purpose of this research is to find out and analyze empirical studies on the event study model in the biotech stock market. This study uses a type of quantitative method, sampling using purposive sampling. Based on the results of the study, there is an influence of financial literacy, personal interest, and environment on interest in investing in the biotechnology stock market, there is an influence of financial literacy on interest in investing in the biotechnology capital market, there is an influence of personal interest on interest in investing in the biotechnology capital market, there is an influence of environment on interest in investing in the biotechnology capital market. Biotechnology plays an important role in the development of medicines and has a positive impact on the stock market and economy. Investing in biotech stocks requires adequate knowledge and a wise approach to avoid irrational investment practices and risks. It is expected that the younger generation will consider investing in the biotech sector, particularly in the pharmaceutical industry, to achieve sustainable profits.

Keywords: biotechnology, empirical capital market studies, investment.

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INTRODUCTION

Biotechnology is a foreign term, even though it has been practiced for a long time and has been a part of everyday life until the day it entered the stock capital market. According to Mender, biotechnology can be interpreted as using biological systems that aim to produce products that meet human needs (Maheswari, 2021). In other words, biotechnology is an activity to increase the value of natural resources (Naradia, 2017). This technique enables the utilization of Genetic Resources (SDGs) in ways that change our fundamental understanding of science and encourage the development of new products and methods that contribute to human well-being ranging from medicine to food security (Ancient et al., 2020).

Modern biotechnology uses many stages of the process through approaches from genetic modification methods carried out by DNA recombination (Nugroho & Rahayu, 2018). It can be said that the characteristics of biotechnology are: First, its implementation refers to strict scientific principles and goes through long qualifications; Second, Born from a long process by experienced verified experts who can be held accountable; Third, have achievements for long-term benefits and human needs today in general and become global or national needs. Biotechnology activities in the pharmaceutical field started several centuries ago (Wahyuni, 2022). The most well-known example is the discovery of Aspirin derived from the Salix and Spirae plants by Edward Stone, known by the

Greeks and Romans as an analgesic and anti-inflammatory drug since the 17th Century. However, scientific testing of the contents and efficacy of the above plants were carried out long after the Roman era. So Aspirin was only patented three centuries later. This knowledge is often used as initial information for developing modern medicines by the pharmaceutical industry in today's biotechnology business.

Furthermore, today the biotechnology industry is used to develop and play an essential role in the discovery and development of drugs which are the lifeblood for the continuity of the pharmaceutical industry in the development of this biotechnology. One example is the American Cancer Institute has collaborated with a pharmaceutical company to develop compounds called cardenolides derived from a type of tree that grows in the tropical forests of Malaysia and Indonesia. According to research, this compound is efficacious in the treatment of HIV type 1 and several types of cancer. Until now, this research is still being developed.

The development of the modern biotechnology pharmaceutical industry has led to higher business value in the capital market (Tjandrawinata, 2016). Initially, the value is tied to the entity (entity) of physical ownership of plant or animal varieties. However, since biology has been increasingly integrated into technology, especially the branch of genetics, the intrinsic value of living things, known as gene variability, has begun to be recognized. Furthermore, the utilization by the pharmaceutical industry has been so massive that it has entered into competition in the capital market business. A study reported that 74 percent of the plants that are raw materials for modern medicine are plants that are used in today's biotechnology business.

Investment is one of the factors that drive economic growth in a region, which is beneficial for improving the economy, creating equity, reducing poverty, and increasing prosperity in an area and individuals with the hope of being profitable, including in the case of the biotechnology capital market (Astuti et al., 2017). The importance of investing in the biotechnology stock market has increased massively. It is quite profitable at the time of the Covid-19 pandemic. It needs to be continuously socialized, especially to the younger and millennial generations, so that in the future, these young generations can consider the capital market, in this case, the pharmaceutical industry-based biotechnology.

Fundamental investment knowledge is crucial for potential investors (Lating et al., 2023). This aims to prevent investors from irrational investment practices, a culture of following along, fraud, and the risk of loss (Marlin, 2020). Sufficient knowledge, experience, and business sense are needed to analyze which securities to buy in investing in the capital market. Adequate knowledge of how to invest correctly is needed to avoid losses when investing, for example, in the capital market, including through stock investment instruments, especially in the pharmaceutical industry, which is engaged in the biotechnology business, which moves very massively and makes money during the Covid-19 pandemic. Over the years, there has been a surge in the capital market engaged in biotechnology, which has increased very rapidly (Agus Arman, 2022).

Investment in the capital market is the placement of several funds at this time to obtain several profits in the future with the hope that several funds or other sources of funds are used for wealth growth through the distribution of results, which can be in the form of interest, royalties, and dividends with the hope to obtain additional or profit from these funds in the future (Tumewu, 2019). Investment can be interpreted as a commitment to invest a certain amount of funds at this

time to obtain future profits in a longer-term Investment can have three aspects as follows (Ady, 2016): First, the aspect of money (invested) and (expected), to judge (wealth) to come. So to assess the (feasibility) of investment is also used the concept of money is used; Second, the time aspect (present and future) therefore, the time aspect is also used to assess investment: Third, the benefit aspect. From this benefit aspect, the investment feasibility assessment must also examine the benefits and costs incurred using the benefit principle or cost-benefit ratio.

There are two types of investment as follows: First, Direct Investment. This investment is in the form of a direct purchase of a company's financial assets. Direct investment can be made in the money market in the form of assets that have a negligible default risk, short maturities with high liquid rates, such as Treasury bills (T-bills), capital markets, in the form of securities fixed-income securities and stocks (equity income), derivative markets, in the form of options and futures contracts (Hayati, 2016); Second, Indirect Investment is the purchase of shares from investment companies that have portfolios of financial assets from other companies (Mahmudah & Suwitho, 2016). An investment company is a company that provides financial services by selling its shares to the public and using the funds obtained to invest in its portfolio (Sri Handini & Erwin Dyah Astawinetu, 2020).

The investment process consists of five stages, namely as follows: First, the Determination of investment objectives. The goals of investors are different from one another, depending on the decisions made; Second, the Determination of investment policy. This stage is the stage of determining policies to meet predetermined investment objectives; Third, the Selection of portfolio strategy. Two strategies are chosen, namely active portfolio strategy and passive portfolio strategy. Active portfolio strategy uses available information and forecasting techniques for better portfolio combinations. Passive portfolio strategy includes investment activities in portfolios that are in line with market index performance; Fourth, asset selection. This stage evaluates each security to be included in the portfolio; the Fifth measurement and evaluation of portfolio performance. This stage includes portfolio performance and comparison of the measurement results with performance. So based on the above background, the purpose of this study is to find out and analyze empirical studies on the event study model in the biotech stock market.

METHODS

The research method used in problem-solving includes analytical methods. The image caption is placed as part of the image title (figure caption) and not as part of the image. The methods used in completing the research are written in this section. The research approach is a way of thinking adopted by researchers about how research designs are made and how the research will be carried out. This research is quantitative in the form of hypothesis testing the relationship between variables. For survey purposes, the number of samples taken was around 100 respondents, namely the younger generation. Sampling is purposive sampling. The research criteria were: youth aged between 15-35 years, often using smartphones in their activities, knowing about the capital market, and knowing a little about the Biotechnology capital market. The type of research data is quantitative data, which can be measured or calculated directly, namely in the form of information or explanations expressed in the form of numbers or numbers. Furthermore, data sources include primary data, namely data from the first source or primary source, as well as secondary data

collected by researchers as support from the first source and in the form of documents and articles. Data collection techniques in this study used a quantitative approach which was then supported by qualitative research. The quantitative approach is carried out by surveying the younger generation.

RESULTS AND DISCUSSION

Empirical Study on Event Study Model on Biotech Stock Market

Biotechnology company stocks received great attention from investors in the first year of the pandemic. However, as access to vaccines becomes easier, interest in these stocks begins to wane. As reported by Bloomberg on Monday (14/2/2022), the inflow of funds to the capital market in this sector managed to penetrate nearly US\$ 5 billion per month in early 2020. Based on Bloomberg Intelligence, that figure is shrinking to an average of US\$ 800 million per month. This depreciation was driven by the decreasing tension among market players related to the spread of the Coronavirus, which was offset by strengthening expectations about handling the pandemic.

South Korea Also Ready to Give Fourth Dose of Covid-19 Vaccine The Nasdaq Biotechnology Index, the most critical measure of the sector, shows a decline of up to 25 percent since its peak of 52 last week on August 9. SPDR S&P Biotech, or XBI, an over-the-counter exchange-traded fund (ETF) used to track industry performance, has plunged 44 percent over the past year. With risks hanging in, biotech stocks suddenly looked less attractive, less promising, and far more daunting, especially with projected interest rate hikes. Indonesia Only Has Third Dose, and This Country Starts Fourth Dose of Vaccine Injections "The market last year was quite crazy, to be honest, because it was too hot. We saw several companies being able to raise funds on projects where we looked at them and said this made no sense," Chief said Ipsen SA Executive Officer David Loew. Biogen Inc. Chairman Stelios Papadopoulos said the current decline in the shares of several biotechnology companies was due to too high valuations at the start of the pandemic. "The problem is that scientific experience is overpriced with a very significant amount of risk."

Furthermore, Biotechnology is "the use of living organisms or the use of their products to improve human health and the environment" (Wardani et al., 2017). The global biotechnology market is expected to be worth \$2.44 trillion by 2028, implying a compound annual growth rate (CAGR) of over 15.5% between 2021 and 2028. The VanEck Biotech ETF (NASDAQ: BBH) invests in healthcare companies that develop and market drugs, especially those related to genetic analysis and diagnostic equipment.

So, Introducing two exchange-traded funds (ETFs) focused on biotechnology companies. To put this discussion in context, readers may be interested to know that Dow Jones Biotechnology made a 19.1% gain in the last 12 months. Likewise, the Dow Jones US Pharmaceuticals Index rose by close to 21%. Two trades in the stock market have always dominated the VanEck Biotech ETF and the Global X Genomics & Biotechnology ETF.

First, the VanEck Biotech ETF, which has 25 holdings, tracks the MVIS US Listed Biotech 25 Index. The top 10 companies make up about 62% of net assets of \$564.6 million, making it a large fund. About 85% of companies are from the US, followed by Ireland and Germany. Notable holdings include the following:

Amgen (NASDAQ: **AMGN**), **Moderna**, **IQVIA Holdings** (NYSE: **IQV**), **GileadSciences** (NASDAQ: **GILD**), **ICON** (NASDAQ: **ICLR**) and **VertexPharmaceuticals** (NASDAQ: **VRTX**).

The fund made gains of 21.7% last year and 13.2% this year. Potential investors looking for a fund that concentrates on some of the most important biotech names could consider investing around \$190.

- a. Current Price: \$194.04
- b. 52 Week Range: \$157.17 – \$222.22
- c. Dividend Yield: 0.32%
- d. Expense Ratio: 0.35% per year



Figure 1. VanEck Biotech Weekly Chart

Second, the Global X Genomics & Biotechnology (NASDAQ: **GNOM**) ETF exposes businesses likely to be at the forefront of advances in genomic science applications, including genome sequencing, gene editing, genetic medicine, and biotechnology. The fund was first listed in April 2019. Among the top companies on the list are the following: **BioMarin Pharmaceutical I** (NASDAQ: **BMRN**), **GenscriptBiotech** (HK: **1548**), **ArrowElectronis** (NYSE: **ARW**), **Qiagen** (NYSE: **QGEN**), **SareptaTherapeutics** (NASDAQ: **SRPT**) and **Pacific Biosciences** (NASDAQ: **PACB**) from California.

Global X Genomics & Biotechnology is down about 9.5% in 2021 but made a 5.1% gain in the last 12 months. After hitting a record high of \$28.45 in February, companies in the fund are under pressure, and the ETF has lost more than 24% of its value. Long-term buy-and-hold investors Global X Genomics & Biotechnology, which has 41 holdings, tracks gains in the Solactive Genomics Index. The leading ten shares comprise approximately 42% of net assets of \$264.3 million. The fund may consider buying around this level.

This fund brings a genomic dimension to healthcare investment. Genomics is "the study of an organism's genome or its DNA and how that information is applied". This niche market is expected to grow from nearly \$28 billion in 2021 to nearly \$95 billion in 2028, translating to a CAGR of nearly 19.5%. Health professionals highlight the importance of genome sequencing in developing an effective global response to the Coronavirus.

- a. Current Price: \$20.95
- b. 52-Week Range: \$19.34 – \$28.45
- c. Expense Ratio: 0.50% per year



Figure 2. Global X Genomics & Biotechnology Weekly Chart.

Even though it was hot at the start of the pandemic, for biotechnology investors in the long term, the current trend of fund inflows actually shows that this sector is still far from being destroyed. "A year ago, [biotechnology] companies were valued as interesting ideas. When the market corrects like that, I think we will appreciate them as a business again," said Loncar Investments Chief Executive Officer Brad Loncar. That means invested funds won't leave the sector, said Piper Sandler analyst Chris Raymond, who analyzes biotech cash flow. However, investors who stay put will pay more attention to which companies they want to support. Some shy away from companies that still need a long time to translate data into drug products. At a time of rising interest rates and rising inflation, investors are preferring the assets of large companies that prove less risky than betting during boom times, according to Brian Coleman, head of global capital markets at Locust Walk, an investment bank and advisor in the science sector. By 2021, healthcare venture companies raised US\$28.3 billion in funding, compared with US\$3.7 billion in 2011, according to Silicon Valley Bank.

Several healthcare and biotech stocks have recently been in the spotlight. In early October, Merck (NYSE: MRK)—covering early November—provided a positive update on molnupiravir, a potential antiviral drug being developed with Ridgeback Therapeutics that has shown outstanding results in the treatment of COVID-19. Then came similar news from Pfizer (NYSE: PFE) regarding Paxlovid, its antiviral drug candidate.

Several investors have made big money this year from shares of companies developing coronavirus vaccines. Some of these stocks have risen by hundreds of points in a relatively short period. This was before any Covid-19 vaccines won emergency use authorization or regulatory approval. Across the pharmaceutical and medical industries, senior executives and board members are making millions after announcing positive developments in the fight against Covid-19. The following are the Covid-19 vaccine stocks that have the potential to make their shareholder wealthy, as reported by the Motley Fool:

Moderna's first, Moderna (NASDAQ: MRNA), looks close to hitting the market with its Covid-19 mRNA-1273 vaccine. The biotechnology company reported excellent efficacy results for a trial vaccine in the past few weeks. Assuming no bumps are in the road, Moderna could win emergency

use authorization for mRNA-1273 by December. The cash inflow is likely to soon flow into Moderna's coffers. The biotechnology company has secured supply agreements for more than 330 million doses. Although the financial details of its supply deals have yet to be announced, the combined Price for these agreements may be as high as \$6 billion and much higher. Indeed, the market capitalization of biotechnology reflects the many potential Covid-19 vaccines. However, mRNA-1273's success could bode well for the rest of Moderna's network, allowing investors who buy shares now to become millionaires over time. The company has a dozen mRNA programs in the pipeline right now. CEO Stephane Bancel hopes to use the cash he expects from the mRNA-1273 supply deal to expand his pipeline of up to 50 mRNA programs in clinical trials.

Second, Novavax Although Moderna ranks as one of the clear leaders in the coronavirus vaccine race, this biotech stock has yet to deliver its most significant gains this year. That honor goes to Novavax (NASDAQ: NVAX), where the stock has rocketed more than 3,000% this year. Novavax is currently undergoing late-stage clinical studies for the Covid-19 vaccine candidate NVX-CoV2373. The company plans to begin late-stage US experimental vaccine studies in late November. If all goes well, these vaccine companies have agreements with Australia, Canada, and the UK to supply 176 million doses of NVX-CoV2373.

Additionally, Novavax received US\$1.6 billion in funding from Operation Warp Speed in an agreement that includes supplying 100 million doses to the US. In addition to the promising coronavirus vaccine, Novavax has an influenza candidate, NanoFlu, which the Food and Drug Administration will likely approve. Biotechnology announced excellent results earlier this year from a late-stage study of NanoFlu.

Third, Vaxart (NASDAQ: VXRT) has not gotten far into clinical trials of its COVID-19 vaccine candidate, VXA-CoV2-1. However, the stock has won more than most, soaring nearly 1,900% this year. Biotechnology is currently evaluating VXA-CoV2-1 in phase clinical studies. Vaxart completed enrollment in the study earlier this month and could report preliminary results in the coming weeks. Could it be too late for Vaxart to achieve VXA-CoV2-1 success? Not necessarily. There is something unique about VXA-CoV2-1 that can be a modifier because it is a single-dose tablet. All the leading coronavirus vaccine candidates are injections, most requiring two doses several weeks apart. If VXA-CoV2-1 proves safe and effective, Vaxart could have great opportunities with oral vaccines targeting other viral diseases. With its market capitalization of just under US\$750 million, investors still have the potential to make much money with the stock if all goes well in Vaxart's clinical studies.

Fourth, Johnson & Johnson (NYSE: JNJ) announced it would separate its consumer healthcare division and concentrate primarily on pharmaceuticals and medical devices. Moreover, on November 19, the CDC recommended a COVID-19 vaccine booster for all adults in the US. The announcement put shares of BioNTech (NASDAQ: BNTX), Moderna (NASDAQ: MRNA), JNJ, and Pfizer on investors' radars.

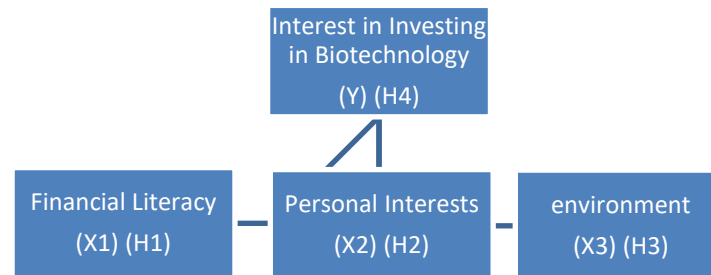


Figure 3. Thinking Framework Picture

Source: Theory Review, 2019.

Variable Operational Definitions

Table 1. Variable Operational Definitions and Research Variable Indicators

Variable	Understanding
Financial Literacy	the ability to read, interpret and analyze, manage money, communicate about personal financial conditions that affect material well-being, calculate, develop independent judgments, and take the resulting actions of those processes to thrive in our complex financial world
Personal Interests	A person's interest in making decisions regarding financial products
Environment	The Environment for Individuals to Invest in the Biotechnology Capital Market
Interest in Investing in Biotechnology Capital Market	Individuals tend to invest in the Biotechnology capital market.

Data analysis technique

The Regression Model is based on a functional or causal relationship between the independent and dependent variables (Oscar & Sumirah, 2019). Multiple linear regression analysis was tested using SPSS version 23. The multiple linear regression analysis models used to test the hypothesis are as follows:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon t$$

Information:

a : Constant value

$\beta_{1,2,3}$: Residual regression coefficient direction numbers

Y : Interest in investing in the Biotechnology Stock Market

X_1 : Financial literacy

X_2 : Personal interests

X_3 : Environment

Shows that:

1. There is an influence of Financial Literacy, Personal Interest, and Environment on interest in investing in the Biotechnology stock market.
2. There is an influence of Financial Literacy on the interest in investing in the Biotechnology Capital Market.

3. There is an influence of Personal Interest on interest in investing in the Biotechnology Capital Market.
4. There is an influence of the Environment on the interest in investing in the Biotechnology Capital Market.

CONCLUSION

Biotechnology plays a crucial role in the development of drugs and has a positive impact on the economy and capital market. Investing in biotechnology stocks can bring substantial profits but requires sufficient knowledge and wise investment practices to avoid losses. Educating the younger generation on investing in the capital market, particularly in the biotechnology industry, can lead to sustainable economic growth and prosperity. It is essential to understand the factors that influence interest in investing and to invest wisely to avoid risks and fraud. As the biotechnology industry continues to grow rapidly, investing in it can be profitable, especially during the Covid-19 pandemic.

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