



## IMPACT OF COVID-19 PANDEMIC ON MARKET SHARE AND RETURN IN CONSTRUCTION INDUSTRY

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### ABSTRAK

**Kata Kunci:**  
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BUMN,  
konstruksi,  
sharpe ratio,  
market share,  
return

Pandemi Covid-19 telah memberikan dampak yang signifikan terhadap semua sektor dan industri di Indonesia, termasuk industri konstruksi. Penyelesaian proyek pembangunan infrastruktur yang dikuasai BUMN konstruksi sebagian besar terhambat. Tujuan dari penelitian ini adalah untuk menganalisis dampak Covid-19 terhadap pangsa pasar dan return BUMN di industri konstruksi dibandingkan dengan kondisi sebelum pandemi. Penelitian ini menggunakan data harga saham pada industri konstruksi gedung selama periode Maret 2018 - 2020 dan Maret 2020 - Agustus 2021. Metode yang digunakan adalah Modern Portfolio Theory with Monte Carlo Simulation untuk optimasi portofolio. Hasil penelitian menunjukkan Sharpe Ratio Portofolio pada periode sebelum pandemi COVID-19 memiliki return sekitar minus 4,9% hingga 33% dan risikonya berkisar antara 30,9% hingga 41,2%. Selama masa pandemi, meskipun return saham yang diberikan oleh portofolio sedikit membaik, risikonya meningkat antara 53,7% hingga 63,3%. Oleh karena itu, pemerintah dan investor harus lebih selektif dalam berinvestasi di sektor konstruksi.

### ABSTRACT

**Keywords:**  
portfolio  
optimization,  
Covid-19,  
SOEs,  
construction,  
sharpe ratio,  
market share,  
return

*Covid-19 pandemic has had a significant impact on all sectors and industries in Indonesia, including the construction industry. Completion of infrastructure development projects which are controlled by construction SOEs is largely hampered. The purpose of this study was to analyze the impact of Covid-19 on the market share and returns of state-owned enterprises in the construction industry compared to conditions before the pandemic. The study used stock price data in the building construction industry during the period March 2018 - 2020 and March 2020 - August 2021. The method used is Modern Portfolio Theory with Monte Carlo Simulation for portfolio optimization. The results showed that the Sharpe Ratio of the Portfolio in the period before the COVID-19 pandemic had a return around minus 4.9% to 33% and the risk was around 30.9% to 41.2%. During the pandemic, although the stock returns provided by the portfolio improved slightly, the risk increased between 53.7% to 63.3%. Therefore, the government and investors should pay more attention to selectively investing in the construction sector..*

## INTRODUCTION

At the end of 2019, the world was shocked by the detection of a deadly virus called the corona virus or Covid-19. The virus first attacked the city of Wuhan, China and then spread to other countries, including Indonesia. The virus spread so fast then on March 12, 2020, the World Health Organization (WHO) declared this outbreak a pandemic.

In Indonesia, the beginning of the pandemic was marked by the first positive confirmed case of Covid in early March 2020. As a response to this outbreak, the government issued a policy, namely Large-Scale Social Restrictions (PSBB). This policy limits social, religious or other activities in public places. Companies and schools are required to implement work from home or online learning to avoid human contact with one another.

Indonesia is ranked 33 out of 215 countries with the highest number of Covid19 cases. In March 2020, the number of confirmed positive cases of Covid in Indonesia was 1,528, with details of 136 patients dying and 81 patients recovering. The number of cases continues to increase every day until April 2021 to reach a total of 44,721 new cases. The spread of this virus has had a fairly severe impact on the Indonesian economy. Economic stability is disturbed. Economic growth decreased by 2.97% in the first quarter of 2020 compared to the previous year. In addition, the Composite Stock Price Index (JCI) on the stock market decreased by around -28.21% or Rp4,511 in May 2020.

This pandemic is referred to as the greater financial crisis (Firazli, 2020). According to Zhang et al (2020), global financial market risks are increasing. Many companies in the world became very weak, unstable, heavily in debt and could not even survive during the pandemic. In this case, investment is one aspect that gets more attention during the crisis. Many investors in various industries suffered losses due to uncertainty and economic turmoil, including the construction industry. Several large projects controlled by state-owned construction companies were hampered, resulting in a decline in the company's financial performance, including its share price.

This study was conducted to see how the market share and returns of five state-owned construction companies were different before the pandemic and during the pandemic using the Monte Carlo method. The next section of this article will describe the literature review, research methodology, discussion, and conclusions at the end.

## LITERATURE REVIEW

### Stock Return

According to Tandellin, stock returns are one of the factors that motivate investors to invest and also a reward for the courage of investors to take risks for their investments.

According to Brigham and Houston (2006: 215), return or rate of return is the difference between the amount received and the amount invested, divided by the amount invested.

### Sharpe Ratio

The Sharpe ratio was developed by William Sharpe and it's often referred to the reward-to-variability ratio (RVAR). Sharpe Ratio compares the difference between portfolio return and risk free rate with portfolio risk expressed by standard deviation, it means that Sharpe measures the difference ( $Rp$ ) or risk premium generated for each unit of risk taken. The highest sharpe ratio indicates good performance. The calculation of the Sharpe ratio using the risk free rate is as follows:

$$S_p = \frac{R_p - r_f}{\sigma_p}$$

Notes :

$S_p$  = Sharpe ratio

$R_p$  = Return of portfolio in a period

$r_f$  = Risk free rate in a period

$\sigma_p$  = Standard deviation of portfolio return for a period

### **Modern Portfolio Theory**

Modern portfolios are measured using basic statistical measurements to explain the portfolio, namely the expected return, the standard deviation of the security or portfolio and the correlation between returns. In general, risk can be reduced by combining several single securities into a portfolio, provided that the returns on the securities are not perfectly positively correlated. Portfolio management recognizes the concept of risk reduction, as a result of adding securities to the portfolio. Markowitz (1952).

The minimum variance portfolio indicates a well-diversified portfolio and results in lowest possible risk for the rate of expected return. Tangency Optimization Portfolio is the portfolio with the maximum Sharpe ratio value and results in the highest expected return per unit of risk.

### **Monte Carlo**

Monte Carlo simulation is a method for analyzing uncertainty and aims to determine how variations in the distribution or error affect the sensitivity, performance or reliability of the system being modeled. Monte Carlo simulation is classified as a sampling method from a real population. Therefore, a model must choose an input distribution that is closest to the data it has (Rubinstein, Y., Kroese, 2004).

## **RESEARCH METHODOLOGY**

### **Data Source**

The data used is a dataset sourced from yahoofinance.com which is directly integrated through RStudio. This study collects 5 stock price data in the building construction industry, namely PT. Adhi Karya (Persero) Tbk (ADHI), PT Pembangunan Perumahan (Persero) Tbk (PTPP), PT Waskita Karya (Persero) Tbk (WSKT), and PT Wijaya Karya (Persero) Tbk (WIKA) and its subsidiary PT Wijaya Karya Bangunan Gedung Tbk (WEGE). The five state-owned companies were sampled because they often received mandates to carry out major construction projects such as road construction, toll roads, high-speed rail projects, port construction, and the construction of LRT and MRT rail lines, so that state-owned construction companies could give a good value to the portfolio to be created.

The data collection technique was carried out by non-participant observation techniques where all data were observed and recorded directly without participating in making the data. The data is divided into two, namely data on stock prices per day as much as 2,585 data from March 2, 2018 to March 2, 2020 or before the confirmation of a positive case of Covid-19 and data on share prices per day as much as 1,795 data from March 2, 2020 to August 30, 2021 or for 1 year. 5 years of Covid-19 cases found in Indonesia.

### Financial Condition of Sample Company

Pandemic covid 19 and restrictions access to all activities including construction activities has been started in 2020. This regulation has an impact on the financial condition of the sample companies shown in table 1

**Table 1** Sample Company Financial Condition

Perusahaan	Tahun	Pendapatan	Laba Bersih	Aset	Aset tetap	Utang Jk Pendek	Utang Jk Panjang
WSKT	2018	48.788	4.619	124.391	7.091	56.799	38.704
	2019	31.387	1.028	122.589	8.663	45.023	48.447
	2020	16.190	- 9.495	105.588	7.819	48.237	40.773
WIKA	2018	31.158	2.073	59.230	4.675	28.251	13.762
	2019	27.212	2.621	62.110	5.154	30.349	12.546
	2020	16.536	322	68.109	5.170	44.168	72.832
PTPP	2018	25.119	1.958	50.201	6.605	26.371	9.648
	2019	23.573	1.048	56.130	7.408	29.768	11.349
	2020	15.831	266	53.472	7.117	27.986	11.478
ADHI	2018	15.655	645	30.118	1.573	18.964	4.869
	2019	15.307	665	36.515	1.836	24.562	5.118
	2020	10.827	23	38.093	2.204	27.069	5.449
WEGE	2018	5.822	444	5.890	86	2.880	873
	2019	4.567	456	6.197	148	3.057	680
	2020	2.810	156	6.081	180	3.164	722

WSKT is a company that has the largest assets than other companies. But in 2020, only WSKT reported losses. Although other companies did not experience losses, the net profit obtained was not as large as the net profit before the Covid-19 pandemic. For debt posts, both short-term and long-term debt, WSKT has the largest debt than other companies, so that in 2021, there is an issue that WSKT will divest all of its toll road assets because the construction of toll roads creates a large debt burden for the company.

### Data Analysis

Analysis techniques and processing data in this study use the R programming with coding that refers to codingfinance.com. The coding will be used to calculate the daily return, risk and sharpe ratio to describe the result of portfolio optimization into a graph before and after pandemic Covid-19 conditions.

**Step 1** : Calculate the daily return for compenies sample

```
# download the price data
tick <- c('ADHI.JK', 'WSKT.JK', 'WIKA.JK', 'PTPP.JK', 'WEGE.JK')

##Before pandemic dataset
harga_saham <- tq_get(tick,
                      from = '2018-03-02',
                      to = '2020-03-02',
                      get = 'stock.prices')

##After pandemic dataset
harga_saham <- tq_get(tick,
                      from = '2020-03-02',
                      to = '2020-08-30',
                      get = 'stock.prices')

# calculate the daily returns for these stocks
daily_returns <- harga_saham %>%
  group_by(symbol) %>%
  tq_transmute(select = adjusted,
              mutate_fun = periodReturn,
              period = 'daily',
              col_rename = 'ret',
              type = 'log')

## grouping data by company
daily_returns_xts <- daily_returns %>%
  spread(symbol, value = ret) %>%
  tk_xts()

# calculate the mean daily returns for each asset
mean_daily_return <- colMeans(daily_returns_xts)

# calculate the covariance matrix for all these stocks
# annualize it by multiplying by 252
cov_matriks <- cov(daily_returns_xts) * 252
```

The daily return result for before and after pandemic is:

**Table 2** Before Pandemic Covid-19 Daily Returns

No.	Tanggal	ADHI	PTPP	WEGE	WIKA	WSKT
1	02/03/2018	0,0000	0,0000	0,0000	0,0000	0,0000
2	05/03/2018	-	-	0,0420	-	-
		0,0254	0,0326		0,0132	0,0137
3	06/03/2018	0,0170	-	-	-	-
			0,0201	0,0208	0,0053	0,0208
...	...	...	...	...	...	...
516	28/02/2020	-	0,0083	-	-	-
		0,0326		0,1178	0,0159	0,0253

**Table 3** After Pandemic Covid-19 Daily Returns

No.	Tanggal	ADHI	PTPP	WEGE	WIKA	WSKT
1	02/03/2020	0,0000	0,0000	0,0000	0,0000	0,0000
2	03/03/2020	0,0199	0,0045	0,0457	0,0055	0,0153
3	04/03/2020	0,0387	0,0392	0,0522	0,0353	0,0495
...	...	...	...	...	...	...
359	27/08/2021	0,0070	0,0058	0,0600	0,0054	0,0064

**Step 2** : Calculate the random weights, annualized portfolio return and portfolio risk and sharpe ratio

```
# To calculate the portfolio returns and risk (standard deviation)
# 1. Random weights
weights_random <- runif(n = length(tick))
weights_random <- weights_random/sum(weights_random)

# 2. calculate the annualized portfolio returns and portfolio risk (Standard deviation)
pos_returns <- (sum(weights_random * mean_daily_return) + 1)^252 - 1
pos_risk <- sqrt(t(weights_random) %*% (cov_matriks %*% weights_random))

# 3. calculate sharpe ratio with assume 0% risk free rate
sharpe_ratio BUMN <- pos_returns/pos_risk
```

Do all these steps as much as the number of random samples that have been determined. This study processed a random sample of 2.585 times before pandemic and 1.795 time after pandemic Covid-19.

### Step 3 : Calculate the minimum variance and tangency optimization portfolio

```
#1. create a data table to store all the values together
portfolio_konstruksi BUMN <- tibble(Return = pos_returns,
                                     Risk = pos_risk,
                                     SharpeRatio = sharpe_ratio BUMN)

#2. Converting matrix to a tibble and changing column names
all_weights <- tk_tbl(all_weights)
colnames(all_weights) <- colnames(daily_returns_xts)

#3. Combing all the values together
portfolio_konstruksi BUMN <- tk_tbl(cbind(all_weights, portfolio_konstruksi BUMN))

#4. calculate minimum variance portfolio and tangency portfolio
# The minimum variance portfolio
min_varians_bc <- portfolio_konstruksi BUMN_bc[which.min(portfolio_konstruksi BUMN_bc$Risk),]
# The tangency portfolio (the portfolio with highest sharpe ratio)
max_srp_bc <- portfolio_konstruksi BUMN_bc[which.max(portfolio_konstruksi BUMN_bc$SharpeRatio),]
```

After running 3 steps of calculation, the result can be describe in a graph for minimum variance, tangency optimization, portfolio optimization and efficient frontier.

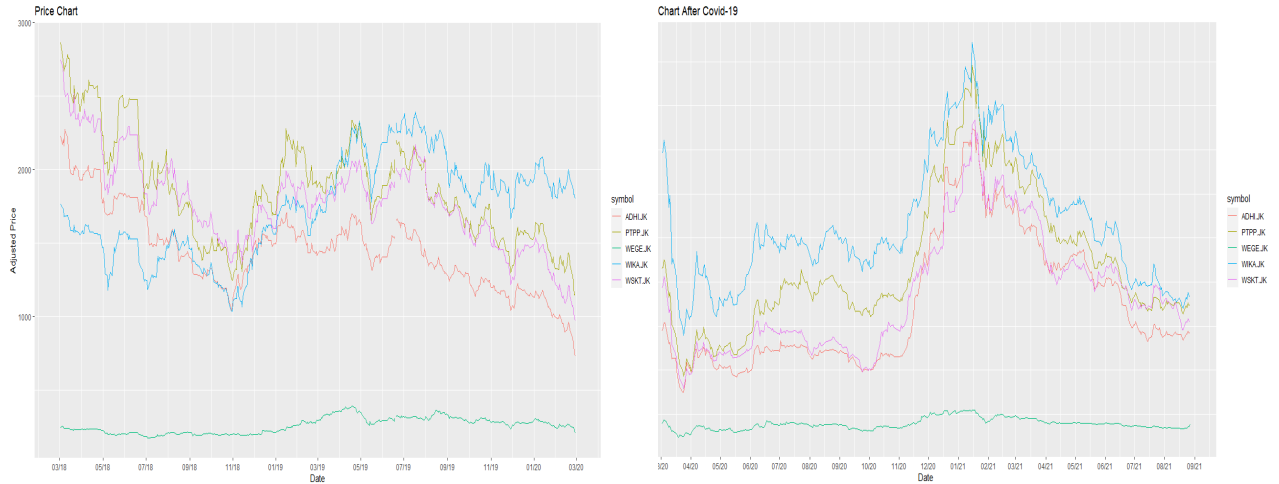
## DISCUSSION

### Market Price

Prior to Covid-19, the stock prices of the 4 SOE samples were around Rp. 1,000 to Rp. 3,000 and the share price of 1 SOE subsidiary sample was under Rp. 500. But in March 2020, all stock prices fell and it can be seen in figure 1 - After Covid-19 is all stock prices ranged from Rp0 to Rp2,000 except WIKA and PTPP which were above Rp2,000 in December 2020 to February 2021.



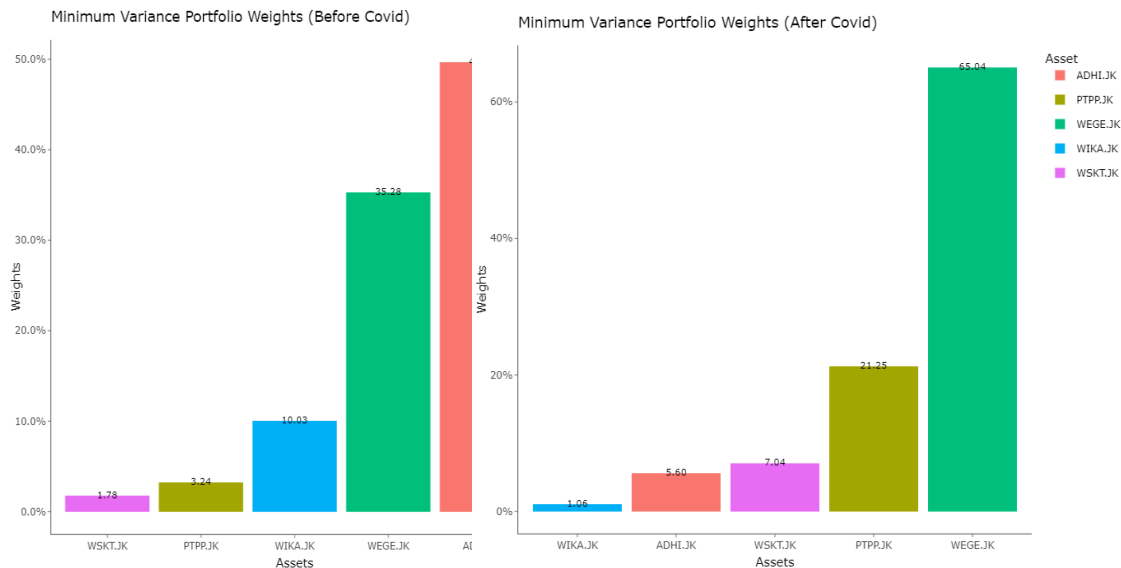
After 1.5 years of the Covid-19 Pandemic, the stock prices of 4 SOE ranged from Rp500 to Rp1,000 and the share price of 1 SOE subsidiary was under Rp250. Therefore, it can be concluded that the Covid-19 pandemic has had a major impact on stock prices in the construction industry sector.



**Figure 1** Market Price Before and After Covid

**Minimum Variance**

The minimum variance represents a well diversified portfolio with the lowest risk to the expected level. Before the Covid-19 Pandemic, to get the best compound for lowest risk is to compile a portfolio of ADHI (49.67%), WEGE (35.28%), WIKA (10.03%), PTPP (3.24%) and WSKT (1.78%). However, during the Covid-19 pandemic in Figure 2, the main weights portfolio came from WEGE (65.04%), which is a subsidiary of WIKA. It can be said that 4 large SOEs have big risks during the Covid-19 Pandemic so the investment can be focused for other companies.



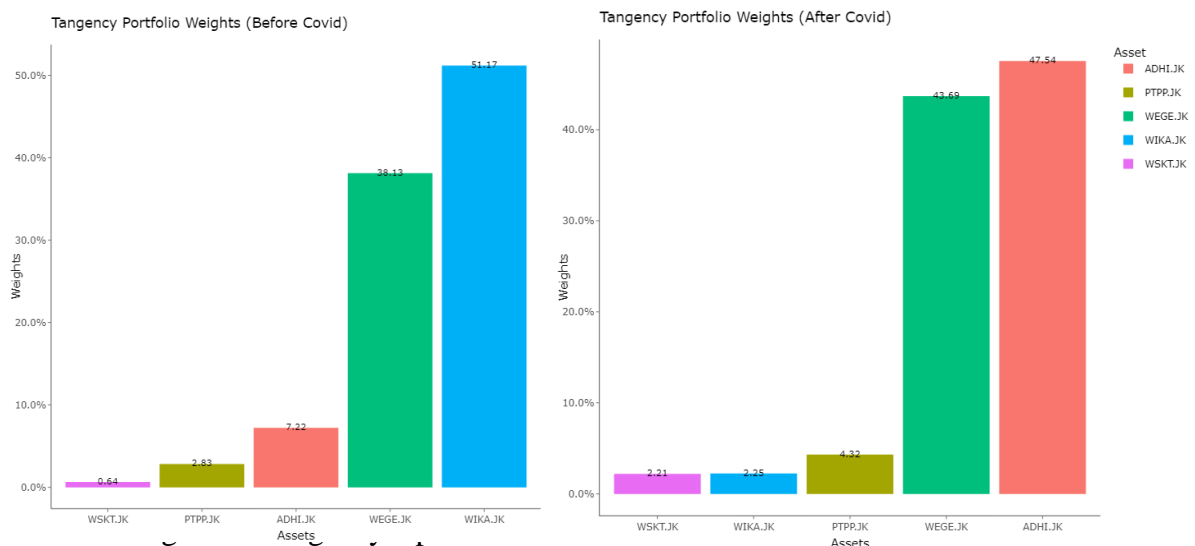
**Figure 2** Minimum Variance Portfolio Before and After Covid

### Tangency Optimization Portofolio

Tangency Optimization Portfolio is the portfolio with the maximum sharpe ratio value so it can provide the highest expected return per unit of risk. Therefore, this portfolio is a risk-efficient portfolio. Prior to the Covid-19 pandemic, to achieve portfolio optimization, investors could compile a portfolio of WIKA (51.17%), WEGE (38.13%), ADHI (7.22%), PTPP (2.83%) and WSKT (0.64%). In 2019, WIKA's shares were preferred in the market because they had bright prospects, especially due to the increased performance of shares in its subsidiary, WEGE. Therefore, portfolio optimization before Covid-19 was dominated by WIKA and WEGE.

However, during the Covid-19 pandemic, portfolio optimization turned to ADHI (47.54%) and WEGE (43.69%). This is because ADHI got 7 major projects and until November 2020, ADHI's total order book reached IDR 47.8 trillion excluding taxes. In addition, in the same year ADHI shares also increased 56.19% with a market capitalization of Rp.2.92 trillion. Furthermore, WEGE focused on building and renovating more than 10 hospitals in the Covid-19 handling area, besides that the company has been active in handling Covid-19 in its CSR activities. ADHI and WEGE's achievements during the Covid-19 Pandemic provided a weight allocation of up to 91.23% in the portfolio and were expected to provide a high rate of return compared to allocations to 3 other companies.

Figure 3 also shows that WSKT shares were not taken into portfolio both before and after the Covid-19 Pandemic. Paralele to WSKT's financial condition, even though it has the largest assets but also has the largest debt so that it does not make investors interested in allocating their funds to WSKT at their risk tolerance level.



### Portfolio Optimization and Efficient Frontier

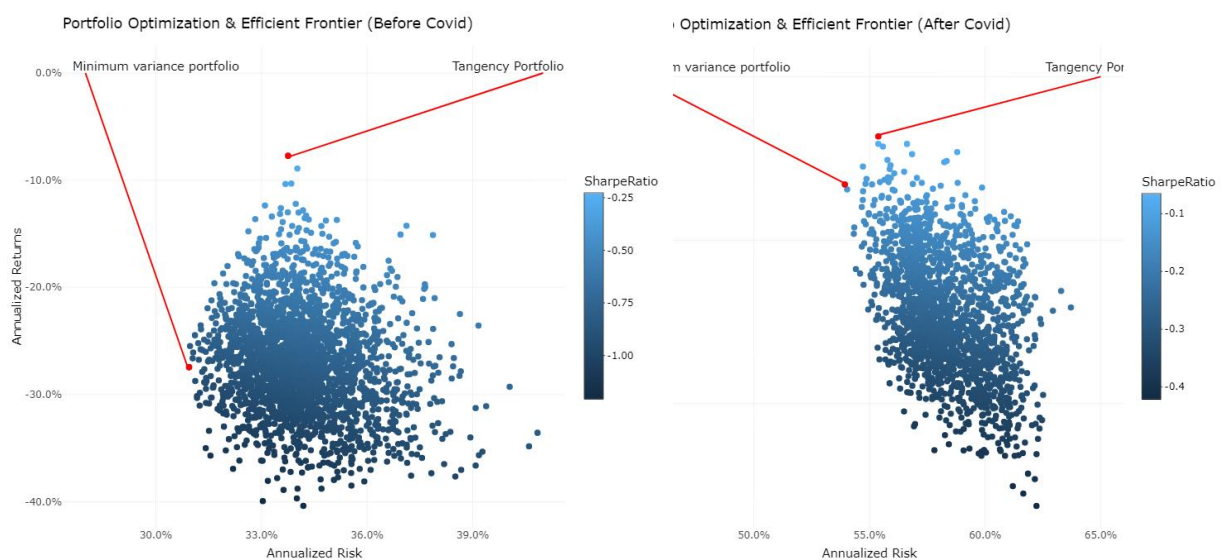
The optimization and efficiency frontier portfolios that have been formed on the stock prices of the 5 sample companies in figure 4 show that the portfolios did not have a positive rate of return both before and during the Covid-19 pandemic. Prior to the Covid-19 pandemic, the rate of return that could be obtained was around minus 4.9% to 33% and the risk was around 30.9% to 41.2%. The minimum value of variance that can be



obtained is at a rate of return of minus 27.44% and a risk of 30.94%, while the optimization of the portfolio is obtained at a rate of return of minus 7.72% and a risk of 33.75%.

During the Covid-19 pandemic, the rate of return was higher, above minus 30%, but had a greater risk between 53.7% to 63.3%. The minimum value of variance that can be obtained is at a rate of return of minus 6.59% and a risk of 53.93% while the optimization of the portfolio is obtained at a rate of return of minus 3.64% and a risk of 55.39%.

From the graphic of the optimization and efficiency frontier portfolio in the construction industry, it can be concluded that prudence aspect is required when investing in this portfolio, both from the private sector and the government sector. The high level of risk that must be taken is not proportional to the rate of return that will be obtained, especially during the Covid-19 Pandemic.



**Figure 4** Portfolio Optimization and Efficient Frontier Before and After Covid

## CONCLUSION

The Covid-19 pandemic has had a major impact on stock prices in the construction industry sector, as can be seen from the decline in the stock prices of 4 state-owned companies from before the pandemic, ranging from Rp1.000 to Rp3000, down to Rp0 to Rp2000. An analysis of the minimal variance that can be described by the portfolio shows that during the Covid-19 pandemic the allocation of shares was more focused on WEGE (65.4%) which is a subsidiary, not on 4 other state-owned companies. However, if investors want to get a portfolio with maximum profits, based on portfolio optimization, it is illustrated that investors should focus more on investing in ADHI (47.54%) and WEGE (43.69%). Although research has concluded that the amount of portfolio weight that can be made based on minimal variance and portfolio optimization, after analyzing the sharpe ratio, this portfolio does not provide a positive rate of return. Conditions before and during the covid-19 pandemic provided a negative rate of return and there was even an increase in risk during the covid-19 pandemic even though the rate of return was better than before the covid-19 pandemic. Therefore, it is necessary for investors and the government to act with prudence when investing in the construction industry in Indonesia.

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