

Forecasting the Performance of PT Pertamina's Petrochemical Products During the Covid-19 Pandemic Era

WALJIYANTO*, M. AL MUSADIEQ, EDY YULIANTO, YUSRI ABDILLAH
Brawijaya University, Veteran Street, Malang INDONESIA
Corresponding Author Email: waljiyanto@student.ub.ac.id

Abstract: The industrial sector is a vital sector in economic development and growth in Indonesia. The industrial sector is also a dominating energy user. This research purposed to examine projected demand for petrochemicals after the COVID-19 pandemic. This study was a quantitative research with the exploratory and descriptive approach; spesifically using forecasting methods (Vector Autoregressive (VAR)). VAR is a multivariate forecasting model used to build a forecasting system from interrelated time series data. The results of the analysis prediction shows that the demand for petrochemicals will increase starting in 2021. The risk impact caused by COVID -19 is estimated to be more significant, with Petrochemical products are Aromatic 45%, Bitumen 45%, and Special Chemical 41%. The effect of COVID-19 in reducing the economy causes the industry to reduce the amount of production.

Keywords: Petrochemicals, Vector Autoregressive, COVID-19; Pandemic; Forecasting

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1. Introduction

Nowadays, COVID-19 pandemic is rapidly widespread in the world, especially in Indonesia. This virus first spread in the Wuhan area, China and made the Chinese government impose a lockdown policy or restriction of entry to Wuhan. As of March 27, 2020, according to Merdeka.com, there were a total of 1,046 more people who tested positive for COVID-19. The impact of the Indonesian business world began. Many business processes have been disrupted due to COVID-19, which has spread rapidly.

The raging spread of COVID-19 is transmitted through droplets or fluids that come out when a person with COVID-19 sneezes and coughs. The COVID-19 virus will immediately be transmitted to individuals with weak immune systems then will have an incubation period of 14 days in the body. Within 14 days, victims of COVID-9 infection may experience coughs, dizziness and difficulty breathing. Some mild cases in victims of COVID-9 infection can heal. However, several other severe cases resulted in shortness of breath and lung damage which leading to death.

Currently, 213 countries, including Indonesia, are affected by disease outbreaks, namely the COVID-19 virus and by WHO it has been designated as a pandemic or disease outbreak that can spread to various regions. At least from December 2019, when the COVID-19 case was announced in China, until April 11, 2020, 1,569,504 people were confirmed positive for COVID-19, with a total of 95,269 deaths worldwide due to COVID. In Indonesia, it was found that people affected by COVID were found around March 2, 2020, and until April 11, 2020, 3842 people were confirmed positive for COVID-19, with a death rate of 327 people. The number of cases of the Corona COVID-19 virus in Indonesia increased by 10,994 on Monday (February, 1, 2021). The total positive became 1,089,308, recovered 883,682, and died 30,227 cases. The number of suspects monitored today is 76,343 people. While there are 175,349 active cases.

The public is urged to take three important steps to fight the fast spread of COVID-19. The three steps are reducing the risk of being exposed to COVID-19, finding correct information regarding COVID-19, and what needs to be done can get sick. Also, wash your hands for at least 20 seconds, use

hand sanitizer (at least 60% alcohol) if soap and running water are not available, keep a distance of at least one meter.

The energy sector is one of the sectors that plays an important role in economic activity and national security. Energy processing which also includes the use, exploitation and supply of energy should be carried out in a sustainable manner. In the long term, management in the energy sector requires planning with integrity in the development of resources used to provide energy in the long term.

The industrial sector is a vital sector in economic development and growth in Indonesia. The industrial sector is also a dominating energy user. Apart from that, another sector that also requires a lot of energy to support the movement of the economy is transportation, where the industrial sector also has needs in the transportation sector.

PT Pertamina is a state-owned company that carries out oil and gas business activities in the Upstream to Downstream Sectors. This business entity has the main mission as a producer of oil and gas, as well as developing new and renewable energy, processing and distributing all fuel oil and gas needs in Indonesia since December 10, 1957. This company supports the government's efforts in realizing national energy security and always develops into world-class national energy company.

In PT Pertamina's Corporate Marketing Business (CMB), there are six primary business unit sizes, namely Industrial Fuel, Aviation, Petrochemical, Gas Business, Lubricants, and Patra Niaga. Of the six business unit sizes, three business units dominate the CMB volume, namely Industrial Petroleum, Aviation and Petrochemical Products. This is supported by predictive data for revenue growth and sales volume for 2020-2026, showing that 77.8% of the CMB business units (Industrial Fuel, Aviation and Petrochemical Products) dominate PT Pertamina's revenue.

Obstruction of economic activity automatically causes business actors to make

efficiency to reduce losses. As a result, many workers are laid off or even laid off (layoffs). The rate of labor absorption will not be as large as the number of workers who have been laid off. The difference in workers who are not absorbed will then fall into the unemployment group.

The government is preparing several scenarios to deal with COVID-19. According to the Minister of Finance, the existence of COVID-19 will result in a decline in economic growth in Indonesia, reaching a negative 0.4 per cent by the end of 2020. The COVID-19 outbreak, which has become a pandemic, will have an impact on the most vulnerable corporate sectors, namely manufacturing, trading, transportation and accommodation companies. The existence of COVID-19 will result in disruption of activities that have an impact on business performance and decrease demand for a company's products. The impact of the COVID-19 was that the price of crude oil in Indonesia fell to USD 31 per barrel.

Furthermore, the existence of the coronavirus will have an impact on the transportation sector regarding the reduction in the price of aviation fuel for airlines. Besides, it also has an impact on decreasing the use of fuel oil (BBM) by the community. The fuel produced by PT Pertamina includes Solar Oil (High-Speed Diesel), Diesel Oil (Industrial / Marine Diesel Oil), and Fuel Oil (Industrial / Marine Fuel Oil). Thus, PT Pertamina must anticipate a decrease in the volume of demand.

The first period of research (April-June 2020) estimated the demand for petrochemical demand throughout 2020. The second period of research (July-September 2020) projections and rejections were performed by adding fundamental macro aspects, both currently occurring, as well as examples. Two economic crises in 1998 and 2008 as a comparison, then in this third part (October-December 2020), a post-COVID-19 Action Plan is carried out.

After the pandemic period ends (hopefully it ends sooner), a more detailed identification is needed, given the minimum

six months of recovery to return to its original position. Planning is the initial preparation for action. At least analytically, planning should be separated from implementation so that critical policy decisions can be taken and implications can be understood in advance of action.

In the Indonesian context, many lessons can be taken by stakeholders, particularly companies, regarding the disaster management efforts that have been carried out so far. When it is related to the disaster management cycle, most companies in Indonesia are still engaged in emergency response efforts, and very few are involved in prevention and mitigation, disaster risk reduction, and restoration of livelihoods after a disaster. So it is natural that when there is no disaster, we seldom hear about the work of companies in the disaster sector. Therefore, the aim of this research is to forecast demand for petrochemicals in 2021 and 2022, after the end of Covid-19. And this is the novelty of research that occurs as a result of the impact of a global disaster that affects all sectors worldwide, including companies. And at the same time provide literature to predict a changing sector affected by a global pandemic.

2. Literature Review

2.1. Petrochemical

Petrochemicals are any chemical fuels that are obtained from fossil fuels. Petrochemicals include purified fossil fuels such as methane, propane, butane, gasoline, kerosene, diesel fuel, aircraft fuel, pesticides, herbicides, fertilizers, plastics, asphalt, and human-made fibres. There are several types of petrochemicals produced by Pertamina, including Polydam, Propylene, Benzene, Paraxylene, Asphalt, Sulfur, Low Aromatic White Spirit (LAWS), Special Boiling Point (SBP-XX), Subang Condensate, Pertasol, Minarex, Paraffinic Oil, Green Coke, Slack Wax, Tenac Sticker, TB 192, Sophy, and Smooth Fluid-05.

Petrochemical products produced by Pertamina are sold to consumers of petrochemical products which consist of

agencies, end-users, and trading companies. The sale of petrochemical products is carried out on a FOB basis, in which the agent or consumer takes the product he wants. However, in line with market dynamics, petrochemicals have been selling on a CFR basis. There are several sales mechanisms for petrochemical products, including:

- 1) Through Agency
- 2) Agencies usually provide varying discounts based on the policies of each product and competitor prices.
- 3) Selling Directly to End-Users
- 4) Through a tender (auction)
- 5) Through natural selection (beauty contest).

The payment systems applied by Pertamina when trading Petrochemicals include cash and credit. Cash Before Delivery for most Petrochemical products and Auto collection are applied for cash payments. Meanwhile, for credit payments, it can be guaranteed by an LC / SKBDN / Bank Guarantee, or it can be without a guarantee, namely using a TT which is intended for a subsidiary.

2.2. Vector Autoregressive (VAR)

The Vector Autoregressive (VAR) model is an extension of the Autoregressive (AR (p)) model. Suppose the Autoregressive (AR (p)) model is one of the univariate time series analysis models. In that case, the Vector Autoregressive (VAR) model is one of the multivariate time series analysis models (Wei, 2006). According to Gujarati (2003), VAR is a method similar to a system of simultaneous equations which considers several endogenous variables together. The VAR model is used when there is a two-way causality relationship between endogenous variables (Cryers, 2008). The equation for the VAR model with the order p can be seen in the following equation:

$$Y_t = \Phi_1 Y_{t-1} + \dots + \Phi_p Y_{t-p} + e_t$$

Y_t = t-period endogenous variable vector of size $m \times 1$

- Φ_i = coefficient matrix of endogenous variables measuring $m \times m$
 Y_{t-1} = vector of endogenous variables at time lag to $(t - 1)$
size $m \times 1$
 e_t = remaining vector of size $m \times 1$
 p = length of lag
 m = many endogenous variables

In the VAR model, each endogenous variable is described by the value of the endogenous variable in the past and the value of other endogenous variables in the past and the present. The VAR method explains that each variable contained in the model depends on the past movements of the variable itself and the past movements of other variables contained in the system of equations. The VAR method can be used to project a system of time series variables and analyze the dynamic impact of the disturbances contained in the equation.

2.3. Response Impulse Method

Impulse Response Function (IRF) is used to detect the current and future response of each variable due to a change or shock of a particular variable (Gujarati, 1988). IRF aims to determine how shock affects the economy. IRF describes how the rate of the shock of a variable against other variables so that through this IRF, it can be seen the length of the effect of a shock/shock of a variable on other variables (Greene, 2003).

3. Research Methodology

This study was a quantitative research with the exploratory and descriptive approach. Exploratory research is a research that aims to explore (excavate) information (scientific) (. (Sumardi & Adji Achmad Rinaldo, 2018; Fernandes & Solimun, 2017; Hakim & Fernandes, 2017). While descriptive research is research that aims to describe (describe clearly and in detail) the relevant aspects of the phenomena that are of interest to researchers (Solimun & Fernandes, 2017; Fernandes et al., 2014; Purbawangsa et al., 2020). The exploratory and descriptive research does not

use hypotheses in its implementation. Exploratory and descriptive approaches are used to solve problems that exist in the demand system of PT Pertamina, which is affected by COVID-19. The location of this research is at PT Pertamina. The time for phase 3 research is carried out from October to December 2020.

The variables used in this study are Petrochemical Demand as the dependent variable (Y1). The data used are monthly secondary data with a period from January 2016 to September 2020. In this study, the VAR forecasting method and impulse response function were used in optimally measuring the level of demand for petrochemical products at PT Pertamina.

VAR (Vector Autoregressive) is a multivariate forecasting model used to build a forecasting system from interrelated time series data and to analyze the dynamic effects of random factors that disrupt the system. Vector Auto Regression (VAR) is usually used to project a system of time series variables and to analyze the dynamic impact of the disturbance factors contained in the variable system. Basically, VAR analysis can be matched with a simultaneous equation model, because in VAR analysis, several endogenous variables are considered in a model.

The advantages of VAR analysis include: (1) This method is simple, there is no need to worry about distinguishing which variables are endogenous from which variables are exogenous; (2) The estimation is simple, where the ordinary OLS method can be applied to each equation separately; (3) The forecast results obtained using this method are in many cases better than the results obtained using even complex simultaneous equation models. Also, VAR Analysis is a very useful analysis tool, both in understanding the interrelationship between economic variables and in the formation of structured economic models. VAR analysis can be used to predict products due to many factors that affect the forecasting level of Pertamina's product marketing.

The forecasting method is used to predict the product demand value until the end of 2020 to get the best policy for PT Pertamina as well as the Impulse Response Function will be used

in forecasting analysis. The response impulse is used to see how the demand reaction of the Petrochemicals products, when other variables get a shock in the current conditions, namely the COVID-19 outbreak.

4. Result and Discussion

4.1 Stationary to Average

There are two kinds of static properties; stationarity to variety and stationarity to the average. So, it is necessary to test stationarity

against the average. The stationarity test against the mean can be done by using the fuller augmented dickey test as follows.

Hypothesis:

H0: There is a unit root (data is not stationary)

H1: There is no unit root (stationary data)

Decision: Reject H0 if p-value < α (0.01)

The results of the Stationarity Test can be seen in the following table.

Table 4. 1 Stationarity Test

Variabel		Augmented Dickey-Fuller		Decicsion
		P-value With constant	P-value With Constant and Trend	
Petrochemical	Aromatic & Olefin	0,005379	0,1282	Stationary
	Bitumen	0,007041	0,1456	Stationary
	Special Chemical	7,744e-006	7,568e-005	Stationary
	Overall Petrochemical	0,0001	0,001053	Stationary

Source: Secondary data processed (2020)

From the stationarity test, it can be seen that all variables produce stationary test results where the variables are Aromatic & Olefin, Bitumen, Special Chemical, and Overall Petrochemical are stationer.

After testing the stationarity, then the optimal lag length is measured. Determination of the Optimum Lag is carried out using the help of GRETL software. The results obtained for demand products are as follows.

4.2. Determination of the Optimum Lag

Table 4.2 Determination of the Optimum Lag

No.	Type of Petrochemical Product	Optimum Lag
1.	Aromatic & Olefin	2
2.	Bitumen	5
3.	Special Chemical	3

Source: Secondary data processed (2020)

So that information is obtained that each product has a different lag because each product has different data characteristics. Determination of the Optimum Lag based on

actual conditions and existing data. The optimum lag is used for Vector Autoregressive (VAR) analysis.

4.3. VAR Forecasting Model

Shaped models are models that are estimated using the least-squares method. The following equation is obtained.

$$\begin{aligned}
 AO_t &= -2,65805e + 07 \\
 &- 0,0237507dAO_{t-1} + 0,112608dAO_{t-2} \\
 &+ 6,54087e + 06dINF_{t-1} - 1,35616e \\
 &+ 07dINF_{t-2} + 5861,94dKURSt_{-1} \\
 &+ 6645,76dKURSt_{-2} - 263844dNP_{t-1} \\
 &+ 380682dNP_{t-2} + 832953dPE_{t-1} \\
 &- 320326 dPE_{t-2} + 4,33091e \\
 &+ 06dTS_{t-1} + 5,23424e + 06dNP_{t-2} \\
 BI_t &= (1,01428e + 07) + 0,760976BI_{t-1} \\
 &- 0,294197BI_{t-2} + 0,202175BI_{t-3} \\
 &- 0,0689612BI_{t-4} - 0,202675BI_{t-5} \\
 &+ (3,73720e + 06)dINF_{t-1} + (9,87550e \\
 &+ 06)dINF_{t-2} + (3,30225e + 06)dINF_{t-3} \\
 &- (3,36596e + 06)dINF_{t-4} \\
 &+ (4,72705e + 06)dINF_{t-5} \\
 &- 8772,7dKURSt_{-1} + 9433,6dKURSt_{-2} \\
 &- 13537,3dKURSt_{-3} + 6012,43dKURSt_{-4} \\
 &- 3825,47dKURSt_{-5}
 \end{aligned}$$

$$\begin{aligned}
 SC_t &= 531939 + 0,0575061SC_{t-1} \\
 &+ 0,0435711SC_{t-2} \\
 &- 0,142340SC_{t-3} \\
 &- (2,22437e + 06)dINF_{t-1} \\
 &+ 146500dINF_{t-2} \\
 &- 490287dINF_{t-3} \\
 &+ 2333,15dKURSt_{-1} \\
 &- 182,268dKURSt_{-2} \\
 &+ 3581,54dKURSt_{-3} \\
 &+ 363077dNP_{t-1} \\
 &- 15245,4dNP_{t-2} \\
 &- 590465dNP_{t-3} \\
 &+ 71002,1dPE_{t-1} \\
 &+ 627354dPE_{t-2} \\
 &+ 261791dPE_{t-3} \\
 &+ 517970dTS_{t-1} \\
 &- 900395dTS_{t-2} \\
 &+ 916963dTS_{t-3}
 \end{aligned}$$

Bitt-i = Demand Bitumen in period t-
i; i=1,2,3

AOt-i = Demand Aromatic in period t-
i; i=1,2,3

SCt-i = Demand Special Chemical in
period t-i; i=1,2,3

4.4. Forecasting Results

The data that will be predicted are as many as 15 periods from October 2020 to December 2021.

Table 4.3 Results of Petrochemical Products Forecasting

Time	Demand (MTD in Thousand KL)		
	Aromatic & Olefin	Bitumen	Special Chemical
Oct 2020	27631	26774	581090
Nov 2020	33410	22289	694830
Dec 2020	35119	22825	946620
Jan 2021	29457	46572	280597
Feb 2021	36754	49176	207571
Mar 2021	50252	54857	418137
Apr 2021	45879	59136	362976
May 2021	46144	60089	336813

Time	Demand (MTD in Thousand KL)		
	Aromatic & Olefin	Bitumen	Special Chemical
June 2021	49408	79831	525070
July 2021	56680	83223	483684
August 2021	57491	79095	798397
Sept 2021	67221	75985	1038154
Oct 2021	69868	78993	493975
Nov 2021	73800	85713	490345
Dec 2021	78088	92344	495597

Source: Secondary data processed (2020)

Based on the forecasting results above, information can be obtained that:

- 1) Special Chemical products are predicted to fluctuate from month to month.
- 2) Bitumen products are predicted to increase from month to month even though the increase is not very visible.
- 3) Aromatic & Olefin products are predicted to increase from month to month although the increase is not very visible.

4.5. PT. Pertamina Product Demand Risk Mitigation

Based on the results of forecasting the demand for PT Pertamina's products under normal conditions with assumptions if COVID-19 Pandemic ends in December 2021.

Table 4.4. Results of Product Risk Mitigation of PT. Pertamina

Variable	Forecasting Demand
Petrochemical	
Aromatic	45%
Bitumen	45%
Special Chemical	41%

Source:
 Secondary data processed (2020)

Based on table above, the impact of risk caused by COVID-19 in Petrochemical is predicted to be more significant is the Aromatic and Bitumen product. The effect of COVID-19 in reducing the economy causes the industry to

reduce the amount of production. This explanation is in contrast to diesel users who are dominated by large industries that have sufficient capital to anticipate a recession from COVID-19. This shows as a whole that the longer the pandemic occurs in Indonesia, the more impact it will have on PT Pertamina, especially Pertamina's products. COVID-19 has an impact on the Petrochemical sector, Pertamina can increase sales of products that are affected by low risk, namely Special Chemical, by expanding its domestic market share.

5. Conclusion and Recommendation

Based on the results of the analysis, the results of the analysis prediction shows that the demand for petrochemicals products of PT Pertamina will increase starting in 2021. It is assumed that the Petrochemical product that has a low risk is Special Chemical. On the other hand, one petrochemical product product that has a high risk of COVID-19 is the Aromatic. The suggestions obtained from this research are as follows: PT Pertamina CMB needs to prepare adaptive policies by taking into account several different scenarios by conducting evaluation and reprojected of Petrochemical in Responding to the Impact of Covid-19.

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