



## PETROCHEMICAL INDUSTRY RAW MATERIAL SPREAD UPSTREAM TO DOWNSTREAM IN THE PANDEMIC COVID-19 PERIOD

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**Denny Saputera, MohdHaizam Saudi, ObsatarSinaga. Petrochemical Industry Raw Material Spread Upstream To Downstream In The Pandemic Covid-19 Period-- Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(10), 1352-1371. ISSN 1567-214x**

**Keywords:**Petrochemical, Petroleum, Upstream and Downstream, Covid 19, Operating Profit.

### ABSTRACT

This study aims to see the distribution of petrochemical industry raw materials in generating operational profits during the Covid Pandemic 19 starting from raw materials, namely petroleum, if it is carried out directly between the price of petroleum, petrochemical industry raw materials and related benefits, namely the raw material for petrochemicals comes from crude oil, where the price of petrochemical raw materials is very sensitive to fluctuations in the price movement of petroleum, as the main raw material that will directly affect company profits. The variables contained in this study are Petroleum Price, Naphtha Price, Ethylene Price, Propylene Price, Polyethylene Price, Polypropylene Price, Polyvinyl Chlorid Price, and Butadiene Price, HDPE Price, LDPE Price, ABS Price, and the dependent variable, Earning Before Interest. and Taxes, population and sample observations were carried out quarterly (quarter) from Q4 2019 - Q3 2020 during (4 quarters), a total of 32 samples. Based on the calculation of the independent variable, simultaneously testing with the F test results in a significant effect on operating profit.

**Keywords:** Petrochemical, Petroleum, Upstream and Downstream, Covid 19, Operating Profit.

### INTRODUCTION

The State of Indonesia is a country consisting of thousands of islands and a wide variety of natural resources owned, of the many natural resources owned by Indonesia, most of its economy relies heavily on the oil and gas sector. Petroleum is a vital input in the industrial production process in generating electricity, running production machines and transporting products from production and most importantly petroleum is an economic driver for

sustainable economic and social development. An industry that is closely related to the oil and gas industry is the petrochemical industry. Currently, there are various kinds of companies engaged in the petrochemical industry that produce various kinds of products which are of course very useful for daily life, one of which is plastics, clothing and fertilizers. The derivatives of the petrochemical industry that are derived from petroleum, whose industries are mostly still in the upstream sector, include the olefins, aromatics, ethylene, propylene, butadiene, benzene, toluene, and xylene industries. So many derivatives directly in the form of plastics, synthetic materials, chemicals, pesticides and others. Some of the ethylene and propylene derivatives can be produced in Indonesia and some are still undeveloped. Furthermore, the derivatives of ethylene and propylene products in the downstream sector such as HDPE (High Density Polyethylene), LLDPE (Linear Low Density Polyethylene), PP (Polypropylene), PVC (Polyvinyl Chloride), PS (Polystyrene), PET (Polyethylene Terephthalate) and PC (Polycarbonate) is used for making plastics.

For now, plastic materials are gradually starting to replace glass, wood and metal. This is due to the fact that plastic has several advantages, namely light weight, malleability and strength, anti-rust and chemical resistance, high electrical insulation properties, can be made colored or transparent, and low processing costs. However, the usability of plastics is also limited because of their low strength, heat resistance, and deterioration at low temperatures. The diversity of plastic types provides many choices in their use and method of manufacture (Baird, 2006).

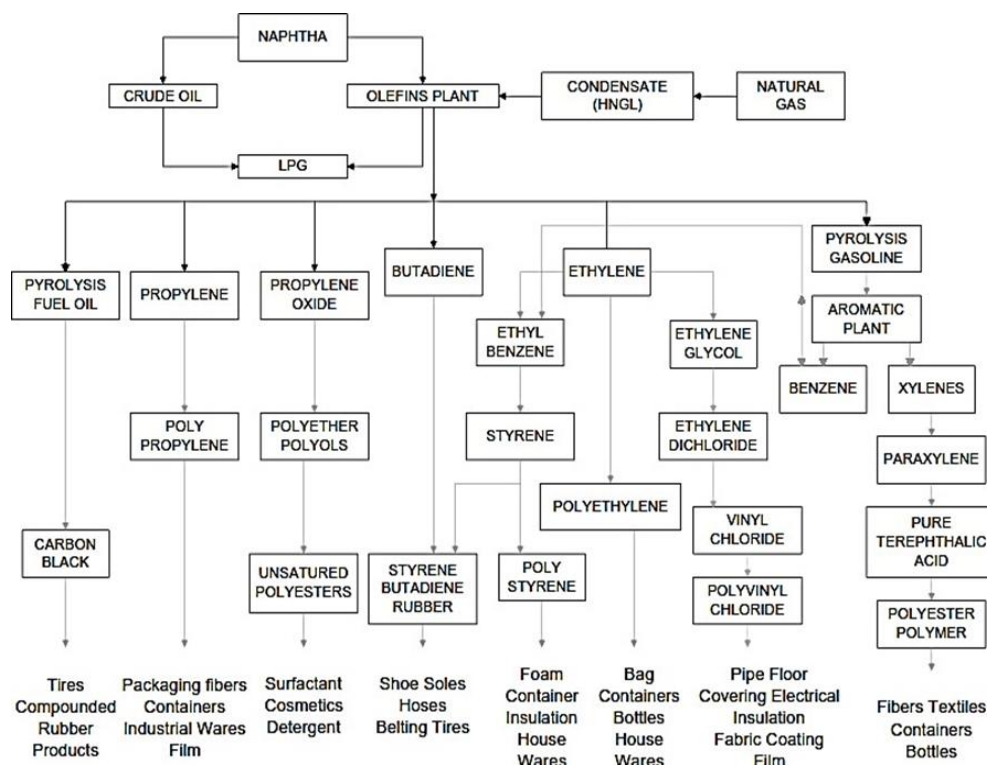


Figure 1: Petrochemical Production  
Source: Petrochemical Industry Tree

Based on the petrochemical production tree, Picture 1 above explains the many types of raw materials in the petrochemical industry as well as their uses, starting from naphtha, ethylene, propylene and others. At the beginning of 2020 the world was shocked by the outbreak of a new virus, namely a new type of Corona virus (SARS-CoV-2), the disease is known as Corona Virus Disease 2019 (Covid-19). The origin of this virus came from Wuhan China which was found at the end of December 2019 and until October 2020 the number of cases was recorded at 43.3 million cases with a death toll of 1.1 million and 31.8 million patients who were declared cured (Worldmeters).

The Covid-19 pandemic, which is uncertain about the end and how much it will impact the global economy, has made market players' sentiment unstable. The longer this pandemic lasts, the economic growth will decline further until the recession deepens. When the corona virus pandemic continues to spread, of course economic activity cannot run, so the economic outlook worsens. As a result of the worsening world economic growth, production and the market follow polymer prices (spreads) which are expected to fall due to the long balance of supply in the market. Demand is expected to weaken due to Covid-19. Global petrochemical market prices fall in line with the fall in the market for crude oil as the main raw material.

Table 1: Crude Oil Price - WTI Spot Price FOB (Dollars / Barrel)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	52.50	53.47	49.33	51.06	48.48	45.18	46.63	48.04	49.82	51.58	56.64	57.88
2018	63.70	62.23	62.73	66.25	69.98	67.87	70.98	68.06	70.23	70.75	56.96	49.52
2019	51.38	54.95	58.15	63.86	60.83	54.66	57.35	54.81	56.95	53.96	57.03	59.88
2020	57.52	50.54	29.21	16.55	28.56	38.31	40.71	42.34	39.63	39.40	40.94	

Source: [www.eia.gov](http://www.eia.gov)

The table above shows the WTI (West Texas Intermediate) crude oil price, which spreads with Brent (Europe) not too far apart, both WTI and Brent are the 2 reference prices for crude oil. In fact, there are various other types of oil that are traded internationally, such as from Dubai, Oman, Russia, and OPEC countries. Even so, Brent and WTI are still the favorite benchmarks for petroleum prices worldwide. Globally, at the beginning of 2020, especially when it entered the second quarter, namely in April, demand for oil dried up due to lockdowns that took place around the world and drastically slowed down the movement of people. Despite the different scope, the number of activities from various sectors with crude oil as the driving force has fallen dramatically in almost all sectors, the EIA (Energy Information Administration) calls on the market to be prepared for the lowest oil demand level in the last 25 years. When the demand for oil decreases rapidly by 30% - 40%, the decrease in demand is followed by a decrease in oil production.

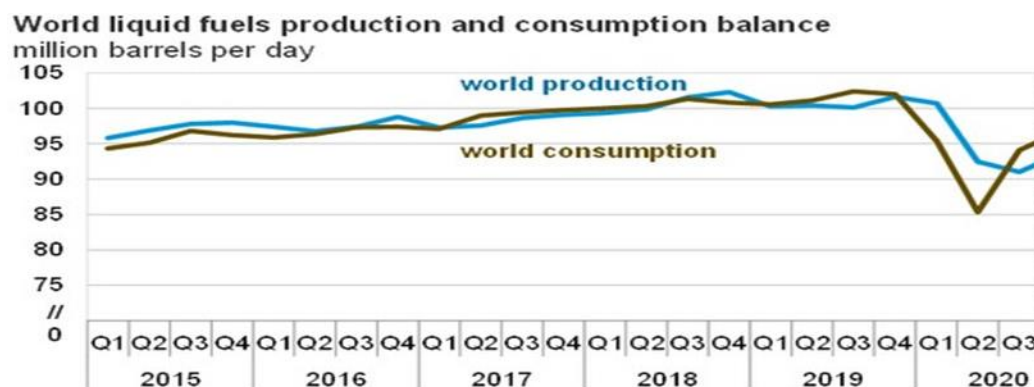


Figure 1: World Production & Consumption Crude Oil

Source: [www.eia.gov](http://www.eia.gov)

The impact of the Corona virus is that the demand for petrochemical raw materials is irregular throughout the value chain, such as automotive and construction applications, which has experienced a very sharp decline, and the demand for packaging (especially in food, sanitary products and medical applications) remains high. One of the reasons is to include hoarding, a surge in maternity services, and an increase in health care-focused activity, all in response to the Covid 19 pandemic.

According to (syndicatemarketresearch) the countries that rule the most in production and sales are divided into several many countries, of these countries have companies whose markets have penetrated throughout the world in production and sales throughout the world including LyondellBasell (Lyon, Francis), SABIC (Riyadh, Saudi Arabia), Exxon Mobil Petrochemical (Texas, US), China Petrochemical Corporation (Beijing, China), LG Chem (Seoul, South Korea), Reliance Industries Petrochemical (India), Braskem (Sao Paulo, Brazil) and in Indonesia itself is represented by PT. Chandra Asri Petrochemical Tbk. These players adopt different strategies to capture a major share in the petrochemical market.

It can be seen that the derivative in the industrial tree in Figure 1, the beginning of the petrochemical industry, namely petroleum and then followed by naphtha, naphtha is also used in the petrochemical industry to produce olefins in steam crackers and is used as a solvent or solvent in the chemical industry (George et al, 2004). Apart from naphtha in the petrochemical industry, the main raw materials in the upstream sector are very important, namely ethylene and propylene, between ethylene and propylene Ethylene is the most prominent, so it is called "The Undisputed Monarch of the Petrochemical Kingdom and The Backbone of Any Petrochemical Complex" (Department of Industry, Bureau and Analysis, 1982). The plastic raw materials produced by the secondary petrochemical industry are processed into staple materials for petrochemical products to produce plastic and propylene as the most important raw materials after ethylene.

According to Masih et al.(2014), there is an 80% correlation between petroleum and the upstream and downstream petrochemical industry raw materials, whose downstream sector is the main raw material in the production of plastic final products. As an illustration, during the Covid 19 pandemic, the

petrochemical company in Indonesia that produces raw materials for naphtha, ethylene and propylene, PT Chandra Asri Petrochemical Tbk (TPIA), will enjoy profits when world oil prices fall because companies can buy raw materials in larger quantities, and sell it at a price that remains high (Miyarso, 2016). The price spreads for crude oil, naphtha, ethylene and propylene are indicators of TPIA's profit as a producer of naphtha, ethylene and propylene (Aprillia, 2016).

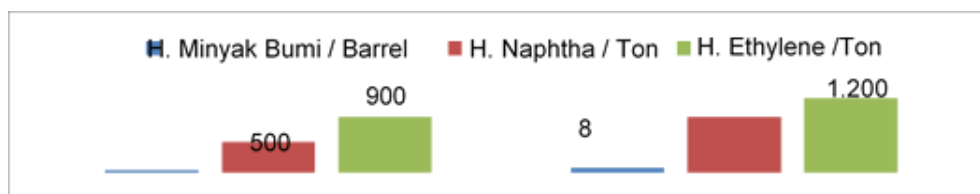


Figure 2: Spread Crude Oil Price, Naphtha and Ethylene

Source: Budiono, 2015 (processed data)

According to Budiono (2015), in 2015 the average price of oil was US \$ 40 per barrel, so the price of naphtha was in the range of US \$ 500 - US \$ 600 per ton. When compared to 2014, when the world oil price averaged at US \$ 80 per barrel, the selling price of naphtha was US \$ 900 per ton. Meanwhile, the price of Ethylene, when the price of oil fell in 2014, with an average oil price of US \$ 40 per barrel was priced in the range of US \$ 900 per ton, lower than the price in 2014 which was still around US \$ 1,000 per ton.

Explanation of Graph 2 above, if it is directly related to the relationship between growth in petroleum prices, growth in petrochemical industry raw materials and profit growth, is related, namely plastic raw materials come from petroleum, where the price of plastic raw materials is very sensitive to fluctuations in the movement of petroleum prices as a material. the main raw material that will directly affect the company's profits. During the Covid-19 pandemic, which began in December 2019 according to chart 3 below in the 4th quarter of 2019, the price of oil is still stable on average at \$ 60 / Barrel, the price is still stable from the beginning of 2019, at the beginning of January and February the price is still In the range of \$ 60 / barrel, stepping on the first quarter of 2020 the price immediately fell sharply to \$ 21 / barrel with a growth of -51% which resulted in a decrease in the selling price of petrochemical products.

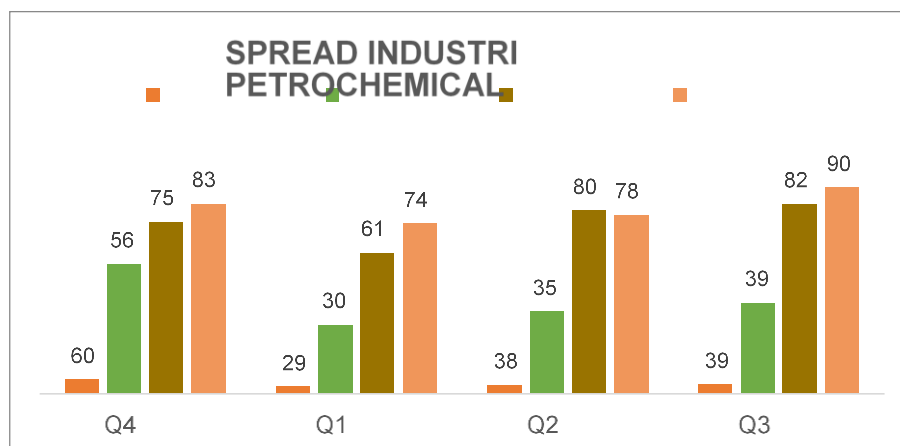


Figure 3: Spread Industry Petrochemical

Source: EIA, ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic (processed data)

Based on the above background, this study intends to observe the spread in the Petrochemical industry in the midst of the COVID 19 pandemic. The spread of raw materials from upstream to downstream results in a gap in its derivative products and of course it can be concluded that there are a number of advantages (profit) from the resulting derivatives in the form of operating profit (EBIT). This type of research includes causal research. Causal research according to Sugiono (2012) is a study to determine the effect of one or more (independent variables) on certain variables (dependent variable). This research requires hypothesis testing with statistical tests. The research method used is a quantitative method. The quantitative method itself according to Sugiono (2012) is a research method based on the positivism philosophy, used to research on certain populations or samples, data collection using research instruments, data analysis is quantitative / statistical, with the aim of testing the established hypotheses, with based on secondary data.

## LITERATURE REVIEW

### *Industry Petrochemical*

Based on Article 1 number 10. Law no. 22 of 2001 concerning Oil and Gas, downstream business activities are business activities that are core or focus on processing, transportation, storage and trading business activities. The downstream oil and gas activity itself is a form of processing in an oil refinery which will produce fuel oil which is usually consumed as a source of energy for vehicles and by-products in the form of raw materials for the petrochemical industry. Petrochemical industry raw materials derived from oil and natural gas, can be grouped into two (Panjaitan, 2006), namely:

1. Those from oil refineries and
2. Those originating from natural gas, either directly or from components after separation.

Petrochemical Industry Classification and Raw Materials. The Petrochemical Industry can be grouped vertically and horizontally, namely:

1. VerticalClassification



## 2. UpstreamPetrochemical

Industry The upstream petrochemical industry is the most upstream industry in the petrochemical industry, processing raw materials in the form of naphtha into olefin, aromatics and pre-defined hydrocarbons. This industry produces basic products or primary products which are ingredients for semi-finished products and finishedproducts for example: olefins industry (ethylene, polyethylene), aromatic industry (benzene, paraxylen and others) prefin industry (ammonia and methanol).

### ***Petrochemical Industry Between.***

The petrochemical industry, among other things, aims to run its downstream industry, requiring chemical raw materials consisting of many types such as benzene, naphtha, butadiene, etc., which come from crude oil processing. The result of this industry is semi-finished products to produce finished products. The raw materials that are processed are olefins, aromatics which then become derivative products such as vinyl choride (VCM), styrene, ethylene glycol, and others.

### ***Downstream Petrochemical Industry.***

The downstream petrochemical industry is an industry that processes materials produced by the petrochemical industry into various end products and finished goods that are used by industry or final consumers (industrial and consumer goods). For example: PET, PP, HDPE, PVC, EDC, PTA, and others.

### ***Horizontal Classification.***

Methane (made from methane).

For example: ammonia, methanol, formaldehyde, urea and others

Olifine (made from Olefin).

For example: ethylene, propylene, butadiene, polyethylene (PE) and others.

Aromatic (Aromatic ingredients).

For example: benzene, toluene, xylene, cyclohexane, caprolactam, purified terephthalic acid (PTA), phthalic anhydride (PA) and others.

## **World Oil Prices**

According to Mulyani (2009) as the minister of finance, the ICP (Indonesia Crude Price) is the basis for the price of crude oil used in the state budget. ICP (Indonesia Crude Price) is the average price of Indonesian crude oil in the international market which is used as an indicator for calculating oil production sharing. ICP is set monthly and evaluated every semester, the determination of the amount of oil price is a very important indicator considering how much the oil price affects the sharing of production (lifting) between the contractor and the government. Therefore, the government takes a role in determining the method of calculating the Indonesian crude oil price (ICP). The current ICP calculation follows a certain formula which is a weighted average price from competent sources in world oil trade, including the US West Texas Intermediate (WTI) and Brent - Europe.

For this study, using the price of petroleum originating from Brent - Europe, from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Naphtha Price**

Naphtha is a group consisting of several types of liquid hydrocarbon products between refineries which are used primarily as raw materials for the production of high-octane gasoline components through a catalytic reforming process. Naphtha is also used in the petrochemical industry to produce olefins in steam crackers and is used as a solvent or solvent in the chemical industry (George et al,2004).

For this study, using Naphtha prices from [markets.businessinsider.com](https://markets.businessinsider.com), AljaziraCapital Research, from the 4th quarter (December) 2019 to the 3rd quarter (September)2020.

### **Ethylene Prices**

Ethylene is by far the most important feedstock in the petrochemical industry. Approximately 130 million tonnes of ethylene were processed worldwide in 2013. Its direct applications include three high-density polyethylene (HDPE) polyethylene plastics, linearlow density polyethylene (LLDPE), and low density polyethylene (LDPE) and petrochemical intermediates, which in turn is mainly used for plastic production (Ceresana, 2013).

For this research, Ethylene prices are used from sources ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, namely from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Propylene Prices**

Propylene plastic producers account for nearly two thirds of all global demand. Polypropylene end uses include films, fibers, containers, packaging, and caps and covers. Propylene is also used for the production of important chemicals such as propylene oxide, acrylonitrile, cumene, butyraldehyde and acrylic acid. In 2013 about 85 million tonnes of Propylene were processed worldwide (NIH).

For this study, using propylene prices from ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Polyethylene Price**

Polyethylene (PE) is a thermoplastic that is used widely by consumer products as a plastic bag. About 80 million metric tons of this plastic are produced annually. Polyethylene is a polymer consisting of long chains of ethylene monomers. In the polymer industry, polyethylene is written with the abbreviation PE, the same treatment that polystyrene (PS) and polypropylene (PP) (NIH) do. The use of polyethylene is very widespread and it is a serious environmental problem. Polyethylene is categorized as waste that is difficult to degrade by nature, it takes hundreds of years for nature to degradeefficiently.



For this study, using Polyethylene prices from sources ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, namely from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Polypropylene Prices**

Polypropylene (PP) with the molecular formula  $C_3H_6x$  is easily formed by polymerizing propylene with a suitable catalyst, generally aluminum alkyl and titanium tetrachloride. Polypropylene is a thermo-plastic polymer made by the chemical industry used in a variety of applications, including packaging, textiles (rope, thermal underwear and carpets), stationery, various types of plastic containers, laboratory equipment, loudspeakers, automotive components, and polymer banknotes. An addition polymer made from the monomer propylene, has an uneven surface and has unusual resistance to most chemical solvents, bases and acids.

The properties of polypropylene vary according to the molecular weight, production method, and copolymers involved. Generally polypropylene has shown certain advantages in increasing strength, stiffness and higher temperature capability than polyethylene. Polypropylene has been successfully applied to fiber forming due to its good specific strength, which is why it is the most widely used polypropylene in the world. Polypropylene is also one of the lightest plastics available with a density of  $0.905 \text{ g / cm}^3$ . Polypropylene was discovered in 1954 and grows very rapidly (NIH).

For this study, using Polypropylene prices from sources ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, namely from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Polyvinyl Chloride Price**

Polyvinylchloride (PVC) with the molecular formula ( $C_2H_3Cl$ ) is the third thermoplastic polymer in terms of total usage in the world, after polyethylene and polypropylene. Worldwide, more than 50% of the PVC produced is used in construction. As a building material, PVC is relatively cheap, durable, and easy to assemble. Flexible PVC is generally used as a material for clothing, piping, roofing, and electrical cable insulation. PVC is produced by polymerizing the common vinyl chloride monomer ( $CH_2 = CHCl$ ). Since 57% of its mass is chlorine, PVC is a polymer that uses the lowest petroleum feedstock among other polymers. The production process that is generally used is suspension polymerization. In this process, vinyl chloride monomer and water are introduced into the polymerization reactor and polymerization initiator, along with additional chemicals to initiate the reaction. (CHEJ, 2008).

For this study, Polyvinylchloride prices were used from sources ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Butadiene prices**

Butadiene (BD) is a colorless synthetic gas that is practically insoluble in water and soluble in ethanol, ether, acetone and benzene. It is used primarily as a monomer for producing various types of polymers and copolymers and as

a chemical intermediate in the production of industrial chemicals. Butadiene is a chemical made from processing petroleum, a colorless gas with a mild odor like gasoline. About 75% of the 1.3 butadiene produced is used to make synthetic rubber. Synthetic rubber is widely used for tires on cars and trucks. 1,3 Butadiene is also used to make plastics including acrylic. Small amounts are found in gasoline.

For this study, using Butadiene prices from sources ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, namely from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **High Density Polyethylene Price**

High Density Polyethylene (HDPE) is a thermoplastic Polyethylene made from petroleum. It takes 1.75 kg of petroleum (as energy and raw material) to make 1 kg of HDPE. HDPE is recyclable, and has the number 2 on the recycling symbol. In 2007, the HDPE production volume reached 30 tons. HDPE has very little branching, this is due to the choice of the type of catalyst in its production (Ziegler-Natta catalyst) and the reaction conditions. Due to the slight branching, HDPE pipe has high tensile strength and intermolecular forces. HDPE is also tougher and can withstand high temperatures (120 oC). HDPE can be processed into plastic rollers, plastic bags, plastic sheets, up to food and non-food product packages.

For this study, the price of High Density Polyethylene was used from sources ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Low Density Polyethylene Price**

Low Density Polyethylene (LDPE) is a thermoplastic made from petroleum. First produced by Imperial Chemical Industries (ICI) in 1933 using high pressure and free radical polymerization.

For this study using Low Density Polyethylene prices from ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, namely from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Price of Acrylonitrile Butadiene Styrene**

Acrylonitrile Butadiene Styrene (ABS) is an amorphous thermoplastic with a glass transition temperature of about 105°C. ABS is a terpolymer made from polymerization of three monomers: styrene, acrylonitrile, and butadiene. The proportions between the three monomers can vary from 15% to 35% acrylonitrile, 5% to 30% butadiene, and 40% to 60% styrene. Polymerization of the three then results in a long polybutadiene chain crossed with a shorter poly (styrene-co-acrylonitrile) chain.

For this study, using Acrylonitrile Butadiene Styrene prices from ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabic, from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

### **Earning Before Interest and Taxes**

Earning Before Interest and Taxes (EBIT) or Profit before Interest and Taxes is one component of the income statement which is commonly known as

Operating Profit. The EBIT value shows how much profit the company generates from its operational activities without including elements of interest or tax expenses. In other words, it is a measure of the company's performance and profitability. Therefore, many people refer to this calculation as Operating Profit.

For this study, using Earning Before Interest and Taxes (EBIT) which came from the Quarter Report sources represented by the most powerful countries in production and sales, namely the company LyondellBasell (Lyon, Netherlands), SABIC (Riyadh, Saudi Arabia), Exxon Mobil Petrochemical (Texas, US), China Petrochemical Corporation (Beijing, China), LG Chem (Seoul, South Korea), Reliance Industries Petrochemical (India), Braskem (Sao Paulo, Brazil) and in Indonesia PT. Chandra Asri Petrochemical Tbk, from the 4th quarter (December) 2019 to the 3rd quarter (September) 2020.

Based on the background description and literature review above, the following hypothesis is obtained:

- $H_1 =$   $H_0: b_1=0$  (Partially the independent variable, the price of petroleum, has no significant effect on the dependent variable on EBIT)  
 $H_a: b_1 \neq 0$  (Partially the independent variable, Petroleum Price has a significant effect on the dependent variable on EBIT)
- $H_2 =$   $H_0: b_2=0$  (Partially the independent variable Naphtha price has no significant effect on the dependent variable EBIT)  
 $H_a: b_2 \neq 0$  (Partially the independent variable Naphtha price has a significant effect on the dependent variable EBIT)
- $H_3 =$   $H_0: b_3=0$  (Partially the independent variable Ethylene price has no significant effect on the dependent variable EBIT)  
 $H_a: b_3 \neq 0$  (Partially the independent variable Ethylene price has a significant effect on the dependent variable EBIT)
- $H_4 =$   $H_0: b_4=0$  (Partially the independent variable price of propylene has no significant effect on the dependent variable EBIT)  
 $H_a: b_4 \neq 0$  (Partially the independent variable propylene price has a significant effect on the dependent variable EBIT)
- $H_5 =$   $H_0: b_5=0$  (Partially the independent variable Polyethylene price has no significant effect on the dependent variable EBIT)  
 $H_a: b_5 \neq 0$  (Partially the independent variable Polyethylene price has a significant effect on the dependent variable EBIT)
- $H_6 =$   $H_0: b_6=0$  (Partially the independent variable Polypropylene price has no significant effect on the dependent variable EBIT)  
 $H_a: b_6 \neq 0$  (Partially the independent variable Polypropylene price has a significant effect on the dependent variable EBIT)
- $H_7 =$   $H_0: b_7=0$  (Partially the independent variable is the price of Polyvinyl Chloride does not have a significant effect on the dependent variable EBIT)  
 $H_a: b_7 \neq 0$  (Partially the independent variable, Polyvinyl Chloride price has a significant effect on the dependent variable EBIT)
- $H_8 =$   $H_0: b_8=0$  (Partially the independent variable butadiene price has no significant effect on the dependent variable EBIT)  
 $H_a: b_8 \neq 0$  (Partially the independent variable Butadiene price has a significant effect on the dependent variable EBIT)
- $H_9 =$   $H_0: b_9=0$  (Partially the independent variable is the price of high density polyethylene does not have a significant effect on the dependent variable EBIT)

- Ha:  $b_9 \neq 0$  (Partially the independent variable price of High Density Polyethylene has a significant effect on the dependent variable EBIT)
- H<sub>10</sub>= H0:  $b_{10} = 0$  (Partially the independent variable Low Density Polyethylene price has no significant effect on the dependent variable EBIT)  
 Ha:  $b_{10} \neq 0$  (Partially the independent variable Low Density Polyethylene price has a significant effect on the dependent variable EBIT)
- H<sub>11</sub>= H0:  $b_{11} = 0$  (Partially the independent variable price of Acrylonitrile Butadiene Styrene has no significant effect on the dependent variable EBIT)  
 Ha:  $b_{11} \neq 0$  (Partially the independent variable price of Acrylonitrile Butadiene Styrene has a significant effect on the dependent variable EBIT)

## RESEARCH METHOD

This research uses the research method used is quantitative methods. The quantitative method itself according to Sugiono (2012) is a research method based on the positivism philosophy, used to research on certain populations or samples, data collection using research instruments, data analysis is quantitative / statistical, with the aim of testing the established hypotheses, with based on secondary data.

This type of research includes causal research. Causal research according to Sugiono (2012) is a study to determine the effect of one or more (independent variables) on certain variables (dependent variable). This research requires hypothesis testing with statistical tests.

According to Kuncoro (2003), a variable is something that can differentiate or change values. In this study, eight independent variables were used, namely Petroleum Price (X1), Naphtha Price (X2), Ethylene Price (X3), Propylene Price (X4), Polyethylene Price (X5), Polypropylene Price (X6), Polyvinyl Chloride Price (X7), and Butadiene Prices (X8), High Density Polyethylene Prices (X9), Low High Density Polyethylene Prices (X10), Acrylonitrile Butadiene Styrene Prices (X11), and the dependent variable, namely Earning Before Interest and Taxes (Y).

According to Soehartono (2012), population is a generalization area consisting of objects / subjects that have certain qualities and characteristics that are determined by the author to be studied and then draw conclusions. The population in this study were all data on growth in the price of Bum Oil, Naphtha, Ethylene, Propylene Prices, Polyethylene Prices, Polypropylene Prices, Polyvinyl Chloride Prices, and Butadiene Prices, High Density Polyethylene Prices, Low High Density Polyethylene Prices, Acrylonitrile Butadiene Styrene Prices.

According to Seohartono (2012), the sample is part of the number and characteristics possessed by the population or in other words, the sample is part of the population which is expected to represent the research population. The samples in this study were 8 (eight) companies representing 8 (eight) countries namely LyondellBasell, SABIC, Exxon Mobil Petrochemical, China Petrochemical Corporation, LG Chem, Reliance Industries Petrochemical, Braskem and in Indonesia PT. Chandra Asri Petrochemical Tbk.

Population and sample observations were carried out on a quarterly basis (quarter) from Q4 2019 - Q3 2020 (4 quarters) with 32 samples. This study must fulfill the basic assumptions, namely the normality test, test the hypothesis with the analysis of the coefficient of determination, the F test and the T test. All tests in this study were carried out with the help of IBM SPSS Statistic Version 20.

## RESULTS AND DISCUSSION

### *Research results*

Data from this study, there are 12 variables to be analyzed, where the nine variables in question are grouped into two parts, namely the independent variable, namely Oil Price (X<sub>1</sub>), Naphtha Price (X<sub>2</sub>), Ethylene Price (X<sub>3</sub>), Propylene Price (X<sub>4</sub>), Price for Polyethylene (X<sub>5</sub>), Price for Polypropylene (X<sub>6</sub>), Price for Polyvinyl Chloride (X<sub>7</sub>), and Price for Butadiene (X<sub>8</sub>), Price for High Density Polyethylene (X<sub>9</sub>), Price for Low High Density Polyethylene (X<sub>10</sub>), Price for Acrylonitrile Butadiene Styrene (X<sub>11</sub>), as well as the dependent variable, namely Earning Before Interest and Taxes (Y), population and sample observations were carried out quarterly (quarter) from Q4 2019 - Q3 2020 (4 quarters), a total of 32 samples.

Table 2: Independent Variable Data

Year	Quarter	Oil price	H. Naphtha	H. Ethylene	H. Propylene	H. Polyethylene	H. Polypropylene	H. PVC	H. Butadiene	H. HDPE	H. LDPE	H. ABS
		(X1) US\$/Barrel	(X2) US\$/Ton	(X3) USD/ton	(X4) USD / ton	(X5) USD / ton	(X6) USD / ton	(X7) USD / ton	(X8) USD / ton	(X9) USD / ton	(X10) USD / ton	(X11) USD / ton
2019	Q4	59,88	540,00	761,00	879,00	892,00	1.073,00	835,00	956,00	807,00	886,00	1.363,00
2020	Q1	29,21	444,00	722,00	813,00	888,00	1.001,00	846,00	817,00	790,00	880,00	1.337,00
	Q2	38,31	274,00	601,00	732,00	791,00	869,00	703,00	358,00	736,00	817,00	1.231,00
	Q3	39,30	396,00	793,00	860,00	939,00	978,00	864,00	595,00	845,00	1.019,00	1.521,00

Source: ICIS, Argaam, Bloomberg, Aljazira, Exxon, Sabc

Table 2 is shown in US \$ units for price units (independent variables), and in the form of growth percentages (Growth) for EBIT (dependent variables) because not all of the dependent variables obtained in the quarterly report are presented in US \$ (dollars), with the description of companies that present in the quarterly report:

1. US \$ namely LyondellBasell (Lyon, Netherlands), SABIC (Riyadh, Saudi Arabia), Exxon Mobil Petrochemical (Texas, US), Braskem (Sao Paulo, Brazil), PT. Chandra Asri Petrochemical Tbk (Banten, Indonesia)
2. RMB (Renminbi) namely China Petrochemical Corporation (Beijing, China).
3. KRW (Won) namely LG Chem (Seoul, South Korea).
4. Indian Ruppee namely Reliance Industries Petrochemical (India).

Table 3: Dependent Variable Data (in US \$, RMB, KRW, Rupee Currency)

Year	Quarter	EBIT LyondellBasell	EBIT SABIC	EBIT Exxon	EBIT China Petro	EBIT LG Chem	EBIT Reliance	EBIT Braskem	EBIT TPIA
	<b>Q3</b>	1.513,00	8,38	241,00	68.340,00	1.100,54	5.167,00	446,00	53.769,00
<b>2019</b>	<b>Q4</b>	1.172,00	7,14	(355,00)	16.586,00	1.416,34	5.601,00	241,00	38.775,00
<b>2020</b>	<b>Q1</b>	646,00	5,07	114,00	(26.305,00)	243,00	6.201,00	294,00	(43.689,00)
	<b>Q2</b>	760,00	3,25	467,00	2.873,00	435,00	7.281,00	213,00	(84.342,00)
	<b>Q3</b>	466,00	5,31	661,00	5.028,00	722,00	7.701,00	529,00	(55.089,00)

Source: Quarter Report Q4 2019 – Q3 2020

Table 4: Dependent Variable Data (Growth)

Year	Quarter	Growth LyondellBasell	Growth SABIC	Growth Exxon	Growth China Petro	Growth LG Chem	Growth Reliance	Growth Braskem	Growth TPIA
	<b>Q3</b>								
<b>2019</b>	<b>Q4</b>	-22,54%	-14,80%	- 247,30%	-75,73%	28,70%	8,40%	-45,96%	-27,89%
<b>2020</b>	<b>Q1</b>	-44,88%	-28,99%	- 132,11%	-258,60%	-82,84%	10,71%	21,99%	- 212,67%
	<b>Q2</b>	17,65%	-35,90%	309,65%	-110,92%	79,01%	17,42%	-27,55%	93,05%
	<b>Q3</b>	-38,68%	63,38%	41,54%	75,01%	65,98%	5,77%	148,36%	-34,68%

Source: Quarter Report Q4 2019 – Q3 2020

### Descriptive Statistics Test Results

Table 5: Descriptive Statistics

N		Minimum	Maximum	Mean	Std. Deviation
H.MinyakBumi	32	29,21	59,88	41,6750	11,40189
H.Naphtha	32	274,00	540,00	413,5000	97,31757
H.Ethylene	32	601,00	793,00	719,2500	73,91844
H.Propylene	32	732,00	879,00	821,0000	57,63064
H.PolyEthylene	32	791,00	939,00	877,5000	54,67794
H.PolyPropylene	32	869,00	1073,00	980,2500	74,33967
H.PVC	32	703,00	864,00	812,0000	64,79745
H.Butadien	32	358,00	956,00	681,5000	230,48056
H.HDPE	32	736,00	845,00	794,5000	39,83514
H.LDPE	32	817,00	1019,00	900,5000	74,73825
H.ABS	32	1231,00	1521,00	1363,0000	105,41959
EBIT	32	-2,59	3,10	-,1423	1,09399
Valid N (listwise)	32				

Source: Output SPSS 20

The results of data processing from the table display above are:

1. In the Petroleum Price variable, there are 32 samples (n), the minimum result is 29.31 in the first quarter of 2020 where the impact of the highest spread in the first quarter and the lowest entry point in March was \$ 29.31 / barrel and the price in April with lowest petroleum price in history

(CNBC Indonesia) \$ 16.55 / barrel with a percentage of -51.22%, the Corona pandemic has attacked blackgold.

The spread of the virus has made human activities stop and led to an abundance of supply, Pricey shut-ins (production cuts because the selling price is lower than production costs) or bankruptcy is easier for operators (oil), rather than spending a lot of money to produce (oil), the impact From the fall of oil, it has an impact on the decline in the petrochemical industry, according to table 2 all raw materials entering the second quarter have an impact on experiencing a decline in prices with an average growth of -19% and the company's operating profit (EBIT) is affected by up to -91%.

### ***Normality Test Results***

Table 6: Normality Test  
One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		32
Normal Parameters <sup>a,b</sup>	Mean	0E-7
	Std. Deviation	,92221163
	Absolute	,097
Most Extreme Differences	Positive	,095
	Negative	-,097
Kolmogorov-Smirnov Z		,548
Asymp. Sig. (2-tailed)		,925

a. Test distribution is Normal.

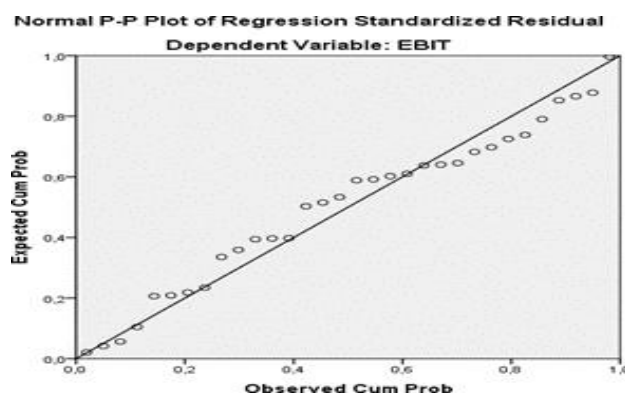
b. Calculated from data.

Source: Output SPSS 20

The normality test in the regression model is used to test the residual value resulting from regression with normal distribution or not. To test the data from the results of this study, SPSS 20 was used with the Kolmogorov-Smirnov statistical test to guide decision making, namely if the significance number (Sig)  $\alpha > 0.05$  then the data was normally distributed and if the significance number (Sig)  $\alpha < 0.05$  then the data was not distributed. normal. From the results of data processing using SPSS 20 from table 6, it shows that the residual magnitude generated from the regression is normally distributed, namely the significance number (Sig) 0.925 (92.5%)  $> 0.05$ , the data is normally distributed.

Based on table 6, it shows that the residuals are normally distributed because of the sig. (2-tailed) 0.925 (92.5%)  $> 0.05$ . Graph of Normal P-P test results Plot of regression standardized residuals.





Source: OutputSPSS 20

From the graph it can be seen that the dots spread around the line and follow the diagonal line, so the residual value is normal or close to normal. Partial Hypothesis (t test) The t test is used to determine the effect of each independent variable (partially) on the dependent variable EBIT. The t test basically shows how far the influence of one explanatory or independent variable individually in explaining the variation of the dependent variable.

Table 7: t Test  
Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1,949	1,982		-0,983	0,334
	H.MinyakBumi	0,038	0,019	0,393	1,981	0,058
	H.Naphtha	-0,01	0,003	-0,915	-3,252	0,003
	H.Ethylene	0,006	0,004	0,422	1,739	0,093
	H.Propylene	0,023	0,009	1,203	2,475	0,020
	H.PolyEthylene	-0,037	0,025	-1,828	-1,450	0,158
	H.PolyPropylene	-0,016	0,006	-1,108	-2,954	0,006
	H.PVC	-0,007	0,006	-0,429	-1,258	0,219
	H.Butadien	-0,006	0,003	-1,342	-2,221	0,035
	H.HDPE	-0,001	0,005	-0,039	-0,212	0,834
	H.LDPE	-0,096	0,066	-6,57	-1,450	0,158
	H.ABS	0,072	0,048	6,95	1,494	0,146

a. Dependent Variable: EBIT

Source: OutputSPSS 20

- Hypothesis (H1) the significance value for t count H. Crude oil is 1.908 while the t table is 2.080 ( $1.908 < 2.080$ ). A significance value of  $0.058 > 0.05$ , which indicates a significance value greater than 0.05, then H1 is accepted, meaning that the variable H. Oil partially has no effect on EBIT
- Hypothesis (H2), the significance value for t count H. Naphtha is -3.352 while the t table is 2.080 ( $-3.352 > 2.080$ ). A significance value of  $0.003 < 0.05$ , which indicates a significance value less than 0.05, then H2 is rejected, meaning that the H. Naphtha variable partially has an influence on EBIT.

3. Hypothesis (H3), the significance for t count H.Ethylene is 1.739 while the t table is 2.080 ( $1.739 < 2.080$ ). A significance value of  $0.093 > 0.05$ , which indicates a significance value greater than 0.05, then H3 is accepted, meaning that the H.Ethylene variable partially has no effect on EBIT
4. Hypothesis (H4) the significance value for t count H. Propylene is 2.474 while t table is 2.080 ( $2.475 > 2.080$ ). A significance value of  $0.020 < 0.05$ , which indicates a significance value less than 0.05, then H4 is rejected, meaning that the H. Propylene variable partially has an influence on EBIT.
5. Hypothesis (H5) the significance value for t count H. PolyEthylene is -1,450 while the t table is 2,080 ( $-1,450 < 2,080$ ). A significance value of  $0.158 > 0.05$ , which indicates a significance value greater than 0.05, then H5 is accepted, meaning that the H. PolyEthylene variable partially has no effect on EBIT.
6. Hypothesis (H6), the significance value for t count H.Propylene is -2,954 while the t table is 2,080 ( $-2,954 > 2,080$ ). A significance value of  $0.006 < 0.05$ , which indicates a significance value less than 0.05, then H6 is rejected, meaning that the H.Propylene variable partially has an effect on EBIT.
7. Hypothesis (H7) the significance value for t count H.PVC is -1.258 while t table is 2.080 ( $-1.258 < 2.080$ ). Significance value  $0.219 > 0.05$ , which indicates a significance value greater than 0.05, then H7 is accepted, meaning that the H. PVC variable partially has no effect on EBIT
8. Hypothesis (H8), the significance value for t count H. Butadien is -2.221 while the t table is 2.080 ( $-2.221 > 2.080$ ). A significance value of  $0.035 < 0.05$ , which indicates a significance value less than 0.05, so H8 is rejected, meaning that the H. Butadien variable partially has an influence on EBIT.
9. Hypothesis (H9) the significance value for t count H.HDPE is -0.212 while t table is 2.080 ( $-0.212 < 2.080$ ). Significance value  $0.834 > 0.05$ , which indicates a significance value greater than 0.05, then H9 is accepted, meaning that the H. HDPE variable partially has no effect on EBIT
10. Hypothesis (H10) the significance value for t count H. LDPE is -1,450 while t table is 2,080 ( $-1,450 < 2,080$ ). A significance value of  $0.158 > 0.05$ , which indicates a significance value greater than 0.05, then H10 is accepted, meaning that the H. LDPE variable partially has no effect on EBIT.
11. Hypothesis (H11) the significance value for t count H.ABS is -1.494 while the t table is 2.080 ( $1.494 < 2.080$ ). Significance value  $0.146 > 0.05$ , which indicates a significance value greater than 0.05, then H10 is accepted, meaning that the H.ABS variable partially has no effect on EBIT.

### *Simultaneous Hypothesis (Test F)*

ANOVA<sup>a</sup>

Model	Sum of Squares	df	Mean Square	F	Sig.
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	Regression	10,736	3	3,579	3,801	,021 <sup>b</sup>
1	Residual	26,365	28	,942		
	Total	37,101	31			

a. Dependent Variable: EBIT

Source: OutputSPSS 20

Based on the results of the calculation of the table above, obtained F count of 3.801 and F table at a significance level of 0.05 (5%) with df 1 = 3 and df 2 = 28 amounting to 2.9467. Because F count > F table (3.801 > 2.9467) then H04 is rejected. This means that the independent variables together have a significant effect on EBIT. This is indicated by the calculated F value of 3.801 with a probability of 0.021, this figure is smaller than the value of 0.05 (5%).

## CONCLUSION

This study aims to determine the spread of petrochemical industry raw materials in generating profit (EBIT) or operational profit during the Covid 19 pandemic starting from the main upstream raw material, namely petroleum, if it is directly linked to the growth in petroleum prices, growth in raw materials for the petrochemical industry and Profit growth has a relationship, namely the petrochemical raw material comes from petroleum, where the price of petrochemical raw materials is very sensitive to fluctuations in petroleum price movements, as the main raw material that will directly affect company profits. The spread (spread) of raw materials from upstream to downstream results in a gap for derivative products and of course from this gap it can be concluded that there are a number of profits (profits) from the derivatives that are generated in the form of operating profit (EBIT).

The drop in oil prices in the first quarter was \$ 29.31 in Q1 2020 where the impact of the highest spread in the first quarter and the lowest entry point in March was \$ 29.31 / barrel and the price in April was the lowest oil price in history (cnbcindonesia) \$ 16.55 / barrel at - 51.22%, the Corona pandemic has hit black gold. The spread of the virus has made human activities stop and led to an abundance of supply, Pricey shut-ins (production cuts because the selling price is lower than production costs) or bankruptcy is easier for operators (oil), rather than spending a lot of money to produce (oil), the impact From the fall of oil, it has an impact on the decline in the petrochemical industry, according to table 2 all raw materials entering the second quarter have an impact on experiencing a decline in prices with an average growth of -19% and the company's operating profit (EBIT) is affected by up to -91%.

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