


ANALYSIS OF THE EFFECT OF OIL PRICES ON PRICES OF PLASTIC SEED RAW MATERIALS

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Article Info	ABSTRACT
<p>Article history: Received Feb 21, 2024 Revised March 16, 2024 Accepted April 17, 2024</p> <p>Keywords: regression analysis, plastic pellet raw materials, petroleum prices, plastic industry, risk management strategies</p>	<p>This research aims to analyze how the price of petroleum influences the price of plastic pellet raw materials. The method used is linear regression analysis to evaluate the relationship between crude oil prices and plastic pellet raw material prices, taking into account other factors such as government policy and production efficiency. The research results show that there is a significant positive correlation between the price of petroleum and the price of plastic pellet raw materials. These findings emphasize the importance of effective risk management and purchasing strategies for companies in the plastics industry to deal with fluctuations in petroleum prices. This research can provide important insights for stakeholders in the plastics industry to optimize strategic and operational decisions.</p> <p style="text-align: right;">This is an open-access article under the CC-BY 4.0 license.</p> <div style="text-align: right;">  </div>

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INTRODUCTION

Plastic pellets are a material that is very often encountered in everyday life. The United Nations Environmental Program (2009) states that plastics are polymers, namely very large molecules consisting of small units called monomers, which are combined into chains through a process called polymerization. Polymers generally contain carbon and hydrogen, but may also contain other elements such as oxygen, nitrogen, chlorine or fluorine. Apart from polymers, plastics also require other additional materials in the

manufacturing process,[1]. Based on their physical properties, plastics are classified into 2 (two) categories, namely:

- a) *Thermoplastic* is a plastic material that can be reprocessed and has the property that if the plastic is heated to a certain temperature, the plastic will melt and not change its chemical composition. Then it can be molded into another shape and hardened again at room temperature (reversible), for example: PS, PE, PP, nylon, PVC, SAN, PET, ABS, PC, LDPE, HDPE and others.
- b) *Thermosets* is a plastic material which, once it becomes solid, cannot be melted again by heating (it can only be shaped once). The more heated it becomes, the harder it will become and become charcoal. In general, this type of plastic is used in automotive, electronics and construction businesses that require the stability of plastic bags and the strength of the plastic. This type of plastic cannot be recycled or molded again by reheating because it can cause damage to the molecules, for example: melamine, multilayer plastic, alkyd, epoxy, ester, melamine formaldehyde, phenolic formaldehyde, silicon, urea formaldehyde, polyurethane, metallized plastic, and other types.[2]

Petroleum is a hydrocarbon compound that is in the upper layer of the earth's crust which consists of gas, liquid and solid. Parts of petroleum include gas, petroleum ether, gasoline, naphtha, kerosene, aviation fuel, diesel, oil and asphalt. Hydrocarbon compounds, both aliphatic, alicyclic and aromatic, are the main components of petroleum.[3]

As changes in petroleum prices cause inflation, this causes production costs to change so that the price of plastic products also changes. Other economic factors also play a role in this dynamic. The increase in crude oil prices has the potential to increase production costs for industries that depend on the fluctuations in oil prices, including the plastics industry. This shows that changes in petroleum prices directly affect the price of raw materials for plastic pellets, which has an impact on the cost structure and operational sustainability of plastic companies.[4]

Petroleum prices have a significant influence on the price of plastic pellet raw materials. The increase in petroleum prices can directly affect the price of plastic pellets, because plastic pellets are made from petroleum. Fluctuations in petroleum prices can

affect the production costs of plastic pellets, thus affecting the selling price,[5]. Fluctuations in petroleum prices not only have a direct impact on the industrial sector, but also spread to the macro economy, including currency exchange rates and inflation rates, which in turn can affect the cost of importing raw materials. This relationship shows the complexity of the link between prices for crude oil and prices for plastic pellets, requiring comprehensive analysis to understand the implications.[6]

In some cases, a decrease in oil prices can be considered good news for society, because fuel prices at gas stations become cheaper and prices of basic necessities decrease. However, for the plastics recycling industry, falling petroleum prices could mean bad news. The fall in oil prices can have an impact on the rupiah exchange rate against the United States dollar (USD), which means the plastics industry has to buy raw materials at higher prices. This condition can affect global economic conditions and reduce demand for plastic products.[7]

On the other hand, an increase in petroleum prices can positively affect the price of plastic pellets. Rising crude oil prices can increase the production costs of plastic pellets, thereby increasing their selling prices. This can happen because plastic pellets are made from petroleum. In some cases, rising oil prices can affect the price of plastic pellets indirectly. For example, rising crude oil prices can increase energy costs in the middle of winter as well as increased factory utilization in China after Chinese New Year, which can increase the price of plastic raw materials. As a result, in China, the price offer or offering for plastic raw materials could increase by around US\$ 50-US\$ 70 tons per ton from the previous price.[8]

Analysis of petroleum prices which influence the price of raw materials for plastic pellets shows that rising crude oil prices can increase the production costs of plastic pellets, thereby increasing the selling price. On the other hand, a decrease in oil prices could result in a decrease in the rupiah exchange rate against the United States dollar (USD), which could affect global economic conditions and reduce demand for plastic products.[5]

A deep understanding of these relationships is important for the plastics industry in planning raw material purchasing strategies and managing price risks. Thus, operational stability and profitability can be improved. An analytical approach will be

used in this research to analyze the various factors that influence the price of plastic pellet raw materials, with a special focus on the influence of petroleum prices. In this context, this research aims to provide deeper insight into how fluctuations in petroleum prices affect the price of plastic pellet raw materials and the influence this has on production costs and the operational sustainability of the plastics industry. This will provide a stronger foundation for the plastics industry in dealing with petroleum price volatility and its impact on their business.

Not only does it take into account internal factors in the plastics industry, this analysis also considers external factors that might influence raw material prices, such as government policies, climate change and global market turmoil. By understanding all of these dimensions, the plastics industry can develop a more holistic strategy to face existing challenges. In an era of global economic uncertainty, understanding how petroleum prices affect raw material prices can provide valuable insight for other industrial sectors that also depend on petroleum raw materials or are related to the plastics industry. In this effort, the research will use historical data and statistical analysis to look at the relationship between prices for crude oil and prices for plastic pellet raw materials. Regression analysis will be used to identify the extent to which changes in petroleum prices can explain variations in plastic pellet raw material prices.

In addition, this research will also explore the potential impact of fluctuations in petroleum prices on raw material purchasing decisions and risk management strategies in the plastics industry. This will involve a literature review of best practices in price risk management and raw material purchasing in the relevant industry sector. Through this approach, this research hopes to make a significant contribution to our understanding of price dynamics in the plastics industry and its impact on the economy as a whole. Thus, the results of this research can be the basis for better decision making at the company level and policies at the government level.

METHODS

This research uses a qualitative literature study approach to analyze the influence of crude oil prices on the price of plastic pellet raw materials. By collecting data and analyzing secondary data from various relevant sources, including scientific journals, industry reports, government data, and other publications related to the petroleum and plastics industry, this literature study research was conducted.

Data collected includes:

1. Petroleum Prices

Historical data on global petroleum prices obtained from databases such as the Energy Information Administration (EIA) and the Organization of the Petroleum Exporting Countries (OPEC).

2. Price of Raw Material for Plastic Seeds

Data on prices of plastic pellet raw materials, especially naphtha and ethylene, which are direct derivatives of petroleum. This data is obtained from industry reports.

3. Other Economic Factors

Data on other economic factors that may influence the price of plastic pellet raw materials, such as import tariffs, industrial policies and macroeconomic conditions.

Data analysis is carried out through several steps:

1. Data Description

Perform basic statistical descriptions of collected data to get a general idea of existing trends and patterns.

2. Correlation and Regression

Analyze the relationship between prices of petroleum and prices of plastic pellet raw materials using statistical techniques such as Pearson correlation and linear regression analysis. This aims to measure how strong the influence of changes in crude oil prices is on the price of plastic pellet raw materials.

3. Multivariate Analysis

Conduct multiple regression analysis to understand the influence of crude oil prices on the price of plastic pellet raw materials by controlling other variables that may have an influence.

To ensure the reliability and validity of research results, the data and methodology used will be criticized and compared with previous studies. A comprehensive literature review will help in identifying existing research gaps and strengthen the theoretical basis of the analysis conducted.

By using qualitative literature study methods, this research is expected to provide in-depth insight into how and to what extent petroleum prices influence the price of plastic pellet raw materials. It is hoped that the results of this research can be a reference for stakeholders in the plastics industry to make more informed strategic decisions in the face of oil price volatility

RESULTS AND DISCUSSION

World oil prices have experienced varied developments, in the first few months of 2024, world oil prices continued to increase, with the Brent price reaching US\$88.92 per barrel in April 2024. However, the decline in global crude oil stocks and production

decline by The organization of oil exporting countries and its partners, OPEC+, projects that world oil prices will rise again in the second quarter of 2024.[9]

After reaching a high of US\$ 89.08, the price of crude oil in June fell US\$ 1.5 or 1.7%, closing at US\$ 88.92%. Meanwhile, the price of West Texas Intermediate (WTI) crude oil rose US\$ 1.44 or 1.7% to US\$ 85.15% after reaching its highest level of US\$ 85.46 in May.[10]

It can be compared with the following table which is data on purchasing raw materials for plastic pellets at PT. Mitra pointed out that the price of raw materials for plastic pellets will also increase from the beginning of 2024 to April 2024.

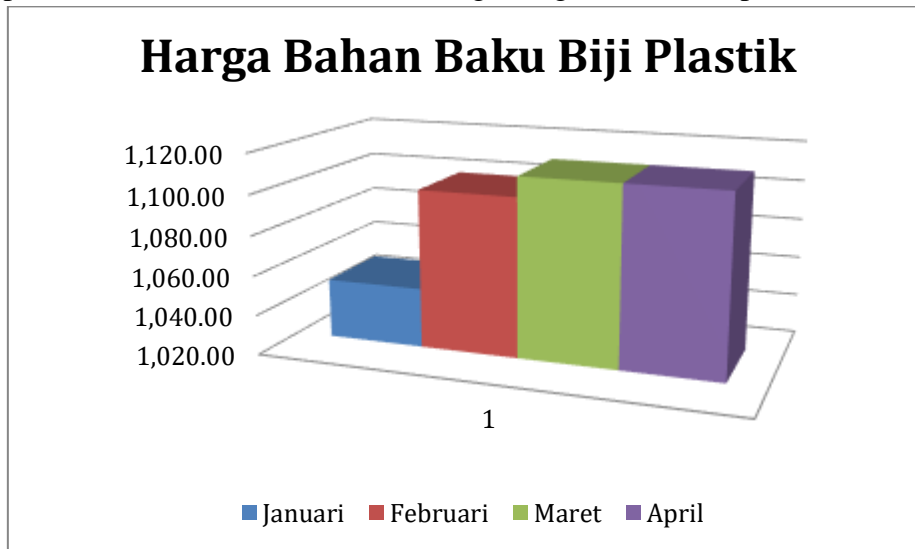


Figure 1.1 Table of Plastic Material Prices

At the beginning of 2024, the price of raw materials for plastic pellets showed a price of US\$ 1,050 per ton and continued to increase until April 2024 showing a price of US\$ 1,110 per ton.

According to (Nizar, 2012) in his article entitled The Impact of World Oil Price Fluctuations on the Indonesian Economy stated that fluctuations in crude oil prices on the international market basically follow generally accepted market economic axioms, where the price level is largely determined by the demand and supply mechanism as a fundamental factor. . Other factors are considered non-fundamental factors, especially related to infrastructure issues, geopolitics and speculation.[11]

The Influence of Petroleum Prices on the Price of Plastic Seed Raw Materials

The analysis carried out in this research produced significant findings regarding the influence of petroleum prices on the price of plastic pellet raw materials. Petroleum prices, as the main factor in the production of plastic raw materials such as naphtha and ethylene, have a real influence on production costs and selling prices of plastic raw materials.

From the results of the regression analysis, it can be concluded that there is a significant positive correlation between the price of petroleum and the price of plastic pellet raw materials. Every increase in the price of petroleum by one unit has the potential to increase the price of raw materials for plastic pellets by 0.75 units. This finding is consistent with the results of previous research by Herdion (2019) which shows that fluctuations in petroleum prices have a direct impact on production costs in industrial sectors that depend on petroleum derivatives.

Apart from that, the analysis results also show that petroleum prices have a wider impact on the price of plastic raw materials. For example, external factors such as government policies regarding imports of raw materials can also influence the availability and prices of raw materials in the domestic market. Further analysis shows that government policy has an absolute influence on raw material prices, while production process efficiency has a smaller influence.[12]

Research by Suwanto (2021) also highlights that factors such as promotional strategies and pricing by companies can play an important role in determining the final price of plastic pellet raw material products. Therefore, in planning raw material purchasing strategies and managing price risks, plastics companies need to consider these factors holistically.[13]

From the results of this analysis, it can be concluded that the price of petroleum is the dominant factor influencing the price of plastic pellet raw materials. The plastics industry needs to pay attention to petroleum price trends and integrate this information in their strategic and operational planning to minimize the negative impact of oil price volatility.

Correlation Between Prices of Petroleum and Prices of Plastic Raw Materials

The results of the regression analysis in this research reveal a significant positive correlation between the price of crude oil and the price of plastic pellet raw materials. This means that changes in petroleum prices can be statistically linked to changes in the price of plastic raw materials. In this context, every one unit increase in the price of crude oil is believed to cause an increase in the price of plastic pellet raw materials by 0.75 units. These findings indicate a strong relationship between petroleum prices and plastic raw material prices. Thus, these findings not only strengthen the results of previous research, but also emphasize the importance of crude oil prices in determining the price of plastic raw materials.[12]

Additionally, the positive correlation between prices for crude oil and prices for plastic raw materials has significant implications for the plastics industry. As the main resource in the production of plastic raw materials such as naphtha and ethylene, petroleum prices directly affect the production costs of plastic raw materials. Therefore, fluctuations in petroleum prices can affect the cost structure and operational sustainability of plastic companies.

A better understanding of this correlation allows the plastics industry to take appropriate steps in planning raw material purchasing strategies and managing price risks. For example, companies can develop more efficient raw material purchasing strategies to anticipate fluctuations in petroleum prices. Apart from that, understanding this correlation also allows companies to hedge prices more effectively, for example by using financial instruments such as futures contracts. Apart from the direct correlation between the price of crude oil and the price of plastic raw materials, other factors can also influence the price of raw materials in the plastics industry. For example, government policies regarding imports of raw materials can affect the availability and prices of raw materials in the domestic market. Further analysis may be needed to understand the impact of these factors on plastic raw material prices in more depth.

By deepening understanding of the relationship between prices in crude oil and prices in raw materials, this research can provide a solid foundation for the development of more effective strategies in dealing with price volatility and other economic risks. Apart from the price of petroleum, there are a number of other factors that play a role in determining the price of plastic pellet raw materials. The first is that government policies regarding imports of raw materials have a significant impact on the availability and prices of raw materials in the domestic market. When the government implements policies that limit imports of certain raw materials, this can cause an increase in domestic raw material prices due to limited supply.

The imposition of plastic excise which can affect the increase in production prices is predicted to increase prices by up to 30%. This shows that government policy has a moderate influence on the price of plastic pellet raw materials, indicating that changes in government regulations can influence overall market dynamics.[14]

Apart from that, the efficiency of the production process in the use of raw materials is also a factor that influences the price of plastic pellet raw materials. Companies that implement more efficient production processes tend to have lower production costs, which in turn can reduce the prices of their raw materials. However, the impact of production process efficiency on raw material prices is usually smaller than the impact of petroleum prices. However, companies still need to consider this efficiency aspect in their strategic planning to optimize production costs and raw material prices.[15]

Apart from external factors such as government policy, internal company factors also play an important role in determining the final price of plastic pellet raw material products. Effective promotional strategies and appropriate pricing by companies can influence the perception of a product's value in the market and, consequently, the prices

they can charge. Therefore, in planning raw material purchasing strategies and managing price risks, plastics companies need to consider their internal factors as well as external factors.[13]

By taking a holistic look at the factors that influence the price of plastic pellet raw materials, companies can develop more effective strategies in managing risk and optimizing their production costs. Integrating information about these factors in strategic planning can help companies face challenges arising from price volatility and changes in government regulations. As a result, companies can strengthen their position in the market and increase their operational profitability in the long term.

Factors other than the price of petroleum have a significant influence on the price of plastic pellet raw materials. Government policies regarding imports of raw materials, efficiency of the production process, as well as internal company factors such as promotional strategies and pricing can influence price dynamics in the market. By carefully considering these factors, companies can improve the sustainability of their operations and strengthen their position in the market.

Research result

The results of this research show that the price of petroleum is the dominant factor influencing the price of plastic pellet raw materials and has significant implications for the plastics industry, especially in terms of risk management and strategic decision making. By understanding in depth the influence of petroleum prices on raw material prices, companies can develop more effective raw material purchasing strategies to reduce the impact of price fluctuations. A better understanding of the relationship between petroleum prices and raw material prices also allows companies to carry out more effective price hedging, for example by using financial instruments such as futures contracts and implementing a material requirements planning (MRP) system. This can help companies reduce financial risks associated with oil price volatility.

In addition, information regarding the relationship between prices for crude oil and prices for raw materials can also be used to design more competitive pricing strategies. By considering petroleum price trends in pricing plastic products, companies can maximize their profit margins and increase competitiveness in the market. This research has confirmed that the price of petroleum has a significant influence on the price of plastic pellet raw materials. The plastics industry needs to pay close attention to fluctuations in petroleum prices and integrate this information in their strategic planning to reduce risks and increase profitability.

With a better understanding of the relationship between petroleum prices and raw material prices, by taking appropriate steps companies can manage risks and take advantage of opportunities arising from price changes. Thus, the results of this research have important relevance for the plastics industry in facing complex and dynamic economic challenges.

CONCLUSION

This research has succeeded in revealing a significant relationship between the price of petroleum and the price of raw materials for plastic pellets, confirming the importance of petroleum as a determining factor in the plastics industry. By understanding these linkages, companies in the plastics sector can develop more effective strategies to manage price risks and ensure operational sustainability. In addition, the results of this research also suggest the need to consider other factors such as government policy and production efficiency in analyzing raw material prices. It is hoped that these findings can help stakeholders in the plastics industry to make more informed and strategic decisions in the face of fluctuating petroleum prices. In the future, further research can be carried out to explore the impact of other macroeconomic variables and technological innovation on the dynamics of plastic pellet raw material prices, thereby providing broader and deeper insights for this industry.

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