The ImpactOf Polyethylene Price Changes on the Macroeconomic Aspect and the Origin Petrochemical Industry in Indonesiafor 2007-2017

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Abstract: *The objective of the research is to recommend the model of Polyethylene Price in terms of Indonesia's Economic Growth, Interest Rate, Inflation Rate,, Supply Polyethylene, Demand Polyethylene, Ethylene and Oil Price in 2007-2017 period. The results will be published in reputable journals. The objectives of the research are 1) To analyze the effect of the Inflation Rate, Interest Rate of Bank Indonesia, Supply Polyethylene, Demand Polyethylene, Ethylene and Oil Price to Price of Polyethylenein 20077 - 2017, 2); Analyzing the most powerful factors affect on the Inflation Rate, Interest Rate of Bank Indonesia, Indonesia's Economic Growth, Supply Polyethylene, Demand Polyethylene, Ethylene and Oil Price in the period 2007-2017.Some of the analytical tools used are Multiple Regression Equations with through the Multicollinearity Test, Heterokedastisitas Test, Autocorrelation Test because if there is a deviation then the t test and F test done previously become invalid. The research stages are literature study and retrieve data from several media Outline of research in the form of international journal publications.The results of the study indicate that the Inflation Rates, Interest Rates of Bank Indonesia and Ethylene Price have a significant influence on the Polyethylene Price. The Inflation Rates and Ethylene Price have a positive impact while the Interest Rate of Bank Indonesia has a negative impact on Indonesia's Polyethylene Price*


I. Introduction

Diabetes Currently there are mainly six polymer commodities that are widely used, including polyethylene, polypropylene, polyvinylchloride, polyetileneterеftalate, polystyrene, and polycarbonate. They make up 98% of all polymers and plastics found in everyday life. Each of these polymers has degradation and heat, light, and chemical properties (Sofia, 2013).

Economic growth is one of the most important indicators in assessing the performance of an economy, especially to conduct an analysis of the results of economic development that has been carried out by a country or a region. Economies are said to experience growth if the production of goods and services increases from the previous year. Thus, economic growth shows the extent to which economic activity can generate additional income or welfare for a given period (Kwon, 2016).

Inflation is a process of increasing prices that apply in an economy. While the inflation rate is a presentation of the increase in the prices of goods in a certain period of time). With the increasing rate of inflation will affect the Downstream Industry or Petrochemical Derivatives Industry or the Industry of Finished Goods, in this case the Plastic Industry that uses Low Density Polyethylene / LDPE and High Density Polyethylene / HDPE. (Koplan, 2015).

Based on Figure 1.0, it can be seen that the lowest Polyethylene price occurred in 2009 of $ 66.5 and the highest price occurred in 2014 of $ 101.5. While the most influential macroeconomic aspects are Indonesia's economic growth from Figure 1.0, the lowest economic growth seen in 2010 was 4.51%, and Indonesia's Economic Growth which was the highest in the period 2007-2017 occurred in 2012 at 6.54% .
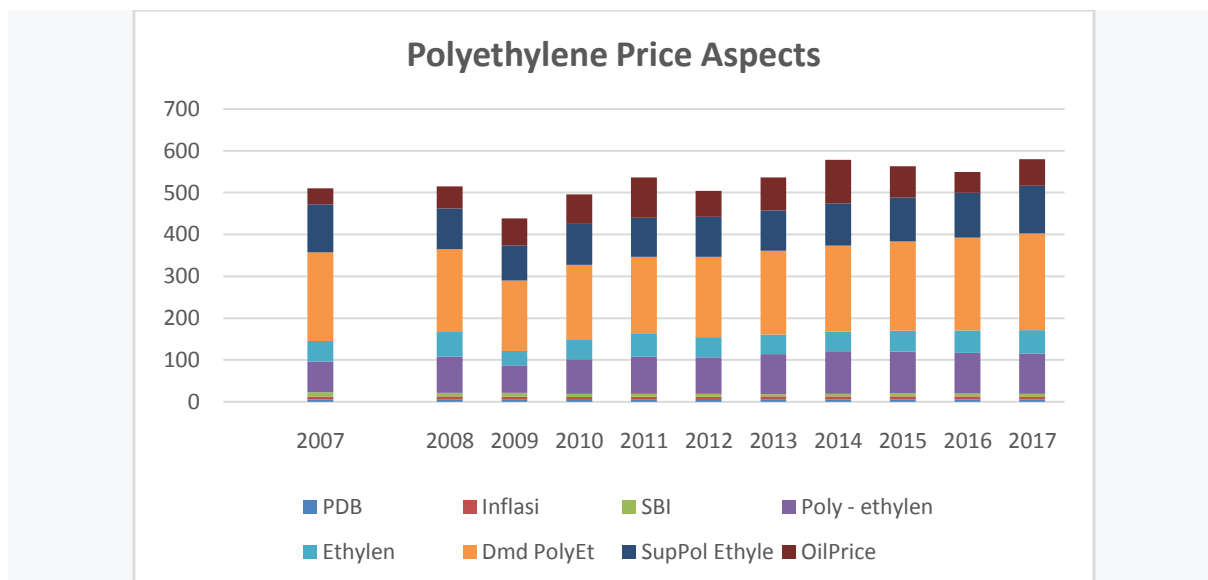
Source : PT CAPC and BPS (2018)

Figure 1.0. Data on inflation rates, economic growth, interest rates, supply & demand for polyethylene, ethylene, polyethylene, oil prices in Indonesia 2007 – 2017.

II. Literature Review

Since the 1950s plastic has become an important part of human life. Plastics are used as raw materials for packaging, textiles, car parts and electronic devices. In the world of medicine, plastic is even used to replace parts of the human body that are no longer functioning. In 1976 plastic was said to be the most widely used material and was chosen as one of the 100 news stories of this century. (Chiranjeev, 2014)

Another macroeconomic factor that is very important and can affect companies that produce petrochemical products is the price of Crude Oil. The price of crude oil has the most basic characteristics and is strongly influenced by changes in the volatility of crude oil prices and reduced crude oil supply in the world market. Volatility of world crude oil prices and reduced supply of crude oil in the world market can be caused by exogenous effects in the form of demand and supply and also strongly influenced by endogenous effects, namely uncertain and volatile political situation in OPEC countries, most of which are countries in Middle East region (Wattanatorn, 2015).

The form of explicit production functions and the equation model approach in the industry of polymers and resins including Polyethylene (LDPE and HDPE) can be done through econometric analysis for price elasticity of supply. This approach is used to estimate the price elasticity of supply using the production function, as described below (Still, 2014):

Ps = f {P, I, G, M}(1)

Where :

Ps: Price of Ethylene.

I: Federal Reserve Bank Interest Rates.

M: Material Input (Oil &Ethylne Price).

G: Gross Domestic Product.

Q: Price of Group I Polymer and Resin products including Polyethylene.

High inflation rates are usually associated with overheated economic conditions. This means that economic conditions experience demand for products that exceed the capacity of their product offerings, so prices tend to increase. The interest rate that is too high will affect the present value of the company's cash flow so that the investment opportunity will not be attractive anymore. Empirical macroeconomic factors have proven to have an influence on investment developments in several countries. (Purnowo, 2014).

A.Formulation of Problem

Polyethylene prices in Indonesia are fluctuating economic phenomena which are influenced by the Global economy and the macro besides being supported by the ability and quality stability in producing Plastic Seeds (HDPE and LDPE) which indicators are influenced by various things including Ethylene Prices, Economic Growth Indonesia, Inflation Rate, Bank Indonesia Interest Rate, Polyethylene Supply, Polyethylene Demand, Petroleum Prices. On the basis of the above problems, the research question that will be solved in this study is:

1).How do Ethylene Prices influence, Indonesia's Economic Growth, Inflation Rate, Bank Indonesia Interest Rates, Supply Polyethylene, Demand Polyethylene, Petroleum Prices on Polyethylene Prices in Indonesia in the period 2007-2017?.

2).What factors have the most influence on Polyethylene Prices in Indonesia in the 2007-2017 period for variables; Ethylene Prices, Indonesian Economic Growth, Inflation Rate, Bank Indonesia Interest Rates, Supply Polyethylene, Polyethylene Demand, Petroleum Prices?

B.Research Purposes

Based on the background and formulation of the problem above, the objectives to be achieved in this study are:

1).Analyzing the influence of Ethylene Prices, Indonesia's Economic Growth, Inflation Rate, Bank Indonesia Interest Rates, Supply Polyethylene, Demand Polyethylene, Petroleum Prices on Polyethylene Prices in Indonesia in the period 2007-2017.

2). Analyzing what factors have the most influence on Polyethylene Prices in Indonesia in the 2007-2017 period for variables; Ethylene Prices, Indonesian Economic Growth, Inflation Rate, Bank Indonesia Interest Rates, Supply Polyethylene, Polyethylene Demand, Petroleum Prices.

III. Methods

The research method used in this study is a causal method that aims to examine the effect of Polyethylene Prices in Indonesia in the period 2007 - 2017 against. Inflation Rate, Bank Indonesia Interest Rate, Polyethylene Supply, Polyethylene Demand, Petroleum Price. The technique used to get a representative sample is purposive sampling. The data used in this study is secondary data. Secondary data obtained from the Central Statistics Agency, Bank Indonesia and KOMPAS Daily.

The analytical method in this study uses the method of multiple regression analysis and deviation test against classic assumptions which include multicollinearity test, autocoleration test, and heterocedasticity test

In analyzing the factors that influence Polyethylene Prices in Indonesia in the period 2007-2017, models are used:

$$LgPE= \alpha + \beta_1 LgE + \beta_2 LgSP + \beta_3 LgDP + \beta_4 LgOP + \beta_5 \ LgSBI + \beta_6 \ LgIf + \beta_7 \ LgPDB \ (2)$$

Where :

PDB = National Economic Growth

PE = Polyethylene price

 E = Ethylene price

DP = Polyethylene Demand

SP = Supply Polyehtylene

OP = Petroleum Price

SBI = Bank Indonesia Interest Rates

If = Inflation Rate

α = constant

Lg = Logarithmic Function

$\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$ $\beta 5$ β 6 $\beta 7$: Coefficient - Coefficient

Inflation Rate, Bank Indonesia Interest Rate, Indonesian Economic Growth, Ethylene Prices, Polyehtylene Supply, Polyethylene Demand, Oil Prices are used as independent variables that are partially or jointly suspected of affecting the Polyethtyelene Prices of Indonesia in the period 2007 - 2017.

IV. Result

A.Simultaneous Test (F) [Conformity Model]

Based on the ANOVA table or F test, the calculated F value is 92,356 with a probability of 0.002. Because the probability is smaller than 0.05, it can be concluded that the coefficient of regression is Inflation Rate (If), Bank Indonesia Interest Rate (SBI), Supply Polyethylene (SP), Polyethylene Demand (DP), Petroleum Price (OP), Price Ethylene (E). or the seven independent or independent variables simultaneously influence the Polyehtyelene Price in Indonesia in the period 2007 - 2017. This also means that the coefficient of determination R^2 is not equal to zero or significant. For more details, see Table 1.0 below:

Table 1.0 Simultaneous Signification Test (ANOVA)

Model	F	Sig.
	92,356	0,002[a]

a. Predictors: (Constant), E, If, GDP, OP.SBI, SP, DP

b. Dependent Variable: PE

Source: Processed Data (2018)

B.Coefficient of Determination

      The outer outer appearance of the SPSS summary model shows the magnitude of Square R^2 of 0.995. This means that Polyethtyelene prices in Indonesia in the period 2007 - 2017. 99.5% can be explained by variations of seven independent or free variables; Inflation Rate (If), Bank Indonesia Interest Rate (SBI), Supply Polyethylene (SP), Polyethylene Demand (DP), Petroleum Price (OP), Ethylene (E) Price.

      While the rest (100% - 99.5% = 0.5%) is explained by reasons other than the model, the Standard Error of Estimate [SEE] is 0.00718, the smaller the SEE value will make the regression model more precise in predict dependent or dependent variables, for more details can be seen in Table 2.0 below:

Table 2.0. Coefficient of Determination.

Model	R	R Square	Durbin-Watson
	0,998[a]	0,995	3,156

Predictors: (Constant), E, If, GDP, OP.SBI, SP, DP
b. Dependent Variable: PE
Source: Processed Data (2018)

C.Multiple Regression Equations

      To interpret the parameter coefficients of independent variables can use unstandarized coefficients or standarized coefficients. Of the seven independent or independent variables included in the model it turns out that only three (3) variables, namely Bank Indonesia Interest Rate (SBI), Inflation (If) and Price Ethylne, are significant at $\alpha < 5\%$, this can be seen from the probability of both far below 0.05 [SBI = 0.01 <0.05 & If = 0.012 <0.05 & E = 0.01 <0.05]. The remaining five (4) independent variables; Supply of Polyethylene (SP), Polyethylene Demand (DP), Petroleum Price (OP), which is influential and insignificant because of $\alpha> 5\%$, where SP = 0.93> 0.05, DP = 0.130> 0.05; GDP = 0.088> 0.05; OP = 0.211> 0.05. For more details, see Table 3 below:

Table 3.0 Partial Significance Test (t Test).

Model	Unstandardized Coefficients		t	Sig.	Level	Sign
	B				$\alpha <= 5\%$	(No)
(Constant)	0,956		2,736	0,072	> 5 %	No
E	0,293		5,800	0,010	< 5 %	Significant
PDB	0,268		2,501	0,088	>5 %	No
SBI	-0,388		-5,904	0,010	< 5 %	Significant
If	0,662		5,446	0,012	< 5 %	Significant
OP	0,058		1,584	0,211	> 5 %	No
SP	-0,225		-0,095	0,930	> 5 %	No
DP	0,483		2,070	0,130	> 5 %	No

Depedend Variabel : Polyethylene(PE)

      The constant coefficient is positive and not significant stating that by assuming the absence of variables Inflation Rate (If), Bank Indonesia Interest Rate (SBI), Indonesian Economic Growth (GDP), Supply Polyethylene (SP), Polyethylene Demand (DP), Petroleum Prices (OP), Price of Ethylene (E), the price of Polyethtyelene in Indonesia in the period 2007-2017 has increased by 0.956 units.
• The regression coefficient of Ethylene (E) Price is positive and significant, stating that the price of Ethylene (E) by assuming the absence of other independent variables, then if it experiences an increase, the Polyethylene price in Indonesia in the period 2007-2017 has increased 0.293 units
• The Indonesian Economic Growth (GDP) regression coefficient is positive and insignificant, assuming the absence of other independent variables, so if Indonesia's Economic Growth (GDP) increases, Polyethylene prices in Indonesia in the 2007-2017 period have increased by 0.268 Units.
• The Bank Indonesia interest rate coefficient (SBI) regression is negative and significant, that assuming the absence of other independent variables, if the Bank Indonesia Interest Rate (SBI) increases, then the Polyethylene Price in Indonesia in the period 2007-2017 has decreased by 0.388 Units.
• The regression coefficient of Inflation Rate (If) is positive and significant, stating that by assuming the absence of other independent variables, then if the Inflation Rate (If) increases then the Polyethylene Price in Indonesia in the period 2007 - 2017 has increased by 0.662 Units.

• The Petroleum Price (OP) regression coefficient, which is positive and not significant, states that by assuming that there are no other independent variables, the Petroleum Price (OP), if increasing, Polyethylene Prices in Indonesia in the period 2007 - 2017 increased by 0.058 Unit.

• Supply Polyethylene (SP) regression coefficient is negative and has no significant effect, stating that by assuming the absence of other independent variables, if Supply Polyethylene (SP) increases, Polyethylene Prices in Indonesia in the period 2007-2017 have decreased by 0.225 Units.

• Demand Polyethylene (DP) regression coefficient is positive and not significantly influential, stating that by assuming the absence of other independent variables, if the Polyethylene Demand (DP) increases, then the Indonesian Polyethylenedi price in the period 2007 - 2017 has increased by 0.483 Units.

So it can be concluded that the Polyethylene Price variable in Indonesia in the period 2007 - 2017 is influenced by Ethylene (E) Price, Bank Indonesia Inflation (If) and Interest Rate (SBI), so that the multiple regression equation becomes as follows:

Log PE = 0,956 + 0,293 Log E - 0,388 Log SBI + 0,662 Log If.(3)
D.Test Multicolinearity

Multicollinearity test aims to test whether the regression model found a high or perfect correlation between independent variables. If there is perfect multicollinearity between independent variables, then the independent variable regression coefficient cannot be determined and the standard error value becomes infinite. If multicollinearity between independent variables is high, the regression coefficient of the independent variable can be determined but having a high standard error value means that the regression coefficient cannot be estimated correctly.

a).Guided by table 4.0, it looks E, SBI, GDP, IF, OP, SP and DP CI values above 30 which show strong multicollinearity.

b).Guided by table 4.0, it looks E, SBI, GDP, IF and OP have a Tolerance value above 0.10. Can be taken Complications there is no multicollinearity, while for Tolerance below 0.10, namely SP (0.049) & DP (0.056). Can be taken Complications have mild multicollinearity. Whereas for VIF; Independent Variables; E, SBI, GDP, IF and OP below 10 So that VIF with the Independent Variable, it can be taken that there is no multicollinearity. while for VIF above 10 are SP (20,213) & DP (17,951). Can be taken Complications have mild multicollinearity.

Table 4.0 Tolerance, VIF and CI Independent Variables

Model	Collinearity Statistics		Condition Index
	Tolerance	VIF	
(Constant)			1,000
E	0,514	1,944	34,99
SBI	0,203	4,914	112,010
PDB	0,169	5,933	57,846
If	0,204	4,905	79,876
OP	0,211	4,180	1017,75
SP	0,049	20,213	418,174
DP	0,056	17,951	182,468

Proceses (2018)

E.Autocorrelation Test

Autocorrelation test aims to test whether in a linear regression model there is a correlation between residual errors in period t with errors in period t - 1 (before). If there is a correlation, then there is a problem with autocorrelation. Autocorrelation arises because sequential observations over time are related to each other (Ghozali, 2014).

This problem arises because the residuals are not free from one observation to another. This is often found in time series data because the disturbance in a person / individual / group tends to affect the disturbance in the same individual / group in the next period.

There are several ways that can be used to detect the presence or absence of autocorrelation. One method commonly used to detect autocorrelation in multiple linear regression is Durbin Watson (DW) Test. The D-W test is one test that is widely used to determine whether there is autocorrelation. Almost all statistical programs have provided facilities to calculate the d value (which describes the DW coefficient). The value of d will be in the range 0 to 4, see the following table:.

Tables: A-5a (Ghozali, 2014) for n = 11& k = 7 obtained dL = 0.595; dU = 2,339
   4-dU <d <4 - dL➜ 4-2,339 < 3,156> 4 -0,595➜1,61 <2,229 <3,405

   Based on the test results in Table 4.8. The Multiple Regression Analysis Equation, obtained Durbin Watson (DW) Value is = 3.156. It means that d is between 1,463 and 2,396, so the conclusion that the Indonesia Multiple Regression Analysis Equation in the period 2000-2016 has no decision or doubtful area ➜Ho; means there is no autocorrelation.

F.Test Heteroscedasticity

   There are two ways to detect the presence or absence of Heteroscedasticity, namely by the graph method and the statistical method. The graph method is usually done by looking at the plot graph between the predicted value of the dependent variable and the residual. While statistical methods that can be used to identify the presence or absence of Heteroscedasticity problems, some of these methods are Park Test, Glejser Test, Spearman Test, Goldfeld-Quandt Test, Bruesch-Pagan-Godfrey Test and White Test. But what will be discussed in this section is only the Glejser Test:

   Results can be seen in table 6.0. clearly shows the overall variables, Inflation Rate (If), Bank Indonesia Interest Rate (SBI), Supply Polyethylene (SP), Polyethylene Demand (DP), Petroleum Price (OP), Ethylene Price (E), has a significance value which is all in above 0.01, which means there is no Heteroscedasticity in this model, in other words all the independent variables contained in this model have the same or homogeneous variant distribution.

Table. 6. Glerjer Test Tables for Determination There Are No Heteroscedasticity

Model	Sig.
(Constant)	0,579
E	0,435
SBI	0,500
PDB	0,544
If	0,542
OP	0,624
SP	0,796
DP	0,834

a. Dependent Variable: AbsUi
Data processed (2018).

V. Discussion

   The volatility of world crude oil prices in the global market has a very significant upward trend from the beginning of 1990 until now. This has an effect on the petrochemical industry which is directly affected by the increase in world crude oil prices in the global market along with risks to company management. Through changes in the market economy, the final product of the petrochemical industry is trying to change the fixed price structure, to a price that can change depending on changes in crude oil prices in the global market (Nizar, 2012).

   Many petrochemical industry producers implement company management policies in anticipating the increase in world crude oil prices through programs such as optimizing capital risk, maximizing debt leverage, reducing risk of obtaining income from volatility, limiting capital investment, cash flow savings, increasing business and sales using flexible petrochemical product price contracts and tax benefits. The main objectives derived from corporate hedging done by industries that produce petrochemical products above are in the form of policies to reduce costs and maximize profits by reducing price volatility or often referred to as crude oil price volatility in the global market. (Malikane, 2014).

VI. Conclusion

   Ethylene Prices, Inflation Rates and Interest Rates Bank Indonesia significantly influences Polyethylene Prices in Indonesia in the period 2007 - 2017.
Ethylene Prices & Inflation Rate contribute positively and significantly, while Bank Indonesia Interest Rate (SBI) contributes negatively and significantly to Ethylene Prices in Indonesia in the period 2007 - 2017.

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