The Impact of Total Cost Changes on Macroeconomic Aspects and Petrochemical Industry of SB Latex in Indonesia in The Period of 1997-2015

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Abstract— **The purpose of this research is to recommend the model of Total Cost Petrochemical Industry (SB latex) in Indonesia viewed from the side of SB Latex Indonesia Industry and Macroeconomic Aspect in the period 1997-2015. The results will be published in internationally reputable journals. Specific objectives of research for nineteen years are 1) Analyzing the effect of Change; Oil Price, SB Latex Price, Styrene Price, Changes in Bank Indonesia Interest Rates, Inflation Rate & Indonesian Economic Growth on Total Cost Changes. 2) Analyzing what factors are the most powerful impact on changes in Total Cost in terms of Macroeconomic Aspects and changes in Oil prices, SB Latex Price, Styrene Price. 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 results show the most influential and significant is the rate of inflation, economic growth, world crude oil prices and styrene prices. The macroeconomic aspect has a positive impact, while the styrene price has a negative effect.**

Index Terms— **Product Domestic Bruto, Total Cost, Styrene, Butadiene, SB Latex Price.**

I. INTRODUCTION

Currently there are three companies in Indonesia that produce SB Latex where the companies are almost simultaneously start up production in 1995 that is PT Dow Chemical and PT Latexia Indonesia while PT BASF Indonesia has been in production in 1991. The first significant influential factor for SB industry Latex to survive and to be competitive in facing of the global competition is the external factor or more commonly termed as a macroeconomics factor, which includes; GDP, exchange rate, inflation rate, Bank Indonesia interest rate and price of Crude Oil (Saygili, 2009). In the making of Styrene Butadiene Latex, there are some other raw materials used besides Styrene and Butadiene, such as solid raw materials (Raw Material Solid), Water (50%) and other additional raw materials and utility chemicals (Ormonde, 2008). Thus, the raw material factor is the variable cost that has the most influence on the pricing structure of the product other than the direct labor and Overhead Cost; the three variables affecting the price of the SB Latex product are Cost Measurement (Misra, 2009). The growth of Polymer Emulsion Synthetic Latex (PESL) Industry is one of the strategic Petrochemical Industries in Indonesia developed from 1990 to present. For now, the main consumers are Paper Industry which has big

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capacity such as APP (Asia Pacific Pulp and Paper) Group including, PT. Indah Kiat, PT. Pindodeli and PT. Tjiwi Kimia. A small portion is allocated to paper mills with medium to small capacity as well as to the Carpet Industry such as; PT. Universal Carpet, PT. Nobel Carpet and PT. Indonesia Carpets (Carpicorn IndoConsultant/CIC 2010).

There are some external factors (macroeconomics) that can affect the performance of the company or External Strategic Factor (Wheelen and Hunger, 2010); they are external environmental factors that have a great influence on corporations or very large companies. Chemical and Petrochemical Industry is inseparable from the dependence of raw materials, where the main raw material of Petrochemical Industry is Ethylene. Ethylene Industry is a Supply Industry (Up Stream industry) for other Petrochemical Industries, which is Down Stream or its derivatives (Reklaitis, G.V, Papageorgaki, S, Tsirukis A.G, , 2010).

As shown in Table 1.0 shows a significant increase starting from January 1997 Oil price is around $ 16 / Ton but by the end of 2013 it has increased to $104 / Ton and by the end of 2015 the price declined almost 200% to reach $ 50 / MT. In addition the table1.0 can be seen in early 1997 at Styrene $ 312 and Butadiene $ 501, end of 2013 the price has reached $ 1685 for Styrene and $ 3484 for Butadiene. So also for the Total Cost beginning in 1997 is still around $ 43.2104 but the end of 2009 reached $ 93,200, more clearly see Table 1.0 below:
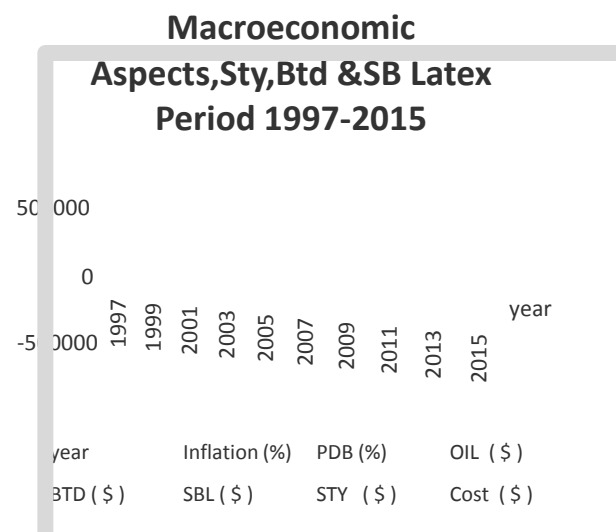

Fig. 1. Macroeconomics Aspects, Styrene, Butadiene, SB Latex from 1997 to 2015 . Source: BPS (2017)

II. LITERATUR REVIEW

The concept used is sistematically related to the concept ever proposed by Porter, 2010 namely the Forces Driving Industry Competition, which explains the similar industry competition that occurs among similar industries through mechanisms: a). Threat of newcomers. b). Other stakeholder interests consisting of: Trade Unions, Government, special interests and others. c). The suppliers, who can provide the bidding power of the suppliers. d). Substitutes, threats of substitute products or with competing services. e). The buyers, who have the bidding power of the buyers.

Petrochemical industry generally includes upstream industry or raw material supplier industry or commonly termed as Raw Material. For the chemical industry that produces Polymer Synthetic Latices is commonly regarded as industrial of semi-finished goods or chemicals or Primary Manufacture (Hunger, 2010). Chemical industries that produce Polymer Synthetic Lates, the technology used is Batch or Semi Batch Reactor, the start of the reactant carried out under certain reaction conditions and further reaction for a specific period of time until the corresponding conversion is obtained. Batch and Semi-Batch Reactors are used routinely in the application of special industrial chemicals, Polymerization Industry, Pharmaceutical Industry (Drugs) and Bioprocessing Facilities (Seeborg and Mellichamp, 2010).

The petrochemical industry is a major producer of raw materials for other industrial sectors since most products are still mostly intermediate products or their products are still mostly raw materials for other industries. The increasing use of petrochemical products for industries, in accordance with industry needs in Indonesia, can be divided into 8 user industry sectors (Panjaitan, 2006), namely; fertilizer industry and pesticide industry, synthetic fiber industry, plastic materials industry, adhesive resin industry, paint or coating raw material industry, detergent or washing industry, elstomer industry or synthetic rubber & special chemical industry.

A. Formulation of The Problem

Changes in Total Cost of SB Latex Industry is generally influenced by several factors, among others; Oil Price, SB Latex Price, Butadiene Price, Styrene Price, Change of Bank Indonesia Interest Rate, Inflation Rate and Economic Growth of Indonesia. Based on the problems mentioned, then the research questions to be solved in this study are.

1).How is the influence of Oil Price, SB Latex Price, Butadiene Price, Styrene Price, Changes of Bank Indonesia Interest Rate, Inflation Rate & Economic Growth of Indonesia to Total Cost of SB Latex Industry in Indonesia in 1997-2015?.

2). Which factors have the most influence on the Total Cost of SB Latex Industry in Indonesia in the period 1997 - 2015 for variables; Oil Price, SB Latex Price, Butadiene Price, Styrene Price, Changes in Bank Indonesia Interest Rate, Inflation Rate & Economic Growth of Indonesia?

B. Research Purposes

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

1). Analizing the influence of Oil Price, SB Latex Price, Butadiene Price, Styrene Price, Changes of Bank Indonesia Interest Rate, Inflation Rate & Economic Growth of Indonesia to Total Cost of SB Latex Industry in Indonesia in 1997-2015?.

2). Analizing which factors have the most influence on the Total Cost of SB Latex Industry in Indonesia in the period 1997 - 2015 for variables; Oil Price, SB Latex Price, Butadiene Price, Styrene Price, Changes in Bank Indonesia Interest Rate, Inflation Rate & Economic Growth of Indonesia?

III. METHOD

The research method used in this study is a causal method that aims to examine the effect of Total Cost of SB Latex Industry in Indonesia in 1997 - 2015 period. Oil Price, SB Latex Price, Butadiene Price, Styrene Price, Changes in Bank Indonesia Rate, Inflation Rate & Economic Growth Indonesia. The technique used to obtain a representative sample is purposive sampling.The data used in this study is secondary data. Secondary data obtained from PT BASF Indonesia and BPS (Statistical Bureau of Indonesia).

The method of analysis in this study using multiple regression analysis method and the deviation test against the classical assumption which includes multicolinearity test, autocoleration test, and heterokedastisity test.

In analyzing the factors influencing the Total Cost of SB Latex Industry in Indonesia from 1997 to 2015 :

$$LgTC = \alpha + \beta 1 LgPDB + \beta 2 LgTI + \beta 3 LgOIL + \beta 4 LgSTY + \beta 5 LgBTD + \beta 6 LgSBL \quad (1)$$

Where:
GDP = National Economic Growth
TC = Total Cost of SB Latex Industry in Indonesia
OIL = World Crude Oil Price
TI = Inflation Rate
STY = Price Styrene in Indonesia
BTD = Butadiene Price in Indonesia
SBL = Price Styrene Butadiene Latex
α = Constants
Lg = Logarithmic Function.
β1, β2, β3, β4 β5 β 6 β7: Coefficients - Coefficients
Price of Oil, SB Latex Price, Butadiene Price, Styrene Price, Interest Rate Changes of Bank Indonesia, Inflation Rate & Economic Growth Indonesia became independent variables partially or together affect the Total Cost of SB Latex Industry in Indonesia in 1997 - 2015 period.

IV. RESULT AND DISCUSSION

A. Simultaneous Test (F) [Conformity Model]

Based on the ANOVA or F test table obtained the F value of 4.841 with a probability of 0.01. Since probability is less than 0.05, it can be concluded that the regression coefficient of Oil Price (OIL), SB Latex (SBL) Price, Butadiene Price (BTD), Styrene Price (STY), Inflation Rate (TI) & Economic Growth Indonesia GDP) or the six independent –free- variables simultaneously affect the total cost of SB Latex Industries in Indonesia in the period of 1997-2015. This also means the value of determination coefficient R^2 is not equal to zero or significant. For more details can be seen in Table 1.0below:

Table 1.0 Simultaniuos Test (ANOVA)

Model	F	Sig.
	4,841	0,01ᵃ

a. Predictors: (Constant), PDB,TI,OIL,STY.BTD, SBL
b. Dependent Variable: TC
Source: Processed data (2018)

B. Coefficient of Determination

The SPSS model summary outlook shows that square R^2 is 0.708. This means that the total cost of SB Latex industry in Indonesia during 1997- 2015 is 70.8% can be further explained by the variation of six independent or free variables: oil price (Oil), SB Latex Price (SBL), Butadiene Price (BTD), Styrene Price (STY), Inflation Rate (IR) and Indonesia's Economic Growth. (IEG). While the remaining procentage (100% - 70.8% = 29.2%) can be explained by some other causes outside the model, Standard Error of Estimation (SEE) is 0.1640417. To lesser the SEE value is the more precise the regression model make in predicting the hanging variables or the dependent variables. For a more detailed explanation can be seen in table 2.0 below:

Table 2.0. Coeficient of Determination

Model	R	R Square	Durbin-Watson
	0,841ᵃ	0,708	2,634

a. Predictors: (Constant), PDB,TI,OIL,STY.BTD, SBL
b. Dependent Variable:TC
Source: Processed data (2018).

C. Multiple Regression Equations

To interpret the coefficients of independent variables parameters can use unstandarized coefficients and standarized coefficients. Of the six independent or independent variables included in the model, there were only four (4) variables: Styrene Oil Price (STY), Inflation Rate (TI) and Indonesian Economic Growth (GDP), which was significant at α <5%, as seen from the probability of significance is well below 0.05 [OIL = 0.049 <0.05; STY = 0,038 <0,05; GDP = 0,006 <0,05; TI = 0.002 <0.05]. The two independent variables are influential and not significant ie SB Latex (SBL) price, Butadiene Price (BTD), since α> 5%, where BTD = 0,413> 0,05 and SBL = 0,616> 0,05. For more

details can be seen in Table 3 below:

Table 3.0 Partial Significance Test (t test).

Model	Unstandardized Coefficients			Level	Sign
	B	t	Sig.	α <= 5 %	no
(Constant)	7,157	2,970	0,012		
				<5 %	Significant
TI	0,524	3,956	0,002		
				< 5 %	Significant
PDB	0,241	3,312	0,006		
				< 5 %	Significant
STY	-1,520	-2,338	0,038		
				< 5 %	Significant
BTD	0,242	0,847	0,413		no
				> 5 %	
OIL	1,332	2,190	0,049		Significant
				<5%	
SBL	-0,434	-0,515	0,616		
				> 5 %	no

Depedend Variabel : TC
Source: processed data (2018)

The constant and positive value coefficient significantly states that assuming the absence of variables: Oil Price (OIL), SB Latex (SBL) Price, Butadiene Price (BTD), Styrene Price (STY), Inflation Rate (TI) & Indonesia Economic Growth (GDP)). The Total Cost of SB Latex Industry in Indonesia in 1997 to 2015 experienced an increase of 7,157 units.
• The regression coefficient of Inflation Rate (TI) is positive and significant, stating that by assuming the absence of other independent variables, if the Inflation Rate (IT) has increased, then the total cost of SB Latex Industry in Indonesia in 1997 - 2015 period experienced an increase of 0.524 units
• The regression coefficient of Indonesian Economic Growth (GDP) is positive and significant, assuming the absence of other independent variables, so if Indonesia's Economic Growth (GDP) has increased, the total cost of SB Latex Industries in Indonesia from 1997 to 2015 experienced an increaseof0.241Units.
• The regression coefficient of the Styrene Price (STY) is negative and significant, assuming the absence of other independent variables, if the Styrene Price (STY) increases, then the total cost of SB Latex Industries in Indonesia from 1997 to 2015 has decreased 1,520 Units.
• The regression coefficient of Butadiene Price (BTD) is positive and insignificant, stating that by assuming the absence of other independent variables, if the price of Butadiene (BTD) has increased, the total cost of SB Latex Industries in Indonesia in 1997 - 2015 has increased by 0,242 Units.
• The World Oil Price Coefficiency (OIL) is positive and significant, stating that by assuming the absence of other independent variables, if Oil Price (OIL) increases, then the Total Cost of SB Latex Industry in Indonesia from 1997 to 2015 has decreased by 1.332 Units.
SB Latex Price (SBL) is negative and insignificant, stating that by assuming the absence of other independent variables, if SB Latex (SBL) increases, then the Total Cost of SB Latex Industry in Indonesia from 1997 to 2015 has decreased by 0.434 Units.
Therefore, it can be concluded that the variable of SB Latex industry Total Cost in Indonesia in 1997 – 2015 is affected by the oil price (OIL)/ Styrene price (STY), Inflation Rate (TI) &

Indonesia Economic Growth (GDP), so that the multiple regression coefficient is :

Log TC = 7,157 +0,524Log TI+0,241LogPDB – 1,520 Log STY+1,332 LogOIL   (2)

D. Test Multicolinearity

Multicollinearity test aims to test whether in the regression model found a high or perfect correlation between independent variables. If the inter-independent variable is a perfect multicolinearity, then the independent variable regression coefficient can not be determined and the standard error value becomes infinite. If the multicollinearity between independent variables is high, then the regression coefficient of independent variables can be determined but has a high standard error value means the regression coefficient value. Cannotbeestimatedproperly.

a). Based on table 4.0, the TI and GDP have CI values below 10, which means no Multicolinearity, then for STY has a CI value between 10 - 30 which means there is mild multicolinearity. Then another variable has a CI value above 30 indicating strong multicollinearity ie BTD, OIL and SBL.

b). Based on table 4.0, it appears that TI, GDP and SBL have a Tolerance value above 0.10. It can be concluded that there is no multicolinearity, whereas for Tolerance less than 0.10 is STY (0.068) & OIL (0,046). It can be concluded that there can be a mild multicollinearity. As for the VIF; Independent Variable; TI, PDB, BTD and SBL below 10 So VIF with Independent Variables; can be taken conclusion there is no multicollinearity. While for VIF above 10 is STY (14,712) & OIL (21,541). It is concluded that there can be a mild multicollinearity.

Tabel 4.0. Tolerance , VIF dan CI Independen Variabel

Model	Collinearity Statistics		Condition Index
	Tolerance	**VIF**	
(Constant)			1,000
TI	0,558	1,792	2,813
PDB	0,465	2,150	9,267
STY	0,068	14,712	22,216
BTD	0,184	5,427	61,478
OIL	0,046	21,541	129,73
SBL	0,129	7,729	234,716

SourceData(2018)

E. Autocorrelation Test

Autocorrelation test aims to test whether in a linear regression has a correlation between residual errors in period t with error in period t - 1 (previous). If there is a correlation, then there is an autocorrelation problem. Autocorrelation arises because of sequential observations over time related to each other (Janie, 2012). This problem arises because residuals are not free from one observation to another. This is often found in time series data because the disruption in a person / individual / group tends to affect the disruption of the same individual / group in thennextperiod.

There are several ways that can be used to detect the presence or absence of autocorrelation. One common way of detecting autocorrelation in multiple linear regression is with Durbin Watson (DW) Test. D-W test is one of the most widely used test to determine whether or not there is autocorrelation. Almost all statistical programs already provide facilities to calculate the value of d (which describes the DW coefficients). The d value will be in the range of 0 to 4, see the following table: : A-5a (Gujarati, 2010) ➔

n=19 & k = 6 obtained dL = 0.649; dU = 2,206

4-dU <d <4-dL ➔4-2,206 <2,634> 4 -0,649➔ 1,794<2,206 <3,351

Based on the test results in Table 4.8. the equation of Multiple Regression Analysis the value of Durbin Watson (DW) obtained is = 2,634. It means d is between 1.794 and 3.351 then the conclusion of Total Cost SB Latex Industry in Indonesia in the period 1997 - 2015 **that no decision or dubious ➔ Ho; areas means no autocorrelation.**

F. Test Heteroscedasticity

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

Glejser Test. The results can be seen in table 6.0. Clearly shows the overall variables SB Latex (SBL), Butadiene Price (BTD), Styrene Price (STY), Inflation Rate (TI) and Indonesian Economic Growth (GDP) have a significance value of all above 0.01. This means that there is no Heteroskedasticity in this model, in other words all the independent variables contained in this model have the same orhomogeneousvariant.

Table. 6. Glejser Test Table which No Heteroscedastisity.

Model	Sig
Constant	0,341
TI	0,204
PDB	0,204
STY	0,402
BTD	0,252
OIL	0,813
SBL	0,315

Dependent Variable :AbsUi
Source:Processed Data(2018)

V. CONCLUSION

Oil Price, Styrene Price (STY), Inflation Rate (TI) and Indonesia Economic Growth (GDP) have significant effects on Total Cost of SB Latex Industry in Indonesia in 1997 - 2015 periods.

Price of Oil, Inflation Rate (TI) and Indonesia Economic Growth (GDP) give positive and significant contribution, while Styrene Price (STY) gives negative and significant contribution to Total Cost of Industry SB Latex in Indonesia inperiod1997-2015.

The petrochemical industry is generally dependent, the supply of fossil raw materials in this case Crude Oil (Oil) which is Upstream product which is Upstream Industry of Petrochemical, from which Crude Oil can be converted into derivative products from Petrochemicals including Styrene Butadiene Latex (Polymer Emulsion). So if the World Crude Oil Price fluctuates it will significantly affect the prices of Petrochemical derivative products including here is Styrene. In the manufacture or production process Styrene is a major component with the greatest composition compared with Butadiene. So do the development of SB Latex Technology that minimize the use of Styrene but produce SB Latex with greaterConversion.

Macroeconomic aspects are so important for the sustainability of the Petrochemical Industry; the most important factor is maintaining the stability of Political, Social, Legal and Security, so that the investment climate will eventually become Condusive. Impact on growing economic growth and stable inflation rate from year to year, so the world feels comfortable, the visible implications are felt by the community opening up new jobs and reducing Unemploymentandpoverty

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