IMPACTS OF SUGAR IMPORT POLICY ON SUGAR PRODUCTION IN INDONESIA

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Abstract

Production of sugar unfulfilled consumption of Indonesia society. The lack of consumption and production have fulfilled by import. Assumption national consumption 2,7 million ton, Indonesia will import sugar in 2013 predicted about 300.000 ton (Tempo.co, August, 21, 2012).
The aims in general of this research are to understand the impact of sugar import policy on sugar production. Especially (1) to understand the factors that influence sugar import price, (2) to understand impact of sugar import price on sugar domestic price and (3) to understand the impact of sugar domestic price on sugar production.
Model analysis of this research is Simultaneous Error Correction Model. This model can estimate the structural parameter exactly (unbiased parameter) (Gujarati, 2010). Policy made on this research can be responsibly.
The results of this research are shown that price of sugar import influenced by world sugar price and the quantity of sugar imported and tariff is not. Price of domestic sugar influenced imported sugar price. And domestic sugar price has influence the sugar production.
Import policy in sugar to fulfill lack of consumption and production will make decreased sugar domestic price. The decrease of sugar domestic price will impact on decrease of sugar production. That policy have dilemma on consumption and production.

Keywords: sugar imported, price of sugar imported, sugar domestic price, sugar production and policy dilemma.

1. BACKGROUND ISSUES

Indonesian sugar industry faces a variety of interrelated issues, such as the placement of sugar as one of the basic needs. Consequences are distribution and prices intervention by the government; producer of sugarcane as raw materials and sugar factory that process raw materials into sugar and its distribution is a separate organization. Also inefficiency both at the farm and the factory is still going on, the bias of government policy, as well as the high trade distortions in the international market. As a result, productivity and yield tends to decrease, which in the long run will threat the existence of the sugar industry in Indonesia.

Sugar is one of the agricultural products and basic commodities that Indonesia needs can not be met by domestic production. Consumption of sugar in Indonesia continued to increase, from 3.15 million tons in 1997 and reached 4.30 million tons in 2007 and in 2010 reached 4.6 million tons. From the production side, since 1995, has decreased to the lowest continue in 2000 to 1.60 million tons. The following year, 2001, production began to increase so as to achieve 1.95 million tons in 2007. In 2010 production of sugar is 2.3 million tons. With increasing consumption is not accompanied by the production, the imports also increased.

National sugar stock is currently prone (AGFI, 2012). According to the Indonesian Sugar Council report of January 2012, the national sugar stock position at 15 December 2011 was 667,000 tons. With an average consumption of 220,000 tons a month, it is only enough supplies for a period of 2.5 months.

Physically AGFI sugar farmers' living record of 30,000 tons (4.6%), sugar traders belonging 378.000 tons (57%), sugar mills owned by 258 000 tons (38%). Of physical stock report could be summed sugar farmers' relatively already sold out. Compared to sugar production by 2011 realized that only 2.1 million tons from 2.7 million tons a target for the stock is safe, then the conditions of production of sugar Indonesia will experience a major shortage in the coming years.

Lack of sugar consumption will be covered with imports. Since 1995 sugar imports have continued to rise; although in 2004 imports slightly decreased compared to the previous year (around 1.35 million tons to 1.34 million tons). Since 2004, imports have continued to rise, and even in 2010 imports reached 2.37 million tons, which is 55 percent of consumption. Condition suggests that the Indonesian sugar commodity markets become highly dependent on external markets.

From one side, sugar consumption increases, but on the other hand the performance of Indonesian sugar industry has declined. Diminishing performance of Indonesian sugar industry caused by a variety of interrelated issues. In general, these problems are:

1) Decrease irrigation sugarcane area and increase dry land area
2) Inefficiency farming
3) Inefficiency at the plant level
4) Unfair competition

1) Decrease irrigation sugarcane area and increase dry land area

In the decade of the 1990s, Indonesia sugarcane acreage declined at a rate of -0.50% / year, in which the irrigation area of sugarcane fields to decline and dry land area moor up. Condition is partly due to higher competition in land use, especially with rice. The movement of area for sugarcane to rice growing stronger as a result of government policy bias to the rice. For example, the ratio of the original price of sugar and rice around 2.40, has dropped to 1.86 *(Rusastra,* et *al,* 2000; Sudana, et al 2000).

Government policy in the provision of credit for sugarcane farming is often late and inadequate numbers also have contributed to the decline in sugarcane acreage (Woeryanto, 2000). Sugarcane cultivation requires more time than the farming of food crops such as rice (Woeryanto 2000) so that the availability of credit is necessary. Uncertainty in the availability of credit to make farmers hesitant to even divert sugarcane cultivation farming faster payback period, such as rice or onion (Husodo, 2000; Murdiyatmo, 2000; Pakpahan, 2000; Woeryanto, 2000).

2) Inefficiency Farming

Along with the decrease in acreage, sugarcane farming is inefficient, as reflected in a decrease in productivity. In 1990, the productivity of sugarcane approximately 76.90 tons of cane/ha, and in 1999 only 62.70 tons/ha (Hadi and Sutrisno, 2000) or decreased -2.24%/year. Productivity stemming from non optimal low cropping systems due to 1) the quality of the plant material is not good, 2) profit-sharing system between farmers and sugar factory were assessed farmers lacked transparency, 3) the low price especially in the last decade, and 4) unfavorable government policies.

3) Inefficiency in the factory

Decrease due to inefficiencies in "*rendemen"* (ratio sugar production on sugarcane) level reached 30%. This condition is caused by several factors. First, sugar mills especially those in Java mostly old that it can not achieve maximum efficiency (Husodo, 2000; Murdiyatmo, 2000; Woeryanto, 2000). Various attempts have been made to improve the efficiency of the repair or update equipment, but the effort is hampered by lack of funding and technology (PT Perkebunan Nusantara XI, 2000).

The second factor is the limited availability of raw materials so that the plant operates under optimal capacity. Decline in sugarcane acreage has reduced the availability of raw materials. Sugar factory is often difficult to achieve minimal capacity. In the last 10 years, from 59 sugar factory in Java, 17 factories have a total day ground below the national standard milled 150 days/year. With minimum criteria milling capacity of 2,000 tons cane/day, 28 million does not meet these standards (Arifin, 2000).

4). Unfair Competition

Before 23 September 2002, when the policy of import trade system implemented, Indonesian sugar industry faced with unfair competition, both in the aspect of production and trade. Very distorted world sugar industry, sugar industry while Indonesia only protected by a tariff of 25%. The main producer and consumer nations do subsidies and protect. This condition became the world sugar trade highly distorted (Devadoss and Kropf, 1996; Noble, 1997; Groombridge, 2001; Kennedy, 2001). Average world sugar prices in the last decade of U.S. $ 8.36 ¢ / lb (1 lb = 0.48 kg) are far below production costs averaged U.S. $ 17.46 ¢ / lb. Groombridge (2001) and Kennedy (2001) states that the sugar industry is an industry with the highest level of distortion due to the strong intervention of the government to protect the sugar industry respectively.

2. RESEARCH PROBLEMS

The problem in this study can be seen from the condition of the domestic sugar industry in terms of production, consumption and its relation to the world sugar market. From the production side, in the conditions of inefficient production and diminishing land area will be able to survive in the era of globalization? Whether the increasing *gap* between production and consumption which shows the dependence of consumption on imports can be sustained?

Of issues related to some aspects of the sugar industry, then this study more emphasis on production, consumption and imports of consumer needs. Election studies on aspects of production, consumption and imports as sugar import policy will greatly affect the structure and the national sugar production. With the import policy, the national sugar producers will be faced with competition from international sugar levels. The domestic sugar production has a higher competitiveness compared to other countries, it will increase sugar production and sugar markets will be more extensive. However, the opposite will happen if the national sugar industry competitiveness is lower when compared to other countries, the production will have an adjustment.

Increase in sugar price in the market is seen as signaling a lack offers in comparison to demand. Situation is resolved by importing sugar to meet the shortfall of supply. With the influx of imported sugar will affect the domestic sugar prices and production.

For producers, government intervention policy in the commodity is not seen in the range of policies, but its effect on the price of the commodity itself, so the price of the product used as consideration in production.

Therefore, it is specifically the main issues raised in this research are:

- What factors are affecting the price of imported sugar?
- What is the relationship between the domestic sugar market and world sugar markets on the domestic sugar price?
- How sugar producer response to changes in domestic prices.

3. LITERATURE REVIEWS

3.1. Theory Overview

Discussion of theoretical models of industry begins with a discussion of theoretical models of production, then the market of commodities.

1. Sugar Production

Actors in the production of the sugar industry consist of farmer as landowners and sugar factory as a provider of processing services to sugarcane. Since the President Instruction No. 9 of 1975, is no longer a sugar mill plantation company, as its main task to processing or grinding sugarcane produced by farmers.

Production of sugarcane produced by farmers will be processed into sugar in the sugar mills. How big is the amount of sugar produced from sugarcane is processed depends on yield ratio ("rendemen"); which is the ratio between the amount of sugar produced by the sugarcane milled.

Production of sugar produced is the product of the yield of the sugarcane production amount, or,

$$QDGL = REN * QTB \quad (1)$$

Where, QDGL is sugar production, REN is yield ratio and QTB is a sugarcane production.

By looking at the sugar factory function only as a sugarcane mill, the sugar production is largely determined by the farmers who grow sugarcane. Farmers as land owners are also faced with the alternative use of the land for other crops.

Farmers in choosing which plants will be grown on beside depending on the expected results of the plants, also take into account the opportunity costs of other plant.

$$TR = QDGL * PDGL \quad (2)$$

TR is total revenue and PDGL is the price of sugar.

As a producer of sugarcane, with its input, a farmer faced with the alternative crop production to be grown and produced. Assuming that rice is a product that competes with the sugarcane, the factors of production owned by the farmers can produce two kinds of alternative commodity. Linking the two is described in the production possibilities curve *(Production Possibility Curve).*

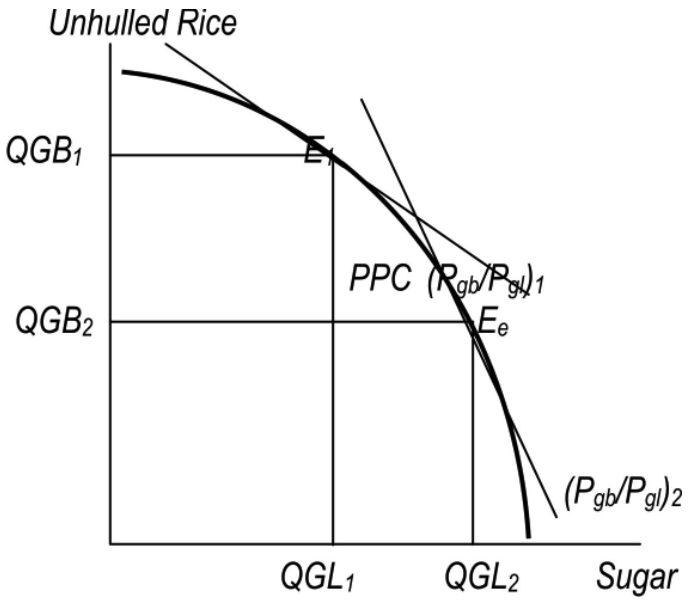

Figure 1. Production Possibility Curve

With a number of its factors of production, farmers can produce maximum production alternatives on the production possibility curve. The production possibility curve can be formulated:

$$A^{0} = f\,(QDGL, QGB) \qquad (3)$$

where:
A^{0} : Factors of production are owned by farmers (in this research is area)
QDGL : The amount of domestic sugar production
QGB : The amount of un hulled rice grain production

At equilibrium, the farmers who have given input will produce a combination of production in which the marginal rate of product transformation ($MRPT_{GL.GB} = dQ_{GB}/dQ_{GL}$) is equal to the ratio between sugar and grain prices (P_{GL} / P_{GB}). In other words, the *slope* of the production possibilities curve equal with *iso-revenue* curve *slope,* so the optimum combination of sugarcane and rice production reached at: $MRPT_{GL.GB} = dQ_{GB}/dQ_{GL}) = (P_{GL} / P_{GB})$. Therefore, the use of inputs (e.g. land) to produce output such as sugar (cane) can be written as follows:

$$A_{GL} = f\,(P_{DGL}, P_{GB}, P_{X}) \qquad (4)$$

where,
A_{GL} : Sugarcane acreage
P_{DGL} : Price of domestic sugar
P_{GB} : Rice price
P_{X} : Input price

Demand factors of production can be derived from the production function. Basing on the assumption that every economic agent producer of sugarcane/sugar will always aim to maximize profits: $= P_{Gdgl}.Q_{DGL} - P_{X}.X$ (Henderson and Quandt, 1980). Profits will reach a maximum when the first derivative of the profit function is equal to zero (0), so that:

$$\delta\prod X = P_{GL}.\delta Q_{GL}/\delta X - P_X\delta X/\delta X = 0 \quad (5)$$

$$P_{DGL} \cdot MP_X = P_X$$

This means that producer will reach equilibrium where the value of the marginal product of inputs used together equal with input prices.

So the demand for factors of production/input (area) can be represented by the price of output and prices of input and formulated as follows:

$$D_A^{GL} = f(P_{DGL,}P_{GB,}P_A) \quad (6)$$

Through the response area, the total production can be calculated by multiplying the area planted with sugarcane productivity, YTB:

$$QDGL = A^{DGL}.YTB \quad (7)$$

Since A^{DGL} and YTB is a function of product prices, commodity prices and input prices competitors, the sugar production is a function of the prices of sugar, un-hulled grain prices and input prices, or:

$$Q_{DGL} = f(P_{DGL}, P_{GB}, P_A) \quad (8)$$

2. Sugar Market

As the country is still importing sugar, the domestic sugar production faced competition from imported sugar. With the competition from imported sugar, then the behavior of domestic sugar producers will be faced with the behavior of the import manufacturers. The production of sugar in the country, mostly by state-owned enterprises (PTPN) and the rest is done by the private enterprise. In the sugar production, PTPN role as a processor of sugar cane into sugar. This phenomenon indicates that the limited number of sugar producers; so that the behavior can be seen as an oligopoly market.

Oligopoly market indicates that the sugar industry is only a few manufacturers that domestic producers are private companies, state-owned companies and importers. Behavior of producers (in this case domestic producers) engaged in oligopoly markets are strongly influenced by the behavior of other producers (importers/producers from abroad).

The combination of price, quantity and profit of oligopoly producers depend on the actions of other manufacturers (Henderson and Quandt, 1980). Manufacturers can control their own level of output (or price if the product *differentiated),* but can not control other variables that affect profit. Profit earned is the result of interaction between actors in the market decision.

No assumptions are generally accepted to see the behavior of producers engaged in an oligopoly market. Assuming sugar producers are only two domestic producers and foreign (imported), the theoretical analysis of the sugar market can be seen more clearly.

Both actors may behave as competitors as in a perfectly competitive market, but also can collude to become a monopolist. There are several solutions to explain the behavior of producers engaged in oligopoly markets, among others (Henderson and Quandt, 1980):

a) Quasi Competition Model

Suppose that in the market there are only two companies that produce homogeneous goods. *Inverse* demand function where the price is a function of the aggregate quantity sold:

$$P = F(q_1 + q_2) \quad (9)$$

q_1 and q_2 are output level of duopolies. Total revenue from each duopoly depended on the level of output itself and its competitors:

$$R_1 = q_1 * F(q_1 + q_2) = R_1(q_1 + q_2) \quad (10)$$

$$R_2 = q_1 * F(q_1 + q_2) = R_2(q_1 + q_2) \quad (11)$$

Rates of return / *profit* of each firm are equal to total revenue minus costs, which depend only on its own output level:

$$\prod_1 = R_1(q_1 + q_2) - C_1(q_1) \quad (12)$$

$$\prod_2 = R_2(q_1 + q_2) - C_2(q_2) \quad (13)$$

The solution indicated in the perfectly competitive price is equal to the Marginal Cost(MC); while the quasi-competitive duopoly market solution to be defined solution can be achieved if the two seller behavior/rules of the competition. In other words the two producers competing completely, so that the solution conditions on the duopolies are:

$$P = F(q_1 + q_2) = C_1'(q_1 + q_2) \quad (14)$$

$$P = F(q_1 + q_2) = C_2'(q_1 + q_2) \quad (15)$$

for P, q_1 and q_2.

b) Collusion Model

Duopolies can make cooperation (collusion) to maximize the total profit in the industry. Both the output level of the two companies may be controlled and treated as a single output in monopoly markets. Thus,

$$R(q_1+q_2) = R_1(q_1 + q_2) + R_2(q_1 + q_2) = (q_1 + q_2)*F(q_1 + q_2) \quad (16)$$

Aggregate profits are,

$$\prod = \prod_1 + \prod_2 = R_1(q_1 + q_2) - C_1(q_1) - C_2(q_2) \quad (17)$$

Where, the profit function duopolies as monopolist profit function of both companies. In other words, the company is a "one" monopolist, so the *first order condition* shown in MC equal to MR for overall output.

c) Cournot Model

Classical solutions to problems raised duopoly early French economist Augustin Cournot in the nineteenth century. As before, it is assumed that the two firms produce homogeneous goods. The key assumptions in

the Cournot duopolies solution each company is going to maximized profits by assuming that the quantity of production of its competitors depends on the quantity produced. First duopolies maximize $\prod_{1,}$ which depends on q_1 to q_2 as a parameter considered, both duopolies will maximized $\prod_{2,}$ which depends on q_2 with regard q_1 as a parameter.

By taking the partial derivative of equation (17) and equating zero,

$$\delta\prod_1/\delta q_1 = \delta R_1/\delta q_1 - \delta C_1/\delta q_{1\,=}\, 0 \qquad \delta R_1/\delta q_1 = \delta C_1/\delta q_1 \tag{18}$$

$$\delta\prod_2/\delta q_2 = \delta R_2/\delta q_2 - \delta C_2/\delta q_{2\,=}\, 0 \qquad \delta R_2/\delta q_2 = \delta C_2/\delta q_2 \tag{19}$$

Maximization process for Cournot solution is not the same for the two cases of oligopoly, in which the two actors will always control the output levels of both. Here, each actor will be profit-maximizing variables that can only be controlled. This means that the MR (marginal revenue) of the two are not the same.
Let $q = q_1 + q_2$ and $q/q_{\,1} = \delta q/q\delta_2 = 1$.

$$\delta R_i/\delta q = P + q_i\ \delta p/\delta q \tag{20}$$

Producers who have a greater output will have a smaller MR.
Manufacturers will seek to maximize profits with respect to output the other manufacturers. In other words, the output of the producer will depend on the output of other manufacturers, so there will be a reaction which is a function of duopolies production output which depends on the output of its competitors, solve the equation (18) above for q_1 and equations (19) for $q_{2,}$

$$q_1 = \psi\,(q_2) \tag{21}$$

$$q_2 = \psi\,(q_1) \tag{22}$$

Reaction function is a relationship between q_1 and q_2 with respect to the value of q_i to maximize other benefits. Reaction function of the two equations, it can be found output solution for each manufacturer that provides the maximum benefit for both.

d) Stackelberg Model
In general, the advantages of each duopoly are a function of both the level of output:

$$\prod_1 = h_1(q_{1,}\, q_2) \tag{23}$$

$$\prod_2 = h_2(q_{1,}\, q_2) \tag{24}$$

Each company will make an assumption about the reaction of competitors. Profit maximization of the two is:

$$\delta\prod_1/\delta q_1 = \delta h_1/\delta q_1 + \delta h_1/\delta q_{2\,.}\ \delta q_2/\delta q_1 = 0 \tag{25}$$

$$\delta\prod_2/\delta q_2 = \delta h_2/\delta q_2 + \delta h_2/\delta q_{1\,.}\ \delta h_1/\delta q_2 = 0 \tag{26}$$

In the Stackelberg solution, two duopolies are divided into two categories only *leader* and one *follower.* Therefore behave as duopolies will *leade*r commented optimal profits without regard behavior *of* his *followers,* while the *follower* behavior will be based on the behavior of its *leader,* thus,

$$\prod_2 = h_2 [q_2 , \psi (q_2)] \quad (27)$$

e) Bertrand Model

Bertrand duopoly model build in 1883 (Koutsoyiannis, 1983, p. 225). The model is different from the Cournot that assumes constant prices set competitors. Assuming the company will behave to maximize profits by assuming competitors will not change the price.

In the Bertrand model reaction curve is the reaction rates, the company will change its price depends on the price set by competitors. Therefore it can be said that products company engaged in the duopoly market depends on the price of its competitors, or,

$$P_1 = f (P_{2)} \quad (28)$$

P_1 is the price set by the company 1 and P_2 is a set price on a competitor.

3.2. Previous Studies

The study of the sugar has been done since the 1970's era. Alcantara and Prato (1973) view of the production that emphasizes the scale and input elasticity in Brazil. Similarly Suryantoro (1992) who conducted a study on the behavior of non-TRI farmers in sugarcane production. From the cropping pattern by Djoyosuwardho (1984), the area of the Tjokrodirdjo and Rusli (1984), Systems and Implementation of Community Sugarcane Intensification Program (Adisasmito, 1984), the price of sugar by the Sweep and Hasan (1984), the institutions involved (Prabowo, Suryantoro and Prakosa , 1992a), the marketing of sugar (Prabowo, Suryantoro and Prakosa, 1992b; Swoop 1998; Sugar Study Team, 1990; Gapegti Bulog, 1992). Assessment of socioeconomic done by Mubyarto and Daryanto (1991), and is generally performed by Bulog (1985). Studies specifically on sugar saw its bid response made by Ramulu (1996) in Andhra Pradesh India.

Studies related the analysis of government policy has been done, but the scope of studies tends focus on one policy. The study by the Indonesian Sugar Council (1999) and Wahyudi and Erwidodo (1999) focused on aspects of the analysis of import tariffs. On the other hand, Malian (1999) emphasizes comparative effectiveness pricing policy and tariffs on sugar in the development of the sugar industry in Indonesia. Abidin (2000) analyzed several policies, but policies have not analyzed the period 2002-2003 was very different from the previous policy. Sudana, et al (2000) is more focused study of the reallocation of resources as a result of the liberalization of sugar trade. With a partial view, and Nuryanti Hadi (2005) looked at the effects of non-tariff and tariff policies on the performance of the sugar industry from both macro and micro aspects of farming.

Susila (2004) looked at the effects of the sugar industry protection, Susila and Sinaga (2005) combine policy trade restrictions in the form of tariff rate quotas also combine with domestic policy in the form of input subsidy to the sugar industry in Indonesia. Widyatmini (2006) looked at the effects of sugar import tariffs, the exchange rate of the volume of imports of sugar. The effects of tariff rate quota in the United States conducted by Haley, Jerardo and Kelch (2006) and USDA (2008). Suryantoro (2010) studied on the effects of the sugar trade liberalization on production, consumption and welfare.

4. EMPIRICAL MODEL

The empirical model used to look at the behavior of economic variables in the study. In this study, the model used to determine the workings of Indonesia's sugar market is integrated with the world sugar market, the influence of external factors (such as changes that occur outside of government control resulting from changes in the world

economy), and internal changes resulting from changes in the domestic economy or because of changes sugar policy towards Indonesia.

The approach used to analyze the relationship between variables such as the approach to economic theory, the theory of statistics and econometric theory. This research will use Error Correction Model to analyze the effect between dependent and independent variables. The analysis tool is more relevant if the data is analyzed stationary, because one of the requirements to apply time series regression is the fulfillment of the data that is stationary (Gujarati, 2003).

According Insukindro (1999:2) ECM has the ability to analyze economic phenomena short and long term and assess whether the model is consistent with empirical economic theory, as well as in the search for solutions to the problem of time series variables are not stationary and spurious regression (spurious correlation) in the econometric analysis. In addition, the ECM can also be used to deal with the imbalance (disequilibrium) where the desired economic actors are not the same as the reality of the matter, therefore needs to be adjusted. By using ECM, can also be analyzed empirically whether the model is generated in accordance with the theory or not.

4.1. Stationary Test

Models using time series data (time series) will cause problems if the data are not stationary. Why is it so important stationary in time series data? If the data is not stationary, then the behavior of economic variables only covered a specific time period. Each group of data represents only the observation period. As a consequence, it is not possible to generalize to other periods, so for the purpose of forecasting doubtful reliability. On the economic analysis, forecasting is an important part, especially for economic policy-making.

Economic variables in this study are a time series data that needs to be seen stationary or not. Tests on time series data necessary to examine the data are stationary or not. This is done to prevent the occurrence of spurious regression (spurious regression) in which the relationship between one variable with one or more other variables actually showed no association, but the indicators used statistical test as if there is a relationship (Gujarati, 2003: 792). One indication of spurious regression is that it contains a relatively high R^2 and Durbin-Watson statistics are low showing symptoms of the strong autocorrelation. Granger and Newbold give simple instructions spurious regression by comparing the value of R^2 and d-statistic. If the value of R^2>d-statistic, we suspect occurrence of spurious regression.

1) Unit Roots Test

This test can be seen as a test of stationary, because in principle, examine it to see if certain coefficients of the model were estimated to have one or no value. So that the time series data must be differentiated several times in order to obtain stationary data. However, because the distribution of the standard model is not a standard statistical tests such as t test and F test was not quite proper to use the model to test the hypothesis in question; therefore, the model will use the test developed by Dickey and Fuller (Gujarati, 2010) with a model assessment autoregressive following:

$$Y_t = \rho Y_{t-1} + u_t \qquad u_t \sim (N, \sigma^2) \tag{29}$$

where u_t is a random variable with mean zero and constant variance. Hypothesis testing is to test whether the value of $a_1 = 1$. If the value of $\rho = 1$, then the value of the variance of a random $Y_t = t\, u_t^{\,2}$.

By manipulating equation (21), then the equation is obtained:

$$\begin{aligned} Y_t - Y_{t-1} &= \rho Y_{t-1} + Y_{t-1} + u_t \\ &= (\rho - 1) Y_{t-1} + u_t \end{aligned} \tag{30}$$

and can be written,

$$\Delta Y_{t-1} = \delta Y_{t-1} + u_t \quad (31)$$

where $\delta=(\rho-1)$ and Δ is the change in the first level (first difference operator). In practice tested whether the value of $\delta=0$. If $\delta=0$, then $\rho=1$, which means there is a unit root problem, which means that the time series data are non-stationary.

2) Degree of Integration Testing

Along with the above test, the test can also be done the degree of integration. Test the degree of integration is performed when the unit root test observed data was not stationary. This test is intended to determine the degree or order of differentiation observed data stationer. Test the degree of integration is an extension of the unit root test. A formal definition: data time series X is said to integrate the degree d or I (d) if the data needs to be differenced times as much data to be stationary or I (0), tests are performed with the following estimation autoregressive models (Insukindro, 1993: 30):

$$D^2X_t = e_0 + e_1 DX_{t-1} \sum_{i=1}^{k} f_i \beta^i \; D^2X_t \quad (32)$$

$$D^2X_t = g_0 + g_1 t + g_2 DX_{t-1} + \sum_{i=1}^{k} h_i \; B^i D^2X_t \quad (33)$$

Where Dimana $D^2X_t = DX_t - DX_{t-1}$, t = time trend variable and X_t is observed variable in period t.

After the above steps, the next step is to test the value of DF and ADF statistics can be determined by looking at the value of t statistics in regression coefficients DX_{t-1}. If e_1 and g_2 equal to one, then the variable X_t is said stationary at first differentiation or integration on the degree of one or I (1). Conversely, if e_1 and g_2 equal to zero, then the variable X has not been stationer at the first differentiation, so that the degree of integration test should be continued until a stationary condition.

3) Co-integration Test

Co-integration test is a continuation of the unit root test and test the degree of integration. To be able to perform co-integration test must first believe that the variables involved in this approach has the same degree of integration or not. In general, most of the discussion of issues related to it has focused on the integration variable zero I(0) or an I(1) (Insukindro, 1993: 132). If two or more related variables have different degrees of integration, the variables can not be co-integrated.

To get an idea of the co-integration approach, considered a set variable X is said co-integrated time series on the degree d, b or CI (d, b) if every element of X integration on the degree d or I (d) and there is a vector k is not equal to zero so that w = k' X ~ I (db) with d> 0 and k is a co-integration vector (Engel and Granger, 1987:265-270; Insukindro, 1993:132).

An important implication of the illustrations and the above definition is that if two or more variables have a different degree of integration, say X = I (1) and Y = I (2) the two variables can not be co-integrated (Insukindro, 1993: 132). CDRW (Co-integration Regression Durbin-Watson) test, DF (Dickey-Fuller) and ADF (Augmented Dickey-Fuller) is a statistical test of this approach. To calculate CRDW, DF and ADF co-integration regression estimated following the method of ordinary least squares (OLS):

$$Yt = m_0 + m_1 X_{1t} + m_2 X_{2t} + e_t \quad (35)$$

where,
Y_t: dependent variable
X_{1t}, X_{2t}: independent variables
e_t: stochastic variable

In this case it is considered that the Y, X_1 and X_2 have the same degree of integration, such as I (1).

Then the following regression estimated by OLS:

$$\Delta \hat{e}_t = p_1 e_{t-1} + v_t \quad (36)$$

CRDW statistical value indicated by the value of DW statistic equation (35) and the DF and ADF statistics indicated by the value of the coefficient t et-1 in equation (36). The main objective is to test the co-integration test whether co-integration regression residuals stationary or not. Testing is especially important when a dynamic model is developed.

4) Co-integration Approach and Error Correction Model (ECM)

The purpose uses co-integration test is to assess whether the co-integration regression residuals stationary or not and to see the long-term equilibrium relationship among the variables were observed. Testing is very important if you want to develop a dynamic model, especially the model error correction or ECM, which includes the key variables related to the co-integration regression. Thus, it can be said that the error correction model is consistent with the concept known as co-integration or Granger Representation Theorem (Gujarati, 2010).

Granger Representation Theorem stressed that if two variables co integrated, the relationship between the two variables can be realized in the error correction model. As an illustration of the relationship between co-integration approach to error correction models, need to be scrutinized again the equation:

$$DY_t = r_0 + r_1 DX_t + r_2 (X - Y)_{t-1} \quad (37)$$

Following the theory developed by Engel and Granger (1987), when e_{t-1} = I (0). Then e_{t-1} can replace the variable Y_{t-1}, X_{1t-1}, and X_{2t-1} on the right-hand side of equation (37) to obtain the equation:

$$DY_t = s_0 + s_1 DX_t + s_2 \hat{e}_{t-1} \quad (38)$$

where:
Y_t : dependent variable
X_t : independent variable
$\hat{e}_{t-1}$: estimated value of the residual co integration in previous period

From equation (38) can be seen that all the variables used in the model are stationary or I (0). This is known as the Engel-Granger ECM (Gujarati, 2010).

Having regard to the estimation ECM (3.29), it can be seen whether the value of the independent variable t significant, because the significance of this will be able to be used to describe the short-term direction. Please also note the significance of the coefficient of ECT. Significant t values will be able to be used to estimate the long-term.

4.2. Derivation ECM in Indonesia Sugar Industry

The model of supply and demand of sugar is the aggregation of the individual offender. Behavior of producers and consumers as a group reflects behavior based assumptions about the behavior of producers and consumers on an individual basis. Every manufacturer in the production of goods is always based on economic considerations

vary from one manufacturer to the other manufacturers. Similarly, in the analysis of consumer demand, consumer demand for a product is the aggregation of individual demand behavior.

Manufacturers are assumed to produce the goods and the prices of the inputs together to achieve the maximum profit (minimum cost) (Sugiyanto, 1992: 51). Consumers are also assumed to be aimed at obtaining the maximum utility. The optimum sugar production is a function of the price of domestic sugar (PDGL), the price of grain (PGB) as an alternative in resource utilization commodity growers and input prices (first-aid).

$$QDGL_t^* = a_0 + a_1 PDGL_t + a_2 PGB_t + a_3 PPPK_t \quad (39)$$

where QDGL * is the optimum sugar production, expected or long run.

Given imperfect information, shock and other factors that rigidity, the condition QDGL * can not be achieved in each period. When actual production is not the same as optimum production, there will be an imbalance costs (C_1) and adjustment costs (C_2).

With the approach developed in Domowitz and Elbadawi (1987), Insukindro (1992, 1993) and Sugiyanto (1992) can be formulated kuardrat single period cost function as follows:

$$C_t = c_1 (QDGL_t - QDGL_t^*)^2 + c_2 [(1 - B) (QDGL_t - j_t Zt)]^2 \quad (40)$$

$QDGL_t$	: actual sugar production
Z_t	: independent variables
$c_1 (QDGL_t - QDGL_t^*)$	: cost imbalance
$c_2 [(1 - B) (QDGL_t - j_t Z_t)]$	: the cost of adjustment
B	: backward lag operator / t – 1

With assume that manufacturers will seek to minimize the total cost, cost minimization is done by derive equation (40) for Qt is obtained,

$$Q_t = c (QDGL_t^*) + (1 – c) (1-B) Z_t \quad (41)$$

where $c = c_1 / c_1 + c_2$

Substituting equation (39) in equation (41) is obtained the equation:

$$Q_t = c(a_0 + a_1 PDGL_t + a_2 PGB_t + a_3 PPPK_t) + (1–c) QDGL_{t-1} +(1-c) (1-B) PDGL_t + (1-c) (1-B) PGB_t + 1-c) (1-B) PPPK_t \quad (42)$$

The general form of the equation (42) in the above equation can be written as an auto-regressive distributed lag, AD (1.1) in the form (Sugiyanto, 1992: 52):

$$QDGL_t = \alpha_0 + \alpha_1 PDGL_t + \alpha_2 PGB_t + \alpha_3 PPPK_t + \alpha_4 QDGLt_{-1} + \alpha_5 PDGL_{t-1} + \alpha_6 PGB_{t-1} + \alpha_7 PPPK_{t-1} + v_t \quad (43)$$

where,

$\alpha_0 = c\, a_0$

$\alpha_1 = c\, a_1 + (1-c)$

$\alpha_2 = c\, a_2 + (1-c)$

$\alpha_3 = c\, a_3 + (1-c)$

$\alpha_4 = (1-c)$
$\alpha_5 = -(1-c)$
$\alpha_6 = -(1-c)$
$\alpha_7 = -(1-c)$
v_t: stochastic variable

Equation (43) is a more general equation of the partial adjustment model equations (partial adjustment model/ PAM) by restriction $\alpha_5 = \alpha_6 = \alpha_7 = 0$. Equation (3:43) can be written as an error correction model (ECM) to obtain short-term elasticity of production of sugar and to avoid spurious regression (Sugiyanto, 1992: 53),

$$\Delta Q_t = \alpha_0 + \alpha_1 PDGL_t + \alpha_2 PGB_t + \alpha_3 PPPK_t + \alpha_4 (QDGLt_{-1} - a_0 - a_1 PDGL_{t-1} + a_2 PGB_{t-1} + a_3 PPPK_{t-1}) + v_t \quad (44)$$

The back of the equation (44) is a disturbance variable (error term) in equation optimum production, the long-term (39) in which the optimum sugar production with actual sugar production. Parameter β_i is a short-term elasticity parameter and the parameter α_i is a long-term elasticity parameter.

In the same way, we obtained the following equations:

Domestic sugar price equation:

$$\Delta PDGL_t = \beta_0 + \beta_1 \psi_1 PMGL_t + \beta_2 (PDGL_{t-1} - b_0 - b_1 PMGL_t) \quad (45)$$

Import price equation:

$$\Delta PMGL_t = \gamma_0 + \gamma_1 MGL_t + \gamma_2 PWGL_t + \gamma_3 TRF_t, + \gamma_4 RATE_t + \gamma_5 PMGL_{t-1} + \gamma_6 (PMGL_{t-1} - c_0 - c_1 MGL_{t-1} - c_2 PWGL_{t-1} - c_3 TRF_{t-1} - c_4 RATE_{t-1}) \quad (46)$$

From equation (45) and (46) obtained short-term response and long-term response to the changes in the variables that influence the following:

1. Short-term response variables influencing change in value is reflected in the coefficients αi, βi, γi, i, ψi for each variable in each equation.
2. Long-term response is reflected in the coefficients ai, bi, ci, in, ei for each variable.

4.3. Estimation Method

Estimated equations above was conducted by Two Stage Least Square (TSLS) estimation is performed for the simultaneous equations model, in which the endogenous variables occur simultaneously relationship.

Estimated structural equation by the first two stages, stage regress the endogenous variables with all the exogenous variables in the model. These equations are called the reduced form equations. Form the equation is as follows:

Reduced Form Equation:

$$\mathbf{\Delta LQDGL_t^{\wedge}} = \alpha_0 + \alpha_1 \Delta LPGB_t + \alpha_2 \Delta LPPPK_t + \alpha_3 \Delta LPWGL_t + \alpha_4 \Delta TRF_t + \alpha_5 \Delta LRATE_t + \alpha_6 \Delta LPOP_t + \alpha_7 \Delta LGDP_t + \alpha_8 \Delta R_t + \alpha_9 \Delta LPOUT_t + \alpha_{10} (LQDGL_{t-1} - a_0 - a_1 LPGB_{t-1} - a_2 LPPPK_{t-1} - a_3 LPWGL_{t-1} - a_4 TRF_{t-1} - a_5 LRATE_{t-1} - a_6 LPOP_{t-1} - a_7 LGDP_{t-1} - a_8 R_t - a_9 LPOUT_{t-1}) \quad (47)$$

$$\mathbf{\Delta LPDGL_t^{\wedge}} = \beta_0 + \beta_1\ \Delta LPGB_t + \beta_2\ \Delta LPPPK_t + \beta_3\ \Delta LPWGL_t + \beta_4\ \Delta TRF_t + \beta_5\ \Delta LRATE_t + \beta_6\ \Delta LPOP_t + \beta_7\ \Delta LGDP_t + \beta_8\ \Delta R_t + \beta_9\ \Delta LPOUT_t\ \beta_{10}\ (LQDGL_{t-1} - b_0 - b_1\ LPGB_{t-1} - b_2\ LPPPK_{t-1} - b_3\ LPWGL_{t-1} - b_4\ TRF_{t-1} - a_5\ LRATE_{t-1} - b_6\ LPOP_{t-1} - b_7\ LGDP_{t-1} - b_8\ R_t - b_9\ LPOUT_{t-1}) \quad (48)$$

$$\mathbf{\Delta LPMGL_t^{\wedge}} = \gamma_0 + \gamma_1\ \Delta LPGB_t + \gamma_2\ \Delta LPPPK + \gamma_3\ \Delta LPWGL_t + \gamma_4\ \Delta TRF_t + \gamma_5\ \Delta LRATE_t + \gamma_6\ \Delta LPOP_t + \gamma_7\ \Delta LGDP_t + \gamma_8\ \Delta R_t + \gamma_9\ \Delta LPOUT_t + \gamma_{10}\ (LQDGL_{t-1} - c_0 - c_1\ LPGB_{t-1} - c_2\ LPPPK_{t-1} - c_3 LPWGL_{t-1} - c_4\ TRF_{t-1} - c_5\ LRATE_{t-1} - c_6\ LPOP_{t-1} - c_7\ LGDP_{t-1} - c_8\ R_t - c_9 LPOUT_{t-1}) \quad (49)$$

The second step is done by estimating the structural equation by replacing the endogenous variables to the endogenous variables estimates resulting from the first step, so that the estimate is as follows:

Structural equation:

$$LQDGL_t = \alpha_0 + \alpha_1\ \mathbf{\Delta LPDGL_t^{\wedge}} + \alpha_2\ \Delta LPGB_t + \alpha_3\ \Delta LPPPK_t + \alpha_4(LQDGL_{t-1} - a_0 - a_1\ LPDGL_{t-1} + a_2\ LPGB_{t-1} + a_3\ LPPPK_{t-1}) + v_t \quad (50)$$

$$LPDGL_t = \beta_0 + \beta_1\ \mathbf{\Delta LPMGL_t^{\wedge}} + \beta_2\ (LPDGL_{t-1} - b_0 - b_1\ LPMGL_{t-1}) \quad (51)$$

$$LPMGL_t = \gamma_0 + \gamma_1\ \mathbf{\Delta LQMGL_t^{\wedge}} + \gamma_2\ \Delta LPWGL_t + \gamma_3\ \Delta TRF_t, + \gamma_4\ \Delta LRATEt + \psi_1\gamma_5\ (LPMGL_{t-1} - c_0 - c_1\ LQMGL_{t-1} - c_2\ LPWGL_{t-1} - c_3\ TRF_{t-1} - c_4\ LRATE_{t-1} \quad (52)$$

Structural equation above is a simultaneous equations to be estimated using a two-step method of least squares (Two Stage Least Square / 2SLS) to obtain the parameters that are not biased (Unbiased estimator). In the simultaneous equations model, using ordinary least squares method to estimate the simultaneous equation bias will be obtained parameters (parameters are estimated is not the same as the actual parameter). This condition is called a simultaneous equation bias (Gujarati, 2010) where the estimator of the OLS is inconsistent.

This method has the properties (Gujarati, 2010):

1. Equation can be applied to an individual without having to take into account the other equations in the system equations. This method can be used to solve the equations econometric model that includes a lot economically.
2. Unlike Indirect Least Square method (ILS), 2SLS method produces only one estimated parameter values.
3. Easy to apply.

This method can also be applied to the equation identified precisely (exactly identified).

5. IMPACT IMPORT QUANTITY, WORLD SUGAR PRICE AND EXCHANGE RATES ON SUGAR IMPORT PRICE

World sugar market is a unique market compared to other agricultural commodities. More than 100 countries produce sugar and all government intervention both in the process of production, distribution and consumption (Roney, 2000). Some of the unique sugar commodity is related to the production process that is different from other agricultural commodities, so the uniqueness is, the commodity of sugar are often separated from other agricultural commodities in the agricultural commodity programs.

Farmers as cane growers (as raw sugar) production results can not be directly marketed or stored. The product of these farmers do not have commercial value if it has not been processed into sugar, while to process sugar cane into another institution that takes the sugar factories, so that farmers can not plant or commercialize sugarcane without any guarantee of sugar factories in the sugar production process. Similarly, the sugar mills can not operate efficiently if there are not guaranteed supply of sugarcane farmers.

A sugarcane processing plant requires special equipment that requires a very large cost. Besides, the process of planting, maintenance and harvesting of sugar cane requires special equipment and treatment. By the nature of the plant and the process requires huge cost both of construction plant and machineries as well as to the provision of agricultural land resulting in this investment requires a long period (multi-year).

World sugar market is dominated by a few developed countries, but sugar exporters dominated by many developing countries. These conditions resulted in a gap between production/supply of sugar to the world sugar demand. Market player in the world sugar market is strongly influenced by developed countries, while the production rate is strongly influenced by developed countries.

These conditions resulted in the world sugar market is not stable and have a high level of volatility, so the import price of sugar being influenced by world market conditions. Price of sugar imports is influenced by the quantity of imports (QMGL), the world price (PWGL), import tariffs (TRF) and exchange rate (RATE).

The estimation of sugar import price equation is shown in equation (53) and equation (54) link below. Equation (53) is the long-term equation and equation (54) is a short-term equation for the price of imported sugar.

$$LPMGL_t = \underset{(-3.63201)}{-0.08954} \; \underset{(-0.54730)}{-0.168977^{**)}} \; LQMGL_t + \underset{(4.21075)}{0.535377^{**)}} \; LPWGL_t + \underset{(1.035664)}{0.581403} \; ATRF_t - 0.581403 \; RATE_t \quad (53)$$

R^2 = 4.210759
R^2 Adj = 0.416655
F-statistik = 14.39224
D-W stat = 1.978030
( ) : t statistic
**) : signifikan pada =1 %

$$DLPMGL_t = \underset{(-4.95398)}{0.052534} - \underset{(-0.18465)}{0.127961} \; DLQMGL_t + \underset{(0.373284)}{0.014645} \; DLPWGL_t + 0.098430 \; TRFt, + \underset{(0.37328)}{0.018850} \; DLRATEt + \underset{(0.71382)}{0.713829} \; ECTLPMGL \quad (54)$$

R^2 = 0.279648
R^2 Adj = 0.223371
F-statistik = 4.969103
D-W stat = 2.092386
( ) : t statistic
**) : significant at =1 %

Despite of the stationary test results for each variable indicates the roots of the unit (unit roots) or not stationary, but not necessarily there is no long-term relationship between the dependent variable and independent variables. Long-term relationships can be seen from the disturbance variables are stationary or not. If the disturbance variable (u_{t-1}) is stationary, the regression results are not spurious (not spurious) (Gujarati, 2010). Thus the dependent variable and the independent variables are co-integrated or long-term relationship between the dependent variable and independent variables.

To see whether there are long-term relationships do Engel-Granger test, Augmented Engel-Granger co-integration test or Co-integration Regression Durbin-Watson (CRDW). The results of the three tests are not much different, so it can be used one such test (Gujarati, 2003: 824).

This study used Engel Grange test to see whether or not a long-term relationship between the dependent variable with the independent variables. In Engel-Granger test is done by estimating the co-integration regression equation:

$$Y_{it}^{\wedge} = {}_{0} + {}_{i} X_{it}$$

Then the residual value, μ_i is tested whether stationary or not by the model:

$$\Delta\mu_{it}^{\wedge} = \beta\ \mu_{t-1} + v_{tl}$$

The stationer of residual variable can be tested significant of parameter β. If the parameter β significant that means there is co-integration or long-term relationship between a dependent variable and the independent variables (Gujarati. 2010).

The estimation equations test the co-integration residuals from co-integration regression equation are:

$$\Delta\mu_{it}^{\wedge} = -0.319481\ \mu_{t-1} \qquad (55)$$
$$t \qquad (-4.117569)$$

Statistic t value (absolute) greater than the value of ADF (5% significance) = -1.943974. This means that the residuals of the regression equation co-integration stationary at 0 degrees, or I (0). These results indicate that no spurious co-integration regression equation (not spurious) although individual variables are not stationer (Gujarati, 2010).

Estimation of the model is to have long-term value of the coefficient of determination R^2 = 0.447767. This suggests that the variation in changes in the import price of sugar (caller) can be explained by the variation of the variable amount of imports (QMGL), world sugar prices (PWGL), tariff (ATRF) and exchange rate (RATE) of 44.78%, while the rest can be explained by the variable- variables outside the model.

To estimate the short-term model of error correction model (ECM) has a coefficient of determination of R 2 = 0.27965. This suggests that the variation of changes in import prices can be explained by the quantity of sugar imports (QMGL), world sugar prices (PWGL), exchange rate (RATE) and the tariff of 27.9779%, while the rest can be explained by variables outside the model.

Statistical F value of 14.39224 for the long term and short term 4.96910 (significant at the 5% level) indicates that together the independent variables affect the import price variable sugar. Statistic-t test showed that in the near term appear that quantitative parameters imports were statistically significant (= 5%), even other parameters were not significant. While in the long term the quantity of imports and the world price of sugar was statistically significant (= 5%) and others are not significant.

Coefficients of import are -0.12796 to -0.168977 for the short term and long term. This means that with the increasing number of imported sugar coming in, the price of imported sugar will decline. If sugar imports increased by 10%, then in the short term will reduce the price of imported sugar by 1.28% and 1.69% in the long run. The decline in prices of sugar imports is influenced by higher import quantity in accordance with the law of demand and supply. If the quantity supplied rises, it will cause prices to fall.

Parameter values world sugar prices (PWGL) short-term elasticity coefficient is not significant and long-term by 0.53538. This suggests that if there is rise in world sugar prices by 10%, then in the short term will not respond This is because the sugar in the world market commodity or agricultural commodities in general demand for sugar have a long period of time to be import activity.

With the integration of agricultural commodity markets with the world market, then in the long run, changes in world sugar prices will respond in a more responsive as indicated by the long-term elasticity of 0.53538. With the increase/decrease in world sugar prices by 10% would result in increase/decrease import price decline of 5.35%.

The difference in elasticity of short-term and long-term substantial illustrates that the world sugar market conditions in the long run to have a considerable influence on the domestic market. This is indicated by the very large or even increasing the amount of the composition of imported sugar in the domestic sugar consumption. With a large share of imports in consumption would lead to dependence on the world market. This suggests that although highly distorted world sugar prices, but still very influential on the price of sugar imports Indonesia.

Exchange rates have a very large role in the economy of a country with an open system where the traffic volume of foreign trade/exports and imports of goods and services have a large enough portion of domestic products in the product mix. In addition, the capital flows also heavily influenced by the exchange rates of foreign currencies against the local currency.

Changes in the exchange rate of a country's currency against the currencies of other countries, especially for the strong currency the world, will influence the composition and quantity of imports and exports of a country. Changes in currency exchange rates will directly affect the prices of the commodities in the world in addition will also affect the purchasing power of people in a country with an open economy in which the dependence on foreign sector. Even the monetary and economic crisis that hit most countries in Southeast Asia and East Asia in the mid and late 1998 was also caused by the falling value of the domestic currency, in addition to unhealthy economic structure (World Bank, 1998).

But in the case of the sugar industry is seen that the elasticity parameter exchange rate (RATE) to the price of imported sugar (caller) significant not good for short term and long term. These results paint a different picture to that expected given that the import price of sugar should have a positive relationship with the exchange rate. This shows that import prices are not affected by the recall rate of imports by importers is not done solely by economic considerations, but by political considerations to secure commodities sugar as a policy tool to control inflation.

From the estimation, short-term and long-term visible import tariff elasticity is not statistically significant both for the short and long term. It gives a good overview of the short and long term tariff does not affect the price of imported sugar. As described earlier, import prices of a commodity in the international market has been established long before the commodity is sent in the importing country. This resulted in changes in the value and magnitude of tariff in the short term will not affect the price of imports. This condition suggests that the tariff policy for sugar commodity ineffective in influencing the price of imported sugar.

6. EFFECT OF SUGAR PRICE IMPORTS TO DOMESTIC SUGAR PRICE

As the country is still importing sugar, the national sugar production faced competition from imported sugar. With the competition from imported sugar, then the behavior of domestic sugar producers will be faced with the behavior of the import manufacturers. In other words, the behavior of the sugar industry in Indonesia can be seen as a duopoly market.

Duopoly markets indicates that the sugar industry there are only two manufacturers of the domestic and import manufacturers. Behavior of producers (in this case domestic producers) engaged in a duopoly market is strongly influenced by the behavior of other producers (importers / producers from abroad). The combination of price, quantity and profit of the producer duopolies depends on the action of other manufacturers (Henderson and Quandt, 1971). He can control their own level of output (or price if the product differentiated), but can not control other variables that affect profit. Profit earned is the result of interaction between actors in the market decision.

Domestic sugar prices are going is the interaction between domestic sugar prices and the price of sugar imports are substitutes, so that domestic sugar prices (PDGL) is a function of import prices (caller). In other words, the price of imported sugar will affect the price of domestic sugar (Bertrandt in Nicholson, 1998; Koutsoyiannis, 1975).

Results of structural equation estimates for domestic sugar price equation long term co-integration regression equation is shown in equation (56) and equation of short-term domestic sugar prices error correction model in equation (57) below.

$$\mathbf{\Delta LPDGL_t} = -0{,}070405 + 0{,}08460\ \Delta LPMGL_t\hat{} - 00183\ ECTLPDGL_{t-1} \quad (56)$$
$$(0.574388) \qquad (-2.148788)$$

R^2 = 0.051878
R^2 Adj = 0.031040
F-statistik = 0.088579
D-W stat = 1.625628
( ) : t statistic
**) : signifikan pada =1 %

$$\mathbf{LPDGL_t} = 5{,}72830 + 1{,}07466\ LPMGL_t \quad (57)$$
$$(6.449541)$$

R^2 = 0.328576
R^2 Adj = 0.320677
F-statistik = 41.59659
D-W stat = 0.387250
( ) : t statistic
**) : signifikan pada =1 %

Equation (56) is the result of long-term estimates. The estimation equations to test for co-integration residual co-integration regression equation:

$$\Delta\mu_{it}\hat{} = -0.353760\ \mu_{t-1} \quad (58)$$

T value (absolute) greater than the value of ADF (5% significance) = -1.943974. This means that the residuals of the regression equation co-integration stationary at 0 degrees, or I (0). These results indicate that the co-integration regression equation is not spurious although individual variables are not stationary, so it can be said that the co-integration regression equation is the long-term equation and parameters obtained a long-term parameter (Gujarati, 2003: 824).

Estimation of the model is to have long-term value of the coefficient of determination R^2 = 0.328576. This suggests that the variation in changes in domestic sugar prices (PDGL) can be explained by variations in sugar import price variable of 32.86%, while the rest can be explained by variables outside the model.

Statistical F value of 41.5966 and significant at α = 5% indicated that together these variables affect the dependent variable domestic sugar prices.

To test individual t-statistics that the price of sugar imported positive effect on domestic sugar prices by 5% significance level.

From the estimation equation short-term domestic sugar prices is seen that the coefficient of the short-term price elasticity of sugar imports are not significant at the 5% significance level and long-term - 1.074663 0 and significant at α = 5%. This shows that if there is a decrease in the price of imports (which means lower than domestic prices) 10% will not lead to lower domestic prices and the long-term effects of 10.75%. Although small elasticity (inelastic), but it looks that the adjustment of domestic prices to import prices in the long run so big it looks

from adjustment coefficient of -0.001825. This indicates that the sugar import policy to bring a low price will soon market responded quickly to immediately reduce domestic prices.

7. DOMESTIC SUGAR PRICE EFFECT ON PRODUCTION OF SUGAR

Results of structural equation estimates for the production of sugar, two sugar production estimates are long-term and short-term. Estimated long term equations production is done by estimating the co-integration regression equation model (Co-integration Regression Equation / CRE) and the short-term equation error correction model (Error Correction Model / ECM). Estimated long-term structural equation co-integration regression of production can be seen in equation (and the results of short-term estimates of the structural equation error correction models for the production of sugar can be seen in equation below.

$$\Delta LQDGL_t = 0{,}05661 + 0.39575\ \mathbf{\Delta LPDGL_t}\ \hat{}\ - 0{,}12985^{**})\ \Delta LPGB_t - (0.732917)\ (-3.938817)$$
$$- 0{,}57325^{**})\ \Delta LPPPK_t + 0.000385\ ECTLDQGL_{t-1} \quad (59)$$
$$(-4.165195) \qquad (-4.165195)$$

R^2 = 0.277291
R^2 Adj = 0.277291
F-statistik = 8.536962
D-W stat = 8.536962
( ) : t statistic
**) : signifikan pada =1 %

$$LQDGL_t = 2{,}90692 + 1.00041\ \mathbf{LPDGL_t}\ \hat{}\ - 0{,}08370\ LPGB_t + 0{,}31646\ LPPPK_t \quad (60)$$
$$(13.43192) \qquad (-3.06237) \qquad (3.85616)$$

R^2 = 0.91229
R^2 Adj = 0.91229
F-statistik = 346.72980
D-W stat = 0.39018
( ) : t statistic
**) : signifikan pada =1 %

The estimation equation of residuals to test the co-integration between the variables and the dependent variable as follows:

$$\Delta\mu_{it}\ \hat{}\ = - 0.353760\ \mu_{t-1} \quad (61)$$
$$t \qquad (-4.690983)$$

Statistic t value (absolute) greater than the value of ADF (5% significance) = -1.943974. This means that the residuals of the regression equation co-integration stationary at 0 degrees, or I (0). The results indicate that the co-integration regression equation is not spurious (not spurious) although individual variables are not stationary.

Estimated long-term model of the co-integration regression has a coefficient of determination of R^2 = 0.91230. This suggests that in the long term, variation of sugar production changes can be explained by variables domestic sugar prices (PDGL), the price of grain (PGB), the price of fertilizer inputs amounted to 91.23%, while the rest can be explained by variables outside model.

Statistic F values of 346.7298 and significant at α = 5% indicated that together these variables affect dependent variable domestic sugar production.

The individual t-statistic test that in the long run, the price of domestic sugar (PDGL), the price of fertilizer (first aid) and the price of grain (PGB) significant at the α = 5%. This suggests that an individual basis, assuming other variables constant, the independent variables significantly influence the dependent variable.

Estimated short-term models to fault correction model has the value of the coefficient of determination R^2 = 0.27729. This suggests that the variation in sugar production changes can be explained by variables domestic sugar prices (PDGL), the price of grain (PGB), the price of fertilizer inputs amounted to 27.73%, while the rest can be explained by variables outside the model. A low coefficient of determination is usually found in the regression using the error correction model (Insukindro, 1993; Gujarati, 2003).

Statistical F value of 8.53696 and a significant at α = 5% level showed that together these variables affect dependent variable domestic sugar production. Similarly, the Durbin-Watson autocorrelation test gives a picture that is not the case serial correlation.

To test individual t-statistics can not be done, because the structural parameters of the equation is not a function of the parameters of the linear equation that reduced its standard error can not be calculated easily (Gujarati, 2010). From the results of the statistical test above shows that the price of domestic sugar (PDGL) is not significant and the price of fertilizer and the price of grain (PGB) significant at α = 5%.

In the short term that the price of domestic sugar (PDGL) were not significant while the price of rice (PGB) and the price of fertilizer inputs is negatively affected. From the results of model estimation adjustments, the value of the adjustment coefficient of 0,00385 were not significant. Statistically, variable parameter error correction (error term) were not significant or equal to zero. This means that the adjustments resulting from changes in the production of the independent variable changes take place at the same time (Gujarati, 2003:. 825).

For the expected price variable, the elasticity of short-term and long-term is not significant at 1.00041. This suggests that in the short term, if there is a rise in domestic sugar price expectations by 10%, then in the short term and the producers did not respond in the long run will increase production by 10.00%.

This situation can be understood that the short term in this study is based on a quarter, while the property of plants as raw sugarcane planting has approximately 1 year. This is parallel to the phenomenon of agricultural commodities is inelastic to price changes in the short term. Price increases can not be directly addressed by the farmers; thus may say this is a very short run conditions.

But by looking at the phenomenon of price changes took place in the long run, the farmers responded with considerable. This is because Indonesia is always possible sugar shortage that could allow an increase in sugar prices in the long term. This phenomenon indicates that the domestic sugar price is still a key consideration for manufacturers in producing sugar.

Grain is an alternative in the production of agricultural commodities in addition to sugarcane. For farmers, the grain is one of a profitable alternative crop for farmers so it is a contender for sugarcane. Grain price elasticity for short term and long term for -0.129845 -0.08370 for all significant at α = 5%. Elasticity of the price of grain negative showing two commodities compete (substitution), but the elasticity of both short and long term value of small (inelastic). This indicates that the sugar cane and rice crops are no longer compete for land. This phenomenon is in accordance with the conditions in the field where sugar cane is grown rarer in technical wetlands planted more rice. Sugarcane has now shifted to dry land. Shifting sugarcane to dry land in accordance with the considerations that sugarcane farmers are the best alternative that provides the highest level of benefits. Nevertheless, judging from the coefficients have negative values indicate a tendency for grain commodities is still a contender cane.

Input price elasticity of fertilizer for the short term and long term -0.57325 0.31646 and significant at α. = 5%. This means that if there is an increase in fertilizer prices 1 0%, then in the short term will reduce production by 5.73% and in the long run it will increase sugar production by 3.1%.

In the short term elasticity fertilizer prices is negative and in the long run have a positive elasticity. This suggests that in the short term, rising prices of fertilizer inputs do not respond by the manufacturer by reducing the use of

fertilizer for sugarcane production pattern of cyclical one year. Despite rising input prices, but the manufacturers are forced to use it. For sugarcane farmer fertilizer inputs is still a very important input in an effort to increase production still oriented to the productivity of sugarcane.

This suggests that the current use of fertilizers in the production of sugar / cane there are tendencies that lead to excessive use of fertilizer for sugarcane production elasticity becomes negative. This parallels the findings Suryantoro (1992) which examines the behavior of independent cane farmers in the use of fertilizers in Ngawi and Sragen in 1991. In that study it was found that the average use of fertilizer for sugarcane above average use of fertilizer recommended local Department of Agriculture. With the use of fertilizer inputs in excess sugarcane production would result in a negative elasticity means the addition of fertilizer use will actually reduce production. Theoretically, sugarcane farmers operating at stage III in the short run production function (Koutsoyannis, 1975).

In the long run, the increase in fertilizer prices farmers will respond by reducing the use of artificial fertilizers (inorganic) and will replace it with manure (organic) by considering a cheaper price. With the decreasing use of fertilizer an-organic are replaced with organic fertilizers will increase the productivity and the next stage will actually increase production.

This result is contrary to the theory that, if input prices rise, the rate of production will decrease due to the reduced use of inputs due to budget constraints (Henderson and Quant, 1971). This result suggests that, if there is an increase in input prices (in this case the fertilizer) in the short term will reduce production, but in the long run it will increase sugar production. Despite the rising price of fertilizer input, but in the short term manufacturers are forced to use it. For sugarcane farmer fertilizer inputs is still a very important input in an effort to increase production still oriented to the productivity of sugarcane. Even the use of fertilizer there is still a tendency to use excessive fertilizer elasticity resulting in the production of sugarcane to be negative (Suryantoro, 1992).

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusion

1. Sugar Import prices. World sugar market is a unique market compared to other agricultural commodities. More than 100 countries produce sugar and all government intervention both in the process of production, distribution and consumption (Roney, 2000). World sugar market is dominated by a few developed countries, but sugar exporters dominated by many developing countries. These conditions resulted in a gap between the concentration of production / supply of sugar to the world sugar demand. Market player in the world sugar market is strongly influenced by developed countries, while the production rate is strongly influenced by developed countries. These conditions resulted in the world sugar market is not stable and have a high level of volatility, so the import price of sugar being influenced by world market conditions. Negative elasticity of import quantity of both short and long term means that a growing number of imported sugar coming in, the price of imported sugar will decline. The decline in prices of sugar imports is influenced by higher import quantity in accordance with the law of demand and supply. If the quantity supplied rises, it will cause prices to fall. World sugar price elasticity for short-term and long-term insignificant. This suggests that the world market sugar commodity or agricultural commodities in general have a long period of time to be import activity. The difference in elasticity of short-term and long-term substantial illustrates that the world sugar market conditions in the long run to have a considerable influence on the domestic market. This is indicated by the very large or even increasing the amount of the composition of imported sugar in the domestic sugar consumption. With a large share of imports in consumption would lead to dependence on the world market. This suggests that although highly distorted world sugar prices, but still very influential on the price of sugar imports Indonesia. Parameter exchange rate elasticity of the import price of sugar is not significant in both the short and long term. These results paint a different picture to that expected given that the import price of sugar should have a positive relationship with the exchange rate. This shows that import prices are not affected by the recall rate of imports by importers is not done solely by economic considerations, but by political considerations to

secure commodities sugar as a policy tool to control inflation. From the estimation, short-term and long-term look elasticity of import tariffs are not statistically significant both for the short and long term. It gives a good overview of the short and long term rates have no effect on the price of imported sugar. As described earlier, import prices of a commodity in the international market has been established long before the commodity is sent in the importing country. This resulted in a change in tariff value in the short term will not affect the price of imports. This condition suggests that the tariff policy for commodity sugar ineffective in influencing the price of imported sugar.

2. Domestic sugar prices. Competition between domestic sugar and sugar imports in the long term. This is shown by the short-term price elasticity of sugar imports are insignificant and significant long-term. This suggests that if there is a decrease in the price of imports (which means lower than domestic prices) in the short term will not lead to lower domestic prices and a new long-term effect. Although small elasticity (inelastic), but it looks that the adjustment of domestic prices to import prices in the long run so great. This indicates that the sugar import policy to bring a low price will soon market responded quickly to immediately reduce domestic prices.
3. Domestic sugar production. Domestic sugar price remains a key consideration for manufacturers in producing sugar. Short-term price elasticity is not significant and long-term significant indicates that the manufacturer does not respond to short-term price changes, but responded in the long run. This situation can be understood that the short term in this study is based on a quarter, while the properties of plants as raw sugar cane planting has approximately 1 year old. This corresponds to the phenomenon of agricultural commodities is inelastic to price changes in the short term. Price increases can not be directly addressed by the farmers; thus may say this is a very short run conditions. Grain is one alternative for sugarcane crop competition. Negative price elasticity of rice suggests that these two commodities compete (substitution), but the elasticity of both short and long term value is small (inelastic). This indicates that the sugar cane and rice crops are no longer competing strictly in getting land. This phenomenon is in accordance with the conditions in the field where sugar cane is grown rarer in technical wetlands planted more rice. While sugarcane has now shifted to dry land. Shifting sugarcane to dry land in accordance with the considerations that sugarcane farmers are the best alternatives that provide the highest level of benefits. Nevertheless, judging from the coefficients that have a negative value indicates a tendency for grain commodities is still a contender cane. In the short term elasticity fertilizer prices is negative and in the long run have a positive elasticity. This result is contrary to the theory that, if input prices rise, the rate of production will decline due to budget constraints (Henderson and Quant, 1971). This suggests that in the short term, rising fertilizer prices are not being addressed by the manufacturer because the pattern of cyclical production of sugarcane a year. But the rising price of fertilizer inputs will be responded in the long run by reducing the use of fertilizers. Reduced use of fertilizers in the long run it will increase production. This is in line with the findings Suryantoro (1992) which shows the elasticity of output to the negative input of fertilizer.

8.2. Policy Implications

1. Based on the above findings, it can be the policy in the field of sugar is oriented to a specific purpose. By looking at the world sugar market is uncertain, the purpose of the policy towards self sufficiency is a policy that must be done. However, this policy course will require sacrifice and is expected to sacrifice as little as possible.
2. Indonesian sugar industry is not a single form of business where producers of raw materials (sugar cane) and processing of sugar cane into distinct, ie farmers and sugar mills. This condition implies different goals and motives among farmers planting sugarcane and sugar mills as a sugar cane processing agency. This situation requires a comprehensive policy that can be decoded by economic actor of sugar industry as a whole.
3. With the condition of the international sugar market is erratic (volatile), self sufficiency policy is a policy that can not be negotiable. Self sufficiency policy is done by providing domestic sugar prices to provide incentives for producers to increase sugar production.

4. Sugar import policy on the one hand can meet the demand for domestic consumption, but in the long run it affects on Indonesia so that the production of sugar import policy and price combination can be used for a combination of policy compliance and consumption as well as for the policy to increase production.
5. Stimulate producer pricing is done by applying a protective policy, the tariff on sugar imports. This policy will be accelerated if combined with input subsidies and pricing sugar.
6. But keep in mind that protective policies and input subsidies in the long run have negative effect on productivity and competitiveness, so that protective policies and input subsidies is not a permanent and long-term policy. This policy should be coupled with policies relating to productivity and competitiveness. This can be done by phasing in the implementation of these policies.

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