UNIVERSITAS INDONESIA

THE ANALYSIS LONG TERM AND SHORT TERM FACTORS AFFECTING THE DOMESTIC PRICE OF SOYBEAN

THESIS

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JAKARTA
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Submitted in partial fulfillment of the requirements for the degree of Master of Economics

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ABSTRACT

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This study aims to analyze the influence of the import volume of soybean, world price of soybean, nominal exchange rate (NER), GDP of Indonesia and import tariff level of soybean to domestic price of soybean at the producer level in the long term and short term. This study period was from 1990 until the year 2006 by using quarterly data.

The approaches used in this study are Johansen Multivariate Cointegration to see long-term relationship of all variables and Error Correction Model (ECM) to see the relationship in the short term.

In the long term, domestic price of soybean in Indonesia is influenced positively and significantly by world price, NER, import tariff level, and GDP of Indonesia. While the import volume of soybean positively affect the formation domestic price of soybean. In the short term, domestic price of soybean is influenced positively and significantly by domestic price in one previous quarter, NER one previous quarter and Indonesia's GDP. While the world price of soybeans and import tariff level in the same quarter also positively influenced domestic price of soybeans, although they are not significant. Meanwhile, the import volume of soybean two previous quarters has a negative affect but not significant. ECT(-1) show a negative and significant effect, it indicates that there is a relationship between long term and short term and the ability to correct for disequilibrium toward equilibrium condition.

Keywords:
Soybean, Import Tariff of Soybean, Error Correction Model (ECM), Johansen Cointegration.

ABSTRAKSI

Nama	:	Setio Widodo
Program Studi	:	Magister Perencanaan dan Kebijakan Publik
Judul	:	Analisa Jangka Panjang dan Jangka Pendek Faktor-Faktor yang Mempengaruhi Harga Domestik Kedelai

Penelitian ini bertujuan untuk menganalisa pengaruh dari volume impor kedelai, harga dunia kedelai, nilai tukar nominal, GDP Indonesia, tarif impor kedelai terhadap harga domestik kedelai. Periode penelitian dimulai dari tahun 1990 sampai dengan 2006 menggunakan data kuartal.

Pendekatan yang digunakan dalam tesis ini adalah Johansen Multivariate Cointegration untuk melihat hubungan semua variabel dalam jangka panjang dan Error Correction Model untuk melihat hubungan jangka pendek.

Dalam jangka panjang, harga domestik kedelai di Indonesia dipengaruhi secara positif dan signifikan oleh harga dunia kedelai, nilai tukar nominal, tarif impor dan GDP Indonesia. Sementara, volume impor kedelai mempengaruhi pembentukan harga domestik kedelai secara positif. Dalam jangka pendek, harga domestik kedelai dipengaruhi secara positif oleh harga domestik kedelai satu kuartal sebelumnya, nilai tukar nominal satu kuartal sebelumnya dan GDP Indonesia. Sedangkan harga dunia kedelai dan tarif impor pada periode yang sama juga mempengaruhi harga domestik kedelai secara positif, meskipun tidak secara signifikan. Volume impor kedelai pada dua kuartal sebelumnya mempunyai hubungan negatif dan tidak signifikan dengan harga domestic kedelai. Variabel ECT (-1) mempunyai tanda negatif dan signifikan. Kondisi ini menunjukkan adanya hubungan antara keseimbangan jangka panjang dengan jangka pendek dan kemampuan untuk mengkoreksi kesalahan pada kondisi ketidakseimbangan menuju kondisi keseimbangan

Kata kunci:
Kedelai, Tarif Impor Kedelai, Error Correction Model (ECM), Johansen Multivariate Cointegration.

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CHAPTER 1
INTRODUCTION

1.1. Background

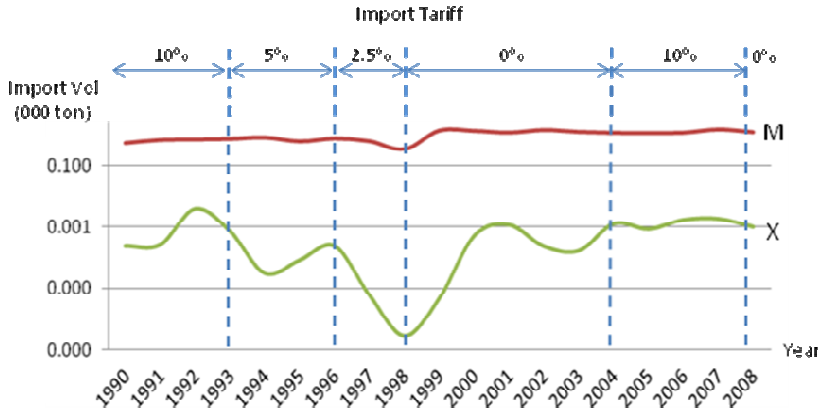
Soybean is one of important commodities which get attention by the Indonesian government right now. As other important food commodities such as rice, whole wheat and sugar, soybean also represent commodity which fiercely negotiated in term of trade. This is due to the fact that soybean is the source of raw material required by downstream food industry which is consumed by most Indonesian people. Hence the availability of soybean very important for the availability of products likes tofu and tempe to meet the demand for nutrient. To meet domestic demand, most of the time Indonesia has to import it. But, when food prices in international market increases, simultaneously it is also transmitted to an increasing price in domestic market.

The need for soybeans continues to increase along with population growth and increasing per capita consumption, especially in the form of processed products and the growth of the animal feed industry (Siregar, 2003). Soybean demand per capita from 1970 to 1990 has increased 160%. While in the period of 1990s to 2010 it is estimated to grow 2.92% per year (Siregar, 1999). Increased consumption of soy is so fast and can not be offset by an increase in domestic soybean production, then the gap occurs. The gap was closed by soybean import, but it takes up a lot of foreign exchange (Amang and Sawit, 1996).

Since trade of soybeans is no longer controlled by BULOG in 1991, soybean import increased very rapidly (Swastika, et al, 2000). An effort to improve land-based production through intensification, extensification, and diversification is not able to increase production significantly. But indications show a decrease dramatically in production after 1998 until now (Siregar, 1999; Sudaryanto et al., 2001; Siregar and Sumaryanto, 2003; Siregar, 2003; Hendayana. R., 2003).

Figure 1.1. shows a trade deficit in soybean in Indonesia. It indicates that we have not been able to meet the needs of soybean through the domestic

production. At the same time the government is expected to protect domestic production from the flood of imported soybean. To protect domestic producers of soybean in Indonesia, the government imposes a policy of import tariffs to protect domestic producer (due to rising imports prices of soybean). Based on research results, it indicates that determination of tariff differences will give a significant impact on soybean farmers' profits. At the level of import tariff 5%, the profit of farmer is expected to reach 18.85% (Nuryanti and Kustiari, 2007).



Source: WITS (processed)

Figure 1.1. Deficit Trade Balance of Soybean

Meanwhile, soybean import tariff rate at 22.3% will increase profits of farmers by 25%. But in aggregate increase in soybean import tariff will only result in loss of social welfare of Rp 147 billion (Nuryanti and Kustiari, 2007). However, the rise in world soybean prices is followed by the decreasing import tariff to 0% in 1998. Due to domestic distribution channels, a 0% tariff rate would actually benefit big importers and dealers so that the effect of tariff reduction does not have a significant impact on prices at the level of farmers and consumers. It also requires intensive supervision of domestic trade route by the government.

Table 1.1 shows that per capita soybean consumption of Indonesian people tends to increase, while domestic production shows a declining trend at the same time. This condition shows that Indonesia is experiencing an increase in dependence on soybean imports. Beside household consumption, soybean is also used as a raw material for small-scale industries such as tofu and tempe as well as

medium-scale industries and large, like soy sauce. World soybean prices continued to soar since the year 2007. It indicates instability in the prices of these commodities. This contributes in mid-2007 to an increasing price of imported soybeans in parallel to an increase in its impact on the domestic prices of soybean.

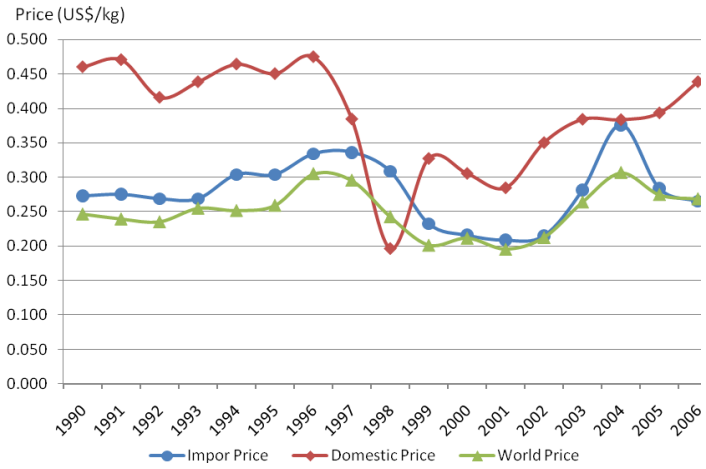
Table 1.1. Growth Production (Indonesia & World) and Indonesia Consumption

Year	Production (ton)		% Production	Domestic Consumption (kg/cap/year)
	Indonesia	World		
1997	1,356,891	144,418,185	0.94	na
1998	1,305,640	160,103,858	0.82	na
1999	1,382,848	157,796,852	0.88	5.7
2000	1,018,000	161,400,626	0.63	na
2001	826,932	177,923,563	0.46	Na
2002	673,956	181,815,725	0.37	7.1
2003	671,600	187,514,812	0.36	6.93
2004	723,483	206,909,669	0.35	7.22
2005	808,353	214,909,669	0.38	7.78
2006	749,038	221,500,938	0.34	8.31
2007*	608,263	na	na	na

Source: BPS (processed); *: prediction

The lower price of imported soybeans than domestic prices can occur, when a large domestic demand and strengthening of the rupiah against the U.S. dollar are expected. So far the effectiveness of 0% tariff policy to dampen price increases of imported soybean is still weak. Several other technical policies are still needed, such as increased production coupled with the implementation of appropriate import tariffs, extensive soybean land and incentives development for farmers to support price stability and trade performance of soybean products.

Even though a 0% tariff rate was imposed in 1998, it can not effectively reduce the domestic price. The BPS data shows that the local soybean prices from year to year is always more expensive than imported soybean. In 1992 the difference in price is Rp. 303/kg, local soybean more expensive than soybean imports, the difference increased to Rp. 1016/kg in 2000. This causes the local soybean not competitive compared to soybean imports (Figure 1.2.)



Source: WITS, BPS, IFS (processed)

Figure 1.2. Price Fluctuation of Soybean (Import, Domestic and World)

Now Indonesia soybean import tariff is 0%. However, the Department of Agriculture has submitted a proposal on soybean import tariff rate to the Ministry of Finance. Soybean import tariff is proposed to increase to be 27%. But in discussion among Ministry of Agriculture, Ministry of Trade and Ministry of Finance there is possibility that soybean tariffs will be applied in stages ± 10-15%. In the era of free trade where Indonesia is also a member of the WTO, the tariff-setting is a problem. But related to the domestic market, government must also provide protection for soybean producers.

The objective of imposing soybean import tariff is to protect domestic producers from a flood of imported soybean in domestic markets. The tariff is expected to reduce imported soybean, encourage domestic soybean price, and provide incentive soybean producers to increase their production. Government revenues from the imposing import tariff can be distributed to the soybean farmers in various forms of incentives in order to encourage increasing the quality and capacity of domestic production.

But, according to Tadjuddin Kadir (2009) this policy does not provide much help because increasing soybean price in domestic market has reached 100%. To solve the soybean problem, it is necessary to analyzed factors that causes rising the soybean prices. This problem can be seen from the domestic condition and global trade. Most Indonesian domestic demand is met by import,

especially from USA. So the domestic soybean trade situation is related with the situation of global soybean trade. Any changes in the global soybean trade will have an impact to the soybean market in the country.

Therefore, based on those backgrounds and problems mentioned above, it is interesting to analyze some factors that affect domestic price of soybean in a long term and short term.

1.2. Research Objective

Based on the background and formulation of the problem that have been presented, the objectives of this research are to:

a. Identify the factors that influence domestic price of soybeans in Indonesia in the long-term and short-term;

b. Analyze the influence of factors that affect the domestic price of soybeans in Indonesia long-term and short-term.

1.3. Scope of Research

The research focuses on several data related to soybean price namely: domestic price of soybean in Indonesia, soybean import volume, international price of soybean, Indonesia's Gross Domestic Product (GDP), nominal exchange rate, and import tariff rate imposed by Indonesia government. The data used is quarterly data from 1990 – 2006.

1.4. Research Methodology

The function of the domestic prices in this study can be formed into a mathematical equation as follows:

$PDOM_t = f\,(M_t, WP_t, NER_t, Y_t, TRF_t)$ ..... (1.1)

where :

PDOM = Domestic Price of Soybean (Rp/kg)
M = Volume Import of Soybean (ton)
WP = World Price of Soybean (US$/ton)
NER = Nominal Exchange Rate (Rp/US$)
Y = Gross Domestic Product (billion Rp)

TRF = Import Tariff Rate of Soybean (%)
t = t period

To analyze several factors influencing the price of soybeans in domestic market, the Johansen Multivariate Cointegration model is used for long term analysis and Error Correction Model (ECM) is for short run.

The data which used in this study is time series data. Source of the data are from WITS (World Integrated Trade Solution), Bureau of Statistics (BPS), Ministry of Agriculture, Ministry of Trade, and other sources including electronic sources.

1.5. Research Hypothesis

Through a theoretical approach, the hypotheses proposed in this research are as follows:

- Volume import of soybean have a negative (-) correlation with domestic price of soybean in long-term and short-term;
- World price of soybean have a positive (+) correlation with domestic price of soybean in long-term and short-term;
- Nominal exchange rate have a positive (+) correlation with domestic price of soybean in long-term and short-term;
- Indonesian GDP have a positive (+) correlation with domestic price of soybean in long-term and short-term;
- Import tariff of soybean have a positive (+) correlation with domestic price of soybean in long-term and short-term.

1.6. Outline

In order to facilitate the understanding of this thesis, brief description about the content of each chapter of the thesis is given as follows:

Chapter 1: Introduction

This part will discuss the background of the problem which explain about the recent condition of research object, objective of the research, research coverage, research methodology, thesis hypothesis and the organization of thesis.

Chapter 2: Theoretical Background

This chapter consists of several theories which underlie the issues. The theories used in this research include international trade theories, demand theory, theory of trade barrier especially about tariff barrier. Moreover, this part also consists of several literature studies about the previous empirical research which related to the topic in this thesis.

Chapter 3: World and Indonesia Soybean Profile

This chapter contains general descriptions concerning the condition of Indonesia's and world soybean production, consumption and trade. In addition, the soybean regulation in Indonesia and market structure will also be included.

Chapter 4: Research Methodology

This chapter will describe how the problems being analyzed. This chapter consists of construction of the models, data source and description, and analysis method.

Chapter 5: Results and Analysis

In this chapter, data will be analyzed by using method developed in Chapter 4. Then both result of regression and its analysis will be presented in order to achieve the objective of the research.

Chapter 6: Conclusion and Recommendation

This chapter consists of the conclusion based on the analysis on Chapter 5 and policy recommendation which can be used as an input for policy makers. Suggestion for research in the future is also presented.

CHAPTER 2
THEORITICAL REVIEW

2.1. International Trade Theory

In the late 17th century mercantilism was born, it related to international trade which states that the way for a country to become rich and powerful is to export and import as little as possible. Surplus generated from exports realized in the form of gold. Number of gold showed the wealth and power of a country in defeating the other countries. They believe that a country can gain trade advantages at the expense of other countries (zero sum game).

This view is challenged by Adam Smith who said trade between two countries is based on absolute advantage (assumed 2 countries and 2 commodities). If a country is more efficient in producing a commodity compared to other countries, but less efficiently than other countries in the production of other commodities, then both countries can benefit by each specialize in producing commodities which have more advantage.

While in 1817, David Ricardo argued with the law of comparative advantage that completes the theory of Adam Smith. Although a country is less efficient than other countries in producing both commodities, but still can trade and benefits both parties by way the first countries specializes in the production and export commodities which have the smallest inefficiencies and to import commodities which have the greatest inefficiency.

Heckscher-Ochlin (H-O) theory (1919) stated that a country will export products/commodities that use intensive raw materials produced by countries itself and will import the raw materials are scarce in country. The H-O theory is also called the theory of proportional factor or the theory of factor endowment. The basic concept of H-O theory is that international trade is due to different opportunity costs between the two countries. The difference is because the alternative costs of differences in the number of production factors such as labor, capital and raw materials owned by Indonesia and the United States. Indonesia is

abundance in raw materials and unskilled labor. In contrast, the U.S. is abundance in capital and skilled labor.

H-O theory within the limits defined the narrowest argue that:

a. A country will produce goods that use factors production is relatively more available, so the price of goods is relatively cheap because production costs are relatively cheap. So when the price of labor (wages) and the price of capital (interest rate) expressed as PL_1 and PC_1 for the state 1 and PL_2 and PC_2 for the state 2, the H-O theory states that if:

$$\frac{PL_1}{PL_2} < \frac{PC_1}{PC_2} \quad \text{or} \quad \frac{PL_1}{PC_1} < \frac{PL_2}{PC_2}$$

The notation above indicates that the proportion of the price of labor to capital in country 1 (PL_1/PC_1) is smaller than the proportion of the price of labor to capital price in the country 2 (PL_2/PC_2), means that the price of labor is relatively cheaper in country 1 while the price capital is relatively cheaper in the country 2. This condition causes the country 1 will export labor-intensive

b. With the emphasis on production and export of goods that use factors of production are relatively more, the prices of production factors are relatively more will go up due to a specialization of each country based on excellence of production factors has, so that each party would be a great benefit of free trade in the world and will increase welfare.

As the development of H-O theory, Samuelsen (1949) put forward the theory of price adjustment factor (Factor Price Equalization Theorem). The essence of this theory is that if specialization is accommodated in the production of free trade, the prices of production factors (wages, interest rates of money, land rent) will be equal to one another among the countries that traded (Salvatore, 2004).

Although the factors of production can not be moved from one country to another, but goods can move, so that traffic through this stuff, actually two parties to buy or sell a particular input.

Suppose that country A that have labor costs much lower and higher interest rates than country B. After those two countries trades which the country directed toward the production of goods X is labor intensive and tend to export goods so that the labor intensive good Y is capital intensive reduced. As a result the amount of labor demanded will increase and the amount of capital decrease, so that wages would rise, and vice versa interest rates will fall.

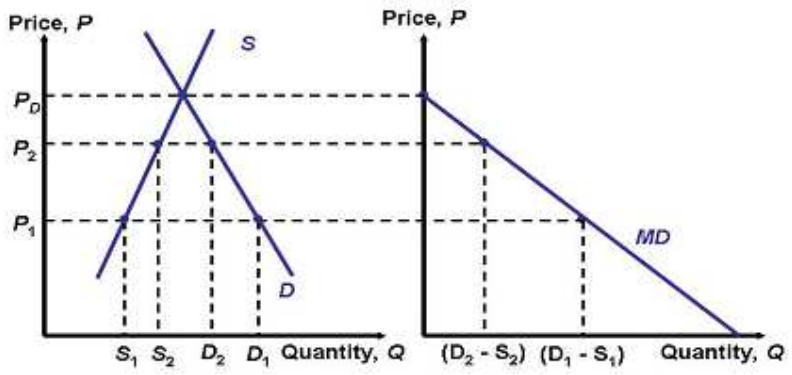
The opposite occurs for the country B, so that the country had a relative wages to rise and lower in country B, the wage was high relative to fall. Thus the tendency of prices of production factors will be the same as the result of efforts to make international trade specialization occurs after.

2.1.1. Export Import Theory

International trade can occur because of differences in demand and supply of a country. This difference is due to: (a) not all countries have and are able to produce commodities that are traded because of natural factors that do not support; (b) the ability of a country to absorb and apply the technology to produce a particular commodity in a more efficient level. Krugman and Obstfeld (2003) explain, if there are two countries, domestic and foreign, and they consume the same goods, which are transported from one country to another without generating costs (transportation costs are zero). Goods in each country where competitive supply and demand is a function of market prices, supply and demand will depend on the domestic currency, while the supply and demand in foreign countries will depend on the price of foreign currency. If then it is assumed that the exchange rate between two currencies are not influenced by the form of trade policies applied in goods market is the price used is the domestic currency.

Trading occurs when there are price differences at the time before the trade. Usually, price of goods in domestic higher than outside price before trade. Having established trade relations, starting good transfers from foreign to domestic because domestic prices are higher than in foreign. This trade increases the price of foreign goods and decreases prices on domestic goods until price difference does not happen again.

To determine the world price and quantity traded in world markets, it is necessary to set up two new curves are demand curve for domestic imports and the supply curve for foreign exports which is basically derived from supply and demand curves in domestic. Demand for imports shows the excess of the amount that consumers are asked for the quantity supplied by domestic producers, while the supply of foreign exports is the excess of the amount offered by foreign producers on the quantity demanded by foreign consumers.



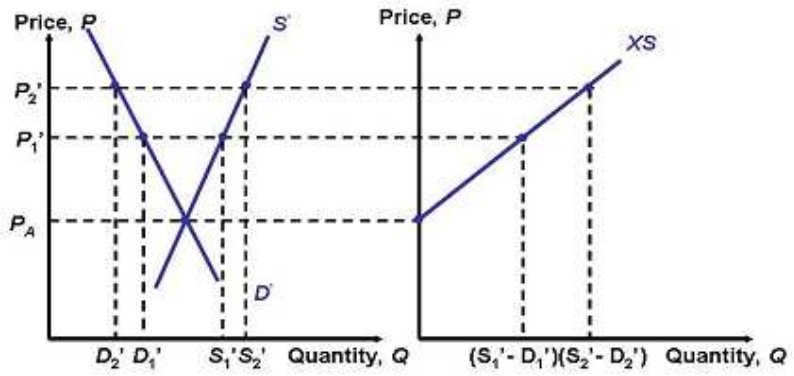
Source: International Economics Theory and Policy (Krugman and Obstfeld, 2006)

Figure 2.1. Demand Curve for Domestic Import

Based on Figure 2.1 for domestic import demand, when price at P_1 domestic consumers requested a total of D_1, while the domestic supply is only for S_1, so that domestic demand for imports amounted to (D_1-S_1), in this case there is excess demand. If the price increases to P_2, demand of domestic consumer was reduced to D_2, while domestic producers increase supply to S2, so the demand for imports fell to (D_2-S_2). This condition is the P_D, supply and domestic demand at same large, which indicates a country without a trade, so that the price at P_D domestic demand for imports cut straight axis, means no imports (import demand in $P_D = 0$).

According to Figure 2.2 for foreign export supply, foreign producers will supply for S1' when the price is at P_1', while foreign consumer demand is only for D_1', so the supply available for export is (S_1'-D_1'), resulting in excess supply. If the price increases to P_2', foreign producers will increase supply to S_2', the foreign

consumer demand reduce to D_2', so the supply for export increased to (S_2'-D_2'). When prices occurred in the P_A, the foreign supply and demand will be equal to the situation without the trade, so at this price the supply curve for foreign exports cut the vertical axis, meaning there is no export (export supply = 0 in P_A).

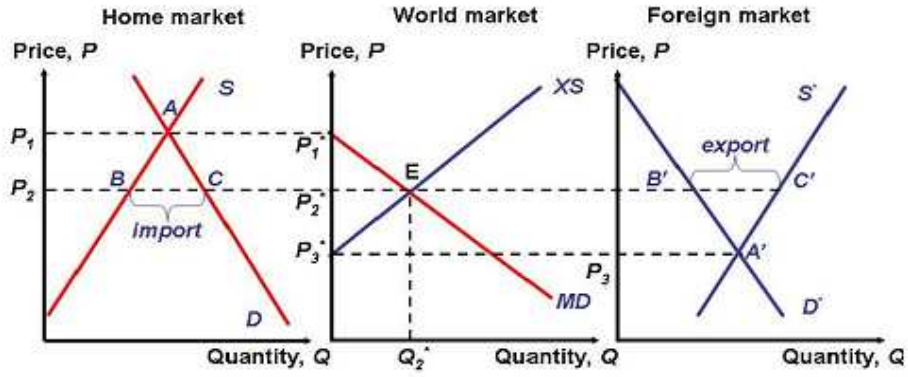


Source: International Economics Theory and Policy (Krugman and Obstfeld, 2006)

Figure 2.2. Supply Curve for Foreign Export

The balance of the world occurs when the domestic demand for imports equals foreign export supply (Figure 2.3). In domestic markets, production and consumption occurs at point A when the price reached P1, while the production and consumption in the foreign market occurs at point A' when the price of P3.

When there is trade, the prices established in the world market are among the P_1 and P_3 when the two countries is a big country. At a price below the P_1, the domestic country will ask for more (point C) than the amount produced domestically (point B) so that it will import the excess demand (B-C). While the price above P_3, foreign countries will produce greater than that requested or consumed. As a result an excess supply (B'-C'), so that foreign countries are exporting excess supply.



Source: International Economics Theory and Policy (Krugman and Obstfeld, 2006)

Figure 2.3. International Trade Equilibrium

When price at P_1, the quantity demanded for consumption commodities in the domestic country equal to the amount they offer, so that the domestic country does not import the commodity (price at P_1*). In domestic markets, P_2 is the excess demand which indicates that the domestic country must import the P_2. On the other hand, in foreign markets, P_3 shows that the quantity supplied equals the quantity demanded that foreign countries do not export these commodities. This state refers to the export supply curve on the world market, which is shown at point P_3*. In foreign markets, P_2 is the excess supply which indicates that foreign countries must export to P_2. The situation in world markets, the P_2*, where the amount demanded by the domestic market equal to the amount offered by foreign markets, indicated by the intersection between MD and XS curve. This intersection is an equilibrium in which trade is reached between the two countries, namely the P_2* and Q_2.

2.1.2. Trade Protection

Free trade will be able to maximize the output of the world and benefits for each country involved. But in reality, almost every state still apply various forms of barriers to free trade. Because of these barriers is closely related to the practice and trade or commercial interests of each country, the obstacles are commonly referred to as trade policy. Although in general the implementation of trade policy is always presented as a tool that should be applied to improve national welfare, in reality it is more contradictory than unilateral interests of

certain groups who are most disadvantaged by the application of trade barriers (Salvatore, 1997).

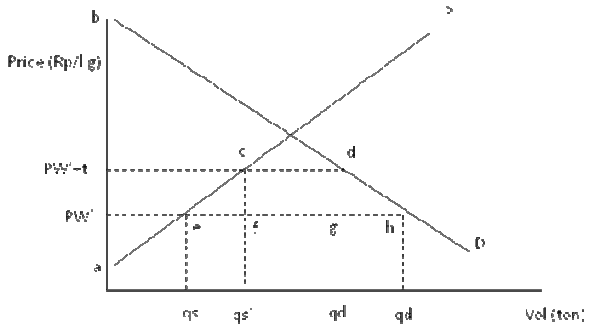
The most prominent form of trade barriers is tariff. Judging from the aspect of origin of commodities, there are two kinds of tariff, import tariffs and export tariff. Then when viewed from the counting mechanism, there are three types of tariffs, specific tariff, tariff combination (compound), and ad valorem tariff. Tariff barriers are usually in the form of countervailing duty, anti-dumping duty and surcharge (additional fee). While the non-tariff barriers usually in form of import licensing, quotas, technical regulations, health regulations, standards, etc. (Salvatore, 1997). Although the level of tariff barriers (percentage of taxes or duties) imposed on primary and secondary products different from one commodity to other commodities, the impact will be the same, namely to reduce foreign exchange earnings (Todaro, 2000).

Analyzing the impact of imposing tariff can be viewed in the framework of partial equilibrium. Partial equilibrium in many cases (but not always) are widely used to analyze the impact of trade policy in one sector's is understood without seeing the impact on other sectors usually using demand and supply curves.

Trade good between two countries occurs where supply and demand is a function of market price with the assumption that the exchange rate between two currencies is not influenced by the shape of trade policy in these two markets. Suppose country 1 supply shortage due to domestic consumption, and country 2 have excess supply which consumption exceeds production so that prices of domestic good is higher than in other countries, then established trade relations between the two countries.

Economic impact of the imposing import tariffs by one country can be explained graphically (Figure 2.4.) Assuming domestic as importer while others are exporters and domestic in this case Indonesia is a major soybean importer in the world, so the changes will affect the import of world markets, especially the world soybean prices (Krugman, 1991; and Salvatore, 1997).

The imposition of tariffs resulted on domestic prices rise to P_t. With domestic prices higher domestic producers increase supply, while domestic consumer demand will decrease, so that domestic demand for imports will be reduced.



Source: International Economics Theory and Policy (Krugman and Obstfeld, 2006)

Figure 2.4. Import Tariff Curve

The increase in domestic prices is smaller than the size of the tariff, because part of the tariff reduction is reflected in the price of exports by foreign and therefore do not burden the domestic consumer. This is natural consequence of trade policies that are restricting imports. In reality, however great this impact is very small, like a country who was wearing a relatively small import tariffs for certain commodities is also a small effect on the commodity trade, so that the imposition of tariffs is only a small effect on commodity prices.

Imposing import tariffs would benefit the domestic producers because import prices of goods are relatively more expensive compared with domestic goods, so the quantity of imports will decrease. In the figure shows the implementation of import tariffs causes costs to be higher. As a result the world price fell to PW', while the prices received by domestic consumers become PW'+ t, the import goods should be down qs'-qd'. Application of this theory leads to an increase of import tariff rates on goods by importer countries, decrease consumption, increase production, decrease imports and government revenue from tariff.

2.1.3. Trade Balance

According to Mankiw (2006), trade balance or net exports is the export value of a country reduced by the value of its imports. While the factors that affect to trade balance, including:

- Consumer tastes for goods produced at home and abroad
- Prices of goods at home and abroad.
- Exchange rates which determine the amount of domestic currency needed to buy some foreign currency.
- Income consumers at home and abroad.
- Cost of goods brought from one country to another.
- Government policies towards international trade.

Theoretically exports of goods affected by a supply and demand. International trade theory stated that the factors affecting exports can be seen from the demand side and supply side (Krugman, 1988; Tan, 2000). From the demand side, exports are influenced by export prices, exchange rate, world income and foreign trade policies of importing and exporting countries devaluation. While the supply side, exports are influenced by export prices, domestic prices, exchange rate, production capacity, the interest of capital, labor wages, input prices, and deregulation policy (exporting countries).

2.1.4. Exchange Rate

Exchange rate is defined as the price of foreign currency from domestic financial views (Blanchard, 2000). According to Krugman and Obstfelt (2006) the rate changes can be divided into two, namely depreciation and appreciation. Depreciation is the decline in the price of domestic currency against foreign currencies, while appreciation is the increase in the price of domestic currency against foreign currencies. If other conditions remain (ceteris paribus), then:

- Depreciation of the currency of a country make the price of the goods becomes cheaper for foreign countries.
- Appreciation of the country's currency led to price the goods become more expensive for foreign countries.

Exchange rates can be calculated into two, namely the nominal exchange rate and real exchange rate. Nominal exchange rate is the relative price of currencies between two countries. Thus if the value of the rupiah against the U.S. $ is Rp. 8500 per U.S. $, we can exchange U.S. $ 1 to Rp. 8500 in the foreign exchange market. Meanwhile, the real exchange rate is the relative price of an item between the two countries. Thus the real exchange rate indicates an exchange value of goods in a country with other countries. The real exchange rate is the nominal exchange rate was corrected with relative prices, i.e. prices in the country compared with prices abroad. Real exchange rate between the two countries is calculated from nominal exchange rates and price levels in the two countries. The relationship of real exchange rate of a currency with a nominal exchange rate, prices of domestic goods and foreign goods prices can be formulated as follows:

Real Exchange Rate = Nominal Exchange Rate x Price Level Ratio

The ratio of the price level is the ratio between the price levels in the country with the price level abroad. From the formula above, if the real exchange rate is high, foreign goods relatively cheaper and domestic goods relatively more expensive. Whereas if real exchange rate is low, foreign goods relatively more expensive and domestic goods relatively cheaper.

While the policies of each country associated with the exchange rate can be classified into two types. First, fixed exchange rate where the local currency is fixed against the specified foreign currency. Second, floating exchange rate system, where the exchange rate or rates may change at any time, depending on the number of supply and demand of foreign currency relative to domestic currency. There are three major factors influencing the foreign exchange demand, such as:

– Import Financing

  The higher imports of goods and services, then the greater the demand for that brief exchange rate will tend to weaken. Conversely, if imports decrease the demand for foreign currency will decline so that the exchange rate will be strengthened.

- Capital Outflow

  The greater the flow of capital out, the greater the demand for foreign currencies will weaken further and the exchange rate. Capital flows including debt payments out of the Indonesian population (both private and government) to foreigners and people of Indonesia placement of funds abroad.

- Speculation Activities

  More foreign currency speculation activities conducted by speculators, the greater the demand for foreign currency exchange rates that weaken the local currency against foreign currencies.

Meanwhile, the supply of foreign currency is influenced by two main factors:

- Export Revenues

  The greater the volume of export revenues of goods and services, then the greater the amount of foreign exchange owned by a country and the subsequent exchange rate against foreign currencies would tend to strengthen or appreciation. Conversely, when exports declined, the amount of foreign exchange will have diminished so that the exchange rate tends to depreciate.

- Capital Inflow

  The greater the capital inflow, the exchange rate tends to increases. Capital inflows in the form of acceptance they will be on foreign debt, short-term placement of funds by foreign parties (portfolio investment), and foreign direct investment (FDI)

It is said that, the factors that affect exchange rates, demand and supply of foreign currency are influenced by the development of exports, imports and capital flows from home and abroad. The development of exports and imports among others influenced by the relative price between a country with a trade partner countries. The higher a country's inflation rate compared to other

countries, the prices of goods a country exports more expensive and can reduce the export and the next will reduce a country's exchange rate.

2.1.5. Income / Gross Domestic Product (GDP)

In macroeconomic theory, the income of a country can be measured from three approaches, namely income of the approach, the production approach and expenditure approach (Nanga, 2001:17).

- Income Approach

  Income approach is a measured by the income of production factor such as from labor, capital, and also profit.

- Production Approach

  From the production approach, income of a country is the amount to produce final goods and services produced by economic sectors in the country in a period (one year). In general, the economic sectors can be summarized into three sectors, namely: agriculture, manufacturing sectors and service sectors. In Indonesia the incomes by production approach are grouped into 9 (nine) sectors in order to make it easier and avoid overlapping calculations, namely: mining and quarrying; agriculture; manufacturing industry; electricity; gas and water supply; construction; trade, hotels and restaurants; transport and communications and warehousing; financial services; and other services.

- Expenditure Approach

  In the expenditure approach, the national income of a country is the amount of spending by the household sector (consumption), the private sector (investment), government sector (government spending) and the foreign sector (exports). The logic of this approach is that the expenditure of a party is income to the other party.

2.1.6. Trade Liberalization

The nature of trade liberalization is to eliminate various tariff and non tariff barrier on trade. With trade liberalization, for example agricultural products

can improve the access to wider markets, reduction of export subsidies and domestic subsidies, and not just in the show to increase the volume of products traded international market, but also to ensure a fair trading system.

Developing countries including Indonesia are very brave in trade policy in accordance with the demands of the market mechanism. In the world trade, Indonesia has making ratification with WTO provisions and without reducing protection to farmers. WTO agreement still allows Indonesia to impose import tariffs for some commodities. The challenge in the near future to be faced by the Indonesian government is the implementation of the scheme Common Effective Preferential Tariffs (CEPT) within the framework of the AFTA agreement. CEPT scheme in its implementation was agreed to classify non-processed agricultural products into 3 groups.

- Commodity groups which immediately went into the CEPT (intermediate inclusion list)
- Commodity groups to temporarily excluded from the CEPT scheme (temporary exclusion list)
- Commodity groups by the member states are considered sensitive and need special mechanisms (sensitive list).

International trades are open and transparent through the process of globalization and closely associated with the global market. Recently, world market price quickly and strongly affects the dynamics of prices in the domestic market. In other words that the formation of prices in the domestic market has a close relationship with changes in the international market prices and changes in exchange rate values. An increase in the international trade is an instrument of import tariffs in the face of trade liberalization, especially soybean commodities.

2.2. Previous Research

Previous study which is similar to this research has been carried out by Wei Si and Wang (2004). They examine the extent to which the Chinese and the world sugar markets are integrated and how price fluctuations in the world market may affect China's domestic sugar market. They use the *Johansen Cointegration*

method to examine whether a long-run co-integration relationship exists between main domestic sugar markets and between domestic and international sugar markets. And also they use the *Error Correction Models* (ECM) to analyses the likely short-run impacts of international sugar price fluctuations on China's domestic sugar market. Their study shows that there is a long run co-integration relationship between domestic sugar markets, and between world sugar spot market and China's domestic sugar market. The world sugar market price tends to lead price changes in China's domestic sugar market. However, in the short run, changes in the world sugar price do not seem to have an immediate impact on the sugar price in China's domestic market. In other word, no short-run cointegration exists in two markets.

Kariyasa and Sinaga (2007) analyze the feed and chicken meat markets behavior in Indonesia, including domestic feed market behavior influence factors, domestic and world markets of chicken meat behavior influence factors, and responsive level each market to its influence factors. The simultaneous equation econometric model approach through the Two Stage Least Squares (2SLS) estimation method had been implemented in order to reach the objectives this research. The analysis results shown that feed production behavior more responsive to the changing in the maize price than the price of feed itself. Feed demand behavior is more responsive to the changes in the chicken meat price than the price of feed itself, and feed price behavior is more influenced from supply side than demand side. Chicken meat production is more influenced by its domestic price than other factors. In the long-run, the world price of chicken meat will be strongly influenced both from supply and demand sides, as well as it through import price has a stronger effect than the domestic market power to create the domestic chicken meat price.

Meanwhile, Center of Research and Development, Ministry of Agriculture (2000) use regression model to analyze the impact of exchange rate, international price and base price of grain to base price of soybean. The regression result concluded that the government should consider currency exchange rates and should not consider the international soybean prices in determining base price of

soybean. It describes further that the value of R^2 relatively low, it show there are other variables that affect base price setting, besides variables in the model.

They continue to analyze the factors affecting price at the soybean producer level. They include variables such as base price, price of producer at previous year, import tariff at previous year, and import volume of soybean at previous period. They conclude that the base price policy tends to affect the price of soybean producers. But the data shows that the base price of soybeans tends to move away from the producer price. Having said that, it can not be said that the base price policy has effectively encouraged farmers to sustain producer prices. Because the base price of soybeans tends to be below the producer price, it can be said that the objectives of applying the base price policy is not effective. According to Rachman (1996) and Rusastra (1991), it is because the annual procurement from BULOG is very small or evens none. The lack of effectiveness of the base price policy is also seen from the harvested area of soybeans. Regression results shows that the base price policy has no affect to the harvested area. However, otherwise the producer price affects the soybean harvested area.

Import tariff is usually raising the price including the domestic price of domestic producers. Negative coefficient for import tariff shows that import tariff policy is not effective against the domestic price. It can be said that the producer price is affected by parity price and import volume of soybeans. During the application of the base price policy of soybeans, import tariffs levied was 30% in the period 1979-80 and 10% in the period 1981-91. This support the conclusion that import tariff is not effective because at the time of declining import tariffs, the consumer price ratio of parity prices actually increased. In other words, consumers pay higher than necessary (Agricultural Socio-Economic Research, 2000). The reduction of import tariff is in accordance with the demands of trade liberalization. But consumers in the country still seem to be worse off**.**

Briefly, the summary of these previous studies can be seen in this table below:

Table 2.1. Summary of Previous Study and Research Position

No.	Previous Study	Research Position
1.	**Wei Si and Wang (2004)** They use ECM method to analyze how price fluctuations in the world market may affect China's domestic sugar market. In the long run, world sugar market price lead to price changes in China's domestic sugar market. In the short run, changes in the world sugar price do not seem to have an immediate impact on the sugar price in China's domestic market.	This research adopts ECM method that used in this journal and also with the same point of view, seeing how the world price fluctuations affect to domestic price.
2.	**Kariya and Sinaga (2007)** They use Two Stage Least Square (2TLS) to analyze the feed and chicken meat markets behavior in Indonesia. In the long-run, the world price of chicken meat will be strongly influenced both from supply and demand sides, as well as it through import price has a stronger effect than the domestic market power to create the domestic chicken meat price.	This journal has the same hypothesis that world price has positive influenced to domestic price. It underlying the author use this journal as material of analysis.
3.	**Center of Research and Development, Ministry of Agriculture (2000)** They use ECM method to analyze the impact of several variables to price forming of soybean. The result related to base price of soybean, exchange rate is significant and world price is not significant in determining base price of soybean. Value of R^2 relatively low, it shows there are other variables that affect base price setting. The result related to price of soybean at producer level, base price, price of producer (-1), import tariff (-1), and import volume of soybean (-1). They conclude that the base price policy tends to affect the price of soybean producers. But the data shows that the base price of soybeans tends to move away from the producer price. Import tariff is usually raising the price including the domestic price of domestic producers. Negative coefficient for import tariff shows that import tariff policy is not effective against the domestic price.	This journal analyzes the soybean commodity. It is the same with this research. So, it can support to analyze this research.

CHAPTER 3
WORLD AND INDONESIA SOYBEAN PROFILE

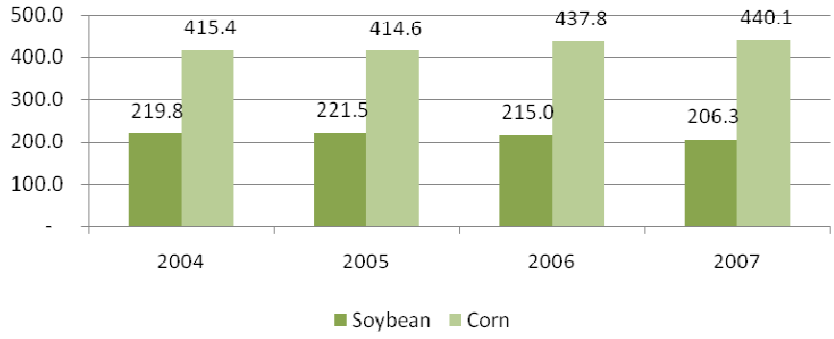
3.1.World Soybean

The current of turmoil in financial markets, especially after the credit crisis freezes property sector in the United States, the market saw that happening attraction at the demand side of food commodities for their own food needs and the needs of bio-fuel that drives the global food price fluctuations.

One of the food commodities experiencing turmoil is soybean. High soybean prices which reached more than 100% indicate a shock occurred in the supply-demand. This chapter attempted to describe comprehensively how the performance of the supply and demand soybean market.

3.1.1. World Production

The bio-fuel development policies make producers of food commodities prioritize what commodity to be produced in the short and long term. This decision had an impact on soybean cultivation. Currently, producers should analyze the ratio of soybean and corn prices.

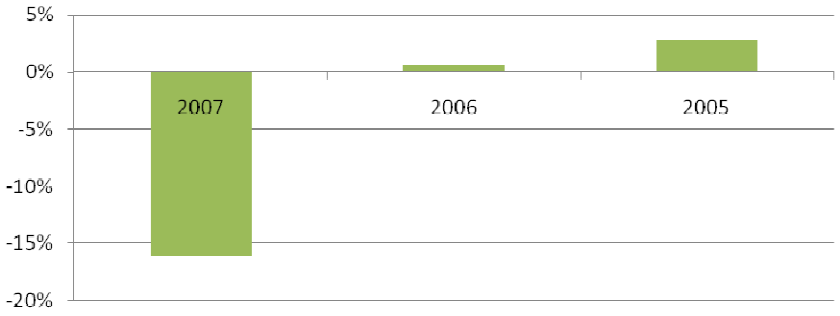


Source: Department of Agriculture, USA (million ton)

Figure 3.1. World Soybean and Corn Production

Figure 3.1. shows a world soybean production continues to decline, with a decreasing trend of 2% during the period 2004-2007. The figure shows that during the period the world soybean production is declining. One of the most common reasons is the conversion of soybean fields into corn fields. With this land conversion, corn production increased by 2% over the period 2004-2007, and in 2007 corn production increase by 1% compared to the previous year.

Conversion of land mentioned above is the conversion of land that occurred in the United States, as the largest producer of soybean production. In 2007, the planting areas in the United States for soybeans fell sharply to 63.6 million acres, whereas in the 2006, the planting area reached 75.5 million acres (www.soystats.com). This means that in 2007 soybean planting area declined by 16% (Figure. 3.2). This is the first decline since 2003.



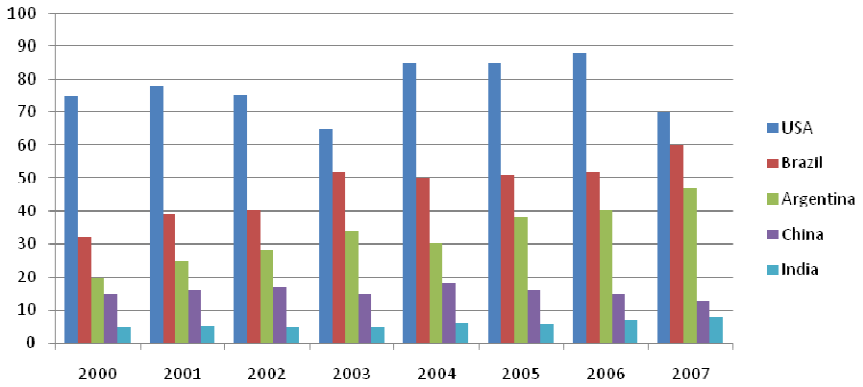
Source: Soystats (in acre)

Figure 3.2. Growth of World Soybean Area

For the world, a shock on the supply side in USA could negatively affect soybean markets and derivatives. In 2007, USA which is the world's largest producer of production world's soybean contributes 32% (70.4 million tons) of world production. The second largest country after USA is Brazil, contributing 28% (Figure 3.3).

For Brazil, the year 2007 is an indicator of stability and sustainability of soybean production for over 4 (four) years before the production contribution to world production stagnant at 24%. It is occurred in Argentina as the country's third-largest producer of the world, its contribution in 2007 was 21% or increased

by 3% compared to 2 (two) years earlier. Two other countries belonging to the 5 (five) main contributors to the world production is China and India. But the production level both countries in 2007 are relatively stable.



Source: FAOSTAT (processed)

Figure 3.3. The big five countries soybean production (million ton)

According to USDA projections (2008), in 2007/2008 period, world production would decrease by 7.28%. This can be caused by the level of productivity and soybean planting area. In the period of 2007/2008, the level of productivity of soybean production is projected to decline globally by 3.97%, and the land / planting area is projected to decrease by 3.63%.

The most feared in the future is a projected decline in productivity in the USA, amounted to 3.48% in the period of 2007/2008. It will impact significantly to world production and import of Indonesian soybean. In other producing countries (not including USA) projected soybean productivity decreased by 2.55% in the same period.

Based on USDA's projection in 2007/2008, the USA soybean supplies will experience a great shock for the year 2007/2008. It was not only a negative shock occurs caused a decrease in productivity, but coupled with a reduction in planted area by 15.8% or decrease the width 4.8 million hectares. In contrast to other countries, precisely in 2007/2008 soybean planting area is projected to

increase by 2.1% or an increase of 1.4 million hectares of area, but productivity decline.

3.1.2. World Consumption

Globally, consumption of soybean world since 2002 to move stable, with a range of changes in consumption levels of 1-3%. Consumption of soybean in the world can be categorized into two, namely the consumption of soy as a source of protein (meat/protein meal) and soybean oil.

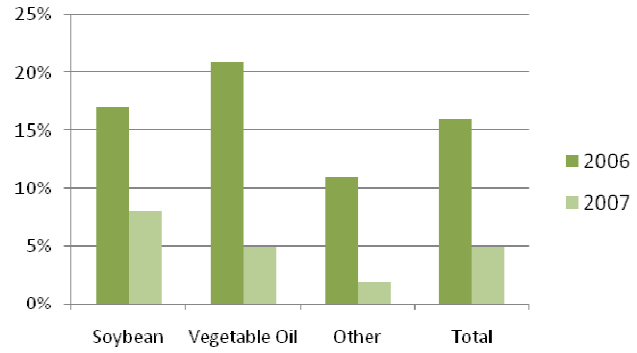
In 2007, for consumption above two categories, when compared with previous years soybean consumption increased by 6.1%. Highest growth of over 7 (seven) last year occurred in 2006 which reached 12.3%. High growth is supported by a factor of production at that time grew by 3%.

Although in 2007, soybean production decreased by 1%, but from an increase in the consumption side. This can be an early indication that the structure of the world soybean market is inelastic market production, at least for the times now. The common thinking about the structure of the soybean market is inverted transmission of consumption-production relationships for the future price. With the ever-increasing consumption (growth) and declining production trend, it is feared happened soybean world price fluctuations, which in turn form a new equilibrium price at a higher level.

Soybean has a significant role in meeting demand for food that contains protein. Other foods that can substitute soy as a protein source is carnel palm (palm kernel oil), peanuts, fish, copra, sunflower seeds, cottonseed and rapeseed. In the data obtained from Soystats, illustrated that rapeseed, cottonseed and sunflower seeds are the most can goods substituting soy. Similarly, the role of soybean to meet the needs of high vegetable oil, place under the palm oil's role in meeting the needs of vegetable oil.

In 2007, soybean is able to meet the needs of protein by 69% of the total world consumption or increased 1% from the previous year. And the contribution of soybean in the world vegetable oil need in 2007 reached 30% or increased by 1% from the previous year. Until now, world vegetable oil demand is mainly

provided or supplied by oil palm. In 2007, the contribution of palm oil an increase by 1% compared to previous year. This illustrates that the increase in the contribution of soybean in fulfilling the world vegetable oil production can be met by 2 (two) things, namely an increase in production and consumption of soybean oil, and the declining of oil production and consumption of other vegetable commodities (not including the red-palm oil).



Source : Soystat

Figure 3.4. Growth of Consumption Level World Vegetable Oil

Increased contributions soybean oil and palm oil in world vegetable oil demand in 2007 was due to the low growth in consumption of oil, other vegetable oils which only reaches 2%. While consumption of soybean oil and palm oil respectively growth reached 7% and 8%. Thus, the contribution of soybean in the world vegetable oil needs can be increased by compete with palm oil.

Today, world soybean consumption is also affected by the development of bio-fuel use or demand. Since four years ago, the demand for vegetable oils is limited to meet the needs of manufacturing industry. In recent years, the price is high enough to cause the purchasing power decreases. This is a beneficial for the bio-fuel industry to increase their production. In the end, the competition in the supply of soybeans have not only limited to food and feed only on, but also for energy.

According to Good (2007), the utilization of soybean oil for bio-fuel production will affect the price of soybean oil and bio-fuel price itself. Utilization

for July 2007 is very large, when the average price of soybean oil reached US$ 0.1 higher than July 2006. During the bio-fuel production based on food increased and soybean production in South America has increased, the demand for soybean oil will be increased significantly.

3.1.3. World Soybean Trade

The development of soybean trade between countries can be used to show the world soybean demand patterns. If an increase in soybean trade volume of the world indicated that the increased world demands (vice versa). United State Department of Agriculture (USDA) has projected that in the period 2007/2008 world soybean trade will increase of 6.4% compared to previous period. In the period 2006/2007 the number of world soybean trade reached 141.4 million tons, whereas in the 2007/2008 it is projected at 150.4 million tons.

Table 3.1. Soybean Export by Year and Countries (in million metric tons)

Country	2006/07	2007/08
Argentina	8.7	10.2
Brazil	23.5	30.7
Other South America	5.4	5.8
China	0.4	0.3
Other foreign	2.2	1.7
United States	30.4	26.5
Total exports	70.7	75.2

Source: USDA

Until now, most of the soybean-exporting countries are the main producers, namely the United States, Brazil, Argentina and China. In 2006/2007, the largest exporting countries are the United States and Brazil, with export value for 30.4 million tons and 23.5 million tons respectively. Other than those two countries, export value is still below 10 million tons. From the import activities, the largest importing country is China, the European Union, Japan, South Korea, Mexico and Indonesia.

The question is China's position in the world soybean trade. On the one hand China is the country's fourth largest producer in the world, but also imports most of the world soybean. This indicates the existence of the domestic demand is

not fulfilled from domestic supply, because historical data showed no decline or a significant increase in production.

Table 3.2. Soybean Import by Year and Countries (in million metric tons)

Country	2006/07	2007/08
European Union 1/	15.4	15.8
Japan	4.1	4.2
South Korea	1.3	1.2
Taiwan	2.4	2.5
Mexico	3.9	4.0
Former Soviet Union 2/	0.0	0.0
Other Europe	0.5	0.5
China	28.7	33.5
Malaysia	0.5	0.7
Indonesia	1.5	1.6
Other	12.4	11.4
Total imports	**70.7**	**75.2**

Source: USDA

Some gives analysis related to the level of soybean imports by China. According to Cao et. al. (2004), the main factor contributing to high soybean consumption in China is increasing income and urbanization. There is a change of food consumption patterns of starch-based foods into the food consumption of protein-based. According the Interfax-China (2007), increased consumption of soybean in China is driven by rapidly growing soybean processing industry. In 2006, 82% consumption of the domestic soybean processing industry comes from imports. In comparison, in 1997, soybean processing industry is only 30% are obtained from imports.

It's also in Mexico, as the second state of the world's largest soybean importer. The occurrence of increased income to pushed increased consumption of meat and vegetable oils, including soybean. Factors' supporting the increase of imports in Mexico are improving border infrastructure in border Mexico-United States.

3.1.4. Role of Policies against World Soybean Price Increase

The high price of grain commodities such as corn, wheat, soybeans in international market is caused by the United States policy in boosting the production of alternative fuels (Nafi and Vennie, 2008). Further note that the

increase in world soybean prices is not caused solely by the energy policy of the United States government as it is also contributed by policy of transferring soybean production to corn, other causes involve:

a. Chinese demand for soybean is large enough (the world's largest population, economic growth in 2007 reached 9%) that triggers the high imported soybean and derivative products. Increasing soybean imports is caused by the storm that strikes some agricultural areas in China. Currently China is the largest country in consuming vegetable oil in the world. This could dictate the price of soybeans in the global market.
b. An inventory of food commodities (soybeans) by the United States, Argentina and Brazil is down to meet domestic needs. It is due to the fact that land to grow corn as a raw material of bio-ethanol has increased.
c. The competing use of soybean oil, palm oil and ethanol for alternative energy.
d. The transition from stock funds or money into commodities markets.

Related to this condition, the question is how the impact on foreign trade of these commodities in Indonesia, along with rising food prices in international markets and rising crude oil prices are causing countries to look for an alternative energy source.

3.2.Indonesian Soybean

The history of how soy enters Indonesia is not known. It most likely brought by Chinese traders in the 13th century. Soybeans originated in China, which has been cultivated since 1000 years before BC (Purnamasari, 2006). But it is started to be cultivated since around 1776. But the development of harvest area is slow and has never been a major crop. This is different from soybeans in United States or in South America which has been cultivated in 1950, but the development is very fast to be major soybean producer in the world (Harnoto and Sumarno, 1983).

3.2.1. Indonesian Trade Soybean

Indonesia is one of the soybean importer countries. Imbalance between national production and consumption has become a trigger of import dependence on soybean Indonesia. This can be seen in Table 1.1, soybean imports tend to increase since 1996 until 2007. The high import of Indonesian soybean is in line with the policies set by the world's largest exporter in the provision of export subsidies that motivates Indonesian soybean importers to import (Malian, 2004). Indonesia import soybean has been declining from 2002 to 2005, ie 1.4 million tons become 1.1 million tons, then increased again since 2006. This is presumably because at that period, there was an increase in world soybean prices is also causing an increase in import price of soybean (see Figure 1.2)

Based on Trade Specialization Index (TSI) as the indicator of product development, it shows that Indonesia is a net importer during the period 1996 to 2007 as indicated by the TSI value of -1.

Table 3.3 Growth of Export, Import and Trade Specialization Index of Soybean (value in thousand US$, volume in ton)

Year	Export		Import		TSI	
	Value	Volume	Value	Volume	Value	Volume
1996	115.6	239.6	251,655.7	746,329.4	-1,0	-1,0
1997	0.8	5.9	206,674.2	616,375.0	-1,0	-1,0
1998	0.0	0.3	98,692.5	343,.7	-1,0	-1,0
1999	17.8	4.6	301,687.5	1,301,754.6	-1,0	-1,0
2000	116.8	520.9	275,.2	1,277,685.0	-1,0	-1,0
2001	344.9	1,188.0	239,321.6	1,136,419.4	-1,0	-1,0
2002	152.2	235.4	299,219.1	1,365,252.7	-1,0	-1,0
2003	300.0	169.0	330,496.6	1,192,717.0	-1,0	-1,0
2004	501.1	1,300.4	416,929.8	1,115,792.8	-1,0	-1,0
2005	484.7	875.6	308,008.9	1,086,178.2	-1,0	-1,0
2006	2,980.7	1,732.4	299,578.2	1,132,143.5	-1,0	-1,0
2007	2,251.8	1,871.6	479,428.4	1,411,588.7	-1,0	-1,0

Source: BPS (processed)

Soybean propensity to import can also be triggered because of the low quality of the domestic soybean than imported one. Moreover, imported soybean

can be obtained with a cheaper price than the domestic soybean prices. According to Sumarno and Harnoto (1983), the difference is due to differences in the quality factors in soybean cultivation. Along with the increasing population and incomes lead to an increase in demand for soybeans that can not be offset by increased domestic production.

Structure import of soybean in Indonesia shows that almost come from USA. The share of soybean imports from USA is relatively larger than the from Argentina and Brazil, where each year tends to increase along with increasing domestic soybean demand as a raw material of food. The share of Indonesia's soybean imports from the United States in 2007 reached 75%.

Apart from the three major producers of the world, Indonesia also imports from Canada and Malaysia. But the amount is relatively small. The high dependence on soybean imports by Indonesia, especially come from medium-scale industries and large. Indonesia in soybean commodity prices acted as price taker. Indonesian soybean production is relatively small that can not control the prices in international market.

Table 3.4 Source of Indonesia Import by Countries

Importer Country	2005	2006	2007
USA			
Total World Import (million US$)	7774.4	7254	544.5
Total Indonesia Import from USA (million US$)	255.7	280.1	409.5
Share (%)	3.29	3.86	75.21
Rank	8	8	-
Brazil			
Total World Import (million US$)	6188.3	6352.4	16.1
Total Indonesia Import from USA (million US$)	-	-	-
Share (%)	-	-	-
Rank	-	-	-
Argentina			
Total World Import (million US$)	2774.7	1864.7	84.8
Total Indonesia Import from USA (million US$)	39.8	16.2	60.5
Share (%)	1.43	0.87	71.34
Rank	7	6	-

Source: Comtrade (processed)

On the other hand, Indonesia is also a soybean exporting countries, although the share of a relatively small compared with the value of imports. Some countries which became the largest export destination for Indonesia soybean in 2002-2006 include India, Japan, and the Philippines. Indonesia so far still has limitations in soybean exports caused by the relative strength of competitors like USA, Argentina and Brazil. In addition, soybean production and the quality of Indonesia which is still relatively lower than the third-country exporters.

Trade between countries will happen if a country has a surplus (natural resources, labor, capital, technology) and other countries in deficit then they will need each other to meet their needs. It also happens for soybean products. Indonesia is known as an agricultural country with farms large enough and should have an abundance of soybean production, but ironically it does not become a reality. This is because most of Indonesian people consume soybean in the form of direct or processed products. The data shows that Indonesian soybean production is declining as a result of land converting from agricultural land into housing or the manufacturing industry, while private consumption continued to increase along with the increasing number of population in Indonesia.

Related to soybean prices, as the international trade are opened, then a country has two possible positions. Indonesia will sell soybeans to international markets, or otherwise buy soybeans from the international market. Indonesia must compare the price of soybeans applicable in the domestic market with the prevailing price in other countries or the world market. If the world price of soybeans is higher than domestic prices, then Indonesia will be the exporter of soybeans. Conversely, if the world price of soybeans is lower than domestic prices, then Indonesia will be a net importer of soybeans.

Until now it generally has been an increase in domestic prices of soybean, in producer price and consumer price. The most significant increase of the period occurred in the monetary crisis that hit Indonesia in 1997/1998. With the depreciating domestic currency (rupiah) against foreign currencies, then the means of production such as fertilizers and pesticides experienced a price hikes. This resulted in increased costs production so that farmers as producers must raise

the selling price of soybean to cover losses incurred due to the increase in production costs.

3.2.2. Indonesian Government Policies

Recognizing the role of soy as an important food in Indonesia, the government set up various policies in soybean development efforts in Indonesia. The government should ideally give a fair proportion of the policy which is good for soybean domestic producers and soybean consumers.

In the early 1980, Indonesian government through BULOG implements procurement, storage and distribution of soybean. The aim is to ensure the availability of soybeans for craftsmen tofu and tempe especially for KOPTI (Cooperative Association of Craftsmen) members. Procurement from domestic producers lasted only 3 years (1979/80-1982/83) and the number is small or less than 1% of domestic production. KOPTI was actually required to buy local soybeans about 20% of soybeans distributed by BULOG (Irawan and Purwoto, 1989). But in reality it was not going well. The reason is because the price of imported soybeans more cheaply than local soybeans.

Since the abolition of monopolies by BULOG, soybean trade is out of control. It has a tendency that import increased rapidly, except in 1998 which was due to the economic crisis experienced by Indonesia (see Table 3.3).

Another policy that the government has implemented related to soybeans is to determine the base price of soybeans with the aim of increasing production and farmers' income. But in 1992, the government no longer set the base prices for soybean commodity because they are not effective. This is because the difference in price between the time (peak and off season) is still relatively low. This is due to limited supply, production at harvest always absorbed without significant price reduction. At the time of production rare, soybean prices do not increase beyond the tolerance limit, caused by the distribution of imported soybean.

Along with the above policies, the government also implemented import policy of soybean that can be used as an alternative to protect the domestic producers. The level of specific tariffs will be set that the price level will not

compete with local soybean prices. This strategy is consistent with the desired policy of globalization to replace all forms of non-tariff policies.

Table 3.5. The Level of Import Tariff of Soybean

Year	Import Tariff	Description
1990 – 1993	10%	
1994 – 1996	5%	
1997 – 1998	2,5%	
1999 – 2004	0%	Kepmenkeu No. 41/KMK.01/1998
2005	10%	Permenkeu No. 591/PMKI.010/2004
2008	0%	Permenkeu No. 1/PMKI.01/2008

Source: Ministry of Finance

The level of tariffs applied to provide the necessary level of protection to protect the soybean producers in domestic market. Soybean import tariffs that apply in 1990-1993 amounted to 10%. Later in 1994-1996 tariffs reduced to 5% and to 2.5% in 1997-1998. This is due to Indonesia has ratified the WTO agreements through the Law No.7/1994. The consequence is that Indonesia is required to immediately make adjustments to agricultural policy and trade policy. Form of adjustments includes reduction of import tariffs of agricultural products and reducing agricultural input subsidies. Based on the Decree of the Minister of Finance No: 41/KMK.01/1998, since 1999-2004 tariff applicable to imported soybeans is 0%, according to the IMF agreement as stipulated in the LOI (Letter of Intent), in which Indonesia must fully comply with the appropriate provisions in the Agreement of the WTO Agriculture (AoA), such as the abolition of monopolies soybean imports by BULOG and a decrease in tariffs as high as 5%.

The reason the government sets a low tariff is to meet the needs of domestic soybeans. But after evaluating the impact of tariffs to farmers in domestic, where 0% import duty is very detrimental to farmers, since 2005 the government decided to raise tariffs on soybeans to 10% through the Regulation of the Minister Finance No. 591/PMKI.010/2004. Planned implementation of the tariff will be valid until the year 2010.

With the changing structure of protection due to new policies it will likely produce structural changes in the level of farmers. Prices declining due to

lower import tariffs may affect the profits and competitiveness of soybean farming. If protected with a tariff mechanism, government and domestic producers organize production structure in accordance with the principle of protection; the tariff reduction will not much affect the structure of production of these commodities. Conversely if during protected by tariff, government and domestic producers do not take advantage to strengthen competitiveness, the reduction of import tariffs would destroy domestic production.

In addition to policies mentioned above, the Indonesian government is also implementing general policies related to the development of soybean and other food commodities, such as:

- Increasing food production and other strategic agricultural commodities, especially soybean, must be a reference for national and local governments (province and district), which not only increase production to meet political targets. But also improve the welfare of farmers.
- Considering the characteristic of the agricultural and food commodities which is inelastic, the strategy of increasing the production should be done carefully by empowerment and improving the welfare of farmers.
- Following up on self-sufficiency policy targets on four strategic food commodities (rice, corn, soybeans and sugar) which were proposed in the G-33 group of World Trade Organization (WTO), particularly the proposal for Special Product (SP) of the strategic commodities to achieve food security.
- Need for agricultural land extensification policies for soybeans in order to increase the production of this commodity.
- In an effort to protect prices, hedging program should be more focused because in the long run it can protect farmers from world price increases that occur suddenly as a result of global economic shock. Therefore international price fluctuations can be transmitted safely into domestic prices.

CHAPTER 4
RESEARCH METHODOLOGY

This chapter will describe the steps and methods used in the research. In general this chapter consists of four sub-chapters, namely: specification models, operational definitions of variables, data and data sources, methods analysis and discussion of the basic assumptions of econometrics theory.

4.1.Model Specification

According the objectives of this research, model is used to estimate how import volume of soybean, word price of soybean, GDP of Indonesia, nominal exchange rate and import tariff policy of soybean influence of price of soybean in domestic market. The model used by the researcher based on the previous models in Chapter 2 with some modification. Referring to the literature that have been outlined in Chapter 2, where domestic price of soybean depend on import volume of soybean, word price of soybean, GDP of Indonesia, nominal exchange rate and level of import tariff of soybean. Mathematical function of the domestic price of soybean can be written as follows:

$$PDOM_t=f(M_t,WP_t,Y_t,NER_t,TRF_t) \quad \text{(4.1)}$$

Table 4.1. Model Description

Variable	Expected Sign	Reason
Import Volume (M)	-	Import volume as proxy of supply of soybean. If there is decreasing in import volume will affect will follow by price rising, vice versa.
World Price (WP)	+	A price on world markets is a comparison of domestic prices. Indonesia's position related to commodity soybeans is very weak, so that Indonesia can not influence world prices. World price increase will be followed by price rising in the domestic market.
Indonesia GDP (Y)	+	Indonesia GDP as proxy of income. Increasing income will be followed by increasing the ability of consumer to consume more, *ceteris paribus*, as the result price will increase.

Nominal Exchange Rate (NER)	+	Nominal exchange rate as price of domestic currency to foreign currency. Related to the domestic price, if there is appreciation in nominal exchange rate, will be followed by an increase in domestic price. Similarly, if nominal exchange rate depreciates, the domestic price will fall.
Import Tariff Level (TRF)	+	As function of imposing import tariff is to protect domestic product from foreign product, an increase at import tariff will reduce volume of import which result in reduced supply and encourage the rising domestic price.

The general form of mathematical equations for the domestic price function above, the model equation to estimate the relationship among variables of this study divided into two models, namely the long term model and short term model.

Long term model for the domestic price of soybean is estimated by Johansen Multivariate Cointegration (1990) procedure. The long term model of this research is:

$$\log PDOM_t = \alpha_0 + \alpha_1 \log M_t + \alpha_2 \log PW_t + \alpha_3 \log Y_t + \alpha_4 \log NER_t + \alpha_5 TRF_t + \mu_t \quad \text{..... (4.2)}$$

where:

$\log PDOM_t$ = logarithm of domestic price of soybean on t period
$\log M_t$ = logarithm of import volume of soybean on t period
$\log PW_t$ = logarithm of world price of soybean on t period
$\log Y_t$ = logarithm of GDP of Indonesia on t period
$\log NER_t$ = logarithm of nominal exchange rate on t period
TRF_t = level of import tariff on t period
μ_t = error term on t period

Meanwhile, Error Correction Model (ECM) is used to view the behavior of each variable on domestic price in the short term, correction models estimating the impact of the period delay (time lag) of each variable. Model of short-term can write as follows:

$$\Delta\log PDOM_t = \beta_0 + \sum\beta_{1i}\Delta\log PDOM_{t-i} + \sum\beta_{2i}\Delta\log M_{t-i} + \sum\beta_{3i}\Delta\log WP_{t-i} + \sum\beta_{4i}\Delta\log NER_{t-i} + \sum\beta_{5i}\Delta\log GDP_{t-i} + \sum\beta_{6i}\Delta TRF_{t-i} + \beta_7 ECT(-1) + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.3)$$

where:

ECT = error correction term

The selection of the model cointegration analysis and error correction based on the consideration that the data used is time series data. Where the time series data are usually not stationary and if it regresses will produce false result (spurious regression). By using cointegration and error correction model, spurious regression problems can be avoided or resolved.

4.2.Operational Definition of Variables

4.2.1. Dependent Variable

Domestic price is the price in the domestic market. In this model is defined as the domestic price of soybean at wholesale level in the domestic market (in Rp/kg) which released by BPS.

4.2.2. Independent Variables

Volume of imports is the amount of imported goods (in ton).World price is the price of goods in the international market, which refers to CIF Rotterdam (in US$/ton). Domestic GDP is the sum of all the value of final goods and services produced in Indonesia within a certain period. In this study the author uses GDP data released by the IFS. Nominal exchange rate is the ratio between the value of currency in the country compared with the value of foreign currency, in this rupiah per US dollar (Rp/US$). Import tariffs levied on imports of soybeans with varying rate 10%, 5%, 2.5, and 0% by the government. Limitation of this research is that all independent variables are assumed to pass trough to dependent variable.

4.3.Data and Data Source

All the data used in this research is secondary data, which data samples are taken quarterly time series data to study period 1st quarter 1990 until the year 4th quarter 2006.

Table 4.2. Data and Source of Data

Var	Description	Source
PDOM	Domestic price of soybean measured at producer level in Rp/kg	Central Bureau of Statistic (BPS)
M	Import volume of soybean measured in ton	WITS
WP	Word price of soybean refers to CIF Rotterdam measured in US$/ton	UNCTAD Handbook of Statistic 2008
Y	GDP Indonesia measured in billion Rp	IFS – IMF
NER	Nominal Exchange Rate measured in Rp/US$	IFS – IMF
TRF	Import Tariff Level measured in percent (%)	Ministry of Trade

4.4.Analysis Method

Estimates made on long-term relationships and short-term between bound variables and independent variables. To estimate the long-term estimated by using Johansen multivariate cointegration and short-term estimates using the error correction model by Engle-Granger.

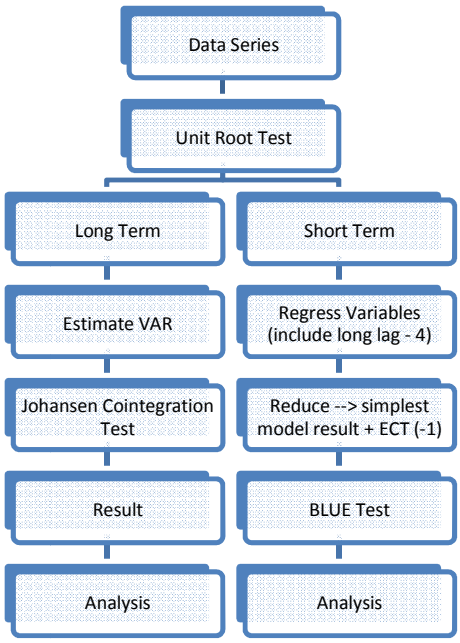


Figure 4.1. Flowchart of Methodology

To identify the relationship between domestic price to import volume, word price, domestic GDP, nominal exchange rate, dummy import tariff will be described through five key stages, namely:

1. Determination of degree of integration of each variable or series of used in this study or test a prerequisite;
2. Cointegration test;
3. Compilation error correction model (Error Correction Model);
4. Diagnostic tests for ECM;
5. Test of BLUE assumption.

4.4.1. Determination of Degree of Integration

Degree of integration of a series will determine the amount of difference to produce a stationary series. In this study used two methods that will use the test unit roots and test the degree of integration. The two type of test is basically in order to show how a series has a stationary nature.

In a study using time series data and model analysis used is the standard economic models such as OLS (Ordinary Least Square), need known in advance the properties of the data used. One of the requirements important to apply the regression model is the fulfillment of the assumption of the nature stationary data. When the regression analysis with time series data are not stationary, then the effects include the coefficient obtained adjuster regression invalid, or the occurrence of false or spurious regression, i.e. a regression that has a significant statistic allegations or R^2 values a high but the economy actually does not have any meaning. If this happens in one study, the results of the analysis carried out are meaningless. Shape testing of data between other stationary with roots tests and test units degree of integration.

The difference between the data series is not stationary and stationary, if the stationary series are shock effect occurs in the data are temporary. Over time, the impact of the shock is reduced and the data series will return to the mean level of long run it and to the fluctuations around the mean.

In general, the behaviors of a stationary data series are as follows: (Enders, 1995:212)

- Mean of stationary data shows a constant behavior.
- Stationary data show a constant variance.
- Stationary correlogram data showed a narrowing (diminishing) as with the addition of time.

Conversely, no stationer data is time-dependent or likely experienced fundamental changes over time. In general, behaviors of time series data are not stationary are as follows (Enders, 1995:212):

- Non-stationary series data do not have a long run mean.
- Stationary series data do not have time dependence. Variance of this data will grow without limit as the change in time.
- Correlogram of this data tends to widen.

There are several ways to test the existence of unit root; one of them is *Augmented Dickey*-Fuller (ADF) test. ADF test regression has the form as following (Enders, 1995:225):

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad \text{..... (4.4)}$$

where:

α = Constanta
t = Time
γ = *ADF* Test Coefficient

ADF test has a test the null hypothesis that the data of non-stationer or H_0: $\gamma = 0$. Testing to reject or not reject H_0: $\gamma = 0$ is to t statistics comparing the results of the regression results with Dickey Fuller table. If the t statistic smaller than the critical value of H_0: $\gamma = 0$ is not rejected, or data from the variable contains data unit root or non-stationer. However, if the value of t statistics greater than the critical value H_0: $\gamma = 0$, means the data from the variable does not contain a unit root or data stationer. The hypothesis of the test unit roots with ADF is:

H_0 : the data contain unit root
H_1 : the data does not contain a unit root (stationary)

After unit root test followed by testing the degree of integration. Degree of integration testing is performed to determine to what level of variables become stationary. In this test, variables derived up to the degree so that all the variables stationary at the same degree. A series is said stationary at first difference if after the one-time-difference and the absolute value of t - ADF statistic larger than the MacKinnon critical values. If the data has not stationary at first difference then proceed to the second test difference and so on until data to be stationary.

4.4.2. Cointegration Test

Cointegration test is used to solve the problem of time series data non-stationer. As a basic approach, that the number cointegration time series data that can deviate from its average in the short term, will move together to the conditions of equilibrium in the long run. If the numbers of variables have some balance in long-term and integrated in the same order can be said that the variables in the model are cointegrated.

Granger (1987) noted that a linear combination of two or more series are not stationary may be stationary. If such a linear combination exists, between series is not stationary is said to cointegrating. A stationary linear combination is called cointegration equation and may be presented as a long-term relationship between the series, where the deviation from the stationary condition is its equilibrium although these series are non-stationer.

Cointegration in economically interpretation is that two series (or more) related to forming long-term equilibrium relationship, then even though each of these series are not stationary they will always move together over time and differences between them will always be stable. (Harris, 1999:22). Thus cointegration concepts related to the existence of long-term equilibrium in which the economic system converges over time as desired in the theory and a way to do a test of the theory.

Then if there is a shock in an economic system, then in the long run there are forces that drive the economy to recover to the condition of balance (equilibrium). In other words, if there is disequilibrium in short term, there will be a force pushing the economy into equilibrium conditions. Cointegration technique

is based on the fact that some major macroeconomic data has not trended stationary (unstable). Imposition of a conventional regression model of series is not stationary, by using t test and F test will result in a false pattern of relationships (spurious regression relationships). Therefore cointegration technique is the solution.

Granger (1987) states that the variables are said to each other if there are cointegration linear combination of variables that are not stationary, where the residual obtained from the regression equation with variables that are not stationary, and then issued the residual from a linear combination must be stationary level.

To find out long term equilibrium relationship, in this study also conducted tests with cointegration *Johansen* procedure. Cointegration Johansen procedure judged better than Engle Granger procedure in terms of seeing whether or not if cointegration between variables amount of more than two (multivariate), because the Johansen procedure is based on the maximum possible (maximum likelihood) that gives the test statistic. The maximum *eigen value* and *trace statistics* to determine the number of vectors in the equation cointegration. Stages of testing with the Johansen procedure are as follows (Enders, 1995: 396-400):

1. Stationary test to all variables to determine the order of integration of each variable;
2. Estimated vector auto regression using data level (indifference data);
3. By using the same lag length, then the variable tested by using vector auto regression (VAR), with the following models:

   $X_t = A_0 + A_1X_{t-1} + A_2X_{t-2} + \ldots + A_nX_{t-n} + e_t$ ..... (4.5)

   and

   $X_t = A_0 + A_1X_{t-1} + \mu_t$ ..... (4.6)

   Where X_t is the vector (n x 1) of the variables to be tested. A_0 is a matrix of intercept (n x 1), A_n is a matrix (n x n) of coefficient and e_t and μ_t is the vector (n x 1) of the error. Model above and then tested to obtain the rank of

the matrix. For example, such a long lag to test the model two above can be transformed into:

$$\Delta X_t = A_0 + \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + e_t \quad \text{..... (4.7)}$$

Where Π is rank of matrix X_n

The next procedure of Johansen Cointegration is a test of the hypothesis $H_0 : \Pi = 0$. If the test results do not reject the null hypothesis, so there is no cointegration between variables

4.4.3. Error Correction Model (ECM)

Cointegration test as described above to see a long term balance in the economy. If you want to see the relationship between variables in the short term, we can use the error correction model (ECM).

A technique for correcting the imbalance towards short-term and long-term balance is called the error correction model introduced by Sargan and popularized by Engle and Granger (Nachrowi and Usman, 2006). Error correction model is essentially discusses related econometric models with dynamic linear model, which the model explains the relationship between variables bound by the independent variable in the present and the past. The use of such a dynamic linear mode fault model has several advantages such as to avoid false regression (spurious regression) and explain the causal relationship as desired in economic theory as well as to assess the long-term coefficient and short-term (Alias and Cheong, 2000, and Mutmainah, 2005).

The model used in this research is the error correction model of Engle Granger (Widarjono, 2005). If there is a long-term relationship or balance between two variables Y and X as below:

$$Y_t = \beta_0 + \beta_1 X_t \quad \text{..... (4.8)}$$

If Y is at equilibrium with respect to X then the balance between the two variables Y and X are met. But in general the economic system is rarely encountered such conditions. If Y_t has a different value with the value of the difference in the balance left and right side of the equation 4.8 is:

$EC_t = Y_t - \beta_0 - \beta_1 X_t$ ..... (4.9)

EC value is what is called the equilibrium error (disequilibrium). If the value of EC = 0 then Y and X are in equilibrium conditions. Often times Y and X are not in balance so that the observations made in imbalance in the relationship by entering inertia elements Y and X. To clarify that it can be seen in the following equation:

$Y_t = \beta_0 + \beta_1 X_t + \beta_2 X_{t-1} + \phi Y_{t-1} + \varepsilon_t$ ..... (4.10)
where $0 < \phi < 1$

In equation 4.10 enter the first level of inertia element, the level of second and so on. The implication is the value of Y requires a full adjustment to the variation of X. This condition is consistent with the idea that Y is not always in equilibrium conditions of the variable X. If data are not stationary at the level, so it needs to be manipulated by reducing the left and right side of the equation with Y_{t-1} to produce equation:

$Y_t - Y_{t-1} = b_0 + b_1 X_t + b_2 X_{t-1} + \phi Y_{t-1} + \varepsilon_t$
$Y_t - Y_{t-1} = b_0 + b_1 X_t + b_2 X_{t-1} + (1-\phi) Y_{t-1} + \varepsilon_t$ ..... (4.11)

Addition and subtraction with the right side of equation 4.11 will produce the following equation:

$Y_t - Y_{t-1} = b_0 + b_1 X_t - b_1 X_t + b_1 X_t + b_2 X_{t-1} + (1-\phi) Y_{t-1} + \varepsilon_t$
$\Delta Y_t = b_0 + b_1 \Delta X_t + (b_1 + b_2) X_{t-1} + \lambda_1 Y_{t-1} + b_2 X_{t-1} + \varepsilon_t$ ..... (4.12)

Where $\lambda = (1 - \phi)$, Re-parameterizes equation 4.12 produces the equation:

$\Delta Y_t = b_0 + b_1 \Delta X_t + \lambda(Y_{t-1} - \beta_1 X_{t-1}) + \varepsilon_t$

$\Delta Y_t = b_1 \Delta X_t + \lambda(Y_{t-1} - \beta_0 - \beta_1 X_{t-1}) + \varepsilon_t$ ..... (4.13)

Equation 4.13 is another way of writing equation 4.12. Mistake the balance of the period of time t-1 is $\lambda(Y_{t-1} - \beta_0 - \beta_1 X_{t-1})$. Equation 4.13 explains that the change in the present Y is influenced by changes in X and the previous period balance errors. This error is the residual balance of the previous period. Equation 4.13 is called error correction model of the first level. But it is also possible to get

a model with a level greater than one. The parameter λ is the adjustment parameter, the parameter *b* describes the influence of short-term and β parameters describe the long-term effects.

Once formed error correction model, the approach used Hendry's general to specific. In accordance with general to specific approach, using ordinary least squares (OLS) method, enter the length of lag is statistically the best of each variable and variable first difference of the least significant which has a t-statistic value of the smallest - eliminated one by one to find the model a simple error correction (parsimonious). Error correction model is a valid model when the error correction term is negative and significant marked. The steps to Hendry's general to specific are as follows:

1. Enter all the variables that will regress include all lag of each variables (which included the long lag by lag optimum test used in cointegration *Johansen*).
2. From the regression results above, and then performed one by one reduction of variables, from the least significant based on the t-statistic value or value probability.
3. After doing step number 2, will get the most simple (parsimonious regression) of the ECM model according to Hendry's general to specific.
4. But keep in mind whether the direction of all the variables according to the research hypotheses, if not necessary modifications lag of each variable that will obtain the results of the most simple (parsimonious regression) and the best of the ECM model.

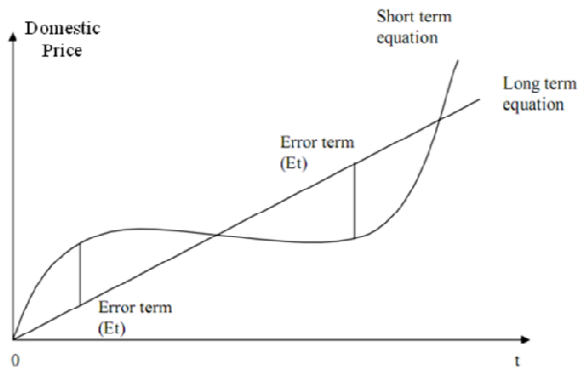


Figure 4.2. ECT Mechanism at Error Correction Model (ECM)

Description:

- Mechanism of negative ECT will correct the movement of a variable moving towards the long-term balance.
- The coefficient of ECT should be negative
- t = time

4.4.4. Basic Assumption of Econometric

After all parameters are estimated, diagnostic tests of ECM needs to be done. This test includes two criteria. First, statistical tests which include testing the coefficient of determination (R^2), t test and the F test. Second, test of the presence or absence of violations of classical assumptions.

As already known, the OLS estimation method is estimated by minimizing the amount of deviation from the estimate of the bound variable. This procedure is used to obtain estimates of the parameters that smoothly nature best linear unbiased (Best Linear Unbiased Estimator / BLUE).

Estimation method to obtain results with the nature of BLUE estimation requires a number of assumptions, namely:

- Average zero interference. This assumption requires that the model can be used accurately describe the average bound variables in each observation. Thus, if repeated samples with variable values fixed, the errors in each observation will have an average equal to zero.
- Heteroskedasticity. This assumption states that the variance of the disorder did not differ from one observation to another observation. Or in other words the noise has a constant variance for all observations.
- Non-autocorrelation. This assumption states that interference from one observation does not correlate with other observations disorders. This assumption asserts that the value of bound variables explained only by the independent variables rather than by interference.

- Non-multicollinearity. This assumption states that among the independent variables used in the model there is no linear relationship. Thus all the independent variables are assumed to be free of one another.
- Disturbance distributed according to normal distribution. This assumption is needed, especially when used in forecasting and hypothesis testing.

The fifth assumption in econometric analysis is known as the classical assumptions. Diagnostic test for the existence of violations of classical assumptions of this study, only limited to the existence of violations of test assumptions homoskedasticity, non-autocorrelation and non-multicollinearity.

Parameters have been estimated by the methods above, then will are tested statistically to see whether the hypothesis is rejected or not. Testing methods that can be done to determine whether or not the model is to look at the adjusted R^2, the value of t test, and test the value of F.

Statistical criteria for ECM regressions include the value of adjusted R^2 often called the coefficient of determination. R^2 value reflects the ability of the model in explaining the variation of dependent variables by the changes caused by the independent variables. R^2 value lies between 0 and 1. The closer the R^2 value is zero, weaker the ability of the model in explaining the variation bound variables. Similarly, the R^2 close to one, more better the model explains variations of the dependent variable.

Subsequent statistical criterion is the value of t-statistics, which show the role of individual independent variables in explaining variation bound variables. By comparing between the values of t-count with t-table can be known whether a particular independent variable affecting individual dependent variable.

F statistical tests used to verify whether all the independent variables are used together have an influence on dependent variables. If you obtained the F-count value is greater than F-table, it can be concluded that the independent variables jointly affect variation dependent variables. However, if the F-count value is smaller than the F-table, then the independent variables jointly affect variation can not be dependent variables.

4.4.4.1. Multicollinearity Test

Multicollinearity means a significant linear relationship between some or all independent variables in regression models. Multicollinearity shows a situation where there is perfect linear relationship or a near-perfect among some or all independent variables in the model. Multicollinearity occurs only in a linear relationship between independent variables and does not apply in relation to non-linear. The consequences of the existence of multicollinearity are:

- Difficult to get coefficient estimates with small standard errors.
- Although BLUE assumptions, OLS estimator has a variance and covariance is high, the standard error grew, confidence intervals will tend to grow, the value of t statistics will likely not significant and encouraging rejection significance variable coefficients, OLS estimator and the standard error would be sensitive to changes in the data although small.

Violation of this multicollinearity is a problem if the goal is to perform regression to interpret the regression coefficient but if our goal is to predict the multicollinearity not be a problem. Multicollinearity detect process has three aspects namely (i) determine whether there multicollinearity; (ii) determine whether or not the weight, (iii) determine the form or nature of the natural. Multicollinearity happened if found the following points:

- High R2 value but low significance of parameters (most of the value of the t-statistic is not significant);
- There is a pairwise correlation or high zero order between the two independent variables (correlation values> 0.80). High pairwise correlations are sufficient condition but not a necessary condition to see any multicollinearity. Because there is also multicollinearity as low pairwise correlation. Thus, although the pairwise correlations are useful tools but not the absolute indicator;
- Seeing the value of the partial correlation coefficient between independent variables. However, the partial coefficient is not an absolute indicator of the emergence multicollinearity;

– Auxiliary regressions. Making regression assistance by regress each independent variable against other independent variables. Multicollinearity identification is done by comparing the value of R2 in the early models with auxiliary model. If the auxiliary model R2is greater than the original model (original model R2 was lower than R2 on the auxiliary model) then there multicollinearity. The advantages of this method are able to investigate the existence and nature of natural multicollinearity. The disadvantage is if there is a complex linear relationship, the use of this method does not provide much meaning.

To overcome this problems, steps can be taken is to remove or eliminate free variables that correlate, changing the model or add the data or sample (Gujarati, 1995).

4.4.4.2. Autocorrelation Test

One of the basic assumptions of the application of the method with least squares regression is the lack of correlation between the disturbances (error) or non-autocorrelation. Autocorrelation problems this will generate results that are consistent coefficient estimates and unbiased but with a large variance, or in other words an inefficient interpretation. Variance parameter estimation of this inefficiency caused t values tend to be small and calculated test results tend not to reject the null hypothesis (H_0).

Testing of the presence or absence of serial correlation can be made using Durbin Watson test. The trick is to calculate the value of Durbin Watson d statistic that can be formulated as follows (Gujarati, D., 1992:263):

$$d = \frac{\sum_{t=2}^{n} \left(e_1 - e_{t-1}\right)^2}{\sum_{t=1}^{n} e_1^2} \quad \text{.....} \quad (4.14)$$

Where n is the number of observations and e is the residual of the estimate. If there are no residual problems with adjacent or in other words there is

no autocorrelation between variables bullies, then the d statistic value are around 2. If there is positive serial correlation, DW values around 2-4.

Another way to detect possible autocorrelation also with test Breusch-Godfrey Serial Correlation LM Test is already available in the program E-views. Unlike the DW-statistic, the LM test can be used for higher order and still be applied to models containing lagged dependent variable. There are at least known by looking autocorrelation probability Obs * R-squared. If the probability Obs * R-squared is less than the going autocorrelation.

Table 4.3. Durbin Watson Table

Value	Result
$4- d_L < d < 4$	Negatif Autocorrelation
$4- d_U < d < 4 - d_L$	No Decision
$2 < d < 4- d_U$	No Autocorrelation
$d_U < d< 2$	No Autocorrelation
$d_L \leq d \leq d_U$	No Decision
$0 < d < d_L$	Positive Autocorrelation

.

Hypothesis testing with Correlation Breusch-Godfrey LM Test is:

Ho: $\rho_1 = \rho_2 = \ldots = \rho_p = 0$ (no serial correlation)

H_1: $\rho_1 = \rho_2 = \ldots = \rho_p \neq 0$ (serial correlation)

Autocorrelation troubleshooting can be done by transforming all variables with differences with ρ. Regression on the difference equation can be done during the DW statistics $<R^2$. Another way is to estimate the residues of which residues autocorrelation have autoregressive process

One way that can be used to identify the occurrence of autocorrelation by Durbin Watson (DW) test. This test is done by comparing the upper limit value (*du*) and lower limit values (*dl*) of DW table by considering the number of observations and independent variables not including the constant term. DW statistic lies in the interval 0 to 4. If the DW value approaching 2, the model does not have problems autocorrelation. Whereas if the value of DW less than *dl* or more than 4, so the model has a serious autocorrelation problems. If the DW count

lays in dl-du or 4-du and 4-dl, so the test results are inconclusive presence or absence of autocorrelation problems.

4.4.4.3. Heteroskedasticity Test

Homoskedasticity assumption implies that the variable has a distribution probablitas bullies and the same variance for each observation of the independent variable (X). Assumption of constant variance can be written with the notation:

$$Var(U) = E[U_i - E(U_i)]^2 = E(U_i)^2 = \sigma^2 \quad \text{..... (4.15)}$$

If this assumption is not met then the variables are said to be heteroskedasticity bullies. The impact of the heteroskedasticity is inefficient estimation process itself while the estimation results remain consistent and unbiased. With heteroskedasticity problems will result the t test and F test cannot be useful (misleading).

There are several ways of testing can be done to detect the presence or absence heteroskedasticity. One is the test of Goldfeld and Quandt (Jackjohnston and John Di Nardo, 1997:168) with the null hypothesis that the variance is a constant nuisance variable or homoskedasticity. Prerequisite use of this test is to a large number of observations on the condition that at least two times the number of parameters.

Testing heteroskedasticity procedures according Goldfeld and Quandt are as follows: First, the sample is sorted from the smallest to the largest, and then divided into two sub-samples of small value sub-samples and sub-samples with great value. The sample was *c* must be removed. Furthermore the value of F statistics calculated by the following formula:

$$F^* = \frac{\sum e^2 2 / [\{(n-c)/2\} - K]}{\sum e_{21} / [\{(n-c)/2\} - K]} = \frac{\sum e_{22}}{\sum e_{21}} \quad \text{.....} \quad (4.16)$$

Where *n* is the number of total samples, *c* is the number of samples was omitted, and *K* is the number of estimated parameters. Acceptance of the null

hypothesis (in other words homoskedasticity assumptions are met) can be done if the F-count has been compared with the F-table and its value was smaller.

Another way of testing that is easier to use the White Heteroskedasticity Test with the null hypothesis that the variant is a constant nuisance (Jackjohnston and John DiNardo, 1997:163). The rule is if the probability Obs * R-squared is less than the going heteroskedastisiticity.

Tests using White Heteroskedasticity Test method hypothesis is:

H0: error is homoskedastis
H1: error is heteroskedastis

Heteroskedasticity problem solving can be done using *Weighted Least Square* by charging each variable with the variance is not constant. Aim to make the variance becomes constant.

Having discussed about the steps that will be done to make estimates and diagnostic test results of estimation, the authors uses the econometrics software (Eviews 4.1) as research tools.

CHAPTER 5
RESULT AND ANALYSIS

In this thesis, dynamic model is used to seek long term relationships between economic variables. In the case of the use of time series data and the analytical model, it follows the standard econometric models. The data stationery must be assumed to avoid the spurious regression. So, a data stationery test will be used.

5.1.Unit Root Test

The purpose of the tests performed unit roots is to know whether the data was stationery or not at the level. This test is needed to know whether a variable has a unit root or the coefficient of the model estimated autoregressive have a value of one or not. Because, if we use the data that is not stationary will cause problems namely spurious regression. The estimate is statistically significant but the economic reality does not have any meaning. (Harris, 1994:14).

In this study the author uses the method Augmented Dickey-Fuller test (ADF test) to test the data stationery of the variables (whether containing the unit roots or not) with the econometric software Eviews 4.1.

The hypotheses for this test are:

H0 = data contain of unit roots (not stationery)

H1 = data not contain of unit roots (stationery)

If there is enough evidence to reject H0, it means the data does not contain unit roots, or in other words the data is stationery. Whereas if there is no evidence to not reject H0, it means the data contain unit roots or in other words the data is not stationery.

The results of the unit roots test can be seen in the table below. While the complete test results can be seen in annex 1.

From the results of unit root tests using the ADF test, it can be stated that only one variable is stationery at level. So the data contains unit roots and the stationery test needs to be done at the first difference.

Table 5.1. The Result Unit Roots Test at Level

	ADF t-statistic	α 1%	α 5%	α 10%	Prob
LPDOM	-0.3741	-3.5332	-2.9062	-2.5906	0.9069
LM	-4.8378	-3.5316	-2.9055	-2.5903	0.0002
LWP	-1.9694	-3.5316	-2.9055	-2.5903	0.2995
LNER	-1.2771	-3.5332	-2.9062	-2.5906	0.6354
LY	-0.2644	-3.5349	-2.9069	-2.5910	0.9238
TRF	-1.3753	-3.5316	-2.9055	-2.5903	0.5893

5.2.Degree of Integration Test

Degree of integration test is a continuation of the test unit roots. It is a consequence of unfulfilled stationery assumptions on the level or degree level 0 (zero) of all variables. The purpose of this test is to test whether the data has been stationary, or do not contain unit roots at the first level of difference.

Results from degree of integration test can be seen in the table below. While the complete test results can be seen in Annex 1.

Table 5.2 The Result Unit Roots Test at First Difference

	ADF t-statistic	%1 α	%5 α	%01 α	Prob
LPDOM	-4.7137	-3.5332	-2.9062	-2.5906	0.0002
LM	-10.8246	-3.5332	-2.9062	-2.5906	0.0000
LWP	-6.6078	-3.5332	-2.9062	-2.5906	0.0000
LNER	-6.0256	-3.5332	-2.9062	-2.5906	0.0000
LY	-4.8775	-3.5366	-2.9077	-2.5914	0.0001
TRF	-8.0000	-3.5332	-2.9062	-2.5906	0.0000

From the results of degree of integration test with the ADF test, it can be stated that all the variables have been stationery at first difference or variable data does not contain unit roots. All the variables was stationery at the α = 1%.

Based on the results, it can be concluded that not all variables stationery at the level, but it has been stationery at the first of difference, and thus the order of integration of all variables are related to I(1) at $\alpha = 1\%$.

Table 5.3 Order of Integration Variables

Variables	Order of Integration
LPDOM	I(1)
LM	I(1)
LWP	I(1)
LNER	I(1)
LY	I(1)
TRF	I(1)

5.3.Cointegration Test

Cointegration test is a test in time series model. The purpose of this test is to determine the existence of long term relationship among the variables observed. These variables to say if there cointegration each linear combinations of variables that are not stationary, and the residuals from the linear combination must be stationary at the level (Granger, 1987).

Cointegration test can be used to solve the problems of time series data that is not stationery. This is because although the data from the two individual variables are not stationary (follow the pattern of random walk), but if both are cointegrated, the linear combination between the two variables are stationery.

The procedure that is usually used to detect the cointegration is Engle-Granger procedure, where the variable residual (error) of the domestic price equation must be stationery or does not contain unit roots at the level. However, due to the observed variables of more than two (multivariate), then the test cointegration test used in this research will also be tested by using Johansen procedure (1990).

The results of the test unit roots (roots unit test) at the variable level of residual (error) by using the ADF test can be seen in the table below. While the complete test results can be seen in Annex 2.

Table 5.4. The Result of Unit Roots Test to Residual Variable

Variables	ADF t-statistic	α 1%	α 5%	α 10%	Prob
ECT	-4.282300	-3.531592	-2.905519	-2.590262	0.0010

Table 5.4. shows that the residual variables of the domestic price equation rejects the null hypothesis (H_0) which means that these variables have been stationery at the level 10%, 5% and 1%. Because the residual variable is stationery at the level, there is cointegration between the variables that are observed.

Meanwhile, to further observe the cointegration among variables of the domestic price equation, then the test performed with Johansen test procedure. The results of the cointegration test using Johansen procedure can be seen in the table below. While the complete test results can be seen in Annex 3.

Table 5.5 The Result of Cointegration Test by Johansen Procedure

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.537992	124.9987	94.15	103.18
At most 1 *	0.485679	74.03522	68.52	76.07
At most 2	0.225795	30.15134	47.21	54.46
At most 3	0.130792	13.26075	29.68	35.65
At most 4	0.055493	4.009335	15.41	20.04
At most 5	0.003649	0.241248	3.76	6.65
*(**) denotes rejection of the hypothesis at the 5%(1%) level				
Trace test indicates 2 cointegrating equation(s) at the 5% level				
Trace test indicates 1 cointegrating equation(s) at the 1% level				

Table 5.5 shows that there is a maximum of 1 (one) cointegration equation at α 1% and 5%; and there are a maximum of 2 (two) cointegration equation at 5%. This shows there is a relationship or a long-term balance among the variables observed. It means that in the long run domestic price variable is influenced by the variable namely volume of import, world price, nominal exchange rate, gross domestic product (GDP) and level of import tariff.

Although trace test stated that there are maximum 2 (two) cointegrating vectors, the analysis in this study are based only on one of the two cointegrating vectors. Cointegrating vectors is selected by looking at the long term relationships of the same or at least close to the theory underlying these relationships.

Cointegration test results with the Johansen procedure produces equations of long-term domestic prices as follows (complete test results can be seen in Annex 3):

LPDOM	= 0.214231*LM*	+ 0.506721*LWP*	+ 0.700767*LNER*	+ 0.086309*LY*	+ 0.010478*TRF*
se	(0.02749)	(0.09721)	(0.06124)	(0.04909)	(0.00280)
t-stat	7,79305**	5,21264**	11,44296**	1,75818**	3,74214**

..... (5.1)

Because the domestic price equation is a double-log equation, then the resulting coefficient reflects the domestic price elasticity coefficient of each independent variable. Partial elasticity of domestic prices to volume of imports, world prices, the nominal exchange rate, GDP and import tariffs are 0.214231; 0.506721; 0.700767; 0.086309 and 0.010478 respectively. All independent variables are significant at α 5% level.

Coefficient value of the domestic price of soybean to import volume of soybean is 0.214231. This means that an increase in the imports volume of soybean by 1 percent, *ceteris paribus*, in the long run will raise domestic prices of soybeans by 0.214231 percent.

Coefficient value of the domestic price of soybean to world price of soybean is 0.506721. This means that an increase in the world price of soybean by 1 percent, *ceteris paribus*, in the long run will raise domestic prices of soybeans by 0.506721 percent.

Coefficient value of the domestic price of soybean to nominal exchange rate is 0.700767. This means that an increase in the nominal exchange rate by 1 percent, *ceteris paribus*, in the long run will raise domestic prices of soybeans by 0.700767 percent.

Coefficient value of the domestic price of soybean to GDP of Indonesia is 0.086309. This means that an increase in the GDP of Indonesia by 1 percent,

ceteris paribus, in the long run will raise domestic prices of soybeans by 0.086309 percent.

Coefficient value of the domestic price of soybean to import tariff of soybean is 0.010478. This means that an increase in the import tariff of soybean by 1 percent, *ceteris paribus*, in the long run will raise domestic prices of soybeans by 0.010478 percent.

All independent variables have been appropriate with the theories and hypotheses of this research, except the relationship between the import volumes of soybean to the domestic price of soybeans. The hypothesis of this research states any changes in the import volume of soybeans will have a negative impact on the domestic price of soybeans.

5.4.Error Correction Model Eagle Granger (EG-ECM)

As already described in the previous section, when the variables are observed to form an interrelated set of variables cointegrating, the dynamic model that is suitable for short term balance is an error correction model (ECM). Furthermore, the error correction model will be valid if the cointegrating variables supported by coefficient value of Error Correction Term (ECT) is negative statistically significant.

Although cointegration test shown that there might be a long-term balance in the domestic price models, but the variables which play a role in the short run dynamic adjustment towards long term balance is not shown. ECM is used to see the short term behavior from the domestic price equation by estimating the dynamics of Error Correction Term. Lag length to be used in estimating the short-term equation is determined from the results of the optimum lag obtained from the cointegration equation, then through general to specific method developed by Hendry (Hendry's General to Specific Modeling), carried out by reducing the longest lag. So it is obtained the most simple result estimation (parsimonious regression).

The simplest results of Error Correction Model (ECM) by the Hendry's general to specifics method is as follows (see Annex 4 for more complete results):

$$DLPDOM = 0.003 + 0.380DLPDOM(-1)^{***} - 0.009DLM(-2) + 0.044DLWP + 0.092DLNER(-1)^{**} + 0.205DLY^{*} + 0.003DTRF - 0.182ECT(-1)^{***} \quad (5.2)$$

***) significant at α = 1%
**) significant at α = 5%
*) significant at α = 10%
R2 = 0.5757
Adj. R2 = 0.5236
S.E = 0.0336
D.W. Stat = 2.3008
Prob (F Stat) = 0.0000

Results from short-term equation (ECM) shows that the coefficient of error correction term (ECT(-1)) is -0.182. It indicates that the adjustment speed to the domestic price equilibrium is 18.2 percent per quarter. Changes in economic variables affecting domestic prices in the short term shows that adjustment process leading from inequilibrium to the equilibriums rate need time to correct.

The impact of domestic price changes to changes in domestic price elasticity itself happened relatively quickly (one quarter). This means that in the short-term the increase in the domestic price variable at previous quarter (DLPDOM(-1)) by 1 percent, *ceteris paribus*, will provide a positive influence on changes in the current domestic price by 0.380 percent and this variable (DLPDOM(-1)) is significant at α = 1% level.

Changes in import volume two previous quarters (DLM (-2)) also shows the direction as expected, i.e. it will have the negative impact on domestic price changes. This means that in the short term every 1 percent increase in import volume two previous quarters, *ceteris paribus*, would reduce the current domestic price by 0.009 percent. Nevertheless, the change of import volume does not affect domestic price of soybean significantly.

Changes in soybean world price in the current quarter (DLWP) also show the direction as expected, giving a positive influence on domestic price changes. It means that in the short-term every 1 percent increase in world soybean prices today, *ceteris paribus*, will raise current domestic prices of soybeans by 0.044 percent. However the world price does not have significant effect.

While, the changes of nominal exchange rate variable in the a previous quarter (DLNER(-1)) also shows the direction as expected, giving a positive influence on domestic price changes. This means that in the short term every 1 percent increase in nominal exchange rate in a previous quarter, *ceteris paribus*, will raise domestic prices of soybeans by 0.092 percent. The nominal exchange rate has a significant effect to domestic price of soybean at α = 5% level.

Changes of Indonesia's GDP in the current quarter (DLY) also show the direction as expected, giving a positive influence on domestic price changes. This means that in the short term every 1 percent increase in Indonesia's GDP at current period, *ceteris paribus*, will raise domestic prices of soybeans by 0.205 percent. The Indonesia's GDP has a significant effect to domestic price of soybean at α = 10% level.

Change of import tariff level in the current quarter (DTRF) also shows the direction as expected, giving a positive influence on domestic price changes. This means that in the short term every 1 percent increase in import tariff at current period, *ceteris paribus*, will raise domestic prices of soybeans by 0.003 percent. The import tariff level has not a significant effect to domestic price of soybean.

5.5.Diagnostic Test

After determining the simplest of short term equation, to know whether these models are the best models and gives a statistical estimate of an unbiased and efficient, it is necessary to test the OLS assumption. Detail about this test can be seen in annex 8.

5.6.Analysis

5.6.1. Variables Analysis

Before analyzing the impact of each variable in the long term and short term, firstly we should see the relationship between each variable to domestic price of soybean.

– Volume of Import to Domestic Price of Soybean

According to the hypotheses of this study, volume of import has negative relation to domestic price of soybean. But in fact, only in period 1994-1995, 1996-1998 and 2003-2005 are according to the hypotheses. Rest of the volume of import has a positive relation with domestic prices of soybean, especially in the period 1991-1994, 1998-1999 and 2005-2006. This discrepancy is expected because soybean is inelastic commodity to changes in supply side such as the world price and world production. Decrease in import volume is greater allegedly affected by the declining exchange rate of the domestic currency against foreign currency, as happened in the period 1997-1998.

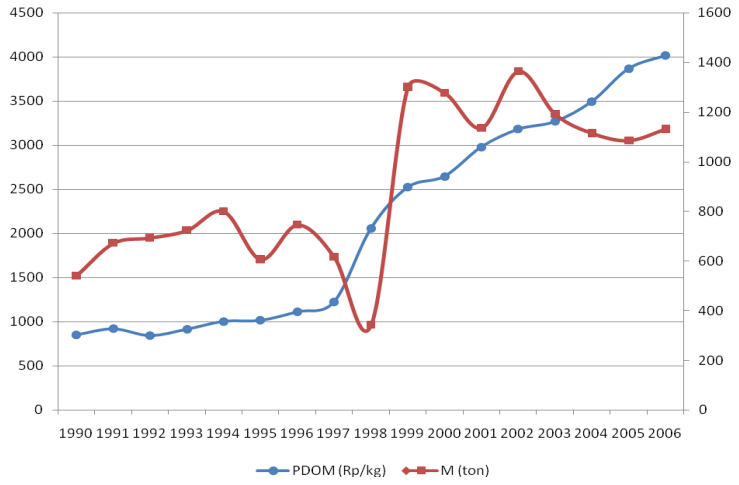


Figure 5.1. Domestic Price and Import Volume of Soybean Relation

– World Price to Domestic Price of Soybean

Generally, relation between world price and domestic price of soybean in conformity with hypothesis of this research, the world price will be positive transmitted to domestic prices. There is little difference, especially in the period 1998-1999, where it is expected also because of the decline in the rupiah against the dollar. In period 2004-2006, expected soybean price competition at the world level in fulfilling demand of raw materials for bio-fuel, encourage the increasing in soybean prices in international market at 2007 (out of scope in this study).

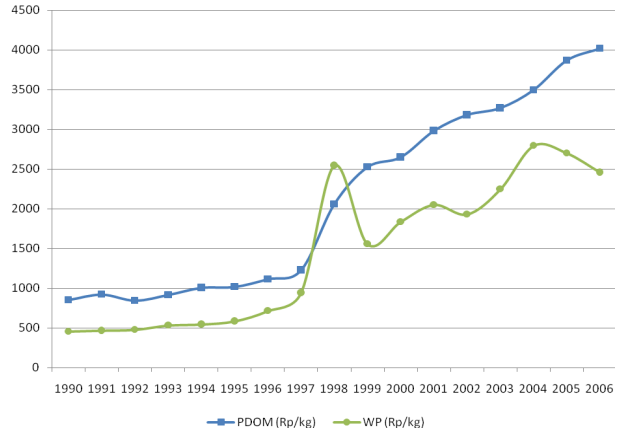


Figure 5.2. Domestic Price and World Price of Soybean Relation

– Nominal Exchange Rate to Domestic Price of Soybean

  According to theory and hypotheses of this study, nominal exchange rate positively affecting domestic price of soybean. If we look at the facts, generally nominal exchange rate has a positive impact on domestic prices. Only in 1998-1999 and 2001-2003 strengthening of nominal exchange rate against US dollar is unable to provide a positive impact on domestic prices.

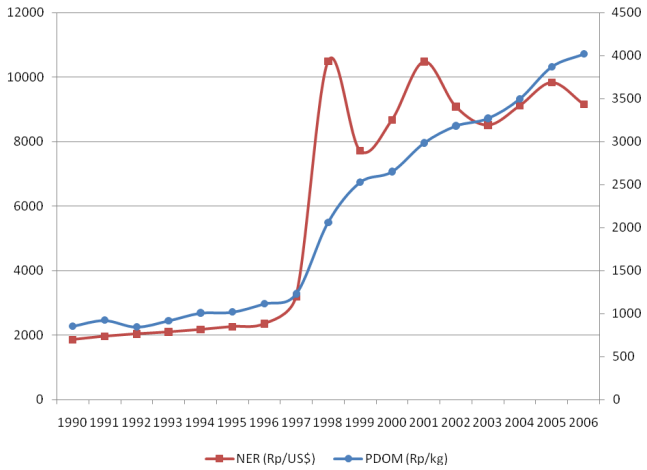


Figure 5.3. Domestic Price and Nominal Exchange Rate Relation

– Indonesian GDP to Domestic Price of Soybean

  Base on fact, increasing Indonesian GDP was encouraged the increasing of domestic price of soybean. It was according to the hypotheses of this study. This reinforces theory that increased income will be followed by an increase in the ability to consume (propensity to consume) and will push the price increases.

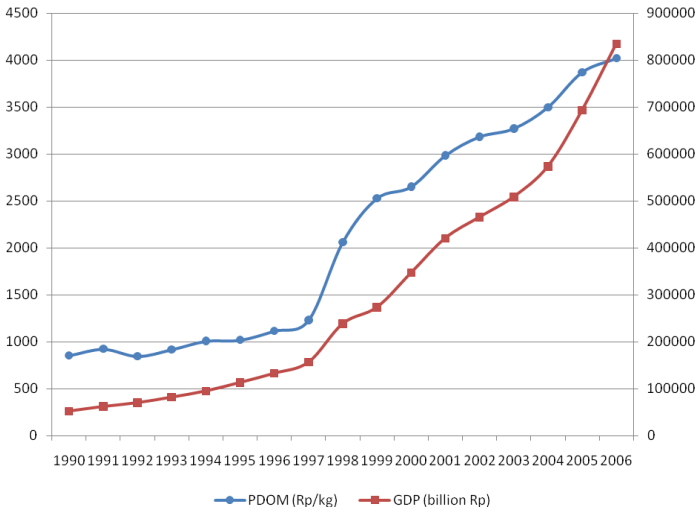


Figure 5.4. Domestic Price and GDP of Indonesia Relation

– Import Tariff Level to Domestic Price of Soybean

  Based on the facts, imposing of import tariff has not effectively effect to changes in domestic prices through changes in import volume. This reaffirms that soybean demand is inelastic to changes in the supply side.

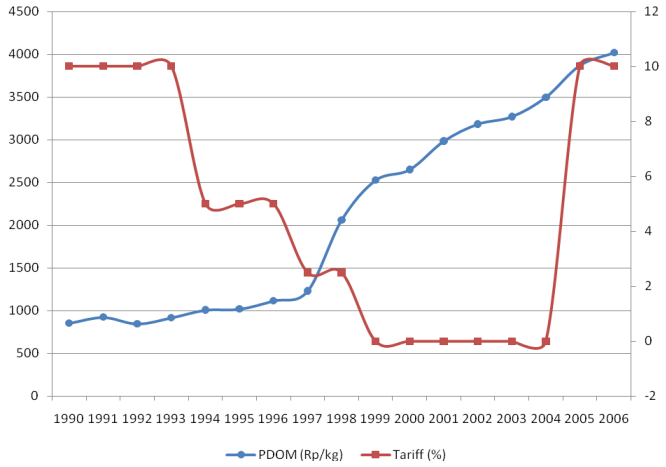


Figure 5.5. Domestic Price and Import Tariff Level of Soybean Relation

Meanwhile, if we seen in Figure 5.6 the impact of the import tariff on the import price of soybeans (calculated by import value divided by import volume), is only effective on the 1999-2004 period, the remaining import tariff did not provide appropriate impact as the theory, and it actually had the opposite effect, as seen in 2007. This condition is expected because the

soybean price competition in the world market as raw material substitution of bio-fuel.

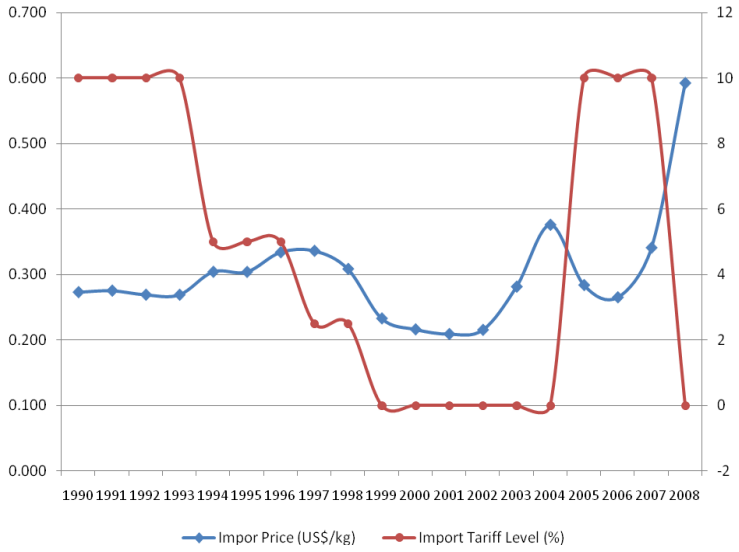


Figure 5.6. Import Price and Import Tariff Level of Soybean Relation

5.6.2. Long Term Impact

Based on cointegration test results using Johansen procedure, the model produce long term equation for domestic soybean prices. In the long run, there is one variable that is not in accordance with the theory and hypotheses of this study. The variable is the volume of imported soybeans. Apart from these variables, all variables conform to the theory and research hypotheses.

The changes of imports volume of soybean (LM) affect positively to domestic price elasticity (LPDOM) with the coefficient value of 0.214. This indicates that volume of import has a significant effect on the domestic price of soybeans, where a one percent increase in volume of imports, *ceteris paribus*, will increase the domestic price of soybeans by 0.214 percent (the volume of imports is inelastic to the domestic price). The cointegration test produces the opposite of the hypothesis. This is an anomaly. The arguments explanations are as follows:

– USA applies export subsidies policy to the agricultural sector, particularly in soybeans commodity. It should be known that the largest share of soybean imports by Indonesia is from USA. USA provides excessive subsidies to their

farmers in the production process, so USA can sell with a cheap price. In addition, USA is also giving special treatment to the importer of soybean in Indonesia with a payment mechanism by providing export credits. As the result the Indonesia importer of soybeans is encourage to import, which will eventually be distributed at a price cheaper than domestic prices.

In 2000 USA experience over production of soybean in USA, so USA market is difficult to absorb their domestic production. To maintain incentives for farmers, the USA government provides export credits. An export credit facility from the USA was granted to importers of soybean particular Indonesia. In 2000, this soybean export credit reached 12 million U.S. dollar and rose to 750 million US dollars in 2001. With this facility, the importers bring in Indonesia lots of soybeans from the USA because of the difference in price. As a result the price of soybean imported from the USA becomes cheaper ± Rp 550/kg compared to the price of domestic soybean. When the local soybean prices US$ 2.500/kg then able to sell soybean importer imports Rp 1.950/kg. In addition to factors at a lower price, tofu and tempe producers prefer soybean import due to the larger size and containing more protein rather than domestic soybean. Situations like this in the future it gives a big risk to the sustainability of domestic soybean production which marked by decline in domestic soybean production.

Meanwhile, from the trade theory perspective, if large country imposing the export subsidy will followed by increasing welfare of domestic producers in exporter country and consumers in importer country. But in the same time, producers in importer country will lose the welfare.

– For most Indonesian people, soybean is consumed almost every day, so that this commodity is inelastic to price changes. Increasing the volume of imports was also driven by population growth in Indonesia.

In the long-term, changes in world prices of soybean (LWP) positively affect to domestic price elasticity with coefficient value of 0.506. This shows that the world price of soybeans is elastic to the domestic price of soybeans. If world

prices rise 1 percent, *ceteris paribus*, then the domestic price of soybeans would increase by 0.506 percent.

This is consistent with price theory that if the world price rises, while Indonesia was not able to determine the soybean commodity prices in international markets, the increase in world prices will be transmitted to domestic prices.

Nominal exchange rate had a positive influence on domestic prices with a coefficient value of 0.700. This indicates that the elasticity nominal exchange rate to domestic price is elastic. If the nominal exchange rate rises (depreciation) by 1 percent, *ceteris paribus*, then the domestic price will increase by 0.700 percent.

The result of nominal exchange rate is in accordance with the theory and the situation in Indonesia. The value of domestic currency (rupiah) has an important impact on import demand and supply. This can be seen at the time of crisis in 1998 when the rupiah against the U.S. dollar depreciates large enough, which lead to lower soybean import demand, which subsequently resulted in decreased supply rising soybean prices in the domestic market.

Indonesia's GDP had a positive influence on domestic prices with a coefficient value of 0.086. This indicates that the elasticity Indonesia's GDP to domestic price is elastic. If the Indonesia's GDP rises by 1 percent, *ceteris paribus*, then the domestic price will increase by 0.086 percent.

These results are in accordance with the theory and hypotheses of the study. If there is an increase in income, there will be a tendency to increase the ability to consume more, while the number of items remain, there will be price increases.

While level of import tariff had a positive influence on domestic prices with a coefficient value of 0.003. This indicates that the elasticity level of import tariff to domestic price is elastic, although with small value. If the level of import tariff rises by 1 percent, *ceteris paribus*, then the domestic price will increase by 0.003 percent.

These results are also in accordance with the theory and hypotheses of the study. An increase at import tariff will reduce volume of import which result in reduced supply and encourage the rising price.

5.6.3. Short Term Impact

The short term model (ECM) estimation by the method of Hendry's general to specific results we have found the simplest model. Of all the independent variables used in the study, there are three variables that do not affect significantly in the short run elasticity to changes in current domestic prices.

The change in domestic price to domestic price itself has a relatively quick effect (a quarter). The increase in the domestic price at a previous quarter (DLPDOM (-1)) by 1 percent, *ceteris paribus*, will provide a positive effect on changes in the current domestic price elasticity by 0.38 percent.

It is quite natural if we look at the reality of what happened that when the earlier period domestic price of soybeans increases, then in the next period there is a possibility that prices will rise.

The change in import volume two previous quarters (DLM (-2)) affects negatively but not significantly to changes domestic price, with a coefficient value of 0.009. This shows that the impact of changes in import volume is relatively moderate, which requires only 2 quarters. A one percent increase in import volume in the two previous quarters, *ceteris paribus*, will increase the domestic soybean price by 0.009 percent.

This result is supported by the results of cointegration tests in which the volume of imports in the long run has a positive effect on domestic prices. A possible explanation is that this is due to the short-term impact of the import volume itself which is not significant and the coefficient values are relatively small.

While in the short term, changes in world prices at the same quarter has a coefficient value of 0.044 with a positive direction, although it is not significantly impacted. It indicates that a change in world price is doing not have

a significant impact on domestic price changes. A one percent increase in world prices, *ceteris paribus*, will raise domestic prices by 0.044 percent.

The explanation for this condition is related to the USA as a country that is able to affect soybean prices (price setter) with a high production capacity (over-production). At the same time they also provide excessive subsidies to producers of soybeans in the USA and provide facilities for Indonesian importer to import with cheaper price. So it might be expected the increase in world prices will not provide a significant impact on domestic price increases.

In the short term, the change in nominal exchange rate at one previous quarter (LNER(-1)) to domestic price has a significant affect with coefficient value elasticity of 0.092. It means that an increase of one percent in nominal exchange rate in the previous quarter, *ceteris paribus*, will provide a positive influence on changes in the current domestic price elasticity of 0.092 percent.

This condition has been in accordance with the theory and the situation in Indonesia, where the value of domestic currency (rupiah) has an important influence on import demand and supply. As has been described in long term condition, that nominal exchange rate also provides the same effect on domestic prices.

In the short term, the change in level of import tariff at the same quarter with domestic price has not significant effect to coefficient value elasticity. It is relatively small about 0.003. It means that an increase in one percent in level of import tariff, *ceteris paribus*, will provide a positive effect on change in domestic price at the same period amount 0.003 percent.

The direction of the influence of import tariff level is in accordance with the theories and hypotheses, but it does have not a significant levels. This condition is also part of the impact of subsidy by the USA to its agricultural sector, particularly for soybeans as described above. This also reinforces Tirta (2007) research that import tariff does not have a significant impact on reducing import.

Results from short-term equation shows that the coefficient of error correction term (ECT (-1)) of -0.182, indicates that the adjustment speed of the

domestic price toward equilibrium is 18.2 percent per quarter. Changes in economic variables that affect the volume of exports in the short term, the impact of changes in variables affecting the domestic price, or take from the adjustment process leading to unbalance the equilibrium between the time needed corrections.

In the short term model, it expected that excess demand occurs in the soybean market in Indonesia, although in the model there are no variables that reflect demand functions. But, it can be explained by an increasing population and consumption per capita volume of Indonesian people. Table 1.1. showed an increase in consumption per capita, and at the same time domestic production decline. Assuming the Indonesian population in 2005 approximately 240 million, the amount of consumption in that year reached 1.86 million tons. And consumption tends to increase from year to year.

CHAPTER 6
CONCLUSION AND RECOMMENDATION

6.1.Conclusion

Based on the formulation of the problem and research objectives in this thesis, the results of research on "The Analysis Long Term and Short Term Factors Affecting the Domestic Price of Soybean" by using Johansen Cointegration and Error Correction Model (ECM) approaches in the period of 1990 to 2006 can be concluded as follows:

1. In the long term, domestic price of soybean in Indonesia is influenced positively and significantly by world price of soybean, nominal exchange rate, import tariff, and GDP of Indonesia. If there is an increase in these factors it will be followed by an increase in domestic price of soybean. The results conform to the research hypotheses. Whereas the volume of imports of soybean in the long term has positive and significant impact. However, it is contrary to the hypothesis in this research.
2. While in the short term, according to the estimation by using the ECM method, it is found that in the short run domestic price of soybean is influenced positively and significantly by domestic price one previous quarter, nominal exchange rate one previous quarter and Indonesia's GDP. The results are in accordance with the hypothesis of the research. While the world price of soybeans and level of import tariff in the same quarter was also positively influenced domestic price of soybeans, although they are not significant. Meanwhile, the import volume of soybean two previous quarters has a negative affect but not significant.
3. The results of coefficient Error Correction Term in one previous quarter (ECT(-1)) show a negative and significant effect. This indicates that there is a relationship between long term and short term and the ability to correct for disequilibrium toward equilibrium condition.

6.2.Recommendation

Based on the conclusions above, some policies can be recommended. They are as follows:

1. The policy implementation of soybean import tariff which currently is 0% should be reviewed so it is expected that the policy could to trigger the desire of farmers to increase production. In addition revenues from the imposition of soybean import tariffs should be returned to the domestic producers, especially farmers in the form of assistance, whether in the form of subsidized seeds, fertilizers or other. It will encourage the farmers to improve the quality and quantity of soybean production in order to meet the needs of the domestic consumption. These recommendations also aim to reduce the impact of fluctuations in soybean world prices and the rupiah against the US dollar.
2. Associated with the position of Indonesia as importer of soybean, the government must maintain the stabilization of the rupiah against the US dollar, because the country's trade balance is strongly influenced by the exchange rate.
3. Related to the external factor, the government is expected to be active in urging developed countries to reduce subsidies for their agricultural sector because it creates distortion. So it is expected that prices in the world market would be competitive and passes through to domestic prices.
4. Related to further research in soybeans, to obtain more accurate results and in accordance with the conditions in Indonesia, the author suggest to add the observation periods, use simultaneous model, and provide other variables that could also influence the formation of domestic soybean prices, such as the level of consumption, domestic production, base price, etc. By doing so, it is expected that the model will produce a more accurate picture on factors affecting domestic prices for both short and long term periods.

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ANNEXES

Annex 1. The Result of Unit Root Test at Level and First Difference

Domestic Price at Level

Null Hypothesis: LPDOM has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.374064	0.9069
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LPDOM)
Method: Least Squares
Date: 11/26/09 Time: 16:52
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPDOM(-1)	-0.003399	0.009086	-0.374064	0.7096
D(LPDOM(-1))	0.487951	0.110178	4.428761	0.0000
C	0.037369	0.068134	0.548462	0.5853

R-squared	0.237484	Mean dependent var	0.023423
Adjusted R-squared	0.213277	S.D. dependent var	0.048669
S.E. of regression	0.043168	Akaike info criterion	-3.403038
Sum squared resid	0.117400	Schwarz criterion	-3.303508
Log likelihood	115.3002	F-statistic	9.810587
Durbin-Watson stat	2.034268	Prob(F-statistic)	0.000195

Domestic Price at First Difference

Null Hypothesis: D(LPDOM) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.713677	0.0002
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LPDOM,2)
Method: Least Squares
Date: 11/26/09 Time: 16:54
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPDOM(-1))	-0.514740	0.109201	-4.713677	0.0000
C	0.011917	0.005873	2.039699	0.0455

R-squared	0.2577(	ean dependent var	-0.000161
Adjusted R-squared	0.246104	S.D. dependent var	0.049382
S.E. of regression	0.042877	Akaike info criterion	-3.431122
Sum squared resid	0.117661	Schwarz criterion	-3.364769

Log likelihood	115.2270	F-statistic	22.21875
Durbin-Watson stat	2.030712	Prob(F-statistic)	0.000014

Import Volume at Level

Null Hypothesis: LM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.837824	0.0002
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM)
Method: Least Squares
Date: 11/26/09 Time: 16:56
Sample(adjusted): 1990:2 2006:4
Included observations: 67 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM(-1)	-0.521251	0.107745	-4.837824	0.0000
C	9.964994	2.058453	4.841012	0.0000

R-squared	0.264744	Mean dependent var	0.011299
Adjusted R-squared	0.253432	S.D. dependent var	0.601423
S.E. of regression	0.519655	Akaike info criterion	1.558091
Sum squared resid	17.55265	Schwarz criterion	1.623903
Log likelihood	-50.19605	F-statistic	23.40454
Durbin-Watson stat	2.041127	Prob(F-statistic)	0.000008

Import Volume at First Difference

Null Hypothesis: D(LM) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.82460	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM,2)
Method: Least Squares
Date: 11/26/09 Time: 16:56
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM(-1))	-1.297487	0.119865	-10.82460	0.0000
C	0.011500	0.071622	0.160570	0.8729

R-squared	0.646744	Mean dependent var	-0.014454
Adjusted R-squared	0.641225	S.D. dependent var	0.970875
S.E. of regression	0.581533	Akaike info criterion	1.783537
Sum squared resid	21.64358	Schwarz criterion	1.849890
Log likelihood	-56.85673	F-statistic	117.1719

Durbin-Watson stat	2.191213	Prob(F-statistic)	0.000000

World Price at Level

Null Hypothesis: LWP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.969379	0.2995
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LWP)
Method: Least Squares
Date: 11/26/09 Time: 17:04
Sample(adjusted): 1990:2 2006:4
Included observations: 67 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LWP(-1)	-0.120321	0.061096	-1.969379	0.0532
C	0.665990	0.336899	1.976823	0.0523

R-squared	0.056309	Mean dependent var	0.002742
Adjusted R-squared	0.041790	S.D. dependent var	0.074796
S.E. of regression	0.073217	Akaike info criterion	-2.361384
Sum squared resid	0.348447	Schwarz criterion	-2.295572
Log likelihood	81.10637	F-statistic	3.878452
Durbin-Watson stat	1.529695	Prob(F-statistic)	0.053175

World Price at First Difference

Null Hypothesis: D(LWP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.607809	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LWP,2)
Method: Least Squares
Date: 11/26/09 Time: 17:04
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LWP(-1))	-0.820536	0.124177	-6.607809	0.0000
C	0.001904	0.009183	0.207347	0.8364

R-squared	0.405553	Mean dependent var	0.000788
Adjusted R-squared	0.396265	S.D. dependent var	0.095995
S.E. of regression	0.074588	Akaike info criterion	-2.323831
Sum squared resid	0.356059	Schwarz criterion	-2.257478
Log likelihood	78.68641	F-statistic	43.66314
Durbin-Watson stat	1.890686	Prob(F-statistic)	0.000000

Nominal Exchange Rate at Level

Null Hypothesis: LNER has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.277147	0.6354
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNER)
Method: Least Squares
Date: 11/26/09 Time: 17:05
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNER(-1)	-0.029882	0.023397	-1.277147	0.2062
D(LNER(-1))	0.285660	0.119964	2.381214	0.0203
C	0.269686	0.198371	1.359500	0.1788

R-squared	0.098975	Mean dependent var	0.024053
Adjusted R-squared	0.070371	S.D. dependent var	0.142456
S.E. of regression	0.137353	Akaike info criterion	-1.088143
Sum squared resid	1.188540	Schwarz criterion	-0.988613
Log likelihood	38.90871	F-statistic	3.460180
Durbin-Watson stat	2.010887	Prob(F-statistic)	0.037516

Nominal Exchange Rate at First Difference

Null Hypothesis: D(LNER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.025622	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNER,2)
Method: Least Squares
Date: 11/26/09 Time: 17:06
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNER(-1))	-0.724738	0.120276	-6.025622	0.0000
C	0.017286	0.017245	1.002364	0.3199

R-squared	0.361966	Mean dependent var	-0.000530
Adjusted R-squared	0.351997	S.D. dependent var	0.171466
S.E. of regression	0.138028	Akaike info criterion	-1.092885
Sum squared resid	1.219312	Schwarz criterion	-1.026531
Log likelihood	38.06519	F-statistic	36.30813
Durbin-Watson stat	1.998406	Prob(F-statistic)	0.000000

GDP at Level

Null Hypothesis: LY has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.264392	0.9238
Test critical values:	1% level	-3.534868	
	5% level	-2.906923	
	10% level	-2.591006	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LY)
Method: Least Squares
Date: 11/26/09 Time: 17:07
Sample(adjusted): 1990:4 2006:4
Included observations: 65 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY(-1)	-0.001515	0.005730	-0.264392	0.7924
D(LY(-1))	-0.132439	0.120719	-1.097085	0.2769
D(LY(-2))	0.348052	0.120971	2.877154	0.0055
C	0.052002	0.070729	0.735217	0.4650

R-squared	0.155058	Mean dependent var	0.042577
Adjusted R-squared	0.113504	S.D. dependent var	0.041847
S.E. of regression	0.039401	Akaike info criterion	-3.570497
Sum squared resid	0.094698	Schwarz criterion	-3.436689
Log likelihood	120.0412	F-statistic	3.731445
Durbin-Watson stat	1.768150	Prob(F-statistic)	0.015740

GDP at First Difference

Null Hypothesis: D(LY) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.877536	0.0001
Test critical values:	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LY,2)
Method: Least Squares
Date: 11/26/09 Time: 17:07
Sample(adjusted): 1991:1 2006:4
Included observations: 64 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LY(-1))	-0.992605	0.203505	-4.877536	0.0000
D(LY(-1),2)	-0.041026	0.181407	-0.226154	0.8219
D(LY(-2),2)	0.269807	0.123771	2.179888	0.0332
C	0.043057	0.009959	4.323352	0.0001

R-squared	0.673246	Mean dependent var	0.000199
Adjusted R-squared	0.656908	S.D. dependent var	0.064564
S.E. of regression	0.037817	Akaike info criterion	-3.651631
Sum squared resid	0.085810	Schwarz criterion	-3.516701

Log likelihood	120.8522	F-statistic	41.20812
Durbin-Watson stat	1.891109	Prob(F-statistic)	0.000000

Level of Import Tariff at Level

Null Hypothesis: TRF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.375303	0.5893
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRF)
Method: Least Squares
Date: 11/30/09 Time: 13:38
Sample(adjusted): 1990:2 2006:4
Included observations: 67 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TRF(-1)	-0.056553	0.041120	-1.375303	0.1738
C	0.261664	0.258609	1.011812	0.3154

R-squared	0.028277	Mean dependent var	0.000000
Adjusted R-squared	0.013327	S.D. dependent var	1.443376
S.E. of regression	1.433726	Akaike info criterion	3.587826
Sum squared resid	133.6120	Schwarz criterion	3.653638
Log likelihood	-118.1922	F-statistic	1.891460
Durbin-Watson stat	1.945093	Prob(F-statistic)	0.173759

Level Import Tariff at First Difference

Null Hypothesis: D(TRF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.000000	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRF,2)
Method: Least Squares
Date: 11/30/09 Time: 13:40
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TRF(-1))	-1.000000	0.125000	-8.000000	0.0000
C	0.000000	0.180422	0.000000	1.0000

R-squared	0.500000	Mean dependent var	0.000000
Adjusted R-squared	0.492188	S.D. dependent var	2.056883
S.E. of regression	1.465755	Akaike info criterion	3.632452
Sum squared resid	137.5000	Schwarz criterion	3.698805
Log likelihood	-117.8709	F-statistic	64.00000

Durbin-Watson stat	2.000000	Prob(F-statistic)	0.000000

Annex 2. The Result of Unit Root Test to ECT at Level

Null Hypothesis: ECT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.807090	0.0045
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT)
Method: Least Squares
Date: 11/26/09 Time: 17:12
Sample(adjusted): 1990:2 2006:4
Included observations: 67 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.332729	0.087397	-3.807090	0.0003
C	-0.001922	0.006797	-0.282786	0.7782

R-squared	0.182328	Mean dependent var	-0.001696
Adjusted R-squared	0.169748	S.D. dependent var	0.061053
S.E. of regression	0.055630	Akaike info criterion	-2.910787
Sum squared resid	0.201156	Schwarz criterion	-2.844976
Log likelihood	99.51138	F-statistic	14.49393
Durbin-Watson stat	2.181649	Prob(F-statistic)	0.000314

Annex 3. The Result of Cointegration Test by Johansen Procedure

Date: 12/10/09 Time: 22:22
Sample(adjusted): 1990:3 2006:4
Included observations: 66 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: LPDOM LM LWP LNER LY TRF
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.537992	124.9987	94.15	103.18
At most 1 *	0.485679	74.03522	68.52	76.07
At most 2	0.225795	30.15134	47.21	54.46
At most 3	0.130792	13.26075	29.68	35.65
At most 4	0.055493	4.009335	15.41	20.04
At most 5	0.003649	0.241248	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.537992	50.96347	39.37	45.10
At most 1 **	0.485679	43.88388	33.46	38.77
At most 2	0.225795	16.89059	27.07	32.24
At most 3	0.130792	9.251413	20.97	25.52
At most 4	0.055493	3.768086	14.07	18.63
At most 5	0.003649	0.241248	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 2 cointegrating equation(s) at both 5% and 1% levels

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LPDOM	LM	LWP	LNER	LY	TRF
-13.86183	2.969638	7.024076	9.713914	1.196402	0.145237
4.194566	2.036949	-2.722823	-4.333356	-0.178996	-0.002768
-10.90018	0.234195	-6.901827	-0.077277	7.103344	-0.007437
-0.095473	0.267665	-4.409150	1.349115	-0.394586	0.260769
0.436646	0.354234	-0.675925	0.271914	0.363104	-0.050946
1.820114	0.379139	-1.513720	1.144406	-3.038522	-0.161137

Unrestricted Adjustment Coefficients (alpha):

D(LPDOM)	0.011319	-0.017136	0.008066	-0.003807	0.000358	-0.000193
D(LM)	-0.234759	-0.258558	-0.057073	0.066932	-0.029535	-0.003776
D(LWP)	-0.024539	-0.002817	0.026265	0.007497	0.002025	0.000636
D(LNER)	-0.001785	0.035684	0.014050	-0.037459	-0.010249	-0.001997
D(LY)	0.007085	0.000495	0.002191	-0.000718	-0.001774	-0.001714
D(TRF)	-0.298943	-0.001275	-0.058835	-0.122754	0.285547	-0.032704

1 Cointegrating Equation(s): Log likelihood 258.8390

Normalized cointegrating coefficients (std.err. in parentheses)

LPDOM	LM	LWP	LNER	LY	TRF
1.000000	-0.214231	-0.506721	-0.700767	-0.086309	-0.010478
	(0.02749)	(0.09721)	(0.06124)	(0.04909)	(0.00280)

Adjustment coefficients (std.err. in parentheses)

D(LPDOM)	-0.156905
	(0.06108)
D(LM)	3.254189
	(0.91603)
D(LWP)	0.340154
	(0.11800)
D(LNER)	0.024740
	(0.23880)
D(LY)	-0.098217
	(0.05553)
D(TRF)	4.143899
	(2.55454)

2 Cointegrating Equation(s): Log likelihood 280.7809

Normalized cointegrating coefficients (std.err. in parentheses)

LPDOM	LM	LWP	LNER	LY	TRF
1.000000	0.000000	-0.550314	-0.802494	-0.072952	-0.007472
		(0.12493)	(0.07837)	(0.05998)	(0.00364)
0.000000	1.000000	-0.203488	-0.474848	0.062350	0.014028
		(0.51422)	(0.32256)	(0.24690)	(0.01499)

Adjustment coefficients (std.err. in parentheses)

D(LPDOM)	-0.228782	-0.001290
	(0.05487)	(0.01364)
D(LM)	2.169651	-1.223818
	(0.82109)	(0.20416)
D(LWP)	0.328338	-0.078610
	(0.12317)	(0.03063)
D(LNER)	0.174417	0.067386
	(0.24009)	(0.05970)
D(LY)	-0.096139	0.022050
	(0.05801)	(0.01442)
D(TRF)	4.138551	-0.890350
	(2.66893)	(0.66363)

3 Cointegrating Equation(s): Log likelihood 289.2262

Normalized cointegrating coefficients (std.err. in parentheses)

LPDOM	LM	LWP	LNER	LY	TRF
1.000000	0.000000	0.000000	-0.429412	-0.342423	-0.003526
			(0.05819)	(0.04481)	(0.00385)
0.000000	1.000000	0.000000	-0.336894	-0.037291	0.015487
			(0.22125)	(0.17037)	(0.01465)
0.000000	0.000000	1.000000	0.677944	-0.489668	0.007171
			(0.09978)	(0.07683)	(0.00661)

Adjustment coefficients (std.err. in parentheses)

D(LPDOM)	-0.316706	0.000599	0.070492
	(0.06593)	(0.01313)	(0.03716)
D(LM)	2.791757	-1.237185	-0.551050
	(1.01864)	(0.20280)	(0.57417)
D(LWP)	0.042048	-0.072459	-0.345967
	(0.14091)	(0.02805)	(0.07943)
D(LNER)	0.021271	0.070676	-0.206665
	(0.29863)	(0.05945)	(0.16832)
D(LY)	-0.120017	0.022563	0.033300
	(0.07241)	(0.01442)	(0.04082)
D(TRF)	4.779864	-0.904129	-1.690258
	(3.33746)	(0.66445)	(1.88119)

4 Cointegrating Equation(s): Log likelihood 293.8519

Normalized cointegrating coefficients (std.err. in parentheses)

LPDOM	LM	LWP	LNER	LY	TRF
1.000000	0.000000	0.000000	0.000000	-0.594575	0.024652
				(0.05431)	(0.01114)
0.000000	1.000000	0.000000	0.000000	-0.235116	0.037595
				(0.07419)	(0.01522)
0.000000	0.000000	1.000000	0.000000	-0.091578	-0.037316
				(0.07528)	(0.01545)
0.000000	0.000000	0.000000	1.000000	-0.587201	0.065620
				(0.11460)	(0.02351)

Adjustment coefficients (std.err. in parentheses)

D(LPDOM)	-0.316342	-0.000420	0.087280	0.178449
	(0.06531)	(0.01304)	(0.04009)	(0.03863)
D(LM)	2.785367	-1.219269	-0.846164	-1.065296
	(1.00612)	(0.20085)	(0.61766)	(0.59514)
D(LWP)	0.041332	-0.070452	-0.379020	-0.218078
	(0.13978)	(0.02790)	(0.08581)	(0.08268)
D(LNER)	0.024848	0.060650	-0.041504	-0.223588
	(0.28501)	(0.05690)	(0.17497)	(0.16859)
D(LY)	-0.119949	0.022371	0.036465	0.065542
	(0.07239)	(0.01445)	(0.04444)	(0.04282)
D(TRF)	4.791584	-0.936986	-1.149016	-3.059446
	(3.32469)	(0.66372)	(2.04102)	(1.96662)

5 Cointegrating Equation(s): Log likelihood 295.7360

Normalized cointegrating coefficients (std.err. in parentheses)

LPDOM	LM	LWP	LNER	LY	TRF
1.000000	0.000000	0.000000	0.000000	0.000000	-0.062704
					(0.09752)
0.000000	1.000000	0.000000	0.000000	0.000000	0.003051
					(0.03969)
0.000000	0.000000	1.000000	0.000000	0.000000	-0.050771
					(0.02117)
0.000000	0.000000	0.000000	1.000000	0.000000	-0.020653
					(0.09631)
0.000000	0.000000	0.000000	0.000000	1.000000	-0.146923
					(0.16546)

Adjustment coefficients (std.err. in parentheses)

D(LPDOM)	-0.316186	-0.000294	0.087038	0.178546	0.075539
	(0.06532)	(0.01310)	(0.04016)	(0.03864)	(0.02603)
D(LM)	2.772471	-1.229732	-0.826200	-1.073327	-0.677129
	(1.00396)	(0.20132)	(0.61728)	(0.59388)	(0.40008)
D(LWP)	0.042217	-0.069735	-0.380389	-0.217527	0.155490
	(0.13974)	(0.02802)	(0.08592)	(0.08266)	(0.05569)
D(LNER)	0.020372	0.057019	-0.034576	-0.226375	0.102337
	(0.28405)	(0.05696)	(0.17465)	(0.16803)	(0.11319)
D(LY)	-0.120723	0.021743	0.037664	0.065060	0.023589
	(0.07229)	(0.01450)	(0.04445)	(0.04276)	(0.02881)
D(TRF)	4.916267	-0.835836	-1.342024	-2.981802	-0.623234
	(3.25543)	(0.65281)	(2.00160)	(1.92571)	(1.29730)

Annex 4. The Result of Short Term Model

Dependent Variable: DLPDOM
Method: Least Squares
Date: 12/01/09 Time: 08:50
Sample(adjusted): 1990:4 2006:4
Included observations: 65 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLPDOM(-1)	0.379058	0.090210	4.201945	0.0001
DLM(-2)	-0.009135	0.007312	-1.249446	0.2166
DLWP	0.043563	0.061465	0.708741	0.4814
DLNER(-1)	0.092021	0.035010	2.628444	0.0110
DLY	0.204759	0.115879	1.767007	0.0826
DTRF(-1)	0.003273	0.002938	1.113912	0.2700
ECT(-1)	-0.181915	0.063949	-2.844665	0.0062
C	0.003472	0.006550	0.530089	0.5981

R-squared	0.575749	Mean dependent var	0.024072
Adjusted R-squared	0.523648	S.D. dependent var	0.048759
S.E. of regression	0.033653	Akaike info criterion	-3.830636
Sum squared resid	0.064552	Schwarz criterion	-3.563019
Log likelihood	132.4957	F-statistic	11.05063
Durbin-Watson stat	2.300802	Prob(F-statistic)	0.000000

Annex 5. The Result of Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.621252	Probability	0.195169
Obs*R-squared	5.370779	Probability	0.146575

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 12/10/09 Time: 22:33
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLPDOM(-1)	0.241487	0.145814	1.656128	0.1035
DLM(-2)	-0.001763	0.007257	-0.242982	0.8089
DLWP	0.002215	0.061841	0.035814	0.9716
DLNER(-1)	0.013195	0.036040	0.366103	0.7157
DLY	0.023834	0.114706	0.207786	0.8362
DTRF(-1)	0.000122	0.002903	0.042132	0.9665
ECT(-1)	0.131411	0.095262	1.379469	0.1734
C	-0.006433	0.007117	-0.903879	0.3701
RESID(-1)	-0.544651	0.258281	-2.108754	0.0396
RESID(-2)	-0.130453	0.173799	-0.750600	0.4562
RESID(-3)	0.015300	0.142061	0.107700	0.9146

R-squared	0.082627	Mean dependent var	-5.36E-18
Adjusted R-squared	-0.087256	S.D. dependent var	0.031759
S.E. of regression	0.033116	Akaike info criterion	-3.824570
Sum squared resid	0.059219	Schwarz criterion	-3.456596
Log likelihood	135.2985	F-statistic	0.486376
Durbin-Watson stat	2.012890	Prob(F-statistic)	0.891607

Annex 6. The Result of Heteroskedasticity Test

White Heteroskedasticity Test:

F-statistic	1.258753	Probability	0.265972
Obs*R-squared	16.93911	Probability	0.259437

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 12/10/09 Time: 22:34
Sample: 1990:4 2006:4
Included observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001127	0.000377	2.990579	0.0043
DLPDOM(-1)	0.005168	0.006356	0.813169	0.4200
DLPDOM(-1)^2	0.049761	0.054749	0.908890	0.3678
DLM(-2)	8.45E-05	0.000320	0.263870	0.7930
DLM(-2)^2	-0.000195	0.000363	-0.536611	0.5939
DLWP	0.001872	0.002648	0.706809	0.4830
DLWP^2	-0.027182	0.016249	-1.672869	0.1006
DLNER(-1)	0.001922	0.002063	0.931355	0.3561
DLNER(-1)^2	-0.011354	0.007780	-1.459265	0.1507
DLY	-0.008868	0.009790	-0.905786	0.3694
DLY^2	0.109689	0.057632	1.903258	0.0628
DTRF(-1)	0.000108	0.000172	0.629364	0.5320
DTRF(-1)^2	-2.35E-05	1.99E-05	-1.185731	0.2413
ECT(-1)	0.007449	0.002918	2.552497	0.0138
ECT(-1)^2	0.015112	0.029696	0.508881	0.6131

R-squared	0.260602	Mean dependent var	0.000993
Adjusted R-squared	0.053570	S.D. dependent var	0.001399
S.E. of regression	0.001361	Akaike info criterion	-10.16157
Sum squared resid	9.27E-05	Schwarz criterion	-9.659783
Log likelihood	345.2509	F-statistic	1.258753
Durbin-Watson stat	1.771435	Prob(F-statistic)	0.265972

Annex 7. Some Programs by American Soybean Association and the USA Government

Year	Programs
2000	- Working with State Associations, ASA establishes the World Initiative for Soy in Human Health (WISHH) program to promote the use of soy protein in international food assistance programs by USDA, USAID, and Private Voluntary Organizations. Use of soy protein products in U.S. food aid programs grew by 10,400 metric tons, worth $4.4 million, in 2001-2007. - ASA worked with U.S. trade officials to block China's proposed soybean import quota at around 110 million bushels per year. As a result, China's soybean imports now total over 1 billion bushels annually, with roughly half of the imports coming from U.S. soybean farmers. From 2000 to 2007, the value to U.S. soybean farmers of U.S. soybean exports over China's then-proposed quota level is over $17 billion.
2001	- ASA and state associations successfully lobby Congress to increase Federal soybean research funding by $3.2 million. - ASA develops specifications for and succeeds in obtaining U.S. government approval to make five soy protein products eligible for purchase under food aid programs. Between 2001 and 2006, the value of soy exports under U.S. food aid programs totaled almost $2.6 billion.
2002	- Soybean farmers achieve full program crop status in 2002 Farm Bill with new 44-cent per bushel direct payment and $5.80 per bushel target price. $607 million per year in direct payments are made to soybean farmers, totaling $3.6 billion between 2002 and 2007. The $5.80 per bushel soybean target price improves the soybean safety net by 10 cents per bushel over pre-2002 levels. - ASA and state associations successful in including a new Bioenergy Program in the Farm Bill that provides payments to domestic biodiesel producers to make biodiesel more competitive with petroleum diesel. As a result of this program, and earlier changes in EPACT legislation, biodiesel sales climb from 5 million gallons in 2001 to 25 million gallons in 2003. - ASA was instrumental in passage of landmark provisions in the 2002 Farm Bill that require federal agencies to buy bio based products. Many bio based products, ranging from spray foam insulation to carpet backing to cleaning supplies, can be made with soybean oil to reduce their petroleum content. Federal procurement encourages growth of private-sector markets. - ASA successfully lobbies for establishment of the Dole-McGovern Food for Education Program, which created funding for new soy programs. Exports of soybean products under Dole-McGovern totaled 79,600 metric tons in 2004-2006.
2003	- ASA and state associations succeed in increasing Federally-funded soy research by $10 million per year over year 2000 levels. As a result of these and previous efforts, Federally-funded soybean research now exceeds $40 million per year.
2004	- ASA and state associations successfully lobby Congress to establish the biodiesel tax incentive. Passage of the tax incentive stimulates biodiesel to grow from 25 million gallons in 2003 to 75 million gallons in 2005. The impact of the incentive on soybean prices is conservatively estimated at 8 cents per bushel, or over $250 million per year in increased revenues for soybean farmers. - ASA and state associations successfully lobby Congress to allow schools to offer soymilk as an option under the school lunch and school breakfast programs without requiring a doctor's note. With 5-10% of the school-age population needing alternatives to cow's milk (due to allergies, lactose intolerance, religious beliefs, or cultural practices), the potential growth of soymilk in school lunch and breakfast programs is great - ASA strongly supports the successful negotiation of the Central American Free Trade

	Agreement (CAFTA-DR) between the United States, the Dominican Republic, and the Central American countries of Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. In 2004-2006, U.S. exports of soybeans to CAFTA-DR countries increased $20 million, soybean meal exports increased $108 million, and soybean oil exports increased $8 million. - ASA supports negotiation of the Chilean Free Trade Agreement (FTA). The value of U.S. soybean meal exports to Chile has increased from $248,000 before the Agreement to $43 million in 2006.
2005	- ASA and state associations successfully lobby Congress to extend the biodiesel tax incentive through 2008. Biodiesel sales grow from 75 million gallons in 2005 to 450 million gallons in 2007. The growth in biodiesel sales raises soybean prices by a conservative estimate of at least $2.00 per bushel, increasing annual soybean farmer revenue by $5.1 billion. - ASA and state associations led political, media, and education efforts to ensure that the United States was prepared to respond to Asian soybean rust disease. As a result of ASA's efforts: USDA has spent approximately $2.5 million annually to implement a sentinel plot and diagnosis network; The U.S. Environmental Protection Agency (EPA) granted 28 approvals for fungicides to be used on soybeans with either Section 18 (emergency) or Section 3 (full) approval; and U.S. soybean farmers were provided with comprehensive education and training programs to teach them about soybean rust scouting, detection and management.
2006	- As a result of ASA and state association efforts, USDA and the Department of Energy announce a joint initiative to map the soybean genome. Genome mapping is key to improved soy yields, pathogen resistance, and improved nutrition. Additionally, in response to ASA leadership, USDA announces $5 million for legume genomics funding.
2007	- After five years of coalition lobbying with other farm organizations, ASA and state associations convince Congress to pass legislation authorizing over $2.2 billion for the construction and upgrading of locks and dams on the upper Mississippi and Illinois Rivers. With 70% of soybean exports moving through these waterways to the Gulf, modernizing this infrastructure is key to maintaining U.S. soybean farmer competitiveness in international markets. - To enhance the federal biobased procurement program, ASA has continued to champion biobased procurement in the 2007 Farm Bill. - ASA worked hard to persuade Congress to approve Free Trade Agreements with Mexico (1993), Canada (1989), Chile (2004) and Morocco (2005). Collectively, these FTAs have resulted in increased sales of $16,264,927,162 or $16.26 billion in soybeans, soybean meal and soybean oil to these markets.

Annex 8. Diagnostic Test

To know whether these models are the best models and gives a statistical estimate of an unbiased and efficient, it is necessary to test the OLS assumption.

1. Multicollinearity Test

Multicollinearity test is done by looking at the correlation matrix. The value of the coefficient correlation between the variables does not more than 0.8. Since the value of the coefficient correlation between variables not exceeds 0.8, it can be concluded that the model does not contain multicollinearity. The results of this test can be seen in the table below.

Table Result of Multicollinearity Test

	DLPDOM (-1)	DLM (-2)	DLWP	DLNER (-1)	DLY	DTRF (-1)	ECT (-1)
DLPDOM(-1)	1.000000	-0.057807	-0.240051	0.208833	0.212189	-0.005151	-0.092269
DLM(-2)	-0.057807	1.000000	-0.081023	-0.201760	-0.216637	0.022963	0.134928
DLWP	-0.240051	-0.081023	1.000000	-0.202205	-0.274863	0.167523	0.012368
DLNER(-1)	0.208833	-0.201760	-0.202205	1.000000	0.394274	-0.008190	-0.402852
DLY	0.212189	-0.216637	-0.274863	0.394274	1.000000	0.062182	-0.208929
DTRF(-1)	-0.005151	0.022963	0.167523	-0.008190	0.062182	1.000000	-0.003149
ECT(-1)	-0.092269	0.134928	0.012368	-0.402852	-0.208929	-0.003149	1.000000

2. Autocorrelation Test

The hypothesis of this test is:

H0 = no serial correlation

H1 = serial correlation

The results from autocorellation tests can be seen in the table below.

Table Result of Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1,621252	Probability	0,195169
Obs*R-squared	5,370779	Probability	0,146575

The table concludes that the probability value of Obs*R-squared of 0.146575 is greater than α 1%, 5% and 10%. Then it can be stated that statistically H0 can not be rejected, this means that short term equation (ECM) has been free from autocorrelation problems.

3. Heteroskedasticity Test

The hypothesis of this test is:

H0 = error is homoskedasticity

H1 = error is heteroskedasticity

The results from this test can be seen in the table below.

Table Result of Heteroskedasticity Test

White Heteroskedasticity Test			
F-statistic	1.258753	Probability	0.265972
Obs*R-squared	16.93911	Probability	0.259437

The table concludes that the probability value Obs*R-squared of 0.259437 is greater than α 1%, 5% and 10%, so statistically H0 can not be rejected. This means that short term equation (ECM) is free from heteroskedasticity problems or error is homoskedasticity.