DEALING WITH COMMODITY PRICE VOLATILITY IN EAST ASIA

Department of Economics
Faculty of Economics and Management
Bogor Agricultural University (IPB)
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Fiscal Policy Office
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RESEARCH TEAM

Team Leader: Noer Azam Achsani, Ph.D

1. Prof. Rina Oktaviani

2. Dedi Budiman Hakim, Ph.D

3. Dr. Alla Asmara

4. Tanti Novianti, M.Si

5. Deniey Adi Purwanto, M.S.E

6. Dian Verawati Panjaitan, M.Si

7. Ahmad Hery Firdaus, M.Si

8. Syarifah Amalia, SE

9. Sri Retno Nugraheni, SE

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I.   INTRODUCTION

1.1. Backgrounds

The discussion on commodity price volatility became crucial when the world economic constellation was facing the "multiple crisis - 3Fs" phase which consisted of fuel, food, and financial components during the period of 2007-2008. Different from advanced countries, the emerging market countries had more limited exposure to the global financial crisis with sub prime mortgage as the crisis epicenter; therefore they have space to keep a positive economic growth momentum. Along with the decline of economic growth, the growth rate of world trade volume also experienced a sizeable deceleration, from 7.2 percent in 2007 to 3.3 percent in 2008 (IMF, 2008). It is predicted that the consequence of the economic contraction phenomenon that occurred in developed and developing countries will reduce economic endurance against external shocks, including the risk of commodity price volatility.

Food Crisis

The realization of international Food Price Index (FAO *food price index*) shows that the increase of international food prices began in 2005. Index growth is stimulated by the price growth of cereals group that reached the highest price level in 30 year period. The fluctuation in that commodity price is suspected as a new pattern that has never happened before and is projected to be persistent, at least in the medium run.
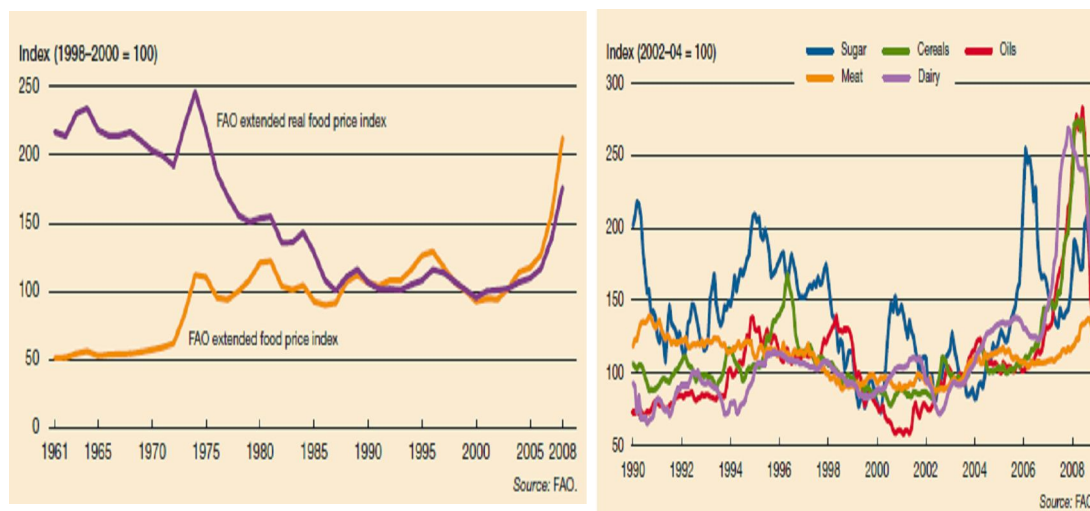
(a) Aggregate FAO food price index period1961-2008   (b) FAO food price index based on sectors
period 1990-2008

Source: FAO (2008)

Figure 1.1. The Realization of FAO Food Price Index Development

FAO (2008) established a generalization on the cause of food price increase issue based on the standard economic concept of Supply and Demand. Identification on Supply, in broad outline, highlights the reality that correlates with food production output. In East Asian context, data recapitulation gathered by FAO points out the tendency of price volatility that varied among commodities from 2002 - 2008. Rice price fluctuation in East Asia could be caused by crop failure and the increase of consumer demand in East Asia. This occurrence could also happen due to the weakening of US dollar, the increase of energy source price, and the rise of biofuel demand. This can be seen from the high level of price and rice price fluctuation in Indonesia and Japan in the figure below. Crop failure in Indonesia due to extreme climate changes contributed to rice price volatility in Indonesia, causing Indonesia to conduct huge import on rice commodity.

Source: FAO (2011)

Figure 1.2. The Realization of Rice Commodity Price Development in East Asian Countries Period 2000-2008

Maize commodity is a commodity that has multiple functions. Beside its function as food, maize is also used as animal feed, and even in some countries, maize is processed into ethanol that is then mixed with gasoline to fuel motor vehicles to reduce pollution. Therefore, maize has better marketing prospect and that influences its price changes. The below figure demonstrates that the highest and most fluctuated maize price changes were in Indonesia.
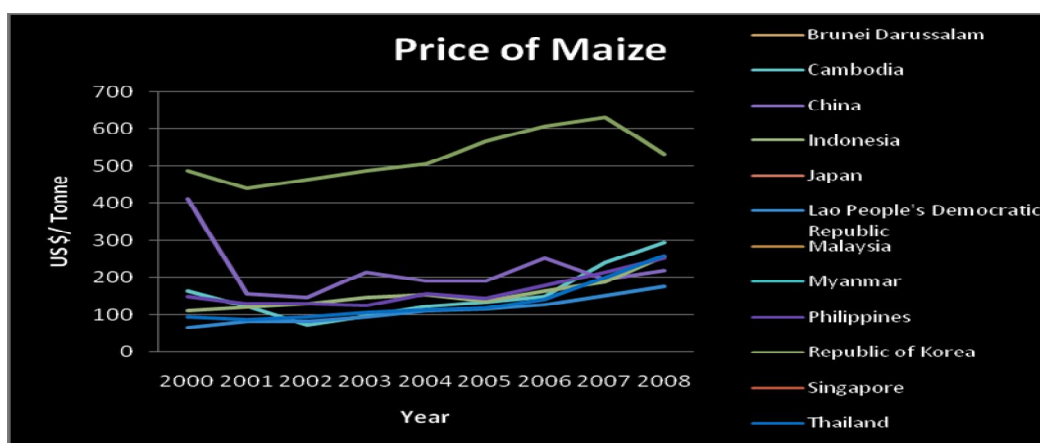
Source: FAO (2011)

Figure 1.3. The Realization of Maize Commodity Price Development in East Asian Countries Period 2000-2008

The changes on soybean price in East Asia countries can be observed from the figure below that explains the reason for this was the decrease of soybean supply and the behavior of speculators. The decrease in soybean supply caused soybean price to easily experience increase. The same thing happened when speculators performed speculation causing uncertainty to prices. The biggest and highest price fluctuation of soybean happened in Japan and Indonesia. This was due to the demand of soybean in these two countries was extremely high, hence the changes in supply would greatly affect price changes.
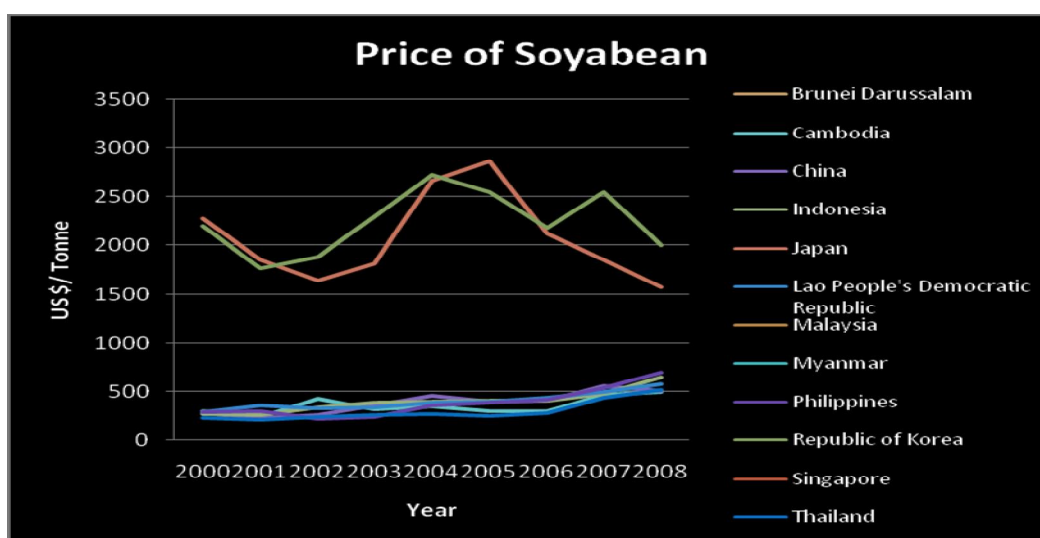
Source: FAO (2011)

Figure 1.4. The Realization of Soybean Commodity Price Development in East Asian Countries Period 2000-2008

Fuel Crisis

The rise of world oil price becomes a significantly worrying phenomenon for many countries, including several countries in the East Asia region. This can't be separated from the high dependence of mostly those countries on this non-renewable energy source. The rise of world oil price that had occurred from late 2008 to early 2009 was a sign that the world is facing energy crisis now.

Based on historic data, it is known that during the period of January 1990 to August 1999 the development of world oil price was relatively stable around US$ 20 per barrel (Figure 1.5). Entering the period of 2000, world oil price showed a tendency to rise. The highest rise happened in the period of March-August 2008

where the world oil price broke through the US$ 100/barrel level. In that period, the world oil price fluctuated in the range of US$ 101/barrel up to US$ 132/barrel. This soaring world oil price was caused by the limitation of supply on one side and the increase of world demand on the other side.

The movement of world oil price that tends to rise also happened during the period of late 2010 to early 2011. The rise of oil price was mostly stimulated by the increase of world consumption. The report of International Energy Agency (IEA) estimated that the world oil consumption level in 2011 reaches 89.4 million barrel per day or increased by 1.5 million barrel per day compared to 2010[1]. The movement of world oil price that tends to rise was also stimulated by the political crisis in Libya. The occurring political crisis has boosted the rise of world oil price to US$ 115.97/barrel[2].

Figure 1.5.   The Development of the World Oil Price during the Period of January 1990-December 2009

Furthermore, the rise of world oil price also impacts the price increase of various commodities in the world market. Food commodity is the commodity group that is relatively responsive to the rise of world oil price. The rise of world oil price

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[1] http://www.antaranews.com/berita/254130/price-minyak-indonesia-capai-117-dolar, April 14th, 2011

[2] http://makassar.tribunnews.com/2011/03/07/price-minyak-dunia-terus-melambung,   March 8th, 2011

tends to push the increase of world food prices. This is due to the increase of production and transportation cost and the existence of fuel substitute from vegetable source. The rise of world oil price that was caused by the crisis in Middle East and North Africa has propelled the rise of food prices by 36 percent higher compared to the food prices in 2010[3].

The growth of world oil and food prices will surely affect the world economy greatly, including the countries in the East Asia region. The price volatility of world and food prices that tends to increase will raise the risk in the economic growth control. In addition to that, the transpiring volatility will propel the increase of goods prices in domestic market. This price increase will have an implication towards a higher inflation performance. The occurring inflation pressure will generally be responded by monetary authority with interest increase. This situation will definitely push a contraction to happen in the economy.

Financial Crisis

The sub prime mortgage in The United States has been predicted to become sub prime bubble. The global financial crisis has given direct and indirect implications to the economic growth of East Asia. The direct impact was the loss of a small portion of investors that owned exposure on assets directly linked to problematic U.S finance institution. For example, Indonesian finance institutions that invested funds in the Lehman Brothers instrument.

US financial crisis also had potential in decreasing the export performance of East Asian commodities. This is because it is estimated that the decrease of US demand couldn't be compensated yet by the other export markets since US is a market with high consumer buying power compared to other countries. Meanwhile, the financial crisis was also purported to contribute in the price volatility of several agricultural commodities at the international futures exchanges, namely:

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[3]http://bisniskeuangan.kompas.com/read/2011/04/17/13425880/Bank-Dunia-Price-Pangan-Membahayakan, April 17th, 2011

(1) Maize and soybean, at the close of trading at the Chicago Board of Trade Exchange (CBOT) on October 22nd, 2008, experienced a significant downturn after having been able to stand firm at their highest positions on the previous week. The maize price for the December 2008 contract decreased by 7.5 cent (1.8%) and became 4.11 dollar per bushel. As for the soybean price for the January 2009 contract, it decreased by 25.5 cent (2.7%) and became 9.152 dollar per bushel. Soybean price experienced a decrease of 44 percent since reaching the highest price on July 3rd, 2008, whereas maize price suffered a decrease of 49 percent since its highest price on June 27th, 2008.

(2) Wheat, for the December 2008 contract at the CBOT futures exchange, went through a decline of 14.5 cent (2.6%) and was closed at 5.49 dollar per bushel position, or decreased by 59 percent after reaching its highest level on February 27, 2008 at 13.495 dollar per bushel.

(3) Arabica coffee, for the December 2008 contract at the Intercontinental Exchange (ICE) Futures, went down until below 1 dollar per lb. This commodity price suffered a decrease by 12 percent during October 2008.

(4) Cacao, at ICE Futures New York, experienced a decrease of 48 dollar (2.3%) and was closed at 2.037 dollar per metric ton position.

(5) Sugar, at ICE Futures New York on October 22nd, 2008, displayed a price decrease for two days straight. The crude sugar price for March 2009 contract dropped by 0.26 cent (93%) and was closed at 11.24 cent per lb position.

(6) Rubber, at the trade at the Tokyo Exchange on October 6, 2008, encountered a decrease of almost 7 percent, reaching the lowest price since the last ten months. While in Shanghai, the rubber futures price for January 2009 subsided by 1.160 Yuan or 6 percent into 18,135 Yuan.

1.2.   Problem Formulation

Based on theoretical frame, if a country is connected to the international market without the existence of any trade distortion, then the commodity prices at domestic level will refer to the international commodity price movement. If the domestic relative price is higher compared to the international price, import will occur until a balance between domestic and import prices transpire. It's similar

with export phenomenon. Therefore, the difference between domestic and international prices should only be represented by transportation cost under the assumption of market clearing conditions.

But in reality, the transmission of international price to domestic and regional levels demonstrates that the possibility of alteration magnitude can vary in all countries. International commodity price is one of the factors that influence the commodity price at domestic or regional level. For countries with high dependency level against import commodities, the volatility price will be influenced by exchange rate, trade policy, and other policies (ADB, 2008). Meanwhile, in countries that have low dependence on import, the commodity prices will be determined by supply and demand, and also subsidy policy and fiscal incentive (World Bank, 2011). For the poor, the commodity price volatility at local level is more relevant than the global food price movement, because the price that they really have to pay is local price.
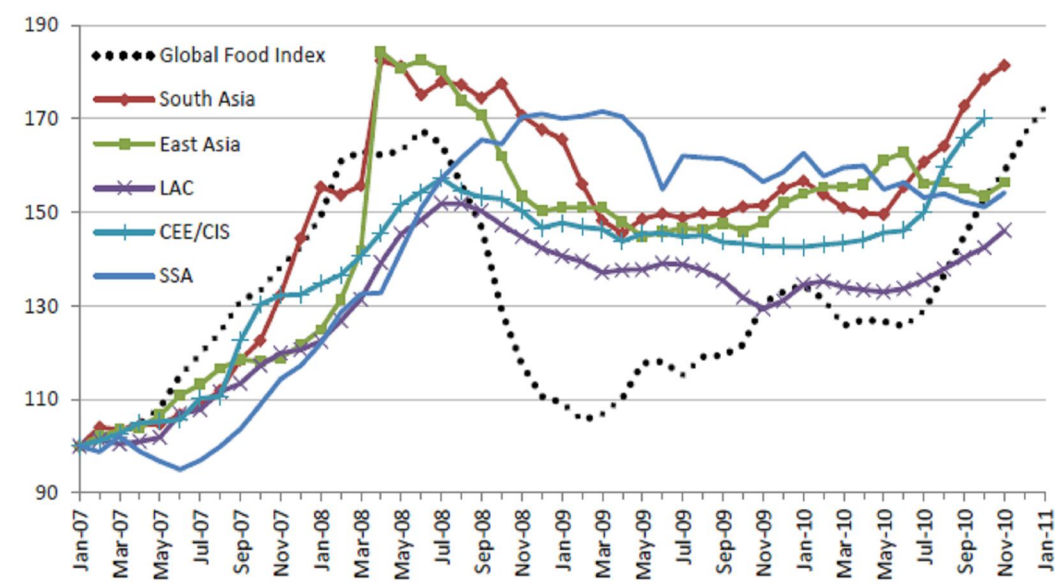
Source: FAO (2011)

Figure 1.6. The Development of International and Regional Food Price Index Period 2007-2011

Averagely, the movement of agricultural commodity price index at regional level in the country was consistent with the global agricultural commodity index, with three month lag in 2007 and 2008, and then showed a reduce in lag response in 2010. This means that there was an indication that the international commodity prices were transmitted perfectly with the increase speed adjustment. Meanwhile,

the early observation could be done through monitoring the pass through price degree; however, **the driven factors behind price volatility need further study and elaboration.**

To formulate an effective policy in order to utilize the opportunity and challenges of international commodity price movement, it is extremely important for the policy maker to understand how far the East Asian regional markets are integrated one to another, and to global commodity market, and the main determinant more than the international commodity price movement. The insight on these issues will enable the policy maker to predict the speed and impact intensity (*pass-through*) of price shocks accurately and understand the impact of price shocks to the economy of the countries in the East Asian region.

Referring to the complexity of commodity price volatility issue as well as the multiple challenges contained inside, the substance of the East Asian Regional Coordination in commodity price volatility risk mitigation can be elaborated in this Study by the points below:

- Identification on factors that influence commodity price volatility in East Asian region.

- Impact analysis on commodity price volatility against the performance of Macro Economy, Sectoral, and Fiscal Condition in the East Asian countries.

- Policy coordination implication within the fiscal, monetary, and other structural policies.

1.3.   The Purpose of the Study

- To identify commodity price volatility in every country in the East Asia region.

- To analyze the factors that influence commodity price volatility.

- To analyze the impact of price volatility to micro and macro variables and food security in every country.

- To identify the policy to reduce the impact of commodity price volatility and strengthen national policy in overcoming commodity price volatility to

secure the regional food security and regional growth in the future, and to improve regional coordination in order to response to commodity price volatility.

II. LITERATURE STUDY

2.1. Agricultural Product Price Volatility

The prices of several products, especially agricultural and animal husbandry products, show a certain fluctuation from season to season. One of the causes of this fluctuation is the late reaction of the producer against prices (Boediono, 1993).

In short term, agricultural product prices tend to undergo relatively high fluctuation. Price can reach a very high level at a certain period, but on the contrary, it will suffer a terrible decline at the next period. Price instability can be caused by the inelasticity of supply and demand on agricultural products. This characteristic leads to highly sizeable changes on price level whenever supply or demand experiences changes. The factors that trigger agricultural price instability can derive from two sources, namely supply changes and demand instability (Sukirno, 2005).

a. Instability that originates from supply changes

The production level of agricultural sector is immensely affected by the factors that are beyond the ability of farmers to control. Agricultural production is extremely influenced by natural factor. Generally, agricultural products always change from one season to another. Season changes are especially shaped by the condition of weather/climate and other natural factors, such as flood and prolonged rainy/drought season. Besides, the attack of pests and disturbing animals can have a significant effect on agricultural product changes.

There are several factors that generate supply inelasticity against agricultural products; the first one is the fact that agricultural products are produced based on season. For example, the cultivation of particular crops that are always done in certain months and have been done for many years will never change even though a fairly big price change occurs. Second, some crops need years before they can be harvested. The examples of this kind of crops are fruit plants and raw materials. The difficulty-to-change agricultural product supply is followed by demand inelasticity and can cause a tremendously big price change if the demand change takes place.

b. Instability that is generated by demand changes

In both short and long term periods, demand on agricultural products is inelastic. In long term, this is because demand elasicity of income against agricultural products is low, there is only a small increase on demand. In short term, demand of agricultural products is inelastic because most agricultural products are daily staple foods which are used everyday. Although the prices greatly increase, the same amount must still be consumed. On the contrary, when the prices vastly decrease, the consumption will not add much because the consumption need is relatively the same. Due to the inelasticity of demand for agricultural products, prices will go through enormous changes if agriculture product supply experiences changes.

2.2. Fiscal and Trade Policies in Support of National Food Availability and Price Control

To ensure national food security and domestic food price controls the number of countries to take some control policies. In Indonesia, rice import policy by Bulog done to maintain the national food stocks and prices stable in the country. Import regulation policy formulated by the Minister of Industry and Trade of Republic of. 9/MPP/Kep/I/2004 an alternative to the tariff policy. In general, the decision set: (1) prohibition on the importation of rice a month before and two months after harvest so that rice imports are prohibited entry into Indonesia in January-June and (2) on the outside of the harvest period, rice imports may go by setting the number, place (port), quality and time.

This tariff policy set forth in Instruction No. 9 of 2002 which was conducted in order to protect farmers from the negative impact of free trade on rice. In practice, the Department of Agriculture are constantly trying to adjust the tariff rates of rice to achieve the most optimal. This tariff adjustment policy is the best option from a variety of existing trade policy because this policy is not to distort the market and have an impact that can be calculated in advance. Private importers of specific tariffs charged for Rp.430 per kg (equivalent to the ad valorem rate of 30 percent of the price of imports (cif) Indonesian rice). In addition, non-tariff barriers are also applied to imports of rice Indonesia in the form of standardization, taxation procedures (custom), and a more rigorous inspections, compared to other imported food products.

In implementation, the determination of HPP or import tarifikasi aimed at protecting farmers / producers will cause the price paid by consumers (RT) is higher. Higher price to be paid by consumers will lead to reduced consumer surplus. Decline in consumer surplus as a result of the intervention will affect the level of welfare.

Tariff on rice imports in Indonesia Minister of Finance Regulation No. 591/PMK.010/2004 on the harmonization of customs duties in 2005-2010 for agricultural products, fisheries, mining, pharmaceuticals, ceramics, and iron and steel. Harmonisari scenario tariffs on agricultural commodities (rice, sugar, corn, soybean, mandarin oranges, mangoes, cloves, onions, potatoes, carrots, orchids, chicken thighs, plant seeds) in accordance with the imposition of tariff is 5% in 2010. A number of fiscal and trade policy is also applied by some countries of East Asia. Fiscal and trade policies by the countries of East Asia are described in Table 2.1.

Table 2.1. Fiscal Policy and Trade in East Asia Countries

No	Country	Fiscal Policy	Trade Policy
1	Indonesia	1. Fiscal policies through the adjustment of tariffs on commodities exports and food imports 2. Preparation of the implementing regulation for the assignment of distribution activities Seeds Direct Aid Excellence (BLBU) and Aid Direct Fertilizer (BLP) and the Presidential Security National Rice Production in the face of extreme climatic conditions	1. Assign Bulog to import rice until the harvest in order to increase national rice stock 2. Domestic rice procurement by Bulog (to absorb the rice farmers, the national rice stock, distribution Raskin) is supported by tables published by the Ministry of Agriculture rafaksi rice in order to provide flexibility to make purchases Bulog rice / rice farmers, if the price is above the "Harga Pokok Pertanian" (HPP). 3. Customs Tariff Policy in the Field of Food: • Determination of the rate of import duty on wheat flour imports by 5% (PMK.07/PMK.011/2009) aim to maintain price stability in the domestic wheat flour: determination of tariffs on imports of wheat flour (Tariff Heading 1101.00.10.00) for 5%

			• Determination of the specific rates of import duty on rice imports by RP0 (PMK.241/PMK.011/2010): The goal for the stabilization of domestic rice prices. Reduction in import duty to be $ 0, kg on imports rice (HS 1006.30.90.00). Rice Import Duty PMK is effective on the date of promulgation to the end of March 2011, after returning a rate of $ 450 applies, kg • Exemption or reduction of import duty Import of Food PMK No. of products. 13/PMK.011/2011: aim to anticipate the impact of rising world food and energy prices. Tariff adjustment BM 57 Top Seed Wheat, Animal raw materials, Fertilizers, Food Products and Food Raw Materials to be o (zero) percent
2	Vietnam, Thailand	Input subsidies and guaranteed prices for farmers	Policy restrictions on rice exports, when the production and domestic stocks fell sharply as well as price stability is threatened.
3	Thailand	1. A. The Thai government has provided funding of U.S. $ 2 billion for the construction of silos, promorsi research and development, and stabilizing prices. 2. The government raised the minimum price (support price) within the framework of the procurement skim through pawnshops rice. In the period 2002-2003, as rice prices fall, many farmers to sell rice in paddy procurement agencies, which reached 5.6 million	Public policy is made, among others: (a) establishment of research centers, (b) the establishment of Public Warehouse Organization (PWO) and (c) the establishment Marketing Organization for Farmers (MOF). Specific policies of interest to be conveyed is Paddy Mortgage, as well as international trade policy. In paddy mortgage scheme (pawnshops rice) that carried out by the Bank of Agriculture and Cooperative, the farmers will get a loan with a preferential loan rates to 90 percent of the value of the mortgaged rice (Utomo, 2002).

		tons. Farmers do not make up for the rice that has been mortgaged to the government. 3. Since 2004, the government raised the minimum price of paddy / rice to U.S. $ 156/ton rice (5% broken) and U.S. $ 239/ton for high quality Jasmine rice (fragrant rice) (Notes: Compare the price of HPP (government purchase price) in Indonesia for 2006 reached U.S. $ 243/ton or $ 384/ton paddy rice) 4. Non-price incentive (non-price incentive): increase farmers' income, through increased productivity and cost reduction.	
4	Vietnam	Broadly speaking, the policy made by the government of Vietnam can be divided into two, namely general and specific policies. Public policy made by the Vietnamese government, among others: (a) food reserves to maintain social and political stability, (b) rehabilitation and development of irrigation networks, and (c) the development of high yielding varieties of rice. While specific policies made by the Vietnamese government, among others: (a) provision of agricultural land that can be used by farmers and poor people without the burden of ground rent, (b) provision of guarantees certain levels of	

		profit for rice farmers to buy all the rice sold in the market if rice prices fall below U.S. $ 0.09 per kg, (c) land use tax exemption for poor farmers, (d) the provision of interest subsidy loans, purchases of products (paddy / rice) for the purposes of food reserves and reducing import tariffs on raw materials, especially for the manufacture of agricultural inputs	
5	Cina	(1) sistem kebijakan pangan nasional yang rasional, obyektif dan fokus serta terkoordinir dengan baik oleh Dewan Negara dengan ujung tombaknya *The State Development Planning Commission* (SDPC), (2) kebijakan industri pedesaan yang dilakukan oleh China sejak tahun 1980-an telah berhasil mengalih profesikan 100 juta jiwa petani untuk bekerja pada sektor industri di pedesaan, (3) dukungan yang kuat dari lembaga-lembaga penelitian dari berbagai perguran tinggi yang selalu meningkatkan usahanya untuk mencapai hasil yang maksimal dan berusaha membimbing petani dan perusahaan-perusahaan yang bergerak di sektor pertanian dan (4) bantuan dan kerjasama teknik luar negeri dan badan-badan pangan dunia dimanfaatkan secara maksimal, fokus, rasional dan berhasil guna	
6	Myanmar	construction of irrigation channels	
7	Jepang	1. Japan is directly subsidizing the production of rice as much as $ 1820000000 (206 billion	1. Japan currently has 150 yen per kilogram tariff imposed on rice all the time across the border.

		yen) Japanese subsidies come through a number of different government programs. 2. The most direct subsidy program, called the Japanese Rice Farming Income Stabilization Program, implemented in 1998. Income Stabilization Program enables rice farmers to claim a payment equal to the difference in domestic rice prices and the specified standard, should market prices fall.	2. In addition, subject to a quota on rice imports 682 000 tonnes, above which imports are taxed at a rate of 341 yen per kilogram. 3. Statistics show that the effective rate prohibit all imports above the quota (Fukuda, et al., 2003).
8	Philipina	A. Construction of dams and irrigation 2. The use of hybrid rice and loan assistance of U.S. $ 196 per acre from the Land Bank 3. Production incentives for farmers and associations that are accredited 4. Direct assistance to farmers "support price" for the harvest season from March to August amounted to U.S. $ 0.2 per kg and the harvest season from September to February at 0.18 kg. 5. Drying and transport incentives amounted to U.S. $ 0.0029 and $ 0.0019 per kg.	1. Import tariffs by 50% under the Minimum Access Volume (MAV) 2. Imports of rice are appointed directly by the government, namely by the National Food Authority (NFA) is not subject to tariff.
9	Laos	Improvement of irrigation facilities as much as 22 240 units	Government of Laos has not had a policy of export and import of specific because of the extensive border area, causing rawanya smuggling

2.2. Several Previous Researches

Noryati Ahmad (2010) analyzed the impact of Malaysian futures and direct market after the alteration from Malaysian Crude Palm Oil Futures (FCPO) to automatic system in December 2001 by using EGARCH-t (p, q) model. The research period was from January 2000 until December 2006. The result demonstrated that system alteration from FCPO to automatic system had caused volatility to become higher. However, asymmetric information didn't happen at both times.

Pratamasari (2008) analyzed the soybean price growth volatility in international market and the impact of international crude oil price growth and harvest season in the United States against soybean price growth in international market using GARCH and TARCH models. The research period was conducted on monthly data from 1997 – 2008. The result showed the existence of time varying volatility and leverage effect on soybean price growth. However, the international crude oil growth didn't affect soybean price growth.

Table 2.2. **Previous Researches**

No	Researcher	Year	Title	Methodology	Result
1	Noryati Ahmad	2010	*Impact of Automated Trading in the Crude Palm Oil Futures Market on its Underlying Spot Market*	EGARCH-t	Change the system of FCPO to the automated system volatility higher. but not the case of asymmetric volatility in both time them.
2	Kindy Retno Pratamasari	2008	Growth Analysis volatility of international prices of Soybean which faced by Indonesia	GARCH, TARCH	The growth of crude oil international prices didn't affect the growth of soybean prices, the time varying volatility in the growth in soybean prices, the leverage effect on soybean price growth
3	Isabel Vansteenkiste	2009	How Important are Common Factors in Driving Non-Fuel Commodity Prices? A Dynamic Factors Analysis	Kalman Filtering tehnique	Significant relationship between non-fuel products with oil prices, exchange dollar, and the global interest rates
4	Nazar, Dahmardeh, dkk	2010	Asymmetry Effect of Inflation on Inflation Uncertainty in Iran: Using from EGARCH Model, 1959-2009	EGARCH (p,q)	The existence of asymmetric relationships between inflation with inflation uncertain and result of the inflation shock uncertainty can not be stopped by rapid

5	Jordaan et al	2007	Measuring the Price Volatility of Certain Field Crops in South Africa using the ARCH/GARCH Approach	ARIMA dan ARCH-GARCH	some commodities have a constant level of volatility, namely wheat and soybeans. Meanwhile, the volatility of the price of white maize, yellow maize and sunflower seed varies over time (time varying). Further studies have revealed that white maize is a commodity with the highest level volatiltas.
6	Mehrara dan Sarem	2009	Effects of oil price shocks on industrial production: evidence from some oil-exporting countries	Grangger Causality Test	A strong causal relationship between oil price shock to output growth in the economy of Iran and Saudi Arabia. Further information is also disclosed that for the case of Indonesia, the proxy shows the influence of oil output in both the short and long term.
7	Lescaroux dan Mignon	2009	On the influence of oil prices on economic activity and other macroeconomic and financial variables.	Grangger Causality Test for short-term analysis and time series cointegration tests for long-term analysis	The study results reveal that there is a relationship between oil prices and various macroeconomic variables.
8	Asmara, A.	2011	The impact of the volatility of economic variables on the performance of the manufacturing sector and Indonesia's macroeconomic	ARCH-GARCH Model and Recursive Dynamic CGE	A number of economic variables are analyzed showing volatility is likely to vary across time (time varying). Influence the impact of volatility varies across industries. Volatiltias oil prices and real interest rates tend to give negative impact on industry and macroeconomic performance in Indonesia. Meanwhile, export price volatility relative industry influence is different.

9	Balcom, Kelvin	2010	The nature and determinants of volatility in agricultural prices : An Empiral study from 1962 - 2008	Decomposition Approach and the Panel Approach	Almost all commodities have significant stochastic trends - Most commodities have a cyclical component with the exception of palm oil. - Volatility of the past was a significant predictor of current volatility - There is a transmission of volatility in all agricultural commodities for almost all commodities (except pigmeat). - Oil price volatility is a significant predictor of the volatility of agricultural commodities. With the growth in biofuel sector, commodity prices and oil prices may become more connected, so there is reason to believe that the role of oil prices in the determine the volatility may be even more powerful in the future. - The shares have an impact (decrease) in volatility is significant - Some commodity prices have a significant trend. However, this trend positive to negative for a few series and other series
10	Cadot, Olivier	2009	Do Trade Agreements reduce The Volatility of Agricultural Distortions	Econometric Approach	Regionalism econometric approach significantly reduces the volatility of agricultural goods trade policy
11	Firdaus, Heri Ahmad	2011	Trade Performance and Impact of Free Trade Area (FTA) ASEAN Plus Three to Indonesia's Economic	RCA, EPD, IIT, GTAP	In general Indonesia has increased imports in all sectors, while the increase in exports is not as big an increase in imports. However, this situation is better than not doing the FTA. Because of Indonesia's trade balance deficit to be smaller at the time of the FTA. Sectors that have relatively large increase in imports is generally the sectors that experienced significant reductions in

					tariffs. While the sectors that experienced a relatively large increase in exports is generally the sectors that have relatively large decline in rates in the country of destination. A decline in output in almost all sectors traded Indonesia to ASEAN Plus Three. Except in the crop sector; livestock, forestry, fishery products, chemicals, rubber, plastic; electronic equipment; and machinery and equipment. Output prices in the traded sectors of Indonesia as a whole has increased. Decline in output prices also occur, especially in sectors which are the largest imports of Indonesia, such as motor vehicles and spare parts. Increase in output prices and lower output and employment decline in most sectors traded Indonesia to ASEAN Plus Three showed Indonesia was not ready to do Free Trade Area with ASEAN Plus Three. Liberalization will deliver shocks in the real sector. Although some sectors have increased its output, but the total trade balance also showed a negative value

III. RESEARCH METHOD

3.1. Types and Sources of Data

This research uses data from various sources. For commodity prices, it uses data of commodity prices in world market that was taken monthly from *Global Financial Data* (GFD), during the period from 1980 to 2010. As a comparison (verification), it also uses data of commodity prices from World Bank, IMF and UNCTAD. As for the data that is related to macro economic variables, it uses data from Bank of Indonesia, Ministry of Finance and Ministry of Trade.

Beside that, the main data from data base of GTAP is used to analyze the effect of the food commodity price volatility impact among ASEAN+3 countries as released by *Centre for Global Trade Analysis*, Purdue University.

3.2. Analysis Method

3.2.1. Volatility Analysis: Application of ARCH-GARCH Model

The purpose of applying ARCH-GARCH model in this research is to measure the volatility physical quantity from main food price variables. Volatility is reflected in residual variants which do not meet the assumptions of homoscedasticity (Firdaus, 2006).

It can be simply stated that volatility based on ARCH(m) model assumes that fluctuation data variants are affected by several m data from previous fluctuation. Later, ARCH model is degeneralized into GARCH model by Bollerslev (1986). GARCH (r,m) model assumes that fluctuation data variants are affected by several m data from previous fluctuation and some r data from previous volatility. The general form of GARCH(r,m) model:

$$h_t = K + \delta_1 h_{t-1} + \delta_2 h_{t-2} + \dots + \delta_r h_{t-r} + \alpha_1 \varepsilon^2_{t-1} + \alpha_2 \varepsilon^2_{t-2} + \dots + \alpha_m \varepsilon^2_{t-m} \dots\dots\dots (3.1)$$

with :

h_t	=	food price variable in time t/variant at time t^{th}
K	=	constant variant
ε^2_{t-m}	=	the ARCH-term /volatility at previous period
$\alpha_1, \alpha_2, \dots, \alpha_m$	=	estimated coefficient of order m

$\delta_1, \delta_2, \dots, \delta_r$ =   estimated coefficient of order r

h_{t-r} =   the GARCH-term/variant at previous period

To see the tendency of analyzed economic variable data, graph analysis is conducted in advance with plot time series. The phases in measuring volatility in ARCH-GARCH model are:

1) Identification Phase

2) Parameter Assumption Phase

3) Best Model Selection Phase

4) Model Sufficiency Examination Phase

5) Economic Variable Volatility Value Measurement Phase

3.2.2. Analysis on Factors That Influence Food Price Volatility: Application of *Dynamic Panel* and *Ordinary Least Square* (OLS) Models

In early phase, analysis is carried out to find out factors influencing world food price volatility by using OLS method. The basic model of OLS is:

$$VOLT_n = a_i + b_{2i}INFL + b_{3in}PI + b_{4in}STOCK + b_{5i}GDPW + b_{6in}QX + b_{7in}QM + b_{8in}PRODUCT + b_{9i}TEMPT$$

....(3.2)

With:

$VOLT_n$: Commodity price volatility of rice, maize, wheat , gold, and oil, measured from the result of ARCHGARCH

$INFL$: World inflation level

PI: commodity price level of rice, maize, wheat, gold, and oil

$STOCK$: World stock total for rice, maize, wheat, gold, and oil commodities.

$GDPW$: World GDP

QX: World export volume for rice, maize, wheat, gold, and oil commodities.

QM: World import volume for rice, maize, wheat, gold, and oil commodities.

$PRODUCT$: World production total for rice, maize, wheat, gold, and oil commodities.

TEMPT: World temperature level

To analyze the fundamental factors that influence food price volatility in every country and for each commodity, dynamic panel model is applied. The basic model of dynamic panel is:

$$P_{1,t}^n = \alpha_i + \beta P_{i,t-1}^n + \gamma C_{i,t-1}^n + \delta Z_{i,t-1}^n + \lambda D_{i,t-1}^n + \varepsilon_{i,t-1}^n \text{.........(3.3)}$$

Where the vector of commodity price (P) will interact with some components. The first component is vector autoregressive (P_{t-1}) that originated from the price itself at the previous period to get a description of price dynamic behavior. The second component is vector costs (C) which consists of variables connected with production cost, inventory cost, and other costs that endogenously affect the formation of commodity price in market. The next component is vector exogenous (Z), which, in this case, in the form of macro economic variables, such as government monetary deficit, the amount of money circulated, exchange rate, and income per capita.

To have a more comprehensive description with longer physical period and also to get the illustration on structural changes in the economy, dummy vector component (D) is also inserted in the above model. At the same time, symbol (n) describes each commodity studied, (i) is for region or countries in the temporary study, and (t) is period of data used in the study.

3.2.3. Analysis on Food Commodity Price Volatility Impact between East Asian Countries: *Global Trade Analysis Project* (GTAP) Application

Impact analysis can be conducted by using GTAP (Global Trade Analysis Project) model. GTAP model uses general balance model (CGE) and trade relations between some countries. As in CGE model, in GTAP, the correlation between economic agents and last demand components is explained. GTAP focuses on a whole correlation of the economy, so that it can be used to analyze policy implication in implementing policy planning.

GTAP model was developed in Purdue University, Department of Agricultural Economy and has taken form since 1993, and the development was led

and initiated by Prof. Thomas Hertel in a consortium. At least once a year, GTAP users all over the world have a meeting to present papers; discuss global issues, and data base. GTAP model is a static comparative model so the percentage changes resulted from the model reflect the changes that happen before and after the policy is made and implemented.

3.2.4. GTAP Aggregation

GTAP Data Base is applied to analyze the impact of food commodity price volatility between ASEAN+3 countries. GTAP data that will be used in this study is the latest version released by Centre for Global Trade Analysis, Purdue University. This data base consists of 113 countries and each country has 57 sectors.

For the purpose of this study, aggregation of 13 (thirteen) countries/regions, which consists of 10 ASEAN countries and 3 East Asian countries (China, Japan and Republic of Korea), is conducted.   The basis of choosing the aggregation of countries/regions is because the study is focused more on ASEAN+3; therefore, the election of countries is based more on 13 (thirteen) countries of ASEAN+3.

Table 3.1. Aggregation of Countries/Regions based on *Data Base GTAP*

No.	Code	Name	Remark
1	Indonesia	Indonesia	Indonesia
2	Malaysia	Malaysia	Malaysia
3	Philippines	Philippines	Philippines
4	Singapore	Singapore	Singapore
5	Thailand	Thailand	Thailand
6	Vietnam	Vietnam	Vietnam
7	Laos	Lao	Lao
8	Cambodia	Cambodia	Cambodia
9	Myanmar	Myanmar	Myanmar
10	China	China	China
11	Japan	Japan	Japan
12	South Korea	South Korea	Korea

| 13 | ROW | All other regions | Australia; New Zealand; Rest of Oceania; Hong Kong; Taiwan; Rest of East Asia; Rest of Southeast Asia; Bangladesh; India; Sri Lanka; Rest of South Asia; Canada; United States; Mexico; Rest of North America; Colombia; Peru; Venezuela; Rest of Andean Pact; Argentina; Brazil; Chile; Uruguay; Rest of South America; Central America; Rest of FTAA; Rest of the Caribbean; Austria; Belgium; Denmark; Finland; France; Germany; United Kingdom; Greece; Ireland; Italy; Luxembourg; Netherlands; Portugal; Spain; Sweden; Switzerland; Rest of EFTA; Rest of Europe; Albania; Bulgaria; Croatia; Cyprus; Czech Republic; Hungary; Malta; Poland; Romania; Slovakia; Slovenia; Estonia; Latvia; Lithuania; Russian Federation; Rest of Former Soviet Union; Turkey; Rest of Middle East; Morocco; Tunisia; Rest of North Africa; Botswana; South Africa; Rest of South African CU; Malawi; Mozambique; Tanzania; Zambia; Zimbabwe; Rest of SADC; Madagascar; Uganda; Rest of Sub-Saharan Africa. |

Sector choosing is based on agricultural commodities that experience price volatility for several periods. After choosing the sector aggregation and observing GTAP data base, ten sectors emerge. A more detailed sector aggregation and its relation to original GTAP data can be seen on Table 3.2.

Table 3.2. Sector Aggregation based on *GTAP Data Base*

No.	Code	Name	Remark
1.	Paddy	Paddy	Paddy rice.
2	Wheat	Wheat	Wheat.
3	Cereal Grains	Cereal	Cereal grains nec.
4	Sugarcane	Sugar Plant	Sugar cane, sugar beet.
5	Meat	Livestock's	Cattle,sheep,goats,horses.
6	Meat Prod	Meat Prod	Animal products nec; Raw milk.
7	Sugar	Sugar	Wool, silk-worm cocoons.
8	Crops nec	Crops nec	Crops nec
9	Crude Oil	Oil	Oil.
10	Other	Other	Vegetables, fruit, nuts; Oil seeds ; Forestry; Fishing; Plant-based fibers; Coal;; Gas, Minerals nec; Vegetable oils and fats; Beverages and tobacco products; Textiles; Leather products; Wood products; Ferrous metals; Metals nec; Metal products; Petroleum, coal products; Chemical,rubber,plastic prods; Electronic equipment; Electricity; Motor vehicles and parts; Transport equipment nec; Meat: cattle,sheep,goats,horse; Meat products nec; Dairy products; Processed rice; Food products nec; Wearing apparel; Paper products, publishing; Mineral products nec; Machinery and

			equipment nec; Manufactures nec; Gas manufacture, distribution; Water; Construction; Trade; Transport nec; Sea transport; Air transport; Communication; Financial services nec; Insurance; Business services nec; Recreation and other services; PubAdmin/Defense/Health/Educat; Dwellings.

3.3. Policy Simulation

Linkage modeling mechanism, to elaborate issues of commodity price volatility in East Asian region, is performed by simulating commodity prices volatility magnitude in countries in East Asian region that have already been estimated with ARCH-GARCH as the main shock towards price variables (market price) in GTAP model. The goal of this linkage mechanism is to find out the depth of commodity price volatility impact between East Asian countries to the existence of macro economy, sectoral, regional welfare, and fiscal performance.

Technically, some simulations that will be conducted are:

- The increase of commodity price volatility between East Asian countries

- The increase of commodity price volatility between East Asian countries and fiscal policy response that has been experienced by countries in East Asian region

- The increase of commodity price volatility between East Asian countries and trade policy response that has been undergone by countries in East Asian region

IV. RESULT AND DISCUSSION

4.1. Analysis of Price Volatility in the International Market

Volatility is a measure that is used to measure the changes and variance of the fluctuation towards the mean value of a time series data. Analysis of price volatility of some commodities, such as food crops, petroleum and minerals that occured in the international market will be discussed in this section.

4.1.1. Data Description

A number of major commodities traded in the world market became the object of this study. This study analyzed the prices of rice, soybean, corn and wheat, Crude Palm Oil (CPO), petroleum (oil), coal and gold. Based on Table 4.1, it is seen that the data in general have the values of kurtosis that are greater than or equal to three. Kurtosis value is an early indicator that the data analyzed have the heteroskedastisity (Firdaus, 2006). Meanwhile, the skewness coefficients of all variables have the values greater than zero. Skewness value that is greater than zero indicates that the economic variables analyzed have the distribution that is skewed to the right, implying that the data tend to accumulate at the low values and have a distribution skewed to the right.

Table 4.1. Descriptive Statistics of Commodities

Variable	Mean	Skewness	Kurtosis
World Price of Rice (US$/Ton)	312.51	2.01	8.52
World Price of Soybean (US$/Ton)	253.19	1.71	5.83
World Price of Corn (US$/Ton)	123.47	2.21	8.79
World Price of Wheat (US$/Ton)	166.35	2.07	8.02
World Price of CPO (US$/Ton)	451.33	1.59	5.78
World Price of Petroleum (Oil) (US$/Barrel)	32.38	1.86	5.89
World Price of Coal (US$/Ton)	46.86	2.45	9.33
World Price of Gold (US$/Toz)	474.55	2.30	8.00

Data Exploration of Food Crops' Prices

The growth of world price of rice is shown in Figure 4.1. In March 2008, the price began to increase sharply and reached its peak in April 2008 to May 2008. The price hike which was very significant in April-May 2008 was, among others, due to agricultural policies implemented by the Thai government. According to the Ministry of Domestic Trade of Thailand[4], at the end of the allied power of Thaksin in 2008, the government had a policy of rice-pledging scheme where the Thai government bought 5.4 million tons of rice from around 700,000 farmers. Due to this policy, the local price of rice in Thailand increased sharply and reached the highest record in the country. Another factor that also caused the price hike of rice in 2008 was the actions of India, China, and Vietnam which restricted or withheld the delivery or sale of rice to the international market.

Figure 4.1. Growth of World Price Of Rice in the Period of
January 1980 – August 2011

The significant increase in soybean price was indirectly affected by the global crisis of the United States which is one of the largest exporting countries of soybean in the world. The crisis in the United States affected the soybean supply from this country to the world market and thus affected the world price of soybean. In addition, there was also the influence of the bad weather that cannot be predicted

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[4] Source: Adik Thaksin Menang, Harga Beras Siap Terbang. 2011. [Artikel]. beritaberas.wordpress.com. [23 Oktober 2011, 21:07].

that ultimately disrupted the production of soybean in the world, for example the drought experienced by Argentina in May 2009[5].

Figure 4.2. Growth of World Price Of Soybean in the Period of
January 1980 – August 2011

The growth of world price of corn is shown in Figure 4.3. Corn price reached the highest price level in the middle of 2008. During the analysis period, the changes of corn price ranged from US $ 50-100/ton. Corn has been used for various purposes in which it made the world demand for corn continue to increase. Besides as a source of food for human consumption, corn is also used as one of the main materials in producing animal feed. Corn is also a raw material used to make bioethanol which is the substitution of oil fuel[6]. On the supply side, increase in production of corn is very difficult to do which is, among others, related to the influence of weather. Corn supply in the international market was difficult to increase because the largest corn exporting country, the United States, suffered from La Nina weather disturbances that caused the corn production declined.

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[5] Source: Perkembangan Harga periode 11-22 Mei 2009. 2011. [Artikel]. http://pphp.deptan.go.id. [23 Oktober 2011, 21:07].

[6] Source : Pergerakan Harga Jagung. 2011. [Artikel]. http://vibiznews.com. [26 Oktober 2011, 20:04].

**Figure 4.3. Growth of World Price Of Corn in the Period of
January 1980 – August 2011**

The growth of world price of wheat from January 1980 to August 2011 is shown in Figure 4.4. In the period of August to September 2007, wheat price has been increasing and reached its peak in March 2008. An increase in wheat price from the beginning of 2008 until August 2011 was due to the decline in production of wheat or wheat supply deficit in the world. One of the factors that caused the wheat deficit was the weather/climate change. Unpredictable weather tended to make the world production of wheat decreased.

Data Exploration of CPO Price

The growth of the world price of crude palm oil (CPO) from January 1980 to August 2011 can be seen in Figure 4.5. At the end of 2010 until the middle of 2011, CPO price reached the highest price level. Fluctuation in CPO price was, among others, due to the reduced dominance of soybean oil in the world. The dominance of soybean oil decreased along with the decreasing supply due to drought in Brazil and Argentina which are the largest supplier of soybean oil in the world.

Figure 4.4.   The Movement of World Price of CPO in the Period of January 1980-August 2011

The supply of soybean oil has been decreasing and at the same time the demand for soybean oil remained high, as the consequence, these had caused the soybean oil price increased. Increase in soybean oil price has pushed the increased demand on its commodity substitute. CPO is one of the commodities which is the substitute of soybean oil. This is because CPO is considered to have a fairly affordable price level compared to other substitute commodities[7]. Onother factor that is also considered to affect the increase in CPO price is the fluctuation of world price of oil. The increasing trend of world price of oil that occurred in the period of 2008-2011 tended to push the increase in CPO price.

Data Exploration of Prices of Mining Goods

The growth of world price of oil during the period of January 1980 to August 2011 is presented in Figure 4.6. The highest increase in world price of oil occurred in the period of March to August 2008. World price hike of oil was caused by the limited supply on one side and the increasing global demand on the other side. The movement of world price of oil that tended to increase was also occurred in the period of the end of 2010 until the beginning of 2011. The increase in oil price was stimulated by the increased world consumption. Report of the International Energy

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[7]Source : Analisis Kenaikan Harga CPO Dunia dan Dampaknya. 2011. [Artikel]. http://primakelola.co.id. [25 Oktober 2011, 20:08].

Agency (IEA) estimated that the level of world oil consumption in 2011 would reach 89.4 million barrels per day or an increase of 1.5 million barrels per day compared to 2010[8]. The movement of world oil price that tended to increase was also stimulated by the political crisis in Libya. This political crisis has pushed an increase in world oil price to US $ 115.97 / barrel[9].

Figure 4.5. Movement of Prices of Mining Goods in the Period of January 1980-August 2011

The growth of world price of coal during the period of January 1980 to August 2011 is shown in Figure 4.7. Coal price began to increase and reached its peak in the middle of 2008. The highest increase in coal price that occurred in 2008 was caused by the imbalance between demand and supply. The world coal producers did not increase the stock of coal although the coal demand has increased. Producers did not increase their stock due to various obstacles in the delivery of coal, such as the cost increase in coal shipment, cost increase in Freight On Board (FOB) and an increase in the thermal coal price.

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[8] http://www.antaranews.com/berita/254130/harga-minyak-indonesia-capai-117-dolar, 14 April 2011
[9] http://makassar.tribunnews.com/2011/03/07/harga-minyak-dunia-terus-melambung, 8 Maret 2011
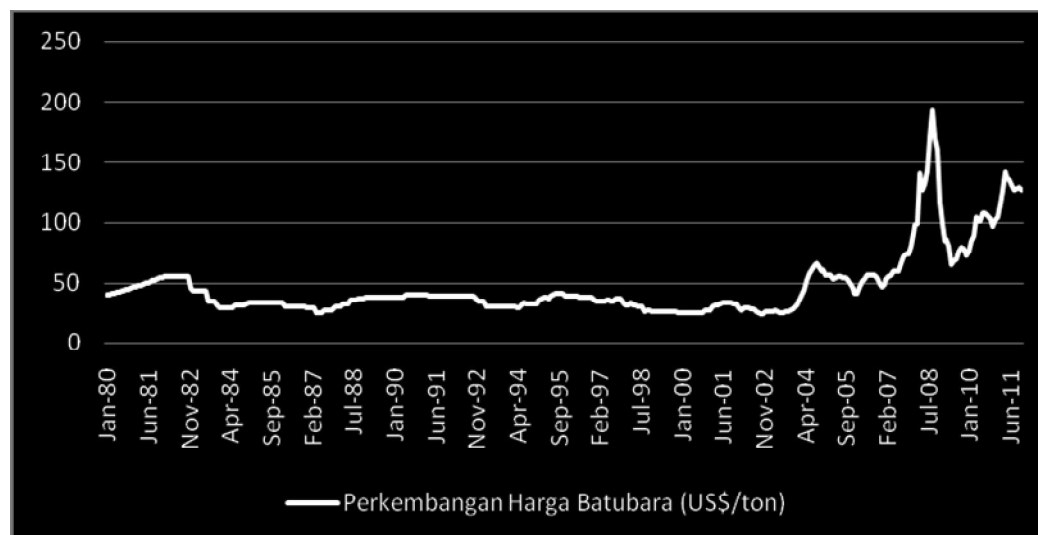
Figure 4.6. Movement of World Price Of Coal in the Period of January 1980-August 2011

The growth of the world price of gold during the period of January 1980 to July 2011 is shown in Figure 4.8. Entering December 2005, the price increased again and continued to increase until reaching its peak at the end of July 2011. The significant increase in world price of gold in the end analysis period was due to the increased demand for gold from the public. This increased demand for gold was due to the increased interest in gold. Gold is an investment which is considered fairly stable compared to the investments in the financial markets (such as stocks). The global crisis in 2008 has affected the financial markets to be unstable, leading to increase the demand for gold. This increased demand was an indicator of the interest change from investment in the financial markets to the gold market which pushed the increase in gold price.

Figure 4.7. Movement of World Price Of Gold in the Period of January 1980-August 2011

4.1.2. Volatility Analysis

Application of ARCH-GARCH model to measure price volatility and financial data has been conducted by several researchers such as Jordaan *et al* (2007) and Podobnik *et al* (2004). The study of volatility was also conducted by Balcom (2010) who analyzed the price volatility of agricultural products.

Determination of the mean model or ARIMA model (mean equation) was the first step and the next step was the identification and determination of ARCH-GARCH model which was performed if the resulted mean equation model or ARIMA model had the ARCH effects. After processing the data, the summary of the estimation results (the best ARIMA and ARCH-GARCH models) for each economic variable is shown in Table 4.2.

Table 4.2. The Best ARIMA and ARCH-GARCH Models

Variables	The Best ARIMA Model	The Existence of ARCH Effect	The Best ARCH-GARCH Model
World Price of Rice (US$/Ton)	ARIMA (0,1,1)	Exist	GARCH (1,1)
World Price of Soybean (US$/Ton)	ARIMA (1,1,0)	None	-
World Price of Corn (US$/Ton)	ARIMA (1,1,3)	Exist	GARCH (1,1)
World Price of Wheat (US$/Ton)	ARIMA (1,1,1)	Exist	GARCH (1,1)
World Price of CPO (US$/Ton)	ARIMA (0,1,1)	Exist	GARCH (1,1)
World Price of Petroleum (Oil) (US$/Barrel)	ARIMA (1,1,2)	Exist	ARCH (3)
World Price of Coal (US$/Ton)	ARIMA (1,1,2)	Exist	GARCH (1,1)
World Price of Gold (US$/Toz)	ARIMA (0,1,1)	Exist	GARCH (1,1)

Based on the ARCH-GARCH model, the volatility of each economic variable which was analyzed can be seen. In the next section, the volatility of each price variable will be explained and also the measure of volatility that will be used as a shock in the CGE model.

Volatility of economic variables that vary over time (time varying) is shown in the graphical form. Volatility values which vary over time were the variables of rice price, corn price, wheat price, CPO price, oil price, coal prices, and gold price at the world level because these price variables were proven to have ARCH effects. The variable of world price of soybean was not proven to have ARCH effects, so it can be concluded that the world price of soybean was not volatile. The volatile measurement of the variable of world price of soybean was shown by its standard error value that was equal to 16.26. Joordaan et al (2007) revealed that in case of no detection of the ARCH effect, the application of ARCH-GARCH was not necessary to be conducted and the measurement of the volatility was the standard error from the ARIMA process.

a.   Price Volatility of Food Crops

Figure 4.9 shows the volatility of world price of rice from January 1980 to August 2011. The volatility of world price of rice reached its highest peak in May 2008 that was more than six times of its standard deviation. The increase in the volatility value of world price of rice in 2008 was due to the increase in world price of rice which was also significant in that period. The high volatility value of world price of rice continued to occur during the period of June 2008 to November 2008.
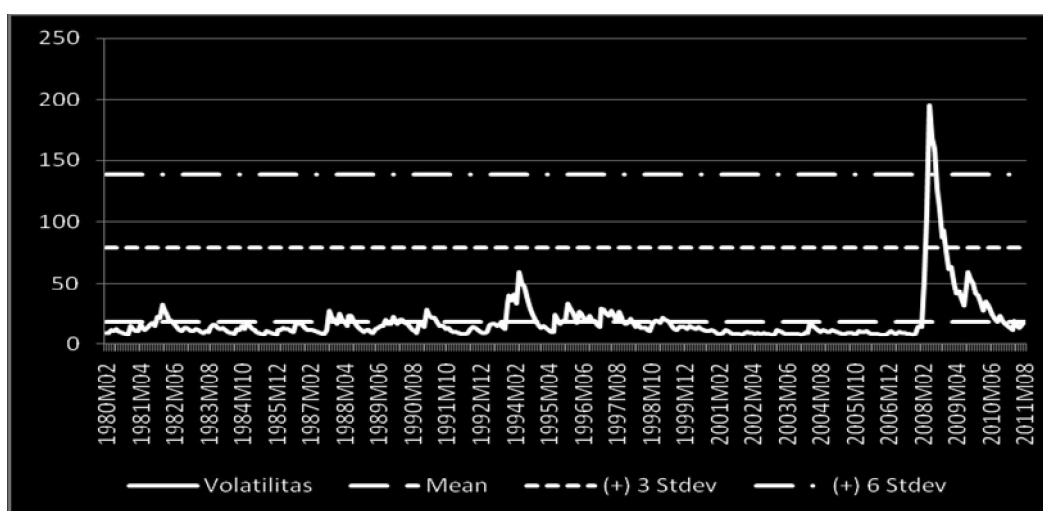
Figure 4.8. World Price Volatility of of Rice

The volatility of world price of corn is presented in Figure 4.10. The volatility of corn price during the period of 1980 to early 1996 tended to vary on the mean value of its volatility. The volatility of corn price reached the highest volatility value in November 2008, reaching more than four times of its standard deviation. Meanwhile, in the next periods, the volatility of world price of corn has decreased but the volatility value was still quite high, reaching two times of its standard deviation.
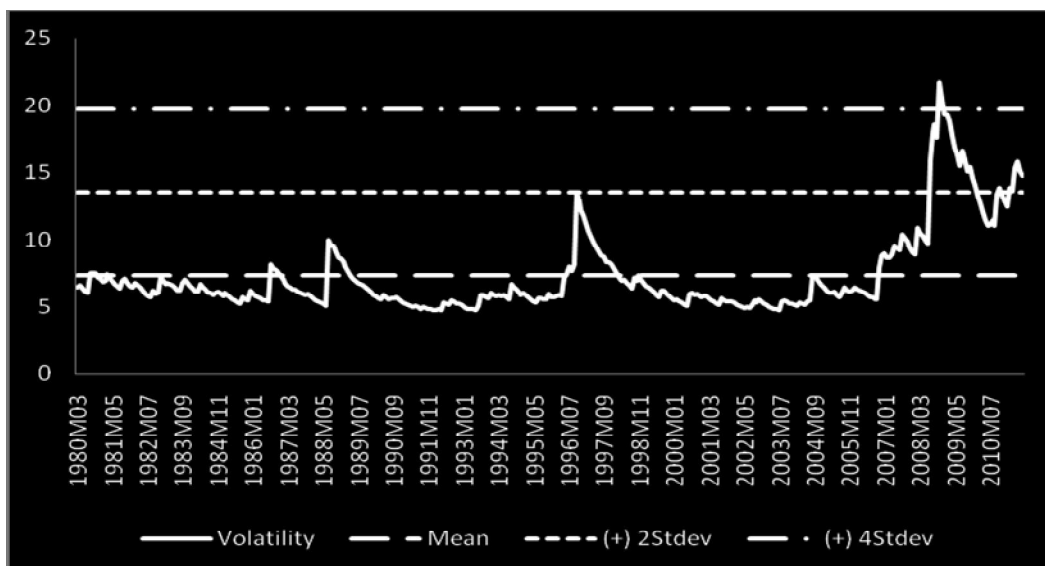
Figure 4.9. World PriceVolatility of Corn

The volatility of world price of wheat during the analysis period is shown in Figure 4.11. In 2008 the volatility of wheat price reached its peak up to more than three times of its standard deviation. The increase in volatility that was quite high in 2008 was in line with the increase in world price of wheat during that period.
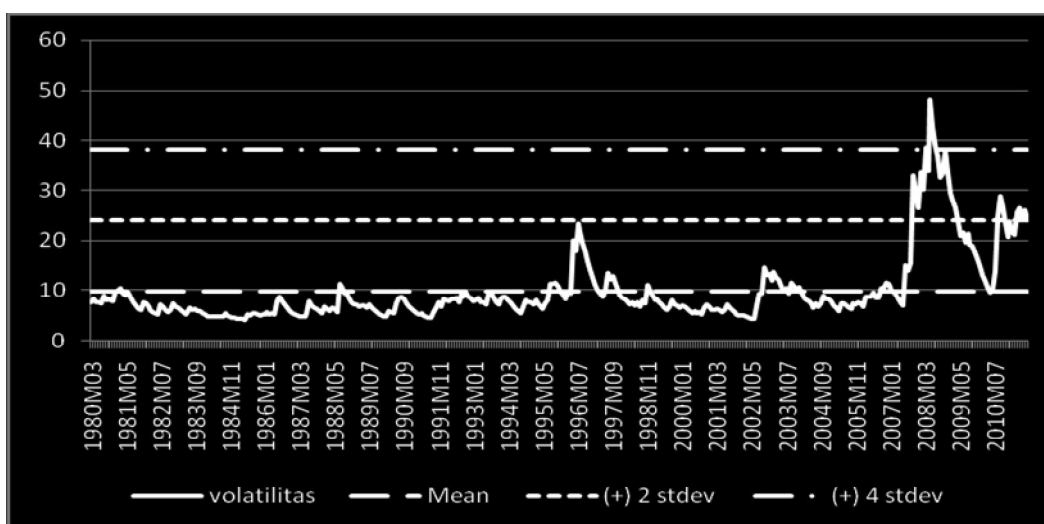
Figure 4.10. World Price Volatility of Wheat

Based on the explanation mentioned above, the volatility of world prices of food commodities showed a significant increase in entering year 2008. A number of factors that occurred in that period had caused the increase in volatility of food

prices. These factors are associated with the growth of supply, demand, and climate of each commodity in the world market.

The increase in world price of oil was also another factor that was predicted to push the increased demand for some food commodities. The increase in world price of oil gave an impact on increasing the prices of commodities, including food prices. World prices of food tended to increase due to the increasing production cost and transportation cost incurred as well as the substitution of fuel from bio-fuel resources. The increase in world price of oil that was caused by the crisis in the Middle East and North Africa had pushed the increase in food prices by 36 percent higher than the food prices in 2010[10].

Specifically, the results showed that the volatility of food prices reached their peaks more than four times of their standard deviations, except the price of rice that reached more than six times of its standard deviation. When we compared them to the median of the conditional standard deviation for each commodity such as rice (13.53), corn (6.15), and wheat (7.53) during the analysis period (long-run volatility), it showed that the volatility of rice price was the most volatile, followed by wheat and corn prices.

The median of conditional standard deviation on each year from 1980 to 2011 (short-run volatility) is shown in Figure 4.12. Based on this figure, it appeared that the median of conditional standard deviation of rice, corn and wheat showed the substantial variation. These median variations indicated the price risks of these foods. Rice was a commodity that had a relatively higher price risk compared to wheat and corn.

During the period of analysis, the median of the conditional standard deviation of the variable of rice price tended to be higher than the variables of wheat and corn prices. In addition, the median fluctuation of rice price was also relatively greater than the variables of corn and wheat prices. The fluctuation of the conditional median of the three variables reached their highest levels in the period of 2008.

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[10]http://bisniskeuangan.kompas.com/read/2011/04/17/13425880/Bank-Dunia-Harga-Pangan-Membahayakan, 17 April 2011
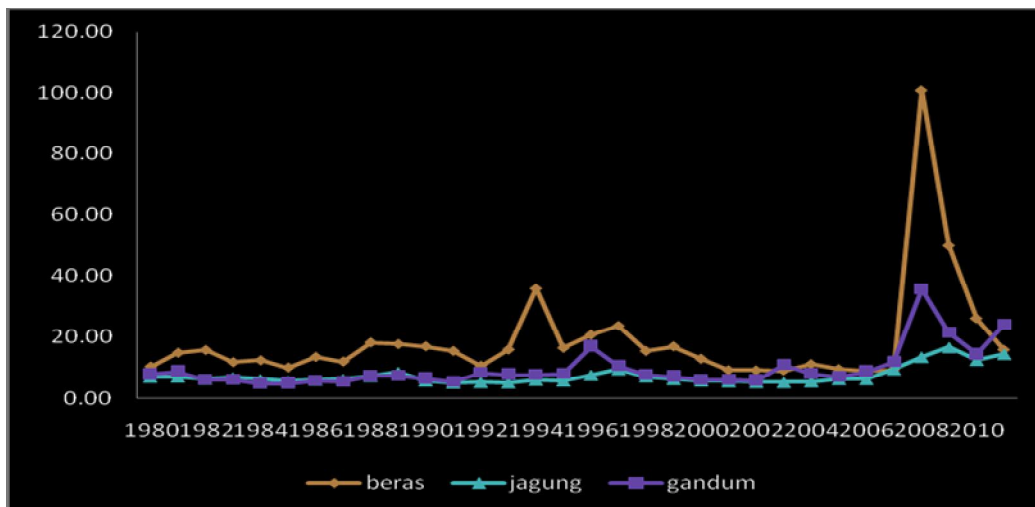
Figure 4.11. Median of the Conditional Standard Deviation

b.   Price Volatility of CPO

Price volatility of CPO is shown in Figure 4.13. The highest volatility of CPO price, more than four times of its standard deviation, occurred in the period of September 2008 to February 2009. This increase in volatility occurred along with the increase in CPO price.
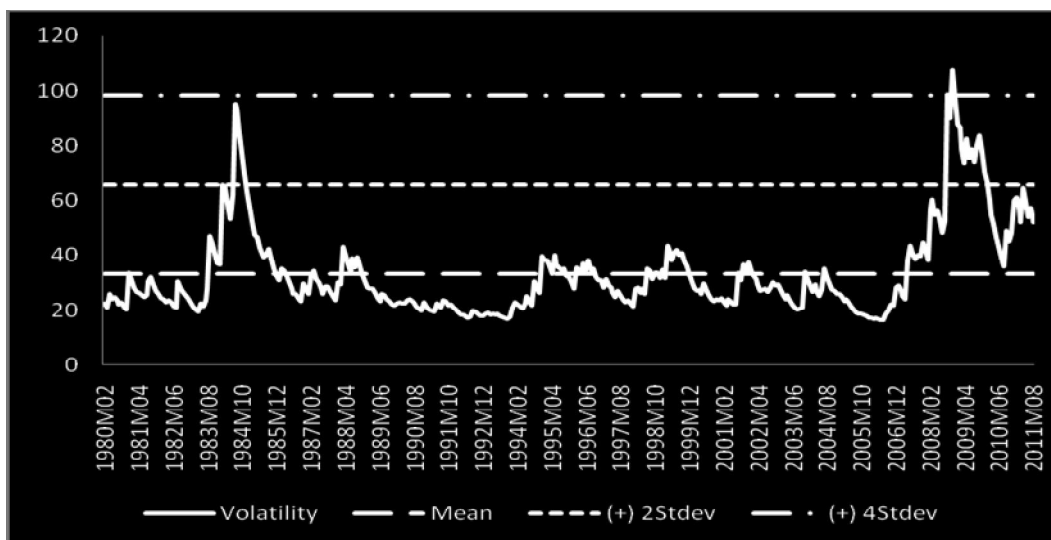
Figure 4.12. World Price Volatility of CPO

c.   Price Volatility of Oil

The volatility of world price of oil can be seen in Figure 4.14. The increase in volatility continued to occur by more than six times of its standard deviation in November 2008. This is due to the increase in demand that could not be met by

supply, so there was a shortage of oil. This oil shortage has pushed the increase of world price of oil.
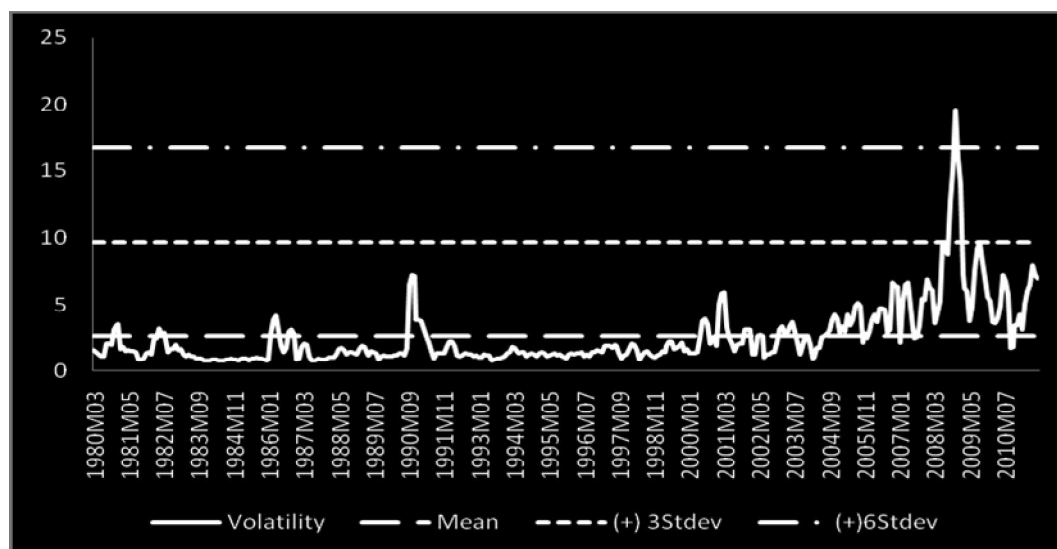
Figure 4.13. World Price Volatility of Oil

d.   Price Volatility of Mining Goods

Volatility of coal price began to increase in March 2008 to mid 2009 (Figure 4.15). The increase in volatility continued until it reached the limit of six times of its standard deviation in November 2008. This volatility value that was relatively high in the mid 2008 was due to the imbalance between demand and supply.
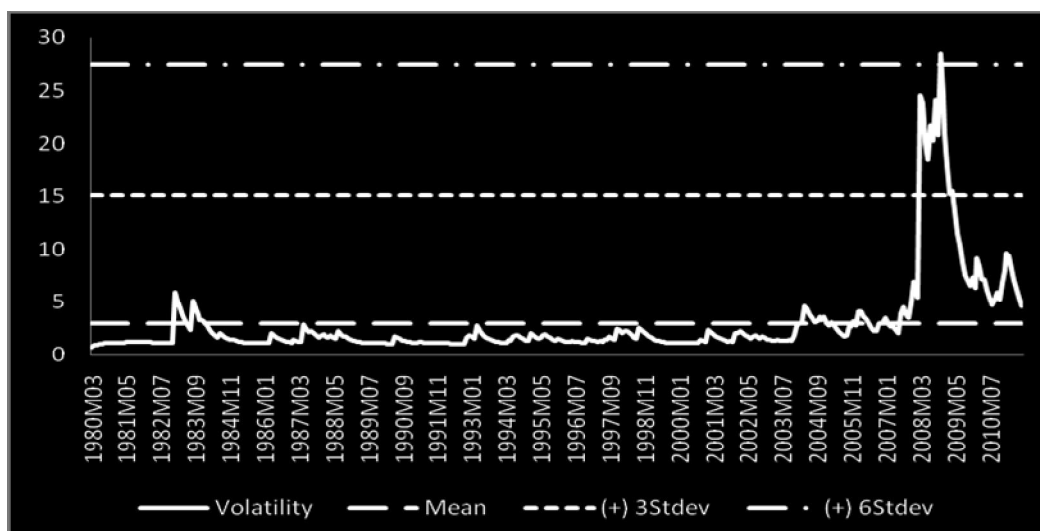
Figure 4.14. World Price Volatility of Coal

The growth of world price volatility of gold from January 1980 to July 2011 is shown in Figure 4.16. The increase in volatility of world price of gold reached its peak in September 2008 where the volatility value reached more than three times of its standard deviation. The significant increase in volatility at the end of the period of analysis (2008-2011) was due to the significant increase in world price of gold.
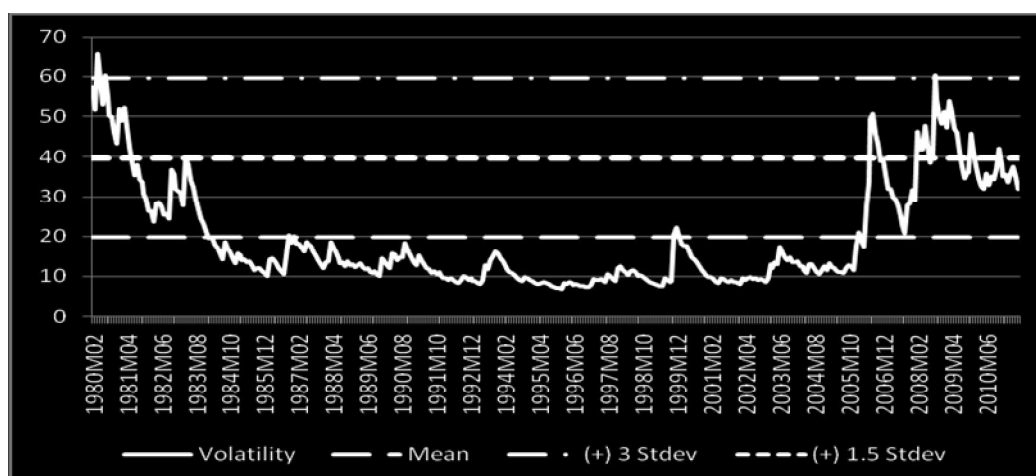
Figure 4.15. World Price Volatility of Gold

Based on the measurement of volatility that occured in a number of economic variables that was analyzed, it could be determined the measurement of shock that is used in CGE model. The determination of shock measure in the percentage change was obtained based on the value of coefficient variation of the

volatility (conditional standard deviation) for each year. The coefficient of variation that will be used for CGE simulation is the coefficient of variation in the period of 2000 to 2011. The shock value for each variable is shown in Table 4.3.

Table 4.3. Value of Shock Volatility

Year	Rice	Corn	Wheat	CPO	Oil	Coal	Gold
2000	11.06	6.05	11.39	8.59	40.72	8.63	21.52
2001	11.59	3.47	10.12	22.08	48.13	22.53	5.40
2002	6.45	4.26	49.68	7.82	39.41	11.51	5.62
2003	13.54	4.90	11.50	17.53	24.10	10.04	13.81
2004	23.07	16.04	11.43	9.80	43.39	15.71	8.10
2005	12.18	3.37	8.25	13.38	27.86	19.97	6.20
2006	10.34	15.97	15.78	18.55	29.33	19.94	37.83
2007	16.52	5.82	59.05*	20.76	38.19	36.81	14.54
2008	56.64*	33.22*	13.86	34.63*	52.45*	35.53	17.77
2009	20.46	10.01	18.84	6.75	35.92	40.41*	15.10*
2010	26.65	9.18	40.20	17.93	39.78	20.60	8.96
2011	16.18	8.49	8.05	7.81	27.53	24.91	5.21

Note: * indicates the highest percentage change.

4.2. Factors Affecting Price Volatility of Commodities

The second objective of this study is to determine the factors that affect the volatility of rice, corn, wheat, gold and oil prices. The data used is the volatility of these commodities prices in the international markets (world). The analytical method used is the Ordinary Least Square (OLS) which is the initial stage of analysis in order to determine the factors affecting price volatility.

Factors Affecting Price Volatility of Rice

The result showed that the significant factors affected the world price volatility of rice were world GDP, inflation rate, price in the commodity market, and the volume of import that are significant at the 5% level. The high price in commodity market will lead to increase the price volatility of rice in the

international market. This condition indicates that the activity of speculation and hedging in the commodity market will affect the volatility of rice price. The equation of the factors that affected the volatility of rice price can be seen in equation 1.

VOLTRICE = 0.34 + 0.001INFL + 0.002PI + 0.005STOCK – 0.02GDPW –
       [7.79]*   [2.49]*   [2.92]*   [1.68]***   [-2.2]*
       0.001QM – 0.01PRODUCT
       [-2.47]*   [-1.43]***..(4.1)

R-squared   : 0.49
Adjusted R-squared   : 0.35
Notes: *) denotes significant at the 5% level.
      **) denotes significant at the 10% level.
      ***) denotes significant at the 20% level.
      [ ] *t-statistic*

Commodity in the commodity exchanges has different characteristics from other financial assets, because commodity is always produced and consumed continously, so the classification of interesting asset for the commodity (in the scope of production and consumption) does not have to match each other in the same period as the commodity can be stored as inventory. Commodity market is a dynamic market, because the price will always change associated with the influence that reflected by the changes in supply and demand. The success in future market hedging depends on the ability to anticipate and analyze the basis of relation (future price - cash price), the identification and understanding of the mechanisms that influence this relationship will help the market players in determining the marketing strategy and production. A better understanding of the basis of relation would help the decision-makers (policy makers) in evaluating the market performance by identifying the movement of price that is not worthy / needed.

The variables of world GDP, the volume of world rice production, and the increased import volume will cause the decrease of rice price volatility in the international market.

Factors Affecting Price Volatility of Corn

Empirically, food commodities' prices (volatile foods) have an important role in controlling inflation. Significant portion of their contribution to inflation and quick response to various shocks make them feasible to serve as the leading indicators of inflation. Consumption demand of food commodities that had become

basic needs tend to be stable, so the price volatility is more influenced by the shock on the supply side such as the harvest cycle, disasters, and distribution (including import volume, the volume of production), as well as the price in commodity market. The latter variable is an important factor in influencing the volatility of commodity price, including corn, where the issue on this matter had begun in 2005 (FAO, 2006).

$$VOLTCORN = -3.01 - 0.001INFL + 0.003PI - 0.0002STOCK - 0.03GDPW -$$

[-1.71]***   [2.40]*   [4.45]*   [-0.38]   [-1.38]*

$$-3.16E\text{-}20QX + 0.53PRODUCT - 0.004TEMPT$$

[-2.73]*   [3.26]***   [-3.23]*..........................(4.2)

R-squared   : 0.56
Adjusted R-squared   : 0.42
Notes: *) denotes significant at the 5% level.
     **) denotes significant at the 10% level.
     ***) denotes significant at the 20% level.
     [ ] *t-statistic*

Corn price in the commodity market (commodity future market), the level of world GDP, the volume of exports, inflation rate, and temperature significantly affected the volatility of corn price. The increases in inflation rate, world GDP, the export volume, and temperature will reduce the world price volatility of corn. Meanwhile, the increase in price in commodity market will increase the price volatility of corn during the study period.

Temperature that is one of the indicators of climate change will affect the production of corn where corn requires the optimum temperature between $23{^0}C$ - $27{^0}C$. In the lower temperature condition than that condition, the corn seed will rot and the temperature that is too hot will cause damage to the leaves and flowers pollination. If not in the optimum temperature conditions, the production will be disrupted. This production shock (supply shock) will affect the stability of corn price. This condition is supported by the results of the analysis that indicate that the increased production will increase the world price volatility of corn and the lack of stock will also increase the price volatility of corn.

Factors Affecting Price Volatility of Wheat

The increase in world price volatility of wheat is influenced by the decline in world GDP, the increases in the volume of production and price in the commodity market. The increase in price volatility of wheat as the world food commodities besides rice, corn, and soybeans will cause uncertainty, and uncertainty increases

the risk. This will greatly affect the decline in production motivation. The impact, of course, will greatly disrupt the food security of each country and lead to food insecurity globally.

$$VOLTWHEAT = 16.03 - 0.06INFL + 0.01PI + 0.102STOCK - 2.06GDPW -$$
$$[6.52]* \quad [-1.71]*** \quad [1.72]** \quad [1.08] \quad [-2.70]*$$
$$-0.05QM + 0.43PRODUCT$$
$$[-0.67] \quad [2.01]** ....(4.3)$$

R-squared   : 0.45
Adjusted R-squared   : 0.31
Notes: *) denotes significant at the 5% level.
      **) denotes significant at the 10% level.
      ***) denotes significant at the 20% level.
      [ ] *t-statistic*

Wheat price in commodity market (the future price of wheat) also affects the world price volatility of wheat. The increasing future price of wheat will disrupt the availability of food and will motivate the speculative importers to increase their purchasing. This is done in order to cope with food inflation if the dry season that disrupts the global harvest occured. The contract price of wheat used is the the contract price at the Chicago exchanges.

At this present time, there is a tendency of the increased value of the investment (speculation) of food commodities in the global commodity market, compared to the global financial market that is under uncertainty. Although it still needs to be examined in the long time period, but at the present time, there is a focus shift to the global commodity trade. The slowing down in the global financial markets or the major stock markets in the world, as well as the weakening U.S. dollar exchange rate against other currencies in the world, also influence the decision of the investors who started to have interest in the global commodity markets.

Factors Affecting the Price Volatility of Gold

Gold is a commodity that is widely used as a means of investment. Although gold price tends to rise, the volatility of gold price also tends to increase. One of the factors that affects the increasing volatility of gold price is the declines in interest rates and the volume of gold production.

VOLTGOLD = 1159 + 0.05INFL + 2.42E-18GDPW – 4.44INTEREST
        [4.39]* [0.59]   [1.11]   [-2.96]*
        +0.42QM-551.6PRODUCT-9.96E-18QX
        [0.74]   [-4.35]*   [-0.70] ....(4.4)

R-squared   : 0.4
Adjusted R-squared   : 0.36
Notes: *) denotes significant at the 5% level.
     **) denotes significant at the 10% level.
     ***) denotes significant at the 20% level.
     [ ] *t-statistic*

Factors Affecting the Price Volatility of Oil

The increase in the world oil production will increase the world price volatility of oil. Also the increase in future price of oil in the commodity market will lead to the increase in oil price volatility. The occurrence of shocks to the supply of oil in the world market is the factor of unstability of world oil price and eventually will increase the volatility of world oil price. The problem of supply shocks in world oil prices is mainly due to the instability of world oil supply and demand. In addition, price speculation by oil companies, especially U.S. oil companies and alternative energy development plans by the western countries had caused this to happen.

VOLTPETRO = -11.3 + 0.22INTEREST + 0.13PRODUCT + 0.005INFL
        [-1.77]   [1.15]   [1.91]***   [0.79]
        + 3.66E-05PI ....(4.5)
        [6.43]*

R-squared   : 0.82
Adjusted R-squared   : 0.80
Notes: *) denotes significant at the 5% level.
     **) denotes significant at the 10% level.
     ***) denotes significant at the 20% level.
     [ ] *t-statistic*

4.3. The Impact Of International Commodity Price Volatility On Asean *Plus Three Economies*

The third objective of this study was to determine the **impact of international commodity price volatility to the ASEAN *Plus Three* Economies.**

The analytical method used is the *Global Trade Anal* ysis Project (GTAP) with modification of *standard closure* because international prices originally classified as an endogenous variable in the *default model.* The amount of *shock* that is used in the model is verified as *coefficient of variance* from the average volatility of commodity prices in international markets during the period 1980-2011. It was originally the output of ARCH-GARCH Model. The next discussion regarding the substance will be divided into three sub sections namely: (1) The Impact of International Rice Price Volatility on ASEAN *Plus Three Economies,* (2) The Impact of International Crude Oil Price Volatility on ASEAN *Plus Three Economies,* and (3) The Impact of International Commodity Price Volatility on ASEAN *Plus Three Economies*

4.3.1. The Impact of International Rice Price Volatility on ASEAN *Plus Three Economies*

Increase in international rice prices has historically predicted. The two main causes of high spike in international rice prices during 2005-2008 *commodity boom* are trade restrictions *(*trade ban*)* and buying behavior which in turn is associated with a pattern of precautionary motive and market psychology. Exporting countries restrict exports to protect domestic consumers even the majority of importing countries seek to guarantee supplies at almost any price (Aldaz Carroll, 2008).

Trade restrictions and *tender* behavior in the stock market commodities triggered by the behavior of the second largest rice exporters (India) who made the decision to restrict exports in October 2007. Trade restrictions were initially done through the establishment of minimum export price that is far above the prevailing market price. This causes the acceleration of international rice prices, thus put pressure on other exporting countries. Domino effect ensued with the international rice prices, food inflation reached alarming levels that it becomes a threat to the welfare of the community. The series of actions put pressure on other rice exporters to take preventive measures of trade policy to secure access to supplies of rice.

The response of several major rice exporters related to the international rice prices have illustrated in Figure 1. First, Vietnam as the world largest rice exporter stopped the export in early 2008. In addition, India banned export of non-basmati rice on 1 April 2008. Other rice exporters, including Egypt, Pakistan, China, Cambodia, and Brazil were also adopting measures to limit rice exports in the short

term. Trade restrictions led to a significant increase in rice prices alongside with *tender* in the international market and hoarding behavior

Export restrictions and price increases triggered by Philipines panic buying as the world's largest importer. Filipinos make large purchases and accepted *the tender* offer price earlier in the month of March and April (Figure 6.1). Trading restrictions, *tender,* and the hoarding behavior gradually led to a very large price shocks in 2002-2007. Every country is maintaining its own interests to take corrective measures and anticipatory actions related with food security. Behavior of individual countries can be economically justified, but collectively these measures have backfired for the international rice market. By triggering a global panic, the actions of each country that are intended to prevent domestic rice prices from rising, actually has caused domestic rice prices rose even faster. This event provides a clearer interpretation that no single country can solve the global rice crisis on an individual basis.
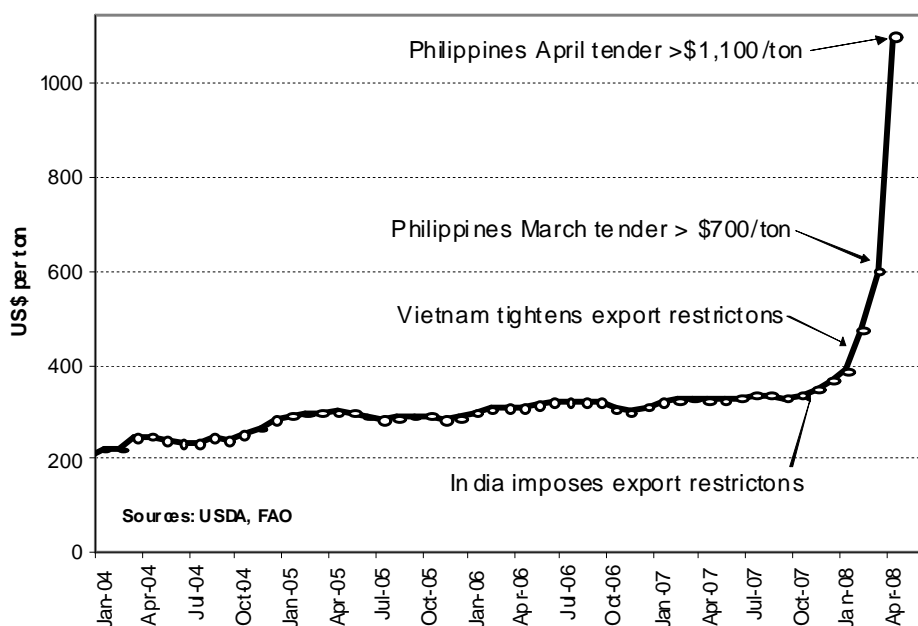
Source Aldaz-Carroll *et al.* (2008)

Figure 4.16. Market Behaviour and The Development of International Rice Price, 2004–2008

Volatility in international commodity prices affects the economic indicators in many countries, one of which is macro-economic indicators. The impact of

commodity price volatility of rice to some macroeconomic variables in ASEAN and East Asia (ASEAN *plus Three)* can be seen in Table 4.4. The macroeconomic impacts will be focused on trade balance, the level of welfare, real GDP, Terms of Trade, Inflation, investment, government expenditure and household consumption.

The volatility of international rice price has a substantial impact on trade balance in all the countries involved. Table 4.4 shows that the balance of trade of all countries are increased (Malaysia and Singapore are excluded). The highest increase occurred in Thailand, which amounted to U.S. $ 3,129.71 million. Indonesia enjoyed a surplus of U.S. $ 557.38 million but less than Japan, Korea and Vietnam. The increase in commodity prices in international markets is actually incentive for producers to increase production. Adequate supply response will cause increasing exports. But the trade balance surplus that occurred is dominantly caused by the increase in exports of non-food commodities (Oil, gold, coal) and other commodities.

Table 4.4. The Comparison of Trade Balance Performance (Million USD)

Countries	Trade Balance (Pre Simulation)	Trade Balance (Post Simulation)
Indonesia	-4,959.60	557.38
Malaysia	-4,743.90	-13.27
Filipina	-1,543.80	192.09
Singapura	-3,950.80	-29.18
Thailand	-5,824.90	3,129.71
Cina	-18,840.20	247.15
Jepang	-23,105.50	805.82
Korea	-12,090.10	768.61

Source: Author's Simulations

The dilemma which arise from the increased volatility of international rice price for Indonesia is how maintaining the condition of food availability and food security. Increase in rice prices in international market is transmitted to the price of rice in the domestic market which will affect the incentives for rice export, availability of rice in the domestic market and the purchasing power of Indonesian people.

Indonesia, China, Japan, and Korea showed a positive response on the variable exports due to price incentives. Indonesian *trade balance* shows the smallest response. The low technological level in Indonesian agricultural related

sectors are major obstacles to achieve these opportunities. Compared to other Asian countries, like Thailand and China in government spending Indonesia for the development of *research & development* for the agricultural sector is still small (Tambunan 2009).

Volatility of international rice prices effect a decrease in the welfare of all member states of ASEAN+3 Countries referred to the decreased values of *equivalent variation* (EV)*.* The largest welfare decline occurred in Japan in the amount of U.S. $ -3812.42 million. While Singapore experience a slight decrease in the level of welfare in the amount of U.S. $ 17.99 million. The reduction in welfare experienced by Indonesia is approximately U.S. $ 1295.73 million, which is constituted as the largest welfare decline among ASEAN countries. Decline in welfare is understandable because of the declining real income.

The impact of rice price volatility generally led to decrease the real GDP in each (Table 6.2). The largest decrease occurred for Myanmar and Laos. The opposite occurred in Singapore. It is because the Singapore's economy is rely on the financial and services sectors. Indonesia's GDP is declined by 0.5 percent. This real decline in GDP in most countries is due to declining performance of its constituent components. Although there was an increase in the trade balance, but this is not enough to boost the GDP performance, considering the fact that household consumption, government spending and investment in general has decreased.

International rice price volatility also affects the variable Term of Trade in each country. Variable *Term of Trade* (TOT) reflects the relative price of exported goods to the price of imported goods of a country*.* In the case of international rice price volatility, China, Cambodia, Myanmar and the Philippines experienced increasement of TOT while others decreased.   The largest decline occurred in Laos by 0.83 percent; while Cambodia and China had the largest TOT's increasement respectively. Indonesia's TOT is declined by 0.03 per cent. This means that the volatility of the rice price has increased TOT, therefore it is declining competitiveness.

The volatility in rice prices will increase the GDP deflator or the inflation rate in the ASEAN Plus Three, albeit relatively small. Inflation in Indonesia increased by (0.02 percent), Singapore (0.001 percent), Malaysia (0.05 percent), the Philippines (0.03 percent). For China, Japan and Rep. of Korea increased respectively by 0.07 percent, 0.01 percent, and 0.003 percent. Increasing the GDP deflator in the ASEAN countries, including Indonesia, partly because the high level of

import dependency on a few commodities, especially from ASEAN countries and East Asia, so that affects the general price index. In genera,l this means that there is a mutual dependence of trade amongst the members of ASEAN *Plus Three*.

Changes in rice prices in international markets have an enormous impact on domestic prices in the countries *of ASEAN Plus Three,* because the domestic prices *of ASEAN Plus Three* is integrate with the international commodity markets. Therefore, fluctuation of commodity prices will consequence a crucial impact, given the commodity rice is a strategic commodity for the economy and considered as *East Asian 'Staple Food.* As an illustration, rice represents a large portion or share of the Indonesian economy from the production side (25% of GDP in 2007) and reaching 15% (agro and mining stocks) of the total stock market capitalization of Indonesia in January 2009 (World Bank 2009).

Decline in real GDP of Indonesia and other ASEAN *Plus Three* is mainly due to a decrease in investment, government spending and household consumption. Investment in Indonesia is much smaller than that occurred in East Asia and ASEAN countries (Malaysia and Singapore). This indicates that the investment attraction in Indonesia is weak when compared with countries in East Asia, Malaysia and Singapore. This is confirmed by data in the *Global Competitiveness Index* of the World Economic Forum (2010), where Indonesia ranked far below Malaysia and Thailand. Indonesia ranked 44, while Malaysia ranked 26.

Based on the simulation results shown in Table 6.2, Indonesia declined relatively small investment that is equal to 1.55 percent, while Thailand experienced the largest decrease reaches 8.27 percent and Vietnam at 5.41 percent. Increase in investment is expected to expand employment opportunities and increase expertise and skills so that in the long run output can be increased and the efficiency can be achieved.

Government spending decreased in the presence of the international rice price volatility. This is evidenced by the existence of a negative indicator of government expenditures experienced by all countries except China. Government spending is the largest decline occurred in the country of Laos (3.15 percent), followed by Myanmar and Vietnam, respectively by 2.85 percent and 1.5 percent.

Table 4.5. The Impact of International Rice Price Volatility to ASEAN *Plus Three* Macroeconomic Performances

Countries	Balance of Trade (U.S. $ million)	Welfare (U.S. $ million)	Real GDP (%)	TOT (%)	Inflation (%)	Investment (%)	Government Spending (%)	Household Consumption (%)
China	247.15	-3,729.95	-0.23	0.03	0.07	-0.24	0.03	0.03
Japan	805.82	-3,812.42	-0.08	-0.01	0.01	-0.12	-0.19	-0.18
Korea	768.61	-1,473.34	-0.21	-0.02	0.003	-0.61	-0.09	-0.09
Cambodia	35.27	-49.3	-1.03	0.03	0.08	-5.3	-0.24	-0.23
Indonesia	557.38	-1,295.73	-0.5	-0.03	0.02	-1.55	-1.13	-1.09
Lao	80.83	-71.82	-2.82	-0.83	0.67	-12.89	-0.53	-0.52
Myanmar	52.19	-255.76	-3.47	0.38	1.01	-5.03	-3.15	-2.51
Malaysia	-13.27	-76.72	-0.06	-0.01	0.05	-0.06	-2.85	-2.51
Philippines	192.09	-366.43	-0.43	0.002	0.03	-1.62	-0.05	0.03
Singapore	-29.18	-17.99	0.0001	-0.01	0.001	0.08	-0.46	-0.46
Thailand	3,129.71	-1,266.25	-0.67	-0.17	-0.27	-8.27	-0.01	0
Vietnam	745.19	-636.94	-1.42	-0.06	0.31	-5.41	-1.23	-1.22

Source: Author's Simulations

Volatility of international rice prices have far-reaching consequences on the economy, particularly for consumption *(consumption effect).* This means that the volatility of rice prices affect the inflation rate and make the community can consume in smaller amounts. In other words, the real income (ie income is measured by how many items can be purchased by the amount of money) decreased with an increase in prices. The simulation results show that the consumption Indonesia declined by 1.09 percent. The largest drop on consumption experienced Malaysia and Myanmar amounted to 2.51 percent. All information on the impact of the international rice price volatility on consumption in each country.

4.3.2. The Impact of International Rice Price Volatility on Sectoral Output of ASEAN *Plus Three Economies*

Volatility of international rice prices cause changes in sectoral economic performance, one of which is a change of sectoral output as shown in Table 6.3. The rice output will be vary in each country. China, Japan, Indonesia, Philippines and Singapore have increased rice output. While other countries experienced decline. The output of rice in Indonesia is only increased by 0.87 percent. Indonesia's rice supply response to an increase in international rice prices is very slow.

International commodity prices should be an incentive for producers to increase production. That is why the influence of the international rice price volatility by 23.42 percent should logically amplify the output. Despite of this, rice-producing countries reduced their output to obtain greater benefits from the increase in rice prices. Thailand and Vietnam and even reduce its exports to international market prices for rice remained high (Table 6.5). Increase in rice output in Singapore is quite large compared with other ASEAN Plus Three (16.16 per cent) although the baseline data is very small in terms of rice production.

Table 4.6. The Impact of International Rice Price Volatility on Sectoral Output of ASEAN *Plus Three Economies*

Sector	China	Japan	Korea	Cam Bodia	Indo nesia	Laos	Myan mar	Malay sia	Fili pina	Singa pore	Thai land	Viet nam
Coal	-0.11	-0.07	0	0.04	0.34	-0.6	1.22	-0.08	-0.01	-0.14	0.14	0.17
Maize	-0.15	-0.82	-3.59	-1.19	-0.65	-2.64	-2.88	-0.65	-0.37	0.17	-1.76	-2.5
Crude_Oil	0	-0.02	-0.19	0.4	0.37	0.04	-3.63	-0.03	-0.02	-0.05	0.4	0.86
CPO	-0.22	-0.06	-0.18	0.46	1.14	-2.97	3.57	-0.28	0.36	0.18	0.73	2.04
PaddyRice	*1.24*	*0.19*	*-1.48*	*0*	*0.87*	*-4.04*	*-3.69*	*-2.14*	*0.39*	*16.16*	*-0.82*	*-1.73*
Wheat	-0.17	-1.47	-4.38	-2.58	-9.15	-1.5	-4.07	-7.87	-2.81	-0.58	-5.66	-5.67
Gold	-0.1	-0.01	0.27	-0.9	1.27	6.76	12.19	-0.16	0.9	-0.11	1.32	-1.09
Soybeans	0.6	1.29	-3.89	-1.51	-2.26	-3.38	-1.32	-0.94	-1.44	0.78	-2.46	-4.64
Others	-0.18	-0.05	-0.15	-0.75	-0.5	-2.19	-3.65	-0.04	-0.34	0	-0.44	-1.06
CGDS	-0.24	-0.12	-0.61	-5.3	-1.55	-12.89	-5.03	-0.06	-1.62	0.08	-8.27	-5.41

Source: Author's Simulation

4.3.3. The Impact of International Rice Price Volatility on Sectoral Price of ASEAN *Plus Three Economies*

Volatility of international rice prices also have an impact on the performance of sectoral output prices as shown in Table 6.4. Prices of various commodities, especially rice has increased significantly in each country. Greatest increase in rice prices in Korea that is equal to 29.41 percent, followed by Indonesia at 29.3 percent. While Japan has the lowest price increase in the amount of 20.26 percent. Transmission of rice from the international market price of the domestic market is quite high. In addition to the increase in rice prices, the volatility of rice prices also raise prices on some other food commodities, including corn, wheat and soybeans. While non-agricultural commodities such as coal and gold prices declined.

Indonesia has increased the price of output on various food commodities. Output prices of corn increased by 2.42 percent, wheat by 1.61 percent and soybeans at 2.15 percent. Even though the elasticity of substitution of rice to the other food is relatively low, the increase in domestic rice prices encourage increased demand for more food so that food prices were also increased.

Table 4.7. The Impact of International Rice Price Volatility on Sectoral   Price of ASEAN *Plus Three Economies*

Sector	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malay Sia	Philip Pines	Singa pore	Thai land	Viet nam
Coal	-0.33	-0.18	-0.25	-0.74	-0.35	-1.58	-1.2	-0.17	-0.41	-0.28	-0.88	-1.04
Maize	0.26	0.8	3.33	2.9	2.42	1.11	1.06	1.15	1.68	0.29	2.56	3.04
Crude_Oil	-0.18	-0.1	-0.09	-0.26	-0.29	-0.37	-12.43	-0.13	-0.15	-0.1	-0.28	-0.22
CPO	0	0	0.01	-0.71	-0.38	-1.47	-2.68	0.01	-0.15	-0.05	-0.76	-1
PaddyRice	*22.58*	*20.26*	*29.41*	*27.05*	*29.3*	*26.58*	*26.22*	*24.95*	*24.98*	*22.4*	*28.36*	*27.3*
Wheat	0.21	0.72	2.03	0.44	1.61	-0.34	0.52	1.17	1.04	0.19	0.92	1.02
Gold	-0.02	-0.03	-0.08	-0.05	-0.26	-1.07	-2.52	0	-0.2	-0.02	-0.19	-0.56
Soybeans	0.5	1.02	4.48	2.71	2.15	0.98	1.28	1.22	1.34	0.6	3.13	2
Others	0.04	0.01	0	0.01	0.02	-1.1	0.36	0.02	0.02	0.01	-0.21	-0.12

Source: Author's Simulations

4.3.4.   The Impact of International Rice Price Volatility on Trade Performance of ASEAN *Plus Three Economies*

Volatility of international rice prices also affects the trade performance for various commodities. In terms of exports, rice price volatility shocks cause a decline in exports of food commodities, especially rice, in every country, except China, Japan and Singapore. This is a logical response because of country's interest to maintain food security, especially of rice in their particular countries. The largest increase in rice exports occurred in Japan that is equal to 37.09 percent, followed by China and Singapore amounted to 29.95 percent and 20.09 percent. On the other hand, exports to non-food commodities in general have increased in many countries.

Table 4.8. The Impact of International Rice Price Volatility on Export of ASEAN

Plus Three Economies

Sector	China	Japan	Korea	Cambo Dia	Indo nesia	Lao	Myan mar	Malay Sia	Phili ppines	Singa pore	Thai land	Viet nam
Coal	0.54	-1.32	-0.16	3.43	0.58	3.18	1.54	-0.18	0.46	-0.14	2.75	2.14
Maize	0.26	-1.31	-7.21	-3.34	-3.99	1.22	-1.48	-0.59	-2.74	0.16	-4.28	-6.03
Crude_Oil	0.34	-0.38	-0.27	1.66	1.65	2.69	123.37	-0.04	0.26	-0.26	1.06	0.86
CPO	-0.14	-0.18	-0.2	3.61	2.12	9.63	16.42	-0.22	0.85	0.22	1.89	6.14
PaddyRice	*29.95*	*37.09*	*-48.01*	*-46.12*	*-46.12*	*-41.54*	*-23.71*	*-26.33*	*-6.97*	*20.09*	*-35.67*	*-30.5*
Wheat	0.17	-4.04	-15.8	-2.8	-11.41	3.18	-2.36	-7.91	-7.33	-0.58	-5.97	-5.91
Gold	0.12	0.11	0.49	-0.08	1.93	8.93	20.04	-0.17	1.59	-0.11	1.42	4.32
Soybeans	1.18	-2.5	-22.36	-10.69	-9.32	-2.77	-1.68	-1.93	-4.82	0.79	-14.24	-9.52
Others	-0.12	0.05	0.1	0.07	-0.03	6.43	-2.68	-0.03	-0.04	-0.02	1.36	0.83

Source: Author's Simulations

Greatest increase in rice imports in Korea that is equal to 36.99 percent, followed by Indonesia, which had an increase of 35.74 percent and 34.48 percent for Laos. While China, Japan, Malaysia and Singapore experienced the opposite. The slow supply response causes each rice-producing countries trying to keep domestic rice needs. This would exacerbate the development of rice prices in international markets. But on the other hand, imports of non-food commodities (Coal, Oil and gold) has decreased in each ASEAN *Plus Three* Countries.

Table 4.9. The Impact of International Rice Price Volatility on Import of ASEAN
Plus Three Economies

Sector	China	Japan	Korea	Cam bodia	Indo Nesia	Lao	Myan Mar	Malay Sia	Phili Ppines	Singa pore	Thai land	Viet nam
Coal	-0.21	-0.05	-0.16	-1.34	-0.11	-5.83	-6.66	-0.03	-0.4	0	-1.04	-3.45
Maize	-0.09	-0.03	0.23	0.76	1.27	-3.94	-5.13	-0.1	0.46	0	1.36	-0.07
Crude_Oil	-0.38	-0.05	-0.15	-1.26	-1.17	-3.05	-66.58	-0.08	-0.34	0	-0.56	-0.66
CPO	-0.1	-0.1	-0.16	-1.77	-0.79	-6	-3.84	0.38	-0.61	0.1	-1.63	-2.16
PaddyRice	*-8.44*	*-4.88*	*36.99*	*31.39*	*35.74*	*34.48*	*8.68*	*-1.28*	*5.89*	*-0.17*	*24.07*	*32.74*
Wheat	-0.17	0.26	0.1	-0.75	-0.5	-3.41	-2.48	-0.07	0.87	0.01	-0.46	-1.05
Gold	-0.23	-0.09	-0.11	-0.66	-0.18	-2.95	-9.3	-0.03	-0.51	-0.03	-0.43	-2.74
Soybeans	-0.2	1.37	7.68	5.59	4.68	-0.85	-1.03	-0.8	1.11	-0.03	3.71	1.08
Others	-0.12	-0.12	-0.25	-0.98	-0.62	-5.16	-3.19	-0.05	-0.41	-0.01	-1.99	-1.62

Source: Author's Simulations

4.3.5. Impact of Oil Price Volatility International (Crude Oil) to the economy in the ASEAN Plus Three Countries

4.3.5.1. Impact of Oil Price Volatility International (Crude Oil) on Macroeconomic Performance

Petroleum is an important energy source in the world. Energy demand in the world stems from petroleum by 35 percent, coal by 25 percent, gas by 21 percent, biomass and waste by 10 percent, nuclear at 6 percent, 2 percent hydro, and renewable sources by 1 percent (International Energy Agency, 2007; FAO, 2008). In addition to experiencing rice commodity price volatility of 23:42 per cent during 1980 to 2011, an international strategic commodities such as oil also experienced price volatility. Average price volatility in petroleum by 30.85 percent has caused changes in the performance of various macro and sectoral economic variables in different countries. This is summarized in Table 6.7

Volatility in real oil prices lead to lower welfare level represented by the equivalent value of Variation (EV) in each of the ASEAN Plus Three Countries. Countries in East Asia has decreased relatively greater prosperity of the countries in ASEAN. Japan experienced a decline in the level of the greatest prosperity in the amount of U $ S 17,595.6 million, followed by China and Korea amounted to U $ S and U $ S 13,409.8 10,164.4 million. High dependence on oil as an energy source and the earth is mostly imported kesejahterann cause a reduction in these countries. In ASEAN, Thailand and Indonesia is the country most likely to have decreased levels of welfare for both countries is also the largest importer of petroleum. On the other hand, Vietnam and Malaysia have increased well-being. Vietnam and Malaysia, erupakan penekspor countries that have oil profits when crude oil prices in international markets is risen.

The next macro-economic performance experienced the shock of oil price volatility is the trade balance. Volatility in oil prices has resulted in changes in performance on the total exports and total imports, resulting in the trade balance in each country in shock. China, Myanmar and Vietnam is a country that is not the performance of the trade balance had a surplus due to the volatility of these shocks.

Trade surplus occur in relatively large countries Thailand, Korea, Singapore, Malaysia and Indonesia. Thailand experienced an increase (surplus) is the largest trade balance which amounted to U $ S 6476.73 million, followed by Korea at U $ S 861.90 million. While Indonesia is only a surplus of U $ S 274.55 million.

Improvement in performance occurs because the trade balance in general (aggregate) increased exports exceed its imports increase.

The improved performance of the trade balance that occurs in various ASEAN Plus Three countries are not necessarily able to push the performance rill GDP. In general, even a decline in GDP in each country rill. The largest decrease occurred in the Vietnam of 1.06 percent followed by Malaysia at 1.03 percent. Meanwhile, Indonesia has decreased by 12.55 percent. While the smallest decline experienced by Japan is only down 0.01 percentage point. The increase in oil prices affect the performance of value-added industries and the petroleum sector so that energy users will influence the overall real GDP.

Table 4.10.   Impact of Oil Price Volatility International (Crude Oil) on Macroeconomic Performance

Countries	Trade Balance (Million US$)	Welfare (Million US$)	Real GDP (%)	TOT (%)	Investment (%)	Government Expenditure (%)	Household Consumption (%)
China	-304.77	-13,409.8	-0.24	-1.54	-0.75	-0.81	-0.81
Japan	-3619	-17,595.6	-0.01	-3.11	0.11	-0.49	-0.49
Korea	861.90	-10,164.4	-0.05	-3.80	-1.97	-1.91	-1.91
Cambodia	0.04	-3.21	-0.17	0.06	0.13	0.14	0.13
Indonesia	274.55	-1,263.64	-0.55	0.02	-0.92	-0.3	-0.31
Lao	2.25	-3.65	-0.19	0.41	-0.31	-0.26	-0.28
Myanmar	-1.04	-18.86	-0.26	0.06	-0.12	-0.28	-0.3
Malaysia	469.91	323.16	-1.03	0.92	-1.05	0.56	0.55
Philippines	73.4	-944.03	-0.05	-1.84	-1.23	-1.29	-1.29
Singapore	412.70	-4,072.5	-0.31	-2.32	-4.81	-4.31	-4.29
Thailand	6476.73	-4,669.05	-0.34	-3.95	-17.92	-4.46	-4.45
Vietnam	-610.66	1,396.25	-1.06	5.58	5.25	5.15	4.73

Source: Author's Simulations

Term of Trade (TOT) have varying effects on each country. China, Japan, Korea, Philippens, Singapore, Thailand TOT decreased, while others have increased, including Indonesia. Rapid adjustments made by China, Japan and Korea so it is still a decline in export price index compared with the import price index. However, overall, only Koreans can still maintain a trade surplus.

4.3.5.2. Impact International Impact of Oil Price Volatility (Crude Oil) on Sectoral Output Performance

Volatility in international oil prices meninbulkan sectoral impact on the economy in each country. Impact on sectoral output are shown in Table 6.8. Output of crude oil generally decreased except in Laos and Thailand with a relatively small amount. Decline in crude oil output was greatest in the Philippines by 13.52 percent. This decline also affects other industries of petroleum users.

Table 4.11. Impact of International Oil Price Volatility on Sectoral Output

Sector	China	Japan	Korea	Cam Bodia	Indo nesia	Lao	Myan mar	Malay Sia	Phili ppines	Singa pore	Thai land	Viet nam
Coal	-0.04	-0.07	0.36	-0.17	0.13	-0.23	-0.15	-0.05	0.04	-0.87	0.95	-1.087
Maize	-0.06	0.17	0.74	-0.36	-0.33	-0.31	0.40	0.43	-0.03	0.84	1.04	-1.185
Crude_Oil	-0.97	-0.88	-0.67	-0.78	-0.11	0.25	-0.26	-0.14	-13.52	-0.37	0.28	-1.409
CPO	-0.33	-0.17	-0.54	-0.77	1.48	-1.24	-0.57	2.48	1.31	1.56	2.71	-2.558
PaddyRice	-0.17	-0.005	0.15	-0.11	-0.59	-0.05	-0.19	-0.05	-0.02	0.82	0.54	-0.465
Wheat	0.21	0.44	1.16	-1.85	4.61	-0.03	0.87	1.96	1.32	2.08	4.36	-2.041
Gold	0.47	0.31	2.09	-1.19	0.86	0.60	3.78	1.16	1.66	4.95	3.69	-1.283
Soybeans	1.59	-0.03	0.74	-0.15	0.73	0.38	0.20	1.04	0.27	1.18	1.36	-2.477
Others	-0.16	-0.002	-0.01	-0.11	-0.62	-0.00	-0.26	-1.11	-0.02	-0.02	-0.13	-1.059
CGDS	-0.74	0.10	-1.96	0.12	-0.92	-0.30	-0.11	-1.04	-1.23	-4.81	-17.92	5.146

Source: Author's Simulations

4.3.5.3. Impact of Oil Price Volatility International (Crude Oil) on Sectoral Output Price Performance

In addition to impact on the level of output, the volatility of world oil prices would also impact on sectoral output prices. Price increases in oil komoitas in each country. Biggest increase in oil prices occurred in Philippines amounted to 32.25 per cent, followed by Vietnam at 31.18 percent. This suggests that high transmission rates of domestic petroleum prices with international market prices.

Meanwhile, the impact of increased volatility in world oil price is likely to have no effect on other mining product prices. Agricultural products are also relatively unaffected. Commodity price increases are contractionary in the petroleum sector in the ASEAN Plus Three is the product processing industries are aggregated as "others" in this study. This affects the overall inflation in each country.

Table 4.12. Impact of International Oil Price Volatility on Sectoral Output Price

Commodities	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malay sia	Phili ppines	Singa pore	Thai land	Viet nam
Coal	-0.85	-0.43	-0.66	-0.40	-0.669	-0.59	-0.95	-0.73	-0.63	-0.52	-1.22	-0.40
Maize	-0.84	-0.29	-0.98	-0.56	-1.706	-0.81	-1.15	-1.19	-0.96	-0.71	-2.07	0.60
Crude_Oil	**29.96**	**29.58**	**29.53**	**30.10**	**30.532**	**31.05**	**30.51**	**30.81**	**32.25**	**29.54**	**29.53**	**31.18**
CPO	-0.14	-0.01	-0.04	0.01	-0.5	-0.13	-0.91	-0.52	-0.40	-0.36	-1.93	1.35
PaddyRice	-1.05	-0.31	-1.45	-0.34	-1.86	-0.74	-1.42	-1.60	-0.92	-0.72	-2.67	0.80
Wheat	-0.61	-0.26	-0.69	-0.08	-0.871	-0.16	-0.92	-0.41	-0.61	-0.53	-0.67	0.21
Gold	-0.23	-0.16	-0.43	0.17	-0.204	-0.02	-0.77	-0.18	-0.35	-0.67	-0.48	0.92
Soybeans	-0.86	-0.29	-1.26	-0.44	-1.109	-0.56	-0.86	-1.11	-0.85	-0.79	-2.36	0.22
Others	0.06	-0.06	-0.25	0.25	0.273	-0.02	0.004	0.36	-0.05	-0.06	-0.69	1.20

Source: Author's Simulations

4.3.5.4. Impact of Oil Price Volatility International (Crude Oil) against the Performance of Trade (Exports and Imports) Sectoral

Performances of export and import sectors of each country are shown in Table 6:10 and 6:11. In general, the performance of exports, especially crude oil has increased, except in the State of Cambodia, and Vietnam Philippes. Increase in prices in the international market for export instentif tersbebut countries even though the quantity is very little.

Table 4.13. Impact of International Oil Price Volatility on Sectoral Exports

Commo dities	China	Japan	Korea	Cam Bodia	Indo nesia	Lao	Myan mar	Mala Ysia	Phili Ppines	Singa pore	Thai land	Viet nam
Coal	1.4	-1.585	0.045	-0.339	0.355	-1.83	-0.156	0.801	-0.611	-0.906	2.42	-2.224
Maize	1.192	0.128	1.568	-1.621	2.658	-1.23	1.719	1.419	1.384	0.859	3.47	-2.619
Crude_Oil	*11.344*	*15.632*	*13.64*	*-4.273*	*4.5*	*1.329*	*4.119*	*2.333*	*-11.91*	*15.052*	*15.55*	*-1.409*
CPO	0.354	-0.008	-0.215	-0.983	2.616	0.88	5.373	2.666	2.441	2.246	8.96	-8.648
PaddyRice	2.249	-1.962	8.637	-1.755	11.739	2.13	8.602	11.058	3.722	1.04	19.26	-12.416
Wheat	3.284	0.977	4.953	-2.128	5.719	0.32	6.416	1.973	4.316	2.082	4.63	-1.891
Gold	1.993	1.051	3.236	-1.879	1.474	0.66	5.953	1.43	2.687	5.016	3.87	-8.188
Soybeans	2.554	-0.63	4.978	-0.854	4.027	0.96	0.265	3.111	2.726	1.507	10.9	-3.218
Others	0.951	1.51	2.606	-0.015	-0.681	1.04	-0.359	-1.295	1.364	1.391	5.41	-6.076

Source: Author's Simulations

Impact on the performance of imports reported in Table 6.10. There are increase in imports in China, Japan, Indonesia, Myanmar, Malaysia, Vietnam, and Philipines. Where Myanmar mengamali largest increase in crude oil imports which amounted to 6.77 percent. While Korea, Cambodia and Singapore crude oil imports declined.

Table 4.14. Impact of International Oil Price Volatility on Sectoral Imports

Commodities	China	Japan	Korea	Cam Bodia	Indo nesia	Lao	Myan Mar	Malay Sia	Phili Ppines	Singa pore	Thai land	Viet nam
Coal	-1.74	-0.001	-0.04	0.01	-1.37	-0.55	-1.57	-1.12	-0.038	0.138	-1.24	-0.05
Maize	-1.08	-0.005	-0.10	0.93	-1.45	0.77	0.57	0.09	-0.261	-0.041	-2.14	2.08
Crude_Oil	*1.56*	*0.002*	*-0.01*	*-2.38*	*3.18*	*0.7*	*6.77*	*5.02*	*0.576*	*-0.015*	*-0.04*	*0.03*
CPO	-0.12	0.087	-0.17	0.78	-1.06	2.94	-0.20	0.79	-0.748	0.391	-3.30	3.42
PaddyRice	-2.19	0.16	-2.64	-0.57	-5.79	-1.28	-4.24	-2.77	-1.418	-0.036	-10.53	7.77
Wheat	-2.08	-0.106	-0.09	0.29	-0.62	-0.09	-1.54	-0.52	-0.791	-0.047	-0.11	-1.05
Gold	-0.64	-0.3	0.21	0.83	-0.20	0.08	-1.11	-0.98	-0.134	1.144	-0.13	1.72
Soybeans	-1.41	0.08	-1.99	0.54	-2.75	-0.78	-0.65	-0.64	-1.425	-0.014	-4.98	0.79
Others	-0.42	-0.73	-1.26	0.17	-0.33	0.64	-0.05	-0.39	-0.583	-1.241	-4.67	1.94

Source: Author's Simulations

4.3.6. Impact of International Commodity Price Volatility in the ASEAN *Plus Three* Economies

The analysis in this section is focused on the simulation of the average volatility of international commodity prices from 1980 to 2011; consisting of:

- Price Volatility of coal at 18.39 percent;
- Price volatility of Maize at 9.43 percent;
- Price volatility of Crude Oil)for 30.85 percent;
- Palm volatility of CPO at 13.66 percent;
- Price volatility of Rice (Paddy Rice) at 23.42 percent;
- Price volatility of wheat at 17.44 percent;
- Price volatility of gold at 14.53 percent;
- Price volatility of soybean at 0.000001 percent

4.3.6.1. Impact of International Commodity Price Volatility on the Macroeconomic Condition of ASEAN *Plus Three* Economies

The simulation results of volatility of eight strategic *agri* and *mining commodities* will simultaneously reduce the performance of real GDP although with a relatively modest percentage changes. It is represented that the commodity price volatility is able to provide a contractionary impact on the economies of the ASEAN *Plus Three*. Negative GDP caused by declining real household consumption indicating reduced *purchasing power.* Real household consumption is a more appropriate indicator for *welfare analysis* that represents a decrease in the level of welfare when it comes to economic shocks arising from external conditions.

Based on the indicators of GDP, it is known that the negative impacts are bigger in the ASEAN 5 countries and CLMV (Cambodia, Laos, Myanmar, and Vietnam) compared to Japan, China, and Korea. Representing the level of the economic vulnerability of ASEAN 5 + CLMV from commodity price volatility is higher compared with Japan, China, and Korea.

Table 4.15. Impact of International Commodity Price Volatility on the Macroeconomic Condition of ASEAN *Plus Three* Economies

Countries	Trade Balance (Million USD)	Welfare (Million USD)	GDP (%)	TOT (%)	Inflation (%)	Investment (%)	Government Spending (%)	Houshold Consumption (%)
China	1944.71	-33066.8	-1.32	-1.83	-0.28	-2.17	-1.81	-1.78
Japan	-3415.91	-32169.1	-0.25	-3.76	-0.29	-0.08	-0.66	-0.66
Korea	1794.62	-15483.9	-0.55	-4.62	-1.84	-3.18	-2.71	-2.69
Cambodia	35.42	-64.09	-1.35	-0.04	0.61	-5.24	-0.98	-0.9
Indonesia	788.08	-2866.19	-1.86	1.99	1.85	-2.2	-0.15	-0.08
Lao	84.1	-80.5	-3.16	-0.54	0.8	-13.47	-3.42	-2.78
Myanmar	49.33	-313.32	-4.1	0.17	1.25	-5.41	-3.27	-2.94
Malaysia	438.14	-656.08	-2.4	1.09	2.36	-3.08	-0.15	-0.02
Philippines	335.81	-1851.47	-1.03	-2.03	-0.88	-3.71	-2.19	-2.16
Singapore	348.3	-4634.97	-0.57	-2.5	-3.48	-5.03	-4.66	-4.61
Thailand	11062.83	-7146.73	-1.27	-4.9	-3.68	-30.17	-6.57	-6.54
Vietnam	729.48	160.13	-3.33	4.83	5.47	-5.11	1.98	2.31

Source: Author's Simulations

Increased international *mining agri* commodity prices have no limited impacts on the change in real GDP, but also resulted in an increase in the general price level. As illustrated in Table 6.12, the simulation gives the effect of an increase in the consumer price index (CPI). Inflation triggered by the rising price of stratrgic foods such as rice, sugar and cooking oil which has a relatively large portion of the consumption expenditure. The income side of GDP shown decline in real wages received by laborers because of the mining agri commodity prices.

4.3.6.2. Impact of International Commodity Price Volatility on the Sectoral Condition of ASEAN *Plus Three* Economies

The impact of rising food prices at the sectoral level can be analyzed using producer side. Rational expectations of economic agents due to the volatility of the price of *agri mining* will drive the behavior to involve in the sectors that are "attractive" in the era of rising commodity prices. However, Table 6.2 suggests the hypothesis is not entirely appropriate because of the impact of variations in sectoral output, either an increase or conversely a decrease in output between agri commodities in the mining region of *ASEAN Plus Three.* Rice and oil are the main sectors that experienced largest fall. This is understandable given the two commodities is a vital commodity for the economy of East Asia. Meanwhile, commodities such as gold showed a positive response in output due to increased demand for gold. CPO is a commodity that responsive to international price incentives.

Japan, Korea, and Singapore showed declining response in the majority of *agri* and *mining* outputs. Price incentives are not able to induce the allocation of resources in the *agri mining* so that the countries will not have a comparative advantage in *agri* commodity *mining.*

Table 4.16. Impact of International Commodity Price Volatility on the Sectoral Condition of ASEAN *Plus Three* Economies

Commodities	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malay sia	Philip pines	Singa Pore	Thai land	Viet nam
Coal	-0.42	-1.56	-1.04	-1.14	0.18	-0.38	2.43	-1.92	-3.26	-0.04	0.34	1.44
Maize	1.42	-0.07	-3.53	-1.83	-1.33	-3.42	-3.69	-1.41	-0.27	1.56	-0.67	-4
Crude_Oil	-0.75	-0.99	-0.98	-0.52	-0.08	0.13	-4.39	0.04	-13.68	-0.59	0.81	-0.02
CPO	-1.62	-0.71	-2.21	6.99	6.27	-2.79	5.28	20.58	-1.19	-55.53	5.87	5.75
PaddyRice	0.77	0.13	-1.22	-0.18	-0.27	-4.2	-4.3	-2.27	0.11	17.16	-0.11	-2.41
Wheat	0.61	0.84	-6.05	-57.04	6.2	-8.78	-6.83	6.65	-4.79	3.66	-24.4	9.08
Gold	0.4	1.98	-18.26	8.24	12.47	32.92	35.56	20.75	12.6	-15.49	4.19	-8.11
Soybeans	4.66	1.59	-2.66	-1.7	-1.88	-2.54	-0.7	1.18	-1.06	2.47	-0.7	-4.72
Others	-0.66	-0.11	-0.13	-0.94	-1.68	-2.28	-4.41	-0.9	-0.62	0.02	-0.67	-2.57
CGDS	-2.17	-0.08	-3.18	-5.24	-2.2	-13.47	-5.41	-3.08	-3.71	-5.03	-30.17	-5.11

Source: Author's Simulations

4.3.6.3. Impact of International Commodity Price Volatility on the Sectoral Price of ASEAN *Plus Three* Economies

Transmission of international price shocks on domestic prices in *ASEAN Plus Three* regions are determined by the level of domestic commodity market integration with the international commodity markets. *ASEAN Plus Three* regions are highly integrated with world commodity markets and hence domestic prices follow international prices. Therefore, the impact of international price shocks on the economy occurs not only through changes in prices and volume of exports and imports, but also through changes in domestic production and changes in domestic prices. The results also describe that the impact of price volatility in international prices are not homogeneous across all countries in the region of *ASEAN Plus Three,* although it showed a consistent direction of response.

**Table 4.17. Impact of International Commodity Price Volatility on the Sectoral
Price of ASEAN *Plus Three* Economies**

Commodities	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malay sia	Philip pines	Singa pore	Thai land	Viet nam
Coal	18.03	16.63	15.95	17.14	18.86	18.36	20.6	15.48	17.72	21.28	15.8	22.51
Maize	10.13	9.28	11.91	13.38	12.41	11.24	10.39	9.44	11.06	8.87	10.4	12.85
Crude_Oil	29.68	29.6	29.58	29.95	30.31	30.8	17.11	30.75	32.19	29.59	29.31	30.97
CPO	15.48	11.91	12.48	11.12	12.52	9.33	9.64	18.8	13.84	23.39	10.83	11.2
PaddyRice	20.94	20.15	27.85	27.04	27.99	26.08	24.69	23.2	24.25	22.36	25.6	27.2
Wheat	16.2	15.86	18.11	24.18	16.23	13.76	17.98	17.12	17.7	16.16	20.36	15.49
Gold	15.94	14.74	19.07	13.26	12.87	10.12	8.34	12.38	13.15	17.08	14.64	17.56
Soybeans	-1.32	0.31	2.37	1.68	0.88	-0.01	-0.12	-0.46	-0.07	-0.55	-0.11	1.49
Others	0.29	0.11	-0.19	0.53	1	-0.96	0.66	0.54	0.19	0.14	-0.84	1.08

Source: Author's Simulations

4.3.6.4. Impact of International Commodity Price Volatility on the Trade Performance of ASEAN *Plus Three* Economies

Increased volatility of international commodity prices have a tendency to increase rice exports to countries in the region *ASEAN Plus Three,* except Thailand and Vietnam. As it is previously stated, rice is the most volatile commodity amongst the agri and mining group. However, the condition of *existing* international trade volume of rice trade volume when compared to the percentage of other grains, showed that the intensity of trade in rice is considered the lowest. Therefore, the international rice market is classified thin *(thin market).* In addition, the exporting countries, such as Vietnam, Thailand and India still maintains a policy of export restrictions on rice, when rice production and domestic stocks fell sharply as well as price stability is threatened. For that reason, the world rice market is often referred to as the residual market *(residual market).* Two characteristics that distinguish the rice trade with cereals or other food trade in world markets. Meanwhile, the price of *Crude Palm Oil* (CPO) makes the majority of countries in the region of *ASEAN Plus Three* (especially Indonesia and Malaysia) increase output of palm oil and divert it to a *massive* export activities abroad.

Table 4.18. Impact of International Commodity Price Volatility on Export of ASEAN *Plus Three* Economies

Commodities	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malay sia	Philip pines	Singa Pore	Thai land	Viet nam
Coal	4	18.48	20.86	-4.82	0.69	13.56	2.84	19.51	24.73	0.03	15.73	7.55
Maize	-1.42	1.26	-6.16	-6.55	-6.16	-1.23	-2.36	1.8	-3.71	1.57	-1.33	-7.58
Crude_Oil	**13.49**	**14.62**	**12.87**	**-2.82**	**6.2**	**3.76**	**138.12**	**2.44**	**-11.87**	**14.28**	**16.39**	**-0.02**
CPO	12.24	10.15	9.66	19.64	10.23	21.37	23.68	27.81	-3.42	58.45	18.18	-15.66
PaddyRice	**38.52**	**40.01**	**-31.39**	**-44.86**	**-33**	**-35.68**	**-7.25**	**-7.48**	**1.96**	**21.58**	**-9.16**	**-27.54**
Wheat	9.32	15.78	-11.83	-59.46	7.83	24.65	1.02	6.76	-8.36	3.69	25.17	-10.85
Gold	-5.62	4.36	-29.26	13.8	17.68	40.51	53.29	22.11	17.53	-15.55	4.71	-19.26
Soybeans	7.77	-1.96	-14.1	-10.26	-5.54	-0.59	-0.43	2.46	0.02	2.9	0.1	-9.24
Others	1.29	1.97	3.76	0.03	-3.61	7.74	-3.68	-0.82	1.42	1.59	7.9	-3.66

Source: Author's Simulations

On the import side, *mining agri* commodity that needs to get attention for the region are Rice, Oil, and Soybean. Rice and Petroleum as noted in the description of previous results are the primary commodities that are very strategic and inelastic, so that *excess demand* will be met with a choice that comes from imports.

Table 4.19. Impact of International Commodity Price Volatility on Import of ASEAN *Plus Three* Economies

Commodities	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malaysia	Philip pines	Singa Pore	Thai land	Viet nam
Coal	6.74	-0.1	-0.23	-3.3	8.52	2.67	6.99	-0.87	0.36	-0.09	-1.6	17.16
Maize	1.2	-0.03	0.39	4.38	1.99	-0.44	-3.34	-2.15	1.65	-0.35	-0.43	3.01
Crude_Oil	0.27	-0.11	-0.12	-3.69	1.39	-2.39	-65.82	5.06	-0.02	0.02	-0.73	2.73
CPO	3.65	-8	-0.35	-9.29	7.25	-11.52	-4.92	11.95	1.58	-20.72	-1.37	-2.57
PaddyRice	-15.33	-6.91	33.51	28.85	29.66	33.5	2.65	-4.86	4.46	-0.4	11.97	38.06
Wheat	1.31	-0.33	0.19	-2	-1.68	-9.54	-0.97	-2.33	2.24	-0.4	-0.7	-2.54
Gold	7.21	7.24	4.76	-6.26	6.69	-3.48	-20.56	0.35	0.15	-0.95	0.15	5.85
Soybeans	-3.41	0.81	4.45	5.74	1.68	-2.45	-2.1	-1.95	-1.26	-0.12	-2.88	1.37
Others	-0.99	-0.96	-2.09	-0.8	-0.23	-4.55	-3.43	-0.67	-1.02	-1.39	-7.67	-0.89

Source: Author's Simulations

4.3.7. Impact of International Commodity Price Volatility against the Economic of ASEAN Plus Three Countries

Analysis in this section is an analysis of the simulation (unison) impact the average volatility of international commodity prices from 1980 to 2011 consisting of:

- Volatility of Coal prices at 18.39 per cent;
- Volatility of Maize prices at 9.43 percent;
- Volatility of Crude Oil prices at 30.85 percent;
- Volatility of CPO prices at13.66 percent;
- Volatility of Paddy Rice prices at 23.42 per cent;
- Volatility of Wheat prices at 17.44 per cent;
- Volatility of Gold prices at 14.53 per cent;
- Volatility of Soybeans prices at 0.000001 per cent

4.3.7.1. Impact of International Commodity Price Volatility on Macroeconomic Performance in the ASEAN Plus Three Countries

The simulation results of volatility of eight commodity agri mining strategic simultaneous will decrease the performance of GDP rill increase although with a relatively modest percentage changes. It is represented that the commodity price volatility is the real substance of the issues and able to provide a contractionary impact on the economies of the ASEAN Plus Three. Negative performance indicators of GDP from the expenditure side one caused by a decline in real household consumption indicating decline purchasing power. Real household consumption is a more appropriate indicator for welfare analysis that represents a decrease in the level of welfare when it comes to economic shocks arising from external conditions.

Based on the indicators of GDP decline, it is known that the negative impact it will give more impact to the economy in the ASEAN 5 countries and CLMV (Cambodia, Laos, Myanmar, and Vietnam) compared to Japan, China, and Korea. It Represents the economic vulnerability of ASEAN 5 + CLMV higher the risk of commodity volatility compared with Japan, China, and Korea.

Table 4.20. Impact of International Commodity Price Volatility on Macroeconomic Performance

Countries	Balance of Trade (Million US$)	Walfare (Million US$)	GDP (%)	TOT (%)	Inflation (%)	Investment (%)	Government Expenditure (%)	Household Consumtion (%)
China	1944.71	-33066.8	-1.32	-1.83	-0.28	-2.17	-1.81	-1.78
Japan	-3415.91	-32169.1	-0.25	-3.76	-0.29	-0.08	-0.66	-0.66
Korea	1794.62	-15483.9	-0.55	-4.62	-1.84	-3.18	-2.71	-2.69
Cambodia	35.42	-64.09	-1.35	-0.04	0.61	-5.24	-0.98	-0.9
Indonesia	788.08	-2866.19	-1.86	1.99	1.85	-2.2	-0.15	-0.08
Lao	84.1	-80.5	-3.16	-0.54	0.8	-13.47	-3.42	-2.78
Myanmar	49.33	-313.32	-4.1	0.17	1.25	-5.41	-3.27	-2.94
Malaysia	438.14	-656.08	-2.4	1.09	2.36	-3.08	-0.15	-0.02
Philippines	335.81	-1851.47	-1.03	-2.03	-0.88	-3.71	-2.19	-2.16
Singapore	348.3	-4634.97	-0.57	-2.5	-3.48	-5.03	-4.66	-4.61
Thailand	11062.83	-7146.73	-1.27	-4.9	-3.68	-30.17	-6.57	-6.54
Vietnam	729.48	160.13	-3.33	4.83	5.47	-5.11	1.98	2.31

Source: *Data Base* GTAP version 7.0

Increase of international mining agri commodity prices are not only impact on the change in real GDP, but also impact in increase the general price level. As illustrated in Table 6:12, the simulation gives the effect of an increase in the consumer price index (CPI). Inflation is triggered by the rising price of food staples such as rice, sugar and cooking oil which has a relatively large portion of the consumption expenditure items imported (imported inflation). Mining the characteristics of agri commodities broadly as economic result manufacturing input costs and reduce their industrial competitiveness approximated final products with increased prices of consumer goods. Performance of inflation in Indonesia, Malaysia, and the CLMV will increase in contrary China, Japan, and Korea showed deflation with a very small scale. This is caused by the fact that food prices and oil is a strategic component of the inflation that is dominant in terms of consumption.

From GDP indicator, it can be corelated that real wages labour will decrease because of the increasing price of agriculture and mining commodities. The workers will receive a negative real wage caused the increasing of Consumer Price Index (CPI) increase in magnitude higher than increasing of nominal wages. Meanwhile, the upward momentum of commodity price volatility agri mining give a positive impact on the State's trade balance improved in the Area ASEAN Plus Three, except

Japan. Japan relies on imports as a source of fulfillment of the demand for agri mining commodity.

4.3.7.2. Impact of International Commodity Price Volatility on Sectoral Output Performance in the ASEAN Plus Three Countries

The impact of rising food prices at the sectoral level can be analyzed using the approach producer side. Rational expectations of economic agents due to the volatility of the price of agri mining betendensi to rise during the period 1980-2011 will drive the agents behaviour for involving in the "attractive" sector in the era of rising commodity prices agri mining. However, Table 6.2. suggests hypothesis is not entirely appropriate because of the impact of variations in sectoral output, either an increase or conversely a decrease in output between agri mining commodities in region of ASEAN Plus Three. Rice and oil are the main sectors of the output decline in the price volatility in the simulation of ASEAN Plus Three. This is understandable because the two commodities is a vital commodity for the East Asia Economic. Meanwhile, mining commodities as gold show a positive response in output caused demand increasing for gold. Characteristics of gold as a commodity that is widely used as a means of investment. CPO is a commodity that is still used as a prime commodity for Indonesia, Malaysia, Thailand, and Vietnam as the outcome of production that responsive to international price incentives.

Japan, Korea, and Singapore show a response in declined output in the majority of agri mining. Price incentives are not able to induce the allocation of resources in the agri mining so that the state still will not have a comparative advantage in agri mining commodity.

Table 4.21. Impact of International Commodity Price Volatility on Sectoral Output Performance

Commodities	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malay sia	Philip pines	Singa Pore	Thai land	Viet nam
Coal	-0.42	-1.56	-1.04	-1.14	0.18	-0.38	2.43	-1.92	-3.26	-0.04	0.34	1.44
Maize	1.42	-0.07	-3.53	-1.83	-1.33	-3.42	-3.69	-1.41	-0.27	1.56	-0.67	-4
Crude_Oil	-0.75	-0.99	-0.98	-0.52	-0.08	0.13	-4.39	0.04	-13.68	-0.59	0.81	-0.02
CPO	-1.62	-0.71	-2.21	6.99	6.27	-2.79	5.28	20.58	-1.19	-55.53	5.87	5.75
PaddyRice	0.77	0.13	-1.22	-0.18	-0.27	-4.2	-4.3	-2.27	0.11	17.16	-0.11	-2.41
Wheat	0.61	0.84	-6.05	-57.04	6.2	-8.78	-6.83	6.65	-4.79	3.66	-24.4	9.08
Gold	0.4	1.98	-18.26	8.24	12.47	32.92	35.56	20.75	12.6	-15.49	4.19	-8.11
Soybeans	4.66	1.59	-2.66	-1.7	-1.88	-2.54	-0.7	1.18	-1.06	2.47	-0.7	-4.72
Others	-0.66	-0.11	-0.13	-0.94	-1.68	-2.28	-4.41	-0.9	-0.62	0.02	-0.67	-2.57
CGDS	-2.17	-0.08	-3.18	-5.24	-2.2	-13.47	-5.41	-3.08	-3.71	-5.03	-30.17	-5.11

Source: *Data Base* GTAP version 7.0

4.3.7.3. Impact of International Commodity Price Volatility on Sectoral Output Price Performance in the ASEAN Plus Three Countries

Transmision of international price shock on domestic price is determined by integration level of domestic commodities market and international commodities market. ASEAN Plus Three regions are highly integrated with world commodity markets and hence domestic prices follow international prices. Therefore, the impact of international price shocks on the economy occurs not only through changes in prices and volume of exports and imports, but also through changes in domestic production and will cause changes in domestic prices. The results of this study also suggests that the impact of price volatility in international prices are not homogeneous across all countries in the region of ASEAN Plus Three, although it shows a consistent direction of response.

Table 4.22. Impact of International Commodity Price Volatility on Sectoral Output Price Performance

Commodities	China	Japan	Korea	Cambodia	Indonesia	Lao	Myanmar	Malaysia	Philippines	Singapore	Thailand	Vietnam
Coal	18.03	16.63	15.95	17.14	18.86	18.36	20.6	15.48	17.72	21.28	15.8	22.51
Maize	10.13	9.28	11.91	13.38	12.41	11.24	10.39	9.44	11.06	8.87	10.4	12.85
Crude_Oil	29.68	29.6	29.58	29.95	30.31	30.8	17.11	30.75	32.19	29.59	29.31	30.97
CPO	15.48	11.91	12.48	11.12	12.52	9.33	9.64	18.8	13.84	23.39	10.83	11.2
PaddyRice	20.94	20.15	27.85	27.04	27.99	26.08	24.69	23.2	24.25	22.36	25.6	27.2
Wheat	16.2	15.86	18.11	24.18	16.23	13.76	17.98	17.12	17.7	16.16	20.36	15.49
Gold	15.94	14.74	19.07	13.26	12.87	10.12	8.34	12.38	13.15	17.08	14.64	17.56
Soybeans	-1.32	0.31	2.37	1.68	0.88	-0.01	-0.12	-0.46	-0.07	-0.55	-0.11	1.49
Others	0.29	0.11	-0.19	0.53	1	-0.96	0.66	0.54	0.19	0.14	-0.84	1.08

Source: *Data Base* GTAP version 7.0

4.3.7.4. Impact of International Commodity Price Volatility on Trade Performance in the ASEAN Plus Three Countries

The increasing of international rice price have a tendecy to increase the rice export in mostly ASEAN plus three region, except for Thailand and Vietnam as the main producer of rice. However, the existing condition show that international rice trade volume is considered as the lowest trade compared to percentage of the other cereal commodities. Because of that, the international rice market is classified as thin market. In addition, the exporter countries, especially Vietnam, Thailand, and India still maintains a restriction export policy when rice production and domestic stocks fell sharply and the stability price is threatened. For that reason, the world rice market usually called as residual market. Those two characteristics distinguish between the rice trade and other cereal commodities trade in world markets.

For Indonesia, supply bottleneck problem still occurs. The fact that the cycle of the rice harvest in Indonesia does not happen all the time every year. Patterns in the domestic rice harvest mostly (65 percent) occurred at rendeng harvest season (now shifted into the April-June) and the rest is done on gadu season (September-November). Rice surplus occurr only during six months in those two harvest seasons, so this is really an artificial surplus. If only because of domestic and international price disparity then Indonesia will encourage the export of rice, it is too much risk to be borne by the public. With the economic character of the rice as now, the elasticity of transmission is low enough, so the benefits of high world rice

prices will be difficult to be transmitted completely to the farmers. Rice exporters and traders will be the people who earn profits from the soaring world rice prices (Arifin, 2008). Furthermore, process of increasing production that is not rely on technological change can not be relied upon to answer the challenges of the increased complexity of food supply problems. Some of the key factors (drivers) in increasing rice production don't seem to support each other. For example, a very slow improvement of irrigation networks, flood disturbance in the production centers, or scarcity of fertilizer more frequently encountered.

Meanwhile, the lucrative price of Crude Palm Oil (CPO) in international market makes the majority of countries in the region of ASEAN Plus Three (especially Indonesia and Malaysia) that involved in the subsystem increase output of palm oil and divert it into a massive export activities. Furthermore, with the accelerating demand for biofuels from countries in the European Union, Japan and the United States.

Table 4.23. Impact of International Commodity Price Volatility on Sectoral Exports

Commodities	China	Japan	Korea	Cam bodia	Indo nesia	Lao	Myan mar	Malay sia	Philip pines	Singa Pore	Thai land	Viet nam
Coal	4	18.48	20.86	-4.82	0.69	13.56	2.84	19.51	24.73	0.03	15.73	7.55
Maize	-1.42	1.26	-6.16	-6.55	-6.16	-1.23	-2.36	1.8	-3.71	1.57	-1.33	-7.58
Crude_Oil	**13.49**	**14.62**	**12.87**	**-2.82**	**6.2**	**3.76**	**138.12**	**2.44**	**-11.87**	**14.28**	**16.39**	**-0.02**
CPO	-12.24	10.15	9.66	19.64	10.23	21.37	23.68	27.81	-3.42	-58.45	18.18	15.66
PaddyRice	**38.52**	**40.01**	**31.39**	**-44.86**	**-33**	**-35.68**	**-7.25**	**-7.48**	**1.96**	**21.58**	**-9.16**	**-27.54**
Wheat	9.32	15.78	11.83	-59.46	7.83	24.65	1.02	6.76	-8.36	3.69	-25.17	10.85
Gold	-5.62	4.36	-29.26	13.8	17.68	40.51	53.29	22.11	17.53	-15.55	4.71	-19.26
Soybeans	7.77	-1.96	-14.1	-10.26	-5.54	-0.59	-0.43	2.46	0.02	2.9	0.1	-9.24
Others	1.29	1.97	3.76	0.03	-3.61	7.74	-3.68	-0.82	1.42	1.59	7.9	-3.66

Source: *Data Base* GTAP 7.0 version (processed)

For Indonesia, the focus commodities of BBN is developed by the government to fulfill the concept of Triple Track Strategy, namely: pro-growth, pro-job, and pro-poor (Ministry of Energy, 2008). Pro-job is intended to open up employment opportunities through the development of biofuels, pro-poor in a way to substituting kerosene with BBN, and the concept is intended as a pro-growth economic activities to enhance economic growth (Ministry of Energy, 2008).

Development of fuel oil will create new jobs by more than three million people until 2010 (Toro and Jamal, 2006; Nainggolan, 2007), and the use of 5 million hectares of degraded land (Nainggolan, 2007).

On the import side, mining agri commodities that needs attention in ASEAN Plus Three region are Rice, Oil, and Soybeans. Rice and Petroleum as noted in the previous result description is a very strategic primary commodities, so that excess demand will be fulled with choices that comes from imports. On the other hand, the high international price incentives also can not be accommodated by increasing the productivity of soybeans so it doesn't immediately produce an adequate supply response. The decline in soybean production due to the decreasing incentives for farmers to plant soybeans is caused by the climate isnot suitable. Soybeans production to meet the needs of ASEAN Plus Three countries can be said still not stable and even tend to decrease. The development of soybeans production show the reduction of land and production thus can not increase production.

Table 4.24. Impact of International Commodity Price Volatility on Sectoral Imports

Commodities	China	Japan	Korea	Cambodia	Indonesia	Lao	Myanmar	Malaysia	Philippines	Singapore	Thailand	Vietnam
Coal	6.74	-0.1	-0.23	-3.3	8.52	2.67	6.99	-0.87	0.36	-0.09	-1.6	17.16
Maize	1.2	-0.03	0.39	4.38	1.99	-0.44	-3.34	-2.15	1.65	-0.35	-0.43	3.01
Crude_Oil	0.27	-0.11	-0.12	-3.69	1.39	-2.39	-65.82	5.06	-0.02	0.02	-0.73	2.73
CPO	3.65	-8	-0.35	-9.29	7.25	-11.52	-4.92	11.95	1.58	-20.72	-1.37	-2.57
PaddyRice	-15.33	-6.91	33.51	28.85	29.66	33.5	2.65	-4.86	4.46	-0.4	11.97	38.06
Wheat	1.31	-0.33	0.19	-2	-1.68	-9.54	-0.97	-2.33	2.24	-0.4	-0.7	-2.54
Gold	7.21	7.24	4.76	-6.26	6.69	-3.48	-20.56	0.35	0.15	-0.95	0.15	5.85
Soybeans	-3.41	0.81	4.45	5.74	1.68	-2.45	-2.1	-1.95	-1.26	-0.12	-2.88	1.37
Others	-0.99	-0.96	-2.09	-0.8	-0.23	-4.55	-3.43	-0.67	-1.02	-1.39	-7.67	-0.89

Source: *Data Base* GTAP 7.0 version

V. CONCLUSION

Commodities which are the objects of this research are Rice, Corn, Wheat, CPO, Petroleum, Coal, Gold, and Soybean. The results identified that among these commodity price volatilities in the international markets during the period of the study, only soybean price that was not significantly volatile, while seven other commodity prices had the fluctuated growth, where rice and oil had the highest level of volatility around 56.64% and 52.45%, respectively, in 2008.

OLS analysis results indicated that the significant factors in affecting the volatility of world rice price were the world GDP, inflation rate, price in the commodity market, production, rice stock and volume of imported rice that were significant at the 5% level. As for corn, at the 5% significant level, the factors affecting the price volatility of corn were the corn price in the commodity market, production, export volume, and temperature. Increased volatility in world grain price, at the 5% significant level, was affected by the decline in world GDP. Factors that affected the increasing volatility in gold price were the decline in interest rates and the volume of gold production (at the 5% significant level). The increase in oil price in the commodity market would lead to an increase in oil price volatility which was significant at the 5% level.

Macroeconomic effects, particularly inflation in Indonesia, Malaysia, Cambodia, Laos, Myanmar, and Vietnam would increase due to CPI as an inflation indicator was strongly influenced by the price volatilities of food and fuel. While in China, Japan, and South Korea, it showed the opposite effect. Increase in inflation would reduce the real wage and give a negative pressure in the well-being. Decline in purchasing power would continuously decrease the value of consumption and real GDP. Decline in real GDP had a relatively high negative effect in the ASEAN countries compared to Japan, China, and South Korea.

The sectoral impact of price volatility in the international market was the increase of commodity prices of agriculture and mining in East Asia. Japan, South Korea, and Singapore were the countries that would experience a decline in output because they did not have a comparative advantage in agriculture and mining. The decline in production of rice and oil in most countries would increase the volume

of their imports. Coal sector in most countries of East Asia showed a positive response because of the price incentive. Domestic bidding for CPO in Indonesia and Malaysia that were responsive to price incentives would increase the export of these commodities.

Based on this study, there are some important reasons for the coordination and joint regulations among of East Asia countries, namely: (1) one country is too small to influence the international prices, (2) the domestic policy of a country is interconnected with other state policies, (3) information on international markets are difficult to access for some countries, and (4) the capital shortage will lead to limited intervention in influencing the price stability

There are some policy options that can be inferred from this study:

1. *Regional buffer stocks*

    The existence of this policy in each country would reduce the incidence of free riders in the costs of storage

2. *Public goods provision*

    Policies that regulate public goods would prevent speculative action because of the market transparency.

3. *Pooled capital reserve instead of foreign aid*

    Required cooperation between the institutions and governments, as well as the regulations in order to accumulate the capital reserve rather than just rely on foreign aid

4. The need for joint policy in trading and reduction of export barriers

5. Needed stability in the future market in each country (regional future market)

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