UNIVERSITY OF INDONESIA

THE IMPACT OF EXCHANGE RATE VOLATILITY TO THE EXPORT OF INDONESIA'S ELECTRONIC PRODUCT

THESIS

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FACULTY OF ECONOMICS
MASTER OF PLANNING AND PUBLIC POLICY
DEPOK
JULY, 2009

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Submitted in partial fulfillment of the requirements for the Degree of Master of Economics

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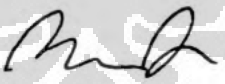

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ABSTRACT

Name : Ernest BJ Tampubolon
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The export performance will be affected by main factors which are the foreign GDP and the real exchange rate. Along with its flexible exchange rate regime that has been implemented by Indonesia's government for more of a decade the rupiah is has been freely move align with the money market condition. This is surely affected the export of Indonesia's commodity in general. Electronics is one of Indonesia's main export commodities that is considered having a stagnant export growth relative to the world's electronic export. This study is intended to analyze the relationship of exchange rate volatility to the export of Indonesia's electronic products (HS 847160, 847170, 847330, 850610, 852190, 852540, 854219) and also to analyze the relationship of trading partner's GDP and the real exchange rate to the exports of such electronic products, with panel data observation regarding with the export value of electronic products to main export destination countries. This study shows that the exchange rate volatility differ in its impact to the export value of the tested electronic products based upon its characteristics.

Keywords : export, exchange rate volatility, panel data, electronic products

Judul : Pengaruh Volatilitas Nilai Tukar terhadap Ekspor Produk-Produk Electronic Indonesia

Kinerja ekspor akan dipengaruhi oleh beberapa faktor yang terutama adalah GDP foreign dan nilai tukar real. Terkait dengan flexible exchange rate yang telah dilaksanakan oleh pemerintah Indonesia selama satu dekade terakhir, nilai tukar rupiah bergerak bebas mengikuti irama pasar uang dunia. Ini tentunya akan memberikan pengaruh terhadap komoditas ekspor Indonesia secara umum. Elektronik merupakan salah satu komoditas ekspor unggulan Indonesia yang pertumbuhannya relatif stagnan apabila diperbandingkan dengan pertumbuhan ekspor produk elektronik dunia. Tesis ini bertujuan untuk menganalisa hubungan antara volatilitas nilai tukar terhadap ekspor produk elektronik Indonesia (HS 847160, 847170, 847330, 850610, 852190, 852540, 854219) dan sekaligus melihat hubungan antara pendapatan nasional negara mitra dan nilai tukar riil terhadap ekspor produk-produk tersebut. Metodologi yang digunakan adalah analisa data panel atas nilai ekspor tujuh produk elektronik tersebut ke negara-negara mitra dagang utama. Hasil penelitian menunjukkan bahwa volatilitas nilai tukar memberikan pengaruh yang berbeda terhadap nilai ekspor masing-masing produk sesuai dengan karakteristiknya.

Kata kunci : ekspor, volatilitas nilai tukar, data panel, produk-produk elektronik

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CHAPTER I
INTRODUCTION

1.1 Background of the Study

Following the 2006 export performance that exceeding US$ 100 billion records in total, Indonesia's export in 2007 grew 13.99 percent that reaching US$ 118,014 million. Oil and natural gas export contributes US$ 22,496 million with 21.74 percent growth rate y.o.y where the rest comes from the export of non-oil commodity that grew 15.59 percent y.o.y. For the share of contribution of non-oil export commodity, the ranks are industrial, mining/minerals and agricultures with its share of 84.8; 10.3 and 4.9 percent. As for the growth, agricultures grew 31.11 percent followed by industrial 20.18 percent and mining/mineral sectors -15.72 percent. The increasing total export growth of Indonesia in 2007 is quite an achievement for the relatively lower world output growth, 4.9 percent compare to 5.0 percent in 2006, indicating a tighter world market competition especially in major countries.

However, it has been expected that Indonesia's export performance will be facing more challenges. The growth of the world economic still decelerated 4.1 percent respectively and the ongoing pressures on world commodity price is still being continued in the coming year. Luckily, despite several constraints that might depress the export performance, Indonesia still have remedial conditions. Targeted export countries has been diversified where weaker export demand from developed countries being compensate by the increasing demand from emerging markets such as China, India and Eastern Europe. The price of oil and natural gas is also expected to be relatively high.

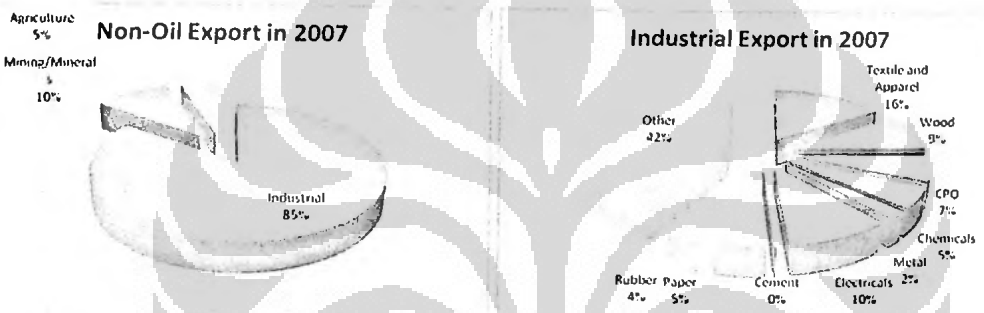
The role of industrial sector is dominant for the overall Indonesian economy for its contribution above the agricultural sector reaching up to 27.1 percent of GDP in 2007, higher than pre-crisis era where its highest contribution accounted only at 22.9 percent. The industrial sector [1] accounted domestic

[1] The Ministry of Industry clustered industries into 32 sectors where 10 of it are core industries. The 10 core industries clusters include Food and Beverage; Fishing; Textile and textile products;

investments 101 projects with the invested value of Rp. 26.3 trillion in 2007 compare to 98 projects of Rp. 13.1 trillion in 2006. As for the foreign direct investment it accounted a number of 361 projects with the value of US$ 3.60 billion in 2007, a slight decrease compare to 2006's 390 projects with the value of US$ 4.70 billion. Significant number of manpower also have been employed where a number of 12.37 million people being absorb in 2007, an increase of 214,906 than in 2006. The total number of companies/firm in 2007 is reaching 3.22 million units of companies, an increase of 463,000 companies for the last ten years.

Figure 1.1

The Contribution of electronics to Export



Source: Bank of Indonesia, Analyzed

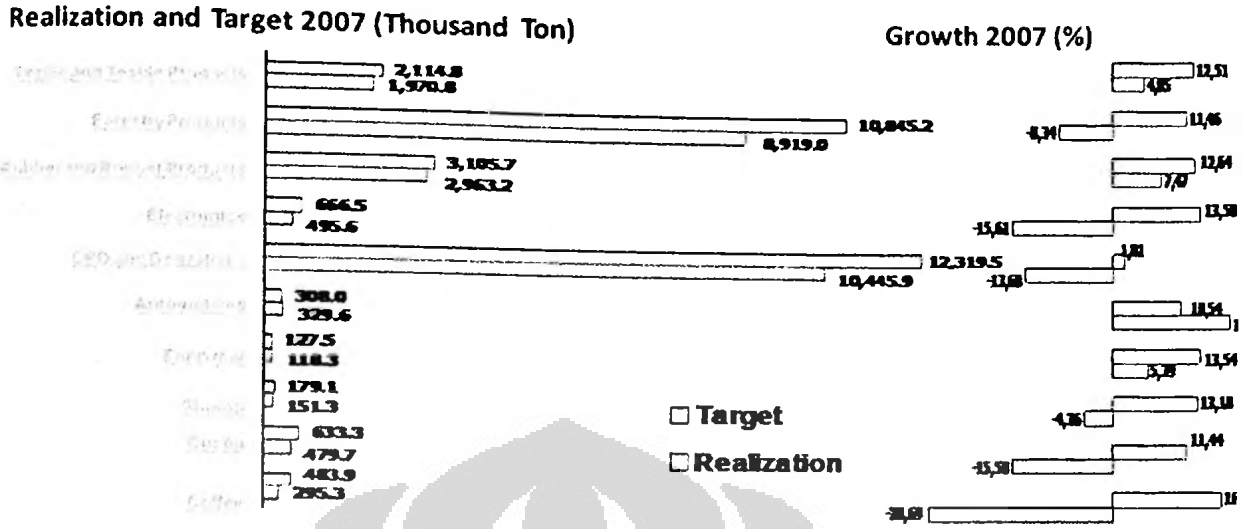
Regarding the exported products, the ministry of trade put extra concern on several products that classified into main products, potential products, and creative products[2]. The main products have significant contribution to non-oil and gas export for its 48.6 percent share mainly driven by comparative advantage in natural resources and considerably important in absorbing labor force. The world economic slowdown decreases the demand for the main products where the export growth of is accounted 8.5 percent which lower than 12.7 percent of 2006. Therefore, the growth is mainly driven by the increasing prices of the exported commodities.

Footwear; Palm oil; Timber; Rubber and rubber-based products; Pulp and paper; Electrical machinery and equipment; and Petrochemical.

[2] Principally, every product is important, but only few can be given specific attention. The main products includes, Textile and Textile Products; Forestry Products; Rubber and Rubber Products; Electronics; CPO and Derivatives; Automotives; Footwear; Shrimp; Cocoa and Coffee. The potential products includes Processed Food; Jewelry; Handicrafts; Fish and Fish Products; Spices; Leather and Leather Products; Medical Equipment; Office Equipment; Essential Oil; and Medicinal Herbs.

Figure 1.2.

The Performance of Main Export Commodities

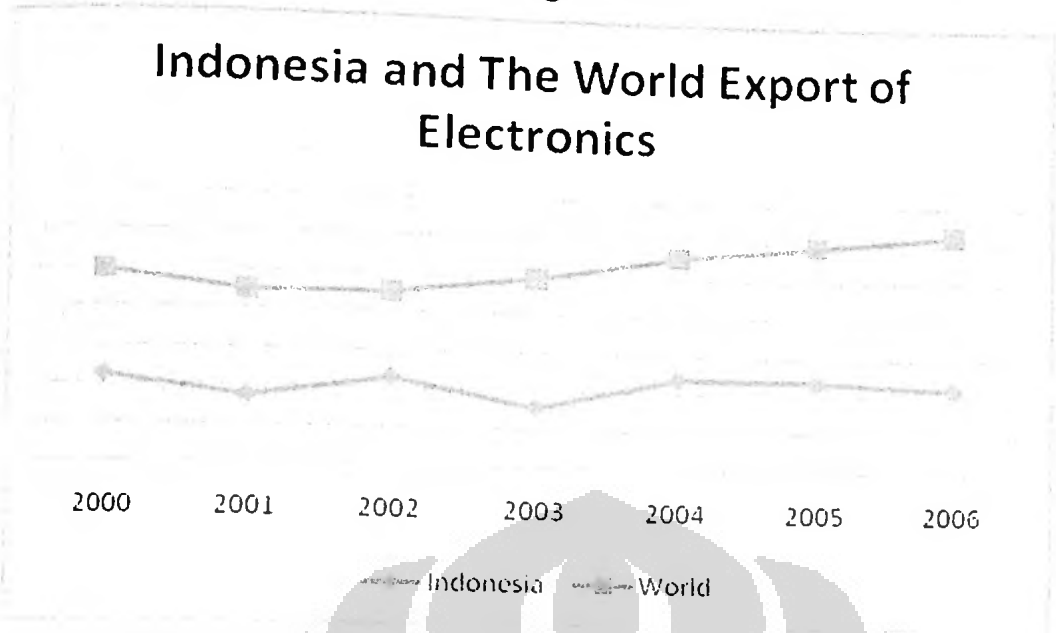


Source: Ministry of Trade, 2007

Automotive and Electronics are the notable sectors in the main products. The automotive grew 26.82 percent in value and 18.26 percent in volume which mainly driven by three factors: increase in domestic and foreign investment; duties exemption on import of automotive for export purpose; special facilities (a car terminal) is being operated in Tg. Priok harbor; and expectation regarding the Japan Indonesia Economic Partnership Agreement (JIEPA) signing. The electronics, however, is rather had a disappointing export performance. Its export value and volume contracted 8.10 percent and 15.61 percent than previous year. It seems that increasing investment is more domestic market oriented. Other negative driven factors are the outdated technology being implemented in the national industry (TV production); the "short" life cycle of electronics products; bad infrastructure that hindered on time delivery; and the application of luxurious goods value added tax.

The disappointing performance of electronics is also can be seen through its comparison to the world export of electronics. Although it is considered fluctuated during 2000-2003, it have a stagnant growth relative to the world since 2003.

Figure 1.3.



Source:UN-COMTRADE, analyzed

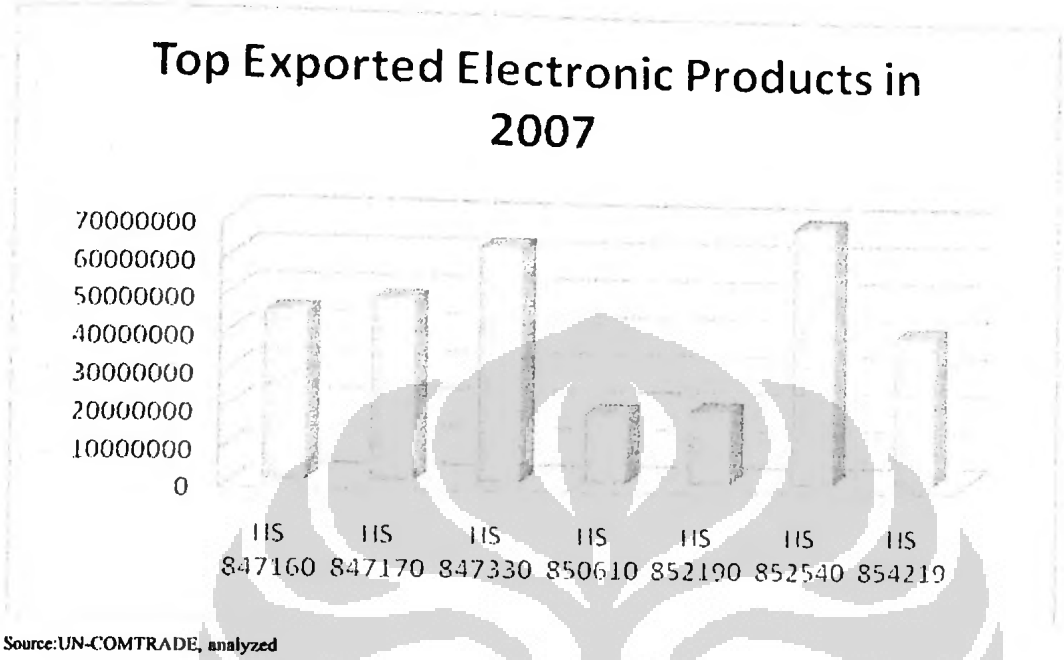
Among hundreds of 9-digits HS classification regarding electronic products, the Ministry of Trade identifies eight 9-digits HS that have the highest export value[3]. The products are from all of the industrial classification that includes:

a. Consumer appliance. HS 850610 which is manganese dioxide cells and batteries, excluding spent; HS 852190 which are aerial reflector and parts, that also includes antennas and reflector of any kind; and HS 852540 which are still image video camera and other video camera that also includes security camera.
b. Industrial/Business. HS 847160 which is input or output units for personal and microcomputer that also considered as computer peripherals such as keyboards, scanners and printers; HS 847170 which are storage units for digital automatic data processing machines that includes in automatic data processing machines and units along with 847160.
c. Components and parts. HS 847330 which are parts and accessories for automatic data processing thereof, magnetic or optical readers, transcribing

[3] For practical reason, the 8-digits HS products widen into 6-digits so that data continuity problems can be avoided (quarterly analysis) and more partner country can be analyzed. In fact, one product (HS 854219) must be excluded from the research since it's contains severe data continuity problems. Table Presented in the Appendix

machine, etc., nesoy that including parts of typewriter and other office machines; HS 854219 which are monolithic integrated circuits, digital, nes.

Figure 1.4.



Source:UN-COMTRADE, analyzed

According to Batiz & Batiz (1994), possible macroeconomics factors that affected international trade are the terms of trade, income of partner countries and the exchange rate fluctuations. Several researches had been conducted in other countries which also resulting in an inconclusive effect of the exchange rate to trade. Debate arises regarding the mixture result of the true effect of it. Cote (1994) summaries it and proposed reasons for the debates which are that, there are possibilities to off-set exchange risk through hedging instruments; there are problems in designing and implementing the methodology and; empirical uncertainty is caused by the methods in measuring exchange rate volatility.

One interesting study is performed by Clark (1973) with its basic uncertainty model based upon firm behavior that being aggregated. The study develop by Baron (1976), Hooper-Kohlagen (1978), Cushman (1982) and Stockman (1995). Their suggesting that exchange rate volatility negatively affected trade since its induce risk premium in price mechanism in the firm level.

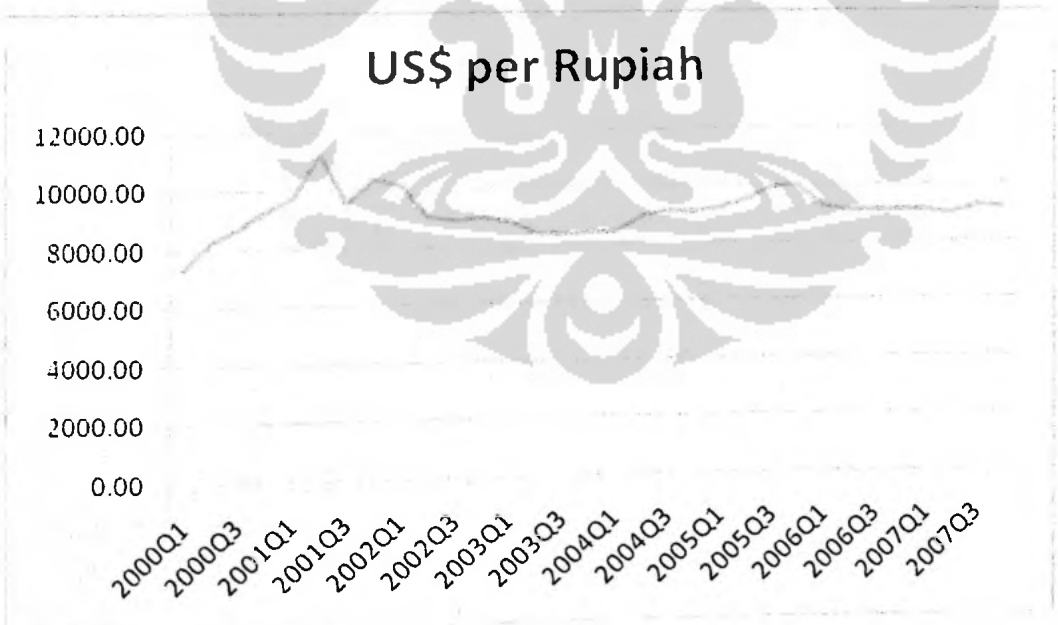
The exchange rate issue in its conjunction with the economic performance especially in international trade is given a big attention nowadays. The forming

European Currency Union (ECU) is a good example. European countries view exchange rate risk as one of their major disturbance in performing international trade activities. Hence, uniting the currencies reduce the risk related to currency exchange.

Indonesia itself have tried to dealt with the exchange rate risk through implementing the fixed exchange rate regime in 1978 and turns to the manage floating exhcange rate regime during 1979-1997 that resulting in a steady and promising export growth in the period. However, Indonesia forced to switch to the flexible exchange rate regime when the 1997 economic crises struck that depriving the country' foreign currency reserves. The significance of the exchange rate issue in Indonesia has been shown through several analyses. Gultom (1997) states that before the switching of the exchange rate regime, the fluctuations of exchange rate did not have a significant effect to trade. Susilo (2001) states that in the long-run, the fluctuations of real exchange rate have a significant effect to non-oil real export while it is considered uncertain in the short-run term.

Figure 1.5.

The Movement of Rupiah to US$



Source: Bank of Indonesia, Analyzed

As being explained throughout, this research will be focused upon export as a dependent variable since it is the most important part in a countries economic development, despite of import or even trade balance as a whole. Increasing export promises extra gains in the open market. As for the factors that might

This chapter explains of the background of the study, objectives of the study, research coverage, and structure of the thesis.

CHAPTER II : INDONESIA'S ELECTRONIC INDUSTRIES

This chapter will explain the electronic industries in Indonesia, its recent conditions, exports and related policies.

CHAPTER III : LITERATURE OF THE STUDY

This chapter will explain the literature of the study that related on the topic and also the previous studies that concentrate on the topic.

CHAPTER IV : RESEARCH METHODOLOGY

This chapter will present information of the model specification used in this study and it will be discussed research methodology such as the characteristic of the data and the source of the data.

CHAPTER V : RESULT AND ANALYSIS

This chapter will explain panel data estimation and the analysis of estimation result will be present.

CHAPTER VI : CONCLUSION AND RECOMMENDATION

In the last chapter, it will present conclusions, policy implications and the recommendations for further study.

affecting export, writers is encourage to find out whether increasing income of trading partners, relative price, depreciation of exchange rate, and the volatility of exchange rate plays significant role.

1.2 Objectives of the Study

This research is intended to analyze the relationship of exchange rate volatility to the export of electronic product of HS 847160, 847170, 847330, 850610, 852190, 852540 and 854219 that have the highest export value. Furthermore, this research also consider main factors that affected export which are the GDP of trading partners and the real exchange rate. Hence, the research intention leads to these questions:

a. How does the volatility of exchange rate affect the export of HS 847160, 847170, 847330, 850610, 852190, 852540 and 854219?
b. How do the GDP of trading partners and the real exchange rate plays its role to the export of such product?

1.3. Research Coverage

This study covers electronic export of Indonesia. In purposely, the data of electronic export is based on Harmonized System (HS) Code of HS 847160, 847170, 847330, 850610, 852190, 852540 and 854219. The data were collected by using secondary data from the documents of the Ministry of Trade, Ministry of Industry, Indonesian Central Bureau of Statistics (BPS), Ministry of Industry, UN-COMTRADE and IMF-International Financial Statistics. The period covered in this study is 2000 to 2007. This study did not considered the effect of domestic demand, the level of technology and the production sharing/vertical integration to the export of Indonesia's electronic products.

1.4. Structure of Thesis

This thesis is divided into six chapters. In specification of each chapter is as follows:

CHAPTER I : INTRODUCTION

CHAPTER II
INDONESIA'S ELECTRONICS INDUSTRIES

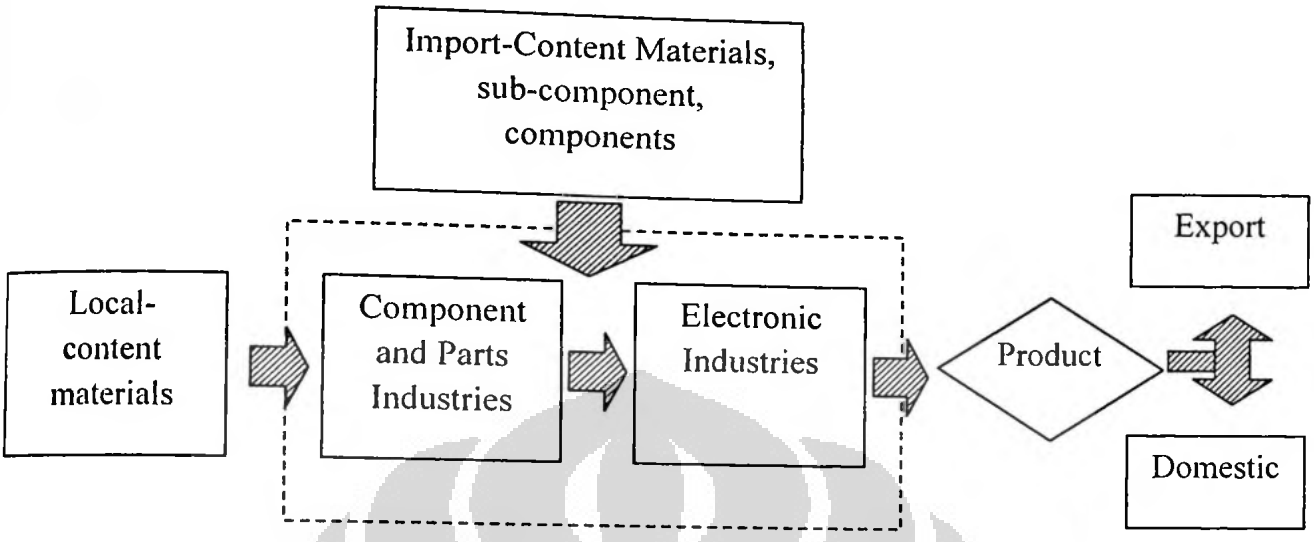
2.1. Recent Condition of Electronic Industries

The electronic industries are key sector for the electrical machinery and equipment industrial cluster, in terms of export share, for its 87.75 percent contribution in its cluster or 9.58 percent of the whole manufacturing sector where it main export destination are USA 21.9 percent, Japan 14.3 percent and Singapore 10 percent. It accumulated a total investment of US$ 481 million with total production value of Rp. 87.39 trillion, employing around 235,000 workforces and approximately has 60 percent level of industrial utilization.

As for the Ministry of Industry, electronic products is classified into consumer appliance (audio/video, house keeping, electrical lamps and dry batteries); business/industrial (office equipment, control, medical, optical, etc); and components (components and modules, either active or passive, parts, etc). World class players such as Panasonic, Sanyo, Toshiba, LG and Samsung that operates manufacturing factory in Indonesia encourage local players in developing supporting industries and local-brand.

Indonesia has advantage point for electronic industries such as the availability of certain mineral sediments that is useful in making electronic components, and manpower availability as the result of several technical institutions. Along with it, several constraints also exist. Road and seaport physical infrastructure, research and development climates, the need for precision mould and dies machinery that support the industries, principal license based production, and outdated technology level are few to mention.

Figure 2.1
Indonesia's Electronic Industry Scheme



Source: Roadmap IATT, MOI

The flow of goods or, products in the electronic industries can be seen from the figure above. Input materials for production can be either local, or, imported in the form of raw materials, sub-component and component. The electronic industries itself divide into two core industry which are the component and part industries, and the electronic industries which produce either consumer appliance or industrial/business electronics. Products of components and parts industries can either be used on the domestic upper level of industries, or, directly exported to be assembled overseas which is known as the case of international production sharing.

This international production sharing, or in particular vertical integration, in electronic sector is stated by Nordas (2005) who's found that Asia has become the global supplier of parts and components of electronics, and to some extent also finished good electronics. This fact is due to the mass customization in the many electronic productions that meet the consumers demand. The transportation cost is also has rendered significantly to the weight to value ratio of the transported components and parts.

2.2. Related Policies

Several points regarding Indonesia's trade policy and its recent condition are summarized in the following statement. High cost economy which is common in developing countries is dealt by Indonesia through maximizing information technology to reduce red tapes and provides general guidelines regarding trading procedures. Distribution efficiency regarding the flow of goods is to be improved by dealing with physical (road and seaport facilities improvement and maintenance) and institution (custom practice reformation, business competition governance, etc) infrastructure problems. Competitiveness of exported product is to be improved through more frequent exhibition, credit scheme either for production or trade, and brand building. The role of SME is also to be improved through the implementation of capacity building and public education program. Brief summary regarding electronic industries and its products is presented in the following explanation.

a. Export

   The ongoing policy regarding with export is that electronics component is classified into products that can freely be exported. The only condition is that companies or firms engage in export activity should have basic registration requirements such as the listed companies/firms registration and the operational/activities registration.

b. Controlling import.

   In order to control import the import of electronics especially depriving illegal import certain measures has already been taken such as: restriction on imported entry point where import can only be performed by registered importer on Tg. Priok harbor, Tg. Perak harbor, Belawan harbor, Makassar harbor, Soekarno-Hatta and Juanda Airport; implementing the Industrial National Standard in order to maintained the quality of the imported products.

c. Import duty relieve on imported material or intermediate goods.

   In order to enhance the competitiveness of electronic products either domestically or internationally, the import duty relieve policy has been

implemented where products that considered as input materials for electronic industries imposed 0 percent import duty.

d. Relieve of domestic luxurious value added tax

The imposing of luxurious value added tax for domestically produced electronic products reduce the competitiveness for domestically produced electronic products. Relieve of such taxes is still under discussion between the Ministry of Finance and at other side is Ministry of Industry and Ministry of Trade.

e. Bounded zone

In order to enhance the flow of goods, several bounded zone has been formed in Indonesia such as Batam, and Cakung-Cilincing. Special treatments that have been applied in these bounded zone such as: easier custom procedure, value added tax relieve in line of production, etc, has proved to increase the number of firms either domestic or foreign-owned; foreign direct investment and export.

f. International cooperation

Indonesia also engages in international trade cooperation. Multilaterally, Indonesia is an active member of the WTO. Regionally, Indonesia took part through the Association of South East Asia Nation (ASEAN) where in the ASEAN Economic Community, Indonesia is fully engaged in the agreements related with goods, mutual recognition, custom procedures and the ASEAN single window while only partial involvements in services and investments. ASEAN China Free Trade Agreement (ACFTA) and ASEAN Korea Free Trade Agreements (AKFTA) provide trade facilitation in goods. India, Japan, Australia and New Zealand are the next promising partner where agreements are still in negotiation. Bilaterally, Indonesia has an agreement with Japan through JIEP.

g. Tariff Harmonization

Since 2006, Indonesia launched a medium tariff harmonization program aims at moving toward a low and uniform tariff and specified a tariff reduction

schedule between 2005 and 2010. The schedule states that 94 percent of all tariff lines would have rates at or below 10 percent while the remaining 6 percent of tariff lines, which related with sensitive sectors, would have their rates reduced to 10 percent in 2010. There are non tariff measures were considered very few and most of it are for agricultural products.

2.3. Export of Electronics

According to Directorate General of Foreign Trade, the Ministry of Trade, Indonesia's electronic have a positive export trend of 1.55 percent during 2003-2007, where from its classification the industrial/business electronics accounted the highest export trend of 9.98 percent whilst the consumer appliance 0.82 percent and component and parts electronics -1.87 percent.

Table 2.1.
Electronic Products with the Highest Export Value
2003-2007

In US$

Description	2003	2007	Trend 03-07 (%)
1. Consumer Appliance	**2.061.159.159**	**2.212.318.979**	**0.82**
852540-Still Image vid.cam	347.095.244	691.366.697	14.63
852719-other rec. app for radio	4.861.895	355.897.445	79.65
852190-other rep. app	255.336.849	197.444.844	-6.30
850610-mangenese diox batter	140.214.518	189.244.860	9.07
2. Industrial/Business	**1.238.083.710**	**1.781.687.347**	**9.98**
847170-other storage	3.131.393	476.905.087	206.51
847160-input and output	240.311.539	444.046.523	67.58
3. Components and Parts	**3.495.313.228**	**3.334.363.156**	**-1.87**
854219-other monolithic IC	123.655.927	400.250.092	25.40
847330-parts and acc of 8471	360.786.785	396.383.047	-1.37

Source: Central Statistical Agency, analyzed

Each of the electronic products presented above fluctuate in their export performance year on year. Product with the most stable export growth is HS 847170-other storage for automated data processing. The fluctuating export performance can be seen in figures 5.1 at chapter 5.

As for the major export destination of Indonesia's electronics, Singapore is ranked the first with its share of 37.28 percent in 2007 follow by Japan 11.81 percent and USA 8.04 percent. Regarding with competitors, China P.R, Japan, USA and Singapore are the main competitor for Indonesia's export of electronic products.

Table 2.2

Major Export Destination of Indonesia's Electronics

In US$

No.	Country	2003	2007	Trend 2003-2007 (%)	Share 2007
1	Singapore	2.028.604.762	2.732.006.474	5,58	37.28
2	Japan	952.887.316	865.513.464	0,16	11.81
3	USA	937.181.355	588.982.677	-1,62	8.04
4	Hong Kong	294.878.751	377.051.469	8,21	5.15
5	China	139.748.083	343.381.098	13,24	4.69
6	Germany	200.092.989	217.969.087	0,24	2.97
7	Belgium	177.492.430	216.075.584	1,05	2.95
8	Malaysia	362.558.816	207.485.805	-1,60	2.83
9	Netherland	174.326.484	181.415.482	6,29	2.48
10	South Korea	117.099.869	152.480.989	-1,16	2.08
11	Others	1.409.685.242	1.446.007.353		19.73
Total		**6.794.556.097**	**7.328.369.482**	**1.55**	**100.00**

Source: Central Statistical Agency, analyzed

2.4. Product characteristics

2.3.1. Consumer appliance electronics

a. HS 850610 products

By definition, it consists of products of manganese dioxide cells and batteries[1].

b. HS 852190 products

By definition, it consists of products of video recording or reproducing apparatus; combined recording and reproducing apparatus incorporating an image and sound editor, operating with discs, magnetic, optical or opto-magnetic media

[1] Description for each product that classified into the Harmonized System (HS) is provided by the UN-Statistic division. However, in this study the description is taken from www.asycuda.net that also refer to the UN-Statistics but with minor changing intended to give a more clear description.

c. HS 852540 products

By definition, it consists of products of still-image video cameras and other video camera recorders; digital cameras

2.3.2. Business/industrial electronics

a. HS 847160 products

By definition, it consists of products of input or output units for digital automatic data-processing machines, whether or not containing storage units in the same housing; keyboards; pointers (mouse, trackball, etc.); digitizing tables; units with monochrome video monitor; units with color video monitor; automatic bank surveillance terminals (computers, notebooks, laptops, palmtops, prints)

b. HS 847170 products

By definition, it consists of products of storage units; units for floppy disk; units for fixed disks, with one head disk assembly (HDA); units for read only; units for cartridge, units for cassette (computers, notebooks, laptops, palmtops)

2.3.3. Components and parts

a. HS 847330 products

By definition, it consists of products of parts & accessories for automatic data-processing machines or for other machines of heading 8471; machines incorporating a power supply, including those with digital displays; head disk assemblies (HDA) for fixed disk unit; positioning arms for magnetic head; magnetic head; magnetic tape transporter; mother boards; storage modules of a surface area not exceeding 50 cm^2; microprocessor modules with cooling devices, whether or not in cartridge; memory card; color displays for portable micro-computer

b. HS 854219 products

By definition, it consists of products of other electronic integrated circuits, monolithic, obtained by a combination of bipolar and mos technologies (bimos technology).

CHAPTER III

LITERATURE STUDY

3.1. Theory

This section, along with its sub-sections, provides some theoretical background regarding with export and its relation with GDP, exchange rate and the volatility of exchange rate.

3.1.1 Goods Market in the Open Economy[1]

In making relationship between export and GDP firstly we must review the concept of goods market in the open economy. Demand for domestic goods[2] in the open economy is determine by the level of consumption, investment, government spending and the net export. The first three determinants constitute the domestic demands for goods. Adjustment should be made by excluding imports that acts as parts of domestic demand for goods, and add export as part of demand for domestic goods that comes from abroad.

The import itself is depend upon the level of domestic income and real exchange rate or, $IM = f(\underset{+}{Y}, \underset{+}{\in})$. Higher domestic income leads to higher domestic demands for all goods either foreign or domestic, and an appreciation in real exchange rate will make foreign goods cheaper thus increasing domestic demands for all goods either foreign or domestic. As for export, it depends upon the level of foreign income and real exchange rate, or, $X = f(\underset{+}{Y^*}, \underset{-}{\in})$ where higher foreign income leads to higher foreign demand for all goods either foreign or domestic, and a depreciation in real exchange rate will make domestic goods cheaper thus increasing foreign demand for all goods either foreign or domestic.

Equilibrium in the goods market reached when domestic output equals

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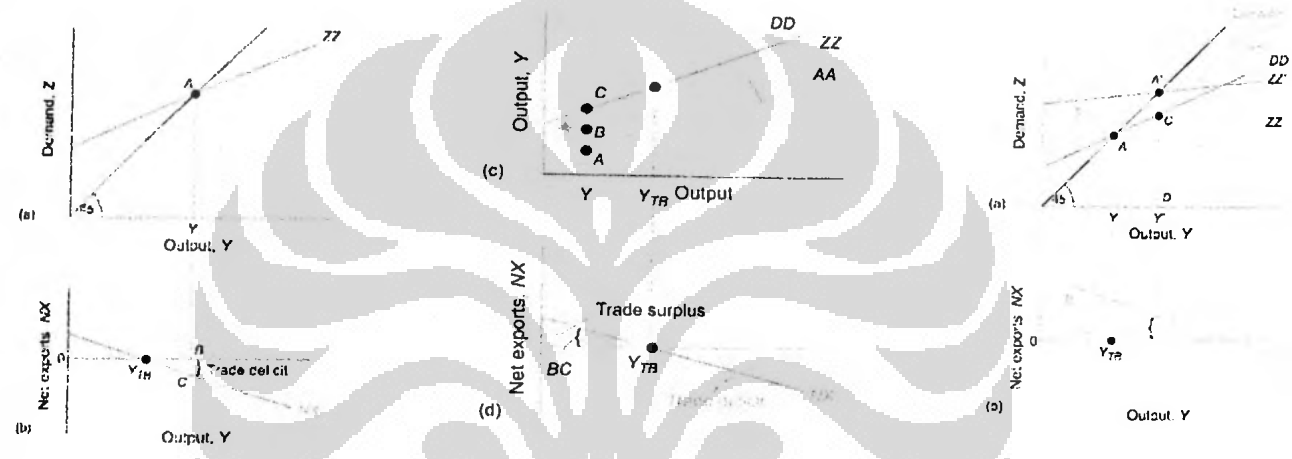
[1] Blanchard (2006)

[2] $Z \equiv C + I + G - IM/\in + X$ where C represents consumption, I investments, G as government spending, IM as import, X as export and $\in$ as the real exchange rate

with the demand for domestic goods[3], either foreign or domestic. In the following figure {the left part figure – panel (a)} we plot ZZ as demand function that is being a function of output where A represents the associated output level Y. Then in panel (b) we plot net export as a decreasing function of output. BC therefore represents the trade deficit.

Figure 3.1

Demand for Domestic Goods and Net Export



Source: Blanchard (2006)

Moving on to imply the effect of export and import to the economy we could pay attention to the centre part of figure 3.1. At this stage, the domestic demand for goods (DD) is subtract by imports that being represented in the AA line {in panel (a)} as domestic demand for domestic goods. Therefore distance between DD and AA is the import value or, $IM/\in$. Then we add exports that shift the AA line upward to ZZ. The ZZ line represents demand for domestic goods. We can state that at the output level of Y, exports are represents in the distance between AC while imports of AB, so net exports are represents by BC. The net export itself is represented by NX line at the lower centre part of figure 3.1. where net export is decreasing function of output. If output increase, export is not affected while import increase, then next export decrease.

[3] $Y = Z$ and considering the relation with the components of demand for domestic goods we get $Y = C(Y-T) + I(Y,r) + G - IM(Y,\in)/\in + X(Y^*,\in)$

Supposedly we have an increasing in foreign income then its effect to net export can be seen at the right part of figure 3.1. The initial domestic demand for goods is represent by ZZ. The equilibrium is at point A where we have the Y_{th} at the output level Y. An increase in foreign income will leads to increase of foreign demand that part of it will be fulfill by domestic goods that represents in the increasing exports ΔX, while imports unaffected. We can see that domestic output is increase since the ZZ line shift into ZZ' where the new equilibrium point is at point A' at the output level of Y'. It can also be seen that although increasing domestic output causing the import to increase it does not offset the increasing export since $\Delta NX > 0$. Therefore it can be stated that the effect of increasing foreign income is positive to export.

3.1.2 The Marshall-Lerner Condition

The Marshall-Lerner explanation is based upon Blanchard (2006) regarding the relationship between depreciation and the trade balance. The Marshall-Lerner condition is the condition under which a real depreciation leads to an increase in the net exports. In order to derive this Marshall-Lerner Condition, firstly we recalled the concept of net export, where:

$$NX \equiv X - IM/\in \quad \text{.....eq. (3.1.)}$$

With the assumption that trade is initially balance ($NX = 0$), we multiply both sides of the equation with $\in$ to get:

$$\in NX = \in X - IM \quad \text{.....eq. (3.2.)}$$

Supposedly there is a change in real exchange rate of $\Delta \in$ then the effect of the changing of real exchange rate is:

$$\in (\Delta NX) = (\Delta \in)X + \in (\Delta X) - (\Delta IM) \quad \text{.....eq. (3.3.)}$$

Then we divide both sides with $\in X$ to get:

$$\frac{\in (\Delta NX)}{\in X} = \frac{(\Delta \in)X}{\in X} + \frac{\in (\Delta X)}{\in X} - \frac{\Delta (IM)}{\in X} \quad \text{.....eq. (3.4.)}$$

Since trade is initially balance, then we can replace the last term of the right equation with $\in X = IM$ that will result in:

$$\frac{\Delta NX}{X} = \frac{\Delta \in}{\in} + \frac{\Delta X}{X} - \frac{\Delta IM}{IM} \quad \text{.....eq. (3.5.)}$$

We can see that the change in the trade balance in response of to real depreciation is equal to the proportional change in the real exchange rate, proportional change in exports and minus proportional change in imports. If the sums of these three terms positive, then the Marshall-Lerner condition is met where real depreciation leads to the increase of net exports.

Therefore, real depreciation makes domestic goods cheaper abroad thus increasing foreign demand for domestic goods.

3.1.3. The exchange rate volatility

Did exchange rate volatility have effect to international trade? Well, the effect of exchange rate volatility to international trade is still being discussed by some economist due to it's considerably ambiguity effects. Even the existing theory did not provide a satisfying answers regarding whether exchange rate volatility depress international trade. The analysis of exchange rate volatility itself is based upon the producer theory of firms under uncertainty.

As being stated by Cothe (1994) basic uncertainty trade model developed through several studies. Clark (1973) developes a model regarding an exporting firm that produces under the condition of perfect competion that can sold its products entirely abroad. Several assumption regarding Clark's model are firms did not use imprted inputs, being paid in foreign currency where hedging is limited, and output is constant throughout. The uncertainty regarding exchange rate arise from the future exports receipts in domestic currencies. Therefore firms need to decide the level of export that can compensate the uncertainty. Supposedly a risk-averse firm want to avoid the risk exposure, they would reduce reduce sales that surely reduce profits but would have an increasing in its utilization.

Baron (1976) dealt with the perfect competition assumption in analyzing the volatility effect on prices through highlighting the role of invoicing currency. These invoicing currency issues can be divided whether its on foreign or domestic. If its on the foreign currency, than the exporter would face price risk where the quantity demanded is known but its revenue or profits considered uncertain. But, if the invoices issues in the home currency than the exporter would have to face quantity risk, where the price is uncertain therefore the along with revenue, the cost of production is uncertain. Risk-averse firm will make anticipative measures but it will differ in the price effects. If the price risk arise from invoicing in foreign currency, firms will increase its price that will reduce the expected profit but increases the expected utility. If the quantity risk being faced, than it would depend on the demand function on the destinated country. If it is linear, than the price will decline that will lead to increasing demand but reduces the profit.

On a bilateral framework, Hooper & Kohlagen (1978) analyzed the effects of echange rate volatility that solely comes from the nominal exchange rate. Deriving the supply and demand function for individual firm that being aggregated in order to obtain a reduced form equation of price and quantity at the market equilibrium, they presented that the key parameter in their model are currency denomination of the contracts, proportion of forward hedging and relative degrees of exporter and importer' risk aversion. The exchange rate variability affects only the portion of profits that is not being hedged. The model is being divided into the demand and supply model. Key terms regarding on the first model is that import is used as input for production, with a certain proportion and that goods being produced is sold entirely in domestic markets (importer's view). The importer assumed to be a price taker with a certain demand curve regarding their product, therefore an increase in volatility will affects the structure of the profits which leads to the shifting of demand curve downward that resulting in a decline in quantity and price. As for the supply model that comes in a monopolistic market framework, it is assumed that exporter are selling all of their production abroad. Thus, the increasing of volatility will contracted the supply curve that leads to the reducing in quantity and increasing in price. Further notes

regarding of Hooper-Kohlagen reduce form model is that exchange rate volatility clearly show negative relationship to the volume of trade, though the price effects is considered ambiguous. This ambiguous effect is depends upon whether the importers or exporter that bear the risk. If it is on the importer than trade price will decrease along with the downward shift of demand curve. But if it is upon the exporter, price will increase since exporter will charge extra risk premium.

Nevertheless, these days policy makers regards the volatility of exchange rate as major policy considerations due to its significant impact to the economic condition, such as:

a. Inflation, the exchange rate will affected price index regarding with imported products, domestic products with high import-dependent components, etc
b. Financial Assets, the exchange rate will affected returns of trans-national asset that denominated in different currencies
c. Current Account, the exchange rate will affected the relative price of import or export (depend on its elasticities) thus affecting the trade balance
d. Balance Sheet, the exchange rate will affected private or public loan to the rest of the world that usually denominated in US$ while its return denominated at local currencies.

Recalling the concept of PPP that can be stated as:

$P_t = S_t..P_t^*$ .....eq. (3.6.)

Where P_t represents the domestic price index, P_t^* as foreign price index, and S_t spot exchange rate of domestic to foreign currencies.

The absence of arbitrage will result in

$(1 + \bar{i}_{t+1}) = (1 + \bar{i}^*_{t+1}).E_t.(1 + \bar{\varepsilon}_{t+1})$..... eq. (3.7)

Where

$(1 + \bar{\varepsilon}_{t+1}) = \frac{S_{t+1}}{S_t}$, and if $\frac{S_{t+1}}{S_t} > 1$ as the nominal depreciation, and if $\frac{S_{t+1}}{S_t} < 1$ as nominal appreciation.

The eq.(3.7) is known as the *Uncovered Interest Parity Condition* or UIP[4] since the exchange rate at $t-1$ was not predetermined and fluctuated over time.

Supposed we want to stabilized the exchange rate at $t-1$ (hedge measures) with the cost of $F+1$ then we will have the *Covered Interest Parity Condition*, that can be stated as:

$$(1 + \bar{i}_{t+1}) = (1 + \bar{i}^*_{t+1}).\frac{F_{t+1}}{S_t} \quad \text{..... eq.(3.8)}$$

Apllying natural logarithm to *UIP* will result in:

$$i_{t+1} = i^*_{t+1} + \text{Et.}(s_{t+1}) - s_t \quad \text{.....eq. (3.9)}$$

Considering Cagan's Money Demand Model:

$$m_t - p_t = -\eta i_{t+1} + \omega y_t \quad \text{.....eq. (3.10)}$$

then PPP with natural logarithm will result in:

$$p_t = s_t . p^*_t \quad \text{.....eq. (3.11)}$$

If eq.(3.11) being substituted into eq.(3.10) and (3.9), and if $z_t \equiv m_t - p^*_t + \eta i^*_{t+1} - \omega y_t$ will result in

$$s_t = \frac{1}{1+\eta}.z_t + \frac{\eta}{1+\eta}.\text{Et.}(s_{t+1}) \quad \text{.....eq. (3.12)}$$

Iterations performed on to eq.(3.12) following the expected iteration will result in:

$$s_t = \underbrace{\frac{1}{1+\eta}\sum_{s=t}^{\infty}\left(\frac{\eta}{\eta+1}\right)^{s-t} E_t(z_s)}_{\textit{fundamental value}} + \underbrace{\lim_{T\to\infty}\left(\frac{\eta}{\eta+1}\right)^{T} E_t(s_t+T)}_{\textit{Bubble speculative}} \quad \text{.....eq. (3.13)}$$

[4] Linking the exchange rate and the international interest rate differentials with the formula of $\frac{e_{t+1} - e_t}{e_t} = i - i^*$, where e_t represent the exchange rate, i as domestic interest and i^* as foreign interest. The term "uncovered" is because e_{t+1} is unknown.

therefore, the exchange rate determined by fundamental value z_t that consist of money supply demand m_t, foreign interest rate ηi^*_{t-1}, foreign price level p^*_t and domestic output ωy_t.

The Fundamental Solution

Through the fundamental solution we will have:

$s_t \sim$ iid $\left(m, \frac{\sigma_k^{\,2}}{(1+\eta)^2}\right)$, which means nominal exchange rate is iid (independent and identically distributed), that eventough the fundamental value (eg. constant money supply) was reach, there is no guarantee that the spot exchange rate can withstand external shock. The fundamental value inherit stochastic properties since S_t is independent and identically distributed (iid) random variable.

The bubble solution

Recalling $z \equiv m_t - p^*_t + \eta i^*_{t-1} - \omega y_t$ for $j \geq t$, where *iid* with 0 means and σ_z^2 variance then with condition of:

$$s_t^f = \frac{1}{1+\eta} \sum_{s=t}^{\infty} \left(\frac{\eta}{\eta+1}\right)^{j-t} E_t(z_j)$$

$$s_t^f = \frac{Z_t}{1+\eta}$$

Then we get:

$$\lim_{T\to\infty} \left(\frac{\eta}{\eta+1}\right)^T E_t(s_t + T) = \lim_{T\to\infty} \left(\frac{\eta}{\eta+1}\right)^T E_t\left(\frac{Z_{t+T}}{1+\eta}\right) = 0$$

Which means $s_t = s_t^f + b_t$ .....eq.(3.14)

Therefore, eventough the fundamental value can stabilized, the bubble's addictive function still exist, thus exchange rate volatility also exist no matter how one maintained the fundamental value. The bubble is an exogeneous variable outside the fundamental value that encourage society in making certain acts which can affected the price level. Bubbles might rise from economic shocks, political decision, overwhelming expectations that misalign with real current condition, and, other unexplainable factors.

3.1.4. The exchange rate volatility to export relationship

This part taken from theoretical research has been conducted by Ekananda (2004). Ekananda, perform his research based the research on Hooper and Kohlagen (1978) that also has been used by Cushman (1983), Akhtar-Hilton (1984), Gotur (1985), Arize (1997), Baum (1999) and Klassens (1999).

3.1.4.1.Export demand model

The supply and demand function derived for individual firms, then being aggregated in order to have reduced-form equation of quantity and price at market equilibrium. Import demand is a derivation of import scheme where import being treated as input in domestic production function. Importers are firms that deal with domestic demand where its output (O) determined by three variables which are: demand function of domestic economy (Y), the price level of other domestic goods (PD), and a derivation price function (P) with the following equation

$$Q = aP + bPD + cY \quad \text{.....eq. (3.15)}$$

For simplication, the model is assumed to have two timeframe, *firstly* firms order goods regarding with its domestic output and classified the order as imported input; and, secondly, firms receive the goods and made payments regarding with the imported input then delivering and receive payments regarding of its own output. Firms dealing with domestic demand flow through the utilization of prts of its imported-inputs inventory and retained the rest for the next period. Therefore, Utilization is an increasing the function of expected earnings and a derivation of standard derivation of the earnings that can be stated below:

$$\max_{Q} U = E\pi - \gamma(V(\pi))^{1/2} \quad \text{.....eq.(3.16)}$$

Where E represent the operator of the expected value, U as total utility, V as variance operator and γ as a relative measures of risk preference. Thus, the earnings of of importers are:

$$\pi = QP(Q) - UC.Q - HP^{*}iQ \quad \text{.....eq.(3.17)}$$

Where UC represents the unit cost (of which labor unit plus unit material cost production), P^{*} as the import price in foreign currencies, i as the ratio of import relative to total output ($q = iQ$ where q is the required import quantity in producing Q), and H as the weighted average of foreign currencies for importers :

$$H = \beta(\alpha F + (1-\alpha)R_1) + (1-\beta)F \quad \text{.....eq.(3.18)}$$

Where $(1-\beta)FP^{*}q$ represents the denominated proportion of importers cost of exchange rate. The total cost of forward market is $\beta\alpha FP^{*}q$. Import proportion in foreign currencies and not being hedge in the forward market is treated as cost $\beta(1-\alpha)R_1P^{*}q$ where R_1 as the expected spot exchange rate at payment due date. $HP^{*}iQ$ then as the total import cost. Earning variance for the importing firms then can be stated as:

$$V(\pi) = [\, P^{*}iQb(1-\alpha)^2\sigma_{R1}^2 \,] \quad \text{.....eq.(3.19)}$$

Where σ_{R1}^2 represents the variance of $1/R_1$. Then the company outputs and import demand then can be determined through the first order condition. Subtituting $\delta P/\delta Q$ from eq.(3.15), for p from eq.(3.16), for $V(p)$ from eq.(3.19) with the assumption that importers are pricetaker in the import market, and deriving eq.(3.16) with Q as the control variable, the first condition order can be met, and through solving the q, will result in import demand function on individual firms as:

$$Q = \frac{i}{2}(aUC + bPD + cY) + \frac{ai^2}{2}p^{*}(EH + \gamma\partial\sigma_{R1}) \quad \text{.....eq.(3.20)}$$

where $\sigma = \beta(1-a)$

It can be seen that an increasing exchange rate volatility *ceteris paribus* will shift demand curve down as much as the level of decreasing income or the increasing level of increasing production cost in the importers firms.

2.4.2. Export supply

In deriving the export supply function that considered quantity demanded for import as imported inputs, several assumptions made such as exporters sell proportions (β) of its total outputs q^* at the price of P^*, and other proportions $(1-\beta)$, at FP^* which denominated in foreign currencies. Thus, the export demand curve will be:

$$q^* = nq = \frac{ni}{2}(aUC + bPD + cY) + \frac{nai^2}{2}P^*(EH + \gamma\partial\sigma R_1) \quad \text{.....eq.(3.21)}$$

It is assumed that exporters maximize their utility which means they would increase the expected earnings function (π^*) and deriving the function of the standard deviation of earning based upon utility function as:

$$\max_{q^*} U^* = E\pi^* - \gamma^*(V(\pi^*))^{1/2} \quad \text{.....eq.(3.22)}$$

Where γ^* is a measure for relative risk aversion for exporter. Then the function of exporters earnings is an analogy for importers, as can be stated:

$$P^* = q^*P^*H^* - q^*UC^* \quad \text{.....eq.(3.23)}$$

UC^* represents the domestically unit production cost of exporters, and H^* can be defined as

$$H^* = \beta + (1-\beta)F\left(\frac{\alpha^*}{F} + \frac{1-\alpha^*}{R_1}\right) = \beta + \alpha^*(1-\beta) + (1-\beta)\frac{F}{R_1} \quad \text{.....eq.(3.24)}$$

It can be seen that H^* shows adjustment to exporter earnings in their local currencies that related to deviation between forward with the next spot value. It is assumed that exporters performs hedging measures at α^* constant proportion of its foreign currencies by selling its forward exchange rate at F value. Based upon

the given variable that can be estimated at date of contract, disregarding R_1, then the variance of exporters earnings is:

$$V(\pi^*) = [P^* q^* (1-\beta)(1-\alpha^*) R]\sigma_{1/R1}{}^2 \quad \text{.....eq. (3.25)}$$

σ_1^2 / R_1 represents the variance of exchange rate $1/R_1$. The export quantity being supplied then can obtained by subtituting π^* of eq.(3.23), $V(\pi^*)$ of eq.(3.25) and deriving eq.(3.22) with respect of output quantity q^*. First order condition of eq.(3.22) will yields a maximimum utility with the level of output at:

$$q^* = (1/\frac{\partial P^*}{\partial q^*})(\frac{UC^*}{EH^* - \gamma^* \partial^* \sigma_{1/R1}} - P^*) \text{, where } d^* = (1 - b)(1-a^*) F \text{.....eq. (3.26)}$$

It can be seen that an increasing of echange rate volatility would reduce export supply on a certain price.

2.4.3. Quantity at market equilibrium

There is a need to derive the import demand of eq.(3.21) in order to obtain the effect of price relative to quantity at a maximum utility. Then the result is being subtituted into the latter equation yielding:

$$P^* = \frac{UC^*}{2(EH^* - \gamma^* \partial^* \sigma_{1/R1})} - \frac{aUC + bPD + cY}{2ai(EH + \gamma \partial \sigma_{R1})} \quad \text{.....eq. (3.27)}$$

and the reduce form of quantity can be presented as:

$$q^* = \frac{ni}{4}(aUC + bPD + cY) + \frac{nai^2}{4}\frac{UC^*(EH + \gamma \partial \sigma_{R1}}{(EH^* - \gamma^* \delta^* \sigma_{1/R1})} \quad \text{.....eq. (3.28)}$$

It can be seen from eq.(3.27) and eq. (3.28) that equilibrium price and quantity is affected by the exchange rate volatility being dealt by exporters and importers.

An increasing in the price of imported inputs will increase the pressure to export as a result of increasing exchange rate volatility. It can also be stated that an increasing in elasticity of demand for importers outpout, *a*, would increase the importers elasticity of demand of tradable goods, and also increase the effect of exchange rate volatility to export (in nominal term). Assuming that unit cost of

exporters and importers remains over time, the reduce form of quantity and price at equilibrium can be stated as:

$$q^* = (\overset{+}{Y}, \overset{+}{PD}, \overset{-}{EH}, \overset{+}{EH^*}, \overset{-}{\sigma_{RI}}) \quad \text{.....eq. (3.29)}$$

In their dissertation, Cushman (1982) and Stockman (1995) developed the model with the assumption that firm utilization depends on real earnings thus disregarding the nominal earnings. Firms are not only focusing on the expected earnings of current contract but also considering possible future contracts. Any possible future contracts might be affected by current investment decision or the level of production. Should any uncertainty arise from such activities will have effect on future trade flow. Cushman (1982) and Stockman (1995) modified the Hooper-Kohlagen Model by forming Y, the exchange rate and its volatility in real terms. PD has been rule out for its use as deflator, EH and EH^* is being replaced exchange rate risk $V^{1/2}$. Thus the variable, expressed in natural logarithm, can be stated as:

$$x = f(y^*, E\{s\}, V^{1/2}\{s\}) \quad \text{.....eq. (3.30)}$$

It can be stated that the real export is being determined by real income of foreign country (positive effect), real exchange rate (positive) and risk/volatility (undetermined effect, can either be positive or negative). Exchange rate depreciation will increase the competitiveness of exported products thus increasing the total export. On the other side, high volatility will increase exchange rate risk thus reducing the total export.

3.2 Previous Studies

Several studies regarding with exchange rate volatility, trade, and manufactured products can be presented below:

3.2.1 Gold Stein and Khan

One of the earliest studies that have been used as a benchmark in making research is the model developed by Goldstein and Khan (1978). Their main research objective is to identify the effects of price volatility to export supply and

demand. They used simultaneous econometric models to avoid bias caused by bidirectional linkage between the quantity and price of export.

Goldstein and Khan doing export research for eight industrial countries during 1955-1970. They develop two models: the equilibrium with the assumption that there is no time-lag in adjusting between export and price each period and; disequilibrium which considered time-lag adjusts.

In the equilibrium model, they find that price and production capacity affects export demand negatively, while income positively. In the disequilibrium model, it gives same results as the equilibrium one in addition that lag export give positive effect for export demand.

Statistically, they cannot determine which method works best. But, disequilibrium model considered being better since it made possible adjustment for excess export or demand.

3.2.2 Khumar and Dhawan

Kumar and Dhawan (1991) research was intended to identified the effects of exchange rate volatility to Pakistani's trade with their main trading partners. They deal with empirical data during 1974-1985.

In their research, calculation has been made separately for each trading partner to determine the effect of exchange rate volatility and other export determinants to the export demand level for each, neglecting the rest of the world. Several finding related with the research are:

a. Log-linier based model specification give better result than linier based.
b. Except for one country, bilateral exchange rate volatility significantly affects Pakistani's export volume to their trading partners.
c. Real exchange rate volatility affect export volume more significantly than nominal exchange rate

3.2.3 Ekananda (2002)

Mahyus Ekananda in his research of the effect of exchange rate volatility to international trade reaches several conclusions, which are:

1. Poissonns-distribution method should be considered in analyzing standard independent variable of export should the econometric model is intended in exploring the variables dynamic-effect of non-oil exports.
2. Types of methods in measuring the exchange rate volatility will greatly affected the resulting effect.
3. The alternative measuring methods resulting in a relatively low significant effect to trade while the moving average measurements with 12-month lag yields a better result.
4. Although serial correlation test indicating that the moving average measurements have a higher serial correlation than the alternative measurements, it still yielding better effect on trade.
5. The exchange rate and exchange rate risk effect on export have certain pattern of effects, such as:
   a. The risk pattern is that in the beginning it will not have a significant effect and gradually decrease until negative. However, starting from 6-month lag it will be positive and constant.
   b. The pattern indicates that analyzing the effect of exchange rate risk with time series data would highly affected by using of lag.
   c. The pattern also provides a solid foundation in analyzing the effect of risk and exchange rate fluctuations on non-oil export products especially for Indonesia'.
   d. Generally, the risk pattern works for all trading partners.
   e. The Rupiah real exchange rate risk mostly generated from its relation with US Dollar, British Pound, and Japanese Yen.
   f. Depreciation has negative effect in less-than-a-year period and reaches its maximum effect on export after 12-month lag.

g. The elasticity of export and import as responding factors of depreciation did not directly affected export as an adjustment period took place.

h. The effect of depreciation on export accelerated more for lesser import-contained products.

i. The existing substitution effect between imported raw products and local one has made Indonesia' international trading vulnerable to the exchange rate risk.

3.2.4 Ekananda (2003)

In its dissertation, Ekananda found evidence that a highly import-contained manufactured product faces different impact to exchange rate volatility compare to its low import-contained ones. The following explanation points out several differentiation of the effect of exchange rate and its volatility either to high or low import-contained manufactured products.

1. The elasticity of exchange rate and its volatility differs for each of commodities export value. The effect may be significant or not at all. Each commodity that has been exported to various countries has its own adjustment period. Existing import on material needed to produce the exported commodity will also affect the export performance itself due to the effect of exchange rate and its volatility.

2. During the manage-floating exchange rate regime, the effect of exchange rate fluctuations to the export value of manufactured commodity did not differs in proportion, either for high import-contained products or for low import-contained ones. Government policies regarding with devaluation and depreciation of the exchange rate is effective in increasing the export of manufactured products at this time.

3. During the flexible exchange rate regime, the effect of exchange rate fluctuations to the export value of manufactured commodity differs in proportion, for high import-contained products or for low import-contained ones. Government has no intervention regarding with the exchange rate

leaving it the industrial capabilities in dealing with it thus resulting with a decreasing of export of manufactured products. Other factor that also contributes to the decreasing exports is the high credit rate, tight bank policy, relatively expensive imported production materials and L/C issuance problems.

4. Two adjustment period measurements have been formulated by Ekananda's research which are the average adjustment period of the effect of exchange rate fluctuations (*ls*) and the average adjustment period of the effect of exchange rate volatility (*lv*), both relative to the export of manufactured products. Estimation results show that there are time differences in the adjustment periods for both high import-contained and low import-contained manufactured products, either in the manage-floating exchange rate regime or the flexible one.

5. Significant differences arise from the estimation result of average adjustment period of depreciation effect measurements (*ls*). In the manage-floating regime, high import-contained exports have longer adjustment periods of 10.21 month lag compared to 7 month of the low import-contained exports. In the flexible regime, high import-contained exports also have longer adjustment periods of 9.81 compared to 5.11 of the low import-contained exports. Differences in the adjustment periods exist because high import-contained industries must reduce a large number of its imported material due to high cost reasons and the lack of capabilities of local material supplier to fill the gap.

6. Adjustment period differences also arise from volatility differences. High import-contained manufactured products experience longer adjustment period in the manage-floating regime of 5.2 month lag in average than 4.29 in the flexible regime. Similar result for the low import-contained where manage-floating needs 8.44 than the 6.97 of flexible regimes.

7. The effect of exchange rate volatility to the export value of the products is also considered uncertain. The effect uncertainties derive from data classifying methods that has been based upon types of manufactured products and its

level import-contained material. Therefore it is suggested that government policies should be based upon analysis of each product classification.

Another implicit point of Ekananda's conclusions is that switching to flexible exchange rate regime, although it is merely external-shock driven, have push the concerning institution (industries, suppliers, banks, etc) to be more efficient. It has been proved by shorter adjustment period between exchange rate regimes for both levels of import-contained exported products.

3.2.5 Aprileny (2005)

Imelda Aprileny in her master thesis performs analysis on the export performance and competitiveness of electronic products. Her conclusions are as describes below.

During 1981-2002,

1. Commodity Performance

Products	Export Growth (avg/yr)	Competitiveness (RCA)
SITC-761	14.2%	0.33%
SITC-762	52.7%	12.24%
SITC-763	64.5%	10.09%
SITC-764	55.4%	-5.14%

2. Determinant Factors

Products	Significant Independent Variables
SITC-761	Real Exchange Rate of Singapore
SITC-762	Real GDP of Singapore
SITC-763	Real GDP of Singapore
SITC-764	Real GDP of Singapore

3. Dummies representing macroeconomics shocks and export-related government policies did not yield significant result at α=5%. Analyzed

government policies include the equity structural-pattern of the electronic industry, the foreign fully-owned business-unit and the import duty reduction in imported electronic materials.

CHAPTER IV

METHODOLOGY

4.1. Model Construction

This study is intended to analyze the relationship of exchange rate volatility to the export value of Indonesia's electronic products. Based upon the research that has been performed by Ekananda regarding the effect of exchange rate volatility to the export of manufactured commodities which implemented the model developed by Hooper-Kohlagen and modified by Cushman and Stockman.

This study will also performed analysis on the effect of exchange rate volatility to export on bilateral framework but with a more disaggregated tested commodities which are 6-digit HS top exported Indonesia's electronic products.

The basic understanding stays where the volatility of exchange rate affects demand through the derivation of the price function. Increasing in volatility will increase uncertainty that will also increase the level of risk. The increasing risk will be shown in the rise in price of the commodity. The increase in price will depress demand.

Recalling the export demand function at eq.(3.30) the model will be as follows:

$$x_t = f(y_t^*, E\{s_t\}, V^{1/2}\{s_t\}) \quad \text{.....eq.(4.1)}$$

The model is expressed in natural logarithm. Since panel data analysis is being applied therefore the model will be:

$$x_{it} = \beta_0 + \beta_1 y_{it}^* + \beta_3 s_t + \beta_3 v_{it}^{1/2} + e_{it} \quad \text{.....eq.(4.2)}$$

Where:

x_{it} = Real export value of Indonesia to country *i* time *t*

y_{it}^* = Real GDP of trading partner country *i* time *t*

$E\{s_{it}\}$ = Bilateral real exchange rate country *i* time *t*

$v_{it}^{1/2}$ = Exchange rate volatility country i time t

Regarding with the expected sign of each independent variable can be seen in the following table.

Table 4.1
The Expected Sign of Independent Variables

Independent Variables	Expected Sign
Real GDP of Trading Partner (y^*)	+
Bilateral Real Exchange Rate ($E\{s\}$)	+
Volatility of Exchange Rate ($v_{it}^{1/2}$)	-

4.2. Data characteristics

This study is performed on a quarterly basis of 2000-2007 time frame This study is intended to analyze the impact of exchange rate volatility to the exports of Indonesia's electronic products. The tested products include seven 6-digits exported electronic products that have highest value during 2000-2007. The tested products include HS 847160, 847170, 847330, 850610, 852190, 852540 and 854219. As for the trading partners, Japan, USA, Hong Kong, Germany, Belgium, Netherland and South Korea have been choose[1]. each of the variable being described below

a. Export

If we combined the given 6-digits products with the Ministry of Industry' industrial classification, then we put them into three different groups which are; The consumer appliance which include HS 850610, HS 852190 and HS 852540

[1] From the ten countries major export destination Singapore and China has been droped for its lacks of macroeconomic data. Malaysia is also being droped for its export data deficiency in many of the tested HS codes.

products; Industrial/Business which include HS 847160 and HS 847170 products; and Components and parts which include HS 847330 and HS 854219 products.

The export is Indonesia's bilateral export value with trading partners that was obtained from UN-COMTRADE. The export value then being deflated by wholesale price index that was obtained from IMF-CDROM. Where the value will be obtained through:

$$x_t = \ln\left(\frac{X_t}{P_t}\right) \quad \text{.....eq.(4.3)}$$

b. Real GDP

Income of trading partner is a traditional factors affecting export that has been prove by various research. Therefore we used the Real GDP of trading partner as proxy of income. The real GDP itself is obtained by dividing quarterly nominal GDP of trading partners with its quarterly deflator. Both of the required data are available in the IMF-CDROM. The real GDP will be obtained through:

$$y_t^* = \ln\left(\frac{Y_t^*}{P_t^*}\right) \quad \text{.....eq.(4.4)}$$

c. Real Exchange Rate

The Real Exchange rate is quarterly bilateral nominal exchange rate of Indonesia to trading partners (S_t). The bilateral nominal exchange rate than being transformed into real value by considering the price index of trading partners (P^*) relative to Indonesia (P). Each of the data is obtained from IMF-CDROM. Therefore we can stated the real exchange rate as:

$$s_t = \ln S_t\left(\frac{P_t^*}{P_t}\right) \quad \text{.....eq.(4.5)}$$

d. Volatility

The exchange rate volatility as a certain measure that would represent the level of risk can be estimated in many ways. Khumar-Dawan (1991) tested the standard deviation, the coefficient of variation, and the moving average standard deviation either for the real or nominal exchange rate. Chou (2000) implemented the GARCH (1,1) model in obtaining the volatility, while Ekananda (2004) implemented the poisson distribution. This study will aplied the method of moving average standard deviation of spot exchange rate that follows one that being applied by Kenen-Rodrick (1986) with the formulation as:

$$V_t = \left[\left(1/m \right) \sum_{i=1}^{m} \left(\ln ER_{t+i-1} - \ln ER_{t+i-2} \right)^2 \right] \quad \text{.....eq.(4.6)}$$

Where (ER) represents the spot value of exchange rate at time t. As for the considering time period, the author takes three quarter period backward.

4.3. Estimation Method

Panel data analysis is used in this study for its advantages[2]. Panel data is a data set that follows given sample of individuals over time thus provides multiple observations on each individuals in the sample. It is also widely available either in developed or developing countries. Panel data sets allows researcher to deal with large number of data points that increasing the degree of freedom and reducing multicollinearity among independent variables thus improving the efficiency of econometric estimation. With its longitudinal aspects, panel data also allows researcher to access a number of economic questions that cannot be addressed using cross-sectional or time series data.

4.3.1. Panel Data Analysis

The major concern in estimating a model is the problems of characteristic in the required data. This research required both time series and cross country data. Econometric calls the combining process of the two forms of data as data pooling, or panel data, or, longitudinal data. Methods in estimating panel data are :

[2] Hsiao, 2003

the OLS (ordinary least squared), the fixed effect model (dummy variable model) and the random effect model (estimation of variance components models)[3].

4.3.1.1. The Ordinary Least Squared (OLS) Approach

In this method, panel data derived from a combining/gathering process of all the cross section and time series data then followed by estimation (the pooling process). Each observation in each period has its own regression which means the data is single-dimensioned.

The method consists of a *K regressor* in x_{it} which is not included as a *constanta*. If the individual effect of α_i remain constant along t period and specific for each i unit, then the model is considered as an ordinary regression model. If the value of α_1 is being constant for each i unit, then the OLS will produce a consistent and efficient estimation for α and β. This is a simple methodology yet it could not yield sufficient results for each observation is being treated as an independent observation.

4.3.1.2. The Fixed Effect/Dummy Variable Model (FEM) Approach

This model uses dummy variables to allow changes in the cross section' and time series' intercepts caused by eliminated variables. The intercept varied for individuals and constant for time, while the slope is constant either for individual or time. So, α_i is a group of specific constant-value in the regression model. The general formulation of the model assumed that differences between units can be identified from the differences in the value of *constanta*.

$$Y_{it} = \alpha + \beta x_{it} + \gamma_2 W_{2t} + \gamma_3 W_{3t} + \ldots + \lambda_N W_{NT} + \delta_2 Z_{12} + \delta_3 Z_{13} + \ldots + \delta_N Z_{iT} + \varepsilon_{it}$$

where

[3] Materials regarding with OLS, FEM, and REM are based upon Gujarati, 2003 and Nachrowi, 2006

$$Z_{it} = \begin{cases} 1 \\ 0 \end{cases}$$

1 for I-individu, I =2,...N

0 Others

We have add $(N-1)+(T-1)$ dummy variables into the model and eliminate the last two for adding them would cause a *perfect colinearity* between the explanatory variables. If the model is estimated with the OLS, unbiased and consistent variables (incl. slope β) can be achieved. And, a total of $NT-2-(N-1)-(T-1)$ or $NT-N-T$ *degree of freedom* can also be achieved.

Dumy variables coefficients will measure the changes in the cross section' and time series' intercepts (related with the first individu of the first period) by eliminating the dummy variable and re-writing the related model regarding with each NT observation.

The decision in adding dummy variables is based upon statitiscal test which includes the error sum of squared. Since the OLS have more limitations then the fixed effect model – where intercepts is limited to be equal between individuals – it is expected that the sum square residual (SSR) will be higher in the OLS model. If there is a siginificant changes in the SSR, then the fixed effect model shall be choosed.

However, there are posible disadvantages in the fixed effect model. First, if there are too many dummy variables introduced, there will be a degree of freedom issue. Second, with so many variables in the model, there is always a possibility of multicollinearity, which might make precie estimation of one or more parameters difficult.

4.3.1.3. The Random Effect/Error Component Model (REM) Approach

The random effect model (or error component model) considered to eliminates problems in the fixed effect model especially related with the degree of freedom. Despite using dummy variable as a representation of the lack of

knowledge regarding the (true) model, it uses error (disturbance) term, as can be described in following figure.

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$$

$$\varepsilon_{it} = u_i + v_t + w_{it}$$

where

$u_i \approx N(0, \sigma_u^2)$ = cross section error component

$v_t \approx N(0, \sigma_v^2)$ = time series error component

$w_t \approx N(0, \sigma_w^2)$ = combined time series and cross section error component

In the random effect model, it is assumed that individual error components are not correlated with each other and are not autocorrelated across both cross section and time series unit.

Difference between the fixed effect model (FEM) and the random effect model/error component model (REM) can be described as followed. In FEM each cross sectional unit has its own fixed intercept value, in all N such values for N cross sectional units. While in REM, the intercept β_1 represents the mean value of the entire cross sectional intercepts and the error component ε_1 represents the random deviation of individual intercept from this mean value.

4.3.2. Selecting the Panel Data Estimation Method

Following the given explanation related with the estimation methods of panel data, some points can be made. The Fixed Effect Model (FEM) relies on the assumption that the disturbance effects are fixed. While the Random Effect Model (REM), it relies on the assumption that the disturbance effects are random. The consideration of the disturbance behavior, either fixed or randomized in i individual, in constructing a model will affect the bias of estimation result. Bias resulting from a failure in constructing a disturbance behavioral based-model is known as selectivity bias. There are three known methods in making panel data estimation, as already been explain, of which includes the OLS, FEM and REM.

Choosing between FEM and REM model can be theoretically pre-determined. If there is an assumption that the error terms have random effect, than one can use the REM. Vice versa with the FEM, where the error term is assumed to have fixed effect. In case that the assumption can not be theoretically pre-determined, REM model can be used when the data is an individual sample that has been randomly picked from a huge population. In other words, conclusion regarding with whole population is made based on individual. But, if the evaluation includes all individual in the population, or, many individuals of which with a stressing on it than FEM model should be used.

Another way to determine between FEM and REM model is by using the relative measurement of size of individual and time period. For a fixed size of individual, the longer time period will produce smaller differences of the estimation result between FEM and REM. For a considerably longer time period, FEM should be used for it is easier to work with.

4.3.2.1. F-test or Chow Test

The F-test (or Chow test) can be used in order to determine whether the OLS or FEM to be picked in data estimation. It can be formally tested to get the best model. The OLS is a restricted model which has an assumption that every individual have the same intercept. This assumption tends to be unrealistic since there are possibilities that every cross section units to have different behaviors. So the *restricted F-test* comes in handy to test the hypothesis of:

H_0: OLS Model (*Restricted*)

H_1: FEM (*Unrestricted*)

where the *restricted F-test* can be formulated:

$$F = \frac{(R^2_{UR} - R^2_R)/m}{(1 - R^2_{UR})/df}$$

the *restricted* R^2 is from OLS model equation, the is *unrestricted* R^2 from the FEM, and m is the number of restriction. The table value of F with df for

numerator, *df* for denominator and the level of acceptance. If it shows that F_{count} is larger than F_{table}, H_0 should be rejected and accept H_1.

Chow Test can also be used as an alternative. Rejection to the null hypothesis base on $F_{Statistic}$ which was formulated by Chow as:

$$CHOW = \frac{(RRSS - URSS)/(N-1)}{URSS/(NT-N-K)}$$

where:

RSSS = Restricted Residual Sum Square (represents the Sum of Square Individual from data panel estimation wih OLS method)

URSS = Unrestricted Residual Sum Square (represents the Sum of Square Residual data panel estimation with FEM)

N = Number of cross section data

T = Number of time series data

K = Number of explaining variables

This test follows the distribution of F Statistics which is $F_{N-1,NT-N-K}$. If the value of Chow Statistics (F_{Stat}) is larger than F_{Tabel}, than it is enough evidence to reject the null hypothesis so that FEM should be used, or, vice versa.

4.3.2.2. HausmannTest

In order to determine whether the FEM or the REM should be used, the Hausmann Test could be performed. Basically, it focuses on two things. First, it is from the already made assumption related to the correlation between u_i cross section error component and the X regressor. If assumed that u_i and X is uncorrelated, than REM is more appropriate. But if otherwise u_i and X is correlated, than FEM should be used. Second, the REM assumed that u_i is

randomly picked from a much larger population, a condition which hardly met. For instance, if we want to analyze the crime level between 50 states of the USA, than to assume that 50 states as sample is not adequate. REM can not be used in this condition.

Decision to use either FEM or REM can be determined by using specification developed by Hausmann. Through Chi-Square Statistic, the specification aids the model determining process, so that the best model can be statistically determined.

The test comes with the following hypothesis:

H_0: *Random Effects Model*

H_1: *Fixed Effects Model*

The next thing is to compare the result of Hausmann Test with the chi-square statistics with $df = k$, where k represents the number of estimated variables. If the Hausmann test yields a significant result, than H_0 is rejected, meaning FEM should be used.

4.3.2.3. LM Test

If model being estimated with the fixed effect, than there is a need to perform an LM Test (Lagrang Multiplier) in order to choose the structure of the estimator, either heteroscedastic or homoscedastic. The hypothesis will be stated as:

$H_0: \sigma_i^2 = \sigma^2$ (homoscedastic structure) and

$H_1: \sigma_i^2 \neq \sigma^2$ (heteroscedastic structure)

Then the test performed by LM criteria with chi-square distribution:

$$LM = \frac{T}{2}\sum_{i=1}^{n}\left[\frac{\sigma_i^2}{\sigma^2} - 1\right]^2$$

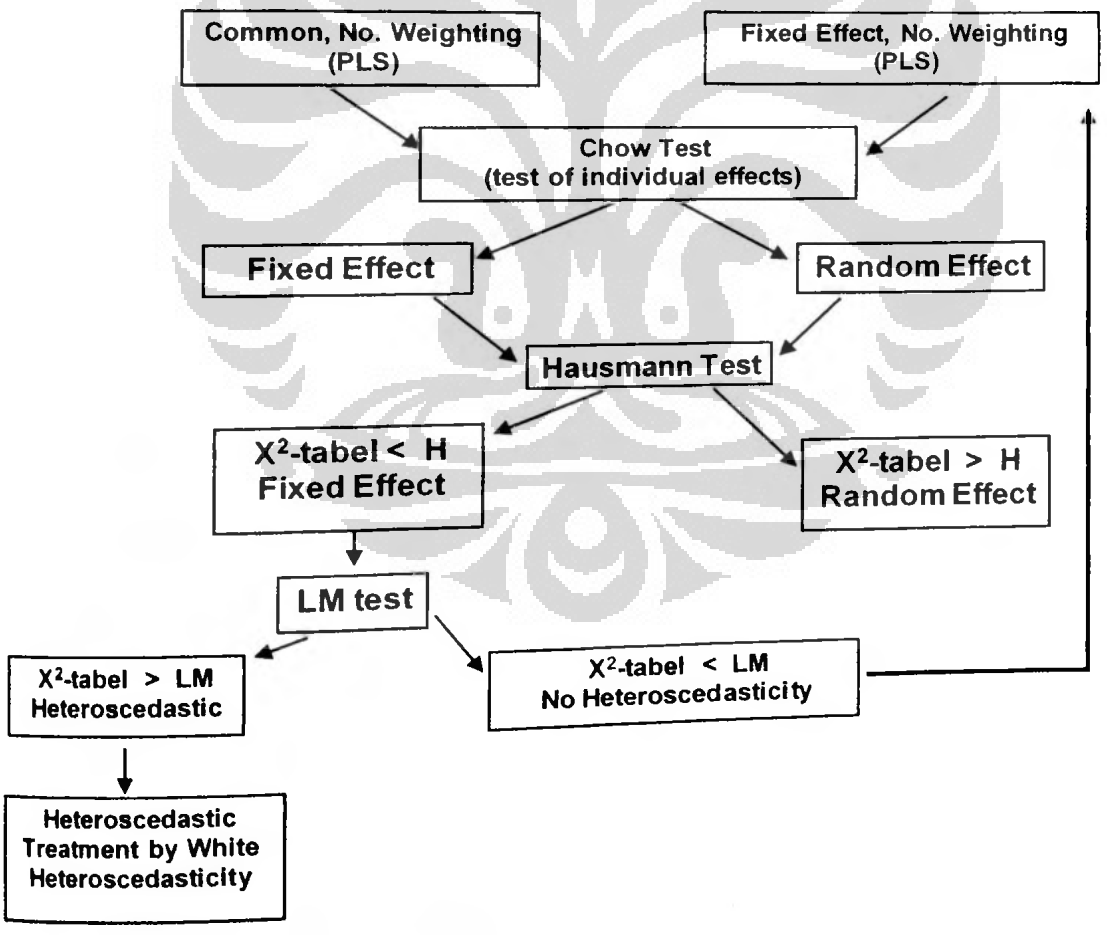
Where σ_i^2 represents the more restricted i residual variance of the equation and σ^2 as sum square residual of the equation.

4.3.2.4 Selecting Panel Data Analysis Methods

As already being explained, from several basic methods in performing panel data analysis either Ordinary Least Square, Fixed Effect Method or Random Effect Method is based on the tests to determine which methods perform most efficient. These tests include the F-test, Hausmann test and the Lagrange Multiplier test. Flow in selecting the most efficient model can be presented in the following figure.

Figure 4.1

Steps in Selecting the method in Panel Data Analysis



4.3.3. Basic Assumption Test (Autocorrelation, Heteroscedasticity, and Multicollinearity)

Common issue that often occured in economic researches is the problem of autocorrelation, heteroscedasticity an multicollinearity. Violation on the assumption resulting in an inefficient model. Detection about the violated assumption should also be performed in the data panel model.

The first basic assumption is regarding with whether a correlation between error is present (autocorrelation) or not. The present of autocorrelation will result in a consistent and unbiased coefficient of the estimation, but with a very high variance, in other words, estimation result is inefficient. This inefficient estimation result leads to small t_{Count} and the acceptance of the null hypothesis (H_0).

The most common methods to detect autocorrelation is Durbin-Watson Test. The test is performed by comparing the value of $DW_{Statistic}$ with the critical value of DW . To solve the problem of autocorrelation is by including the autoregressive variable.

The next assumption is that variance of each error terms is constant. If the condition can not be met than there is a problem of heteroscedasticity, where every observation have different level of reliability. Heteroscedasticity cause the estimation process to be inefficient while its result remain consistent and unbiased. It will also cause the result of t and F test useless or even misleading.

Heteroscedasticity often occured in cross section data, while it hardly in the time series data. As for detection test regarding with heteroscedasticity, the methods of White's general test, Goldfield-Quandt or Breush-Pagan test can be mention.

The last thing regarding with basic assumption is multicollinearity, where there is a significant linear relationship between some of, or, all of the independent variables in the model. The condition often occured in a macroeconomic time series model, where many of the variables tend to shift together through time. It will resulting in a higher variance and smaller t_{Count} ,

unbiased estimation, but inefficient for the estimator is highly affected by the number of observations. There are several signs of multicollinearity where two of it can be presented. First, high R^2 and significant F test but there are variables that, statistically speaking, partially not significant (t test). Another sign is by looking coefficient correlation matrix between each independent variable. The common norm is that coefficient correlation between two independent variables is very high (over 0.8 or 0.9), than multicollinearity is serious problem.

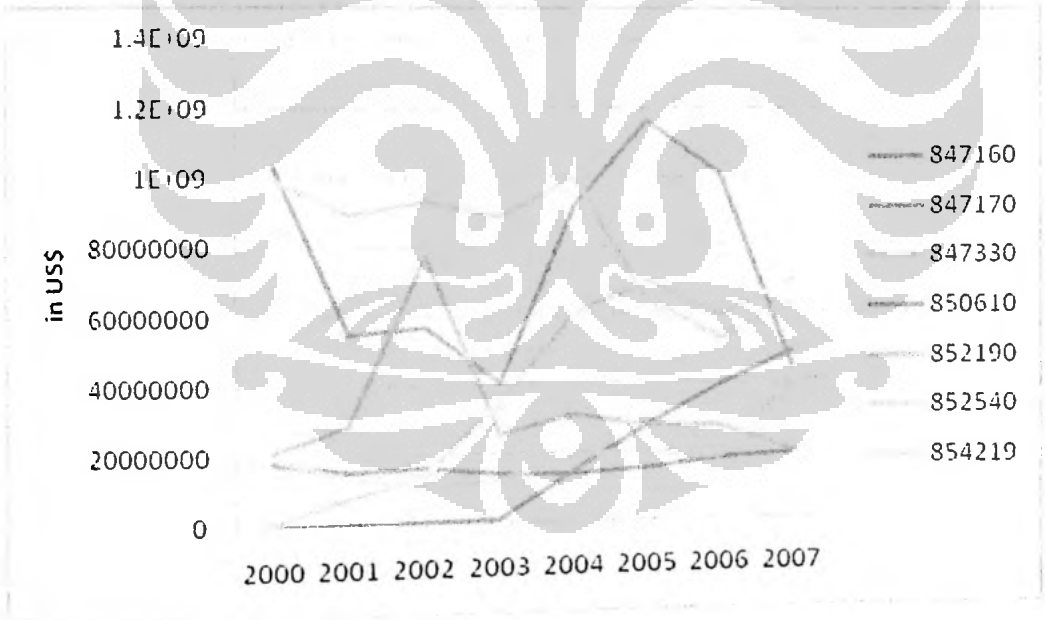
Chapter V
Result and Analysis

5.1. Statistic descriptive

The export of Indonesia's electronic products of HS 847160, 847170, 847330, 850610, 852190, 852540 and 854219 are fluctuated during 2000-2007 period. It can be seen that the year of 2003 is a turning point for several product. For Input and Output Units for Automated Data Processing (HS 847160), the year of 2003 started a positive export trend. The same condition also applied for storage units for automated data processing (HS 847170) where it accounted a relatively high growth. However, for video recording and reproducing apparatus (HS 852190) it has a negative trend.

Figure 5.1

Export Value of Electronic Products



Source: UN-COMTRADE, analyzed

As for the real GDP of trading partner, the overall growth is considered relatively small with the exception of Japan and Korea. The growth of Real GDP of Japan and Korea is began to increase relative to Belgium, Netherland, USA, Germany,and Hong Kong since 2003.

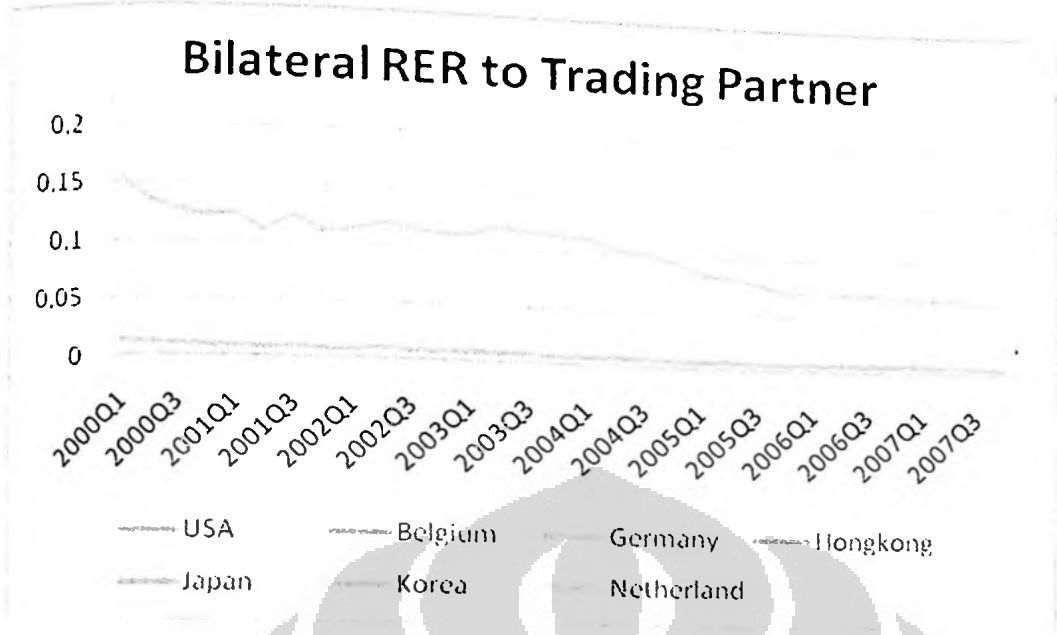
Figure 5.2[1]

Source: IMF-CDROM (analyzed)

As for the bilateral real exchange rate, USA, Belgium, Germany, Hong Kong, Japan and Netherland accounted a relatively similar movement. This is due to those countries economy being integrated to the world. Korea is the special case where its economy is relatively independent expressed by the non-align movement regarding with its exchange rate and the level of price indices. Lastly, it can be seen that either from the exchange rate or from the price level comparison in between Indonesia and its trading partner, Indonesia still have competitiveness.

[1] The real GDP is stated in million US$. There is a note regarding with USA and Japan where each countries real GDP is divided by 500 in order to make comparisons.

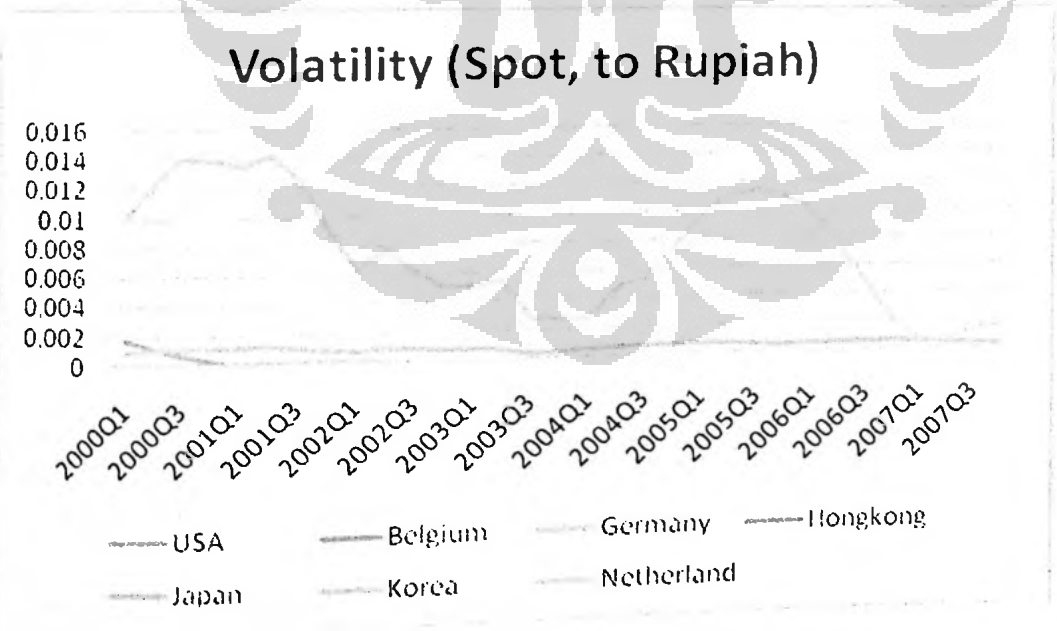
Figure 5.3



Source: IMF-CDROM (analyzed)

The bilateral exchange rate volatility also has the same behavior with the real exchange rate regarding with the countries. Korea has also a unique pattern of volatility.

Figure 5.4



Source: IMF-CDROM (analyzed)

5.2 Result of Tests

Since this research based on panel data analysis, then common estimation-related procedure performed. Whether it will be using Pooled Least Square or Fixed Effect Model based upon the existing individual effect with the Chow Test. And then it will be followed by the Hausman Test in determining whether the Random Effect Model or Fixed Effect Model most efficiently fitted. Lastly, if the Fixed Effect Model be choose, the LM Test is performed in determining whether heteroscedasticity exist that will be followed by a common treatment should one have been found.

Only the Hausmann test will be presented in the analysis while the other two can be found in the appendix. The Chow test shows that each product have individual effects, while the LM Test shows that the product of HS 850610, 852190, 852540, 847170 and 854219 have heteroscedasticity problem.

5.2.1 Hausmann Test

As for the Chow Test pointing out that each commodity have individual effects, the next step is to determine whether the Fixed Effect Model or Random Effect Model most fitted. The Hausman test shall be performed. The given hypothesis will be:

H_0 : Random Effect Model

H_1 : Fixed Effect Model

Null hypothesis will be rejected if χ^2 is lower than the Hausman Test.

Table 5.1

Result of the Hausmann Test

Commodity	Hausman	X^2-Tabel		Ho	Conclusion
		α	X^2-tab		
Consumer Goods					
850610	19.7896	1%	13.2767	H > X^2-tab	Fixed Effect
852190	53.5531	1%	13.2767	H > X^2-tab	Fixed Effect
852540	18.8309	1%	13.2767	H > X^2-tab	Fixed Effect
Business/Industrial					
847160	3.5426	1%	13.2767	H < X^2-tab	Random Effect
847170	13.3388	1%	13.2767	H > X^2-tab	Fixed Effect
Components and Parts					
847330	2.8071	1%	13.2767	H < X^2-tab	Random Effect
854219	23.8704	1%	13.2767	H > X^2-tab	Fixed Effect

Source: author calculations

The Hausman tests give various results. Fixed Effect Model being choose for HS 850610, 852190, 852540, 847170 and 854219 since the null hypothesis are rejected for $\alpha = 1\%$. HS 847160 and 847330 products the Random effect Model are being used.

5.2.2. Summary of Test

Summary of the most efficient model will be used for each products that based upon the Chow test, Hausmann test and LM test is presented in the following table.

Table 5.2

Summary Model – Test Based

Products (HS)	Model
Prod (1) – 850610	Fixed Effect Model
Prod (2) – 852190	Fixed Effect Model
Prod (3) – 852540	Fixed Effect Model
Prod (4) – 847160	Random Effect Model
Prod (5) – 847170	Fixed Effect Model

Prod (6) – 847330	Random Effect Model
Prod (7) – 854219	Fixed Effect Model

Source: author calculation

5.2. The Estimation and its Analysis

5.2.1. Sign and Elasticity Analysis

Analysis that has been performed for each selected products with the most efficient model has been done with Eviews 4, analytical software. Each analysis of the selected products yielding information that will be presented in the following points.

Furthermore, since panel data analysis has made it possible to analyze the performance of each cross sectional individuals, a cross sectional analysis base upon substituted coefficient of each cross sectional units, acts as an intercepts, has been performed. Through the concept that intercepts is time in-varying although it may varies between cross sectional units, relative position will be based upon the intercept value. That is the least possible information revealed regarding the relative position of each trading partner in term of export potentials related to independent variables being used in this research which are the real GDP, Real Exchange Rate and the Exchange Rate Volatility.

5.2.1.1 Consumer Appliance

Regression result regarding consumer goods electronics is presented in the following table.

Table 5.3

Consumer Appliance- Regression Result

Variable	Prod (1)	Prod (2)	Prod (3)
C			
Y?	2.784018 **	-7.4302 **	4.0431 *
E?	2.113318 ***	2.6067 *	1.4506 (-)
V?	-0.644943 ***	-0.8926 **	-0.7015 ***
Obs	161	77	98
R^2	0.707458	0.70192	0.80616
adj R^2	0.690022	0.66188	0.78633
DW-Stat	0.968961	1.30885	1.40914
Prob (F-Stat)	0.000000	0.00000	0.00000
Method	FE	FE	FE

Source: author calculation

Notes:

Expected Sign

RDGP +

RER +

VOLAT -

Significancies

*** at α = 1 percent

** at α = 5 percent

* at α = 10 percen

(-) Not Significant

a. Manganese Dioxide (Baterries) - HS 850610

The result of the estimation indicates that independent variables that are the real gross domestic products, real exchange rate and the exchange rate volatility statistically significant and also with appropriate signs.

As can be seen from the above table, the volatility of exchange rate yields the expected negative impact significantly at 99 percent confidence interval indicates that export of manganese dioxide (batteries) will decline if volatility of exchange rate increase. The coefficient result is 0.64 percent means that one percent increase in volatility of exchange rate will decrease the export of manganese dioxide by 0.64 percent (ceteris paribus). It also means that producer charge risk premium regarding the increasing of exchange rate volatility that affected the demand for the products even though considered inelastic.

The real GDP yields the expected positive impact to export significantly at 95 percent confidence interval indicates that export of manganese dioxide (batteries) will increase if the real GDP of trading partner increase. The coefficient result is 2.78 percent means that one percent increase in real GDP of trading partner will increase export of manganese dioxide batteries by 2.78 percent. Since electronic products have high import-content material it also means that the increasing real GDP of trading partner which increase it demands for manganese dioxide (batteries) did not offset by imports of such products.

As for the real exchange rate, it is also yields the expected positive impact significantly at 99 percent confidence of interval indicates that a real depreciation will increase the export of manganese products. The coefficient result is 2.11 percent means that one percent increase in real depreciation will increase the export of manganese dioxide (batteries) by 2.11 percent (ceteris paribus). It is also indicates that in terms of change of export proportion to the change of import proportion still yielding a positive net exports.

b. Video Recording or Reproducing Apparatus -HS 852190

The result of the estimation indicates that the independent variables that are real exchange rate and the exchange rate volatility statistically significant and also with appropriate signs. In the other hand, the real gross domestic product of foreign trading partner is statistically significant however with the unexpected coefficient sign.

The unexpected negative impact of real GDP to export significantly at 95 percent confidence interval indicates that export of video recording or reproducing apparatus will decrease if the real GDP of trading partner increase. The coefficient result is 7.43 percent means that one percent increase in real GDP of trading partner will decrease export of video recording or reproducing apparatus by 7.43 percent (ceteris paribus). It can be seen from the descriptive analysis that the export of video recording or reproducing apparatus accounted a negative export trend since 2002. Since electronic products have high import-content material it also means that the increasing real GDP of trading partner which increase it demands for manganese video recording or reproducing apparatus is offset by imports of such products.

As can be seen from the above table, the volatility of exchange rate yields the expected negative impact significantly at 95 percent confidence interval indicates that export of video recording or reproducing apparatus will decline if volatility of exchange rate increase. The coefficient result is 0.89 percent means that one percent increase in volatility of exchange rate will decrease the export of video recording or reproducing apparatus by 0.89 percent (ceteris paribus). It also

means that producer charge risk premium regarding the increasing of exchange rate volatility that affected the demand for the products even though considered inelastic.

As for the real exchange rate, it is also yields the expected positive impact significantly at 90 percent confidence of interval indicates that a real depreciation will increase the export of video recording or reproducing apparatus. The coefficient result is 2.60 percent means that one percent increase in real depreciation will increase the export of video recording or reproducing apparatus by 2.60 percent (ceteris paribus). It is also indicates that in terms of change of export proportion to the change of import proportion still yielding a positive net exports.

c. Still Image Video Camera and Others-HS 852540

The result of the estimation indicates that independent variables that are the real gross domestic products, and the exchange rate volatility statistically significant and also with appropriate signs. In the other hand, the real exchange rate is not statistically significant although it yields the appropriate signs. It means that the real exchange rate cannot be explained in the period of research.

As for the real exchange rate, the condition it is due to the contribution of the input content of still image video camera products. Although real depreciation occurs, either from the exchange rate or from price level comparison of basket of goods, it did not affected the demand of still image video camera products. Depreciation will increase the cost of input thus increasing the cost of production that will result in an increasing price of still image video camera products. The increasing price is offseting the effect of real depreciation to the export of still image video camera products.

As can be seen from the above table, the volatility of exchange rate yields the expected negative impact significantly at 99 percent confidence interval indicates that export of still image video camera and other will decline if volatility of exchange rate increase. The coefficient result is 0.70 percent means that one percent increase in volatility of exchange rate will decrease the export of still

image video camera and other by 0.70 percent (ceteris paribus). It also means that producer charge risk premium regarding the increasing of exchange rate volatility that affected the demand for the products even though considered inelastic.

The real GDP yields the expected positive impact to export significantly at 90 percent confidence interval indicates that export of still image video camera and other will increase if the real GDP of trading partner increase. The coefficient result is 4.04 percent means that one percent increase in real GDP of trading partner will increase export of still image video camera and other by 4.04 percent. Since electronic products have high import-content material it also means that the increasing real GDP of trading partner which increase it demands for still image video camera and other did not offset by imports of such products.

5.2.1.2 Business/Industrial

Regression result regarding business/industrial electronic products is presented below.

Table 5.4.

Business/industrial – Regression Result

Variable	Prod (4)		Prod (5)	
C	26.27437	***		
Y?	0.042162	(-)	3.40854	(-)
E?	0.528123	(-)	-3.88469	**
V?	-0.141237	(-)	-1.85789	***
Obs	112		136	
R^2	0.691721		0.345956	
adj R^2	0.683158		0.299238	
DW-Stat	0.869369		1.36617	
Prob (F-Stat)			0.00000	
Method	RE		FE	

Source: author calculation

Notes:

	Expected Sign	Significancies
RDGP	+	*** at α = 1 per
RER	+	** at α = 5 per
VOLAT	-	* at α = 10 pe
		(-) Not Signifi

a. Input and Output units for automated data processing - HS 847160

The result of the estimation indicates that independent variables that are the real gross domestic products, real exchange rate and the exchange rate volatility not statistically significant but with appropriate signs. This means that

the real gross domestic products, real exchange rate and the exchange rate volatility can not be explained in the period of study.

The real GDP of foreign trading partner did not affect the export of input and output unit for automated data processing products in the period of research. The real GDP of foreign trading partner is proxy for foreign income where it is expected that increasing income will increase the demand for goods. Since the products includes display monitor, printer and other input and output units for computer, the level of technology issue come front. This was confirmed by the Secretary General of MOT in his presentation in MPKP in 2007. It is also can be seen from the export performance of such products in the descriptive analysis

As for the real exchange rate that did not affect the export of input and output unit for automated data processing products in the research period, the condition it is due to the contribution of the input content of input and output unit for automated data processing products. Although real depreciation occurs, either from the exchange rate or from price level comparison of basket of goods, it did not affected the demand of input and output unit for automated data processing products. Depreciation will increase the cost of input thus increasing the cost of production that will result in an increasing price of input and output unit for automated data processing products. The increasing price is offseting the effect of real depreciation to the export of input and output unit for automated data processing products.

The volatility of exchange rate did not affect the export of input and output unit for automated data processing products in the period of research. It means that the increasing of exchange rate volatility that induce the increasing risk that forcing producer charge risk premium that expressed in the increasing price did not affect the demand of input and output unit for automated data processing products. Furthermore, due to the technology issue contain in the products, producers choose to stop importing input materials and reduce its production to a certain level, just to finished what is left on the inventory.

b. Storage units for automated data processing - HS 847170

The result of the estimation indicates that the independent variables which is and the exchange rate volatility statistically significant and also with appropriate signs. In the other hand, the real exchange rate real is statistically significant however with the unexpected coefficient sign. As for the gross domestic product of foreign trading partner is not statistically significant but with appropriate sign which means that the gross domestic product of foreign trading partner can not be explained in the period of study.

The real GDP of foreign trading partner did not affect the export of storage unit for automated data processing products in the period of research. The real GDP of foreign trading partner is proxy for foreign income where it is expected that increasing income will increase the demand for goods. Since the products includes harddisk, cartridge, read only memory (ROM) units and storage other units for computer, the level of technology issue is also applied. The electronic industry, especially for storage media, have a short product cycle. New inventions such as the digital versatile disc (DVD), blue-ray technology are made in a relatively short time periods. Therefore, the electronic products especially in media storage technology are rapidly become obsolete and being replaced by newer technology that are more preffered by consumers.

The negative elasticity of real exchange rate with respect to the export of storage units for automated data processing indicates that the export of storage units for automated data processing decline when real depreciation occurs significantly at 95 percent confidence of interval. The coefficient result is 3.88 percent means that one percent increase in real depreciation will decrease export of storage units for automated data processing by 3.88 percent (ceteris paribus). This condition occurs due to the high import content dependencies. Although real depreciation occurs, either from the exchange rate or from price level comparison of basket of goods, it affected the demand of storage unit for automated data processing products negatively. Depreciation will increase the cost of input thus increasing the cost of production that will result in an increasing price of storage unit for automated data processing products. The increasing price is overcoming

the effect of real depreciation to the export of storage unit for automated data processing products.

As can be seen from the above table, the volatility of exchange rate yields the expected negative impact significantly at 99 percent confidence interval indicates that export of storage unit for automated data processing products will decline if volatility of exchange rate increase. The coefficient result is 1.85 percent means that one percent increase in volatility of exchange rate will decrease the export of storage unit for automated data processing products by 1.85 percent (ceteris paribus). It also means that producer charge risk premium regarding the increasing of exchange rate volatility that affected the demand for the products.

5.2.1.3 Components and Parts

Regression result regarding component and parts of electronics is being presented in the following table.

Table 5.5.

Components and Parts – Regression Result

Variable	Prod (6)	Prod (7)
c	19.31302 *	
Y?	0.675581 **	2.891696 (-)
E?	0.529319 (-)	4.091215 ***
V?	-0.210765 (-)	-0.252888 (-)
Obs	199	105
R^2	0.579747	0.738511
adj R^2	0.573282	0.713738
DW-Stat	0.642563	1.00540
Prob (F-Stat)		0.00000
Method	RE	FE

Source: author calculation

Notes:

Expected Sign		Significancies
RDGP	+	*** at α = 1 pe
RER	+	** at α = 5 pe
VOLAT	-	* at α = 10 p
		(-) Not Signif

a. Parts and Accesories for automated data processing - HS 847330

The result of the estimation indicates that independent variables that is the real gross domestic products of foreign trading partner statistically significant and also with appropriate signs. In the other hand, the real exchange rate and the exchange rate volatility are not statistically significant although it yields the

appropriate signs. It means that the real exchange rate and the exchange rate volatility cannot be explained in the period of research.

As for the real exchange rate that did not affect the export of parts and accessories unit for automated data processing products in the research period, the condition it is due to the contribution of the input content of parts and accessories unit for automated data processing products. Although real depreciation occurs, either from the exchange rate or from price level comparison of basket of goods, it did not affected the demand of parts and accessories unit for automated data processing products. Depreciation will increase the cost of input thus increasing the cost of production that will result in an increasing price of parts and accessories unit for automated data processing products. The increasing price is offseting the effect of real depreciation to the export of parts and accessories unit for automated data processing products.

The volatility of exchange rate did not affect the export of parts and accessories unit for automated data processing products in the period of research. It means that the increasing of exchange rate volatility that induce the increasing risk that forcing producer charge risk premium that expressed in the increasing price did not affect the demand of parts and accessories unit for automated data processing products.

The real GDP yields the expected positive impact to export significantly at 95 percent confidence interval indicates that export of parts and accessories for automated data processing will increase if the real GDP of trading partner increase. The coefficient result is 0.67 percent means that one percent increase in real GDP of trading partner will increase export of parts and accessories for automated data processing by 0.67 percent. Since electronic products have high import-content material it also means that the increasing real GDP of trading partner which increase it demands for parts and accessories for automated data processing did not offset by imports of such products.

b. Monolithic digital integrate circuits (other) - HS 854219

The result of the estimation indicates that independent variables that is the real exchange rate statistically significant and also with appropriate signs. In the other hand, the real gross domestic products of foreign trading partner and the exchange rate volatility are not statistically significant although it yields the appropriate signs. It means that the real gross domestic products of foreign trading partner and the exchange rate volatility cannot be explained in the period of research.

The real GDP of foreign trading partner did not affect the export of monolithic digital integrate circuits (other) products in the period of research. Since electronic products have high import-content material it means that the increasing real GDP of trading partner which increase it demands for monolithic digital integrate circuits (other) products is offset by imports of such products.

The volatility of exchange rate did not affect the export of monolithic digital integrate circuits (other) products in the period of research. It means that the increasing of exchange rate volatility that induce the increasing risk that forcing producer charge risk premium that expressed in the increasing price did not affect the demand of monolithic digital integrate circuits (other) products.

As for the real exchange rate, it yields the expected positive impact significantly at 99 percent confidence of interval indicates that a real depreciation will increase the export of monolithic digital integrate circuits (other). The coefficient result is 2.11 percent means that one percent increase in real depreciation will increase the export of monolithic digital integrate circuits (other) by 2.11 percent (ceteris paribus). It is also indicates that in terms of change of export proportion to the change of import proportion still yielding a positive net exports.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1. Conclusion

The main objective of this study was to find whether exchange rate volatility did affected the export demand of Indonesia's electronic products. The focused of the study was at 2000-2007 periods with panel data analysis. The result of the study is as follows:

a. The exchange rate volatility affects the export of manganese dioxide (batteries) products along with the real GDP of foreign trading partner and the real exchange rate.
b. The exchange rate volatility affects the export of video recording or reproducing apparatus products along with the real exchange rate.
c. The exchange rate volatility affects the export of still image video camera products along with the real GDP of foreign trading partner.
d. The exchange rate volatility did not affect the export of input and output unit for automated data processing products as well as the real GDP of foreign trading partner and the real exchange rate.
e. The exchange rate volatility did not affect the export of storage unit for automated data processing products as well as the real GDP of foreign trading partner. As for the real exchange rate, the effect of increasing imported input overcomes the the effect of real depreciation thus decreasing export.
f. The exchange rate volatility did not affects the export of parts and accessories unit for automated data processing products as well as the real exchange rate. Only real GDP of foreign trading partner affect the export of parts and accessories unit for automated data processing products.
g. The exchange rate volatility did not affects the export of monolithic digital integrate circuits products as well as the real GDP of foreign trading partner. Only real exchange rate affect the export of parts and accessories unit for automated data processing products.

6.2. Recomendation

6.2.1. Policy Implication

These study finds that exchange rate volatility have different affect to the export of Indonesia's electronic products. The high-import content dependencies make electronic products prone to the exchange rate volatility, with the exception for the tested components and parts. Moreover the zero import duty for electronic components make electronic producers tend to imports its materials thus the high import-dependencies problem will still exist. Therefore the zero import duty for electronic components need to be reconsidered periodically to determine which product should be classified into.

6.2.2. Recommendation for further study

Due to the stagnancies of export trend of electronic products, it may be very usefull in performing research in determining whether Indonesia should choose to improve export or concentrated to expand the domestic market, and analyzing the effect of the technology adopted by industries and the effect of production sharing/vertical integration to the export of Indonesia's electronic products.

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Appendix 1 – The Chow Test

The test comes with the hypothesis of

H_0 : Pooled Least Square

H_1 : Individual effect

If F-stat > F-table than the null hypothesis rejected. The result of the Chow Test for the analyzed products is presented below.

Table A.1

Result of Chow Test

Commodity	SSR1 (PLS)	SSR2 (FEM)	F-Stat	F-Tabel		Ho	Conclusio
				α	F-tab		
Consumer Goods							
850610	308.78	198.84	19.6293	1%	2.8876	F-Stat>F-Tab	Individual Effe
(N=7 ,T=32 ,K=4)							
852190	1,029.21	774.39	11.6817	1%	2.8876	F-Stat>F-Tab	Individual Effe
852540	678.05	493.13	13.3121	1%	2.887602	F-Stat>F-Tab	Individual Effe
Business/Industrial							
847160	621.45	341.27	29.145	1%	2.8876	F-Stat>F-Tab	Individual Effe
847170	1,219.85	913.73	11.8935	1%	2.8876	F-Stat>F-Tab	Individual Effe
Components and Parts							
847330	790.27	483.81	22.4867	1%	2.8876	F-Stat>F-Tab	Individual Effe
854219	1,618.72	489.68	81.8513	1%	2.8876	F-Stat>F-Tab	Individual Effe

Appendix 2 – LM Test

The LM Test is performed for the products that considered using Fixed Effect Model after the Hausman test.

The given hypothesis is:

H_0 : Heteroscedastic

H_1 : Homoscedastic

Null hypothesis will be rejected if χ^2 is lower than the LM Test.

Table A.2.
Result of LM Test

Commodity	LM Test	X^2-Tabel		Ho	Conclusion
		α	X^2-tab		
Consumer Goods					
850610	110,9026	1%	16,81189383	LM > X^2-tab	Heteroscedasticity
852190	110,7721	1%	16,81189383	LM > X^2-tab	Heteroscedasticity
852540	110,6634	1%	16,81189383	LM > X^2-tab	Heteroscedasticity
Business/Industrial					
847170	110,2209	1%	16,81189383	LM > X^2-tab	Heteroscedasticity
Components and Parts					
854219	110,7217	1%	16,81189383	LM > X^2-tab	Heteroscedasticity

The LM Test results yield conclusion that for a given α of 1 percent, the product of HS 850610, 852190, 852540, 847170 and 854219 have heteroscedasticity problem. This heteroscedasticity problem will be treated by using White Heteroscedastivity Consistent tools in Eviews 4.1.

Appendix 3 – Regression Result

HS 850610 (Eviews 4.1.)

Dependent Variable: X?
Method: Pooled Least Squares
Date: 07/17/09 Time: 11:46
Sample(adjusted): 2000:1 2007:1
Included observations: 23
Excluded observations: 6 after adjusting endpoints
Number of cross-sections used: 7
Total panel (balanced) observations: 161
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y?	2.784018	1.150352	2.420144	0.0167
E?	2.113318	0.664891	3.178445	0.0018
V?	-0.644943	0.243713	-2.646325	0.0090
Fixed Effects				
_USA--C	11.15163			
_JPN--C	5.347902			
_DEU--C	20.45514			
_NLD--C	22.12925			
_BEL--C	22.32773			
_KOR--C	8.121273			
_HKG--C	20.77826			

R-squared	0.707458	Mean dependent var	22.47403
Adjusted R-squared	0.690022	S.D. dependent var	1.805731
S.E. of regression	1.005353	Sum squared resid	152.6210
Log likelihood	-224.1467	F-statistic	40.57388
Durbin-Watson stat	0.968961	Prob(F-statistic)	0.000000

HS 852190 (Eviews 4.1.)

Dependent Variable: X?
Method: Pooled Least Squares
Date: 07/13/09 Time: 19:14
Sample(adjusted): 2000:4 2005:3
Included observations: 11
Excluded observations: 9 after adjusting endpoints
Number of cross-sections used: 7
Total panel (balanced) observations: 77
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y?	-7.430236	3.026505	-2.455055	0.0167
E?	2.606737	1.532756	1.700686	0.0936
V?	-0.892617	0.404398	-2.207276	0.0307
Fixed Effects				
_USA--C	108.5390			
_JPN--C	91.66017			
_DEU--C	71.11757			
_NLD--C	73.13653			
_BEL--C	65.90172			
_KOR--C	58.63741			
_HKG--C	59.84902			

R-squared	0.701924	Mean dependent var	22.58656
Adjusted R-squared	0.661884	S.D. dependent var	2.824543
S.E. of regression	1.642407	Sum squared resid	180.7326
Log likelihood	-142.1070	F-statistic	17.53056
Durbin-Watson stat	1.308845	Prob(F-statistic)	0.000000

HS 852540 (Eviews 4.1.)

Dependent Variable: X?
Method: Pooled Least Squares
Date: 07/13/09 Time: 19:15
Sample(adjusted): 2003:4 2007:1
Included observations: 14 after adjusting endpoints
Number of cross-sections used: 7
Total panel (balanced) observations: 98
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y?	4.043067	2.043766	1.978243	0.0510
E?	1.450635	0.914403	1.586430	0.1162
V?	-0.701513	0.263455	-2.662745	0.0092
Fixed Effects				
_USA--C	-5.907269			
_JPN--C	-6.586013			
_DEU--C	12.12161			
_NLD--C	10.57732			
_BEL--C	11.78241			
_KOR--C	0.538402			
_HKG--C	12.61756			

R-squared	0.806159	Mean dependent var	24.80791
Adjusted R-squared	0.786334	S.D. dependent var	1.737864
S.E. of regression	0.803311	Sum squared resid	56.78714
Log likelihood	-112.3188	F-statistic	40.66438
Durbin-Watson stat	1.409135	Prob(F-statistic)	0.000000

HS 847160 (Eviews 4.1.)

Dependent Variable: X?
Method: GLS (Variance Components)
Date: 07/17/09 Time: 09:00
Sample: 2000:1 2006:2
Included observations: 16
Excluded observations: 10
Number of cross-sections used: 7
Total panel (balanced) observations: 112

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26.27437	3.294042	7.976333	0.0000
Y?	0.042162	0.417129	0.101077	0.9197
E?	0.528123	0.345853	1.527016	0.1297
V?	-0.141237	0.200295	-0.705148	0.4822
Random Effects				
_USA--C	2.324470			
_JPN--C	-0.348462			
_DEU--C	1.284823			
_NLD--C	2.231273			
_BEL--C	-2.955550			
_KOR--C	-3.043538			
_HKG--C	0.506984			
GLS Transformed Regression				
R-squared	0.691721	Mean dependent var		24.18373
Adjusted R-squared	0.683158	S.D. dependent var		2.148909
S.E. of regression	1.209594	Sum squared resid		158.0167
Durbin-Watson stat	0.869369			
Unweighted Statistics including Random Effects				
R-squared	0.707009	Mean dependent var		24.18373
Adjusted R-squared	0.698870	S.D. dependent var		2.148909
S.E. of regression	1.179220	Sum squared resid		150.1804
Durbin-Watson stat	0.914732			

HS 847170 (Eviews 4.1)

Dependent Variable: X?
Method: Pooled Least Squares
Date: 07/13/09 Time: 19:10
Sample: 2000:1 2007:4
Included observations: 32
Number of cross-sections used: 7
Total panel (unbalanced) observations: 136
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y?	3.408538	2.554718	-1.334213	0.1845
E?	-3.884691	1.509952	-2.572724	0.0112
V?	-1.857890	0.448623	-4.141314	0.0001
Fixed Effects				
_USA--C	-6.684705			
_JPN--C	19.19451			
_DEU--C	-25.92721			
_NLD--C	-22.85879			
_BEL--C	-24.62104			
_KOR--C	17.96085			
_HKG--C	-13.98707			

R-squared	0.345956	Mean dependent var	20.52891
Adjusted R-squared	0.299238	S.D. dependent var	3.216902
S.E. of regression	2.692918	Sum squared resid	913.7275
Log likelihood	-322.5073	F-statistic	7.405275
Durbin-Watson stat	1.366174	Prob(F-statistic)	0.000000

HS 847330 (Eviews 4.1.)

Dependent Variable: X?
Method: GLS (Variance Components)
Date: 07/13/09 Time: 19:11
Sample: 2000:1 2007:4
Included observations: 32
Number of cross-sections used: 7
Total panel (unbalanced) observations: 199

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.31302	2.358590	8.188375	0.0000
Y?	0.675581	0.302582	2.232720	0.0267
E?	0.529319	0.323139	1.638051	0.1030
V?	-0.210765	0.218396	-0.965057	0.3357
Random Effects				
_USA--C	0.164523			
_JPN--C	0.781587			
_DEU--C	0.208544			
_NLD--C	0.541943			
_BEL--C	-0.084969			
_KOR--C	-3.064773			
_HKG--C	1.583981			
GLS Transformed Regression				
R-squared	0.579747	Mean dependent var		21.55927
Adjusted R-squared	0.573282	S.D. dependent var		2.533275
S.E. of regression	1.654829	Sum squared resid		533.9993
Durbin-Watson stat	0.642563			
Unweighted Statistics including Random Effects				
R-squared	0.590306	Mean dependent var		21.55927
Adjusted R-squared	0.584003	S.D. dependent var		2.533275
S.E. of regression	1.633908	Sum squared resid		520.5825
Durbin-Watson stat	0.659123			

HS 854219 (Eviews 4.1.)

Dependent Variable: X?
Method: Pooled Least Squares
Date: 07/17/09 Time: 09:02
Sample(adjusted): 2000:2 2006:4
Included observations: 15
Excluded observations: 12 after adjusting endpoints
Number of cross-sections used: 7
Total panel (balanced) observations: 105
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y?	2.891696	2.414928	-1.197425	0.2341
E?	4.091215	1.019849	4.011590	0.0001
V?	-0.252888	0.172366	-1.467158	0.1456
Fixed Effects				
_USA--C	85.33440			
_JPN--C	64.77848			
_DEU--C	71.38882			
_NLD--C	66.51812			
_BEL--C	66.15714			
_KOR--C	42.29341			
_HKG--C	62.04104			

R-squared	0.734324	Mean dependent var	21.81362
Adjusted R-squared	0.709155	S.D. dependent var	2.838552
S.E. of regression	1.530833	Sum squared resid	222.6278
Log likelihood	-188.4444	F-statistic	29.17539
Durbin-Watson stat	1.006797	Prob(F-statistic)	0.000000