FACTORS AFFECTING IMPORT DEMAND OF INDONESIAN TIN BY SINGAPORE IN THE YEAR OF 1985 – 2002

Thesis



By

Dian Safitri

Student Number: 00313059

DEPARTMENT OF ECONOMICS

INTERNATIONAL PROGRAM FACULTY OF ECONOMICS

ISLAMIC UNIVERSITY OF INDONESIA

YOGYAKARTA

2004

FACTORS AFFECTING IMPORT DEMAND OF INDONESIAN TIN BY SINGAPORE IN THE YEAR OF 1985 – 2002

Thesis

Presented as Partial Fulfillment of the requirements to obtain the Bachelor Degree in Economics Department

By

Dian Safitri

Student Number: 00313059

DEPARTMENT OF ECONOMICS

INTERNATIONAL PROGRAM FACULTY OF ECONOMICS

ISLAMIC UNIVERSITY OF INDONESIA

YOGYAKARTA

2004

APPROVAL

FACTORS AFFECTING IMPORT DEMAND OF INDONESIAN TIN BY SINGAPORE IN THE YEAR OF 1985 – 2002

By

Dian Safitri

Student number: 00313059

Approved by,

Content Advisor,

(Sahabudin Sidiq, Drs., MA)

..... **July 15, 2004**

Language Advisor,

(Noor Qomariya, A, S.Pd)

..... **July 15, 2004**

FACTORS AFFECTING IMPORT DEMAND OF INDONESIAN TIN BY SINGAPORE IN THE YEAR OF 1985 – 2002

A BACHELOR DEGREE THESIS

By

DIAN SAFITRI

Student Number: 00313059

Defended before the Board Examiners

On July 31, 2004

and Declared Acceptable

Board of Examiners

Examiner 1:

(Sahabudin Sidiq, Drs., MA)

....

Examiner 2:

(Eko Atmaji, Drs., M.Ec)

....

Yogyakarta, July 31, 2004

International Program

Faculty of Economics

Islamic University of Indonesia

Dean



iii

..., MA

ABSTRACT

The target of economic development in Indonesia is to develop the national society as a whole with the surplus condition in the international trading. The government is well aware that the mineral sector provides Indonesia with one of its major competitive advantages The contribution of the mining industry to the economy is needed now, to drive national economic recovery and in the longer term to play a key role in national sustainable economic development. The empirical study in few countries shows that a country that has a high export production enjoys a high rate of economic development rather than a country that has a low export production. A trade, majors on export, is believed as a motor for the economy. Export can bust up the development of economy in a country and it is also a dominant factor. In Indonesian government balance of trade the tint export is one of the important commodity in mining sector beside oil, gas and chopper. Indonesia as one of the world's four major tin producers, except Brazil close in ore production to Malaysia and China in the late 1980s. Tin ore production was centered on Bangka Island, part of South Sumatra Province. Around 95% of Tins product are exported outside of Indonesia; this tin performance is influenced by market condition. For tint commodity Indonesia own 20% of the whole international tin product (Statistic Indonesia 1990).

The demand of Indonesian tin by Singapore affected by four variables. The variables are: International Price of Indonesian tint (US Cents/ pound), Exchange value of dollar to rupiah (US $/ Rp), GDP real of Singapore (Sin $), and International Price of Indonesian Aluminum (US Cents/ pound). The purpose of the research is to analyze the effect of International Price of Indonesian tint (US Cents/ pound), Exchange value of dollar to rupiah (US $/ Rp), GDP of Singapore (Sin $), International Price of Indonesian Aluminum (US Cents/ pound) toward import demand of Indonesian tin by Singapore. Research hypothesis based on theory and on data analysis that a demand theory as a general, which the demand theory is the demand of export affected by the price of the related good, the GNP of the imported country, the exchange rate rupiah to Singapore Dollar, and Indonesian tint total product. To reach the purpose of the research and hypothesis method, the writer used the time series data regression 1985 – 2002 while for analysing the data used the regression linear model.

From the regression result that variables joined (F- Test) of International Price of Indonesian tin, Exchange value of dollar to rupiah, GDP Singapore, and International Price of Indonesian Aluminum affect very significant to the import demand of Indonesian tin by Singapore, with high correlation around 0.9503. The coefficient determination shows that 90.3164%. Price of Indonesian tin, Exchange value dollar to rupiah, GDP of Singapore, and International price of Indonesian Aluminum can explain the variation of Import Demand Volume of Indonesian tin by Singapore. And the rest, which is affected by the other variables, is only 9.6836%.

Acknowledgement

The writer would like to thank Allah for His strength and blessing that the writer as a student of International Program, Economic Department Faculty of Economics, Indonesian Islamic University can finish the Thesis. The writer also would like to give Shalawat for the Prophet's Rosulullah SAW as the guidance of Moslems.

A Thesis is one of the prerequisites that must be done by every student of Economic faculty, Indonesian Islamic University as partial fulfillment of the requirement to obtain bachelor degree in Economic Department of International Program of Faculty of Economics Indonesian Islamic University. The writer would like to thank for everyone who has helped the writer in completing this Thesis. They are:

1. Thanks to my lovely parent Winarno Notohamiprojo, SH and Fauziah, for accompanying me every night typing the thesis until finish, supporting me and praying for me every day.
2. Thanks to Bapak Sahabudin Sidiq, Drs., MA my content advisor, for the advice and supervision to finish the thesis.
3. Thanks to Ibu Noor Qomariya, A, S.Pd my language advisor, for the advice and supervision to finish the thesis.
4. Thanks to my sweethearth Budi Mukti Wibowo, ST.kom, for everythings, a great support advice and accompaniment. Thank you so much.

5. Thanks to my three little brothers Ali Akbar Diponegoro, Mega Satria Putra, and Mada Satria putra. Thank for the happiness and the cheeriness.
6. Thanks to Kaik, Ninik, Mami, Cil Lina thank you so much.
7. Thanks to Yuliono family, Om and Tante, Mbak Diah and Mas Samsul, Agung, thank you for the prayer advice and support.
8. Thanks to my sweet friends Arin, Billy, Reza, Darwis, Sigit, Andhika, Bram, Didin, Gugum, and Arif. We are friends forever.
9. Thank you for everyone that helped the writer could finish the Thesis.

The writer do hope that this thesis could give positive contributions to the development of Indonesian Export of Tin, as well as other parties who intended to conduct the researchers.

Table of Content

Page of Title.....i

Approval page.....ii

Legalization page.....iii

Acknowledgment.....V

Table of Content.....VII

List of Table.....XI

List of figures.....XII

List of Appendices.....

Appendices: 1. Heteroscedasticity.....

2. Multicollinearity.....

3. Autocorellation.....

Chapter 1 INTRODUCTION

1.1. Back ground of the study.....1

1.2. Problem Identification.....4

1.2.1. The Tin Market.....6

1.2.2. Tin Description.....8

1.3. Problem Formulation.....11

1.4. The Research Method.....11

1.5. Hypothesis Formulation.....12

1.6. Research Objectives.....12

1.7. Research Contribution.....13

1.8. Writing Systematiztion.....13

Chapter 11 LITERATURE REVIEW

2.1. Review of Related Literature.....14

2.1.1. Moehammad Oetomo.....14

2.1.2. Prasetyo Budi Laksono.....15

Chapter 111 RESEARCH METHOD

3.1. Research Method.....16

3.2. Data Specification & Data Sources.....17

3.3. The Important of International Trade 17

3.4. International Trade Theory.....18

3.5. Absolute Advantage Theory.....19

3.6. Comparative Advantage Theory.....19

3.7. Hescher – Ohlin Theory.....20

3.8. Demand Theory.....22

3.8.1. Change in demand.....23

1. prices of other goods.....24
2. Income.....24
3. Population.....25
4. Tastes.....25

3.8.2. Elasticity of demand.....27

3.9. Theory of Consumer Behavior.....28

3.10. Theory of Import.....29

3.11. Foreign Exchange Rate.....31

3.12. Analysis Method.....32

3.12.1. t- Statistics.....32

3.12.2. F- Statistics.....33

3.12.3. Coefficient Determination (R^2).....34

3.13. Classical Assumption.....35

3.13.1. Multicollinearity.....35

3.13.2. Autocorrelation.....36

3.13.3. Heteroscedasticity.....37

Chapter IV DATA ANALYSIS

4.1. Description Analysis.....39

4.1.1. The Import demand volume of Indonesian tin by Singapore.....39

4.1.2. International price of Indonesian tin.....41

4.1.3. Exchange value of dollar to rupiah.....42

4.1.4. GDP of Singapore.....43

4.1.5. International price of Indonesian Aluminum.....44

4.2. Hypothesis Testing.....45

4.2.1. F- Statistics.....45

4.2.2. t- Statistics.....47

4.2.2.1The effect of International price of Indonesian tin Toward Import demand volume of Indonesian tin by Singapore.....47

4.2.2.2 The effect of Exchange value dollar to rupiah toward Import demand volume of Indonesian tin by Singapore.....48

4.2.2.3 The effect of Singapore GDP toward Import demand volume of Indonesian tin by Singapore.....50

4.2.2.4 The effect of International price of Indonesian Aluminum toward Import demand volume of Indonesian tin by Singapore.....51

4.3. Log linear Regression Analysis.....53

4.3.1. Regression Model.....53

4.4. Testing Violation on Classical Assumption.....56

4.4.1. Multicollinearity Testing.....56

4.4.2. Heteroscedasticity Testing.....58

4.4.3. Autocorrelation Testing.....59

Chapter V CONLUTION &IMPLICATION

5.1. Conclusion.....62

5.2. Implication.....63

BIBLIOGRAPHY.....65-66

Appendices

LIST OF TABLES

1.1. Indonesian Export Data.....5

1.2. Export of tin by Major Country destination.....10

4.1. Import demand volume of Indonesian tin by Singapore.....40

4.2. International price of Indonesian tin.....41

4.3. Exchange value of dollar to rupiah.....42

4.4. GDP of Singapore.....43

4.5. International Price of Indonesian Aluminum.....44

4.6. The result of the multiple linear regression.....54

4.7. The result of multicollinearity testing.....58

4.8. Result of Heteroscedasticity.....59

LIST OF FIGURES

4.1. Area of accepted & rejected on F test hypothesis.....46

4.2. Area of accepted and rejected on International Price of Indonesian tin.....48

4.3. Area of accepted and rejected on exchange value of dollar to rupiah.....49

4.4. Area of accepted and rejected on Singapore GDP variable.....51

4.5. Area of accepted and rejected on International Price of Indonesian Aluminum.....52

4.6. Accepted and unaccepted hypothesis for autocorrelation testing.....61

CHAPTER I

INTRODUCTION

1.1. Background of the Study

Indonesia is one of the developing countries that follow an open economy system. It means that an international economy has an important role in developing the national economy. The target of economic development in Indonesia is to develop the national society as a whole with the surplus condition in the international trading. The improving of advanced technology can be a help to increase the production on goods and services for trading. In international trade theory, a country has a comparative advantage in producing goods in term of other goods that are lower in that country compare to another country. Hence, trade between two countries can benefit both countries if each country export the goods in which it has a comparative advantage theory. The international trading could be, the exchange of good and services, the movement of row material in each country, the exchange and expand of the goods and services can pursued the increasing of economic development.

In 1997 the economic crisis hit Indonesia and many other Asian countries, resulting in local currency depreciation particularly against US$. In Indonesia the depreciation was severe and had a negative impact on most of national industry performances including the mineral sector. However, the mining industry was less affected than most others were as most of the production was exported. It earned foreign exchange while many production cost components

were in local currency. Hence, the industry was not affected seriously by the crisis. However, the economic crisis in Indonesia was followed by a political crisis, which led to deterioration in law and order. This situation occurred in several regions, and increased illegal mining operations. The above unpromising features created an uncomfortable situation in the mining industry, in particular, causing a downturn in exploration activities, either due to delays or suspensions. As a result, during the last four years there was no significant mineral discovery, and consequently, no new mine operations started up. Exploration and feasibility expenditure tended to decrease, while development spending increased from 1996 to 1999 and continued by a decrease. The other factors that contributes the decline of the Indonesian mining industry were the enactment of discouraging regulations, which caused the decentralization of the mining authority following the autonomy policy, and the restriction of mining operations following the Forestry Law No 41 of 1999. Therefore, although the mining industry was not affected directly by the economic crisis during the last four years, steps are being taken to address this and to restore the mining industry to its former vibrancy. The government is well aware that the mineral sector provides Indonesia with one of its major competitive advantages, in terms of geo-resource assets, second only to oil and gas. Allowing the mining industry to gradually decline is not an option. The contribution of the mining industry to the economy is needed now, more than ever, to help driving national economic recovery and in the longer term to play a key role in national sustainable economic development. With this idea the government is implementing a number of programs, as follows:

1. In mineral sectors, preparing a new mining law to replace the previous law no 11 of 1967. This new law is designed to accommodate the prevailing issues such as decentralization, the new investment policy, regional and community developments, small scale mining operations, land ownership, worker health and safety, and environmental management.
2. Making efficiency Improvement of state owned mining companies, through privatization program.
3. Establishing close coordination with related institutions such as forestry and environment agencies, to create favorable regulations for the optimal benefit of national development.
4. Implementing swift and firm action to stop illegal mining operations.
5. Solving the problems related to regional autonomy implementation.
6. Optimizing ore process toward producing an end product to secure high additional value to meet domestic downstream industry demand.
7. Expanding research and development programs toward the utilization of domestic mineral raw materials for intensifying domestic industry.

In government balance of trade the tint export is one of the important commodity in mining sector beside oil, gas and chopper. For tint commodity Indonesia own 20% of whole international tint product (Statistic Indonesia 1990). Based on the fact above the writer wants to make tint commodity as an object to make research with entitle:

FACTORS AFFECTING DEMAND OF INDONESIAN TIN BY SINGAPORE IN THE YEAR OF 1985 – 2002.

1.2. Problem Identification

The empirical study in few countries shows that a country that has a high export production enjoys a high rate of economic development rather than a country that has a low export production. A trade, majors on export, is believed as a motor for the economy. Export can bust up the development of economy in a country and it is also a dominant factor. In Indonesia the research's of export and economy development show that basically the dominant export can improve the development of economy as a whole (Emeri, 1967).

The dominant movement from Indonesia oil and gas export to non oil and gas exports show that there is a change in Indonesian export structure, where oil and gas export defeated by non oil and gas export in the government balance of trade (Statistic Indonesia, 1990). Indonesia which own a large area land and tropical climate are famous with the rich of harvest forestry and minerals which have high value such as gold, tint, chopper, iron, etc. The mining activity in Indonesia it self started hundred years ago, especially in tin in Indonesia is include as the biggest tint export country in the world beside Peru and China.

Indonesian's trade balance, including oil and non-oil was surplus from year to year during 1988 – 2002. The balance of trade recorded surplus around US $ 5.970.0 million in 1998 and rose more than three times to US$ 25,869.9 million in 2002. Of non-oil and gas, it tended deficit until 1996 whereas the lowest was around US$802.7 million in 1998 and the highest deficit was US$ 5,312.4 million in1990. In the meantime, the surplus of non-oil and gas trade accrued to 1993 registered to US$ 920.0 million and went down to US$743 million in 1994. For

the last five years, the balance of trade of non oil and gas have a positive effect namely US$ 16,292.3 million in 1998, US$ 18,551.0 million in 1999, US$ 20,262.1 million in 2000, US$ 18,194.3 million in 2001, and US$ 20,283.0 million in 2002 (Indonesian Statistics). The data is shown on the table 1.1 below

TABLE 1.1

Indonesian export data:

Year	Oil & gas		Non oil & gas		Total
	Value	%	Value	%	
1984/1985	13.994	70,3	5.903	29,7	19.901
1985/1986	12.473	66,8	6.175	33,2	18.612
1986/1987	6.966	50,9	6.731	49,1	13.697
1987/1988	8.841	48,2	9.502	51,8	18.343
1988/1989	7.640	38,5	12.814	61,5	19.824
1989/1990	9.337	39,2	14.493	60,8	23.830
1990/1991	12.763	45,4	15.380	54,6	28.143
1991/1992	10.706	36,0	19.008	64,0	29.714
1992/1993	10.480	29,7	24.823	70,3	35.303
1993/1994	9.334	25,6	27.140	74,4	36.504
1994/1995	10.446	24,8	31.176	75,2	42.161
1995/1996	10.616	22,2	37.138	77,8	47.754
1996/1997	10.238	19,8	41.488	80,2	51.726

Source: central bureau of statistics

Indonesia as one of the world's four major tin producers, except Brazil, close in ore production to Malaysia and China in the late 1980s. Tin ore

production was centered on Bangka Island, part of South Sumatra Province. New exploration was planned in 1989 on Sumatra and offshore Bangka Island. Indonesia is a member of the Association of Tin Producing Countries and was required in FY 1989 to restrict tin exports to no more than 31,500 tons as part of the association's Supply Rationalization Scheme. The government enterprise, PT Timah, controlled the majority of tin mining and, together with an Australian mining firm, operated a tin smelter in Muntok, located in northwestern Bangka Island. In 1989 the smelter, which had a capacity of 32,500 tons per year, produced 29,900 tons of refined tin from local ore. In the late 1980s, Indonesia exported 80 percent of its tin production. Some tin ore was shipped to Malaysia for processing, although tin metal was shipped primarily to Singapore. Most of the growing domestic tin consumption was used in tin plating and for solder. Officials proven reserves of tin were 740 million tons.

1.2.1 The Tin Market

Around 95% of Tins product are exported outside of Indonesia; this tin performance is influenced by market condition. In PT Timah Tbk's 2001 Annual Report it was indicated that tin price decline substantially since August of 2001. These low prices continued into 2002 and remained at these low levels until the end of 2002. LME average tin price for the whole of 2002 was US$4075 per metric tones, which is 9.4% lower than that of 2002 of US$4,498 per metric tones.

The decline in tin prices can be attributed to the changes in the tin industry as follows:

- The prolonged economic crisis has resulted in the decline in the demand of tin. Such condition was anticipated by players of the market and as a consequence released their holdings into the market

- The geographical shift of tin consuming industries to Asia, most prevalent is the electronic industry to China. This has prompted LME to open a warehouse in Singapore. As a result traders and consumers in an attempt to alleviate holding cost release their metal into LME warehouses.

- During 2001, the Indonesian government legalized the export of tin concentrate, which provides an opportunity for local traders to export tin concentrate to neighboring countries. These triggered the sprawl of the so-called unconventional mining activities and increase the flow of concentrate out of Indonesia and into the international market. The export ban issued on the 1 June 2002 by the Minister of Industry and trade has alleviated the pressure on tin prices although it has not yet reached the level of that in 2000. (Annually financial report of PT TimahTbk's)

1.2.2 Tin Description

Taken from US Bureau of mines 1996, metallic chemical element; symbol Sn [Lat. stannum]; at. no. 50; at. wt. 118.69; m.p. 231.9681°C; b.p. 2,270°C; sp. gr. 5.75 (gray), 7.3 (white); valence +2 or +4. Tin exhibits allotropy; above 13.2°C it is a lustrous, silver-white, highly crystalline metal with tetragonal structure. A brittle form with orthorhombic structure may exist above 161°C. Below 13.2°C pure tin tends to become a gray powder, a change commonly designated "tin pest" or "tin disease." Tin is very soft (only slightly harder than lead) and malleable; it can be rolled, pressed, or hammered into extremely thin sheets (tin foil). When iron or steel is dipped into molten tin, a layer of tin is deposited on the surface. A tin coating may also be applied by electroplating, which uses less tin. The tin serves to prevent rusting, since it is barely affected by moisture. The tin plate used in tin cans is an iron or steel sheet coated with tin. A tin coating is used to protect copper and other metals. Tin is a component of antifriction metal, bell metal, britannia metal, bronze, gunmetal, pewter, solder, and other alloys. Tin forms stannous compounds, in which it has valence +2, and stannic compounds, in which it has valence +4, as well as stannites, stannates, and other complex salts. Industrially useful compounds of tin include stannous chloride, important as a reducing agent, as a mordant in dyeing, and for weighting silk; stannic chloride, for the last two purposes and to stabilize perfume and color in soap; stannic oxide, for the preparation of white porcelain enamelware; and sodium stannite, a reducing agent. Stannous fluoride is added to toothpaste and water supplies to prevent tooth decay. Tin forms a number of toxic organometallic compounds that.

Are used as fungicides, catalysts, and for other uses. Tin very rarely occurs uncombined in nature; the dioxide, which occurs as cassiterite, or tinstone, is the only ore of commercial importance. It is obtained chiefly from Bolivia, Indonesia, the Malay Peninsula, Congo (Kinshasa), and Nigeria. The tin mines of Cornwall, England, were formerly the principal sources. The metal is prepared from cassiterite by heating in the reverberatory furnace. The ore from the mines is first given special treatment, and the "concentrates" thus obtained are mixed with coal in the furnaces. Tin was known and used by humans at least as early as the Bronze Age. The metal and its compounds were known and used by the alchemists. In 1673, Robert Boyle published a description of experiments on the oxidation (calcination) of tin. Lavoisier recognized the metal as an element. (US Bureau of Mines 1996)

Exploration for tin is concentrated around Bangka Island. The geophysical surveys also give cause to believe that the probability of finding deposits outside the "traditional" tin belt is high. For other minerals, exploration for gold commenced in the Province of Aceh, North Sumatra, Central Kalimantan, West Kalimantan, East Kalimantan, and East Java. Preliminary surveys for coal are in East Kalimantan.

Starting in 1996, Tin puts into use in modern GPS (Global Positioning System) devices to facilitate exploration activities. This tremendously increased the efficiency and accuracy of mapping and measuring. Data from the laboratory tests and GPS is captured on computer to produce highly accurate geological maps for systematic and efficient mining.

The mining operations are undertaken with a fleet of 21 dredges constitutes the world's largest offshore mining fleet and 300 inland gravel-pump contractors. In 1996 Tin achieved record-breaking performance in tin production, volume of earth moved, and operating hours for the dredge fleet

The research of elluvial and alluvial tint are done by geological map with pitting test and boring with banka bor. Intensive research in such prospective regions are made by methods of geological mapping, geophysics and geology quarter. The tint deposits are spread in the islands of Riau, Kundur, Karimun, and over the sea of Bangka and Belitung. The exploration that was made before is to increase the measurement of material resource 92,266 ton with specification 30,137 ton with the rate value of tint 0,34 per meter qubik from land and over the sea 62,129 ton with the rate value 0,34 kg pre meter qubik. The volume of tin export is shown on the table below:

TABLE 1.2

Export of Tin by Major Country of destination:

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Singapore	22.2	29.2	36.9	42.2	42.7	40.8	39.0	35.0	45.2
Korean Rep	-	-	-	-	0.1	0.2	0.0	0.1	0.2
UK	-	1.5	1.4	1.3	1.3	0.6	0.5	0.4	0.2
Netherlands	-	6.7	7.6	5.8	7.9	4.8	4.2	6.7	8.3
Italy	-	0.8	-	-	-	0.3	0.8	0.8	1.1
Others	0.2	0.8	0.5	0.2	1.2	1.6	1.4	2.0	2.4

Source: central bureau of statistics

1.3. Problem Formulation

1. International Price of Indonesian Tin

   To know how far is the International tin price affected the import demand of Indonesian tin by Singapore.

2. Exchange rate of Rupiah to US Dollar

   To know how far is the exchange rate Rupiah to Dollar affected the import demand of Indonesian tin by Singapore.

3. GDP Real Singapore

   To know how far is the GDP Real Singapore affected the import demand of Indonesian tin by Singapore.

4. International Price of Indonesian Aluminum

   To know how far is the price of aluminum affected the import demand of Indonesian tin by Singapore.

1.4. The Research Model

To conduct the analysis which is not out of the contact easily, the writer make a limitation of the problems on four variables that affect import demand of Indonesian tin by Singapore. The variables are:

$$Y = F(X_1, X_2, X_3, X_4)$$

Y = The import demand volume of Indonesian tin by Singapore (ton)

X_1 = International Price of Indonesian tint (US Cents/ pound)

X_2 = Exchange value of dollar to rupiah (US $/ Rp)

X_3 = GDP real of Singapore (Sin $)

X_4 = International Price of Indonesian Aluminum (US Cents/ pound)

1.5. Hypothesis Formulation

1. International price of Indonesian tin has negative and significant effect toward demand import of Indonesian tin by Singapore.
2. Exchange rate has positive and significant effect toward import demand of Indonesian tin by Singapore.
3. GDP real of Singapore has positive and significant effect toward import demand of Indonesian tin by Singapore.
4. The International price of Aluminum has positive and significant effect toward import demand of Indonesian tin by Singapore

1.6. Research Objectives

1. To analyze the effect of international price of Indonesian tin toward import demand of Indonesian tin by Singapore.
2. To analyze the effect of exchange rate Dollar to Rupiah toward import demand of Indonesian tin by Singapore.
3. To analyze the effect GDP real Singapore toward import demand of Indonesian tin by Singapore.
4. To analyze the effect of international price of Indonesian Aluminum toward import demand of Indonesian tin by Singapore.

1.7. Research Contribution

1. To give other researcher temporary data and argument about Indonesia tin export
2. To show the effect of Indonesian tin export on government balance of trade.
3. To give an additional information to the other researcher.
4. As an additional information tin commodity can increase the government balance of trade
5. As a requirement to have a bachelor degree in economic faculty of Indonesian Islamic University.

1.8. Writing Systematization

Chapter I = Explain the reason of choosing the demand of Indonesian tin by Singapore as the topic of writer's thesis. This chapter explains about the way to analysis the model

Chapter II = This chapter explain about the research review that can support the analysis of the model

Chapter III = This chapter explains about the theory that being foundation of this thesis.i.e. Theory of demand, demand curve, and analysis method data.

Chapter IV = This chapter is the core of the thesis. This chapter contains of the data analysis and data testing

Chapter V = Conclusion and implication

CHAPTER II

LITERATURE REVIEW

2.1. REVIEW OF RELATED LITERATURE

2.1.1. Moehammad Oetomo

A research, done by Moehammad Oetomo (1999) could be an additional material for the writer to make research. The research was focused on the strategy of tin marketing to anticipate the fluctuation price on tin[1]. Following his research the price of tin fluctuated since 1960 and the worst one is in the year of 1974 and it ended in 1985. After that the tin price is fluctuated until now. The data analysis used simple statistics. As a requirement to explore the data on statistic are total sample and data homogeneous which is from the same population. Data population or total samples are used in 3 years periods, which come from the same population, from PT Koba Tin. From this research the researcher see there are some factors that affect the demand of tin, they are:

1. Price of Indonesian tin in international market that competes to another tin exporter country.
2. There is a substitution goods like aluminum that can reduce the used of tin because the price of the substitution good are cheaper than tin.
3. The discovery of potential tin deposits in Peru that may become the Indonesian competitor in tin exports
4. The charge of exported goods that are done by exported country to imported country.

Besides that, the researcher see the demand of tin increase when the related company makes expanding strategy by "customized product' it means that the company can produce a specific goods that consumer wants.

2.1.2. Prasetyo Budi Laksono,

Followed by Prasetyo (1997), the price of tin in the international market was drop because of the increasing of supply in the country that produces tin. The export of Indonesian tin prediction was increase in this few year as same as the tin export in Peru and China. The biggest volume of Indonesia tin export (around 50% to the Asia, 24% to Europe and the less 21% to the South America)[2].

Even though supply is increasing Prasetyo predict the demand of tin also increase around 2% per year. More over based on the new research technology which is done by International Tin Research Institute (ITRI) in the matter of reducing the used world tin, this institute predict that in the whole year of 2000 the consumption of tin will be increase around 34,000 ton.

Beside the consumer will like the Indonesian white tin because the white tin from Indonesia has a high percentage of tin for example in the Merck of Bangka Low Lead.

---

1. Moehammad Oetomo, Tin Marketing Strategy to anticipate the fluctuation prices in PT. Koba Tin. Technique Faculty of UGM, Yogyakarta, 1999
2. Prasetyo Budi Laksono, International tin trading, "Bulletin Economy Journal", Jakarta, 23 of July 1997.

CHAPTER III

RESEARCH METHOD

3.1. Research Method

The theory based on data analysis is a demand theory as a general, which is the demand of export affected by the price of the related good, the GDP real of the Singapore, the exchange rate rupiah to Singapore Dollar, and the price of substitute good. The model analyses of demand on Indonesian tin are:

$$Y = F(X_1, X_2, X_3, X_4)$$

Y = Import demand volume of Indonesian tin by Singapore (ton)

X_1 = International Price of Indonesian tin (US Cents/ pound)

X_2 = Exchange value of dollar to rupiah (US $/ Rp)

X_3 = GDP real of Singapore (Sin $)

X_4 = International Price of Indonesian Aluminum (US Cents/ pound)

To meet the purpose of this research and hypothesis testing this research will use regression analysis with time series data. This analysis used log linear regression:

$$Y = \beta_0 \times X_1^{\beta 1} \times X_2^{\beta 2} \times X_3^{\beta 3} \times X_4^{\beta 4} \times Ui$$

$$LnY = Ln\,\beta_0 + \beta_1 Ln\,X_1 + \beta_2 Ln\,X2 + \beta_3 Ln\,X_3 + \beta_4 Ln\,X_4 + Ui$$

$$Y^* = \beta_0 + \beta_1 X_1^* + \beta_2 X_2^* + \beta_3 X_3^* + \beta_4 X_4^* + Ui$$

$Y^* = \text{Ln } Y$ $\quad$ $X_1^* = \text{Ln } X_1$ $\quad$ $X_3^* = \text{Ln } X_3$

$\beta_0^* = \text{Ln } \beta_0$ $\quad$ $X_2^* = \text{Ln } X_2$ $\quad$ $X_4^* = \text{Ln } X_4$

To reach the purpose research and hypothesis method used in this analysis is using the time series data regression 1985 – 2002. The analysis data is using the regression linear model.

3.2. Data Specification and Data Sources

The method of collecting data is done by the numbers of collected and secondary data, which the sources are from:

a. International monetary found (related addition)

b. Statistics year book of Indonesia (related addition)

c. Central bureau of statistics (BPS, International Indonesian Trading Statistics)

Literature research is done to study the independent variables affect the Indonesian tin export to Singapore.

3.3. The important of International Trade

The relation between export and economic growth for the few decades gained attention a lot. This international trade especially export is believed as a locomotive for the economic growth. For example, Taiwan, South Korea, Brazil that shown strategy export expansion can bust up the economic growth and

income distribution. It will be hard to fulfill their need without any relationship with other country. With this improvement of technology, which grow fast as an effect of many variance and production increases of good a service production to fulfill our needs. These trades between country can make:

a. Good and service trade
b. The distribution of resource across countries
c. Broadly use of technology can improve the economic growth of the country that include.

Two main important things that we face in the international trade:

Difference of currency:

- Government policy in cross-country trading that is not happen in regional trade likes terrifying, quota, subside, protection, and others.
- The currencies, there is a different currencies between countries. This reality can make problems likes foreign exchange fluctuation, foreign exchange changing, and other problems.

3.4. International Trade Theory

The main important thing in the international trade as a whole is there's a gain when a country sell their goods and services to the other country, and for the country who buy the good and services will get the profit also, so the international trade is like mutualism symbiosis. As an earlier step we must know about the effect of the world international trade, start from there we know the concept that the world analyst make.

3.5. Absolute advantage theory

This concept declared by Adam Smith. It was a critisition from the mercantilism policy. Smith gives the first reason that international trade will be the foundation of classical analysis. According to Smith trading countries could increase the combination of output in each country that already specialized in produce good efficiently and then sell to another country that doesn't have the same good that another country produces. Reverse, our country must buy goods that our countries do not produce. Every where each country will get their profit according to selling goods to be consumed and sold the extra output that has been produced. The profit from specialization could increase the world output that can make each country specialize in absolute advantage and it's all will be distributed to their trade partner. But absolute advantage has many analytic weaknesses. Such as: how if the country doesn't have any absolute advantage in their commodity because of the assumption of this theory is getting far from the reality. (Samuelson, Microeconomics Seventeenth Edition)

3.6. Comparative advantage theory

David Ricardo introduces this theory. The theory is the way out from the failed of absolute advantage theory in explaining the situation if the entire comparative advantage in the good produced is handling by one country. In the reality these condition is always appears in relation of developing country and less develop country. That the develop country has more absolute advantage. According to David Ricardo trade is can be continued because the basic trade is

comparative advantage not absolute advantage. Absolute advantage an is special case from comparative advantage. (Samuelson, Microeconomics Seventeenth Edition)

3.7. Hechser – Ohlin Theory

- This theory explains the failures of H-O theory. Assumption is used in this theory.
- In this theory the condition of demand and supply commodities in trading always changes because the variable that depend on it is always moving. In H-O theory the condition of demand and supply are constant because there is ceteris paribus.
- In this theory the competition condition has been changed from monopoly (in a short time, are the steps of "taped sales growth") up to oligopoly. In H-O theory, it is a perfect competition.
- In this theory, the quality and the quantity of production and technology factor can be changed in a short time. H-O theory assumes constant.
- In this theory of international trade, a trade shouldn't have a free trade. It might be a tariff of import has been burdened. H-O theory assumes that a trade is a free.

From the explanation above, it's known that Product Life Cycle (PLC) theory consider the entire dynamic variable that could be change in a time.

The theory is the answer of the faildness of H – O theory that is changed from comparative statistics too dynamic. Those assumptions are:

a. In PLC theory the demand and supply commodity trading always change because the variables that affect demand and supply always move and change every time (H – O theory). The demand and supply condition is stable because the assumption of ceteris paribus.

b. In PLC theory the competition in trading is changing from monopoly (in short time Rapid Sales Growth) to oligopoly. (In H – O theory competition condition is in perfectly competition).

c. In PLC theory the quantity and quality of production factor and technology are changing time to time. (in H – O theory trading is free)

d. In PLC theory international trade is not suppose to be free, the import tariff are known by trader. (in H – O theory the international trade are free)

As mentioned above, the PLC theory considered about all of the variable that affect international trade as a dynamic variable, that is always changing time to time, the changing are happened in the model, because PLC theory is build from testable hypothesis about what will happen if all the curve are relevant (that the assumption before is constant in comparative statistics). This changing are affect of trading and also affecting the whole welfare. (Samuelson, Microeconomics Seventeenth Edition)

3.8. DEMAND THEORY

The simple Keynesian approach considers the market for domestic goods produced domestically. The Keynessian framework assumes that the domestic price of goods is rigid and the firms producing these goods can supply all the output that is demanded from them at the given prices. In a demand-supply setting, the assumption is that the aggregate supply curve of domestic goods is perfectly horizontal, because sales are constrained only by the level of demand. It is the level of aggregate demand of domestic goods that is, desired spending on output in this contact is tin.

The factor influence aggregate demand of tin is the basic national income or GNP of Singapore. It breaks down GNP the value of the entire final goods and services produced by Singapore in a given period. In an open economy, both foreign residents on domestic goods and services can purchase the goods produced by a country's residents. The spending on domestic goods is equal to absorption plus the trade balance. Trade balance represents the difference between domestic exports and the value of imports. Domestic exports correspond to the foreign demand for domestic goods and, as with demand relationship, depend on relative prices and foreign income. Interdependence and the international transmission of aggregate demand disturbances

The aggregate demand has been determining a given economy's macro equilibrium and it is affected by domestic disturbances, assuming that foreign variables (foreign income and foreign prices) remain unchanged. In an interdependent world, disturbances affecting income in one country can have

significant effects on other countries. As a result, an economy can be subject to major dislocations associated with economic events abroad. For instance, by reducing foreign demand for domestic goods (our export), a recession and unemployment in the domestic economy. The relationship between the aggregate quantity of demanded of domestic goods and the price level of domestic goods, at the given levels of the domestic money supply, the exchange rate and fiscal parameters such as the level of government spending and tax rates.

In order for and aggregate demand policy disturbance to have perceptible effects on domestic output whether in the short run or over time its must be able influence aggregate demand positively. A real disturbances in the form of changes in autonomous spending such as fiscal policy disturbances do not tend to be effective in altering aggregate demand under flexible exchange rates and perfect capital mobility. Any positive effects in the increased autonomous spending in aggregate demand are seriously hampered by the negative impact of the spending increase on the real exchange rate and, hence, on domestic export. (Samuelson, Microeconomics Seventeenth Edition)

3.8.1. Change in Demand

The term demand refers to the entire relationship between the quantity demanded and the price of good. The demand for tin is described by both the schedule demand schedule and the demand curve, were hold constant all the other influences on consumers' buying plans. The effects of those other influences are:

1. Prices of other goods

The quantity of tin consumers plan to buy does not depend only on the price of tin. It also depends in part on the prices of other relevant goods. These other goods fall into two categories: substitutes and complements. **A substitute** is a good that can be used in place of another good. Tin good substitutes for aluminum. If the price of substitute increase the demand for tin increase, meanwhile the demand of aluminum decrease. Conversely if the price of tin increase the demand of substitutes good increase, meanwhile the demand of tin decrease. The effects of a change in the price of substitutes occur no matter what the price of a tin. Whether tin have a high or a low price, a change in the price of substitutes encourages people to make the substitutes that it is reviewed. As a consequence, a chance in the price of a substitute changes the entire demand schedule for iron and shifts the demand curve. A complement is a good used in conjunction with another good. **The complement** of tin is iron if the price of tin doubles, fewer tin are bought and as a consequence, fewer people are interested in buying iron the demand for tin decreases. Conversely, if the price of this complement decrease, people were buy more tin. For example, if the price of the tin halves, more tin is bought and a larger number of people buy iron the demand for iron increase.

2. Income

Another influence on demand is consumer income. When income increases, consumers demand more of most goods. When increase decreases, consumers demand less of most goods. Higher average incomes means consumers

demand more of most goods. Rich people consumer more food; clothing, housing, art, vacations, and entertainment than do poor people. Although an increase in income leads to an increase in the demand for most goods, it does not lead to an increase in the demand for all goods. Goods that do increase in demand as income increases are called **normal goods.** Goods that decrease in demand when income increases are called **inferior goods.** Example of inferior goods is rice and potatoes. These two goods are a major part of diet of people with very low incomes. As incomes increase, the demand for these goods declines as more expensive meat and dairy products are substituted for them.

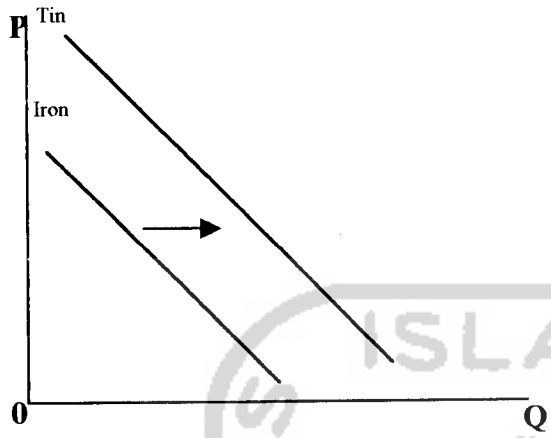
3. Population

Demand also depends on the size of the population. The larger the population, the greater is the demand for all goods and services. The smaller the population, the lower is the demand for all goods and services.

3. Tastes

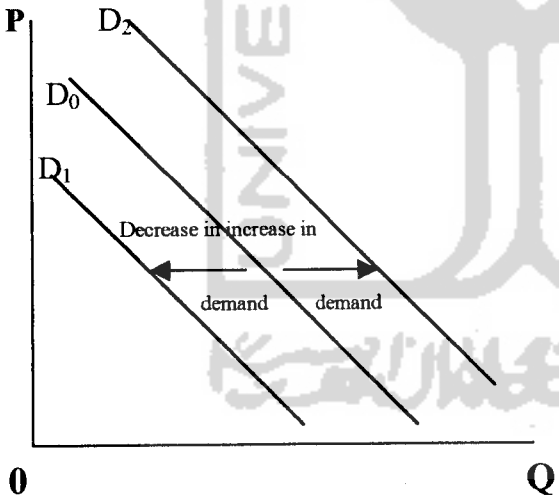
Tastes are an individual's attitudes or preferences toward goods and services. Tin has a much greater tastes for heavy industrial than a woods industry. As a consequence, even if they have same incomes, their demands for tin will be different. There is, however, a fundamental difference between tastes and all the other influences on demand. Tastes cannot be directly observed it can observe the price of a good and of its substitutes and complements. It can observe income and population size. But it cannot observe people's tastes. Economists assume that tastes do not change or that they change only slowly, and that they are

independent of all the other influences on demand. Movement Along Versus a Shift in the Demand Curve



A change in any influence on buyers other than the price of the good itself results in a new demand schedule and a shift in the demand curve

A Change in Demand versus a Change in the Quantity Demanded



When the price of good changes, there is a movement along the demand curve and a change in the quantity of the good demanded. If the demand curve is D_0 arise in the price of a good produces a decrease in the quantity demanded and a fall in the price of the good produces an increase in quantity demanded. The

arrows on demand curve D_0 represent the movement along demand curve. If some other influence on demand changes, which increase the quantity that peoples plan to buy, there is a shift in the demand curve to the right (from D_0 to D_2) and an increase in demand. If some other influence on demand changes, which reduces the quantity peoples, plan to buy, there is a shift in the demand curve to the left (from D_0 to D_1) and a decrease in demand. (Samuelson, Microeconomics Seventeenth Edition)

3.8.2. Elasticity of Demand

Price elasticity of demand measures the responsiveness of the quantity demanded of a good to a change in its price. It measures responsiveness by calculation the percentage change in the quantity demanded by the percentage change in its price. Price elasticity of demand is represented by (η). Using the following formula to calculate the price elasticity of demand:

$$\eta = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

When the price of a good rises, the quantity demanded falls. If the percentage change in price is positive, the percentage change in quantity demanded will be negative. As consequences, the price elasticity of demand will be a negative number. Because the price elasticity of demand is always negative, it adopts the convention of dropping the minus sign and the magnitude of elasticity. Price

elasticity demand (η) is the ratio of the percentage change in the quantity demanded to the percentage change in price. That is:

$$\eta = \frac{\Delta Q/Q}{\Delta P/P}$$

They're three things about the calculation of the price elasticity of demand:

1. The change in price and the change in the quantity demanded are both recorded as positive numbers
2. The changes in prices and quantities demanded are expressed as percentages of the average price and average quantity demanded
3. Although it is convenient to think of elasticity as the ratio of the percentage change in the quantity demanded to the percentage change in the price, it is also equivalently, the proportionate change in the quantity demanded divided by the proportionate change in the price.

- Inelastic, is elasticity's between 0 and 1
- Elastic, is elasticity's greater than 1
- Unit elastic, is dividing line between inelastic and elastic
- Perfectly elastic, is elasticity equal to zero

(Samuelson, Microeconomics Seventeenth Edition)

3.9. Theory of Consumer Behavior

The model of consumer choice has four elements that describe the consumer and his market environment

- The consumer takes as given the price at which he can buy any amount of the existing goods and services
- The consumer has a given income available for spending
- The consumer has tastes that allow him to evaluate, or rank, alternative combinations, or baskets, of goods by the satisfaction they yield. The consumer prefers more of any one good to less.
- The consumer chooses his consumption basket so as to maximize satisfaction, or, as it is called utility

3.10. Import Theory

Imports are foreign produced goods and services that are sold domestically. When a country allows trade and becomes an importer of a good, domestic consumers of the good are better off, and domestic producers of the good are worse off. Trade raises the economic well being of a nation in the sense that the gains of the winners exceed the losses of the losers. (Gregory Mankin, Macroeconomics). When the price of good X rises relative to the price of good Y rises. Country 1tend to purchase good X toward good Y. Thus, out of any given production of good X by country 1, more of good X will be available for export since home consumers do not wish to consume as much of it. This substitution effect makes the offer curve upward sloping, other things being equal. The higher price of good X is related to a rise in the quantity of exports of good X, when the price of good X rises to the price of good Y producers of country 1 will have an incentive to produce more good X and less good Y since the higher price of good X indicates potentially higher profitability in good X rather than good Y. This

Elasticity demand of import means a percentage change in the quantity of imports demanded divided by the percentage change in the relative price in imports. (Thomas A Pugel & Peter A Lindert, International Economics). (e) represent the elasticity of import.

$$e = \frac{dY/Y}{\frac{d(X/Y)}{X/Y}} = \frac{(dY/Y)(X/Y)}{d(X/Y)}$$

3.11. Foreign Exchange Rate

The essential role of money is to provide a general accepted unit of exchange and standard of value. Exchange rate is the price of one country's currency expressed in terms of another's the domestic price of a foreign currency. Most exchange rates are determined in foreign exchange markets beside government intervention. Hence, the demand for foreign currency is primarily an expression of the demand for foreign goods and services.

There are 4 methods to determine foreign exchange rates: depreciation is a fall in the price of one currency in terms of one or all others; appreciation is a rise in the price of a currency in terms of another currency; devaluation is continued to situations in which a country has officially set or "pagged" its exchange rate to another currency or to gold and in which the pagged rate or parity is change by the rising the price of the other currency. Appreciation and depreciation always happen in the foreign exchange market.

3.12. Analysis Method

3.12.1. t - Statistic

This test is used to detect the correlation between dependent variable and independent variables individually. In this research, the researcher uses one tail tests positive and negative because this research has a strong theoretical expectation, such as:

- One tail test (positive):

The hypotheses are as follow:

$Ho \leq 0$; $Ha > 0$

If t-test > t-table, Ho is rejected, it means that the individual independent variable significantly have positive influences to the dependent variables.

If t-test < t-table, Ho is accepted, it means that the individual independent variable does not significantly have positive influence to the dependent variables.

- One tail test (negative):

The hypotheses are as follow:

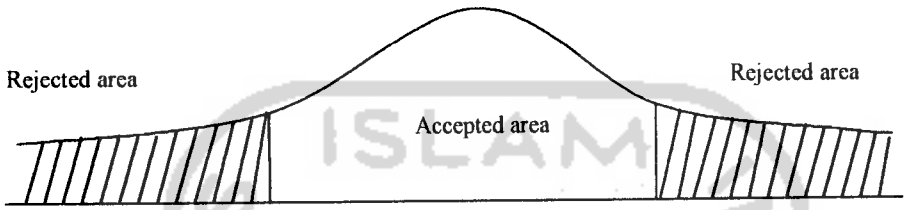
$Ho \geq 0$; $Ha < 0$

Ho is accepted if t-test > t-table, partial independent variable do not have negative influence to the dependent variables.

Ho is rejected if t-test < t-table, partial independent have negative influence to the dependent variables.

T-table formula: $t = \frac{\beta_i}{Se\beta_i}$

Test criteria:



(Gujarati 1978, related edition)

3.12.2 F-Statistic

Testing the overall significance of the sample regression (F-Test) is a test of the overall significance of the observed or estimated regression line, that is whether Y as dependent variable is linearly related to independent variable K, P, D. (Gujarati 1978, related edition)

All independent variable have significant influence on variable dependent

Ho: $\alpha 0 = \alpha 1 = \alpha 2 = 0$

All independent variable does not have significant influence on variable dependent

Ho: $\alpha 0 \neq \alpha 1 \neq \alpha 2 \neq 0$

Independent variables have overall influence to the dependent variable with using F-statistic table so;

- If F-statistic < F-table

df denominator = (n-k), df numerator = (k-1)

Ho accepted and Ha rejected

- If F-statistic > F-table

df denominator = (n-k), df numerator = (k-1)

Ho rejected and Ha accepted

F statistic formula:

$$F = \frac{R^2/(k-1)}{(1-R^2)/(N-k)}$$

3.12.4. Coefficient of Determination (R^2)

Multiple coefficient of determination (R^2) is the measure of good regression lines sample show the data. As verbal R^2 measure total proportion of variable dependent that explained by model regression. . (Gujarati: 1978,44).

The variation in X explained by the variables K, P and D. multiple coefficient determination is an abstraction that describes the condition of sample regression line showing all data. That R^2 lies between 0 – 1. If it is 1, the fitted regression line explains 100 percent of variation in X. The other hand, if it is 0, the model does not explain any of the variation in X. Typically, however R^2 lies between these extreme values. The fit of the model is said to be "better" the closer is R^2 to 1. Multiple correlation denoted by R, and it is a measure of the degree of association between X and the entire explanatory variable jointly. R^2 is always taken to be positive.

R^2 behavior:

a. R^2 is non negative

b. Border is $0 < R^2 < 1$

$R^2 > 1$: Perfectly match

$R^2 < 0$: No relation between independent variable with dependant variable

$R^2 = 1$: Dependent Variable explains as much 100% by variable independent

$R^2 = 0$: Dependent Variable has nothing explained by independent variable

Match model better if R^2 closer to 1, value R^2 get from formula:

$$R^2 = 1 - \frac{\sum et^2}{\sum yi^2}$$

3.13. CLASSICAL ASSUMPTION

3.13.1. MULTICOLLINEARITY

Multicollinearity refers to the existence of more than one exact linear relationship or a linear relationship among some or all explanatory variable K, P, and D. There are several sources of multicollinearity. Multicollinearity may be due to the following factors:

2) The data collection method employed, for example, sampling over a limited range of the values taken by the regression in population.
3) Constrains on the model or in the population being sampled.
4) Model specification.
5) An over determinate model.

The regression model contains multicollinearity if there is a perfect multicollinearity among explanatory variable. The way to detecting multicollinearity is by comparing the value of partial coefficient determination (r^2) with multiple coefficient of determination (R^2). If (r^2) < (R^2) there is no multicollinearity. (Gujarati 1978, related edition)

The F-formula is:

$$F = \frac{R^2/(k-1)}{(1-R^2)/(N-k)}$$

If F statistic > F table, it means independent variable correlation with other independent variable, so there is multicollinearity.

If F statistic < F table, it means independent variable not correlation with other independent variable, so there is no multicollinearity.

3.13.2. AUTOCORRELATION

The term autocorrelation may be defined as correlation between residual of one observation ordered in time (as in time series data) or space (in cross sectional data). If there is autocorrelation in the model, it will raise the value of residual and the impact is the number of t test, f test and R^2 will decline. (Gujarati 1978, related edition)

To test are estimation result a model regression not contain serial correlation between disturbance term, so use D-W statistic:

$$DW = \frac{\sum_{t=2}^{N}(et - et_{-1})^2}{\sum_{t>1}^{N} et^2}$$

The term autocorrelation defined as "correlation between members of series of observations ordered in time or space. In the regression context, the classical linear regression model assumes that such autocorrelation does not exist in the disturbances (μ). The classical model assumes that the disturbance term relating to any other observation. Thus, correlation between two series where the former is the latter series lagged by one time period, is autocorrelation. The most celebrated test for detecting serial correlation is that developed by statisticians Durbin-Watson *d* statistic.

1) If $0 < d < dL$	Reject null hypothesis
	No positive autocorrelation
2) If $dL < d < du$	No decision
	No positive autocorrelation
3) If $4- dL < d < 4$	Reject null hypothesis
	No negative correlation
4) If $4-du < d < 4-dL$	No decision
	No negative autocorrelation
5) If $du < d < 4-du$	Do not reject null hypothesis
	No autocorrelation, positive or negative

3.13.3. HETEROSCEDASTICITY

An important assumption of heterocedasticity is shows the conditional of X increases as y increases. Here the variances of X are not the same. Detecting heterocedasticity with Glejser test. It is a situation where the variance is not

constant for all the free variables. To detect this, the writer use of the formal method, Glejser test.

The glejser test is by regressing the absolute residual value from the estimated model to the variables. The glejser model such as:

$|u_i| = \sqrt{\alpha_1 + \alpha_2 X_i} + v_i$ and $|u_i| = \sqrt{\alpha_1 + \alpha_2 X^2_i} + v_1$

If the value of t test is significant, there is Heterocedasticity in the independent variable, otherwise. (Gujarati 1978, related edition)

CHAPTER IV

DATA ANALYSIS

4.1 DESCRIPTION ANALISIS

This chapter described about the research result and secondary testing data collected from many resources to know the factors affecting Indonesian tin exports to Singapore year in the year of 1985 – 2002. Analysis description are based on the secondary data collected from many resources. The resource are:

1. International monetary found (related addition)
2. Statistics year book of Indonesia (related addition)
3. Central bureau of statistics (BPS, International Indonesian Trading Statistics).

This analysis provides the data, mean, and deviation standard, on each research variable:

4.1.1 The demand import volume of Indonesian tin by Singapore

The demand import volume of Indonesian tin by Singapore from year 1985 – 2002 are:

Table 4.1

The Import Demand Volume of Indonesian Tin by Singapore

(ton)

Year	Volume	Year	Volume
1985	133	1994	224
1986	152	1995	299
1987	195	1996	369
1988	222	1997	422
1989	254	1998	427
1990	243	1999	408
1991	224	2000	390
1992	223	2001	350
1993	163	2002	452
Mean : 286.11111			
Standard Deviation : 104.65287			

Source: Indonesian Statistic yearbook

The table 4.1 above, it can be conclude that the mean of import demand of Indonesian tin by Singapore is 286,111 ton per year. From the year 1985 until 1989 volume of tin imported was increasing, but in the year of 1990 until 1993 the volume of import was decreasing. It was decreasing until the lowest levels of import, that is 163 ton in the year of 1993. In the year of 1994 until 1998 volume of import increased again, but at the beginning of the year of 1999 volume of import was decreasing until the year of 2001. And finally the volumes of import increased until the year of 2001 and reach the top at year of 2002 that the volume is 452 ton. From the year of 1985 until 1994, the volume of tin imported were

under the mean, that is 286.11 ton per year, but in the year of 1995 – 2002 the volume of tin import were at the top of the rate.

4.1.2 International Price of Indonesian tin (US Cents/ pound)

International Price of Indonesian tin, from the year of 1985 until 2002, is in this table 4.2:

Table 4.2

International price of Indonesian tin

(US Cents/ pound)

Year	Price of tin	Year	Price of tin
1985	523.40	1994	247.66
1986	279.48	1995	281.11
1987	303.45	1996	279.36
1988	319.86	1997	255.85
1989	387.12	1998	251.12
1990	276.03	1999	244.55
1991	253.83	2000	246.57
1992	276.88	2001	240.66
1993	234.40	2002	238.48
Mean : 285.545			
Standard Deviation : 69.959708			

Source: International Monetary Fund

The table 4.2 above, it can be concludded that the mean of the international price of Indonesian tin is US Cents 285.545 US Cent/pound. The highest price level is in the year of 1985, it reaches 523.40US Cent/pound, and the

lowest level of price occurred in the year of 1993 and the price is 238.48US Cent/pound. The fluctuations on international price of Indonesian tin are so vary but it seems declining at the year of observation. In the beginning of the year 1985 1987, 1988, and 1989 the price of Indonesian tin export were above the rate while the other years are below the rate

4.1.3 Exchange value of dollar to rupiah (US $/ Rp)

Exchange values of dollar to rupiah, from the year of 1985 until 2002, are on this table 4.3 below:

Table 4.3

Exchange value of dollar to rupiah

(US $/ Rp)

Year	Exchange Value		Year	Exchange Value
1985	1125		1994	2200
1986	16441		1995	2308
1987	1650		1996	2383
1988	1731		1997	4650
1989	1797		1998	8025
1990	1901		1999	7085
1991	1992		2000	9595
1992	2062		2001	10400
1993	2110		2002	9800
Mean : 4847.5				
Standard Deviation : 4353.2767				

Source: Indonesian Monetary Fund

The table 4.3 shows that the mean of Exchange value of dollar to rupiah is Rp 4847.5/US$. From year to year the exchange value is getting higher and higher reached the top level in the year of2001 on the value Rp 10,400/US$ and declined in the year of 2002 on the value of Rp 9800/US$. The highest fluctuation happened in the year of 1997 until 2002. The exchange value is above the rate. Meanwhile after the year of 1997 the value of exchange were under the mean except in 1986. The value is Rp 16441/ US$. This is the highest value of the years that is observed.

4.1.4 GDP real of Singapore

GDP real of Singapore, from the year of 1985 until 2002, is on this table 4.4 below:

Table 4.4

GDP real of Singapore (Sin $)

1985 - 2002

Year	GDP	Year	GDP
1985	38924	1994	105313
1986	38962	1995	106677
1987	43145	1996	118115
1988	51082	1997	128244
1989	58943	1998	140279
1990	67705	1999	137618
1991	75280	2000	140070
1992	80673	2001	160913
1993	92348	2002	152006
Mean : 96460.945 with the base year of 1985			
Standard Deviation : 41220.04			

Source: International Monetary Fund

The table 4.4 shows that the mean of GDP Singapore is 96460.945 $Sin. In the first ten years, GDP real of Singapore is below the mean, meanwhile in the ten-year after the GDP real are above the mean. From year to year the GDP real of Singapore tend to increase except in the year of 1998 – 1999 meanwhile in the year of 2001 - 2002 it declined.

4.1.5 International Price of Aluminum (US Cents/ pound)

International Price of Aluminum, from the year of 1985 until 2002, is on this table 4.5 below:

Table 4.5

International Price of Indonesian Aluminum

1985 – 2002

(US Cents/ pound)

Year	Price of Aluminum	Year	Price of Aluminum
1985	47.21	1994	66.93
1986	52.15	1995	81.88
1987	70.99	1996	91.90
1988	115.51	1997	88.60
1989	88.48	1998	75.20
1990	74.37	1999	75.40
1991	59.15	2000	86.00
1992	56.98	2001	80.20
1993	51.71	2002	78.70
Mean : 74.52			
Standard Deviation : 17.14			

Source: International Monetary Fund

1995 the price of Aluminum was exceed the mean and it fluctuate until the year of 2002, but the prices are still above the mean.

4.2 HYPOTHESIS TESTING

4.2.1 (F- test)

The joined effect on International Price of Indonesian tin, Exchange value of dollar to rupiah, GDP of Singapore, and International Price of Aluminum toward the Singapore import demand volume of Indonesian tin by Singapore.

- Hypothesis :

Ho : There is no joined impact on International Price of Indonesian tin, Exchange value of dollar to rupiah, GDP of Singapore, and International Price of Aluminum toward the Singapore import demand volume of Indonesian tin by Singapore.

Ha : There is joined impact on International Price of Indonesian tin, Exchange value of dollar to rupiah, GDP of Singapore, and International Price of Aluminum toward import demand Volume of Indonesian tin by Singapore.

- F- Statistics

From the test results

F Statistics = 30.31178

F-table (5%; df = 4; 13) = 3.18

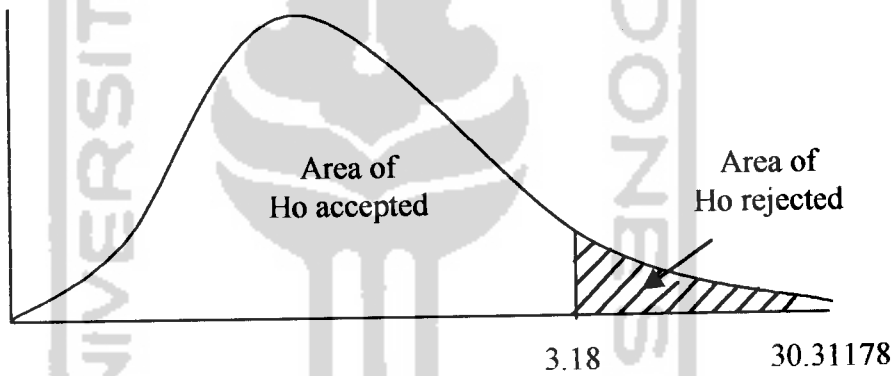
- **Decision criteria :**

  - If F > 3.18; p < 0.05; Ho is rejected and Ha is accepted.
  - If F < 3.18, and p > 0.05, Ho is accepted and Ha is rejected.

Visually the area of accepted and rejected on F test hypothesis is shown on the figure 4.1 below:

Figure 4.1

Area of accepted and rejected on F test hypothesis



- **Conclusion**

  Because F = 30.31178 > F-table = 3.18, and p = 0.000 < 0.05 (5%), so it can be concluded that Ho is rejected and Ha is accepted.

It can be said that there is a significant effect joined between International Price of Indonesian tin, Exchange value of dollar to rupiah, GDP of Singapore, and International Price of Aluminum toward the Import Demand Volume of Indonesian tin by Singapore.

4.2.2 t- Statistics

4.2.2.1 The effect of International Price of Indonesian tin toward Import Demand Volume of Indonesian tin by Singapore.

- Hypothesis :

Ho : There is no effect on International Price of Indonesian tin toward import demand volume of Indonesian tin by Singapore.

Ha : There is an effect on International Price of Indonesian tin export toward Import Demand Volume of Indonesian tin by Singapore

.

t - Statistics

From the test result

t- statistics = 1.169227

t- table (2.5%; df = 13) = 2.160

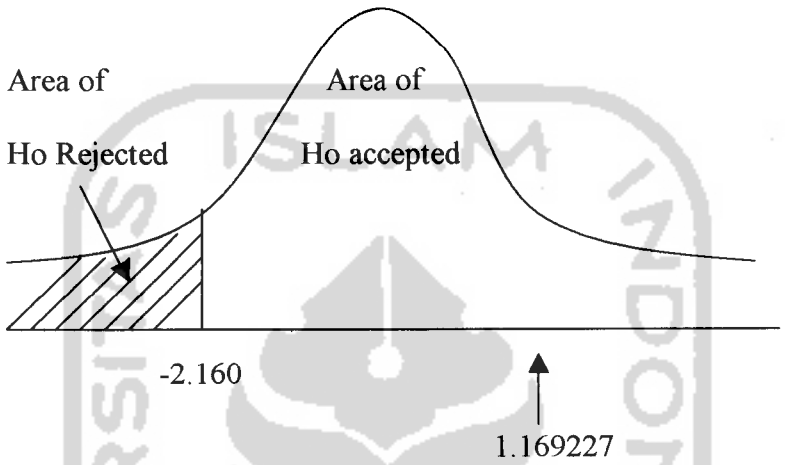
- Criteria of decision making:

- If t statistics > +2.160, or t statistics < -2.160 and p < 0.05; Ho is rejected and Ha is accepted.
- If –2.160 < t statistics < +2.160 and p > 0.05 Ho is accepted and Ha is rejected.

Visually the area of accepted and rejected hypothesis for Price of Indonesian tin variable is shown on the figure 4.2 below:

Figure 4.2

Area of accepted and rejected on International Price of Indonesian tin variable



- Conclusion

Because t- statistics = 1,169227 < t-table =2,160 and p = 0,2633 > 0,05 (5%), the conclusion is Ho is accepted and Ha is rejected. It can be said that there is no significant effect on International Price of Indonesian tin toward Import Demand Volume of Indonesian tin by Singapore

4.2.2.2 The effect of Exchange value of dollar to rupiah toward Import Demand Volume of Indonesian tin by Singapore

- Hypothesis:

Ho : There is no effect on Exchange value of dollar to rupiah toward Import Demand Volume of Indonesian tin by Singapore.

Ha : There is an effect on Exchange value of dollar to rupiah toward Import Demand Volume of Indonesian tin by Singapore.

t - Statistics

From the test results

t- statistics = 1.991051

t- table (5%; df = 13) = 1.771

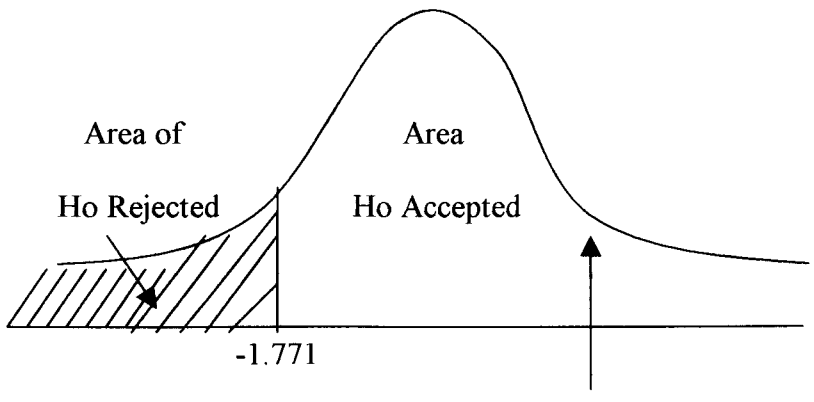
- Criteria of decision making:

- If t statistics > +1.771, or t statistics < - 1.771, and p < 0,10; Ho is rejected and Ha is accepted.
- If – 1.771 < t statistics < +1.771, and p > 0.10, Ho is accepted and Ha is rejected.

Visually the area of accepted and rejected hypothesis for Exchange Value of Indonesian tin variable is shown on the figure 4.3 below:

Figure 4.3

Area of accepted and rejected on Exchange value of dollar to rupiah



- Conclusion

Because t-statistics = 1.991051 < t-table = 1.771 and p = 0.0679 > 0.10 (10%), the conclusion is Ho is rejected and Ha is accepted. It can be said that there is significant and positively effect on exchange value dollar to rupiah toward Import Demand of Indonesian tin by Singapore.

4.2.2.3 The effect on GDP real of Singapore toward Import Demand of Indonesian tin by Singapore.

- Hypothesis:

Ho : There is no effect on GDP real of Singapore toward Import Demand of Indonesian tin by Singapore

Ha : There is an effect on GDP real of Singapore toward Import Demand of Indonesian tin by Singapore.

- t - Statistics

From the test results

t-statistics = 5.369858

T-table (2.5%; df = 13) = 2.160

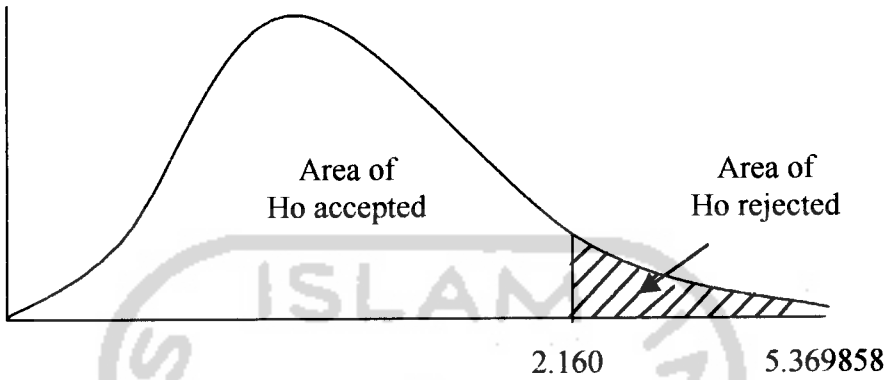
- Criteria of decision making:

- ♦ If t statistics > + 2.160, or t statistics < -2.160, and p < 0.05; Ho rejected and Ha accepted.
- ♦ If – 2.160 < t statistics < + 2.160, and p > 0.05, Ho is accepted and Ha is rejected.

Visually the area of accepted and rejected hypothesis for GDP real of Singapore of Indonesian tin export variable is shown on the figure 4.4 below:

Figure 4.4

Area of accepted and rejected on GDP real of Singapore variable



- Conclusion

Because t-statistics = 5.369858 < t-table = 2.160 and p = 0.0001 > 0.05 (5%), the conclusion is Ho is rejected and Ha is accepted. It can be said that there is significant and positive effect on GDP real of Singapore toward Import Demand of Indonesian tin by Singapore.

4.2.2.4 The effect of International Price of Indonesian Aluminum toward Import Demand of Indonesian tin by Singapore.

- Hypothesis :

Ho : There is no effect on International Price of Indonesian Aluminum toward Import Demand of Indonesian tin by Singapore.

Ha : There is an effect on International Price of Indonesian Aluminum toward Import Demand of Indonesian tin by Singapore.

- t - Statistics

From the test results

t- statistics = 4.271397

T-table (2.5%; df = 13) = 2.160

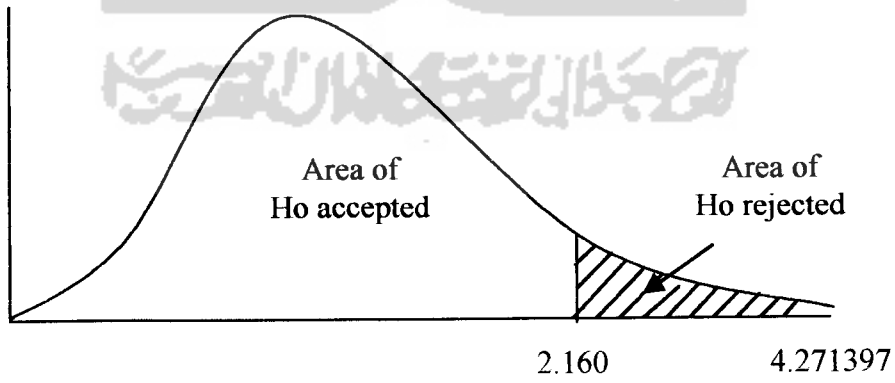
- Criteria of decision making:

- If t statistics > + 2.160, or t statistics < - 2.160, and p < 0.05; Ho is rejected and Ha is accepted.
- If – 2.160< t statistics < + 2.160, and p > 0.05, Ho is accepted and Ha is rejected.

Visually the area of accepted and rejected hypothesis for International price of Indonesian Aluminum variable is shown on the figure 4.5 below:

Figure 4.5

Area of accepted and rejected on International Price of Indonesian Aluminum variable



- Conclusion

Because t- statistics = 4.271397 < t- table =2.160 and p = 0.0009 > 0.05 (5%), the conclusion is Ho rejected and Ha is accepted. It can be said that

there is significant and positive effect on International Price of Indonesian Aluminum toward Import Demand of Indonesian tin by Singapore

4.3 LOG LINEAR REGRESSION ANALYSIS

4.3.1 Regression Model

Log linear regression model is for International Price of Indonesian tin (Ln X_1), Exchange value of dollar to rupiah (Ln X_2), GDP of Singapore (Ln X_3), and International Price of Aluminum (Ln X_4), Import Demand Volume of Indonesian tin by Singapore (Ln Y). The formulation is:

$$\mathbf{Ln\ Y = a + b_1\ Ln\ X_1 + b_2\ Ln\ X_2 + b_3\ Ln\ X_3 + b_4\ Ln\ X_4 + e}$$

The multiple linear regression analysis model explored by Eviews program, the result are shown on the table 1.8

Table 4.6

The result of the multiple linear regression

Variable	**Regression Coefficient**	**t-stat**	**Probability**	**Conclusion**
X_1	0.291454	1.169227	0.2633	Not Significant
X_2 *	0.097917	1.991051	0.0679	Significant
X_3 **	0.565971	5.369858	0.0001	Significant
X_4 **	0.658450	4.271397	0.0009	Significant
Constanta (a)	-6.110293	-2623582		
R Square = 0.903164 (*) Significant on α = 10% Adjusted R Square = 0.873368 (**) Significant on α = 5% F-Statistics = 30.31178 Probability = 0.000002 Durbin Watson = 1.726441				

Source: Primary data explored in 2004

From data table 4.6 above, the regression equation analysis can be shown as follows:

Ln Y = -6.110293 + 0.291454 Ln X1 + 0.097917 Ln X2 +

0.565971 Ln X3 + 0.658450 Ln X4

From this equation can conclude that:

Constanta (a)

If the International Price of Indonesian tin (Ln X_1), Exchange value of dollar to rupiah (Ln X_2), GDP real of Singapore (Ln X_3), and the International Price of Aluminum (Ln X_4) equal to 0, so the Import Demand Volume of Indonesian tin by Singapore (Ln Y) = -6.110293.

- Coefficient Exchange value of dollar to rupiah (b_2)

Exchange value of dollar to rupiah, is a variable that affects Import demand Volume of Indonesian tin by Singapore with regression coefficient positive by 0.097917. So when exchange value of dollar to rupiah increase by 1% the Import demand Volume of Indonesian tin by Singapore will be increased by 0.97917% assuming that other variables are constant

- Coefficient GDP real of Singapore (b_3)

GDP real of Singapore is a variable that affects Import Demand Volume of Indonesian tin by Singapore with regression coefficient positive by 0.565971. Means that GDP real of Singapore increased by 1% so that the Import Demand Volume of Indonesian tin by Singapore will increase by 0.565971% assuming that other variables are constant. It means that Indonesian tin is inelastic goods and with the coefficient 0 – 1 Indonesian tin include in necessity goods.

- Coefficient of International Price of Aluminum (b_4)

Price of Aluminum is a variable that affects the Import Demand Volume of Indonesian tin export with regression. It means that when the International price of Aluminum increased by 1% the Import Demand Volume of Indonesian

tin by Singapore will increase by 0.658450% assuming that other variables are constant.

- Coefficient Determination

The coefficient determination (R-Square) is 0.903164 shows that 90.3164% Import Demand Volume of Indonesian tin by Singapore is affected by International Price of Indonesian tin, Exchange value of dollar to rupiah, GDP real of Singapore, and the International Price of Indonesian Aluminum. And the rest is 9.6836%.

4.4 TESTING VIOLATION ON CLASSICAL ASUMPTION

The purpose of quantitative analysis is to test the hypothesis statistically with multiple regression linear. From the secondary data it is found that Import Demand Volume of Indonesian tin by Singapore (ton) as dependent variable while International Price of Indonesian tint (US Cents/ pound), the Exchange value of dollar to rupiah (US $/ Rp), GDP real of Singapore, and the International Price of Indonesian Aluminum (US Cents/pound) are as independent variable.

To avoid the bias specification on the conclusion of this research regression model transferred into log linear model from the primary data, so it is ready for classical assumption testing. The classical assumption testing are; multicollinearity test, heteroscedasticity test and autocorrelation test.

4.4.1 Multicolinearity testing

Multicollinearity refers to the existence of more than one exact linear relationship or a linear relationship among some or all explanatory variable K, P,

and D. There are several sources of multicollinearity. Multicollinearity may due to the following factors:

1. The data collection method employed, for example, sampling over a limited range of the values taken by the regression in population.
2. Constrains on the model or in the population being sampled.
3. Model specification.
4. An over determinate model.

The regression model contains multicollinearity if there is a perfect multicollinearity among explanatory variable. The way to detect multicollinearity is by comparing the value of partial coefficient determination (r^2) with multiple coefficient of determination (R^2). If (r^2) < (R^2) there is not multicollinearity.

From the data exploration by Eviews program and use the Klein, the result of multicollinearity analysis testing are shown in the table 4.7:

The table shows that all of r^2 test (there is correlation between independent variable and the other independent variable) are smaller than R^2 model. So it can be concluded that all of the independent variables do not have Multicolineartity.

Table 4.7

Result of multicollinearity testing

Variable	r^2 test	R^2 model	Conclusion
International Price of Indonesian tin	0.558	0.903	No Multicoliniarity
Exchange value of dollar to rupiah	0.327	0.903	No Multicoliniarity
GDP of Singapore	0.579	0.903	No Multicoliniarity
International Price of Indonesian Aluminum	0.156	0.903	No Multicoliniarity

Source: Primary data that explore in 2004

The table shows that all of r^2 test (there is correlation between independent variable and the other independent variable) are smaller than R^2 model, so it can be concluded that all of the independent variables do not have Multicolineartity.

4.4.2 Heteroscedasticity testing

An important assumption of heterocedasticity shows the conditional of X increases as y increases. Here the variances of X are not the same, the result can be detected by Park test. It is a situation where the variance is not constant for all

of the free variables. To detect this, the writer uses the formal method, namely Park test.

If the value of t test is significant, there is Heteroscedasticity in the independent variable.

The result of heteroscedasticity analysis testing are shown on this table 4.8:

Table 4.8

Result of Heteroscedasticity with Park test

Variable	t – statistics	p-value	Conclusion
International Price of Indonesian tin	-1.722112	0.1087	No Heteroscedasticity
Exchange value of dollar to rupiah	-0.874503	0.3977	No Heteroscedasticity
GDP real of Singapore	-0.239237	0.8147	No Heteroscedasticity
International Price of Indonesian Aluminum	-0.207292	0.8390	No Heteroscedasticity

Source: Primary data that explore in 2004

The data shows that all the p-value (probability) > 0,05 (5%), so it can be conclude that all of independent variables do not have Heteroscedasticity.

4.4.3 Autocorelation testing

The term autocorrelation may be defined as correlation between residual of one observation ordered in time (as in time series data) or space (in cross

sectional data). If there is autocorrelation in the model, it will raise the value of residual and the impact is the number of t test, f test and R^2 will decline.

To test is to estimate the result of a model regression which not contain a serial correlation between disturbance term, D-W statistic can be used:

$$DW = \frac{\sum_{t=2}^{N}(et - et_{-1})^2}{\sum_{t>1}^{N} et^2}$$

The term autocorrelation is defined as "correlation between members of series of observations ordered in time or space (Gujarati 1978, related edition). In the regression context, the classical linear regression model assumes that such autocorrelation does not exist in the disturbances (μ). The classical model assumes that the disturbance term relating to any other observation. Thus, correlation between two series where the former is the latter series lagged by one time period, is autocorrelation (Gujarati 1978, related edition). The most celebrated test for detecting serial correlation is the one that was developed by statisticians Durbin-Watson *d* statistic.

1) If $0 < d < dL$	Reject null hypothesis
	Positive autocorrelation
2) If $dL < d < du$	No decision
	No positive autocorrelation
3) If $4- dL < d < 4$	Reject null hypothesis
	Negative correlation

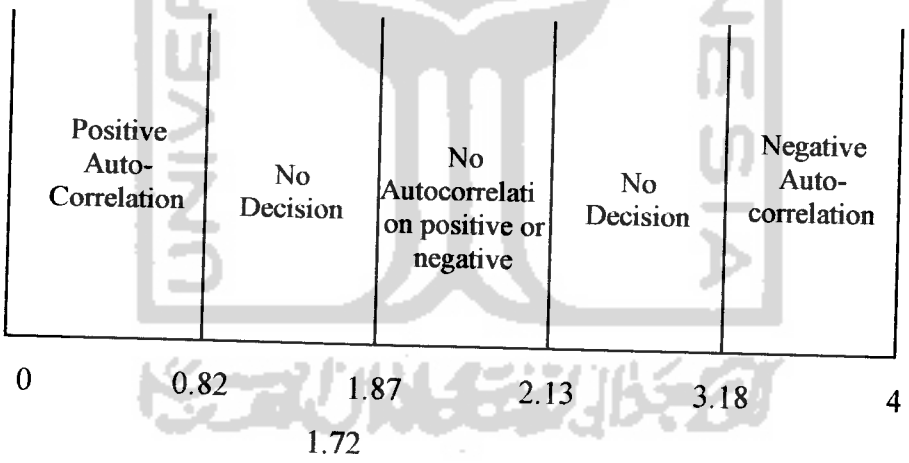
4) If 4-du < d < 4-dL	No decision
	No negative autocorrelation
5) If du < d < 4-du	Do not reject null hypothesis
	No autocorrelation, positive or negative

Criteria of autocorrelation testing with = 4; n = 18, and α = 5% are shown on the graph below:

Figure 4.6.

Accepted and unaccepted hypothesis for autocorrelation testing

On α = 5%



In figure 4.6 above, shows that the value of d = 1.72 is on the area of no decision. So, on α = 5%, there is still a doubt whether there is autocorrelation or not on the model.

CHAPTER V

CONCLUSION AND IMPLICATION

5.1 CONCLUSION

1. This result shows that variables joined (F- Test) of International Price of Indonesian tin, Exchange value of dollar to rupiah, GDP real of Singapore, and International Price of Indonesian Aluminum affect very significant to the import demand of Indonesian tin by Singapore, with high correlation around 0.9503. The coefficient determination shows that 90.3164%. Price of Indonesian tin, Exchange value dollar to rupiah, GDP real of Singapore, and International price of Indonesian Aluminum can explain the variation of Import Demand Volume of Indonesian tin by Singapore. And there's only 9.6836% affected by the other variables.
2. From the hypothesis result International Price of Indonesian tin cannot affect significantly to the Import Demand Volume of Indonesian tin by Singapore. As the probability result is 0,2633; it means that International Price of Indonesian tin has 26.33% degree of failure and affect positively and significantly to the Import Demand Volume of Indonesian tin by Singapore. With t- statistics = 1,169227 < t-table =2,160 and p = 0,2633 > 0,05 (5%) the hypothesis is not proved.
3. From the hypothesis result the Exchange value of dollar to rupiah is affect positively and significantly to the Import Demand of Indonesian tin by Singapore with the t- statistics = 1,169227 < t- table = 2,160 and p = 0,0679 > 0,10 (10%) with the coefficient determination (R- Square) is 0,903164. It

shows that 90,3164% Import Demand of Indonesian tin is affected by Exchange value of dollar to rupiah.

4. From the hypothesis result, the GDP real of Singapore affect positively and significantly to the Import Demand of Indonesian tin by Singapore with the t-statistics = 5,369858 < t- table = 2,131 and p = 0,00001 > 0,05 (5%) with the coefficient determination (R- Square) is 0,903164. It shows that 90,3164% Import Demand of Indonesian tin is affected by GDP of Singapore.
5. From the hypothesis result the International price of Indonesian Aluminum affect positively and significantly to the Import Demand of Indonesian tin by Singapore with the t- statistics = 4,271397 < t- table = 2,131 and p = 0,00001 > 0,05 (5%) with the coefficient determination (R- Square) is 0,903164. It shows that 90,3164% Import Demand of Indonesian tin is affected by International price of Indonesian Aluminum.

5.2 IMPLICATION

1. The international price of tin is not significant because, the price of Indonesian tin is too low and has a good quality compared by the other country like Brazil or Peru. Meanwhile, Singapore as an imported country has an electronic industry, which one of the basic materials is tin, so to overcome the demand of Singapore electronic industry Singapore will buy Indonesian tin because the price of Indonesian tin is cheaper compare to the other exporter tin country.

2. The exchange value of dollar to rupiah is affected positively because when rupiah depreciate the price of Indonesian tin will be cheaper, and than Singapore demand of Indonesian tin will be increase. So that, if rupiah depreciates, then it is good news for Tin Industry in Indonesia if government want to increase tin revenue than government should let rupiah depreciate.

BIBLIOGRAPHY

Algifari, *"Analisis regresi: Teori, Kasus dan Solusi"*, 2nd edition, Yogyakarta:BPFE, 2000.

Rider, A, King, Philip, *"International economics and International Policy"*, 7th Addition Addison Wesley Publishing Company 1994.

Arief, Sirtua; *"Metodologi Penelitian Ekonomi"*, Jakarta: ui Press, 1993.

David, Dornbusch, Rudriger & Fischer, Stanley, *"Macroeconomics"*, 6th edition Department of Economics Massacusets of Technology, Mc Graw Hill 1997.

Emeri, William D, "Revolution of export and economic growth", *Journal of Political Economy vol.2* 1967.

Gujarati, Damodar; *"Essentials of Econometrics Second Edition"*, United Stated Academy, West Point, 1999.

International Monetary Statistics, 1st edition 1980 – 2003.

Krugman, R Paul & Obstfeld, Maurice, *"International Economic Theory and Policy"*, 5th edition, Massacusets Institute of Technology, Addison – Wesley Publishing Company 1996.

Laksono, Budi Prasetyo "International tin trading", *Bulletin Economy Journal*, Jakarta, 23 of July 1997.

Mankin, Gregory, *"Macroeconomics"*, 2nd edition, Harvard University Hartcourt Collage Publishers 1997.

Mc Clave, Sincich, "*Statistics*", 8th edition, University of South Florida Prentice Hall, New Jersey 1998.

Oetomo, Moehammad; "*Tin Marketing Strategy to anticipate the fluctuation prices in PT. Koba Tin*". Thesis (not published) Technique Faculty of UGM, Yogyakarta, 1999.

Romer; "*Advance Macroeconomics*", International edition, University of California Barkley Mc Graw Hill. Inc 1997

Statistical year book of Indonesia 1985 – 2002.

Sudjana, "*Metoda Statistica*", 5th, Bandung: Tarsito, 1992.

Sumodiningrat, Gunawan; "Pengantar *Ekonometrika*", Yogyakarta: BPFE, 1995.

Pugel, A, Thomas, & Lindert, A, Peter, "*International Economics*", 11th edition University of South Carolina at Davis, Mc Graw Hill 1990.

Todar, Michael P, "*Economic Development*", 6th edition New York Pearson Aducation Limited 1998.

REGRESSION



obs	Y	X1	X2	X3	X4
1985	133.0000	523.4000	1125.000	38924.00	47.21000
1986	152.0000	279.4800	16441.00	38962.00	52.15000
1987	195.0000	303.4500	1650.000	43145.00	70.99000
1988	222.0000	319.8600	1731.000	51082.00	115.5100
1989	254.0000	387.1200	1797.000	58943.00	88.48000
1990	243.0000	276.0300	1901.000	67705.00	74.37000
1991	224.0000	253.8300	1992.000	75280.00	59.15000
1992	223.0000	276.8800	2062.000	80673.00	56.98000
1993	163.0000	234.4000	2110.000	92348.00	51.71000
1994	224.0000	247.6600	2200.000	105313.0	66.93000
1995	299.0000	281.1100	2308.000	106677.0	81.88000
1996	369.0000	279.3600	2383.000	118115.0	91.90000
1997	422.0000	255.8500	4650.000	128244.0	88.60000
1998	427.0000	251.1200	8025.000	140279.0	75.20000
1999	408.0000	244.5500	7085.000	137618.0	75.40000
2000	390.0000	246.5700	9595.000	140070.0	86.00000
2001	350.0000	240.6600	10400.00	160913.0	80.20000
2002	452.0000	238.4800	9800.000	152006.0	78.70000

Dependent Variable: Y
Method: Least Squares
Date: 05/06/04 Time: 08:33
Sample: 1985 2002
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1	0.152100	0.200379	0.759062	0.4614
X2	0.002580	0.002787	0.925803	0.3714
X3	0.002064	0.000355	5.805794	0.0001
X4	1.891919	0.673083	2.810827	0.0147
C	-109.8772	93.49146	-1.175265	0.2610

R-squared	0.860284	Mean dependent var	286.1111
Adjusted R-squared	0.817294	S.D. dependent var	104.6529
S.E. of regression	44.73296	Akaike info criterion	10.66943
Sum squared resid	26013.49	Schwarz criterion	10.91676
Log likelihood	-91.02488	F-statistic	20.01140
Durbin-Watson stat	1.625499	Prob(F-statistic)	0.000018

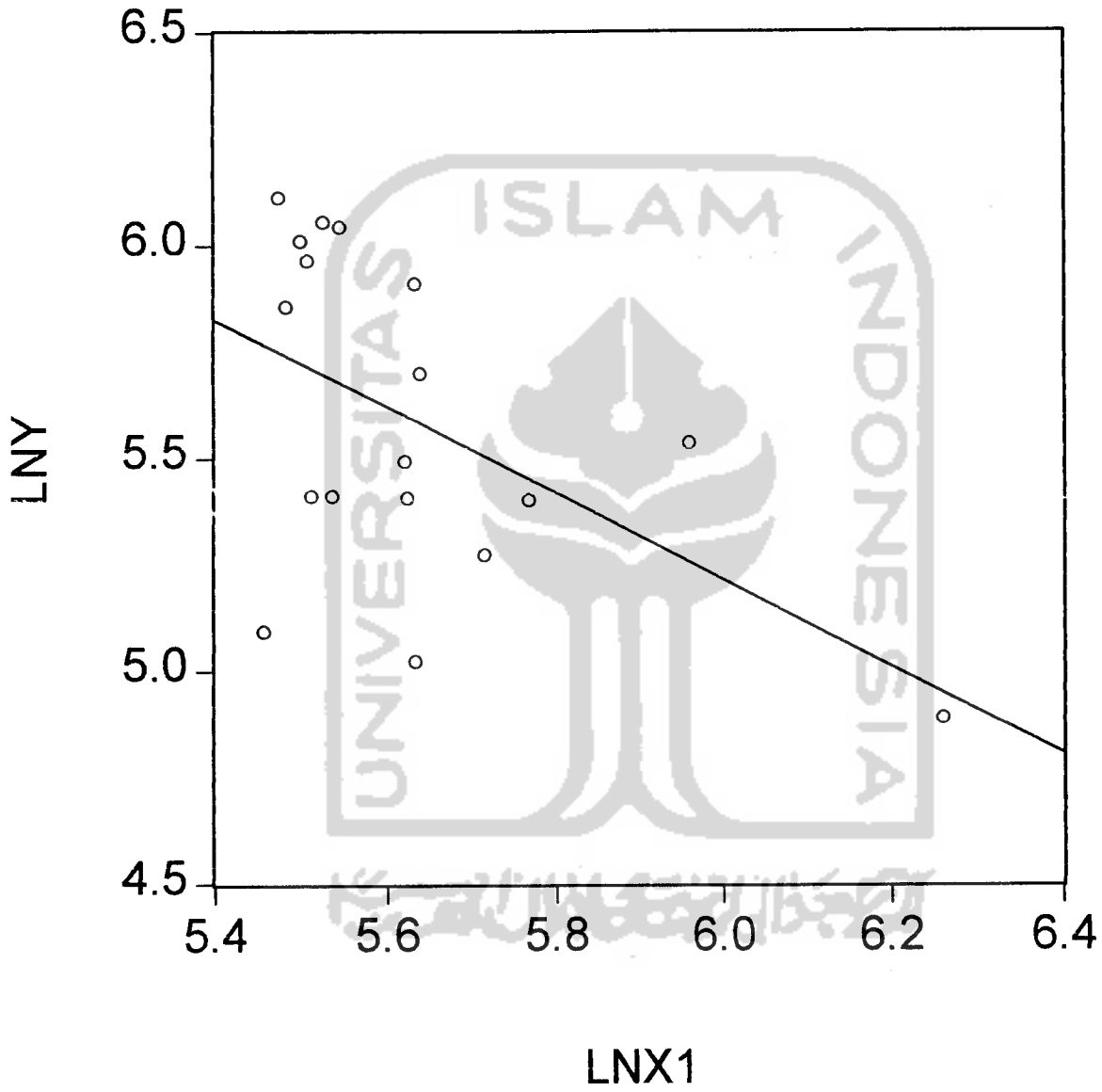
Year	Y	Ln Y	x1	Ln x1	x2	Ln x2	x3	Ln x3	x4	Ln x4
1985	133	4.890349	523.4	6.260346	1125	7.025538	38924	10.56937	47.21	3.854606
1986	152	5.023881	279.48	5.632931	16441	9.707533	38962	10.57034	52.15	3.954124
1987	195	5.273	303.45	5.715217	1650	7.408531	43145	10.67232	70.99	4.262539
1988	222	5.402677	319.86	5.767883	1731	7.456455	51082	10.84119	115.51	4.749357
1989	254	5.537334	387.12	5.958735	1797	7.493874	58943	10.98433	88.48	4.482777
1990	243	5.493061	276.03	5.62051	1901	7.550135	67705	11.12292	74.37	4.309053
1991	224	5.411646	253.83	5.536665	1992	7.596894	75280	11.22897	59.15	4.080077
1992	223	5.407172	276.88	5.623584	2062	7.631432	80673	11.29816	56.98	4.0427
1993	163	5.09375	234.4	5.457029	2110	7.654443	92348	11.43332	51.71	3.945651
1994	224	5.411646	247.66	5.512057	2200	7.696213	105313	11.56469	66.93	4.203647
1995	299	5.700444	281.11	5.638746	2308	7.744137	106677	11.57756	81.88	4.405255
1996	369	5.910797	279.36	5.632501	2383	7.776115	118115	11.67941	91.9	4.520701
1997	422	6.045005	255.85	5.544591	4650	8.444622	128244	11.76169	88.6	4.484132
1998	427	6.056784	251.12	5.525931	8025	8.990317	140279	11.85139	75.2	4.320151
1999	408	6.011267	244.55	5.49942	7085	8.865735	137618	11.83224	75.4	4.322807
2000	390	5.966147	246.57	5.507646	9595	9.168997	140070	11.8499	86	4.454347
2001	350	5.857933	240.66	5.483385	10400	9.249561	160913	11.98862	80.2	4.384524
2002	452	6.113682	238.48	5.474285	9800	9.190138	152006	11.93168	78.7	4.365643

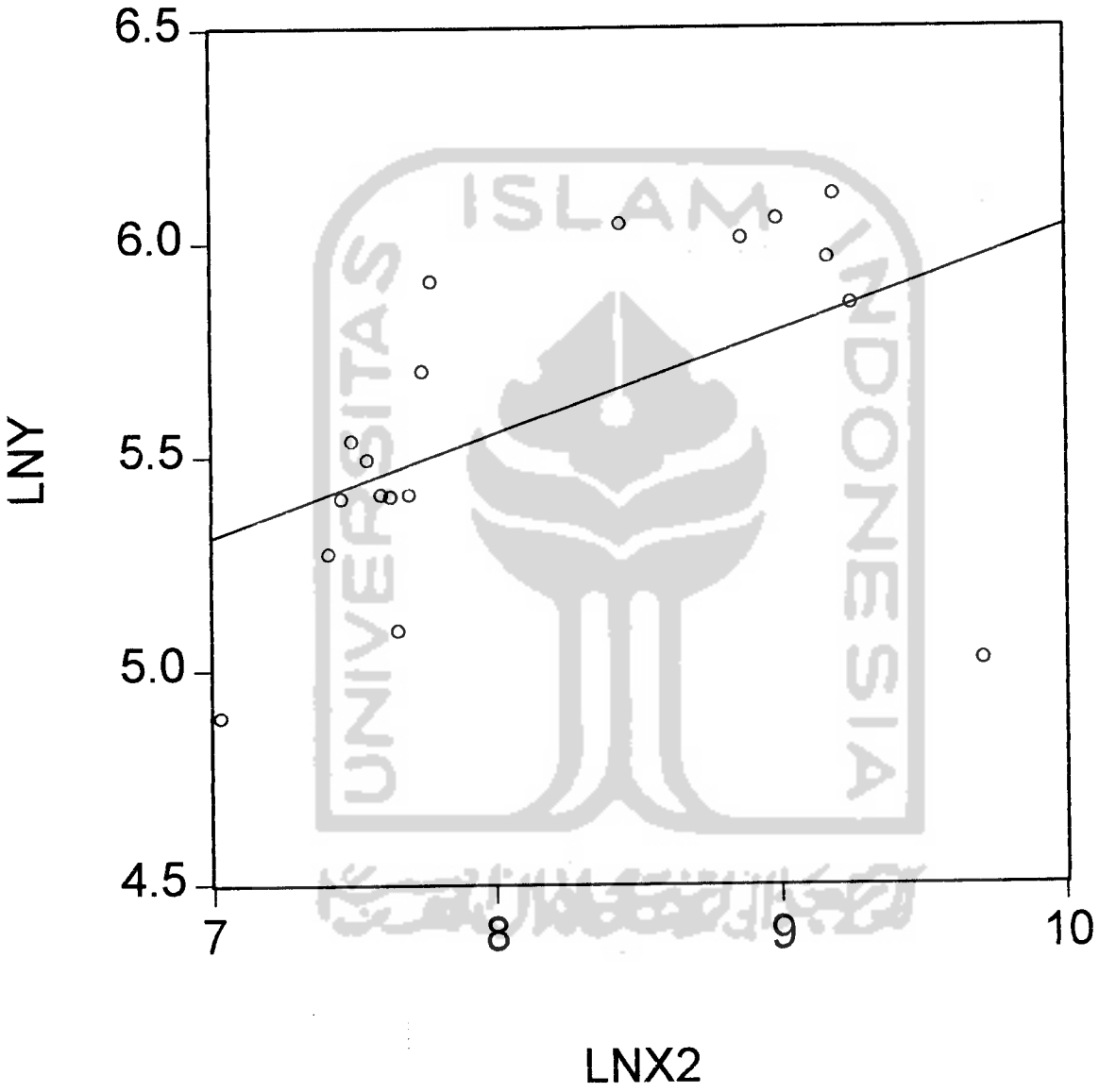
obs	LNY	LNX1	LNX2	LNX3	LNX4
1985	4.890349	6.260346	7.025538	10.56937	3.854606
1986	5.023881	5.632931	9.707533	10.57034	3.954124
1987	5.273000	5.715217	7.408531	10.67232	4.262539
1988	5.402677	5.767883	7.456455	10.84119	4.749357
1989	5.537334	5.958735	7.493874	10.98433	4.482777
1990	5.493061	5.620510	7.550135	11.12292	4.309053
1991	5.411646	5.536665	7.596894	11.22897	4.080077
1992	5.407172	5.623584	7.631432	11.29816	4.042700
1993	5.093750	5.457029	7.654443	11.43332	3.945651
1994	5.411646	5.512057	7.696213	11.56469	4.203647
1995	5.700444	5.638746	7.744137	11.57756	4.405255
1996	5.910797	5.632501	7.776115	11.67941	4.520701
1997	6.045005	5.544591	8.444622	11.76169	4.484132
1998	6.056784	5.525931	8.990317	11.85139	4.320151
1999	6.011267	5.499420	8.865735	11.83224	4.322807
2000	5.966147	5.507646	9.168997	11.84990	4.454347
2001	5.857933	5.483385	9.249561	11.98862	4.384524
2002	6.113682	5.474285	9.190138	11.93168	4.365643

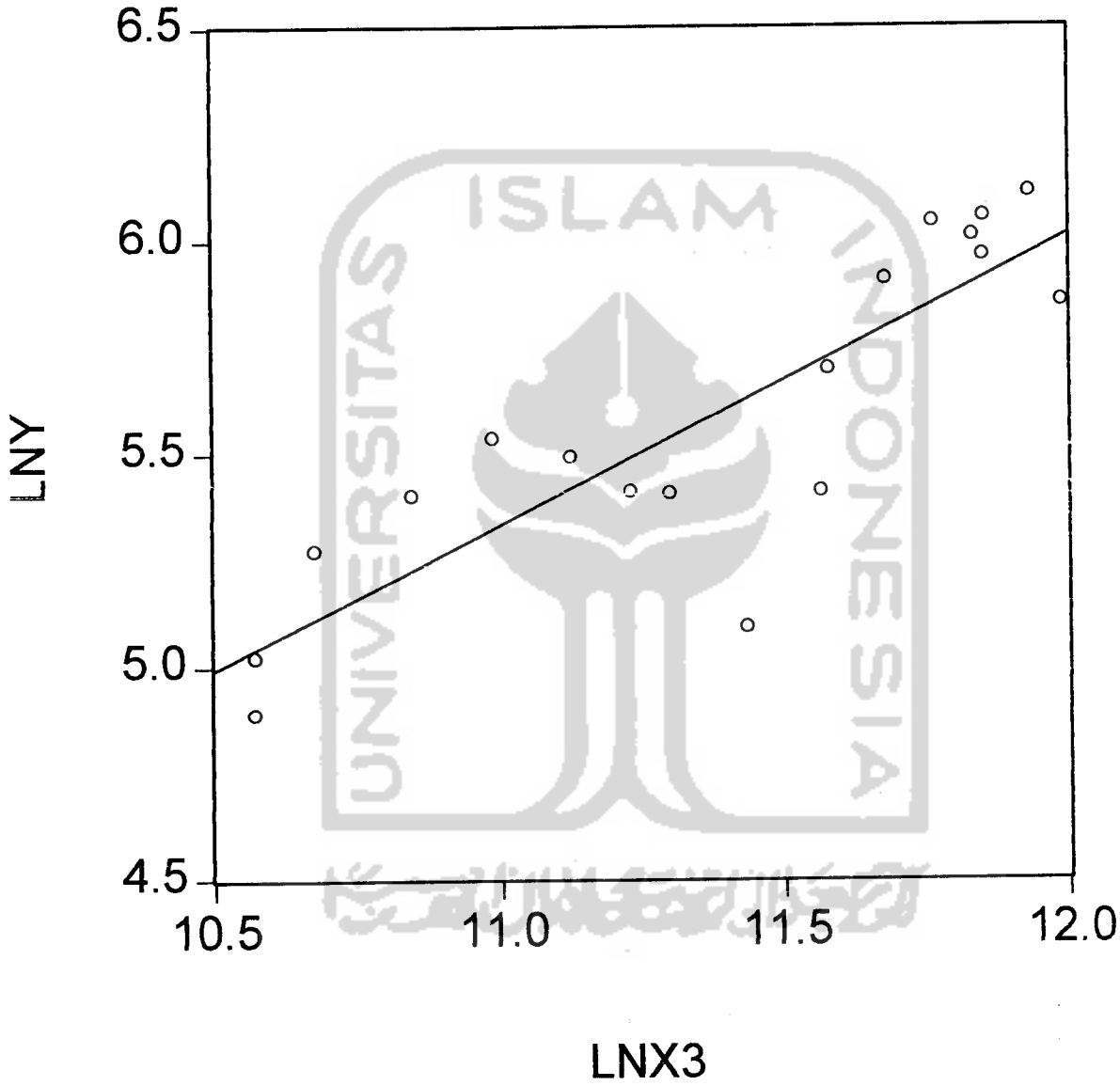
Dependent Variable: LNY
Method: Least Squares
Date: 06/21/04 Time: 12:50
Sample: 1985 2002
Included observations: 18

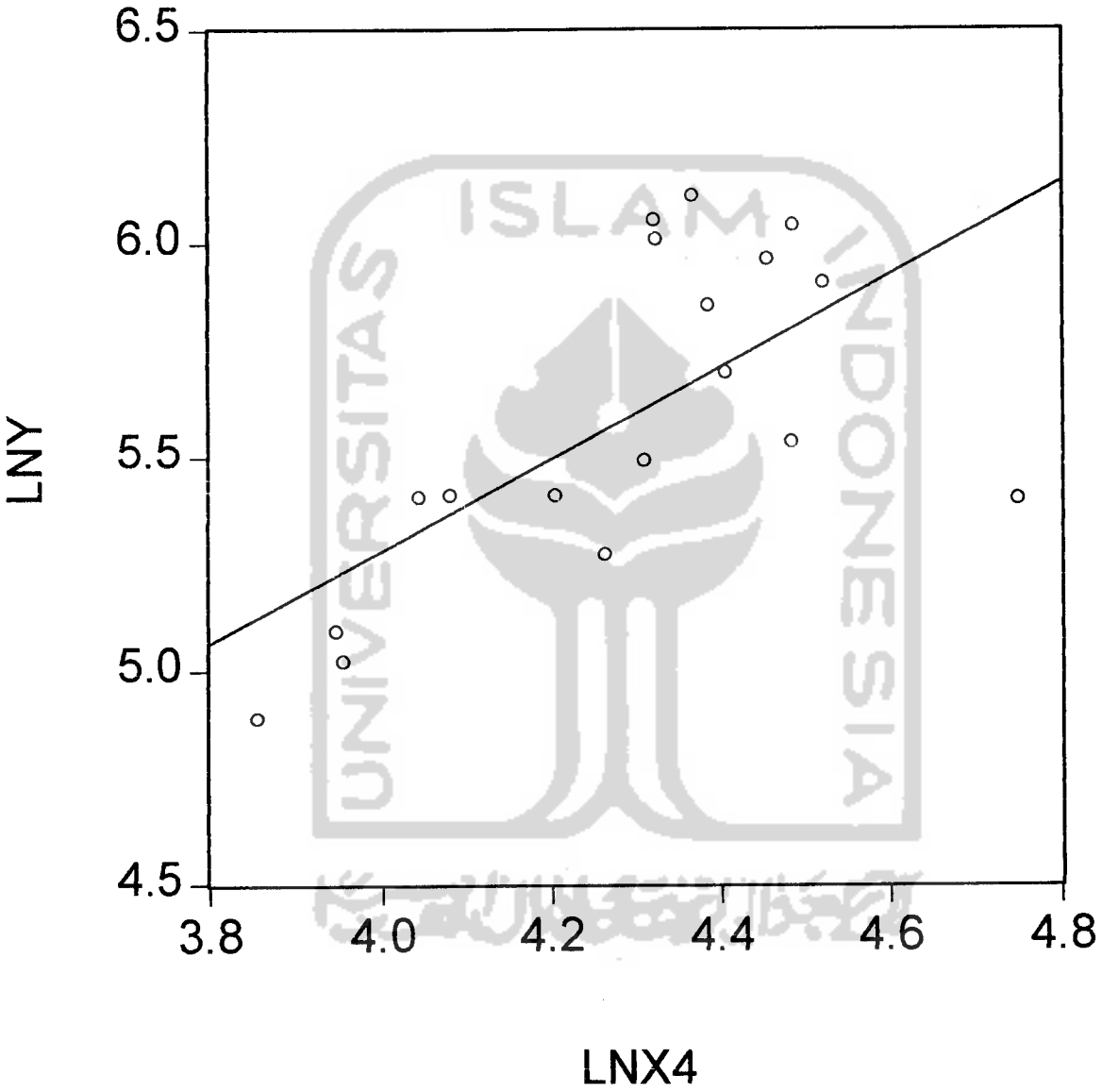
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.110293	2.328989	-2.623582	0.0210
LNX1	0.291454	0.249270	1.169227	0.2633
LNX2	0.097917	0.049179	1.991051	0.0679
LNX3	0.565971	0.105398	5.369858	0.0001
LNX4	0.658450	0.154153	4.271397	0.0009

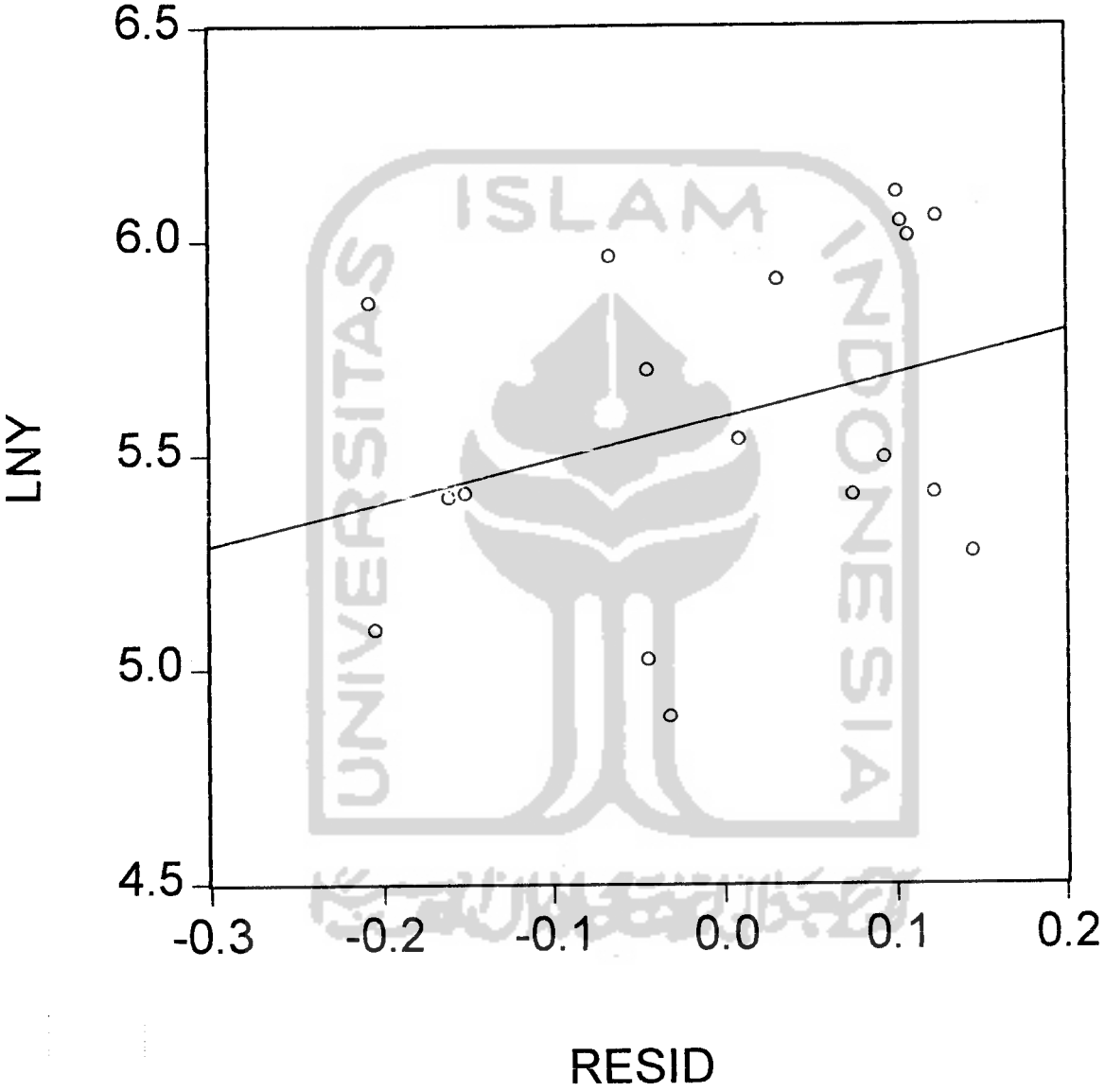
R-squared	0.903164	Mean dependent var	5.589254
Adjusted R-squared	0.873368	S.D. dependent var	0.383947
S.E. of regression	0.136629	Akaike info criterion	-0.912960
Sum squared resid	0.242678	Schwarz criterion	-0.665634
Log likelihood	13.21664	F-statistic	30.31178
Durbin-Watson stat	1.726441	Prob(F-statistic)	0.000002


6.5
6.0
5.5
5.0
4.5
LNY
5.4
5.6
5.8
6.0
6.2
6.4
LNX1


6.5
6.0
5.5
5.0
4.5
LNY
7
8
9
10
LNX2


6.5
6.0
5.5
5.0
4.5
LNY
10.5
11.0
11.5
12.0
LNX3


6.5
6.0
5.5
5.0
4.5
LNY
3.8
4.0
4.2
4.4
4.6
4.8
LNX4


6.5
6.0
5.5
5.0
4.5
LNY
-0.3
-0.2
-0.1
0.0
0.1
0.2
RESID

APPENDIC

Uji Multikolinieritas X_1

Dependent Variable: LNX1
Method: Least Squares
Date: 06/21/04 Time: 12:51
Sample: 1985 2002
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.694226	0.914420	9.507917	0.0000
LNX2	-0.062544	0.050008	-1.250675	0.2316
LNX3	-0.252072	0.090727	-2.778342	0.0148
LNX4	0.073647	0.164103	0.448786	0.6605

R-squared	0.558308	Mean dependent var	5.632859
Adjusted R-squared	0.463659	S.D. dependent var	0.200027
S.E. of regression	0.146490	Akaike info criterion	-0.810586
Sum squared resid	0.300431	Schwarz criterion	-0.612726
Log likelihood	11.29527	F-statistic	5.898754
Durbin-Watson stat	1.409933	Prob(F-statistic)	0.008066

Uji Multikolinieritas X_2

Dependent Variable: LNX2
Method: Least Squares
Date: 06/21/04 Time: 12:51
Sample: 1985 2002
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.44899	12.13578	1.108209	0.2864
LNX1	-1.606851	1.284787	-1.250675	0.2316
LNX3	0.403777	0.562526	0.717792	0.4847
LNX4	-0.196867	0.836093	-0.235460	0.8173

R-squared	0.327459	Mean dependent var	8.147259
Adjusted R-squared	0.183343	S.D. dependent var	0.821643
S.E. of regression	0.742511	Akaike info criterion	2.435572
Sum squared resid	7.718520	Schwarz criterion	2.633433
Log likelihood	-17.92015	F-statistic	2.272191
Durbin-Watson stat	1.129600	Prob(F-statistic)	0.124978

Uji Multikolinieritas X_3

Dependent Variable: LNX3
Method: Least Squares
Date: 06/21/04 Time: 12:51
Sample: 1985 2002
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.31415	3.983294	4.095642	0.0011
LNX1	-1.409949	0.507479	-2.778342	0.0148
LNX2	0.087909	0.122471	0.717792	0.4847
LNX4	0.533669	0.363943	1.466355	0.1647

R-squared	0.578751	Mean dependent var	11.37545
Adjusted R-squared	0.488483	S.D. dependent var	0.484416
S.E. of regression	0.346456	Akaike info criterion	0.911009
Sum squared resid	1.680446	Schwarz criterion	1.108869
Log likelihood	-4.199080	F-statistic	6.411499
Durbin-Watson stat	1.143241	Prob(F-statistic)	0.005873

Uji Multikolinieritas X_4

Dependent Variable: LNX4
Method: Least Squares
Date: 06/21/04 Time: 12:51
Sample: 1985 2002
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.526290	4.035401	0.130418	0.8981
LNX1	0.192571	0.429093	0.448786	0.6605
LNX2	-0.020036	0.085094	-0.235460	0.8173
LNX3	0.249476	0.170133	1.466355	0.1647

R-squared	0.155705	Mean dependent var	4.285672
Adjusted R-squared	-0.025215	S.D. dependent var	0.233948
S.E. of regression	0.236879	Akaike info criterion	0.150594
Sum squared resid	0.785562	Schwarz criterion	0.348454
Log likelihood	2.644654	F-statistic	0.860630
Durbin-Watson stat	0.843207	Prob(F-statistic)	0.484292

obs	LNY	LNX1	LNX2	LNX3	LNX4
1985	4.890349128	6.26034599	7.025538315	10.56936631	3.854605735
1986	5.023880521	5.632930734	9.707533494	10.57034209	3.954124181
1987	5.272999559	5.715216852	7.408530567	10.67232181	4.262539022
1988	5.402677382	5.7678834	7.456454555	10.84118746	4.749357106
1989	5.537334267	5.958734722	7.493873887	10.98432615	4.482776538
1990	5.493061443	5.620509555	7.550135342	11.12291531	4.309052635
1991	5.411646052	5.536664752	7.596894438	11.22896977	4.08007659
1992	5.407171771	5.623584199	7.631431665	11.29815923	4.042700329
1993	5.093750201	5.457029058	7.654443226	11.43331933	3.945651186
1994	5.411646052	5.512056838	7.696212639	11.56469215	4.203647297
1995	5.700443573	5.638746052	7.744136628	11.57756086	4.405254761
1996	5.910796644	5.632501273	7.776115477	11.67941401	4.520701029
1997	6.045005314	5.544591335	8.444622499	11.76168998	4.484131858
1998	6.056784013	5.525930913	8.990316948	11.85138858	4.320151231
1999	6.011267174	5.499419787	8.865735152	11.83223701	4.322807275
2000	5.966146739	5.507645929	9.168997408	11.84989758	4.454347296
2001	5.857933154	5.483385149	9.249561085	11.98861913	4.384523515
2002	6.11368218	5.474285449	9.190137665	11.93167527	4.365643155

APPENDIC

Uji Heteroskedastisitas Teknik Park

Dependent Variable: E2
Method: Least Squares
Date: 06/21/04 Time: 12:51
Sample: 1985 2002
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.321699	0.224871	1.430590	0.1761
LNX1	-0.041448	0.024068	-1.722112	0.1087
LNX2	-0.004152	0.004748	-0.874503	0.3977
LNX3	-0.002435	0.010176	-0.239237	0.8147
LNX4	-0.003085	0.014884	-0.207292	0.8390

R-squared	0.233276	Mean dependent var	0.013482
Adjusted R-squared	-0.002639	S.D. dependent var	0.013175
S.E. of regression	0.013192	Akaike info criterion	-5.588283
Sum squared resid	0.002262	Schwarz criterion	-5.340958
Log likelihood	55.29455	F-statistic	0.988816
Durbin-Watson stat	2.204272	Prob(F-statistic)	0.447625