



## Indonesia's Crude Palm Oil (CPO) Performance: Why Do Export Activities Exist?

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### Article Info

### Abstract

#### Keywords:

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This study aims to analyze the performance of Indonesia's CPO exports and the effect of world CPO prices, rupiah exchange rate per US dollar and CPO production on the supply of CPO export in Indonesia from 1995-2020. The method that used in this research is Error Correction Model (ECM). The results of descriptive analysis are reflected: (a), the export volume of Indonesia's CPO is very fluctuating in relation to the development of production variables, the value of the rupiah per US dollar and the world CPO export price; (b), the competitiveness of Indonesia's CPO exports computed by the RCA Index reflects a relatively low competitiveness are less than one, but the trend has improved since 2012, where the RCA Index is greater than one. The regression results showed that, in the long-term, CPO production have a positive and significant impact on the CPO exports growth during the period, whereas in the short term the production have a negative and insignificant effect. The world price of CPO in the long and short-term prices have a negative and insignificant effect. The rupiah exchange rate per US dollars in the long term and short term have negative and significant effect. In the long term all independent variables have significant effect on the dependent variable, while in the short term all the variables have no significant effect on export volume variables..

## 1. INTRODUCTION

In an open economic era, international trade is one form of economic interaction between one country and another, with the existence of inter-country trade can open a good cooperative relationship, so that the production of a country can be exported and imported to supply domestic needs. Export and import activities have an important role to accelerate the economic development of a country, which is reflected for the net contribution of exports in conformation of Gross Domestic Product (GDP).

Indonesia is one of rich countries with natural resources (SDA), especially in agricultural sector, including the wealth of economic potential in plantation sub-sector. Some of the leading products of plantation sub-sector are rubber, coffee, cinnamon, coconut, tea, clove and Crude Palm Oil (CPO). Statistics show that in 1990 the plantation sub-sector contributed 4.3 % for GDP of Indonesia, 2000 increased by 7.8 % and 1,7 % in 2010 and 7.33

% in 2015. One of potential and fast growing plantation export products is CPO, despite fluctuations during the period 1997-2022, especially for the last three years, there has been a downward trend.

The fluctuation of CPO export growth is possible due to changes in the variables that affect it. Theoretically, export is a function of export price, production, and rupiah exchange rate per US dollar. It is not denied, however, that Indonesia's CPO export growth is still showing a positive trend which is predicted to be due to the increasing demand for CPO in Indonesia such as Europe and the United States, although deceleration of world economic growth in 2012 until 2015 will influence the reduction of Indonesian CPO exports.

In the long term perspective, the stability of CPO export development in Indonesia is necessary, so that it can contribute to the growth of foreign exchange which is expected to have a positive impact on the economic growth of Indonesia. This research will focus on analyzing CPO export performance which is seen from the development of production, volume / value, export price of CPO and its competitiveness during 1997-2022 period and to analyze factors that affect CPO export growth.

One of the most popular trading theories is the comparative advantage which developed by David Ricardo and Hecksher Ohlin (HO). Basically this theory explains that a country will profitably produce and export a product that has its comparative advantage compared to other countries (Dominict, 1993). The comparative advantage can be either labor intensive or natural resources intensive.

The theory of comparative advantage turned into a competitive advantage theory which developed by Porter (1990), where an export product not only excels in labor and natural resources but also driven by other factors such as the quality, design and promotion of exports and the availability of facilities and infrastructure which in turn will lower the cost of production. In relation to Indonesia, agricultural products, especially plantation products, not only have a comparative advantage but also expected to have a competitive advantage in the international market. One of the comparative advantages of Indonesia's export products is the CPO product, due to its relatively labor-intensive and natural resources, which implies the low cost of production will increased competitiveness in the international market

Basically, exports are goods and services produced and marketed by a country to another country with the aim of obtaining profits derived from the difference in export prices compared to domestic prices. On the other hand exports can be seen from the difference between production and domestic consumption, resulting in production increased followed by reduction in consumption or consumption in a constant country will increase export growth (Dornbush, 2004). But indirectly the influence of production is also driven by the increase in product quality, because excess production does not automatically increase exports if not followed by improving product quality. While the competitiveness of export products is closely related to the use of labor inputs, capital, land, skills and technology. Thus export is also a function of the growth of production.

Export performance is one way to see the superiority of a commodity that can compete in international trade. These advantages can be seen in three ways, namely from its development, contribution and competitiveness (Tan, 2014). One technique of measuring export performance can be seen from its development both in monthly, yearly and in certain period. A positive export growth means that export data show an increase in a given year over the previous year or in a given period. Export performance is also reflected in increased export contribution of a product to total exports, or its contribution to Gross Domestic Product (GDP). The competitiveness of export products means whether they can compete with similar products from other countries in the international market. But competitiveness also means a competitive product compared to the same export product at a higher level.

Theoretically, many factors can affect the growth of exports, both from demand and supply. On the demand side, several factors affecting Indonesia's CPO exports include: the relative prices of exports to domestic prices, importer country revenues, the rupiah exchange rate per US dollar and trade policy. From the supply side it means export growth seen from the exporting country side, several factors affecting export development are: export price, production amount, rupiah exchange rate per US dollar and trade policy for export country.

According to Widayanti (2009), the price in the international market is the price of the commodity which is calculated based on the export price with the unit of US \$ / Ton. The price has a set price benchmark for the goods to be exported. In simple terms, the export offer function is a derivation of the ordinary supply function in which the development of exports is influenced by the price of its own exports, in international trade is called the relative price which is the ratio between the export price and the domestic price ( $P_x / P_d$ ), or it can be written:

$$S_x = f(P_x/P_d) \dots \dots \dots (2.1)$$

Export prices will positively affect The growth of a country's exports. The higher the price of relative exports, the number of products be exported and otherwise causes the reduction in the number of export offerings. The rupiah exchange rate per US dollar can be depreciation of the rupiah against the US dollar, will be able to boost export growth because exporters will get a larger of Rupiah with the same dollar amount, while importers are increasing demand as the value of US dollar is more expensive. Simultaneously, there is a significant influence between production, world CPO price, and the rupiah exchange rate per US dollar against the export volume of Indonesian CPO. While partially, production and export prices have a positive effect on the growth of Indonesian CPO exports, while the rupiah exchange rate per US dollar will negatively affect the assumption that other factors are unchanged such as production cost and technology.

The development of the world economy is indicated by the increase in income per capita of a country, hence the shift from relying on comparative advantage to competitive advantage. Both concepts are not separate but integrated, comparative advantages can be regarded as a necessary condition to be able to achieve competitive export products in the international market (sufficient condition). Conceptually, there are at least two indicators of export products have competitiveness, namely: (a), cheap products; And (b), quality products. Both of these factors are not only based on the benefits of cheap labor and a lot of natural resources, but also must be produced at a relatively cheap price and applying technology resource-rich owned.

In addition to these factors, it also needs to be supported by marketing channels and improve the skills of human resources (government and private) in penetrating the international market. Balassa (1990) explains that one of the ways used to measuring export competitiveness is using the formula "Revealed Comparative Advantage (RCA)". If the RCA Index is greater than one then the competitiveness of export products is greater than the average competitiveness of the exported products at a higher level.

However, despite the fluctuation of the CPO index per year reflecting the unstable Indonesia maintained its competitiveness, in the period 1990-2006, the competitiveness of Indonesian CPO exports was lower than the average of world cpo competitiveness (RCA <1). One factor is the relatively high level of inefficiency in the production process, which is due to the low quality of labor and the use of technology. Improvements in the period 2007-2015 there is an increase in competitiveness as reflected by the value of RCA index > 1. From the internal side can illustrate the increasing efficiency of product and also the improvement of external variable, so it can increase the demand of Indonesian cpo export products.

**2. METHODS**

The approach used in this research is quantitative and descriptive approach. The type of data used to complete this research is secondary data that has been processed and recorded officially in government and private agencies. Some of the data required are the value and volume of exports, export prices and the rupiah exchange rate per US dollar. The export volume of CPO and CPO production peride from 1990 to 2015 is sourced from the Directorate General of Plantation. World CPO prices are sourced from the World Bank. The Rupiah Exchange Rate against US Dollars and Indonesia's GDP is sourced from Bank Indonesia (BI), as well as other literary studies.

Descriptive analysis is a tool that used to describe CPO export performance, namely (a) CPO export growth; (B) calculating the contribution of CPO exports to total exports of plantation products and in Indonesia's GDP; And (c), to calculate competitiveness can be calculated using Revealed Comparative Advantage (RCA), with the following formula (Balassa, 1990):

$$RCA = \frac{X_{ij}/X_{it}}{W_{ij}/W_{it}} \dots \dots \dots (4.1)$$

Where: Xij is the amount / value of Indonesian CPO exports; Xit is the total / total value of Indonesian plantation exports; Wij is the number / value of world CPO exports; Wit is the total / total value of world plantation exports

The analysis used to see how the influence of independent variables (world price of CPO, Rupiah / US \$ exchange rate and production) to the dependent variable is the value of Indonesian CPO exports. To answer the second problem in this research is by using Error Corection Model (ECM) method. This model was chosen because it can calculate and analysing the short-run and long-term effects of independent variables on the dependent variable. The model equation is as follows :

$$VX_t = f(PCPOD_t, PROD_t, NTR_t) \dots\dots\dots(4.2)$$

Where:  $VX_t$  : the amount of CPO export;  $PCPOD_t$ : world CPO price;  $PROD_t$ : CPO Production;  $NTR_t$  = Rupiah Exchange Rate per US Dollar

The model that used in this research is econometric model with the initial model is:

$$VX_t = \alpha + \alpha_1 PCPOD_t + \alpha_2 PROD_t + \alpha_3 NTR_t + \epsilon_t \dots\dots\dots(4.3)$$

There are two criteria that must be fulfilled for using ECM (Enders, 2004). Firstly, at least one variable used is not stationary at the level. Second, the equation used has a cointegration relationship. If both criteria are not fulfilled, Then the ECM method can not be used to analyze the existing problems. If the data is not cointegrated at certain level, so that model must be double log. Referring to the articles of Agus and Prawoto (2016) said, for the data can be cointegrated in long term, the model made in double log.

$$\text{Log}VX_t = \alpha + \alpha_1 \text{Log}PCPOD_t + \alpha_2 \text{Log}PROD_t + \alpha_3 \text{Log}NTR_t + \epsilon_t \dots\dots\dots(4.4)$$

The steps that must be done in using this method are: (a), stationeritas test (Unit Root Test); (b), integration degree test; and (c), cointegration test. The long- term model used is:

$$VX_t = \beta_0 + \beta_2 PCPOD_t + \beta_3 PROD_t + \beta_1 NTR_t + \epsilon_t \dots\dots\dots(4.5)$$

If using the log model used in a long term is:

$$\text{Log}VX_t = \beta_0 + \beta_2 \text{Log}PCPOD_t + \beta_3 \text{Log}PROD_t + \beta_1 \text{Log}NTR_t + \epsilon_t \dots\dots\dots(4.6)$$

If using the log model used in a short time is:

$$\text{Log}VX_t = \beta_0 + \beta_2 \text{Log}PCPOD_t + \beta_3 \text{Log}PROD_t + \beta_1 \text{Log}NTR_t + \beta_4 ECT + \epsilon_t \dots\dots\dots(4.7)$$

### 3. RESULT AND DISCUSSION

#### 3.1 Competitiveness Of CPO Export

In relation to the competitiveness of Indonesian CPO exports computed by the RCA Index approach, reflected during the study period (Table 1), the competitiveness of CPO exports was higher than the average of world CPO exports, as seen from the RCA Index with an average of 1,54, which is greater than 1, which means that the competitiveness of Indonesian CPO exports is superior to the average competitiveness of world CPO exports. This is understandable because Indonesia has an absolute and comparative advantage in producing CPO products, especially in the low cost of labor input and natural resource wealth including land.

Interesting thing, when viewed by annually growth, the Indonesian RCA CPO export index is smaller than 1 (one), which illustrates the competitiveness of Indonesia's CPO export products lower than the world's CPO export products. From 2007 to 2014, the RCA Index is greater than one, indicating: (a) the world economic recovery has resulted in increased demand for Indonesia's CPO export products; And (b) there is technological development and skill in the process of CPO production so as to decrease CPO export price in international market which in turn can more compete with other country's CPO products. However, the fact that the CPO index fluctuates per year reflects the unstable Indonesia maintains its competitiveness, certainly this is closely related to the relatively large influence of external variables on the development of competitiveness of Indonesian CPO export products.

Tabel 1: RCA Indeks Of Indonesia's CPO Export

Year	(1)	(2)	(3)	(4)	RCA
1995	174.898	2.567.500	2.040.000	17.964.557	0,60
1996	208.429	2.914.200	3.890.000	18.774.545	0,35
1997	332.744	3.396.700	3.820.000	21.304.378	0,55
1998	413.321	3.682.300	4.446.000	23.426.319	0,59
1999	579.153	4.005.500	5.888.000	25.626.672	0,63
2000	590.496	4.541.700	6.285.000	24.068.024	0,50
2001	487.032	4.981.400	6.735.000	34.479.262	0,50
2002	699.056	5.629.800	9.374.000	36.372.063	0,48
2003	220.634	5.037.000	7.417.000	33.462.700	0,20
2004	269.987	5.124.300	10.172.000	39.519.512	0,20
2005	476.438	6.540.300	14.063.000	48.017.790	0,25

Year	(1)	(2)	(3)	(4)	RCA
2006	406.409	5.736.100	16.793.000	47.355.807	0,20
2007	791.999	5.916.600	18.438.000	49.382.508	0,36
2008	1.062.215	6.410.800	19.910.000	59.401.306	0,49
2009	1.444.422	7.076.661	22.201.000	75.849.333	0,70
2010	1.592.823	8.699.606	24.545.000	87.090.000	0,65
2011	1.993.667	10.552.700	29.000.000	101.310.000	0,66
2012	3.738.652	11.001.300	30.048.000	120.230.000	1,36
2013	6.561.331	12.160.600	37.143.000	131.600.000	1,91
2014	6.709.762	14.164.600	38.243.000	105.550.000	1,31
2015	9.084.888	17.977.910	38.854.000	123.010.000	1,60
2016	10.960.993	19.549.661	39.024.000	143.380.000	2,06
2017	6.676.504	15.203.183	45.530.000	144.960.000	1,40
2018	4.978.533	13.455.175	43.269.000	149.480.000	1,28
2019	4.206.741	12.829.268	46.569.000	149.950.000	1,06
2020	3.436.895	10.228.240	47.616.000	134.820.000	0,95
Average					1,54

Source: Directorate General of Plantation, Oil World and World Bank (processed data)

Note: (1). The value of Indonesian CPO exports in US \$. (2). The value of Indonesian plantation exports in US \$. (3). The value of world CPO exports in US \$, and (4). The value of world plantation exports in US \$.

### 3.1.1 Unit Root Test

Before the regression should first test the stationarity of the data by testing the unit roots (unit root test), using  $\alpha$  5 % or see the probability (p-value), if p- value  $< \alpha$ , H0 is rejected and H1 accepted or data is stationary and otherwise if p- value  $> \alpha$  means the data is not stationary. Test the root of the unit to test whether all variables have units root or stationary data test or there is no a certain  $\alpha$  level. From the test results, it turns out that the variable VX, PROD and NTR are not stationary, while the CPO export price variable (PCPOD) is stationary, so it fulfill the criteria on using regression with ECM.

Tabel 2. Stationary Test Results at Level Observation

Variable	Testing Method	t-stat	t-crit	Probability (p-value)	Interpretation
VX	ADF	-1.186133	-2.991878	0.6631	Data is not stationary
PCPOD	ADF	-3.991453	-3.081002	0.0094	Stationary data
PROD	ADF	2.923534	-2.998064	1.0000	Data is not stationary
NTR	ADF	-1.999922	-2.986225	0.2849	Data is not stationary

The result of stationarity test of data at level observation or in the table 3 shows that all variables have t-critical > t-stat, at level  $\alpha = 5\%$ , all variables have unit root or non stationary data at level distribution, because all variables have p - value  $> \alpha$  level, except world CPO price variables. Since there is nothing stationary for all variables of export volume, production and exchange rate, it is necessary to advanced the stationary test at the First Difference level.

Tabel 3. Stationary Test Results at First Difference Level Observation

Variable	Testing Method	t-stat	t-crit	Probability (p-value)	Interpretation
VX	ADF	-3.036064	-2.991878	0.0457	Stationary data
PCPOD	ADF	-4.958001	-3.175352	0.0032	Stationary data
PROD	ADF	-1.891247	-3.004861	0.3299	Data is not stationary
NTR	ADF	-5.352405	-2.991878	0.0002	Stationary data

From the results of stationary test at the first difference level based on table 3 above shows that all variables can accepted, except the production variable. This means that world CPO price, export volume and

rupiah exchange rate per US Dollar stationary at the first difference level. So it is followed by testing stationarity of data at second level difference to get that all stationary variables.

Tabel 4. Stationary Test Results at Second Difference Level Observation

Variable	Testing Method	t-stat	t-crit	Probability (p-value)	Interpretation
VX	ADF	-6.745050	-2.998064	0.0000	Stationary data
PCPOD	ADF	-7.175526	-3.212696	0.0003	Stationary data
PROD	ADF	-8.199837	-3.004861	0.0000	Stationary data
NTR	ADF	-9.866461	-2.998064	0.0000	Stationary data

The stationary test results at second level difference based on table 4 above shows that H0 is rejected and H1 accepted, means export volume, world CPO price, production and rupiah exchange rate per US dollar stationary at second integration degree of difference. It is evident that the t-critical < t-stat and p-value < α. Once it is believed that all variables are stationary at the same level then cointegration testing of the observation variables will be done.

### 3.1.2 Cointegration Test

After all variables are stationary on the second difference, then to see the effect of independent variables on the dependent variable, first, do regression to estimate the long term (table 5).

Tabel 5 Estimation Output And Root Unit Test Result On Residual Regression Equation

variable	coefficient	Std.error	t-statistic	Probability	f-statistic
C	-3279167	741468.8	-4.422529	0.0002	0.000000
PCPOD	5162.011	669.0495	7.715440	0.0000	
PROD	0.228295	0.026680	8.556795	0.0000	
NTR	-167.6050	76.15633	-2.200803	0.0385	
Recidual		t-statistic	t-crit	Probability	
ADF		-3.504870	-2.986225	0.0164	

Then the model obtained is:

$$VX_t = -3279167 + 5162.011PCPOD_t + 0.228295PROD_t - 167.6050NTR_t + \epsilon_t$$

(0.0002) (0.0000) (0.0000) (0.0385)

After regressing the independent variable to the dependent variable then the next step is to look at the value of the unit roots of the residual or ECT regression equation.

### 3.1.3 Long Term Regression

OLS model aims to determine the effect of independent variables on the dependent variable in the long run. The following is the result of long-term estimation of production variables, world CPO price and rupiah exchange rate against export volume of Indonesian CPO from 1995 to 2020. The following estimates are obtained:

Table 6: OLS Long Term Estimate Results

Variable	coefficient	Std.error	t-statistic	probability
C	-1.996536	0.357712	-5.581470	0.0000
LogPCPOD	1.013337	0.150950	6.713055	0.0000
LogPROD	1.329965	0.091990	14.45777	0.0000
LogNTR	-1.024816	0.1224877	-8.206635	0.0000

The model obtained is:

$$\text{Log}VX_t = -1.9965 + 1.0133 \text{Log}PCPOD_t + 1.3299\text{Log}PROD_t - 1,0248\text{Log}NTR_t + \epsilon_t$$

(0.0000) (0.0000) (0.0000) (0.0000)

Where is : F-statistic = 277.0970; F-probability = 0.0000; R<sup>2</sup> = 0.9742

### 3.1.4 Short Term Of Regr

To see the effect of independent variables on the dependent variable in the short term then do regression for the short term by entering the previous residual (-1) as the independent variable.

Tabel 7: Regression Result Of ECM

Variable	coefficient	Std.error	t-statistic	probability
C	0.026881	0.027519	0.976785	0.3403
D(LogPCPOD)	1.240888	0.178914	6.935663	0.0000
D(LogPROD)	0.386395	0.546992	0.706399	0.4881
D(LogNTR)	-0.616415	0.201080	-3.065521	0.0061
RESID01(-1)	-0.806658	0.238959	-3.375717	0.0030

The model obtained is:

$$\text{LogNX}_t = 0.0269 + 1.2409\text{LogPCPOD}_t + 0.3864\text{LogPROD}_t - 0.6164\text{LogNTR}_t - 0.8067\text{ECT}_t$$

(0.3403)      (0.0000) (0.4881)                      (0.0061)                      (0.0030)

Where is : F-statistic = 36.0968      F-probability = 0.0000      R<sup>2</sup> = 0.8783

### 3.1.5 Hypothesis Testing and Economic Analysis

Based on the simultaneously test results, in the long term obtained F- statistics of 277,09 and F-probability 0.0000 and in the short term obtained F- statistics 36.0968 and F-probability 0.0000 at 5% significant level, it can be concluded that the variable world price of CPO, production and the rupiah exchange rate per US dollar significantly influence the growth of variable export volume of Indonesian CPO together during the period 1997-2022 . The accuracy of the influence of independent variables, followed by the value of coefficient of determination in the long term is 0.9742 and short term 0.8783. This means that the contribution of all independent variables in explaining the dependent variable of 97.42% and 87.83 %. The remaining of 2.58% and 12.17%, respectively, can be explained by other variables outside the model, including product quality and external variables sourced from the economic development of importer countries.

Partial test results, production variables in long term have t-statistic for 14.4577 with probability of 0.0000. By using a significant level of 5%, the influence of positive and significant production variables on the export volume of Indonesia's CPO during the period 1997-2022, with the elasticity coefficient of 1.3299 is elastic, 1% increase in production will increase the export volume of CPO About 1.3299%. In the short term the result of calculation yields t-statistic equal to 0,7064 and probability 0,4881, means of production does not significantly, albeit at a confidence level of 10%. This indicates that the relatively weak competitiveness of CPO exports in the international market, which is possible due to inefficiencies in the production process, especially in the use of technology, the lack of human resources and also other relatively large costs.

The result of analysis shows that world price of CPO variable in long term has t-statistic equal to 6,713055 and probability 0.0000, while in short term tstatistik equal to 6,9357 with probabilita 0.0000. The world CPO price variable has a positive and significant impact on the export volume of Indonesian CPO. The increase in world CPO price by 1% will increase the export volume of CPO around 1.0133%. In the short term there is an improvement in the coefficient of price elasticity to 1.2409, which means the response of CPO export volume increase as a result of 1% price hike to be more elastic at 1.2409%. The results of this study are consistent with

the theoretical mechanisms concerning the effect of export prices on export volumes, and during the period of observation there were relatively large fluctuations in CPO export prices during the observation period.

The results of this study also proves that the variable of rupiah exchange rate per US dollar has a negative and significant effect on CPO export volume growth at a higher 1% confidence level. It can be seen from t-statistic at 8.206635 and probability 0.0000, while in the short term t-statistic equal to 3,065521 with probability equal to 0.0061, so that can be concluded exchange rate of rupiah to US dollar have negative and significant effect to export volume at  $\alpha = 5\%$ . With the elasticity of coefficient about -1.024816 and -0.80665, respectively, that the rupiah exchange rate increase by 1 % will reduce the export volume of CPO around 1.0248% and 0.8066%. An interesting elasticity price of CPO exports in the short term is inelastic which means the response to changes in CPO exports is less than the exchange rate of the rupiah against the US dollar.

#### 4. CONCLUSION

Indonesia's CPO export performance during the period 1997-2022 fluctuated and unstable, as reflected in the fluctuations in the export volume, production, and export prices of CPO in Indonesia. Then on average during the study period the competitiveness of Indonesian CPO exports was smaller than the average competitiveness of world CPO exports, but after 2001 there was a reverse trend. This is due to increased production efficiency in CPO product processing which in turn accelerates export growth.

From the empirical results, in the long run and short-term variables of world CPO price, production and exchange rate of rupiah per US dollar significantly influence the export volume of Indonesian CPO together during period 1997-2022, which is also reflected from the amount of termination coefficient.

Individually viewed, Indonesia's CPO production in the long run has a positive and significant impact on the export volume of CPO, but in the short term does not have a significant effect. This is predicted due to domestic consumption and declining export prices, although the export price of CPO in the long term and short term has a positive and significant effect on the increase of export volume of Indonesian CPO. Similarly, the influence of the rupiah exchange rate per US dollar is negative and significant, in accordance with the theoretical mechanisms.

Then for ECT residual value shows the rate of adjustment on the short term to balance in the long run. In the estimation results show negative ECT value which means relatively slow rate of adjustment to return to equilibrium condition, about 80.67% adjustment process occurs at first and the rest for next year.

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