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The Price of Palm-Cooking Oil in Indonesia: Antecedents and Consequences on the International Price and the Export Volume of CPO

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Abstract
Palm-cooking oil is considered to be one of the primary commodity for the Indonesians. In the world of the palm-oil products, Indonesia has currently established its contribution to the production of palm-oil goods globally. However, in the local market, Indonesia has experienced the volatility on the price of one of the most popular palm-products': the palm-cooking oil. Extant literature suggest various factors affecting the palm-cooking price in Indonesia. The objective of this study is to analyze the influence of the volume of palm-cooking oil production, the Gross Domestic Product (GDP), the consumer price index, the export tax of Crude Palm Oil (CPO), the Indonesian Rupiah (IDR) exchange rate, the volume of CPO production, the price of soy-bean oil, the size of plantations area, and interest rate on to the price of palm-cooking oil in Indonesia. In addition, by using SEM on the 204 samples covering the period during 1996 - 2012, this study expands the analysis by further investigating the effect of these nine factors to determine the international price of CPO and the volume export of CPO. Generally, the main findings indicate that the nine factors as mentioned influence the price of palm-cooking oil, the international price of CPO and the volume export of CPO individually. More specifically, as the substitution product to the soy-bean oil, the palm-cooking oil have underlined the greater elasticity due to the various utilities that can be further produced to fulfil the local and international demands that has increased progressively.
Keywords: Palm-cooking oil, the price of palm-cooking oil, the international price of CPO, the volume export of CPO, SEM.

1. Introduction and Literature Review

Palm oil is a kind of vegetable oil produced from the fruit of the palm tree. Nowadays, the demand for palm oil has increased significantly due to its versatile utilization that is beyond for food-consumption e.g. cooking oil and margarine. According to several reports (see for example Abdullah and Wahid, 2010; World Growth, 2011; Goenardi, 2008; Thoenes, 2006), the palm oil also provides numerous values for non-food consumption e.g. bio-fuel and medicine emphasizing its substitution value against other existing materials such as fossil-fuel and chemical extract. Other points highlighting the advantage of the palm oil include the long-term availability and health issues. More specifically, the palm oil itself is now considered as the best option to substitute the use of trans-fat oil with a relatively lower cost thus can promote a healthier life-style, as well as to overcome the availability of fossil-fuel in the long term. As the demand for the palm oil increases, many producers and exporters in tropical countries e.g. Indonesia, Malaysia, Thailand and Nigeria have tried to optimize the production of palm oil by a massive opening of new palm plantations in order to produce tons of palm fruits for further production of palm oil (World Growth, 2011).
Indonesia in particular, has now become the highest contributor for the world palm-oil products and together with Malaysia, have covered more than 85 percent of world total of palm-oil production (Arifin, 2013; World Growth, 2011). Accordingly, the report also highlighted the condition mentioned earlier on that the promising economic value of palm-oil products motivates the Indonesian local producers to open new fields for the palm plantations substantially. More specifically, Arifin (2013) highlight the issue on variety of Indonesians' palm-tree producers, from smallholders to major players holding large-scale plantations, which contribute a particular challenge on the palm-oil industry in Indonesia. The author further acknowledge that some major palm-oil business actors in Indonesia have become the participants in the Roundtable Sustainable Palm Oil (RSPO), a major certifying body of palm oil trade system, whereby the Indonesian Palm Oil Association (IPOA) has withdrawn its membership from the RSPO. The author suspects this condition as one of the significant factor affecting the stability of the palm-oil price in Indonesia.

According to World Growth (2011), an average of 80 percent of the palm oil production worldwide is used for food purposes such as cooking oil and in margarines. The report also predicts that the demand for the palm oil is

growing following an increasing awareness from the developing nations to the use of palm oil in the variety of food manufacturing industries e.g. fast food, baking and snack. The hydrogenation process of unsaturated fats is needless as palm oil is very much adaptive to the high heat compared with other kinds of vegetable oils e.g. soy oil, sunflower oil and olive oil thus establishing the competitiveness of palm oil against other vegetable oils. The other point worth highlighting that many developed countries (see for example the United States, the United Kingdom, Canada, Denmark and Switzerland) have encouraged efforts to minimize the use of trans-fat oil into their food industries. Consequently, the commercial value of palm oil raises significantly due to its substitution for the trans-fat cooking oil, (World Growth, 2011; Abdullah and Wahid, undated).

As the major producer of palm oil, Indonesia also experiences a huge number of palm oil consumption. Indonesians in majority has now massively used the cooking oil extracted from palm oil and yet affecting the rapid growth on the local consumption of palm oil (Rifin, 2010a, b; Obado et al., 2009; Goenardi, 2008). The authors report that the use of palm oil for cooking oil in Indonesia reached 75.85 percent in 2003 and was expected to be at 77 percent in 2008. Considering its essential utilization for public consumption, the government of Indonesia sets cooking oil as one of staple food commodities. Therefore, the government has the right to control the price of cooking oil. The government sets the relevant policies by releasing Ministry of Finance Decree No. 09/PMK.011/2008 and revised in December 2008 with the issue of Ministry of Finance Decree No 223/PMK.011/2008 which impose higher export tax rate when the international price of palm oil increase. Accordingly, the issue of this decree is expected to maintain the availability of palm oil for the domestic market for the further production of cooking oil (Rifin, 2010a, b).

Beside several factors as briefly introduced and discussed above: the size of plantation area, the production volume of the palm-cooking oil and other inherent product of palm oil e.g. CPO, and the export tax; extant literature have underlined other factors that influence the price of palm-cooking oil. Abdullah and Wahid (2010), Talib and Darawi (2002), and Carrere (2001) emphasize the positive effect of the price of soybean oil on to the price of palm-cooking oil due to the closest substitute of soybean oil for palm oil and cross price elasticity. Frankel (2008) and Kohn (2008) argue the impact of the real interest rate on real price of mineral and agricultural commodities, including the palm-cooking oil. The authors suggest “a carry-trade” effect resulted from the extent of interest rate on to the availability of stock of product. It is claimed that, the higher the interest rate offered by the banking sector, the lower the productivity of the producer due to the increase of savings. Thus, it decreases the availability of stock of a product and increases its price subsequently.

The other factor worth highlighted is the exchange rate. A decrease of the exchange rate of a local currency e.g. Indonesian Rupiah (IDR) against the foreign currency e.g. the United States (US) Dollar or Euro influence the export and import activities. Adiningsih et al. (2013), Husman (2005) and Onafowora (2003) argue that the real exchange rate of IDR influence the trade balance between Indonesia and its trading partner such as Singapore, Japan, China and the US. The authors indicate that an increase of IDR will increase the price of domestic product, including the palm-cooking oil, due to a greater volume of the particular product for the export purpose, and likewise. Subsequently, Prastowo (2008) posits that the movement of a real local exchange rate also determine the consumer price index, including the palm-cooking oil as one of the primary commodity in Indonesia. Based on the findings from the ordinary least square analysis, Prastowo (2008) indicated that the decrease of the IDR exchange rate increases the consumer price index and further raises the price of palm-cooking oil in Indonesia. The Government of the Republic of Indonesia has been imposing the free-floating exchange rate policy since 14th August 1997 that is much affected by the occurrence of Asian Crisis in 1997. Therefore, the real exchange rate of IDR is currently depending by the market system that further results the volatility of the IDR exchange rate.

Furthermore, Hubbard et al. (2012) implied that the gross domestic product (GDP) of a country affect the drive of a product price. The authors suggest that the movement of the GDP is more likely influence the of price variety of products in general and palm-cooking oil price in particular as there is a positive relationship between the GDP and the purchasing power parity (PRR) of the nation. A higher GDP indicates a higher demand in the fulfilment of the primary of needs for the palm-cooking, and yet increasing the price of the commodity.

Hence, based on the literature review as prior described, this study aims to analyze the influence several independent variables namely: the volume of palm-cooking oil production, the GDP, the consumer price index, the export tax of CPO, the IDR exchange rate, the volume of CPO production, the price of soy-bean oil, the size of plantations area, and interest rate on to the price of palm-cooking oil in Indonesia. In addition, this study expands the analysis by further investigating the effect of these nine factors in determining the international price of CPO and the volume export of CPO. The analysis was conducted under the Structural Equation Model (SEM)

to further examine the inter-relationship among the observed variables following rationales developed from the review of relevant literature in the topic of the study, as well as to explain the research objective as established previously.

The remainder of this paper presents a brief discussion on the research method and design, followed by the result of data analysis. The final section discusses the conclusion and further implications for the future studies.

2. Research Method and Design

This study uses the *secondary* data consisting seventeen years of observation period from 1996 to 2012. The time series data is then detailed into monthly basis resulting the total of 204 samples (17 years x 12 months = 204 samples) that are further deemed for linearity and normality tests. Table 1.1 summarizes the operationalization of the observed variables and their measures.

Table 1. Operationalization of Variables

Sources of Data	Unit of Measurement	Name of Variable	Symbol	Sign
1.Indonesian Bureau of Statistics 2.Ministry of Trade of Republic of Indonesia	IDR/Kilogram	Palm-Cooking Oil Price	HMG_t	Y1
Oil World	*Metric ton*/US$	International Price of CPO	HCP_t	Y2
Indonesian Bureau of Statistics	*Metric ton*	Export Volume of CPO	VEC_t	Y3
Indonesian Bureau of Statistics	*Metric ton*	Production Volume of Palm-Cooking Oil	VPM_t	X1
Asian Development Bank (ADB)	IDR/ year on year	*Gross Domestic Product*	GDP_t	X2
ADB	100 base years (1978,1996,2001)	Consumer Price Index	IHK_t	X3
1. Ministry of Finance of Republic of Indonesia 2. Ministry of Trade of Republic of Indonesia 3. ADB	*Average rate (% / metric ton)*	Export Tax of CPO	PEC_t	X4
ADB	*Units end of period*	IDR Exchange Rate to USD	KRS_t	X5
Indonesian Bureau of Statistics	*Metric ton*	Production Volume of CPO	VPC_t	X6
Oil World	*Metric ton*	International Price of Soy-bean Oil	HMK_t	X7
Ministry of Agriculture of Republic of Indonesia	Acre	Size of Palm Plantations	$LLK_{(t-4)}$	X8
ADB	*Average rate (%)*	Interest Rate	TSB_t	X9

Subsequently, the collected data is analyzed using the Structural Equation Modelling (SEM) that estimates a series of separate, but interdependent, multiple regression equations simultaneously by specifying the structural model (Hair et al, 2010; Ghazali, 2008). The authors highlight that the structural model can present the relationships among independent and dependent variables both in the same model of the relationship involving these variables and when dependent variables treats as the independent variables in the other model of relationships. The use of SEM provides two major advantages for the study. First, it provides a direct method when dealing with multiple relationships simultaneously emphasizing the statistical efficiency. Secondly, the SEM is more powerful than any other statistical tools in examining the relationships comprehensively and further becomes a confirmatory analysis instead of the exploratory analysis. In sum, the use of SEM is to test the research hypothesis whether volume of palm-cooking oil production, the GDP, the consumer price index, the export tax of CPO, the IDR exchange rate, the volume of CPO production, the price of soy-bean oil, the size of plantations area, and interest rate; influence the the price of palm-cooking oil in Indonesia; the international price of CPO and the volume export of CPO, simultaneously and individually.

In fulfilling the objective of the research as discussed earlier on, this research employs independent variables (Y) and dependent variables (X) (see Table 1.1). The independent variables are termed as the latent variables in SEM that requires the inter-related examinations with the observed variables or the dependent variables. Further, the latent variables are determined in terms of observed variables. Thus, the latent variables in SEM are treated as

the properties of the observed variables. Figure 1.1 displays the SEM employed within the research model of the study.

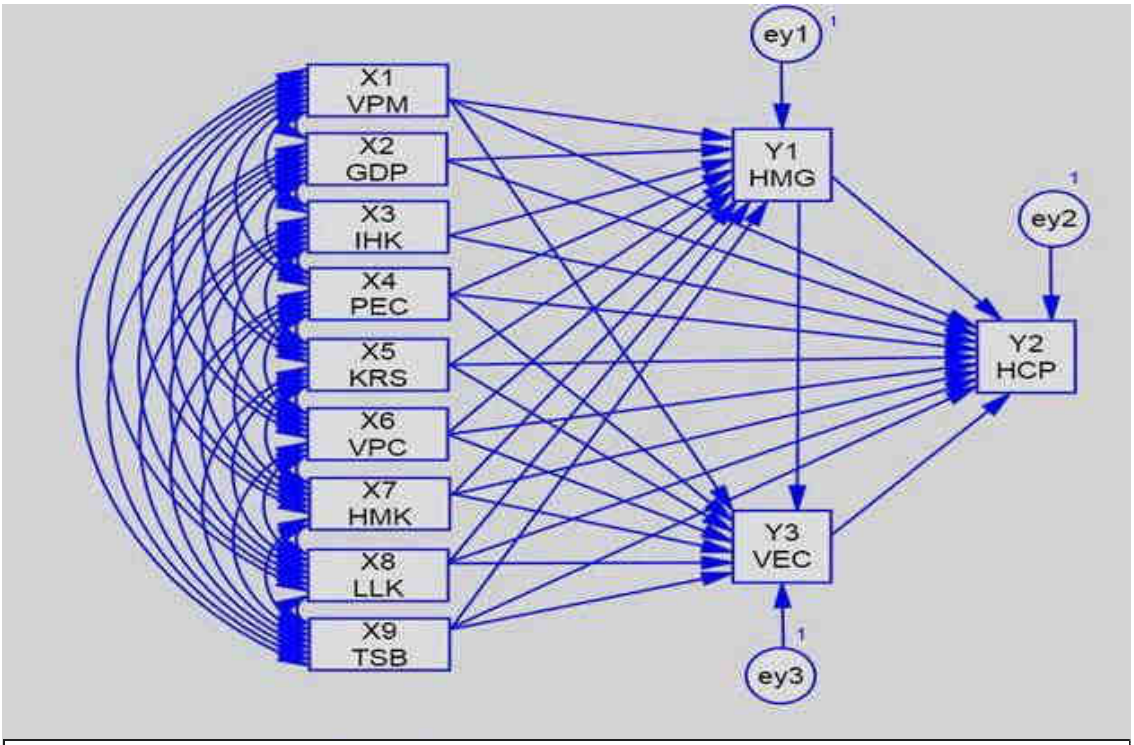

Figure 1. The SEM in Analyzing the Factors Influencing the Palm-Cooking Oil Price and Their Effects on the Indonesia's Export Volume of CPO and the International Price of CPO

3. Discussion and Analysis

Prior to proceed the SEM in the fulfilment of the objective of this research, Hair et al. (2010) suggest that it is pivotal to conduct linearity and normality tests of the data. The test of analysis of variance (ANOVA) was conducted to examine the continuous linearly related variables in this study. The result of ANOVA indicate that except for the linearity between Y1 and X3 (HMG*IHK), the linearity among all related variables are below the 0.5 threshold and significant at 0.000 (see Appendix 1). The value of the test of linearity between Y1 and X3 is 0.418 that is below the 0.5 threshold, thus it presents a low concern of the linearity between these two variables.

Further, the normality test was conducted to determine the normally distribution of the samples. The statistical results from the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality show a normal distribution of the samples for each independent variables. The data that were free from the linearity and normality concerns are further tested to determine the simultaneous interrelated dependence relationship among latent and observed variables using AMOS statistical software version 19.0.

Following the SEM-based research model as shown on Figure 1, this study estimated the free parameters from the observed data using the maximum likelihood estimation (MLE) (see Table 2). The findings from the MLE test results indicate that, except for the relationship between the production volumes of palm-cooking oil (X1) to the international price of CPO (Y2), as well as the relationship between the international price of soy-bean oil (X7) and the export volume of CPO (Y3), all relationships among related latent and observed variables are significant.

Table 2. Maximum Likelihood Estimation

Sig.	P	C.R.	S.E.	Estimate			
Yes	***	20,14944	,00119	,02392	ey1	<---	y1
Yes	***	-4,67475	,09452	-,44187	x1	<---	y1
Yes	***	3,45929	,07811	,27020	x2	<---	y1
Yes	***	-6,44113	,01827	-,11771	x3	<---	y1
Yes	***	6,80295	,07281	,49533	x4	<---	y1
Yes	***	15,50836	,05728	,88837	x5	<---	y1
Yes	***	4,47093	,47017	2,10208	x6	<---	y1
Yes	***	3,84030	,28401	1,09068	x7	<---	y1
Yes	***	-6,24132	,15046	-,93906	x8	<---	y1
Yes	,00295	-2,97315	,06728	-,20003	x9	<---	y1
Yes	***	20,14944	,00017	,00339	ey3	<---	y3
Yes	,01196	2,51332	,00883	,02218	y1	<---	y3
Yes	,01371	-2,46486	,01038	-,02560	x4	<---	y3
Yes	***	8,95298	,01040	,09308	x5	<---	y3
Yes	***	4,60759	,06651	,30643	x6	<---	y3
Yes	***	6,91892	,01941	,13431	x8	<---	y3
Yes	***	-4,65028	,00713	-,03317	x9	<---	y3
No	,91997	-,10047	,03709	-,00373	x7	<---	y3
Yes	***	-3,41153	,01405	-,04793	x1	<---	y3
Yes	***	4,20289	,03557	,14949	x5	<---	y2
Yes	***	20,14944	,00043	,00865	ey2	<---	y2
Yes	,02491	-2,24283	,18853	-,42285	x6	<---	y2
Yes	***	-6,13821	,02565	-,15742	y1	<---	y2
Yes	***	10,32881	,10645	1,09952	x7	<---	y2
Yes	,00323	2,94510	,18033	,53108	y3	<---	y2
No	,09320	1,67874	,03709	,06227	x1	<---	y2
Yes	***	-6,39334	,00728	-,04652	x3	<---	y2
Yes	,06354	-1,85536	,02918	-,05414	x2	<---	y2
Yes	***	11,57204	,06336	,73321	x8	<---	y2
Yes	,00206	3,08125	,02956	,09108	x4	<---	y2
Yes	***	-3,40839	,02603	-,08871	x9	<---	y2

These exceptions on the relationships between X1-Y2 and X7-Y3 underline the inelasticity of the extracted palm oil also known as CPO. It shows a contrast feature of the local production volume of palm-cooking oil that has no effect on the international price of CPO. In addition, the CPO and palm oil have remarked their competitiveness as the valuable alternative of the substitution good emphasizing the versatility of the CPO in further generating variety of products. Thus the increase of international price of soy-bean oil does not influence the export volume since there has been a great demand of CPO to be further used by the various producers internationally.

Subsequently, the evaluation of the model fit was conducted and resulted a SEM of the factors influencing the palm-cooking oil price and their effects on the Indonesia's export volume of CPO and the international price of CPO. The study evaluate the goodness-of-fit criteria resulted from the statistical software of AMOS version 19.0 as depicted in Figure 2. Various criteria employed to determine the goodness-of-fit on the implied matrix yielded an acceptable goodness of fit of the SEM for this analysis. The implications of the results indicate that the observed variables consist of nine measures from X1-X9 influence the palm-cooking oil price, the international price of CPO, and the export volume of CPO. Accordingly, individual factors in determining the palm-cooking oil price, the palm-cooking oil price and the international price of CPO have a direct effect on the export volume of CPO.

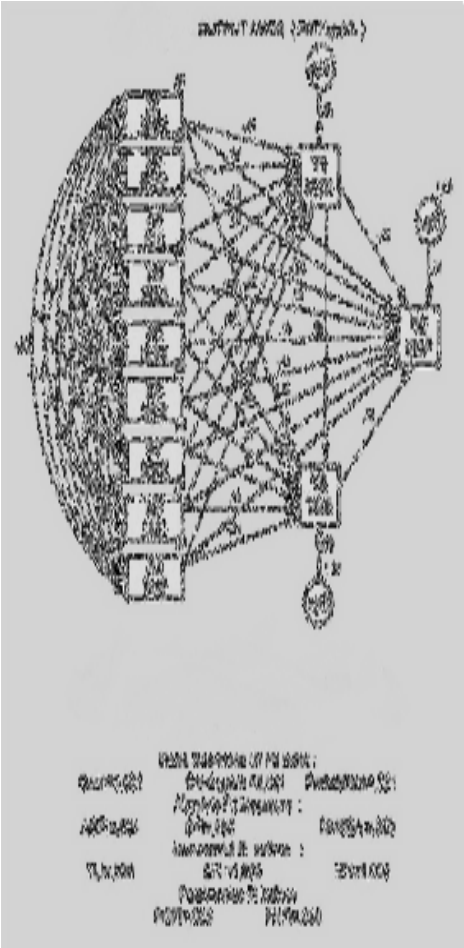

Figure 2. The Full Structural Equation Model for the Analysis on Factors Influencing the Palm-Cooking Oil Price and Their Effects on the Indonesia's Export Volume of CPO and the International Price of CPO

4. Conclusion and Implications

Agriculture sector in general, and the palm oil industry in particular, has played a pivot role in the Indonesian economy. It is claimed that palm oil is considered to be a strategic sector since it is the raw material in further producing the cooking oil consumed by Indonesians (Rifin, 2010a,b; Obado et al., 2009; Goenardi, 2008). It is also claimed that Indonesia has become the largest producer of palm oil, overtaking Malaysia since 2006, and the total export of palm oil from both countries contributed 91 per cent of the total world palm oil export in 2007 (based on the report by United States Department of Agriculture in 2008, quoted in Obado et al., 2009). Accordingly, the increasing demand of the palm oil products (consisting of CPO and refined palm oil) locally and internationally influences the price of palm-cooking oil as well as both of the international price of CPO and the export volume of CPO.

The main findings indicate that the volume of palm-cooking oil production, the GDP, the consumer price index, the export tax of CPO, the IDR exchange rate, the volume of CPO production, the price of soy-bean oil, the size of plantations area, and interest rate influence the price of palm-cooking oil in Indonesia, as well as the international price of CPO and the Indonesian's export volume of CPO. More specifically, the local production volume of palm-cooking oil has no effect on the international price of CPO. It can be argued that the price of local palm-cooking oil is determined following the change of the international price of CPO. Thus, a particular tax policy by the Government of Indonesia in imposing a high rate of export tax provide might present a greater impact on to the government's income instead of decreasing the palm-cooking oil price and the international price of CPO, consistent with Rifin (2010b). Furthermore, in comparison with the soy-bean oil, the CPO and palm oil have underlined the greater elasticity due to the various utilities that can be further produced using the main palm oil products as mentioned above.

The findings of the study provides a significant insight especially to the local regulator for further managing the concern on the change of palm-cooking oil price. Instead of imposing the high export tax towards maximizing the availability of palm-cooking oil for the local market, the regulator can integrate the different needs from various local palm-oil business players. Given the fact that the actors of palm-oil industry in Indonesia varied from the smallholders of palm plantation to the major producers; the initiative can bring more positive outcomes to the local industry towards the stability of the competitive palm-oil price that beneficial to both producers and consumers in Indonesia. The current role of the IPOA as the co-promoter in developing the certification system for the Indonesian Sustainable Palm Oil (ISPO) can be further maximized when all parties are incorporated within this scheme. Thus, it will create more positive contributions to both of local producers and the government, especially in term of strengthening the bargaining position as well as the production value of the Indonesians' palm-oil products in the global palm-oil business.

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APPENDIX 1. **The Result of test of Linearity: Anova.**

Results	Sig	F	Mean Square	df	Sum of Squares	Linearity Beween
linear	,000	158,768	7,094	1	7,094	y1*y2 (HMG*HCP)
linear	,000	613,304	9,429	1	9,429	y1*y3 (HMG*VEC)
linear	,000	613,304	9,429	1	9,429	y1*x1 (HMG*VPM)
linear	,000	5921,441	11,894	1	11,894	y1*x2 (HMG*GDP)
linear	,418	,669	,028	1	,028	y1*x3 (HMG*IHK)
linear	,000	28,645	1,732	1	1,732	y1*x4 (HMG*PEC)
linear	,000	3474,342	15,325	1	15,325	y1*x5 (HMG*KRS)
linear	,000	44823,122	12,888	1	12,888	y1*x6 (HMG*VPC)
linear	,000	162,833	9,077	1	9,077	y1*x7 (HMG*HMK)
linear	,000	3165,122	8,477	1	8,477	y1*x8 (HMG*LLK)
linear	,000	199,969	3,779	1	3,779	y1*x9 (HMG*TSB)
linear	,000	1561,863	1,490	1	1,490	y2*x1 (HCP*VPM)
linear	,000	53641,514	1,578	1	1,578	y2*x2 (HCP*GDP)
linear	,000	70,817	,326	1	,326	y2*x3 (HCP*IHK)
linear	,000	989,598	1,315	1	1,315	y2*x4 (HCP*PEC)
linear	,000	63,686	,320	1	,320	y2*x5 (HCP*KRS)
linear	,000	31260,568	1,480	1	1,480	y2*x6 (HCP*VPC)
linear	,000	8814,973	1,698	1	1,698	y2*x7 (HCP*HMK)
linear	,000	34964,480	1,758	1	1,758	y2*x8 (HCP*LLK)
linear	,000	3028,100	1,549	1	1,549	y2*x9 (HCP*TSB)
linear	,000	37873,474	,449	1	,449	y3*y1 (VEC*HMG)
linear	,000	1700,296	,393	1	,393	y3*x1 (VEC *VPM)
linear	,000	127,908	,161	1	,161	y3*x4 (VEC *PEC)
linear	,000	735,464	,348	1	,348	y3*x5 (VEC *KRS)
linear	,000	56463,906	,470	1	,470	y3*x6 (VEC *VPC)
linear	,000	549,740	,394	1	,394	y3*x7 (VEC *HMK)
linear	,000	3534,880	,386	1	,386	y3*x8 (VEC *LLK)
linear	,000	715,792	,241	1	,241	y3*x9 (VEC *TSB)

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