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The Effects of G-8's GDP, US $ Exchange Rate, and Gold Exchange Rate to the Indonesian Export

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***Abstract*— This study attempts to analyze the relationship between Indonesian export volume, as the dependent variable, and real exchange rate (Rp/US$), G8's GDP, and Gold Exchange rate. The largest export object countries for Indonesia are USA, Germany, French, Italy, UK, Italy, Russia, Canada and Japan, which is called G8 countries. The destination export of Indonesia for over ten years are 31 % to G8 countries as shown in table 1. In particular, the study examines the implication of G8's GDP, US $ real exchange rate change, and exchange price of Gold on the demand export of Indonesia. US $ exchange rate variable shows a negatively relationship in the long term with Indonesian export, and it is also affects the export volume decrease in the short run. On the other hand, Gold exchange rate and G-8's GDP have positive and significant impact in the long run, whereas in the short run, changing of the variables adjust about 6% by export variable. In addition to discussing the factors that affect the exports in the aggregate, it is suggested that US$ give bad effect to Indonesian export, because the more fluctuating occur, the more risk Indonesian export it will be. On the contrary, there is an opportunity for using Gold base currency as a better alternative. In fact, it gives positively and significantly relationship with Indonesian export volume.**

***Keywords*— G-8s, GDP, Exchange Rate, Gold.**

I. INTRODUCTION.

Almost every developing country today has made a commitment to nation building to catch up in various aspects of life. One aspect is that economic development is an integral part of the per capita of population increased in the long term to encourage the improvement of economic welfare of the poor. To achieve these economic development, Indonesia to development in all economic sectors. One of the economic sectors that receive attention is the trade sector (export), which have consequences on the domestic economic associated with international economic.

Export is conducted by a country style is also associated with both economic growth, namely domestic economy, and object countries economy. While object countries economy are determined by changes in their demand composition, industrial sector, or their balance of payments.

TABLE 1 : EXPORT DESTINATION COUNTRIES
(AVERAGE 1996 – 2006).

COUNTRY	**Total Export (%)**
G8 Countries (USA, UK, Germany, French, Italy, Russia, Canada, Japan)	31
Other Asian countries	26
Other European countries	22
Other American countries	13
Australia	8
	100

Source : "Buletin Ekpor Indonesia , Vol 1, April 2007.

This study attempts to analyze the relationship between Indonesian export volume, as the dependent variable, and real exchange rate (Rp/US$), G8's GDP, and Gold Exchange rate. The largest export object

countries for Indonesia are USA, Germany, French, Italy, UK, Italy, Russia, Canada and Japan, which is called G8 countries. The destination export of Indonesia for over ten years are 31 % to G8 countries as shown in table 1. (Sri Mulyani I, 2007). In particular, the study examines the implication of G8's GDP, US $ real exchange rate change, and exchange price of Gold on the demand export of Indonesia.

Indonesia provides a good case for the examination of the economic changes on the demand of export. This is because Indonesia is considered as a country characterized by small and open economy with managed floating exchange rate, export orientation, and is Concerned with orientation to the industrial sector orientation. These characteristics allow the model to be developed and implemented according to the theories associated with the motive for economic growth.

Assumption grounded the research is a volatility of US$ exchange rate will affect to the prices in abroad which is to become more expensive or cheaper. Theoretically, a rupiah depreciation can make price of Indonesian goods cheaper in foreign market. This is because, consumer purchasing power in abroad increase due to increasing of exchange rate rupiah to the US $. It also will happen if the rupiah undergo appreciation.

The paper would be to explain the impact of exchange rate changing, G8's GDP, and exchange rate of gold to the Indonesian export demand in period 1997 – 2007. The model is applied to the analysis of this research is dynamic, ie combine the short-term effects with long-term impact of the basic calculation using Ordinary Least Square (OLS). Achieving dynamic model is done by combining the standard model and the model of quadratic cost function. Quadratic cost function analysis were included in the model with the consideration that in the short-term price rigidity occurs causing disequilibrium. The combination is done will trigger Error Correction Model (ECM).

Because OLS is a simple analytical model, then to be able to apply it well, without losing Must unbiased nature, required a strict statistical test. In the early stages of the test conducted using the data stationary-unit root test which refers to the two methods by Dickey-Fuller (DF) and the method of Phillip-Perron (PP). One also will be in the equation stationery test using Johansen Co-integration test methods. Elementary tests are needed to arrive at analytical model Error Correction Model (ECM), as well as an effort to meet the classical OLS assumptions. ECM can be formed after the diagnostic test is still needed, a test of the homoskedastisity, autocorrelation, normality, specification model, and the stability of the model.

II. THE DATA

The data are mining from International Financial Statistic (IFS) published by International Monetary Fund (IMF). The data are G8's GDP, Indonesian export, US $ exchange rate, and Gold Exchange rate. Furthermore, the data are analyzed using EVIEWS 5.0.

The data used for the analysis were collected from various sources, such as Notes of the Indonesian Budget of the Financial Planning and Disbursement (Budget), Indonesian Economic Statistics and Finance of Bank Indonesia (BI), Indonesian Statistics (BPS), and International Financial Statistics of the International Monetary Fund (IMF). These secondary data were reasonably easy to collect. The data consisted of a time series form spanning from 1971 to 2007. In other words, the data were in the form annually.

Some variables that will be used in this analysis, can be defined specifically as follows: (1) variable G8's GDP is abbreviated by LGDP; (2) Indonesian export is abbreviated by LEXP; (3). Variable foreign exchange rates in this case US $ and Gold namely LDOL and LGOLD. The study is done with maximize the data from 1971 - 2007. In this research use time series data namely, Indonesian export, G8's GDP and real exchange rate (Dollar and gold). Besides that, this research also uses other data which is related to the research.

III. LITERATURE REVIEW, MODELS , AND METHODS

The export growth is according with the fluctuating rate especially US$. The better exchange rate happens, the more export it will be (***BambangPrijambodo, 2009). Besides that,*** Ricardo J. Caballero, dan Vittorio Corbo, in their paper in World Bank Economic Review, The Effect of Real Exchange Rate Uncertainty on Exports: Empirical Evidence, has founded that it is positively associated between fluctuating exchange rate and export among the countries.

Moreover, a research conducted in industrializing countries has reinforced that developed countries' GDP influenced developing countries export. So, it can be said that developing country includes Indonesia is affected by economic growth of developed countries because their economic can support demand, and the demand will affect to the production.

Besides that, there are several research related to the topic especially on volatility aspects. An usual method used to measure volatility of currencies is Generalized Autoregressive Conditional Heteroscedasticity (GARCH) by Bollerslev, Verbeek, 2000 : 266). This method have been used on several research associated with volatility.

Mc Kenzie(1998) and Vergil (2002) counted the volatility of a currency using coefficient of variance method and its effect to the bilateral trades. Esquivel and Larrain (2002) use the method to obtain the relation between disperse and real exchange rate. They have done a volatility research in G-3's countries and the effect to the international trade for developing countries. They use a formula, as bellow:

$$CV_{t+m} = \frac{\frac{1}{m}\sum (Є_{t+I-1} - Є)^2}{Є} \quad .....(1)$$

Where : m : order from moving average and Є : mean bilateral exchange value from year t to t+m-1

Chou, (1970 : 107) and Kane, (1969,78) use CV method which is counted with percent. They make a model to predict developing countries export. They use model G-3 countries:

$$X = \int (GDP, EXCHANGERATE), \ldots\ldots\ldots\ldots\ldots (2)$$

Subject to :

$$Ln (X_t) = a+b\ Ln (GDP_w) + c\ RER_{us} + d\ VOL_{yen/\$} + e\ VOL_{DM/\$} + \epsilon_t \quad \ldots\ldots\ldots\ldots (3)$$

(X_t) = Total export developing countries.
(GDP_w) = GDP all over the world
RER_{us} = bilateral US$ exchange rate.
$VOL_{yen/\$}$ + e $VOL_{DM/\$}$: Coefficient of variance of G-3 countries.

Tinbergen (1962) and Poyhonen (1963) have evaluated international trades using "gravity model" . The model have resulted international trade as GDP and distance functions. Trades volume are correlated positively with GDP, as a result, the more GDP they have, the bigger volume of trades it will be.

Rose (200), Glick and Rose (2002) have reported that the more countries join in currencies area, the more trade creating effect it will be. Pakko and Wall (2001) use the same method, but it has a lower result than Rose.

Benjilali (1994) measure the "Trade Creating Effect" used a revised Gravity Model, and it has added cost of trade variable which have done by IDB countries.

Hassan and Islam (2001) use the same model to look for trade creating effect in OKI countries. The model should be in follow:

$$\text{Log (Trade)} = \alpha \pm \beta_1 \log(GDP) * GDP) \pm \beta_2 \log (PCI)*PCI) \pm \beta_3 \log (DISTANCE) \pm \beta_4 (BORDER) \pm \beta_5 (BLOCK) \pm \epsilon \quad \ldots\ldots\ldots\ldots (4)$$

Where PCI : Income per capita, Distance : distance between two countries. BLOCK : member a Block or not. Furthermore, Teo, 92005), measures Identification of Factors Affecting the Volatility, using a model :

$$\text{Ln (Odds)} = \ln [\ P_i/(1-P_i)\ ] = \ln (e^{Xb}) = Xb \quad \ldots\ldots\ldots\ldots (5)$$

This is known as the logit transformation, which is linear transformation of the nonlinear odds to Xb, which is linear additive. Thus, in binary logistic regression, Xb is also called the logit, or the (natural) log odds.

IV. TRADE EFFECT OF GOLD VOLATILITY

Volatility's impact to International Trade, Volatility of currency can increase risk of uncertainty that has negative impact for international trade. It is necessary to press excessive risk volatility of the US dollar, hedging can be done by additional cost compensation. This is unnecessary happens if they have any strategy to manage it..(*Grauwe (1982 :241).*

Moreover, Gold is more stable against with paper money. So, it can secure economic stability that constitute important factor to achieve welfare and to avoid economic disease such as Inflation and high prices (*Muhaimin Iqbal: 2006*). This instability in a general way is caused by using paper money.

Besides that, Receiver Economics *noble prize Robert A. Mundell* said "Gold is going to be part of the structure of the international monetary system for the 21st century. There is enough evidence that gold is going to come up to the world currencies as it has many superiority such as stability and efficiency. Volatilities of a currencies can increase uncertainty risk that has impact negatively to international trade. To press volatility risk because of excessive dollar, hedging can be done as a result additional cost will be imposed. That thing is not necessarily happens if gold as medium of exchange, since gold has to assess intrinsic that auto protects itself from changing rate risk. (A. Mundel, (1993).

As a commodity, gold points out its performance, especially of stability aspect along history. Such graph, shows that in 1792 until 1972 gold prices just changed significantly four times. On 1792 price of gold to reach 19,75 US$. Then in row 1834, 1934 and 1972 as each 20.67, 35 and 38 US $. After *Bretton Woods collapse*, gold price then fluctuates until now.

Moreover , *Meera and Larbani (2004)* have developed trade matrix model to solve how detail and that trade will be done by gold. Gold trade based can increase volume of trade. If Gold as medium of exchange of international trade will push trade volume among members of OKI's state (Lutfi Hamidi,2006).

Lutfi Muhamidi (Lutfi Muhamidi, 2006) measure trade Creating Effect due to using gold standards (expanding form Tinbergen model :

$$\text{Log (Trade)} = \alpha \pm \beta_1 \log(GDP) * \pm \beta_2 \log (US / GOLD) \pm \beta_3 \log (Yen / DOLLAR) \pm \beta_4 (DM / DOLLAR) \pm \epsilon t \quad \ldots\ldots\ldots\ldots (6)$$

Furthermore, as a commodity, gold points out its performance, especially of stability aspect along history. Such graph, shows that in 1792 until 1972 gold prices just changed significantly four times. On 1792 price of gold to reach 19,75 US$. Then in row 1834, 1934 and 1972 as each 20.67, 35 and 38 US $. After *Bretton Woods collapse*, gold price then fluctuates until now.

V. UNIT ROOT TEST

The first step who shall be done in economic model estimation with data *time series* are using tests stationery` on data or is called also *stationary stochastic process*. To test this data can use Augmented Fuller's Dickey (`ADF`) on same degree *(level* or *different* ) until is gotten a data that stationery, which is its variance do not too large and `tend near to average of the data. (Enders,1995) .

Gujarati (2003:817) explained a formula for stationary test using ADF :

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \beta_i \sum_{i=1}^{p} \Delta Y_{t-i+1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots (7)$$

Where :

ΔY_t = *first difference*
α_0 = Intercep
Y = Variables tested with stationery
P = Lag used in the model
ε = *Error term.*

In that equation is known that zero hypothesis (`Ho`) point out of a *unit root* and hypothesis one (H_1) point out no unit *root.* If in this `stationery test point out `ADF``S point $_{statistic}$ greater than `*Mackinnon critical value*` , therefore that that is stationery because does not contain *unit root.* On the contrary if `ADF` $_{statistic}$ less than `*Mackinnon critical value*` , therefore can be concluded that data is not stationery on the level. Accordingly, it shall be done *differencing of the* data in the same degree in the first different , which is reducing that data with previous data (t-1).

VI. COINTEGRATION TEST

Widarjono (2007:354-355) explained that approach used in the co-integration test is using Johansen method. Johansen method use *autoregressive* model by ordo P , as shown bellow :

$$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + B\pi_t + \in_t \quad (8)$$

Where :

y_t : vector- *k (unstationary* variables)

π_t : vector-*d (* deterministik variables)

$\in_t$: inovation vectors.

Moreover, the equation can be noted :

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + B\pi_t + \in_t \quad (9)$$

Where :

$$\prod = \sum_{i=1}^{p} A_i - I, \quad \Gamma_i = -\sum_{j=i+1}^{p} A_j \quad (10)$$

Representation Granger theory, explained that matrix coefisient $\prod$ has $\tau < k$ *reduce rank which has* $k \times \tau$ matrix α and β with rank τ , as $\prod = \alpha\beta$ and $\beta' y_t$ which is constitute $I(0)$. τ is cointegration value *(rank), while every colomn* β shown a vector cointegration. α is adjustment parameter in VECM. Moreover, Johansen method used to estimate a matrix $\prod$ from *unrestricted VAR, and it uses to examine whether reduced rank* $\prod$ accepted or rejected.

Moreover, in the such rank *reduce test*t, Johansen uses two different statistic test namely *trace test* (λ_{trace}) and *maximum eigenvalue test* $(\lambda_{\max})$. *Trace test examines* H_0 in the cointegration τ as alternative cointegration from cointegration equation *-k,* where *k* is variables endogen value for $\tau = 0,1,.....,k-1$. H_0 test by *trace test is shown :*

$$LR_{tr}\langle\tau|k\rangle = -T\sum_{i=r+1}^{k}\log(1-\lambda_i) \quad (11)$$

Where λ_i is the biggest *eigenvalue from* matrix $\prod$. While, The *maximum eigenvalue test examines* H_0 in the cointegration equation τ . It is an alternative cointegration from the equation *-k*+1. Examining H_0 $_{by}$ *maximum eigenvalue test can be shown :*

$$LR_{\max}\langle\tau|k+1\rangle = -T\log(1-\lambda_{r+1})$$
$$= LR_{tr}\langle\tau|k\rangle - LR_{tr}\langle\tau+1|k\rangle; \tau = 0,1,...,k-1 \quad (12)$$

VII. RESULT AND DISCUSS

A. *Unit Root Test.*

In the equation we are using 4 variables, namely: (1) variable G8's GDP is abbreviated by LGDP; (2) Indonesian export is abbreviated by LEXP; (3). Variable foreign exchange rates in this case US $ and Gold namely LDOL and LGOLD.The variables are performed in the equation : LEXP=LGDP+LDOL+LGOLD.

TABLE 2 :
UNIT ROOT TEST

VARIABLE	LEVEL		FIRST DIFFERENCE	
	ADF	PP	ADF	PP
LEXP	-3.46007	-3.46007	-3.63699**	-5.4050*
LGDP	-2.77129	-2.77129	-5.18035*	-33.840*
LDOL	-0.44346	-0.44346	-6.3047*	-6.3045*
LGOLD	-3.11307	-3.11307	-4.11733**	-5.4050*

*) Sign 1%
**) Sign 5%

Although all variables (LEXP, LGDP, LDOL and LGOLD) are not stationary at level, however the variables are stationary at 1st difference, whether by ADF test or PP test. Table 1 above is the result of ADF and PP test, where the tests are implemented intercept without time trend.

B. *Co-Integration Test*

TABEL 3
COINTEGRATION TEST

Trace		
Null Hypothesis	**Statistic**	**5%**
r = 0	61.7781*	56.8762
r =1	42.91525*	32.46618
r = 1	10.67466	18.57519
r = 1	9.388794	12.51798
Max Eigenvalue		
Null Hypothesis	**Statistic**	**5%**
r = 0	33.46618*	32.11832
r =1	28.57519*	25.82321
r = 1	9.388794	19.38704
r = 1	7.621201	12.51798

***) Denote rejection of the hypothesis at the 5%**

Using time lag equal 3 (Table 2) is final lag where no autocorrelation in the residuals, and it is chosen as the lag for co integration test. Table 3 report the results for the co-integration test. Both trace and eigenvalue tests indicate that at least one co-integrating equation at 5%.

The test suggests two major contention. Firstly, the selected variables move along together in the long run and short term deviations will be corrected toward equilibrium. Secondly, co-integration literally indicates causality in at least one direction. Thirdly, the co-integration test assume the linear restriction tests to examine whether the selected variables (macroeconomic perspective) belong to the co-integration area. Therefore, the Indonesian exports seem have a long run co-movement with the advanced developed countries GDP (8 countries), US dollar rate, and the price gold rate.

C. VECM.

TABLE 4
COINTEGRATION EQ.

Cointegration Equation :				
LEXP(-1)	**LGDP(-1)**	**LGOLD(-1)**	**LDOL(-1)**	**C**
1.000	-0.08327	-0.00972	0.04689	-4.1026
	-0.12140	-0.12667	-0.01395	
	0.68588	0.07677	-3.36098	

TABEL 5
OLS

OLS :				
VARIABLE	**LGDP**	**LGOLD**	**LDOL**	**C**
Coeff	0.00827	0.11149	-0.17226	3.99902
Std Error	0.00217	0.02317	0.01173	0.11298
t stat	3.80671	4.81290	14.68557	35.39649

TABEL 6
ERROR CORRECTON

Error Correction :				
CointEq1	**D(LEXP)**	**D(LGDP)**	**D(LGOLD)**	**D(LDOL)**
	0.09012	-0.32805	-1.88020	0.09207
	-0.07027	-10.76420	-1.36698	-0.82178
	[1.2825]	[-0.03058]	[-1.3754]	[0.1121]

Table 4 shows VECM long run co-integration vector based on-johansen and juselius framework. In general it has long run equation / relation, as follow :

$$Lexp = 4.102568 + 0.083266\ Lgdp + 0.009724\ Lgold - 0.0468857\ Ldol \quad (13)$$

$$Lexp = 3.999016 + 0.008267\ Lgdp + 0.111489\ Lgold - 0.0172261\ Ldol \quad (OLS) \quad (14)$$

The equation shows positively association between Indonesian Export and G8's GDP countries , and the exchange rate of Gold (Price of Gold). Besides that, export negatively associated with exchange rate of dollar. In the presence of co-integration in long run a 1 % increase in G8's GDP and the price of gold will enhance Indonesian export approximately 0.08 % and 0.009%.

Whereas, an increase 1% of exchange rate of US $ will affect decreasing of Indonesian export about 0.04%.All variables are significant at 5%. In addition, table 6 shows the OLS estimates of the variables. The results illustrate almost similar estimates, and it is significant at 5% for all variables. Moreover, table 6 shows speed of adjustment toward the long run relation. Export will adjust if the absence of any disequilibrium is approximately 9%.

D. Granger Causality.

Although co-integration implicitly infers causality it does not show the direction of causation. The granger causality test in vector error correction form allows the examination of the dynamic causality interaction among the intended variables. The short run causality is based on the F statistics of lagged first differenced terms while the long run term error correction term is based t – test. Significant error correction term. In table 7 reinforce the presence of co-integration in long run and variables adjust toward lung run equilibrium.

The granger causality among the variables are illustrated as above in table 7.

TABEL 7
GRANGER CAUSALITY

Null Hypothesis:	**Criteria**		**Conclusion**
LGDP does not Granger Cause LEXP	Prob. F stat > 10%	Reject Ho	LGDP influence LEXP
LEXP does not Granger Cause LGDP	Prob. F stat > 10%	Reject Ho	LEXP influence LGDP
LGOLD does not Granger Cause LEXP	Prob. F stat < 10%	Accept Ho	LGOLD does not influence LEXP
LEXP does not Granger Cause LGOLD	Prob. F stat > 10%	Reject Ho	LEXP Influence LGOLD
LDOL does not Granger Cause LEXP	Prob. F stat > 10%	Reject Ho	LDOL Influence LEXP
LEXP does not Granger Cause LDOL	Prob. F stat < 10%	Accept Ho	LEXP does not Influence LDOL
LGOLD does not Granger Cause LGDP	Prob. F stat > 10%	Reject Ho	LGOLD Influence LGDP

LGDP does not Granger Cause LGOLD	Prob. F stat > 10%	Reject Ho	LGDP influence LGOLD
LDOL does not Granger Cause LGDP	Prob. F stat > 10%	Reject Ho	LDOL Influence LGDP
LGDP does not Granger Cause LDOL	Prob. F stat > 10%	Reject Ho	LGDP Influence LDOL
LDOL does not Granger Cause LGOLD	Prob. F stat > 10%	Reject Ho	LDOL Influence LGOLD
LGOLD does not Granger Cause LDOL	Prob. F stat < 10%	Accept Ho	LGOLD does not influence LDOL

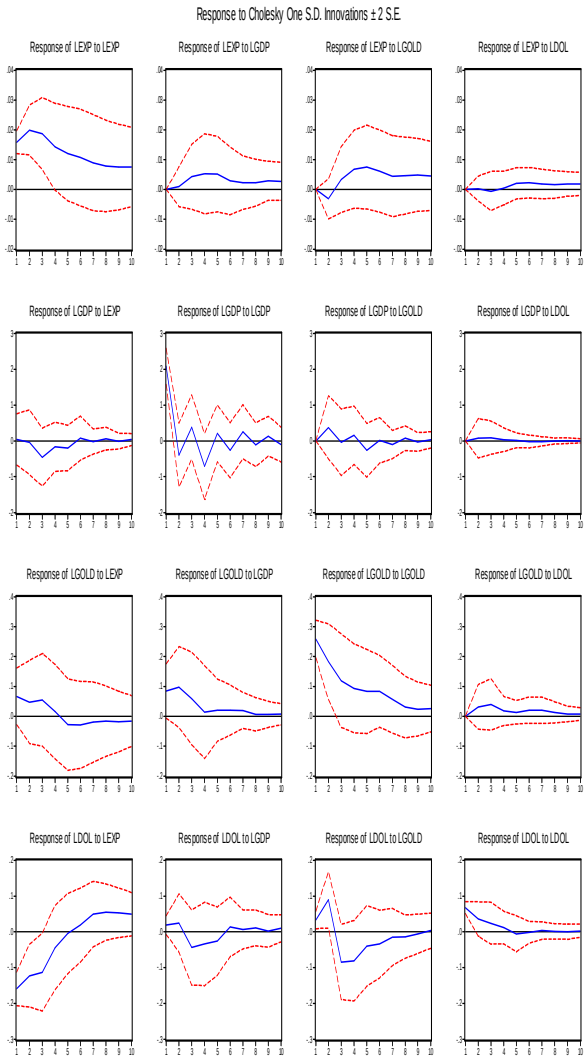
E. Impulse Response And Variance Decomposition.

From the Impulse Response pictures, it can be said how is the response a variable due to shock other variable. Almost the graph show there are positively relationship among variables even though in the beginning of period, however the relationship is not significant.

The shock, moreover, if we want to know how strong or weak a response, it should look in variance of decomposition. For example, response export due to shock in gold have a small number (1.387) in second period, and it is moving for 4.05 in 10^{th} periods. The complete result can be shown in table 8.

TABEL 8
VARIANCE DECOMPOSITION

Variance Decomposition of LEXP:					
Period	**S.E.**	**LEXP**	**LGDP**	**LGOLD**	**LDOL**
1.000	0.015	100.000	0.000	0.000	0.000
2.000	0.028	95.590	0.259	1.387	2.764
3.000	0.039	89.313	0.482	1.840	8.364
4.000	0.046	87.342	0.371	2.545	9.742
5.000	0.053	87.814	0.523	2.239	9.423
6.000	0.059	88.391	0.422	2.240	8.948
7.000	0.064	88.079	0.370	2.672	8.879
8.000	0.067	87.656	0.393	3.228	8.723
9.000	0.069	87.544	0.449	3.635	8.372
10.000	0.071	87.426	0.517	4.050	8.006



Pig 1 : Impulse Response VAR

IX. CONCLUSION.

US $ exchange rate variable shows a negatively relationship in the long term with Indonesian export, and it also affects the export volume decrease in the short run. On the other hand, Gold exchange rate and G-8's GDP have positive and significant impact in the long run, whereas in the short run, changing of the variables adjust about 6% by export variable. Finally, by using OLS also found a positively relationship between the volume of exports with gold exchange rates, and it is significant relationship in the short term.

In addition to discussing the factors that affect the exports in the aggregate, it is suggested that US$ give bad effect to Indonesian export, because the more fluctuating occur, the more risk Indonesian export it will be. On the contrary, there is an opportunity for using Gold base currency as a better alternative. In fact, it gives positively and significantly relationship with Indonesian export volume.

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