CO-MOVEMENT 4 PERIOD ASEAN CURRENCY 1997-2005 A THEORY APPLICATION NAMELY *OPTIMAL CURRENCY AREA* USING *VECTOR ERROR CORRECTION* MODEL

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A b s t r a c t

Starting from the Optimum Currency Area (OCA), this paper utilize the Vector Error Correction Model (VECM) to identify the dynamic short term and the long term co-movement between the ASEAN 4 currencies, including their existing fundamental mechanism. There are at least 3 important findings, (i) the co-movement between the ASEAN 4 currencies is not proved empirically, (ii) the theory of OCA does not robust in explaining the co-movement pattern in ASEAN, and (iii) the existance of OCA is a global phenomena, indicated from the significance of Yen currency on the ASEAN 4. These findings led to a conclusion of this paper that the ongoing economic integration as well as the financial one in ASEAN are not enough to form a unified monetary arrangement nor a common currency in this region.

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I. INTRODUCTION

This research investigates the fundamental factor/mechanism working behind the *co-movement* (if exist) on a currency pair. It is exactly expected that by using currency fixed by market, the existing fundamental mechanism can be clearly seen. It is caused by the minimum distortion i.e. in a form of central/government bank interference.

The implication of existing *co-movement* can be economical and political. From the economic side, if a group of countries apparently have currencies that tightly correlating, those countries can implicitly unify their currencies. In other words those countries can release their monetary power and give it to a super-national board (in a unified economic arrangement).

One of the most successful union is the existing *European Monetary Union,* (EMU) and single currency with *European Central Bank* (ECB) as their central bank. However the process of unifying monetary has been occurring for decades. *Treaty Of Rome* (1957) can be said as the starting point that put the base/phase that must be sailed through in order to establish a European economic community. One of important studies doing research to the readiness of OCA prerequisites in ASEAN and European Union versus comparison done by Bayoumi and Mauro (1999). They explain that ASEAN countries have achieved the same level with European Union before Maastricth tractate 1991 in some aspects as follow:

1. Intra regional trade (measured by internal trade share on GDP).
2. Trade composition based on product type. By economic transition occurs, all countries (excluding Singapore) have a tendency as manufacturing countries.
3. Economic shock pattern. Even though the shock impact is bigger in ASEAN, the recovery process is faster in this area. Thus, we can say that net income form the economic shock tends to be neutral.

Nevertheless, they found some factors considered decrease the ASEAN unified currency affinity. Those factors are:

1. Culture diversification and political system in ASEAN tend to be higher than European Union
2. Significant trade diversification. Even though US, Japan, and European Zone are the primary trade partner, each proportion is heterogenic. It implies that each ASEAN country has a specific shock on a certain level.
3. *OCA index* (Eichengreen dan Bayoumi, 1996) shows the ASEAN countries readiness is lower than European countries on pre-Maastritch tractate. It shows the divergence is a correlation direction ASEAN currency towards one of the main currency in the world. Singapore, Malaysia, dan Philipine are suitable with USD block, menawhile Indonesia and Thailand are suitable with JPY block.

This result confirmed the Frankel and Wei empirical finding (1994), Kim and Ryou (2001), and Alesina et al (2002) that problem faced in unifying ASEAN currencies is there is no single *anchor* currency for those ASEAN currencies.

From institution side, official activities regarding to existing OCA can be said as rare. Some of regional cooperation board has existed in this region i.e. ASEAN, AFTA, and SEACEN, ASEAN was established in 1967. However discourse in term of tighter regional agreement through monetary agreement (and unified currency) has just been appeared after ASEAN monetary crisis in 1997. Before this era, a monetary agreement seemed to be stuck because of the heterogenic exchange rate regime in ASIA (Wilson, 2002).

In 1997, Japan offered an idea to establish Asian Monetary Fund (AMF). It is the form of an awareness regarding to the need of *emergency* fund that can be directly used anytime (if it is needed). It can be a kind of disappointment to IMF's slow respond in overcoming crisis in ASIA. The idea got hard complaint from IMF (with US as the prime stakeholder) and it is finally failed to establish. To replace it, in an ASEAN+3 frame an agreement in term of providing *emergency* fund was implemented in a form of *swap* agreement. This initiative is well-known as *Chiang Mai Initiatives.* Though this forum, it seemed to be a development to an ASIAN obligation instrument.

From the unified currency effort side, countries in this area seem to be more "stiff". Even under Hanoi Plan Action on December 1998, ASEAN leaders agreed to begin a feasibility study on unified currency adoption. However in 2001, a formal project for this research began (Wilson, 2002). The project is known as *Kobe Research Project.*

Even in a decision maker level the unified monetary agreement moved slowly, pre-condition for ASIAN countries has actually existed. Eichengreen and Bayoumi (1996) in one of their study explained that Eastern Asian region has fulfilled OCA standard prerequisite and already had the same readiness with European zone. Bayoumi and Mauro (1999) has prposed the same thing by requiring a political commitment to ensure that the project will be succesful. Other proposal that can be seen are Wilson (2002), Mundel (2003), and Branson and Healy (2005).

Theoritical requirements and condition in which the unified currency is beneficial is a subject of *Optimum Currency Area* (OCA) theory. Modern OCA theory is comprehensively explained by Robert Mundell (1961) in his paper seminar with the tittle "*A Theory Of Optimum Currency Areas*". The thory briefly examines a group of county can get a bigger benefit by releasing their own currency utility and (together) adopt other currency or determine a fixed exchange regim (especially among OCA's member currency).

A bigger benefit can occur because of several things i.e. significant internal trade transaction among OCA's members, high production factor mobility, business cycle correlation, etc. In this condition, advantage that can be achieved by using their own currency (seignorage and independency of monetary policy) is lower compared by advantage achieved by unifying currencies (low transaction cost, stability and credibility of policy).

By assuming all those conditions are fulfilled, this research is conducted to identify existing OCA in ASIA especially among countries such as Indonesia, Singapore, Philippine, and Thailand (ASEAN4). Specifically, the problems of this research are done by answering three questions, *first,* Is there any *co-movement* that is statically useful or meaningful for ASIAN countries currencies? *second,* Are some criteria that are referred to OCA theory such as inflation diversity, national income, interest rate, and the number of circulating money among countries can be used as a clarifying factors from the *co-movement* of those ASIAN countries' currencies?; *third,* Is the ASIAN countries' currencies *co-movement* most likely a phenomenon of global currency exchange rate (JPY)?

The second part of this paper will discuss about theory point of view, theoretical model, and some of prime literature studies in terms of OCA establishment. The third part will discuss about methodology especially empirical model used to answer the three proposed research question. The forth part will discuss about result and analysis, and summary and suggestion of policy will be the closure.

II. THEORY

Classical thought regarding to unified economy (in a form of unified currency) can be tracked at least since John Stuart Mill (1848, page 176), in which he wrote

> *"…..so much barbarism, however still remains in the transactions of most civilized nations that almost all independent countries choose to assert their nationality by having, to their own convenience and that of their neighbors, a peculiar currency of their own."*

Mill's paradigm (as well as other classical economists) was based on a world in which all its economic aspects are flexible. Thus an economic shock can actually be overcome through real variable adjustment (i.e. production factor movement) without involving a nominal variable (i.e. exchange rate). For instance, if demand from country A drastically decrease (because of the shifting of world consumption pattern), then the production factor of the country can be used to other production (either domestic or in other countries) and by that, there will be a new

equilibrium. The adjustment was assumed occur shortly (because of no obstacles) so the substantial nominal variable deviation would no longer stand.

The more modern and comprehensive thought regarding to OCA theory was explained by Robert Mundel *paper seminar* with the tittle *A Theory Of Optimum Currency Areas* in 1961. OCA theory kept developing from here, in which by following structure from Mongeli (2002), it can be divided into some phases as follow[2]:

1. First phase (1960s until the beginning of 1970s). This phase is categorized by world situation that generally adhere a fixed exchange rate *(Bretton Wood)* and devisa supervision. Ideas come up to ask the benefit and the cost between fixed exchange rate and flexible exchange rate regime and the possibility of economic integration (especially Europe). Form this period, criteria came up and has to be fulfilled to optimize the economic integration benefit. Mundel (1961), Ingram (1962), McKinon (1963), Kenen (1969), Grubel (1970), Mintz (1970), Fleming (1971), and Corden (1972) are some of the beginning paper in term of OCA.

2. Reconsiliation phase (1970s). In this phase, OCA theory was develop by using cost benefir versus thought frame. (see Corden, 1972 and Mundell, 1973). If some areas (or som countries) are identified as OCA, then those areas can do unified currencies (unified monetary agreement). This fiscal implication can give a benefit but certainly has a cost. Warjiyo (2004) made a summary upon the benefit and the cost that can be seen in table IV.1.

Table IV.1 Benefit and Cost of Economic Integration	
B e n e f i t	C o s t
1. Micro efficiency increase due to extanding money utility 2. Macro stability recovery and development due to price stability and fund access that is bigger than financial integration 3. Positive externality from transaction cost and lower cadangan devisa and policy coordination that is more effective	1. Some wekanesses on micro level especially on the first level of integration 2. Limited choice of policy instrument to stabilize macroeconomy 3. Discipline problem: existing incentive for the member (countries) to do deviation from joint economic tractate.
Source : Warjiyo (2004)	

3. *Reasement* phase (1980s until 1990s). Based on "*One Market, One Money Report*" report (Emerson et al, 1992), it was found that some aspects from OCA theory (the old one) needs to be adjusted. Those aspects include:

   a. Uneffective monetary policy on long term output (*short run Phillips Curve phenomenon*). It reduced the cost from the lost independent monetary. (Impact of economic integration).

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2 See Horvarth (2003) and Hawkins and Mason (2003) to an OCA theory survey in a different points of view.

b. The need of high credinility to help reduce inflation control cost in OCA member states

c. Exchange rate adjustment is not effective in influencing real sector. It was caused by the existing transmission process through *capital account.*

d. The single currency impacy is getting smaller on labor market that caused by contract negotiation desentralization on corporate level.

4. Empirical phase (1990s). The effort to operate OCA increase by the existing European Union project (with their single currency: Euro). It can be said that European Union is a very important *"landmark"* for OCA theory development. In this phase, OCA theory developed through an empirical test towards thoritical model and characteristics (i.e Frankel and Rose (1996), Alesina et al (2002), and Baele (2004)).

In accordance with OCA theory development, OCA definition developed too. The latest and the most comprehensive definition given by Mongeli (2002) in which OCA is defined as

> *"Optimal geographic domain of a single currency, or of several currencies, whose exchange rates are irrevocably pegged and might be unified. The single currency, or the pegged currencies can only fluctuate in unison against the rest of the world"*

It can be seen here that OCA has two key words which are (i) *OCA domain* defined as sovereign country that decides to adopt single currency or prevailing permanently fixed exchange rate (among OCA member country), (ii) *Optimality*, defined as character in which the benefit of macroeconomic adjustment (internal and external) from the respective exchange rate (by OCA *domain*) will decrease compared by the use of unified currency or bilateral exchange rate that is fixed and permanent. In other words, a group of countries will establish OCA if benefit given by OCA's membership is bigger than the lost caused by monetary policy control lost.

In order to optimize the unified currency, it needs to fulfill some certain characteristics. These characteristics shows the required condition so the OCA's benefit earned by its member can be optimized. Table IV.2 explains the OCA's characteristics (Mongeli, 2002).

On the latest decade, there is a development of contemporary thought in OCA theory. Unlike the previous thought pattern in which joint monetary area can be optimal the member states fulfill the requirements of OCA characteristics, Frankel and Rose (1998), precisely stated instead: OCA characteristics are endogenous. In other words, a group of countries could not fulfill one or more OCA characteristics *ex ante* but unifying monetary will be optimal *ex post*. Research that they did in 20 industrial countries gave an empirical support. Moreover, Corsetti and Pesenti (2002) gave a formal model about this aspect that had came up from the general equilibrium theory, and is called as OCA *self validating* model.

No.	Karakteristik OCA	Persyaratan Untuk OCA
— Table IV.2 / *Optimum Currency Area* Requirements		

No.	Karakteristik OCA	Persyaratan Untuk OCA
1.	Price and Wage Flexibility	Price and wage flexibility in and among OCA countries minimize exchange rate adjustment if shock occurs
2.	Production factor mobility	Production factor mobility, including labor, among OCA countries minimize the production factor price adjustment and exchange rate on the shock
3.	Financial market integration	Financial integration in a form of capital mobility (FDI, portfolio investment, investment) among OCA countries enables shock adjustment through capital flow.
4.	Economic openness level	Economic openness among OCA countries that is high will maximize international price transmission to domestic price.
5.	Production and consumption diversification	Various labor, economic sector, and production among OCA countries minimize Term of Trade adjustment
6.	Inflation rate equality	Inflation equality (in a low and stable meaning) among OCA countries push the term of trade stability and balance the current account.
7.	Fiscal integration	Fiscal transfer system amomg OCA countries enables fund distribution to a country that needs it.
8.	Political integration	Political wiliingness strengthens the joint commitment obedience, cooperation in any economic policy, and organizational relations among OCA countries

Source : Mongeli (2002)

II.1. Theoretical Model

The theoretical frame of this study was established (*flexible price monetary approach*, FLMA)[3] . FLMA began from criticism on exchange rate determination using *flow* approach of balance payment. Mussa (1979) stated that exchange rate determination should have been approached by using asset price approach (because exchange rate is relative price of domestic currency towards other currencies).

If the exchange rate is considered as an asset, the there will be implications as follow:

1. Expectation factor will important in determining exchange rate. It occurs because money *durability* is high. Thus expectation change in the future will influence the current exchange rate.

2. Due to asset is a stock concept, then equilibrium is defined as a situation in which currency demand stock will be equal with the money supply stock. Thus balance of payment *flow* can not be used in determining exchange rate because it is just a situation of disequilibrium that is temporal. It is the central spot from the thought of monetary approach towards exchange rate proponent.

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3 Frenkel (1976), Mussa (1976) and Bilson (1978) papers can be considered as FLMA model pioneer.

3. Real factor can influence exchange rate, but just through money demand factor.
4. *Empirical regularities* which is: (1) *spot rate and forward rate* have a tight corelation, (2) exchange rate with *random walk* attitude (from market efficiency hypothesis, see Fama (1970), (3) *forward rate* can be used as an exchange expectation and (4) relevant new information will change the current exchange rate.

Before examining more about model in detail, it is firstly assumed several things (MacDonald, 1988 and Gartner, 1993):

1. World economy is devided into two, domestic and world with the relevant macroecomic variables.
2. *Small economy* which means domestic economic variable vaule has no impact on world economy
3. Domestic and world economy are always in *full employment* condition.
4. Good and service market always achieve the equilibrium condition (if there is a shock)
5. Domestic and foreigh financial market have the same characteristics.
6. Fulfillment of *uncovered interest rate parity.*
7. Price flexibility and purchasing power parity/PPP prevail.
8. *Constant Real Exchange Rate.*

Notation Convention for variable within the model:

y	: national income	r	: domestic interest rates
y*	: world income	r*	: world interest rates
s	: exchange rate (in x of the domestic currency loy currency world)	M	: domestic money supply
p*	: world price level	M*	: world money supply
p	: domestic price level	$\dot{s}$	: depreciation rate
g	: domestic goverment spending		

All the above notations (excluding interest rate) are in natural logarithm form (y=ln (Y); Y = national revenue in Rupiah)[4].

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4 This kind of modelling gives a comparative statistical interpretation benefit. In a natural logarith form, coefficient that is generated from the first derivation of a variable towards other variable is an elasticity. For example y = ax, then d/dx (y) = a d/dx (x) = 1/y y'= a x'/x so a = y'/y : x'/x which is an elasticity.

FLMA model can be simply explained in the following equations:

1. **Real sector equation (IS Curve):**

$$y = \delta(s + p^* - p) + \gamma y^* + \beta r + g \tag{IV.1}$$

Where δ>0 (Marshall-Lerner Condition is fulfilled), γ>0, β<0

2. **Monetary Sector:**

$$m - p = \phi y - \lambda r \tag{IV.2}$$

$$m^* - p^* = \phi y^* - \lambda r^* \tag{IV.3}$$

With assumption: ϕ>0, λ>0 (Cagan money demand)

3. **Asset Market *(Uncovered Interest Parity)*:**

To get an exchange rate that guarantee equilibrium on the above three markets, we can do some mathematical operations as follow:

$$r = r^* + E(\dot{s}) \tag{IV.4}$$

Rearrange equation IV.1 as

$$p - p^* = s + \frac{1}{\delta}(-y + \gamma y^* + \beta r + g) \tag{IV.5}$$

From equation IV.2 and IV.3 we can get

$$\begin{aligned} p - p^* &= m - \phi y + \lambda r - (m^* - \phi y^* + \lambda r^*) \\ &= (m - m^*) - \phi(y - y^*) + \lambda(r - r^*) \end{aligned} \tag{IV.6}$$

Rearrange equation IV.5 and substitute equaiton IV.6

$$s = (p - p^*) - \frac{1}{\delta}(-y + \gamma y^* + \beta r + g)$$

$$s = (m - m^*) - \phi(y - y^*) + \lambda(r - r^*) - \frac{1}{\delta}(-y + \gamma y^* + \beta r + g)$$

$$= (m - m^*) - \phi(y - y^*) + \lambda(r - r^*) + \frac{1}{\delta}y - \frac{\gamma}{\delta}y^* - \frac{\beta}{\delta}r - \frac{g}{\delta}$$

$$= (m - m^*) + \frac{1 - \phi\delta}{\delta}y + \frac{\phi\delta - \gamma}{\delta}y^* + \frac{\lambda\delta - \beta}{\delta}r - \lambda r^* - \frac{g}{\delta} \tag{IV.7}$$

By substituting equation IV.4 into equaiton IV.7 we can get

$$s = (m - m^*) + \frac{1 - \phi\delta}{\delta} y + \frac{\phi\delta - \gamma}{\delta} y^* + \frac{\lambda\delta - \beta}{\delta}(r^* + E(\dot{s})) - \lambda r^* - \frac{g}{\delta}$$

$$= (m - m^*) + \frac{1 - \phi\delta}{\delta} y + \frac{\phi\delta - \gamma}{\delta} y^* - \frac{\beta}{\delta} r^* + \frac{\lambda\delta - \beta}{\delta} E(\dot{s}) - \frac{g}{\delta} \qquad \text{(IV.8)}$$

With assumption *real exchange rate* is constant, then the equations can be re-written as

$$s = (m - m^*) + \frac{1 - \phi\delta}{\delta} y + \frac{\phi\delta - \gamma}{\delta} y^* - \frac{\beta}{\delta} r^* + \frac{\lambda\delta - \beta}{\delta}\left[E(\dot{p}) - E(\dot{p}^*)\right] - \frac{g}{\delta} \qquad \text{(IV.9)}$$

Finally, because economy is assumed in full employment condition, then inflation expectation will be same with the circulating money development expectation, or

$$s = (m - m^*) + \frac{1 - \phi\delta}{\delta} y + \frac{\phi\delta - \gamma}{\delta} y^* - \frac{\beta}{\delta} r^* + \frac{\lambda\delta - \beta}{\delta}\left[E(\dot{m}) - E(\dot{m}^*)\right] - \frac{g}{\delta} \qquad \text{(IV.10)}$$

Exchange rate attitude can be derived as follow:

$$\frac{\partial s}{\partial m} = 1 + \frac{\lambda\delta - \beta}{\delta}\frac{dE(\dot{m})}{dm} > 1 \ ^5 ; \quad \frac{\partial s}{\partial m^*} = -1 - \frac{\lambda\delta - \beta}{\delta}\frac{dE(\dot{m})}{dm^*} < 0 ; \quad \frac{\partial s}{\partial r^*} = -\frac{\beta}{\delta} > 0$$

$$\frac{\partial s}{\partial g} = -\frac{1}{\delta} < 0 \qquad \text{(IV.11)}$$

and

$$\frac{\partial s}{\partial y} \text{ and } \frac{\partial s}{\partial y^*} \text{ can take any values}$$

The above FLMA model has just discussed 4 from 8 OCA characteristics, which is Financial Market Integration, Economic Openness Level, Inflation Rate Equality, and Fiscal Integration. Thus this model is not completed yet. To discuss about exchange attitude towards COA that aren't included yet, the above model can be re-extending. It is done as follow:

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5 Exchange rate respond towards development change of circulating money number more than proportional (1:1). Is called *magnification effect* by Bilson

1. The use production function Y = F(X) which is a special class from CRTS production function (*Constant Return To Scale*), which is Cobb-Douglas[6] production function. In the log linear function form, it can be written as

$$y = \sum_{i=1}^{n} \alpha_i x_i \qquad \sum_{i=1}^{n} \alpha_i = 1 \; ;^{[7]}$$

(IV.12)

Where $x_i = \ln(X_i)$

2. By assuming that corporation is (1) *price taker* (in a perfect market) and (2) single goal: maximizing profit, then we can formulize producer problems mathematically as follow:

    Min **wx**

    x ≥ 0

    st f(x) ≥ **y**   (IV.13)

    where **w**: input price vektor (and **w >> 0**), **y** is output vektor desired. Solution of this problem is

$$\mathbf{w} \geq \ddot{\mathbf{e}}\nabla\mathbf{f}(x^o) \;\; \text{and} \;\; \mathbf{w} - \ddot{\mathbf{e}}\nabla\mathbf{f}(x^o) = \mathbf{0}$$

(IV.14)

Where **Δ f**(x) is *gradient vector.* $\dfrac{\partial f(x)}{\partial x}$

From this solution we can implicitly define x^o input price function (w) and output (y) or

x° = **x°(w,y)**   (IV.15)

3. By substituting IV,15 into IV.12 then we get

$$y = \sum_{i=1}^{n} \alpha_i x(w, y)_i ; \quad \sum_{i=1}^{n} \alpha_i = 1$$

(IV.16)

Atau dalam kondisi optimisasi adalah

$$y = \sum_{i=1}^{n} \alpha_i x(w)_i \; ; \quad \sum_{i=1}^{n} \alpha_i = 1$$

(IV.17)

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6 General form of Cobb-Douglas function is $Y = A\prod_{i=1}^{n} X_i^{\alpha_i}$, with assumption of CTRS: $\sum_{i=1}^{n} \alpha_i = 1$ so and thus the function can be re-written as; $Y = A\prod_{i=1}^{n} X_i^{\alpha_i}; \sum_{i=1}^{n} \alpha_i = 1$

7 Proof: $Y = A\prod_{i=1}^{n} X_i^{\alpha_i}$; ; with assumption A = 1 and by taking log value then the production function can be re-written as $\ln(Y) = \sum_{i=1}^{n} \alpha_i \ln(X_i)$ where $\sum_{i=1}^{n} \alpha_i = 1$. Consistent with convention, where the lower case is logarith from, then $y = \sum_{i=1}^{n} \alpha_i x_i$; $\sum_{i=1}^{n} \alpha_i = 1$ as desired.

4. Hasil yang terakhir ini dapat disubsitusikan kembali ke pers. IV.10 dan memberikan

$$
s = (m - m^*) + \frac{1 - \phi\delta}{\delta} \sum_{i=1}^{n} \alpha_i x_i(w) + \frac{\phi\delta - \gamma}{\delta} \sum_{i=1}^{n} \alpha^*_i x^*_i(w) - \frac{\beta}{\delta} r^*
$$
$$
+ \frac{\lambda\delta - \beta}{\delta} \left[E(\dot{m}) - E(\dot{m}^*) \right] - \frac{g}{\delta}
\tag{IV.18}
$$

Equation IV.18 completes the overall discussion about exchange rate attitude from OCA characteristics. As seen the existing component $\sum_{i=1}^{n} \alpha_i x(w)_i$ and $\sum_{i=1}^{n} \alpha^*_i x^*_i(w)$ shows price and wage flexibility, production factor mobility, and production and consumption diversification.

As the summary, model that has been derived above can be interpreted as follow:
1. Exchange rate is a negative function on the difference between domestic and foreign circulating money. With assumption rational expectation, magnitude from difference variable of the number of circulating money will be bigger than static expectation condition.
2. The shock on supply side (wage, business cycle, trade cooperation, etc) has an undetermined impact on exchange rate. It is a logic consequences which is agregat output parameter from model can not have a certain sign.
3. Foreign interest rate increase will negatively impact the domestic exchange rate.
4. The impact of fiscal expansion is positive for domestic exchange rate.

It needs to emphasize that this model assumes that the world consisting of two countries, the next generalization on many countries' condition needs a note. Theory frame as explained above is valid if ASEAN 4 has a same *anchor* currency (i.e. USD or JPY). In this condition, the one getting role as foreign party is US or Japan. A variant concerning double *anchor* (currency basket) can be also adapted along the currency basket is identical for all ASEAN4 countries.

With the term the above assumption is fulfilled, this model can explain the aggregate movement of ASEAN4 currency (if proven statistically significant). It can be explained as follow:
1. Notate s_j first as j's exchange rate (assumed as OCA member consisting n countries) towards a currency considered as *benchmark* (i.e. USD).
2. The existing OCA on the group of countries can characterized by fulfilling the following equation
 $$ s = w_1 s_1 = w_2 s_2 = \ldots = w_n s_n \tag{IV.19} $$
   where s is OCA's unified currency which is currencies function of OCA member (s_i ; i = 1,2,…,n) and w_i is currency weigh s_i within s.

3. If currencies of a group of country is OCA, then coefficient w_i should have the same mathematical sign (positive). *Magnitude* can be diferent depends on the economic significance.

4. Implication from FLMA is macroeconomic variable movement has to be consistent with the exchange rate, because

$$s = w_1 s_1 [(m_1 - m^*), (y_1 - y^*), \dots] = w_2 s_2 [(m_2 - m^*), (y_2 - y^*), \dots] = \dots$$
$$= w_n s_n [(m_n - m^*), (y_n - y^*), \dots] \tag{II.20}$$

In other words, policy or country's economy that is not consistent will make the country out from OCA[8].

Figure IV.1.
A *Currency Unit* constraction
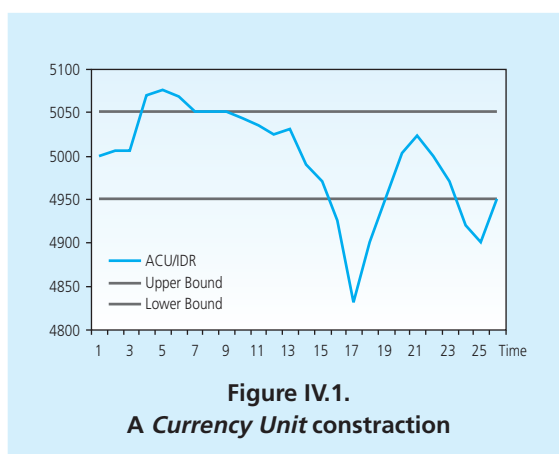
Graphically, the concept that has just been explained above can be concluded in Figure IV.1. As seen here, if Indonesia joined in the commitment of ASEAN4 unified currency (let say its currency is ASEAN *Currency Unit*; ACU), then IDR versus ACU movement should be in the range that has been agreed. If IDR moves out of the range continously, then the commitment (and ability) of IDR to keep being the ASEAN4 monetary agreement member will be questioned.

Moreover, as the consequences the OCA currency must move parallelly with *anchor* currency. The writer will explain it through an illustration. Let say Indonesia and Thailand are ACU member with convertion rate 1 ACU = IDR 1000 and 1 ACU = 10 THB. Both countries is known have the same *anchor* on USD with exchange rate 1 USD = IDR10.000 and 1 USD = 100

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8 As seen later, the writer put the inflation variable and interest rate separately into model. It potentially evokes a multicolinearity problem. Nevertheless, as seen on the formal model expalined here, inflation needs to be put to be a proxy from the inflation expectation. If the expectation is perfect then it can be expected a multicolinearity that occurs is light (ignoreable)

THB. Now, the internal (towards ACU) and external (towards USD) exchange rate are consistent. But if the change of external exchange rate occurs, especially IDR, i.e. 1 USD = IDR 5000 and other are fixed, then there will be an *arbitrage* chance. Externally, exchange rate of 1 THB = IDR 50, meanwhie through ACU 1 THB = IDR 100. Benefit without risk can be gained by buying THB by IDR (through USD) and (concurrently) sell it through ACU.

II.2. Some of Previous Empirical Study

One of the OCA empirical study that is very influencial is from Frenkel and Wei (1993). They try to see the existing trade block and currency block based on gravitation theory. This theory gave a ready hypothesis test: trade intensity and co movement of currency is (1) linear with economic size and (2) reverse to distance. The taken sample inculdes 63 countries all around the world (Europe, Western Hemisphere, and Asia zone) with any observation period that are not identical. By using estimation technique on the *first difference* they found that currency of a country commonly has a tight relation with the prime world currency (USD, Yen, and Deustchmark). For Europe zone, Deustchmark is dominant and for western hemisphere and ASIA is USD.

A study that specially focus on the ASIAN currencies (IDR, THB, PHP, SGD, KRW, MYR) towards the two world currencies which are USD and JPY is done by Takagi (1996). He used a descriptive approach through episodes observation in which JPY fluctuatively moved along 1980-1995. Here he thought that JPY's role may be more significant than econometric estimation (especially the study result of Frenkel and Wei (1993)) but not simetric. When JPY experienced a depreciation depression, ASIAN currencies tends to follow it. In other words, there were an increase in JPY weigh in determining the exchange rate of ASIAN currency, when JPY experienced depreciation. Takagi (1996) stated that it happened in order to keep the competititve export. Instead, if JPY tends to be stable, the weigh will be much more on USD. The last is assumed to stabilize the domestic inflation stability.

Other methods in calculating relation among currencies was done by Kim and Ryou (2001). They tried to estimate the world prime currencies weigh (USD, JPY, and Deustchmark) in determining the exchange rate of some ASIAN countries (Korea, Singapore, Malaysia, Indonesia, Thailand, Philipine, Hong Kong, and Taiwan). The weigh was calculated by doing OLS regression between i towards USD, JPY, and Deustchmark in the denominator (*Special Drawing Right*/SDR). They found that ASIA can not be chategorized as a single currency block (i.e. USD or JPY). Moreover they assumed that the *setting* of the countries' exchange rate determination is toward the currency basket.

The above studies generally do a separated research between exchange rate *co-movement* and macroeconomic variable co-movement or just observe one aspect only. It is a weakness. Interaction between exchange rate and macroeconomic variable can be in two ways, all of them are endogenous variable. Thus a research on exchange rate co-movement only without involving macroeconomic variable will end on misspecification problem.

Other weaknesses of the previous research is in the methodology aspect. All empirical research given above was estimated by using OLS (or its variant). OLS technique use has some weaknesses as follow:

1. Spurious regression. A research is generally done by using *time series* data. Special characteristics from this data is the existing autocorrelation phenomenon (current variable value can be explained by the varibles value in the past. Thus LS estimation between two variables with its data that has the characteristics would make spurious regression problem. (Gujarati, 2003).

2. *Endogeneity.* LS technique assumed the existing clear relation direction. So when Y is regressed towards X, then in the model, it is assumed at once that X is clarifying variables and Y is clarified variables. Many relations among economic variables that are simultanous, so according to Sims (1980), those variables should have been treated on the *equal footing*

3. *Ad hoc process.* Macroeconomic variables is usually *nonstationary / integrated* on orde 1 or 2 (Nelson and Plosser, 1982). Whereas LS will be valid only if variable used is *stationary.* To overcome this problem, the previous research is done by using *first differenced.* Sims (1980) argued this technique because he assumed that it can waste any valueable information on the data.

4. *Short term vs long term.* By using LS technique, relation obtained isn't certainly long term, it might be even prevailing in sample period. Thus, it needs a technique that can show the existing equilibrium and linear realtions among variables that are *nonstationary* but has a *stationary error* that is called *cointegration*. (Enders, 1995)

In this paper, the writer tries to do some recoveries based on the above mentioned weaknesses. The recovery includes:

1. Modelling that involves exchange rate *co-movement* (versus two *currency anchors* which are USD and JPY) and other macroeconomic variables *co-movement* (which are price rate, interest rate, national output, and circulating money). Nevertheless the writer limits relation form as the exchange rate is dependent variable and macroeconomic variable as an independent variable (exogenic). Thus model used is for (1) identification of the exisitng exchange rate *co-movement* and (2) the use macroeconomic variable as a controlling variable (that is why OCA theory is valid as a clarifying)

2. Estimation techniqur recovery, by reason as mentioned above, this paper doesn't use OLS. To replace it, it uses an econometric technique that is called as *vector error correction model/ VECM* (Johansen, 1988)[9].

III. METHODOLOGY

The research hypothesis is tested by estimating relation model among variables in *vector error correction model* (VECM) as given by equation IV.21.

$$\Delta \mathbf{Y_t} = \sum_{i=1}^{k-1} \Gamma_i \Delta \mathbf{Y_{t-i}} + \Pi \mathbf{Y_{t-k}} + \Phi \mathbf{X_t} + \mu + \varepsilon_t \qquad (IV.21)$$

To estimate this model, the writer uses The Johansen method (1988). The empirical model should be able to show that OCA characteristics variable (X_t) is very influential on ASEAN4 exchange rate *co-movement*. It is done by taking out some of OCA characteristics as a controlling variable that is assumed exogenous towards the exchange rate. Because OCA is defined as an area in which the use of unified currency would give an optimal result, then the impact of a shock or a policy on a currency is equal to other currencies.

For instance, if Thailand Monetary Authority decided to increase the number of circulating money (monetary expansion), it would not just weaken THB towards USD (based on FLMA), but all ASEAN4 countries' currency. It is the most ideal OCA's form (let say a *strong form OCA*). In a weak form, OCA is estimated exist, only with the existing co-integration. It is caused the limited OCA characteristics variable involved as controlling / exogenous variable.

The characteristics will be automatically answered if the equilibrium that is gained has the same direction, i.e. IDR = _ SGD; where _>0. The most tight OCA's form requires _ = 1. Thus here, the writer considers that OCA has been identified along _>0 and statistically significant. Hereafter the writer was also interested to know the possibility of the existing other *anchor* currencies, in which in this paper JPY is choosen. To avoid representation complexity, JPY variable (towards USD) is used as exogenous variable. Certainly, if this variable has positive and significant coefficient, then ASEAN4 currency has *anchor* on JPY too.

The variables used can be explained as follow[10]:

1. IDR, SGD, PHP, and THB: exchange rate with convention 1 USD is equal to X domestic currency.

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9 VECM is a class from *Vector Auto Regressive Model* that is introduced by Sims (1980). This method is a development from simultanous equation used atheoritically.

10 Variabel yang digunakan adalah dalam bentuk log. Notasi X didepan setiap variabel merujuk pada Indonesia (ID), Singapura(SG), Philipina(PH) dan Thailand(TH) sedangkan t adalah periode.

2. XUS_INF_t: difference between ASEAN4 versus US
3. XUS_IRT_t: difference of interest rate change between ASEAN4 versus US
4. XUS_GRW_t: difference of real GDP growth between ASEAN4 versus US
5. XUS_MIC_t: difference of growth between M1 ASEAN4 versus US
6. JPY_FX: first difference from log JPY ($JPY_t - JPY_{t-1}$).

Number of variables used in this study is 21 variables. Data that has a monthly frequency with observation period includes 1997:09 to 2005:09 (97 observation).

OCA testing is done in 2 steps. The first step is bivariate OCA testing that just involved two ASEAN4 currencies. Overall, there are 6 bivariate OCA combination as follow:

1. OCA1: endógenous variable: IDR, SGD dan exógenous variable: IDUS_INF, IDUS_IRT, IDUS_GRW, IDUS_M1C, SGUS_INF, SGUS_IRT, SGUS_GRW, SGUS_M1C dan JPY_FX.
2. OCA2: endógenous variable: IDR, PHP dan exógenous variable: IDUS_INF, IDUS_IRT, IDUS_GRW, IDUS_M1C, PHUS_INF, PHUS_IRT, PHUS_GRW, PHUS_M1C dan JPY_FX.
3. OCA3: endógenous variable: IDR, THB dan exógenous variable: IDUS_INF, IDUS_IRT, IDUS_GRW, IDUS_M1C, THUS_INF, THUS_IRT, THUS_GRW, THUS_M1C dan JPY_FX.
4. OCA4: variabel endogen: SGD, PHP dan variabel eksogen: SGUS_INF, SGUS_IRT, SGUS_GRW, SGUS_M1C, PHUS_INF, PHUS_IRT, PHUS_GRW, PHUS_M1C dan JPY_FX.
5. OCA5: variabel endogen: SGD, THB dan variabel eksogen: SGUS_INF, SGUS_IRT, SGUS_GRW, SGUS_M1C, THUS_INF, THUS_IRT, THUS_GRW, THUS_M1C dan JPY_FX.
6. OCA6: variabel endogen: PHP, THB dan variabel eksogen: PHUS_INF, PHUS_IRT, PHUS_GRW, PHUS_M1C, THUS_INF, THUS_IRT, THUS_GRW, THUS_M1C dan JPY_FX.

The second step is done by modelling all the above 21 variables: 4 currencies, 16 OCA exogenous, and JPY_FX (let say as Complete OCA Model).

It is done to obtain more comprhensive description about the exisitng OCA in ASEAN4. If there is a consistency on OCA either in bivariate or complete model, it gives stronger description on how OCA was established.

1. The form of relation is short-term, if the co-integration variable / *error correction term* is not significant.
2. The form of relation is long-term, if the co-integration variable / *error corrrection model* is negative and significant[11].

To make a VECM estimation, the writer follows the steps as suggested by Enders (1995) and A.V. Hardiyanto (2004):

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11 If *Error Correction Ter mis* significant and positive, the existing relation is explosive and it means that the system is not convergent

1. The test of integration degree. It is to ensure that variables in analisys doesn't have any different integration orde.
2. Choose the *Auto Regressive* Vector based on *lag length criteria.*
3. Conduct a *Cointegration Test*
4. Estimation and Investigation of the process result of *Vector Error Correction* in term of the realtion of *normality* criteria and *classical test.*
5. Conduct a restriction and a test that parameter that is found has matched with hypothesis.

Research hypothesis is tested by observing whether the characteristics are fulfilled on VECM below:

1. The exisitng joint movement among ASEAN4 currencies. It shown by *Impact Matrix* (Π), where the adjusting coefficient a_i is negative and significant. It means there is a long term equilibrium relation and a mechanism in which a deviation of equilibrium relation will be balance.
2. OCA theory can explain *co-movement*: OCA characteristics which are inflation difference, national revenue, interest rate, and the number of circulating money among countries can be used as a clarifying factor from the ASIAN correncies *co-movement.* It occurs if:
   a. All coefficient of ASEAN4 price rate difference with US are positive and significant.
   b. All coefficient of ASEAN4 interest rate difference with US are positive and significant.
   c. All coefficient of ASEAN4 real GDP difference with US can be either positive or negative but the important one is direction consistency and is significant[12]
   d. Coefficient difference of ASEAN4 circulating money with US is positive and significant.
3. Global influence: ASEAN4 currencies has anchor currency that is identical (USD, JPY, or USD and JPY). It shown by coeficient matrix of short term relation (Γ_i) and cointegration relation vector (β) that have the same coefficient symbol (positive) and is significant. The alternative: if the coefficient is not significant but the JPY coefficient is significant (by taking any symbols) then *anchor* for currencies in this area is JPY. The rejection to both of the conditions can be interpreted by OCA absence defined towards USD and/or JPY *anchor*. Int he other hand if those both *anchors* are significant then ASEAN4 currencies is considered have a kind of yoke on a currency basket where either USD or JPY place the dominant portion.
4. If the intended coefficient on point 1, 2, or 3 are not different from zero or it obtains a divergent result, then it concludes that the requirements of OCA from this study are not fulfilled.

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12 Based on the coefficient 10 equation from GDP differencen (ASEAN4 versus US) is $\dfrac{1-\phi\delta}{\delta}y + \dfrac{\phi\delta-\gamma}{\delta}y*$, the parameter value can not be determined early because the value of δ, Y and ϕ is unknown. It emphasizes on consistency, exchange rate respond. If in IDR, GDP increase is depreciative then on GDP, THB, and PHP should be depreciative too

In term of hypothesis verification, it explains that:

1. Bivariat model and complete model is a hypothesis verification phasing thus bivariate model will be a support for complete model. In other words, coefficient algebraic symbol and significance obtained should be same.

2. If differences between the two models, then it is seen model with the higher statistical significance size wholly or partially.

3. The next summary is done statistically. If the partial model has a better statistical size, then it can be concluded that OCA empirical support is low in ASEAN4 level. In this case, OCA is defined better bilaterally.

4. Inexpediency on hypothesis is considered as a gradation on OCA requirements. *Maintained hypothesis* is the existing OCA in ASEAN4. This hypothesis got the strongest support if all coefficient have the appropriate algebraic symbol and is statistically significant. The more algebraic symbols or coefficient that are not significant, the bigger deviation gradation on the existing OCA.

IV. RESULT AND ANALYSIS

Result and analysis part will explain the estimation result and analysis on the empirical finding. The first sub section will explain the pretest result and model validation consisting of stationarity and cointegration variable testing that ae used (including lag optimal selection). In the Pre Test and Model Validation part, there is a stability and classical assumption disobedience. In the second sub section, it will discuss about the co movement phenomenon and the variable that infulences it. At the end of this discussion, we have some opinions in term of the exisiting OCA and evaluation (assestment) on the empirical requirements fulfillment that has been obtained.

IV.1. Pre Test and Model Validation

Table IV.3 shows that (excluding IDR) Exchange rate variable is integration degree 1 (I(1)). Here we thought IDR got problems namely *near stationary*. As explained by Harris (1995), one of the problem in unit *root testing*, is the low *power* and *size* form the technique testing. Thus, it seems better to consider that IDR data characteristics is *non stationary*.

Testing on the stationarity characteristics from exogenous variable shows that these variables are I(1). First differencing is enough to change the characteristics of data to be stationary (see table IV.4).

Table IV.3
Integration Degree Testing on Exchange Rate Variable

No.	Variable	ADF				Phillips-Perron				Conclusion
		Model	Lag	t stat	p value	Model	Bandwidth	t stat	p value	
1	IDR (Lv)	Constant	5	-3.76	0.005	Trend	8	-5.04	0.000	I(0)
	IDR (1d)	None	4	-4.42	0.001	Constant	12	-7.52	0.000	
2	SGD (Lv)	Constant	4	-1.19	0.677	Constant	5	-3.60	0.008	I(1)
	SGD (1d)	None	3	-10.32	0.000	Trend	18	-8.48	0.000	
3	PHP (Lv)	Trend	1	-2.76	0.216	Constant	1	-2.47	0.125	I(1)
	PHP (1d)	Constant	0	-7.60	0.000	Constant	6	-7.46	0.000	
4	THB (Lv)	Constant	5	-2.05	0.266	Constant	4	-3.21	0.022	I(1)
	THB (1d)	None	4	-4.13	0.000	None	22	-7.33	0.000	
5	JPY (Lv)	Constant	5	-1.54	0.507	Constant	4	-2.00	0.284	I(1)
	JPY (1d)	None	4	-5.58	0.000	None	3	-7.44	0.000	

Table IV.4
Integration Degree Testing on Exogenous Variable

No.	Variable	ADF				Phillips-Perron				Conclusion
		Model	Lag	t stat	p value	Model	Bandwidth	t stat	p value	
1	IDUS_INF (LV)	Constant	4	-3.75	0.00	Constant	9	-3.92	0.00	I(0)
	IDUS_INF (1d)	Constant	3	-12.15	0.00	Constant	65	-22.40	0.00	
	SGUS_INF (Lv)	Constant	1	-9.65	0.00	Constant	4	-13.14	0.00	I(0)
	SGUS_INF (1d)	Constant	5	-8.32	0.00	Constant	18	-46.67	0.00	
	PHUS_INF (Lv)	Constant	0	-7.56	0.00	Constant	4	-7.52	0.00	I(0)
	PHUS_INF (1d)	Constant	5	-7.40	0.00	Constant	50	-43.70	0.00	
	THUS_INF (Lv)	Constant	2	-4.05	0.00	Constant	2	-7.14	0.00	I(0)
	THUS_INF (1d)	Constant	5	-6.67	0.00	Constant	54	-29.47	0.00	
2	IDUS_IRT(Lv)	Constant	0	-4.09	0.00	Constant	1	-4.05	0.00	I(0)
	IDUS_IRT(1d)	Constant	1	-9.57	0.00	Constant	9	-13.09	0.00	
	SGUS_IRT (Lv)	Constant	0	-6.46	0.00	Constant	2	-6.47	0.00	I(0)
	SGUS_IRT(1d)	Constant	5	-6.55	0.00	Constant	20	-27.68	0.00	
	PHUS_IRT(Lv)	Constant	1	-5.86	0.00	Constant	4	-9.68	0.00	I(0)
	PHUS_IRT(1d)	Constant	3	-7.65	0.00	Constant	15	-42.68	0.00	
	THUS_IRT(Lv)	Constant	1	-4.76	0.00	Constant	4	-7.45	0.00	I(0)
	THUS_IRT(1d)	Constant	4	-6.76	0.00	Constant	15	-27.75	0.00	
3	IDUS_GRW(Lv)	Constant	3	-3.10	0.03	Constant	94	-5.32	0.00	I(0)
	IDUS_GRW(1d)	Constant	5	-8.23	0.00	Constant	20	-20.36	0.00	
	SGUS_GRW (Lv)	Constant	5	-5.50	0.00	Constant	10	-10.07	0.00	I(0)
	SGUS_GRW(1d)	Constant	5	-7.64	0.00	Constant	41	-14.77	0.00	
	PHUS_GRW(Lv)	Constant	5	-5.40	0.00	Constant	32	-7.26	0.00	I(0)
	PHUS_GRW(1d)	Constant	2	-18.94	0.00	Constant	20	-20.52	0.00	
	THUS_GRW(Lv)	Constant	5	-10.83	0.00	Constant	1	-4.51	0.00	I(0)
	THUS_GRW(1d)	Constant	5	-10.91	0.00	Constant	2	-10.66	0.00	
4	IDUS_M1C(Lv)	Constant	0	-9.99	0.00	Constant	2	-9.99	0.00	I(0)
	IDUS_M1C(1d)	Constant	4	-7.86	0.00	Constant	57	-80.84	0.00	
	SGUS_M1C (Lv)	Constant	0	-12.47	0.00	Constant	2	-12.59	0.00	I(0)
	SGUS_M1C(1d)	Constant	4	-7.41	0.00	Constant	23	-63.37	0.00	
	PHUS_M1C(Lv)	Constant	0	-10.18	0.00	Constant	6	-10.32	0.00	I(0)
	PHUS_M1C(1d)	Constant	5	-7.10	0.00	Constant	31	-56.06	0.00	
	THUS_M1C(Lv)	Constant	3	-4.19	0.00	Constant	5	-9.14	0.00	I(0)
	THUS_M1C(1d)	Constant	1	-12.44	0.00	Constant	3	-21.74	0.00	

With this kind of data characteristics, in which the endogenous variables is I(1) and exogenous variable (*first difference form*) is stationary, then the use of VECM technique has fulfilled its first requirements. All variables here already have the same integration degree. The next analysis step is done by selecting the *optimal lag.*

Just like *unit root* testing, optimal lag is choosen by firstly chhosing the maximum lag that is estimated doesn't have autocorrelation characteristics anymore. Here, the formula from Said-Dickey is re-used (1984), that gives a maximum lag by 5 (see table 5). Information criteria calculation for each OCA model (bivariate and complete model) shows optimal lag is on the lag 5. Exception exist on IDR-PHP bivariate, that gives equal preferences between lag 4 and lag 5. Beside fulfilling the optimal requirements, VAR with the choosen lag fulfills the stability requirements too.

No.	OCA Type	Lag Optimal	Criteria	Stability
	Table IV.5			
	Optimal Lag Selection and Stability Requirements			
1	IDR-SGD	5	LR, FPE, AIC, HQ	Yes
2	IDR-PHP	5	FPE, AIC	Yes
		4	LR, HQ	
3	IDR-THB	5	LR, FPE, AIC, HQ	Yes
4	SGD-PHP	5	LR, FPE, AIC, HQ	Yes
5	SGD-THB	5	LR, FPE, AIC, HQ	Yes
6	PHP-THB	5	LR, FPE, AIC	Yes
7	Complete Model	5	LR, FPE, AIC	Yes

The previous obtained lag will be used as the choosen lag in cointegration testing. Cointegration testing procedure is done by using Johansen technique (1988) which is cointegration testing VAR basis. This technique uses *reduced rank* to determine the number of cointegration equation that exist in the analyzed variable.

Cointegration testing result is sensitive towards deterministic component that is assumed on the model (Johansen, 1995). There are 5 kinds of model with considered deterministic component as follow[13]:

1. The data doesn't have any deterministic trend and the cointegration equaiton doesn't have any intercept
2. The data doesn't have any deterministic trend and the cointegration equaiton has intercept
3. The data has linear trend and the cointegration equation that just have intercept

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13 The best model that considered reflect the cointegration equation will be seen from information criteria value (used AIC and SIC). The choosen model is model with the lowest information criteria on cointegration lag

4. The data and the cointegration equation have the linear trend
5. The data has the quadratic trend and the cointegration equation have the linear trend.

As displayed on table IV.6 , excluding on the SGD-PHP bevariate, Johansen's cointegration testing (1988) shows a significant result. There is at least a cointegrated equation on bevariate:

No.	OCA	Model 2 AIC	AIC	Model 3 AIC	SIC	Number of Cointegrated Press Statistical Testing
						Table IV.6
						Johansen Cointegration Testing (1988) on OCA model ASEAN4
1	IDR-SGD	-9.8943	-9.0666	-9.8943	-9.0666	(Trace=2; Max Eigen=2)
2	IDR-PHP (lag 5)	-8.7211*	-8.0313*	-8.707	-7.9896	(Trace=1; Max Eigen=1)
	IDR-PHP (Lag 4)	-8.5005*	-7.9249*	-8.4999	-7.8967	(Trace=1; Max Eigen=1)
3	IDR-THB	-9.0973*	-8.4075*	-9.078	-8.3606	(Trace=1; Max Eigen=1)
4	SGD-PHP	-12.0247	-11.4729	-12	-11.393	(Trace=0; Max Eigen=0)
5	SGD-THB	-12.4584*	-11.7686*	-12.4366	-11.7192	(Trace=1; Max Eigen=1)
6	PHP-THB	-11.0815	-10.3917*	-11.0917*	-10.3743	Model 2: (Trace=0; Max Eigen=0)
						Model 3: (Trace=1; Max Eigen=0)
7	Complete Model	-21.8359*	-19.3802*	-21.7763	-19.2378	Model 2: (Trace=1; Max Eigen=1)
						Model 3: (Trace=2; Max Eigen=1)

* Chosen model

IDR-PHP, IDR-THB, SGD-THB and complete model. Cointegration model gives a weak result for PHP-THB pair and is negative for SGD-PHP. Meanwhile for complete model, conclusive testing shows at least there is a single cointegration model

This result gives the first indication in term of the support for hypothesis on the existing OCA in ASEAN4 area. Nevertheless the stricter conclusion should be still obtained through the existing *error correction* mechanism that is significant.

Excluding PHP-THB bevariate, all bivareate OCA model have moderate *goodness of fit* (R^2) model (0.5 to 0.65) (see tabel IV.7). *Goodness of fit* highest level belongs to IDR-THB

No.	OCA Type	R^2	F Stat	AIC	SIC
					Table IV.7
					***Goodness Of Fit* Model OCA**
1	IDR-SGD	0.61	5.88	-2.90	-2.34
2	IDR-PHP (lag 4)	0.58	6.01	-2.87	-2.37
3	IDR-PHP (Lag 5)	0.65	6.98	-3.01	-2.45
4	IDR-THB	0.66	7.11	-3.02	-2.47
5	SGD-PHP	0.64	6.69	-6.43	-5.88
6	SGD-THB	0.64	6.27	-6.41	-5.83
7	PHP-THB	0.34	1.93	-5.14	-4.59
8	Complete Model	0.78	5.22	-3.10	-2.05

bevariate (lag 4) with R² value amounting 0.58. The independent variable here concidely explain 50%-65% of variaiton occuring on dependent variable. Complete model OCA has the *goodness of fit* that is higher from bevariate model. The R² here is amounting 0.78, is significantly above the OCA bevariate.

IV.2. The ASEAN Currencies Co Movement and The Determining Factor

From table IV.8, it is seen that just 14 from 88 (16%) of the coefficient that is estimated passes the partial significance testing on a = 5%. It shows the first indication about the weak data support towards the existing *co movement* that is statistically valuable.

Algebraic symbol on the short-term *co-movement* coefficient is not homogenous. This condition is not in accordance with the hypothesis, in which even in short term it is expected the currency moves paralelly (and thus it has a positive coefficient). In some certain bevariates, short-term co-movement coefficient that is not significant is negative (see OCA IDR-PHP lag 5 coefficient D(PHP(-3)) amounting -0.6699) .

The above tendency prevails either OCA bevariate or OCA complete model. Thus it can be said that short-term equation doesn't support the existing *co-movement.*

From table IV.9, the exisitng adjusting mechanism *(error correction model)* on SGD-THB and PHP-THB bevariate don't get any supporting data. It is seen from the low statisitc *t* coefficient

	Table IV.8 Short-term Co-movement coefficient (statistic t in parenthess)									
No.	**OCA Type**	**D(IDR(-1))**	**D(IDR(-2))**	**D(IDR(-3))**	**D(IDR(-4))**	**D(IDR(-5))**	**D(SGD(-1))**	**D(SGD(-2))**	**D(SGD(-3))**	**D(SGD(-4))**	**D(SGD(-5))**
1	IDR-SGD (D(IDR))	0.1428	0.0665	-0.0773	0.0498	0.0941	-0.0972	-0.5629	-0.8789	-0.9344	-0.0633
		[1.1984]	[0.6947]	[-0.8249]	[0.5871]	[1.0926]	[-0.1732]	[-0.9954]	[-1.5325]	[-1.683]	[-0.1147]
2	IDR-PHP Lag 4 (D(IDR))	0.0113	-0.0334	-0.0467	0.0742	-	-	-	-	-	-
		[0.1175]	[-0.3939]	[-0.5454]	[0.9585]	-	-	-	-	-	-
	IDR-PHP Lag 5 (D(IDR))	0.1507	0.0432	-0.0704	0.1024	0.0348	-	-	-	-	-
		[1.5137]	[0.5014]	[-0.8708]	[1.3892]	[0.4682]	-	-	-	-	-
3	IDR-THB (D(IDR))	0.1581	-0.0739	-0.0666	0.1451	-0.156	-	-	-	-	-
		[1.4844]	[-0.6798]	[-0.6667]	[1.5273]	[-1.6545]	-	-	-	-	-
4	SGD-PHP (D(SGD))	-	-	-	-	-	0.01789	-0.1392	-0.0645	-0.0597	-0.0325
		-	-	-	-	-	[0.2002]	[-1.5561]	[0.0862]	[-0.7334]	[-0.3881]
5	SGD-THB (D(SGD))	-	-	-	-	-	0.112	-0.3001	-0.0032	0.0957	0.0749
		-	-	-	-	-	[1.0325]	[-2.7131]	[-0.0286]	[0.8865]	[0.6837]
6	PHP-THB (D(PHP))	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-
7	Complete Model (D(IDR))	0.1988	-0.1137	-0.0832	0.1157	-0.1942	-0.0593	-0.501	0.0378	1.4449	0.3633
		[1.6803]	[-0.9705]	[-0.7294]	[1.0400]	[-1.7041]	[-0.0743]	[-0.6792]	[0.0453]	[2.0682]	[0.5058]

No.	OCA Type	D(PHP(-1))	D(PHP(-2))	D(PHP(-3))	D(PHP(-4))	D(PHP(-5))	D(THB(-1))	D(THB(-2))	D(THB(-3))	D(THB(-4))	D(THB(-5))
	Table IV.8 (continued) **Short-term Co-movement coefficient (statistic t in parenthess)**										
1	IDR-SGD (D(IDR))	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-
2	IDR-PHP Lag 4 (D(IDR))	-0.5431	-0.1261	-0.8632	-0.7693	-	-	-	-	-	-
		[-1.5639]	[-0.3781]	[-2.6815]	[-2.2665]	-	-	-	-	-	-
	IDR-PHP lag 5 (D(IDR))	-0.165	-0.2186	-0.6699	-0.7491	0.6855	-	-	-	-	-
		[-0.4867]	[-0.6500]	[-2.1834]	[-2.3654]	[1.9922]	-	-	-	-	-
3	IDR-THB (D(IDR))	-	-	-	-	-	-0.0395	0.4991	-0.5733	-0.7511	0.8182
		-	-	-	-	-	[-0.1214]	[1.4577]	[-2.2427]	[-2.9383]	[2.8642]
4	SGD-PHP (D(SGD))	0.01923	-0.1092	-0.0829	-0.0472	0.0061	-	-	-	-	-
		[0.3021]	[-1.9025]	[-1.4239]	[-0.8419]	[0.1082]	-	-	-	-	-
5	SGD-THB (D(SGD))	-	-	-	-	-	-0.0468	0.0318	-0.1081	-0.1165	-0.0414
		-	-	-	-	-	[-0.8009]	[0.5850]	[-2.0400]	[-2.2324]	[-0.7796]
6	PHP-THB (D(PHP))	0.3174	-0.0943	0.0013	-0.1457	0.1712	0.1194	-0.0211	-0.0369	0.1093	-0.1213
		[2.4877]	][-0.7277]	[0.0098]	[-1.1328]	[1.3600]	[1.085]	[-0.2225]	[-0.4090]	[1.2422]	[-1.4219]
7	Complete Model (D(IDR))	-0.7742	-0.2095	-0.2714	-0.5506	0.08764	0.4888	0.7178	-0.4772	-1.0004	0.6205
		[-1.7848]	[-0.5340]	[-0.6612]	[-1.3721]	[0.2174]	[1.0032]	[1.5312]	[-1.1365]	[-2.6631]	[1.4401]

error correction/cointegrating term amounting (respectively) -0.5004 and -1.2001 that is lower deeply under the critical *t* on the standard *level of significance* (5% and/or 1%). It is quite not in accordance with the cointegration testing result that shows at least 1 (one) cointegrated equation (see table IV.6).

In the other hand, estimation result of SGD-PHP bevariate is not consistent by cointegration testing. The negative and significant cointegration coefficient is not in accordance with the cointegration testing result (Trace dan Max-Eigen statisic) that shows 0 (zero) cointegration relation.

This paper uses a rather conservative approach. Result that tends to be contradicitve on the above three bevariate encourages the writer to conclude that there is no equilibrium relation among Singapore-Thailand (SGD-THB), Singapore-Philipine (SGD-PHP), and Philipine-Thailand (PHP-THB) currency.

Meanwhile for other bevariate which are the pair of Indonesia-Singapura (IDR-SGD), Indonesia-Philipina (IDR-PHP) dan Indonesia-Thailand (IDR-THB) currencies and complete model, we can accept the hypothesis in terms of existing that is valueable. For this models, cointegration coefficient has been apropriate with the hypothesis and is significant on the standard level. Thus for this currency's pair, *error correction* representation can be valid.

Equilibrium equation coefficient that is obtained generally from bevariate OCA estimation has fulfilled the hypothesis (equilibrium equation coefficient is positive). There is an exception

Table IV.9
Equilibrium *co-movement* coefficient, error correction and OCA variable
(*t* statistic in parenthesses)

No.	OCA Type	Cointegrating Equation				COINT TERM	Exogen					
		IDR	SGD	PHP	THB		IDUS_INF	IDUS_IRT	IDUS-GRW	IDUS_M1C	SGUS_INF	SGUS_IRT
1	IDR-SGD	1	-0.8769	-	-	-0.2657	0.9437	0.179	0.6722	0.4859	-3.3066	-0.0159
			[-1.1715]	-	-	[-3.8786]	[1.8748]	[2.1899]	[1.5189]	[2.6415]	[-2.5947]	[-0.1940]
2	IDR-PHP(lag 4)	1	-	-0.3757	-	-0.3138	1.6684	0.2237	0.2981	0.6614	-	-
			-	[-2.8848]	-	[-4.2400]	[3.2020]	[2.8359]	[0.4478]	[3.6140]	-	-
3	IDR-PHP(lag 5)	1	-	-0.367	-	-0.335	1.7442	0.1499	0.3728	0.4186	-	-
			-	[-3.059]	-	[-4.5047]	[3.3681]	[1.8919]	[0.5300]	[2.3139]	-	-
4	IDR-THB	1	-	-	-1.0615	-0.2893	1.4855	0.0387	0.0999	0.3807	-	-
			-	-	[-2.8546]	[-3.8595]	[2.7707]	[0.4921]	[0.2408]	[2.1956]	-	-
5	SGD-PHP	-	1	0.5468	-	-0.029	-	-	-	-	-0.3414	0.0107
		-	-	[2.3807]	-	[-2.7646]	-	-	-	-	[-1.5960]	[0.8596]
6	SGD-THB	-	1	-	-0.6633	-0.0211	-	-	-	-	-0.4413	0.0279
		-	-	-	[-5.9703]	[-0.5004]	-	-	-	-	[-1.8344]	[2.2656]
7	PHP-THB	-	-	1	-4.0494	-0.0127	-	-	-	-	-	-
		-	-		[-3.7281]	[-1.2001]	-	-	-	-	-	-
8	Complete Model	1	2.4204	-0.1709	-1.9277	-0.3563	1.809	0.0972	0.0148	0.4566	-2.2786	0.1101
		-	[3.3525]	[-1.5639]	[-3.6049]	[-3.207]	[2.9445]	[0.9962]	[0.0198]	[2.3692]	[-1.6799]	[1.2972]

Continued

No.	OCA Type	Exogen										
		SGUS-GRW	SGUS_M1C	PHUS_INF	PHUS_IRT	PHUS-GRW	PHUS_M1C	THUS_INF	THUS_IRT	THUS-GRW	THUS_M1C	JPY_FX
1	IDR-SGD	0.4466	-0.4181	-	-	-	-	-	-	-	-	0.4946
		[0.7320]	[-1.7001]	-	-	-	-	-	-	-	-	[1.9843]
2	IDR-PHP(lag 4)	-	-	-0.82	0.0395	0.1102	-0.1086	-	-	-	-	0.5607
		-	-	[-0.8346]	[0.9461]	[0.4719]	[-0.5656]	-	-	-	-	[2.2329]
3	IDR-PHP(lag 5)	-	-	-1.2067	0.0262	0.1582	-0.0649	-	-	-	-	0.383
		-	-	[-1.2934]	[0.6744]	[0.6696]	[-0.3472]	-	-	-	-	[1.5815]
4	IDR-THB	-	-	-	-	-	-	0.5465	-0.0015	-0.4884	-0.0389	0.3524
		-	-	-	-	-	-	[0.3569]	[-0.0221]	[-1.346]	[-0.2507]	[1.4925]
5	SGD-PHP	-0.0597	0.0211	0.0143	0.0133	0.0422	0.0115	-	-	-	-	0.2945
		[-0.4695]	[0.4958]	[0.0883]	[1.9096]	[1.3503]	[0.3610]	-	-	-	-	[7.2381]
6	SGD-THB	0.0106	0.0168	-	-	-	-	0.0859	-0.0128	-0.0047	0.0426	0.3036
		[0.1023]	[0.3844]	-	-	-	-	[0.2659]	[-1.1746]	[-0.0774]	[1.5405]	[6.7928]
7	PHP-THB	-	-	0.1266	0.0063	0.0147	-0.0084	-0.5296	-0.0033	0.0811	0.0803	0.2097
		-	-	[0.4384]	[0.4638]	[0.2925]	[-0.1263]	[-1.0422]	[-0.1685]	[0.6795]	[1.3817]	[2.7799]
8	Complete Model	0.5088	-0.6607	-0.6794	0.0719	-0.2894	0.1887	1.1167	-0.1289	-0.1309	-0.1979	0.3006
		[0.6473]	[-2.4424]	[-0.6773]	[1.728]	[-0.9515]	[0.9499]	[0.5940]	[-1.7411]	[-0.3052]	[-0.1709]	[1.1183]

on SGD-PHP bevariate where the obtained coefficient is negative, in this case is SGD = -0.5468 PHP. In other words SGD exchange rate (towards USD) decreases (getting stronger) when PHP increases (getting weak). It is different from hypothesis expecting relation with the same coefficient symbol. Meanwhile for IDR-SGD bevariate, coefficient of long-term relation is not significant.

Magnitude of OCA bevariate is various enough. For instance IDR-THB alsmost corresponded one by one. One percent of inlation (decrease) of IDR exchange rate will be followed by one percent inlation (decrease) of THB value. The biggest respond is given by PHP-THB bevariate amounting 4.0494 while the smallest is IDR-PHP amounting 0.3737.

On the bevariate OCA in which IDR is an independent variable, controlling variable coefficient itself is generally in accordance with hypothesis and has the proper significance level. For instance, OCA bevariate IDR-SGD, either interest rate different variable or the number of circulating money (towards US) has a positive influence on the exchange rate and is significant on the standard _. Other controlling variables on the bivariate OCA has coefficient that is in accordance with the hypothesis even the significance level that has to be used is aggressive (>10%). Exception exists on the growth difference variable, in which no bivariate OCA where this variable is significant.

On other bivariate OCA, some of the controlling variable coefficient themselves have a wrong symbol (for instance SGUS_INF variable on OCA bivariate SGD-PHP and PHPUS_M1C on OCA bivariate PHP-THB). Coefficient significance is not generally equal. It can be seen for example on OCA bivariate SGD-PHP, in which no single controlling variable can be said significant on the standard level. The only bivariate OCA beyond IDR that has its own controlling variable coefficient that is significant is SGD-THB (which is SGUS_IRT).

Coefficient symbol from foreign[14] controlling variable is not generally consistent with hypothesis. On some bivariate OCA and certain variables, the sigh that it has been in accordance with hypothesis, see for example THUS_INF on OCA IDR-THB. In the other hand, variable symbol is not just in accordance with hypothesis, it happens for example on OCA bivariate SGD-THB (THUS_IRT variable). Beside that the significance requirements of foreign controlling variables isn't achieved (on the standard level). An exception is on SGUS_INF variable on OCA bivariate IDR-SGD that is significant on $\alpha = 5\%$.

In a complete model, in which IDR is a dependent variable on the equilibrium equation, controlling variable itself: IDUS_INF and IDUS_M1C, has an appropriate symbol with hypothesis and is significant on the standard level (1% and 5% each). Other variables (IDUS_IRT and IDUS_GRW) have the appropriate symbol with hypothesis but is not significant.

Meanwhile, foreign controlling variable symbol is not consistent with the hypothesis. For example on some variables, PHUS_M1C and THUS_INF, the change of the impact is already in

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14 Foreign controlling variable is an exogenous variable that is related to independent variable in the right side of cointegrated equation. On OCA bivariate IDR-SGD, these variables are all exogenous variables SGUS_X where X is Inflation Rate (INF), exchange rate (IRT), growth (GRW), and the number of circulating money (M1C)

accordance as expected. But the contrariwise thing occurs on some other variables, i.e. SGUS_M1C and THUS_M1C that are contradictory with the hypothesis. Here, excluding SGUS_M1C variable, foreign controlling variable is not significant on _ = 5%.

Exogenous variable coefficient symbol of JPY exhange rate (towards US) is positive on all OCA bivariate. It is already in accordance with the hypothesis. On some OCA bivariate (IDR-SGD, IDR-PHP(lag=4), SGD-PHP, SGD-THB and PHP-THB, coefficient that is obtained is significant on standard _ (5%). While on OCA bivariate IDR-PHP (lag=5) and IDR-THB, JPY exogenous variable doesn't seem have any significant clarifying influence.

The biggest respond from JPY change belongs to IDR-PHP bivariate (amounting 0.5607), while the smallest (by keep concerning coefficient significance) belongs to PHP-THB bivariate (amounting 0.2097).

On OCA complete model, the JPY's impact is consistent with OCA on bivariate level. Nevertheless, JPY variable on OCA complete model is not significant. Thus it can be said by considering all *co-movement,* there is no reason to accept that equilibrium relation can be explained by the JPY movement.

IV.3. The Existing OCA and Its Requirements Assessment

From the VECM estimation and cointegration testing that are already reported above, it seems that a *co-movement* in a strong form in South East Asia can not be supported by data. It can be seen fro (1) weak significance from the *co-movement* coefficient of short term equation and (2) devergen *error correction term* estimation result and long-term *co-movement* coefficient.

The weak coefficient significance of short-term equation shows the low interaction ability among ASEAN4 currencies that is observed. Nevertheless, it is quite strange, the *error correction term* coeffficent apparently has a relatively better performance. Economic interpretation in this case is even though the short term ASEAN4 currencies interaction is weak (they move independently), but there is a correction mechanism if they are beyond the parity.

On long-term equation side, an assumption regarding to *co-movement* on ASEAN4 currencies that have stronger supporting data than short-term equation. A better significance level is obtaned for equilibrium *co-movement* coefficient for OCA bivariate: IDR-SGD, IDR-PHP, IDR-THB and OCA are completed. While on OCA bivariate: SGD-THB, PHP-THB and SGD-PHP, the exisitng phenomenon doesn't have any significance that is needed.

Moreover by considering OCA bivariate in which IDR is dependent variable, then the exisitng *co-movement* for ASEAN4 currencies with USD currency *anchor* are valid. Some of

equilibrium relations that can be explained to justify it are

a. IDR-SGD, each appreciation/depreciation amounting 1% on SGD (towards USD) will be accompanied by appreciation/depreciation amounting 0.88%[15] on IDR

b. IDR-PHP, each appreciation/depreciation amounting 1% on PHP (towards USD) will be accompanied by appreciation/depreciation amounting 0.37%(lag 5)-0.38%(lag4) on IDR

c. IDR-THB, each appreciation/depreciation amounting 1% on THB (towards USD) will be accompanied by appreciation/depreciation amounting 1.06% on IDR

The next OCA bivariate development by involving other ASEAN4 currency completely gives a support to the existing exchange rate *co-movement.* For complete model of partial interpretation[16] , relation that occurs is appreciation/depreciation on PHP amounting 1% will be accompanied by appreciation/depeciaition amounting 0,17% on IDR. While appreciation/depreciation THB amounting 1% will give impact amounting 1.93% on appreciation/depreciation of IDR. An exception exists on SGD because the movement direction belongs to it is opposite (and is significant). Here 1% appreciation/depreciation of SGD will be accompanied by depreciation/appreciation of IDR amounting 2.42%.

For *error correction* representation, the adjusting process on the disequilibrium time can be decreased for each of currecncies as follow:

1. IDR-SGD = 3.77 months (there is an adjustment amounting 26.57% from disquilibrium condition every month)

2. IDR-PHP (lag 4) = 3.19 months (there is an adjustment amounting 31.38% from disequilibrium condition every month)

3. IDR-PHP (lag 5) = 2.99 months (there is an adjustment amounting 33.35% from disequilibrium condition every month)

4. IDR-THB = 3.46 months (there is an adjustment amounting 28.93% from disequilibrium condition every month)

5. Complete model = 2.78 months (there is an adjustment amounting 35.63% from disequilibrium condition every month)

A glance from this analysis, it is seen that there is a posibility of existing co-movement that is statistically significant among ASEAN4 currencies. The basic currency is USD. This finding supports the Frankel and Wei studi result (1994) that assums that ASIAN area has a basis to USD. Exchange rate determination orientation that tends to be on USD is strong that is assumed in order to control the inflation *(cost push inflation)*

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15 Nevertheless SGD coefficient on equilibrium equation that is not significant.

16 Partial interpretation especially occurs on a regression equation with more than two variables. Partial is an impact that would be observed on the bonded variable is the impact of one independent variable change by assuming other independent variables are constant

Furthermore, the existing co-movement is also influenced by beyond USD currency, in which it propose an alternative JPY on this paper. As reported on the first part before, coefficient uniformity (and good and sufficient significance) of JPY variable on all OCA (either bivariate or complete) strengthen this assumption. The positive relation between ASEAN4 currencies and JPY has made an assumption of relation movement among countries in this area with Japan as the rival (especially in the trade aspect).

Further implication is the possibility of the existing anchor currency which is a currency basket, where both USD and JPY are dominant component. It strengthen the empirical finding done by Kim and Ryou (2001). This JPY dominant role is actually indicated by Frankel on his studi in 1992, in which because economic and non economic factor (agenda from washington), it is assumed that the Japanese role in ASIA will increase.

As the conclusion, it can be said here that the existing *co-movement* among ASEAN4 currency is not strongly supported by data. It is caised by (1) weak significance on short-term co-movement coefficient and (2) error correction coeffcient symbol that is not homogenous and long term *co-movement*. Nevertheless, this study has revealed a possibility of the exisitng OCA. It is shown by the homogenous JPY coefficient symbol (with moderate significance). Further study by using a composite anchor may be better reveals the existing OCA.

Several things that might make monetary approach variable failed to get role as controlling variable on some OCA models are
1. Restriciton among countries that are not valid, assumption of the same function of money demand among countries doesn't get any empirical support (Boothe and Glassman, 1987)
2. Money demand and supply function are not a stable function (Frankel, 1981).

By restricting OCA model with IDR as an unfree variable. Then it is seen that national output difference variable (IDUS_GRW) is never an influential variable. Related to argumantation from Frankel (1981), then transactional influence from income on cash in hand is getting smaller. It occurs by the increase of technology use, in which the need of holding money in cash will decrease.

Interest rate variable (and also interest rate expectation through inflation) has the biggest influence in the role as controlling variable. Unlike the general expectation that tends to consider that interest rate increase is appreciative. Interest rate increase here is depreciative. If a country uses an *interest rate targeting* and interest rate is determined above the equilibrium interest rate, then there will be *excess money supply* (relative on foreign currency) and as the consequence, this currency will experience depreciation.

The OCA's variable ability in explaining OCA with IDR as a bonded variable seems to be bonded by Alesina's finding et al (2002). Their analysis on price co-movement and output on some world's area conclude that there is an area defined as USD area.

Thus as a conlusion, economic analysis and interpretation on OCA's charactersitics ability in explaining ASEAN4 currencies *co-movement* is limited. This characterisitcs is just sufficient if it is used to explain to explain OCA model where IDR gets role as a bonded variable. In other words, the choosen OCA characterisitcs can not become a general clarrification for all ASEAN4 countries. It is assumed that there is a different mechanism in determining IDR exchange rate compared to other ASEAN4 countries.

V. CONCLUSION AND SUGGESTION

Estimation result shows that ASEAN4 OCA in an idela form doesn't seem obtain a strong empirical support. Nevertheless, research that has been done keeps giving interested result as follow:

1. *Co-movement* that is identified among ASEAN4 currency is not *rebust.* Based on the short-term perspective, hypothesis is failed to be fulfilled (either in symbol side or significance) while from long-term, hypothesis is not fulfilled even though the obtained estimation result is better.

2. Variable ability/OCA's characteristics in explaining the *co-movement* can be explained as follow:
   a. On bivariate model in which IDR is a bonded variable terikat (IDR-SGD, IDR-PHP and IDR-THB), coefficient symbol and controlling variable significance level/OCA characterisitc itself (i.e. IDUS_INF) generally has an appropriate symbol with the hypothesis and is significant.
   b. On other bivariates (SGD-PHP, SGD-THB and PHP-THB), either single or foreign controlling variable doen't support hypothesis. Relating to *error coreection* coefficient that is not significant (see point 1.b above), it seems that both of *co-movement* and OCA are not identified in this bivariate model.

3. The xisitng OCA is also a global phenomenon. It is indicated from coefficient symbol homogenity and significance either equilibrium equation (showing USD anchor) and JPY variable as an alternative anchor beyond USD.

Result that is obtained from this reserach has some policy implication as follow:

1. Empirical finding shows the Rupiah's role is acimetric. IDR is *weak currency* surrounded by other *strong currencies.* The relation of IDR on the regional currency co-movement (ASEAN4)

suggest the decison maker to pay attention on the shock that is happening in some neighboring countries.

2. Monetary variable (the number of circulating money and interest rate empirically gets role in determining IDR exchange rate. Thus, the authority (Bank of Indonesia) needs to pay attention to its monetary process to prevent any shocks on the exchange rate. Instead, the monetary policy can actively gets role in proceeding exchange rate to be consistent with economic stability.

3. The mechanism/factors of exchange rate determination that are not homogenous among ASEAN4 countries shows that specific-domestic shock is still dominant (*idiosynchratic shocks*) in determining exchange rate. It implies that the orientation of the decision maker should tend to the domestic condition.

4. There is an indication of the role increase of global variable, especially from Japan. Thus the decision maker has to ancipate the economic condition movement in some prime world area beyond USA, especially Japan. This proactive role is necessary so every shock can be anticipated early.

This study has expalined some urgent and interested empirical finding regarding to oCA in ASEAN4. Further development can be done in the two direction, (1) Controlling variable/OCA characteristics addition that assumed strong in influencing all currencies that are observed through a certain statistical criteria and (2) The use of *anchor* which is a composite from the prime world's currency.

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