

Reference of basket: Linkage of China and Asian Currencies

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China changes its pegging

- Ever since July 2005, China changed its pegging on US dollar and shifted RMB volatility reference to a basket of currencies. The change is responded by other transitional economies.
- Nearly two years passed, the effects of basket will be tested and real weights reveal some facts that indicate regional trend towards mutual linkage of their currencies in volatility, variance and frequency.

Textbook tells us

- A bundle of foreign currencies gathered into a single unit, against which an exchange rate can be set. Often the representation of a foreign currency in the basket is weighted for the importance of its use in the country's trade.

Effective Exchange Rate

$$V_{i,t} = \frac{S_{i,t}}{S_{i,0}} \times 100$$

$$E_t = w_1 V_{1t} + w_2 V_{2t} + \dots + w_m V_{m,t}$$

$$E_t = \sum_{i=1}^m w_i V_{it}$$

where w_i = weight for country i

$0 \leq w_i \leq 1$

and $w_1 + w_2 + \dots + w_m = \sum w_i = 1$

Market tells us

$$e_t^{\text{EASF}} = \alpha_1 + \alpha_2 e_t^{\text{\$SF}} + \alpha_3 e_t^{\text{YSF}} + \alpha_4 e_t^{\text{MSF}} + \mu_t$$

Makinnon's Methodology to calculate the weights and linkages.

The market tells the weight

$$y_t^{\text{RMB}} = \alpha_1 + \alpha_2 y_t^{\text{USD}} + \alpha_3 y_t^{\text{YEN}} + \alpha_4 y_t^{\text{EURO}} + \dots + \alpha_n y_t^{\text{ASIAN}} + \mu_t$$

$y_1 = d\log(\text{A})$, country A and its
currency y_1

$y_2 = d\log(\text{B})$, country B and its
currency y_2

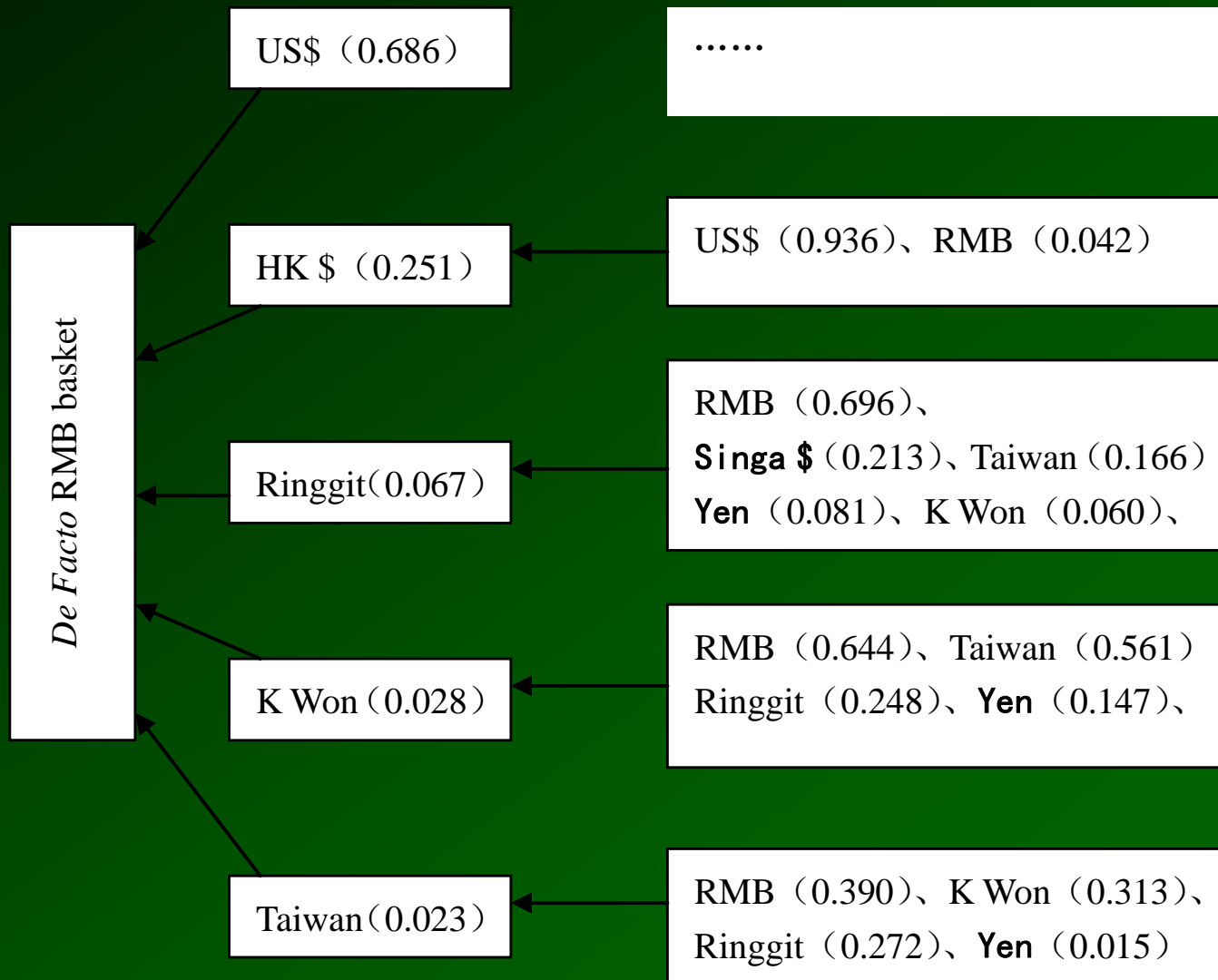
Estimation of Weight in the Basket of RMB

Before July 21, 2005	US	Japan	Euro	Korea	Taiwan
Ratio in China's Total Import and Export 2001	15.800	17.200	15.000	7.000	6.300
Coefficient of OLS of RMB Rate	1.038	-0.002	0.004	0.003	0.006
Pairwise Comparison of Variance of Currencies	0.999	0.426	0.279	-0.022	0.511
Comparison of Covariance and Time Effects	0.969	0.970	0.952	0.914	0.912
After July 21, 2005	US	Japan	Euro	Korea	Taiwan
Ratio in China's Total Import and Export 2006	21.000	9.500	17.400	4.600	2.100
Share of Investment to China 2006	7.730	6.250	6.310	10.280	9.050
Coefficient of OLS of RMB Rate	0.686	-0.003	-0.006	0.028	0.023
Pairwise Comparison of Variance of Currencies	0.995	0.329	0.124	0.279	0.626
Comparison of Covariance and Time Effects	0.928	0.848	0.623	0.743	0.781

Estimation of Weight in the Basket of RMB

Before July 21, 2005	Hong Kong	Malaysia	Thai	Singapore
Ratio in China's Total Import and Export 2001	11.000	1.849	1.383	2.145
Coefficient of OLS of RMB Rate	-0.043	0.000	-0.002	-0.003
Pairwise Comparison of Variance of Currencies	0.998	0.038	-0.013	0.312
Comparison of Covariance and Time Effects	0.852	0.959	0.926	0.956
After July 21, 2005	Hong Kong	Malaysia	Thai	Singapore
Ratio in China's Total Import and Export 2006	16.000	2.108	1.575	2.320
Share of Investment to China 2006	37.360	0.810	0.260	2.870
Coefficient of OLS of RMB Rate	0.251	0.067	-0.006	-0.053
Pairwise Comparison of Variance of Currencies	0.995	0.869	0.025	0.775
Comparison of Covariance and Time Effects	0.929	0.964	0.743	0.916

Market tells RMB Weights



Other Asian Currencies Linkage

<i>N</i> Currency	Impact on <i>n</i> currency, their Weights and Variances
Japanese Yen	Singapore dollar (0.795)
Singapore Dollar	Yen (0.152), Euro (0.224), Won (0.124), Ringgit (0.155), Thai Baht (0.078) [US\$ not statistically significant]
Thai Baht	Singapore Dollar (0.630)

Variance and Covariance

$$H_t = \overline{\alpha\alpha'} + \overline{\beta}H_{t-1}\overline{\beta'} + \overline{\gamma\mu_{t-1}\mu_{t-1}'\gamma'}$$

$$H_t = \begin{vmatrix} \text{Var}(y_{1,t}) & \text{Cov}(y_{1,t}, y_{2,t}) \\ \text{Cov}(y_{2,t}, y_{1,t}) & \text{Var}(y_{2,t}) \end{vmatrix}$$

$$\text{Cov}(y_{1,t}, y_{2,t}) = \text{Cov}(y_{2,t}, y_{1,t})$$

$$\bar{\alpha} = \begin{vmatrix} \alpha_1 & 0 \\ \alpha_2 & \alpha_3 \end{vmatrix} \quad \bar{\beta} = \begin{vmatrix} \beta_1 & 0 \\ 0 & \beta_2 \end{vmatrix} \quad \bar{\gamma} = \begin{vmatrix} \gamma_1 & 0 \\ 0 & \gamma_2 \end{vmatrix}$$

$$\text{Var}(y_{1,t}) = \alpha_1^2 + \beta_1^2 \text{Var}(y_{1,t-1}) + \gamma_1^2 \mu_{1,t-1}^2$$

$$\text{Var}(y_{2,t}) = \alpha_2^2 + \alpha_3^2 + \beta_2^2 \text{Var}(y_{2,t-1}) + \gamma_2^2 \mu_{2,t-1}^2$$

$$\text{Cov}(y_{1,t}, y_{2,t}) = \alpha_1 \alpha_2 + \beta_1 \beta_2 \text{Cov}(y_{1,t-1}, y_{2,t-1}) + \gamma_1 \gamma_2 \mu_{1,t-1} \mu_{2,t-1}$$

Covariance Persistence

$$\rho_{\text{Var}(y_{1,t})\text{Var}(y_{2,t})} = \frac{\sum_{t=1}^n [(\text{Var}(y_{1,t}) - \overline{\text{Var}(y_{1,t})}) \times (\text{Var}(y_{2,t}) - \overline{\text{Var}(y_{2,t})})]}{S_1 \times S_2}$$

$$S_1^2 = \frac{1}{n-1} \sum_{t=1}^n (\text{Var}(y_{1,t}) - \overline{\text{Var}(y_{1,t})})^2$$

$$S_2^2 = \frac{1}{n-1} \sum_{t=1}^n (\text{Var}(y_{2,t}) - \overline{\text{Var}(y_{2,t})})^2$$

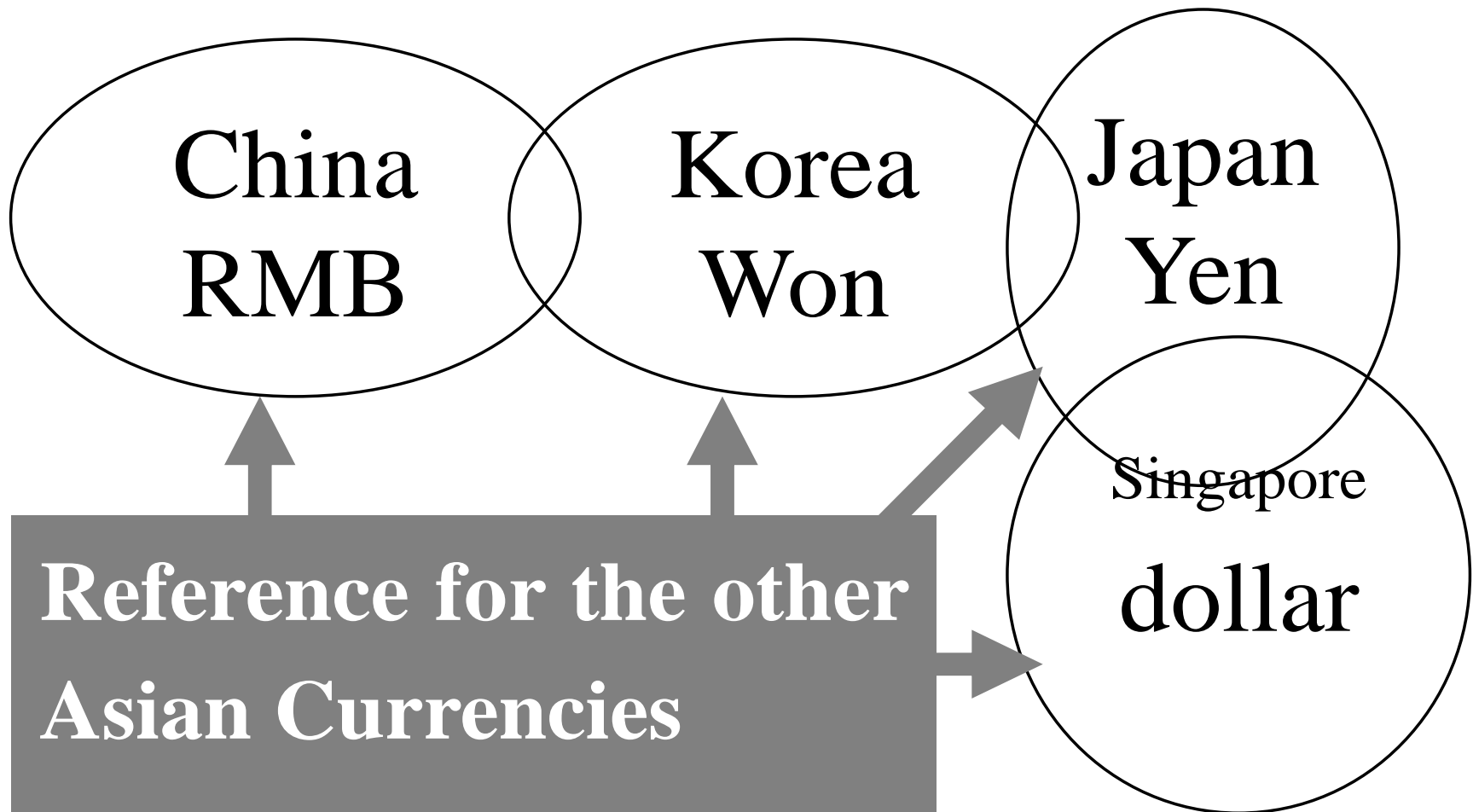
Covariance Persistence

	US\$	RMB	Yen	Won	Taiwan	HK \$	Sing \$	Ringgit	Baht
RMB	0.928		0.847	0.743	0.781	0.929	0.916	0.964	0.820
Yen	0.887	0.874		0.743	0.871	0.848	0.703	0.944	0.944
Won	0.707	0.743	0.952		0.888	0.673	0.869	0.660	0.927
Taiwan	0.554	0.781	0.871	0.888		0.546	0.745	0.587	0.842
HK \$	0.956	0.929	0.848	0.673	0.545		0.918	0.867	0.724
Sing \$	0.920	0.916	0.703	0.869	0.745	0.918		0.914	0.761
Ringgit	0.852	0.964	0.803	0.660	0.587	0.867	0.914		0.919
Baht	0.574	0.820	0.944	0.927	0.842	0.724	0.761	0.919	

What we find?

- The weight in RMB has something to do with investment ratio to China. Those investments exceed 7% of the total are included in the weight.
- Five currencies are clearly within the basket of RMB: US dollar, Hong Kong dollar, Malaysian Ringgit, Korean Won and Taiwan dollar.
- Variance and Covariance persistence also support basket.

The market tells the basket



Conclusions

- Growth of inter linkage of Asian Currencies demonstrates the trend of regional currency independence via basket reference.
- The currency basket not only explains the gravity model (More closer, More Weight), but also indicates similarity of industrial structure and commodity structure.
- During the process of the fixed (pegging to dollar) to the floating, the common reference of the basket will be a choice for the East Asian Economies.

Let's Keep in contact



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