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The Optimum Currency Basket Approach to East Asia's Coordinated Exchange Rate Intervention

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The Optimum Currency Basket Approach to East Asia's Exchange Rate Policy Coordination

ABSTRACT

This paper develops a basis for exchange rate policy coordination for three countries, China, Japan, and Korea. We suggest that in managing the exchange rate, the three countries should establish the common rules for exchange rate intervention and propose that each country should use the optimum basket rate as the target exchange rate.

In this paper we propose a basket rate formula for each country and derive the optimum weights for the currencies in the basket. To find the optimum currency weights, we minimize the variance of the percentage changes in the target exchange rate. Through empirical analysis, we get the result that the actual exchange rate of each country tends to fall within a range of plus- minus 3 percent around its target exchange rate.

JEL Classification Code: F33, F41, and F42

Key words: The optimum currency area, the target exchange rate, optimum currency weights, the basket exchange rate, and the minimum variance.

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I. Introduction

In July 2005 reform policy the Chinese government revalued its currency, renminbi by 2 % point and changed its exchange rate system, the US-dollar peg to the basket-currency peg. China had been under strong pressure from the US to revalue the renminbi because of China's ever increasing trade surpluses with the US.

China's switch to a different exchange rate regime created concerns to trade partners, in particular, three major countries in East Asia such as China, Japan, and Korea. Naturally these three countries would have a strong incentive to devalue their currency as possible as they can because their export products complete one another in the US market.

To sustain export growth and financial stability in East Asia requires regional exchange rate stability. To explore long-term stability in exchange rates and financial systems, East Asian countries have been contemplating to achieve long-term goals of the regional common currency and eventually the region's single currency. While pursuing such goals, these countries need to maintain stable exchange rates before they achieve their step-wise goals.

This paper develops a basis for exchange rate policy coordination for three countries, China, Japan, and Korea. We suggest that in managing the exchange rate, the three countries should establish the common rules for exchange rate intervention and propose that each country should use the optimum currency –basket rate as the target exchange rate. In this paper we suggest a suitable target exchange rate formula for each country and derive the optimum currency weights. To find the optimum weights of the currencies in the basket, we minimize the variance of the percentage changes in the target exchange rate.

The structure of this paper is the following. Section II describes the background for region-wide exchange policy coordination among the countries in East Asia. Section III derives the optimum weights in the currency basket. Section IV conducts an empirical work to get measures of the optimum currency weights. Section V concludes the paper.

□. The Background for Regional Exchange Rate Coordination

The discussion of regional exchange rate coordination began after the 1997 Asian currency crisis. To prevent a regional currency crisis, ASEAN ten plus China, Japan, and Korea agreed in May 2000 on the Chiang Mai Initiative and advised that member countries should establish swap arrangements, and that they pursue exchange rate coordination to avoid competitive exchange rate devaluation.

Regional exchange rate coordination is required in the establishment of monetary integration in Asia. Kuroda (May 204) argued that monetary integration involves an evolutionary process starting from exchange rate policy coordination to a regional common currency, ACU (Asian Currency Unit) for example, and will eventually converge to Asia's single currency. To achieve these challenging objectives, member countries are required to coordinate their monetary and exchange rate policy at the early stage.

Exchange rate coordination in East Asia involves some serious problems. One problem is that countries in this region maintain very different relations with non-regional trading partners such as Europe and the U.S. The Philippines, for example, is more oriented in trade towards the U.S. than Thailand which is oriented more towards Europe. Another problem is that countries can manipulate their exchange rates for different reasons. Commodity-producing countries can manipulate exchange rates in order to lower the burden for exports of non-commodity sectors. These asymmetries existing in East Asia make regional exchange rate coordination extremely difficult although it is not impossible.

Given the problems and bottlenecks associated with monetary and exchange rate coordination among many countries in East Asia, the three countries, China, Japan, and Korea may handle the regional exchange rate coordination problem relatively well. As was indicated earlier, participating countries will have to forego some of its control over domestic economic variables. Nonetheless the three countries have potentially strong reasons to coordinate their exchange rate policy. Most of all, the potential gain from prevention of competitive devaluation is enormous. Moreover, the three countries currently face a serious issue of holding excess foreign exchange reserves. This may cause a regional instability. An arbitrary manipulation of foreign exchange reserves would easily disturb the international foreign exchange markets. Excess holdings of foreign exchange reserves undoubtedly forego valuable investment opportunities. As of August 2009, China held about $2 trillion, Japan near $1 trillion, and Korea over $250 billion.

□. The Model of the Optimum Currency Weights

In this section, we propose a currency-basket approach to exchange rate coordination among China, Japan, and Korea. When the three central banks intervene in their exchange rate determination, each authority needs to know its own target exchange rate as well as other rivals' target exchange rates. The target or benchmark exchange

rate for each country can take the form of a currency basket. The practical issues that each central bank confronts are: (1) which currencies are included in the basket and (2) what weights are assigned to each basket currency. These issues are quite different than those involved in the establishment of the region's common currency, which has been addressed by Ogawa and Ito (2000), Kawai (2002), and Zhang Bin (2006).

Let us suppose that countries in East Asia adopt a special basket-currency formula to use it as a target exchange rate. Once the target exchange rate is formulated, we compare the actual and the target rate. We assume that they consider five major currencies in determining their target exchange rate. They are: the US dollar($), the euro(€), the Japanese yen(¥), the Chinese yuan(￥), and the Korean won(₩).

In this paper, we assume that China, Japan, and Korea adopt a basket-currency formula as the target exchange rate and derive a theoretical model of optimum currency weights. We allow each country to have different currencies in its currency basket. For China, the percentage change in the yuan/dollar exchange rate is decomposed into the percentage changes in three exchange rates -- the euro/dollar rate, the yen/dollar rate, and the won/dollar rate.

At this point, it should be noted that currency weights for each basket play some role in establishing the country's target exchange rate formula. One would want to benchmark the most stable exchange rate as the target exchange rate. On this ground, we try to derive the optimum currency weights by minimizing the variance of the basket exchange rate for each country.

$$\%\Delta S = a\%\Delta\left(\frac{ER}{UD}\right) + b\%\Delta\left(\frac{JY}{UD}\right) + c\%\Delta\left(\frac{CY}{UD}\right) \qquad -(1)$$

In equation (1), *%ΔS denotes the percentage change in the target won-dollar exchange rate,* $\%\Delta\left(\frac{ER}{UD}\right)$, the percentage change in the euro-dollar rate, $\%\Delta\left(\frac{JY}{UD}\right)$, the percentage change in the yen-dollar rate, and $\%\Delta\left(\frac{CY}{UD}\right)$, the percentage change in the yuan-dollar rate. Also a, b, and c refer to the weight of each currency in the basket and the sum of the three weights is assumed to be unity.

To derive the optimum weights for basket currencies, we set up an objective function as expressed in (2). The objective is to minimize the variance of the percentage in the target rate. Then the conditions for variance minimization yield the optimum currency weights.

$$Var(K) = Var(aX_1 + bX_2 + cX_3) \qquad -(2)$$

In (2) "K" denotes the percentage change in the target won-dollar exchange rate, "S" and X , X , and X represent the percentage change in the euro-dollar rate, the yen-dollar rate, and the yuan-dollar rate respectively. Now our final objective function may be set up as in (3).

$$L = Min\ Var(K) = Var(aX_1 + bX_2 + cX_3) \qquad -(3)$$

where a+b+c=1.

Using the properties of variance and covariance, we can change (3) to (4).

$$\begin{aligned} Var(aX_1 + bX_2 + cX_3) = {} & a^2 Var(X_1) + b^2 Var(X_2) + c^2 Var(X_3) \\ & + 2ab\,Cov(X_1, X_2) + 2ac\,Cov(X_1, X_3) + 2bc\,Cov(X_2, X_3) \\ = {} & a^2 Var(X_1) + b^2 Var(X_2) \\ & + (1 + a^2 + b^2 - 2a + 2ab - 2b)\,Var(X_3) \\ & + 2ab\,Cov(X_1, X_2) + 2(a - a^2 - ab)\,Cov(X_1, X_3) \\ & + 2(b - b^2 - ab)\,Cov(X_2, X_3) \end{aligned} \qquad -(4)$$

Totally differentiating (4) with respect to "a" and setting its value to zero yields (5) as below.

$$\begin{aligned} \frac{\partial L}{\partial a} = {} & 2a\,Var(X_1) + (2a - 2 + 2b)\,Var(X_3) + 2b\,Cov(X_1, X_2) \\ & + (2 - 4a - 2b)\,Cov(X_1, X_3) - 2b\,Cov(X_2, X_3) = 0 \end{aligned} \qquad -(5)$$

Rearranging the terms in equation (5) yields (6).

$$\begin{aligned} & a\left[Var(X_1) + Var(X_3) - 2Cov(X_1, X_3)\right] + b\left[Var(X_3) + Cov(X_1, X_2) - Cov(X_2, X_3)\right] \\ & = Var(X_3) - Cov(X_1, X_3) \end{aligned} \qquad -(6)$$

Now totally differentiating (4) with respect to "b" yields (7).

$$a\left[Var(X_3)+Cov(X_1,X_2)-Cov(X_2,X_3)-Cov(X_1,X_3)\right]$$
$$+b\left[Var(X_2)+Var(X_3)-2Cov(X_1,X_3)\right]=Var(X_3)-Cov(X_2,X_3) \quad -(7)$$

Simplifying (6) and (7) generates (8) and (9) respectively.

$$M = Var(X_3) - Cov(X_1,X_3)$$
$$N = Var(X_3) - Cov(X_2,X_3)$$
$$X = Var(X_1) + Var(X_3) - 2Cov(X_1,X_3)$$
$$Y = Var(X_3) + Cov(X_1,X_2) - Cov(X_2,X_3) - Cov(X_1,X_3)$$
$$Z = Var(X_2) + Var(X_3) - 2Cov(X_2,X_3)$$

$$aX + bY = M \quad -(8)$$
$$aY + bZ = N \quad -(9)$$

Using the Cramer's rule, we can derive the optimum currency weights that are made up by the multiple terms of variance and covariance as shown in (10), (11), and (12).

$$a^* = \frac{MZ - VY}{MZ - YZ} \quad -(10)$$
$$b^* = \frac{NX - MY}{XZ - Y^2} \quad -(11)$$
$$c^* = 1 - a^* - b^* = \frac{XZ - Y^2 - MZ + NY - NX + MY}{XZ - Y^2} \quad -(12)$$

In the same manner, we can establish the target exchange rate formula for Japan and China as expressed in (13) and (14).

$$J = \%\Delta\left(\frac{JY}{UD}\right) = \beta_1\%\Delta\left(\frac{ER}{UD}\right) + \beta_2\%\Delta\left(\frac{CY}{UD}\right) + \beta_3\%\Delta\left(\frac{KW}{UD}\right) \quad -(13)$$

$$C = \%\Delta\left(\frac{CY}{UD}\right) = \gamma_1\%\Delta\left(\frac{ER}{UD}\right) + \gamma_2\%\Delta\left(\frac{JY}{UD}\right) + \gamma_3\%\Delta\left(\frac{KW}{UD}\right) \quad -(14)$$

Then we can set up the two countries' objective functions minimizing the variance of their target exchange rate.

The objective function for Japan, Min Var(J) and that for China, Min Var(C) can be set up as

shown in (15) and (16).

$$Min\ Var(J) = Var(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3)$$
$$= Var\left[\beta_1 \%\Delta(\frac{ER}{UD}) + \beta_2 \%\Delta(\frac{CY}{UD}) + \beta_3 \%\Delta(\frac{KW}{UD})\right]$$
$$where\ \beta_1+\beta_2+\beta_3=1 \qquad \text{-(15)}$$

$$Min\ Var(C) = Var\left[\gamma_1 \%\Delta(\frac{ER}{UD}) + \gamma_2 \%\Delta(\frac{JY}{UD}) + \gamma_3 \%\Delta(\frac{KW}{UD})\right]$$
$$where\ \gamma_1+\gamma_2+\gamma_3=1 \qquad \text{–(16)}$$

Again, totally differentiating (15) and (16) with respect to currency weights and settings the results to zero will yield the optimum currency weights for Japan and China such as $\beta_1^*, \beta_2^*, \beta_3^*$ and $\gamma_1^*, \gamma_2^*, \gamma_3^*$.

In reality each government may include different currencies in the currency basket. Once the target basket currencies are decided, however, the optimum currency weights can be derived in the same way as introduced above.

Then the actual values of $a^* b^* c^*$ are derived as follows.

$$MZ - NY = Var(X_1)Var(X_3) - Var(X_2)Cov(X_1,X_3) - Var(X_3)Cov(X_1,X_2)$$
$$+ Cov(X_1,X_3)Cov(X_2,X_3) + Cov(X_1,X_2)Cov(X_2,X_3) - Cov^2(X_2,X_3)$$

The value of $XZ - Y^2$ is :

$$\cdot Var(X_1)Var(X_2) + Var(X_1)Var(X_3) + Var(X_2)Var(X_3)$$
$$- 2\,Var(X_1)Cov(X_2,X_3) + Var(X_2)Cov(X_1,X_3) + Var(X_3)Cov(X_1,X_2)$$
$$+ 2\,Cov(X_1,X_3)Cov(X_2,X_3) + Cov(X_1,X_2)Cov(X_2,X_3 + Cov(X_1,X_3)Cov(X_1,X_3)$$
$$- Cov^2(X_1,X_2) - Cov(X_2,X_3) - Cov^2(X_1,X_3)$$

The value of b^* is $\dfrac{NX - MY}{XZ - Y^2}$ where the value of ***NX-MY*** is:

$$Var(X_1)Var(X_3) - Var(X_1)Cov(X_2,X_3) - Var(X_3)Cov(X_1,X_2)$$
$$+ Cov(X_1,X_3)Cov(X_2,X_3) + Cov(X_1,X_2)Cov(X_1,X_3) - Cov^2(X_1,X_3)$$

Therefore, $c^* = 1\text{-}a^*\text{-}b^*$ which is equal to:

$$\frac{XZ - Y^2 - MZ + NY - MY}{XZ - Y^2}$$

The numerator can be expressed as follows:

$$Var(X_1)Var(X_2) - Var(X_1)Cov(X_2,X_3) + Cov(X_1,X_3)Cov(X_2,X_3)$$
$$- Cov^2(X_1,X_2) + 2\,Var(X_2)Cov(X_1,X_3) + 3\,Var(X_3)Cov(X_1,X_2)$$

If we assume that the values of the covariance are all zero, the results can be expressed much simpler as below:

$$a^* = \frac{\text{var}(x_2)\,\text{var}(x_3)}{\text{var}(x_1)\,\text{var}(x_2) + \text{var}(x_1)\,\text{var}(x_3) + \text{var}(x_2)\,\text{var}(x_3)}$$

$$b^* = \frac{\text{var}(x_1)\,\text{var}(x_3)}{\text{var}(x_1)\,\text{var}(x_2) + \text{var}(x_1)\,\text{var}(x_3) + \text{var}(x_2)\,\text{var}(x_3)}$$

$$c^* = \frac{\text{var}(x_1)\,\text{var}(x_2)}{\text{var}(x_1)\,\text{var}(x_2) + \text{var}(x_1)\,\text{var}(x_3) + \text{var}(x_2)\,\text{var}(x_3)}$$

IV. Empirical Estimation

In this section we conduct empirical work to compute the optimum weights for the currencies in the basket and we show how closely the actual exchange rate moves with the target exchange rate. In the Korean currency basket are there four currencies. This means that the target Won-Dollar rate is influenced by the three exchange rates, namely, the Euro-Dollar rate, the Yen-Dollar rate, and the Yuan-Dollar rate. So we try to get the optimum weights for these three rates. In order not to miss the covariance effect, we use equations (10), (11), and (12).

In our empirical analysis, we used the monthly data. The sample period is a two-year period starting from July 2005 which is the month of China's switch from its US dollar peg system to a more flexible currency basket system. The sample period can be

extended but we proceeded to the next stage of analysis. We collected the time series data for the Won-Dollar rate, the Euro-Dollar rate, the Yen-Dollar rate, and the Yuan-Dollar rate. Then we assigned a weight to each of the three exchange rates. All countries do not have to put only three external currencies in their basket. However, we made a simple assumption that each country considers only three foreign currencies in its currency basket.

The Table 1-A and Table 1-B indicate the original data for the three exchange rates which involve four currencies. By using the variance- minimization method, we tried to compute the optimum weights for the exchange rates in the Korean basket, **α1, α2 and α3.** Also we used the same method to compute the values of **β 1, β2, β3** and **γ1, γ2, γ3.** Table 2 reports the estimation results.

<Table 1-A>The Percentage Changes in the Yen/Dollar and Yuan/Dollar Rates

Period	The Yen/Dollar Rate		The Yuan/Dollar Rate	
	Exchange Rate	Percentage Change	Exchange Rate	Percentage Change
2005/07	111.89		8.23	
2005/08	110.78	-0.9920	8.10	-1.5421
2005/09	111.03	0.2257	8.09	-0.1185
2005/10	114.86	3.4495	8.09	-0.0371
2005/11	118.34	3.0298	8.08	-0.0680
2005/12	118.56	0.1859	8.08	-0.0965
2006/01	115.53	-2.5557	8.07	-0.1114
2006/02	117.97	2.1120	8.05	-0.1884
2006/03	117.30	-0.5679	8.04	-0.2000
2006/04	117.14	-0.1364	8.02	-0.2514
2006/05	111.68	-4.6110	8.01	-0.0137
2006/06	114.67	2.6773	8.01	-0.0861
2006/07	115.68	0.8808	7.99	-0.1986
2006/08	115.79	0.0951	7.97	-0.2340
2006/09	117.12	1.1486	7.94	-0.4252
2006/10	118.81	1.4430	7.91	-0.4257
2006/11	117.32	-1.2541	7.87	-0.4883
2006/12	117.16	-0.1364	7.83	-0.5237
2007/01	120.37	2.7398	7.79	-0.4179
2007/02	120.63	0.2160	7.75	-0.5082
2007/03	117.21	-2.8351	7.74	-0.1909
2007/04	118.87	1.4163	7.73	-0.1602
2007/05	120.74	1.5731	7.68	-0.6239
2007/06	122.63	1.5653	7.63	-0.5913

<Table 1-B>The Percentage Rates in the Euro/Dollar and Won/Dollar Rates

Period	The Dollar/ Euro Rate	The Euro/Dollar Rate		The Won/Dollar Rate	
	Exchange Rate	Exchange Rate	Percentage Change	Exchange Rate	Percentage Change
2005/07	1.2			1307.44	
2005/08	1.23	0.81	2.0010	1021.17	-1.5683
2005/09	1.23	0.82	-0.1954	1029.33	0.7991
2005/10	1.2	0.83	-1.9330	1046.25	1.6438
2005/11	1.18	0.85	-1.8546	1041.43	-0.4607
2005/12	1.19	0.84	0.4491	1024.15	-1.6593
2006/01	1.21	0.83	2.1259	987.03	-3.6245
2006/02	1.2	0.84	-1.2638	970.22	-1.7031
2006/03	1.2	0.83	0.6275	975.09	0.5019
2006/04	1.23	0.82	1.9122	954.44	-2.1178
2006/05	1.28	0.78	4.1279	941.40	-1.3662
2006/06	1.27	0.79	-0.8540	955.16	1.4617
2006/07	1.27	0.79	0.3161	950.15	-0.5245
2006/08	1.28	0.78	0.8980	960.72	1.1125
2006/09	1.27	0.79	-0.5543	953.68	-0.7328
2006/10	1.26	0.79	-1.0755	954.23	0.0577
2006/11	1.29	0.78	2.1665	936.22	-1.8874
2006/12	1.32	0.76	2.5944	925.75	-1.1183
2007/01	1.3	0.77	-1.5975	936.36	1.1461
2007/02	1.31	0.76	0.5924	937.02	0.0705
2007/03	1.32	0.76	1.3079	943.26	0.6659
2007/04	1.35	0.74	1.9404	931.50	-1.2467
2007/05	1.35	0.74	0.0963	927.91	-0.3854
2007/06	1.34	0.75	-0.7769	928.32	0.0442

<Table2> Optimal Currency Weights for Korea, Japan, and China

Korea		Japan		China	
α_1	0.0377988	β_1	0.0233790	γ_1	0.3903563
α_2	0.0181902	β_2	0.5762066	γ_2	0.1071897
α_3	0.9440110	β_3	0.4004144	γ_3	0.5024540

Notes: 1. α's, β's, γ's are the currency weights for Korea, Japan and China.

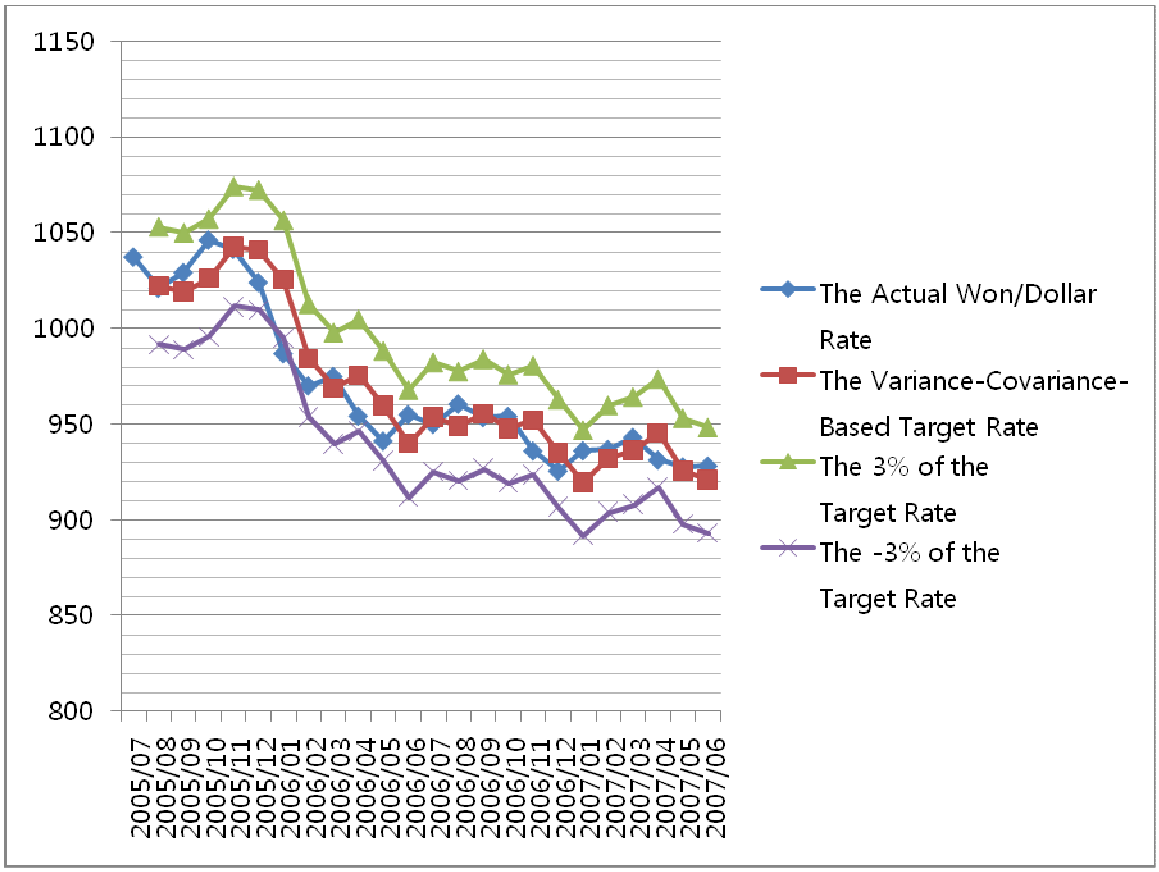
2. "a", "b", "c" in the text change to α_1, α_2 and α_3 for Korea.

<Table 3> Korea's Actual Won/Dollar Rate, the Variance-Covariance-Based Target Rate, the ±103% of the Target Rate

Period	The Actual Won/Dollar Rate	The Variance-Covariance-Based Target Rate	The 103% of the Target Rate	The -103% of the Target Rate
2005/07	1037.44			
2005/08	1021.17	1022.45	1053.124	991.7765
2005/09	1029.33	1019.498	1050.083	988.9131
2005/10	1046.25	1026.458	1057.252	995.6643
2005/11	1041.43	1042.956	1074.245	1011.667
2005/12	1024.15	1041.204	1072.44	1009.968
2006/01	987.03	1025.805	1056.579	995.0309
2006/02	970.22	984.334	1012.834	953.834
2006/03	975.09	968.9053	997.9725	939.8381
2006/04	954.44	975.5922	1004.86	946.3244
2006/05	941.4	959.6224	988.4111	930.8337
2006/06	955.16	939.8986	968.0956	911.7016
2006/07	950.15	953.8439	982.4592	925.2286
2006/08	960.72	949.1864	977.662	920.7108
2006/09	953.68	955.4514	984.1149	926.7879
2006/10	954.23	947.6175	976.046	919.189
2006/11	936.22	952.1673	980.7323	923.6023
2006/12	925.75	934.8995	962.9465	906.8525
2007/01	936.36	919.474	947.0582	891.8898

2007/02	937.02	931.9881	959.9477	904.0285
2007/03	943.26	936.228	964.3095	908.1361
2007/04	931.5	945.3131	973.6725	916.9537
2007/05	927.91	925.5314	953.2973	897.7655
2007/06	928.32	920.8088	948.4331	893.1845

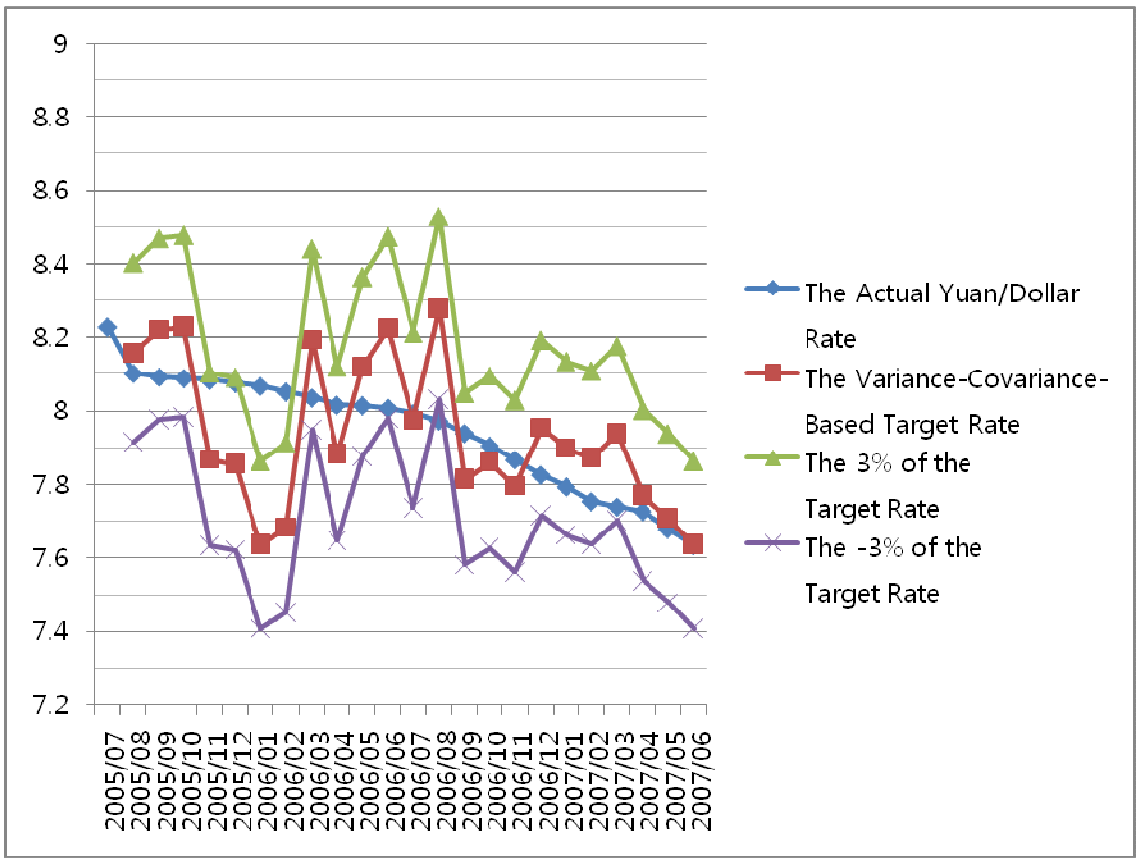
<Figure5> Korea's Actual Won/Dollar Rate, Variance-Covariance-Based Target Rate, ±103% of the Target Rate



<Table6> China's Actual Yuan/Dollar Rate, the Variance-Covariance-Based Target Rate, the ±103% of the Target Rate

Period	The Actual Yuan/Dollar Rate	The Variance-Covariance-Based Target Rate	The103% of the Target Rate	The -103% of the Target Rate
2005/07	8.229			
2005/08	8.1021	8.15804	8.402781	7.913299
2005/09	8.0925	8.221521	8.468167	7.974875
2005/10	8.0895	8.229743	8.476635	7.982851
2005/11	8.084	7.868001	8.104041	7.631961
2005/12	8.0762	7.855936	8.091614	7.620258
2006/01	8.0672	7.635121	7.864175	7.406067
2006/02	8.052	7.682743	7.913225	7.452261
2006/03	8.0359	8.193781	8.439594	7.947968
2006/04	8.0157	7.883408	8.11991	7.646906
2006/05	8.0146	8.120608	8.364226	7.87699
2006/06	8.0077	8.225619	8.472388	7.97885
2006/07	7.9918	7.973965	8.213184	7.734746
2006/08	7.9731	8.279517	8.527903	8.031131
2006/09	7.9392	7.814229	8.048656	7.579802
2006/10	7.9054	7.861387	8.097229	7.625545
2006/11	7.8668	7.795722	8.029594	7.56185
2006/12	7.8256	7.954054	8.192676	7.715432
2007/01	7.7929	7.898467	8.135421	7.661513
2007/02	7.7533	7.872713	8.108894	7.636532
2007/03	7.7385	7.939052	8.177224	7.70088
2007/04	7.7261	7.770035	8.003136	7.536934
2007/05	7.6779	7.707726	7.938958	7.476494
2007/06	7.6325	7.635436	7.864499	7.406373

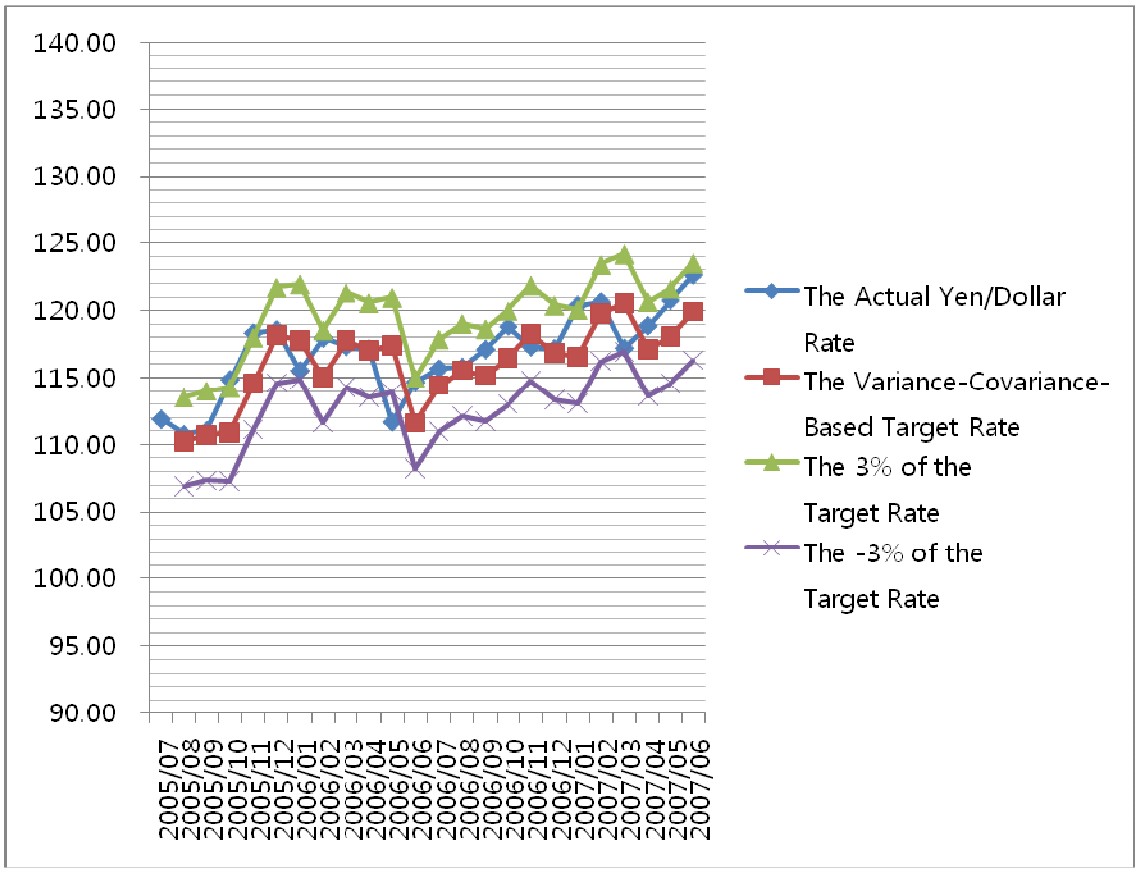
<Figure7> China's Actual Yuan/Dollar Rate, Variance-Covariance-Based Target Rate, ±103% of the Target Rate



<Table8> Japan's Actual Yen/Dollar Rate, the Variance-Covariance-Based Target Rate, the ±103% of the Target Rate

Period	The Actual Yen/Dollar Rate	The Variance-Covariance-Based Target Rate	The 103% of the Target Rate	The -103% of the Target Rate
2005/07	111.89			
2005/08	110.78	110.2034	113.5095	106.8973
2005/09	111.03	110.6756	113.9959	107.3553
2005/10	114.86	110.9009	114.2279	107.2739
2005/11	118.34	114.5625	117.9994	111.1256
2005/12	118.56	118.1581	121.7028	114.6134
2006/01	115.53	117.8236	121.9482	114.8444
2006/02	117.97	115.0679	118.5199	111.6159
2006/03	117.30	117.8236	121.3583	114.2889
2006/04	117.14	117.0471	120.5585	113.5357
2006/05	111.68	117.4347	120.9577	113.9117
2006/06	114.67	111.5893	114.9370	108.2416
2006/07	115.68	114.4329	117.8659	110.9999
2006/08	115.79	115.5621	119.0290	112.0952
2006/09	117.12	115.1795	118.6349	111.7241
2006/10	118.81	116.5001	119.9951	113.0051
2006/11	117.32	118.3042	121.8533	114.7551
2006/12	117.16	116.8696	120.3757	113.3635
2007/01	120.37	116.5666	120.0636	113.0696
2007/02	120.63	119.8057	123.3999	116.2115
2007/03	117.21	120.5722	124.1894	116.9550
2007/04	118.87	117.1273	120.6411	113.6135
2007/05	120.74	118.0901	121.6328	114.5474
2007/06	122.63	119.9258	123.5236	116.3280

<Figure9> Japan's Actual Yen/Dollar Rate, the Variance-Covariance-Based Target Rate, the ±103% of the Target Rate



V. Conclusion

In this paper we developed a basis for exchange rate policy coordination for three countries, China, Japan, and Korea. We suggested that in managing the exchange rate, the three countries should establish the common rules for exchange rate intervention and proposed that for regional exchange rate stability, each country may use the optimum currency –basket rate as the target exchange rate. We argue that in formulating the target exchange rate, the three countries need to cooperate with one another.

Once the number of currencies in the basket is agreed upon, each country will have to decide the appropriate weights for the basket currencies. To obtain the optimum weights for the currencies for each country, we used the variance-minimization technique. We derived a formula for optimum currency weights by minimizing the variance of the percentage changes of the target exchange rate. Through empirical analysis, we obtained the result that the actual exchange rate of each country tends to fall within a range of plus- minus 3 percent around its target exchange rate.

In this study, we assumed that each country adopted one basket and four currencies so that three exchange rates are considered. In reality, however, the number of basket currencies may change depending on the economic conditions of each country. Also the number of baskets can be more than one.

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