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AMU Deviation Indicator for Coordinated Exchange Rate Policies in East Asia and its Relation with Effective Exchange Rates[♣]

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Abstract:

The monetary authorities in East Asian countries have been strengthening their regional monetary cooperation since the Asian Currency Crisis in 1997. In this paper, we propose a deviation measurement for coordinated exchange rate policies in East Asia to enhance the monetary authorities' surveillance process for their regional monetary cooperation. We calculate the AMU as a weighted average of East Asian currencies following the method used to calculate the European Currency Unit (ECU) and the AMU Deviation Indicators, which how the degree of deviation from the hypothetical benchmark rate for each of the East Asian currencies in terms of the AMU.

Furthermore, we investigate the relationships between the AMU and its Deviation Indicators and the effective exchange rates of each East Asian currency. As a result, we found the strong relationships between the AMU or the AMU Deviation Indicators and the effective exchange rates except for some currencies. These results indicate that the AMU Deviation Indicators have positive relationship with their effective exchange rates. Accordingly, we should monitor both the AMU and the AMU Deviation Indicator for the monetary authorities' surveillance in order to stabilize effective exchange rate in terms of trader partners' currencies.

Keywords: AMU (Asian Monetary Unit), deviation indicator, surveillance process, exchange rate policies and effective exchange rate (EER)

JEL Classification Codes: E58, F31 and F33

1. Introduction

The monetary authorities of East Asian countries have been strengthening their regional monetary cooperation since the Asian currency crisis of 1997. This monetary cooperation after the crisis resulted in the Chiang Mai Initiative (CMI), which was launched by the ASEAN + 3 (Japan, Korea, and China) as a network of bilateral and multilateral swap arrangements to deal with a currency crisis in member countries.

The CMI calls on the region's monetary authorities to monitor exchange rate movements and in our study we propose a possible way in which an Asian Monetary Unit (AMU) could be constructed and develop AMU Deviation Indicators. These should help to coordinate exchange rate policies in East Asia, thereby enhancing the monetary authorities' surveillance capabilities. Ogawa and Shimizu (2005) calculate the AMU as a weighted average of East Asian currencies following the method used to calculate the European Currency Unit (ECU) adopted by EU countries under the European Monetary System (EMS) prior to the introduction of the euro. The AMU Deviation Indicator for each East Asian currency is calculated to show the degree of deviation from the hypothetical benchmark rate for each of the

East Asian currencies in terms of the AMU.[1]

Ogawa and Shimizu (2005) calculated some candidates for an AMU in East Asia according to the method used to calculate the ECU and compared them from a viewpoint of stability of a value of the AMU in terms of a weighted average of the US dollar and the euro. Based on the results, we provide two indicators: a Nominal AMU Deviation Indicator on a daily basis; and a Real AMU Deviation Indicator on a monthly basis, which is adjusted for differences in inflation. The Real AMU Deviation Indicator is more appropriate for monitoring the effects of changes in exchange rates on the real economy, while the Nominal AMU Deviation Indicator is more useful for monitoring their day-to-day deviations from the AMU.

In this paper, we investigate the relationships between the AMU and its Deviation Indicators and the effective exchange rates of each East Asian currency. It is regarded that a value of the combination of the AMU, which is quoted in terms of a weighted average of the US dollar and the euro, and its Deviation Indicator should be a proxy of its effective exchange rate in terms of currencies of the rest of

[1] We propose the creation of an Asian Monetary Unit (AMU) and AMU Deviation Indicators for East Asian currencies as a result of a joint project of the RIETI and Hi-Stat (see website on the RIETI http://www.rieti.go.jp/users/amu/en/index.html).

world for each the East Asian currencies. Although in the case of the AMU and the AMU Deviation Indicators, it is supposed that all of the relevant East Asian currencies have the same shares on each currency of the rest of the world. Accordingly, we should check how strong relationship each East Asian currency has between the combination of the AMU and its Deviation Indicator and its effective exchange rate.

The reminder of this paper consists of the following sections. Section 2 describes our method to estimate the AMU and Section 3 calculates nominal and real deviation indicators for each of the East Asian currencies from the AMU. Section 4 investigates the relationships of each East Asian effective exchange rate with AMU and AMU Deviation Indicators. The final section offers concluding remarks.

2. Calculating the value of the AMU

We choose the ASEAN10+3 currencies as the component currencies of the AMU. The ASEAN10+3 is composed of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam, Japan, South Korea, and China.

The weight of each currency in the basket is based on countries' respective share in regional GDP measured at PPP and their trade volume share (the sum of exports and imports) in 2001-2003 in order to reflect the most recent trade relationships and economic conditions of the 13 East Asian countries for calculation of the AMU.[2]

We should quote the value of the AMU in terms of a weighted average of the US dollar and the euro because both the United States and EU countries are important trading partners for East Asia. The weighted average of the US dollar and the euro (hereafter, US$-euro) is based on the East Asian countries' trade volumes with the United States and the euro area. The weights on the US dollar and the euro are set at 65% and 35%, respectively[3].

Next, we choose a benchmark period in order to calculate AMU Deviation Indicators based on the following criterion: the total trade balance of member

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[2] In Ogawa and Shimizu(2005), we examined four different kinds of economic size indicators, which are 1.Trade volume, 2.Nominal GDP, 3.GDP measured at Purchasing Power Parity (PPP), 4.International reserves (minus Gold). From the standpoint of stability vis-à-vis the US$-euro basket currency, we choose PPP measured GDP and trade volume as the indicators of weights.

[3] We calculate the average trade volumes from 2001to 2003.

countries, the total trade balance of member countries (excluding Japan) with Japan, and the total trade balance of member countries with the rest of world should be close to zero.

Table 1, which shows the trade accounts of the 13 East Asian countries from 1990 to 2003, indicates that the trade accounts were closest to balance in 2001. Assuming a one-year time lag before changes in exchange rates affect trade volumes, we should choose 2000 and 2001 as the benchmark period. For the benchmark period, the exchange rate of the AMU in terms of the US$-euro is set at unity. We define the exchange rate of each East Asian currency in terms of the AMU during the benchmark period as the Benchmark Exchange Rate.

In summary, the AMU weights are calculated based on both the arithmetic shares of trade volumes and GDP measured at PPP for 2001-2003. The Benchmark Exchange Rate for each currency is defined in terms of the AMU during 2000-2001. We define the nominal exchange rate of the AMU in terms of the US$-euro as the weighted sum of each country's US$-euro exchange rate using the AMU weights in Table 2, which shows the AMU weights as well as trade volumes, GDP measured at PPP, arithmetic shares, and the Benchmark Exchange Rates. We can use them to

calculate an exchange rate for the AMU in terms of the US$-euro as follows[4]:

$$
\begin{aligned}
US\$ / euro/_{AMU} = {} & 0.0069\, US\$ / euro/_{BN\$} + 7.4235\, US\$ / euro/_{CBR} + 2.7711\, US\$ / euro/_{CNY} \\
& + 452.7871\, US\$ / euro/_{IDR} + 30.5681\, US\$ / euro/_{JPY} + 113.1459\, US\$ / euro/_{KRW} \\
& + 5.9500\, US\$ / euro/_{LOK} + 0.1953\, US\$ / euro/_{MLR} + 0.0239\, US\$ / euro/_{MYK} \\
& + 1.3347\, US\$ / euro/_{PLP} + 0.1075\, US\$ / euro/_{SP\$} + 2.0630\, US\$ / euro/_{TLB} \\
& + 243.0432\, US\$ / euro/_{VTD}
\end{aligned}
$$

Figure 1 shows daily movements in the nominal exchange rate of the AMU in terms of the US$-euro. For reference, we add daily movements in both of the nominal exchange rates of the AMU in terms of the US dollar and the euro.

Also, we can show exchange rates of the East Asian currencies in terms of the AMU. We can compare their movements with those of exchange rates of the East Asian currencies in terms of the US dollar and the euro. For example, Figure 2 shows movements in exchange rates of the Japanese yen in terms of the AMU, the US dollar, and the euro. The exchange rate of the Japanese yen in terms of the AMU (yen / AMU) is affected by movements in the exchange rates of a weighted average of exchange rates of the US dollar and the euro in terms of the AMU

[4] BN$=Brunei dollar, CBR=Cambodia riel, CNY=Chinese yuan, IDR=Indonesian rupiah, JPY=Japanese yen, KRW=Korean won, LOK=Laos kip, MLR=Malaysian ringgit, MYK=Myanmar kyat, PLP=Philippine peso, SP$=Singapore dollar, TLB=Thailand baht, VTD=Vietnamese dong

($US\$euro/AMU$) because the reciprocal of the yen/AMU (AMU/yen) is a product of $US\$euro/AMU$ and a weighted average of $US\$/yen$ and $euro/yen$ as shown in the following equation:

$$\frac{yen}{AMU}=\frac{\frac{US\$euro}{AMU}}{\frac{US\$euro}{yen}}=\frac{\frac{US\$euro}{AMU}}{w\frac{US\$}{yen}+(1-w)\frac{euro}{yen}}$$

$$\frac{1}{\frac{AMU}{yen}}=\frac{US\$euro}{AMU}\left(\frac{1}{w\frac{US\$}{yen}+(1-w)\frac{euro}{yen}}\right)$$

where w : weight of the US dollar of the US$-euro currency basket (65 %), 1-w : weight of the euro of US$-euro currency basket (35 %).

3. Calculating Nominal and Real Deviation Indicators

We use the nominal exchange rate of each East Asian currency in terms of the AMU to calculate a Nominal AMU Deviation Indicator (%). It indicates how far each East Asian currency i deviates from the Benchmark Exchange Rate in terms of the AMU, which is a weighted average of East Asian currencies.[5] The Nominal AMU Deviation Indicator is calculated as follows:

[5] Please see the Appendix about the relationship between the AMU Deviation Indicators and the actual exchange rate.

$$\text{Nominal Deviation Indicator (\%)} = \frac{\text{actual exchange rate of AMU/a currency} - \text{benchmark exchange rate of AMU/a currency}}{\text{benchmark exchange rate of AMU/a currency}} \times 100 \quad (1)$$

Figures 3 and 4 show movements in the Nominal AMU Deviation Indicators on a daily and monthly basis, respectively.

Next, we calculate an AMU Deviation Indicator in real terms by taking into account inflation rate differentials. Given that the Nominal AMU Deviation Indicator is defined as equation (1), we calculate a Real AMU Deviation Indicator according to the following equation:

$$\text{Rate of Change in Real AMU Deviation Indicator}_i = \text{Rate of Change in Nominal AMU Deviation Indicator}_i - \left(\dot{P}_{AMU} - \dot{P}_i\right) \quad (2)$$

where $\dot{P}_{AMU}$: inflation rate in the AMU area, $\dot{P}_i$: inflation rate in country *i*.

We use the Consumer Price Index (CPI) to calculate the Real AMU Deviation Index, which can therefore only be computed on a monthly basis with a 5 to 6 month time lag due to data constraints.[6] As for the inflation rate in the AMU area, we

[6] CPI data are used as the price index because in some of the countries no other price data are available. There is also a 5 to 6 month time lag until CPI data for all countries are available.

calculate a weighted average of the CPI for the AMU area using the AMU shares. Figure 4 shows the movement in the Real AMU Deviation Indicator on a monthly basis for each of the East Asian currencies.

When we look at the Real AMU Deviation Indicator, we find that inflation makes the related currency appreciate in real terms while deflation makes it depreciate in real terms. For example, while the Indonesian rupiah, the Laos kip, and the Korean won have appreciating in nominal terms, they have larger depreciating deviation in real terms. On one hand, while the Philippine peso and Vietnamese dong have over 10 percent depreciating in nominal terms, they have smaller depreciating deviation in real terms. These findings indicate that we have to monitor both the nominal and real deviation indicators carefully for surveillance over intra-regional exchange rates among the East Asian countries. Especially, the Chinese yuan has the largest depreciating deviation in real terms in June 2003 in the case of AMU with GDP measured at PPP (May and June 2003 in the case of AMU with trade volume) although it has not so largely depreciating deviation in nominal terms. In contrast, the Japanese yen appreciates by nearly 5 percent in 2004 in nominal term although it stays around 0 or even depreciates in real terms

due to deflation in Japanese economy.[7] Furthermore, both Figure 6 and Figure 7 show that the East Asian currencies have over 40 percent of deviations between the most overvalued and the most undervalued currencies in real terms. Misalignments among the East Asian currencies are larger in real terms than those in nominal terms.

We consider what are merits and demerits for each of the nominal and real deviation indicators. From the viewpoint of data frequency, nominal deviation indicators can be monitored in real time. We are able to use them as the indicator of daily surveillance for the monetary authorities. On the other hand, real deviation indicators are available only on a monthly basis and there might be some time lags when we obtain the real deviation indicators.[8]

The Real AMU Deviation Indicator is more appropriate when considering the effects of exchanges on real economic variables such as trade volumes and real GDP. On the other hand, the Nominal AMU Deviation Indicator is more useful when it is

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[7] For the differences of nominal and real deviation indicators of the Indonesian rupiah, the Chinese yuan and the Japanese yen, please see the Figures 8, 9, and 10, respectively.

[8] Due to the data constraints, the Real AMU Deviation Indicator is available with 5 or 6 months lag.

important to monitor exchange rate movements on a timely basis. Accordingly, the Nominal and Real AMU Deviation Indicators should be regarded as complementary measures for the surveillance of exchange rate policy and related macroeconomic variables and, in turn, for devising coordinated exchange rate policies among the East Asian countries.

4. Relationship of the effective exchange rates with the AMU and the AMU Deviation Indicator

In this section, we investigate the relationships between the AMU and its Deviation Indicators and the effective exchange rates of each East Asian currency. It is regarded that a value of the combination of the AMU, which is quoted in terms of a weighted average of the US dollar and the euro, and its Deviation Indicator should be a proxy of its effective exchange rate in terms of currencies of the rest of world for each the East Asian currencies. Although in the case of the AMU and the AMU Deviation Indicators, it is supposed that all of the relevant East Asian currencies have the same shares on each currency of the rest of the world. Accordingly, we should check how strong relationship each East Asian currency has

between the combination of the AMU and its Deviation Indicator and its effective exchange rate. We regress the nominal effective exchange rates of each East Asian currency on the AMU and its Nominal AMU Deviation Indicator in order to investigate how each of the AMU and the AMU Deviation Indicator explain the each nominal effective exchange rate.

The monthly effective exchange rates are calculated using the monthly average of exchange rate (*International Financial Statistics*, IMF) and monthly volumes of export and import (*Direction of Trade Statistics*, IMF).[9] We calculate two types of effective exchange rate. One is an effective exchange rate in terms of currencies of the rest of world ("ROW"), which is calculated by the trade data in terms of the rest of world. It includes at most 180 countries. Figure 6 indicates each of the effective exchange rates of East Asian currencies in terms of the currencies of the rest of world.[10] The other is an effective exchange rate in terms of currencies of the rest of sampled East Asian countries ("ROEA"), which is calculated based on trade data in terms of the rest of sampled East Asian countries. Figure 7 indicates the

[9] We have to mention the great help of Mr. Kawasaki to calculate the effective exchange rates.

[10] We compare the each country's figure with JP Morgan's effective exchange rates, which are widely accepted by international researchers, and both are mostly similar.

intra-effective exchange rate of each of the East Asian currencies.[11]

The sample period covers from January 1999 to December 2004 and its number of observation is 71 after adjusting endpoints. The AMU and the nominal AMU Deviation Indicator are the monthly average of daily calculated AMU and AMU Deviation Indicators, respectively. We estimate the following equation:[12][13]

$$\Delta\left(\log EER_{ROW}\right) = \beta_0 + \beta_1 \cdot \Delta\left(\log AMU\right) + \beta_2 \cdot \Delta\left(AMUDI\right) \quad (3a)$$

$$\Delta\left(\log EER_{ROEA}\right) = \beta_0 + \beta_1 \cdot \Delta\left(\log AMU\right) + \beta_2 \cdot \Delta\left(AMUDI\right) \quad (3b)$$

where EER_{ROW}: effective exchange rate in terms of currencies of the rest of world, EER_{ROEA}: effective exchange rate in terms of currencies of the rest of sampled East Asian countries, AMU: Asian Monetary Unit, AMUDI: AMU Deviation Indicator.

Table 3 and Table 4 show the analytical results using by EER_{ROW} and

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[11] Due to the data constraint, trade data of Singapore against Indonesia is not published and so the effective exchange rate of Singapore does not include the data against Indonesia.

[12] We transpose the data of EER and AMU into the difference of logarithm. We transpose the data of AMU Deviation Indicators into first difference since they are quoted in the percent of change.

[13] If residuals have any serial correlation, we use the Cochran-Orcutt method for the residuals. We show a term of AR(1) that is added in the figure.

EER_{ROEA}, respectively. For the effective exchange rate of the Japanese yen in terms of the "ROW", both the coefficients on AMU and AMU Deviation Indicator are positive and significant. For the effective exchange rate of the Japanese yen in terms of the "ROEA", only the coefficient on AMU Deviation Indicator is positive and significant.

For the effective exchange rate of Chinese yuan in terms of the "ROW", only the coefficient on AMU Deviation Indicator is positive and significant. For the effective exchange rate of the Chinese yuan in terms of the "ROEA", both the coefficients on AMU and AMU Deviation Indicator are positive and significant.

For the effective exchange rate of the Korean won in terms of the "ROW", only the coefficient on AMU is positive and significant. On one hand, there are no significant coefficients on AMU and AMU Deviation Indicator in the case of the effective exchange rate of the Korean won in terms of the "ROEA".

For the both effective exchange rate of the Thai baht in terms of the "ROW" and the "ROEA", only the coefficient on AMU Deviation Indicator is positive and significant.

For the effective exchange rate of the Indonesian rupiah in terms of the "ROW", the coefficient on AMU is significant but negative, and the coefficient on AMU

Deviation Indicator is positive and significant. For the effective exchange rate of Indonesian rupiah in terms of the “ROEA”, both the coefficients on AMU and AMU Deviation Indicator are positive and significant.

For the effective exchange rates of the Malaysian ringgit and the Cambodian riel in terms of the “ROW” and the “ROEA”, only the coefficient on AMU Deviation Indicator is positive and significant..

For the effective exchange rate of the Vietnamese dong in terms of the “ROW”, both the coefficient on AMU and AMU Deviation Indicator are positive and significant, but there are no significant coefficients for the effective exchange rate of the Vietnamese dong in terms of the “ROEA”.

For the both effective exchange rates of the Singaporean dollar, the Philippine peso, the Brunei dollar, the Laos kip and the Myanmar kyat in terms of the “ROW” and the “ROEA”, there are no significant coefficients estimated.

The above analytical results are mixed. For the Japanese yen and the Chinese yuan, most of the coefficients are significant and positive. We suppose that these results are due to the higher weights of both currencies in AMU. The coefficients on AMU Deviation Indicator are positive and significant for the seven East Asian currencies, which are more than half of the sampled East Asian currencies. These

results indicate that the AMU Deviation Indicators have positive relationship with their effective exchange rates for some of the East Asian currencies.

5. Conclusion

In this paper, we investigated the relationships between the Nominal AMU Deviation Indicators and the effective exchange rates. It is regarded that combination of the AMU plus the Nominal AMU Deviation Indicator of each East Asian countries correspond to its effective exchange rate. We conducted regression of the nominal effective exchange rates on both the AMU and the Nominal AMU Deviation Indicator for each currency to investigate how both the change in the AMU and the Nominal AMU Deviation Indicators explain changes in its effective exchange rate.

In the case of the Japanese yen and the Chinese yuan, most of the coefficients are significant and positive. We can explain that these results are due to the higher weights of both the currencies in AMU. The coefficients on AMU Deviation Indicator are positive and significant for the seven East Asian currencies, which are more than half of the sampled East Asian currencies. These results indicate that the

AMU Deviation Indicators have positive relationship with their effective exchange rates for some of the East Asian currencies.

Except for some currencies, the strong relationships are found between the AMU or the AMU Deviation Indicators and the effective exchange rates for some East Asian currencies. Accordingly, we should monitor both the AMU and the AMU Deviation Indicator in order to stabilize effective exchange rate in terms of trader partners' currencies. The avenue for future research may include consideration of the relationship between AMU and AMU Deviation Indicators and some macro economic indicators, such as trade figures. We wish that they will be widely used not only as surveillance criteria but also in future research.

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Table 1. Trade Accounts of ASEAN10 + 3(Japan, South Korea & China)

millions of US$

	with Japan*	within ASEAN+3	with World
1990	-23,437	-1,738	35,513
1991	-33,084	-4,710	56,318
1992	-41,172	-871	87,331
1993	-54,184	-4,995	86,324
1994	-65,089	9,511	1,969,336
1995	-73,856	14,610	2,376,160
1996	-59,680	12,231	2,437,658
1997	-54,531	26,440	236,500
1998	-29,802	12,102	215,241
1999	-32,065	4,791	4,819
2000	-37,239	-6,593	-6,562
2001	-23,997	1,934	1,953
2002	-40,027	12,265	12,289
2003	-55,724	27,701	27,727

Notes: All figures are calculated by the authors. Trade data are from DOTS (IMF) and GDP data are from IFS (IMF).

* The trade account with Japan is the total amount of the trade accounts with 12 East Asian countries vis-à-vis Japan.

Table 2. AMU weights of East Asian Currencies (benchmark year=2000/2001)

	Trade volume* %	GDP measured at PPP** ,%	Arithmetic shares % (a)	Benchmark exchange rate*** (b)	AMU weights (a)/(b)
Brunei	0.41	0.41	0.41	0.5912	0.0069
Cambodia	0.19	0.21	0.20	0.0003	7.4235
China	21.65	47.93	34.79	0.1256	2.7711
Indonesia	4.67	5.56	5.12	0.0001	452.7871
Japan	27.31	28.30	27.80	0.0091	30.5681
South Korea	12.86	6.65	9.76	0.0009	113.1459
Laos	0.09	0.08	0.08	0.0001	5.9500
Malaysia	8.85	1.83	5.34	0.2735	0.1953
Myanmar	0.38	0.38	0.38	0.1598	0.0239
Philippines	3.12	2.74	2.93	0.0220	1.3347
Singapore	11.90	0.81	6.36	0.5912	0.1075
Thailand	6.60	3.56	5.08	0.0246	2.0630
Vietnam	1.96	1.53	1.74	0.0001	243.0432

* : The trade volume is calculated as the average of total export and import volumes in 2001, 2002 and 2003 taken from DOTS (IMF).
**: GDP measured at PPP is the average of GDP measured at PPP in 2001, 2002 and 2003 taken from the World Development Report, World Bank. For Brunei and Myanmar, we again use the same share of trade volume since no GDP data are available for these countries.
*** : The Benchmark exchange rate ($-euro/Currency) is the average of the daily exchange rate in terms of US$-euro in 2000 and 2001.

Table 3. Relationship of effective exchange rate (ROW) with AMU and AMU Deviation Indicator

Effective Exchange Rate	constant		AMU		AMU D I		AR(1)		Adjusted R-squared	F-statistic
Japanese yen (ROW)	0.0090	**	1.2850	**	0.0111	***	-0.2876	**	0.2593	9.0532
	(0.0039)		(0.4913)		(0.0032)		(0.1183)			(0.0000)
Chinese yuan (ROW)	-0.0001		1.7181		0.0248	*	-0.2093		0.0432	2.0388
	(0.0087)		(1.2119)		(0.0127)		(0.1305)			(0.1169)
Korean won (ROW)	0.0067	*	1.3331	**	0.0043		-0.5163	***	0.3291	11.3014
	(0.0038)		(0.5343)		(0.0037)		(0.1147)			(0.0000)
Singapore $ (ROW)	0.0023		0.5968		0.0083		-0.4077	***	0.1492	5.0327
	(0.0045)		(0.6483)		(0.0093)		(0.1121)			(0.0033)
Thailand baht (ROW)	0.0045		0.8166		0.0131	**	-0.2869	**	0.0991	3.5289
	(0.0064)		(0.7662)		(0.0055)		(0.1210)			(0.0195)
Indonesian rupiah (ROW)	-0.0046		-0.9345	**	0.0122	***	-0.4549	***	0.6436	42.5325
	(0.0036)		(0.4634)		(0.0010)		(0.1114)			(0.0000)
Malaysian ringgit (ROW)	0.0036		0.6066		0.0111	*	-0.3773	***	0.1201	4.1406
	(0.0044)		(0.6469)		(0.0067)		(0.1128)			(0.0095)
Philippine peso (ROW)	0.0018		0.6987		0.0083		-0.4554	***	0.1645	5.5306
	(0.0096)		(1.1258)		(0.0070)		(0.1150)			(0.0019)
Brunei $ (ROW)	-0.0014		2.0011		0.0435		-0.3637	***	0.1055	3.7120
	(0.0271)		(3.8377)		(0.0534)		(0.1161)			(0.0157)
Canbodian riel (ROW)	-0.0140		4.4152		0.0512	*	-		0.0188	1.6738
	(0.0318)		(3.4575)		(0.0303)					(0.1952)
Laos (ROW)	-0.0415		2.5081		0.0013		-0.3069	**	0.0650	2.6000
	(0.0298)		(3.4958)		(0.0046)		(0.1186)			(0.0595)
Myanmar kyat (ROW)	0.0021		-0.0165		-0.0139		-0.2908	**	0.0559	2.3634
	(0.0179)		(2.5999)		(0.0240)		(0.1163)			(0.0791)
Vietnamese dong (ROW)	0.0015		4.9215	***	0.0424	**	-0.3701	***	0.1433	4.7373
	(0.0129)		(1.7378)		(0.0186)		(0.1188)			(0.0048)

1. Sample period is from Jan 1999 to Dec 2004. All data are monthly and the number of Observation is 71after adjusting endpoints.
2. Effective exchange rate (ROW) is calculated by using the trade data against the rest of the world. On the other hand, effective exchange rate (ROEA) is calculated by using the trade data against the Sampled East Asian countries.
3. AMU and AMU Deviation Indicator (nominal) are the montly average of daily calculated AMU and AMU Deviation Indicators, respectively.
4. Estimated method is OLS and . If the residual has serial correlation, the term of AR(1) is added. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 4. Relationship of effective exchange rate(ROEA) with AMU and AMU Deviation Indicator

Effective Exchange Rate	constant	AMU	AMU D I	AR(1)	Adjusted R-squared	F-statistic
Japanese yen (ROEA)	-0.0029 (0.0052)	0.1832 (0.6348)	0.0133 *** (0.0042)	-0.2009 (0.1216)	0.1213	4.1754 (0.0091)
Chinese yuan (ROEA)	-0.0031 (0.0037)	0.8595 ** (0.4138)	0.0300 *** (0.0055)	-0.3026 ** (0.1199)	0.3142	11.5382 (0.0000)
Korean won (ROEA)	-0.0055 (0.0045)	0.4191 (0.6076)	0.0002 (0.0042)	-0.4479 *** (0.1108)	0.1667	5.6036 (0.0017)
Singapore $ (ROEA)	-0.0049 (0.0047)	-0.4682 (0.6759)	0.0099 (0.0096)	-0.4143 *** (0.1102)	0.1710	5.7454 (0.0015)
Thailand baht (ROEA)	-0.0033 (0.0064)	-0.1576 (0.8000)	0.0117 ** (0.0056)	-0.4212 *** (0.1120)	0.1610	5.4145 (0.0022)
Indonesian rupiah (ROEA)	0.0051 (0.0049)	1.0082 * (0.6147)	0.0109 *** (0.0013)	-0.4368 *** (0.1180)	0.4599	20.5917 (0.0000)
Malaysian ringgit (ROEA)	-0.0017 (0.0070)	-0.4931 (0.9879)	0.0198 * (0.0104)	-0.2304 *** (0.1152)	0.0872	3.1962 (0.0290)
Philippine pesp (ROEA)	-0.0108 (0.0104)	-0.7995 (1.1428)	0.0067 (0.0073)	-0.2430 ** (0.1197)	0.0339	1.8088 (0.1541)
Brunei $ (ROEA)	-0.0041 (0.0186)	-0.5915 (2.6416)	0.0579 (0.0378)	-0.4171 *** (0.1129)	0.1838	6.1811 (0.0009)
Cambodian riel (ROEA)	-0.0200 (0.0337)	5.6355 (3.6646)	0.0611 * (0.0321)	-	0.0335	2.2127 (0.1172)
Laos (ROEA)	-0.0542 (0.0367)	2.2781 (3.6824)	-0.0028 (0.0049)	-	-0.0175	0.3986 (0.6728)
Myanmar kyat (ROEA)	0.0000 (0.0148)	1.0423 (2.2908)	0.0111 (0.0214)	-0.5274 *** (0.0985)	0.2639	9.2468 (0.0000)
Vietnamese dong (ROEA)	-0.0048 (0.0109)	1.0079 (1.5091)	0.0134 (0.0161)	-0.4809 *** (0.1114)	0.1916	6.2940 (0.0008)

1. Sample period is from Jan 1999 to Dec 2004. All data are monthly and the number of Observation is 71after adjusting endpoints.
2. Effective exchange rate (ROW) is calculated by using the trade data against the rest of the world. On the other hand, effective exchange rate (ROEA) is calculated by using the trade data against the Sampled East Asian countries.
3. AMU and AMU Deviation Indicator (nominal) are the montly average of daily calculated AMU and AMU Deviation Indicators, respectively.
4. Estimated method is OLS and . If the residual has serial correlation, the term of AR(1) is added. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Figure 1. The AMU in terms of the US$-euro (benchmark year=2000/2001)

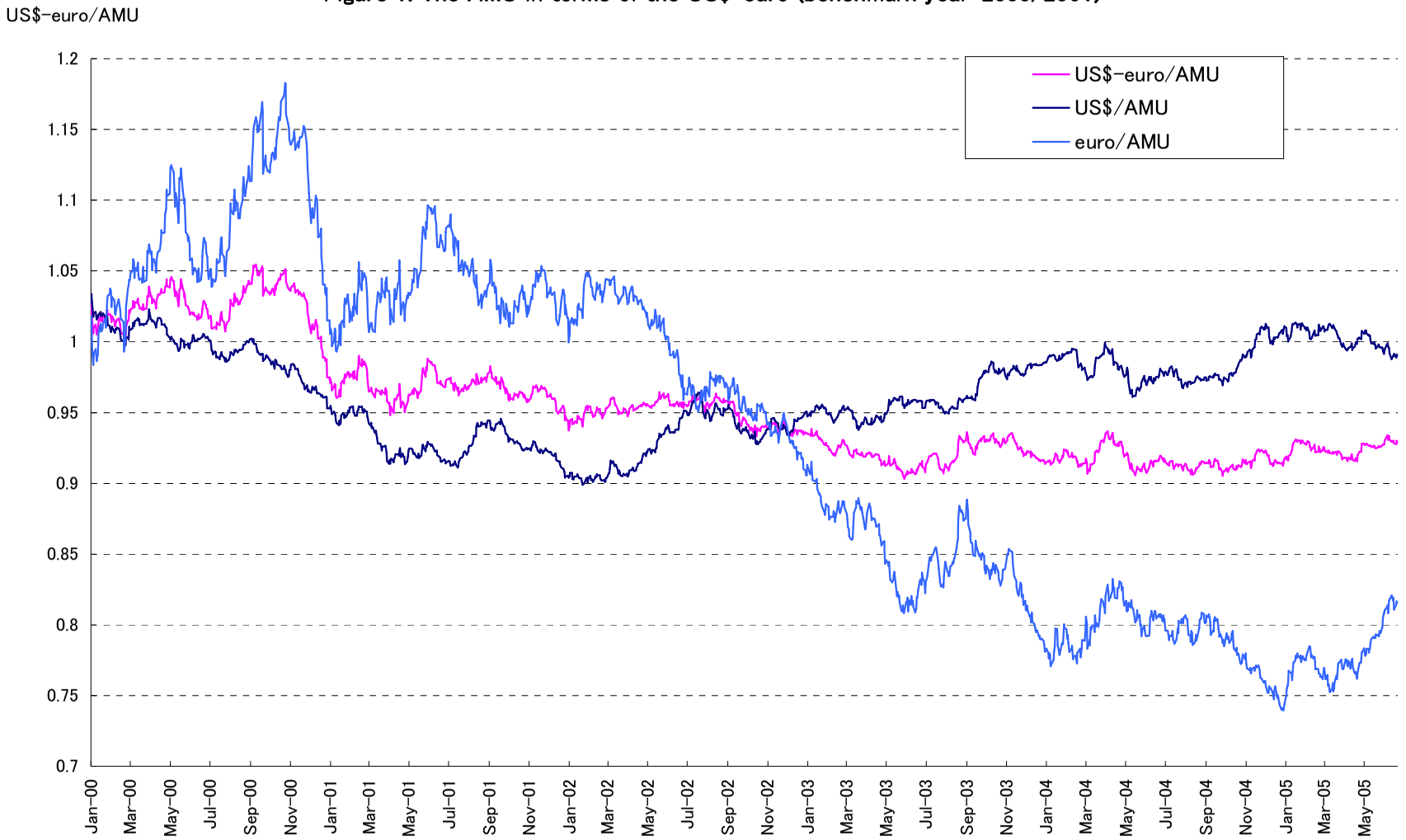


Figure 2. Japanese yen in terms of AMU (benchmark year 2000/2001)

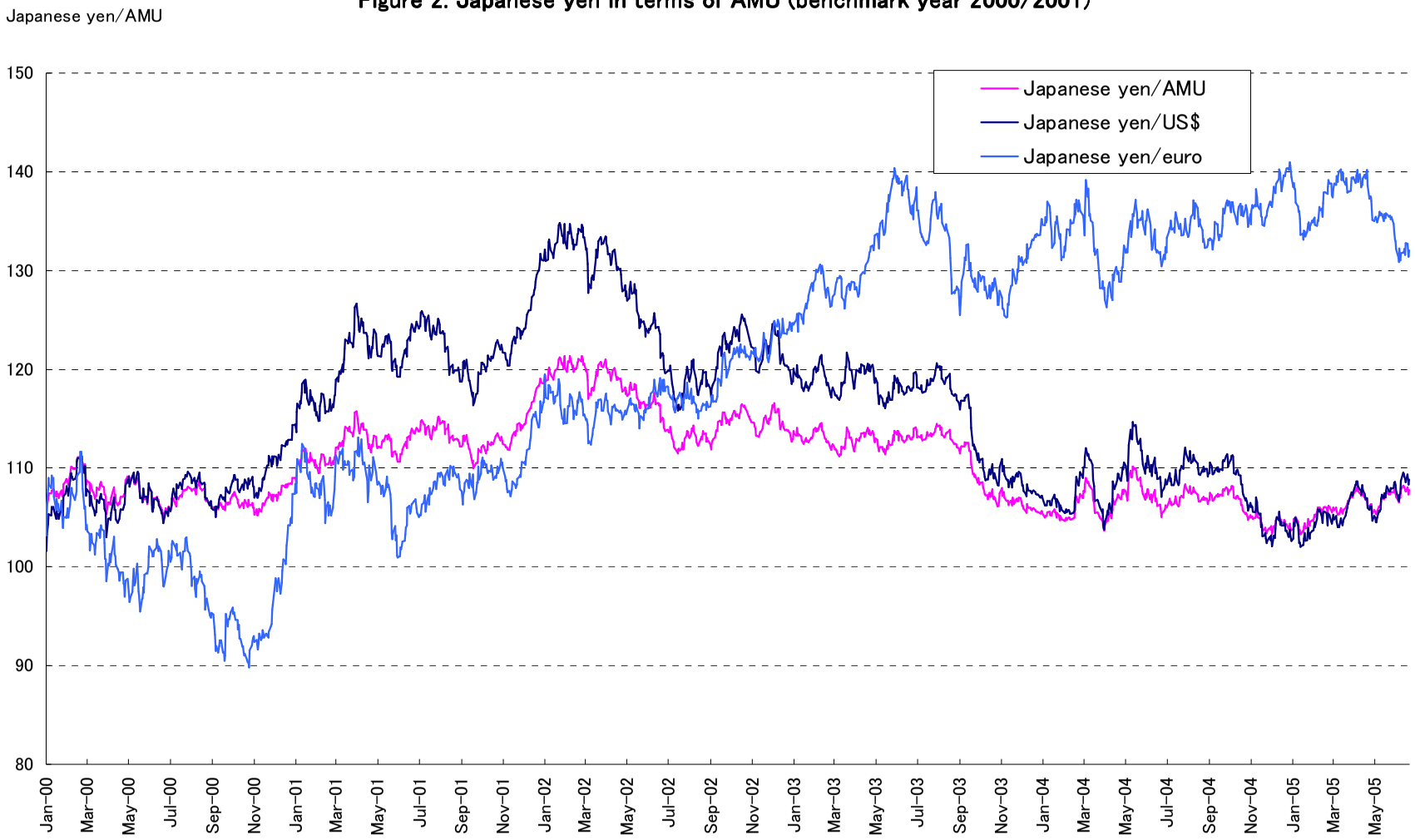


Figure 3. Nominal AMU Deviation Indicators (bennchmark year=2000/2001, daily)

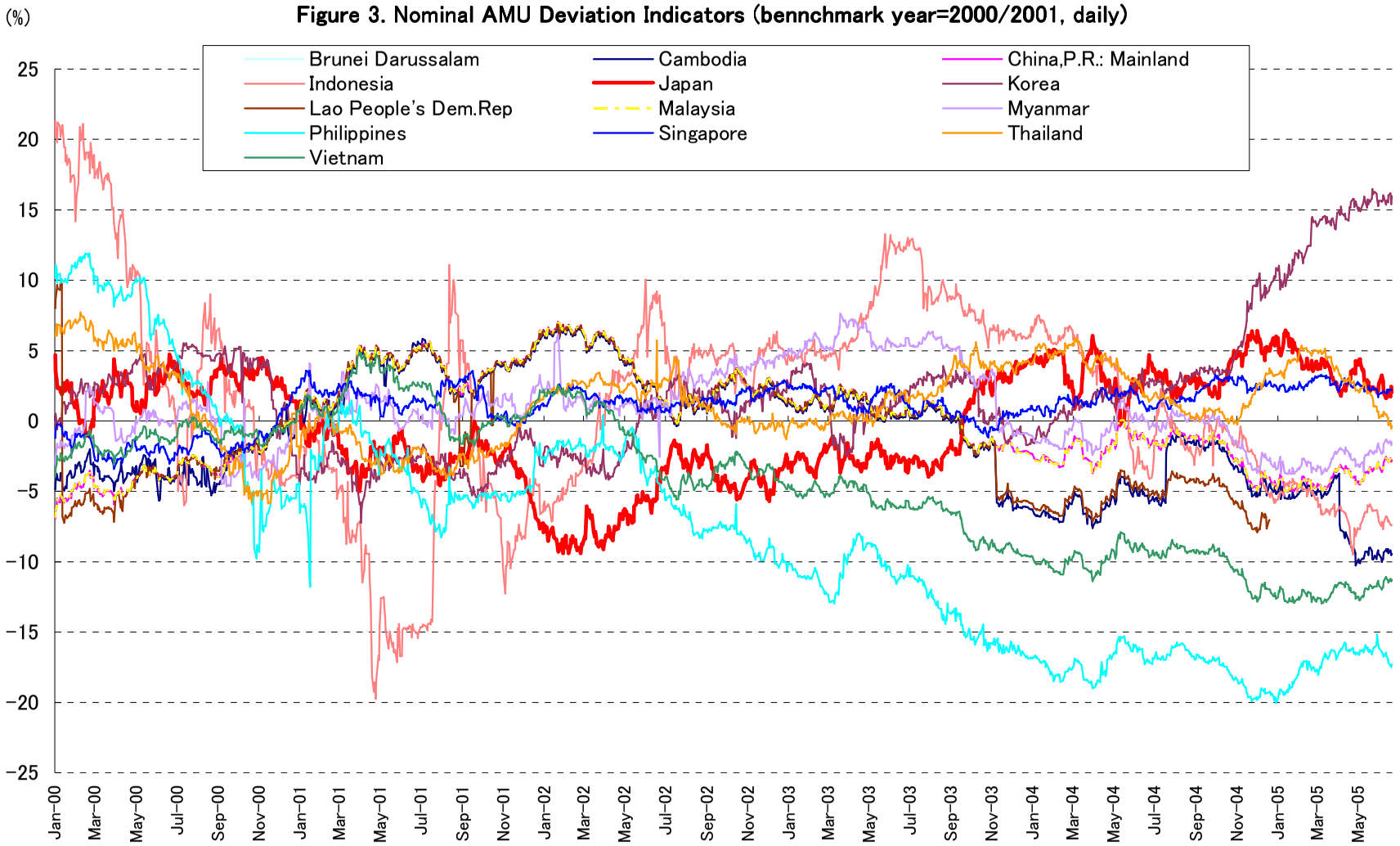
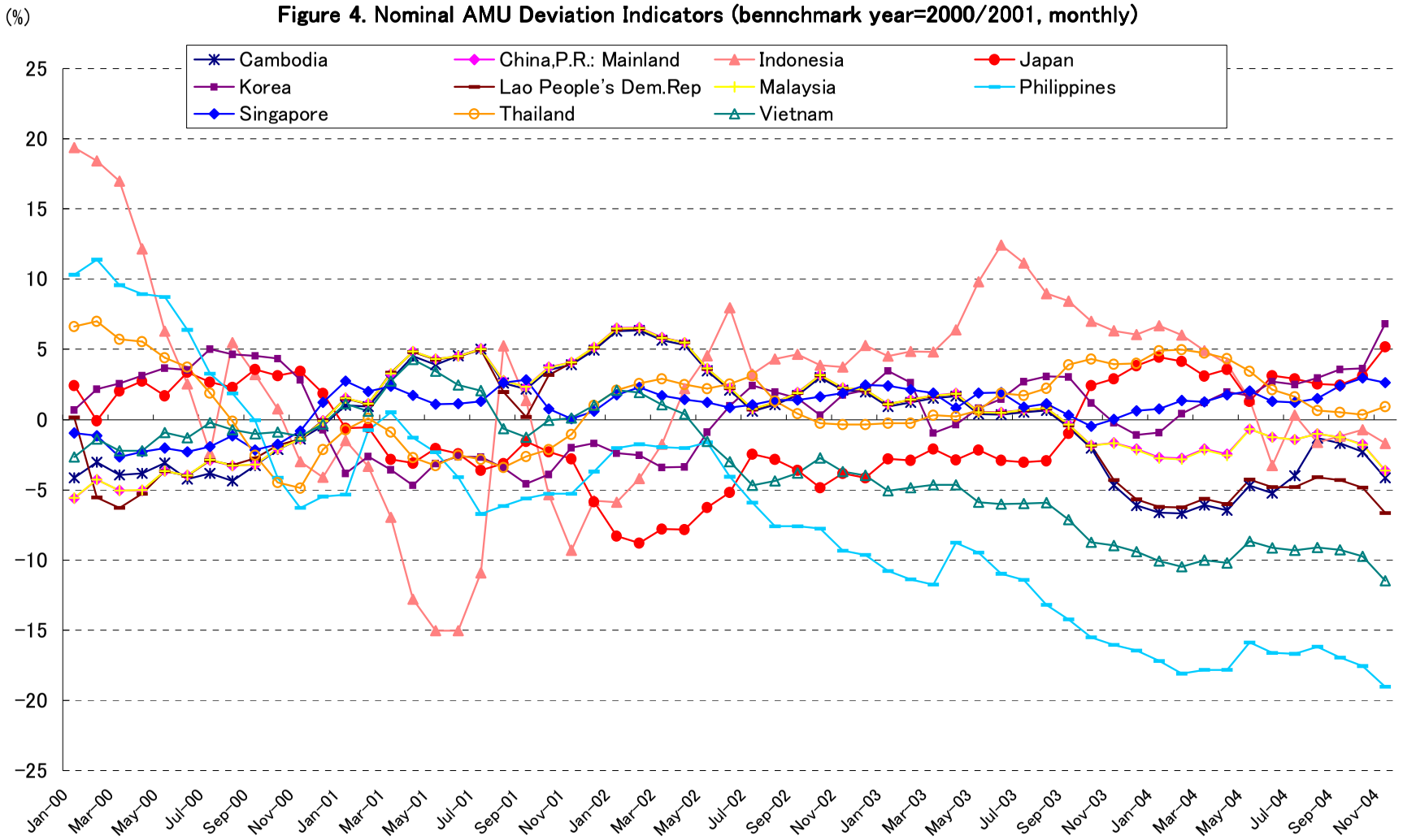


Figure 4. Nominal AMU Deviation Indicators (bennchmark year=2000/2001, monthly)



(%)

Figure 5. Real AMU Deviation Indicators (bennchmark year=2000/2001, monthly)

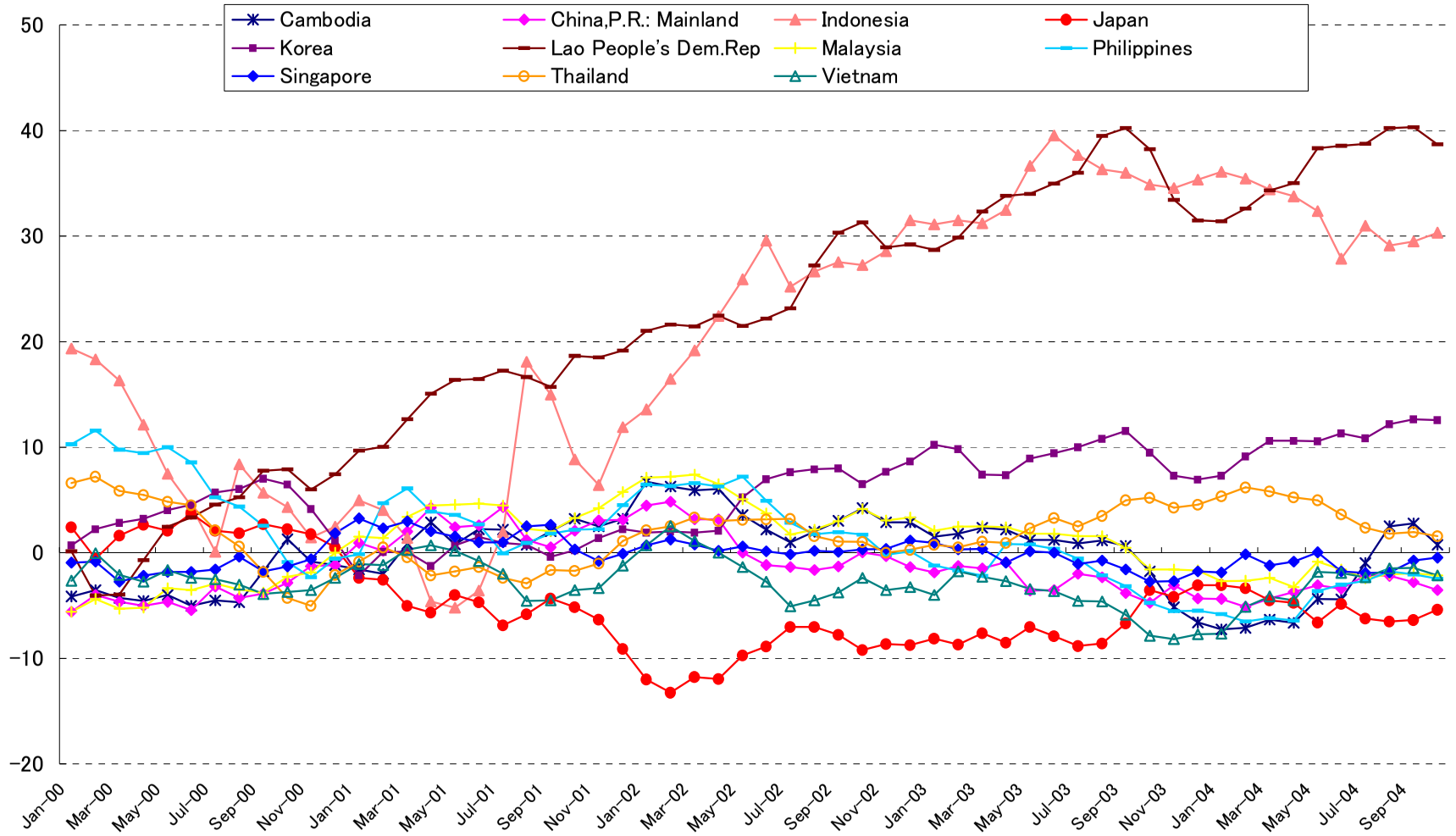


Figure 6. Effective Exchange Rate (in terms of the rest of world, 2000=100)

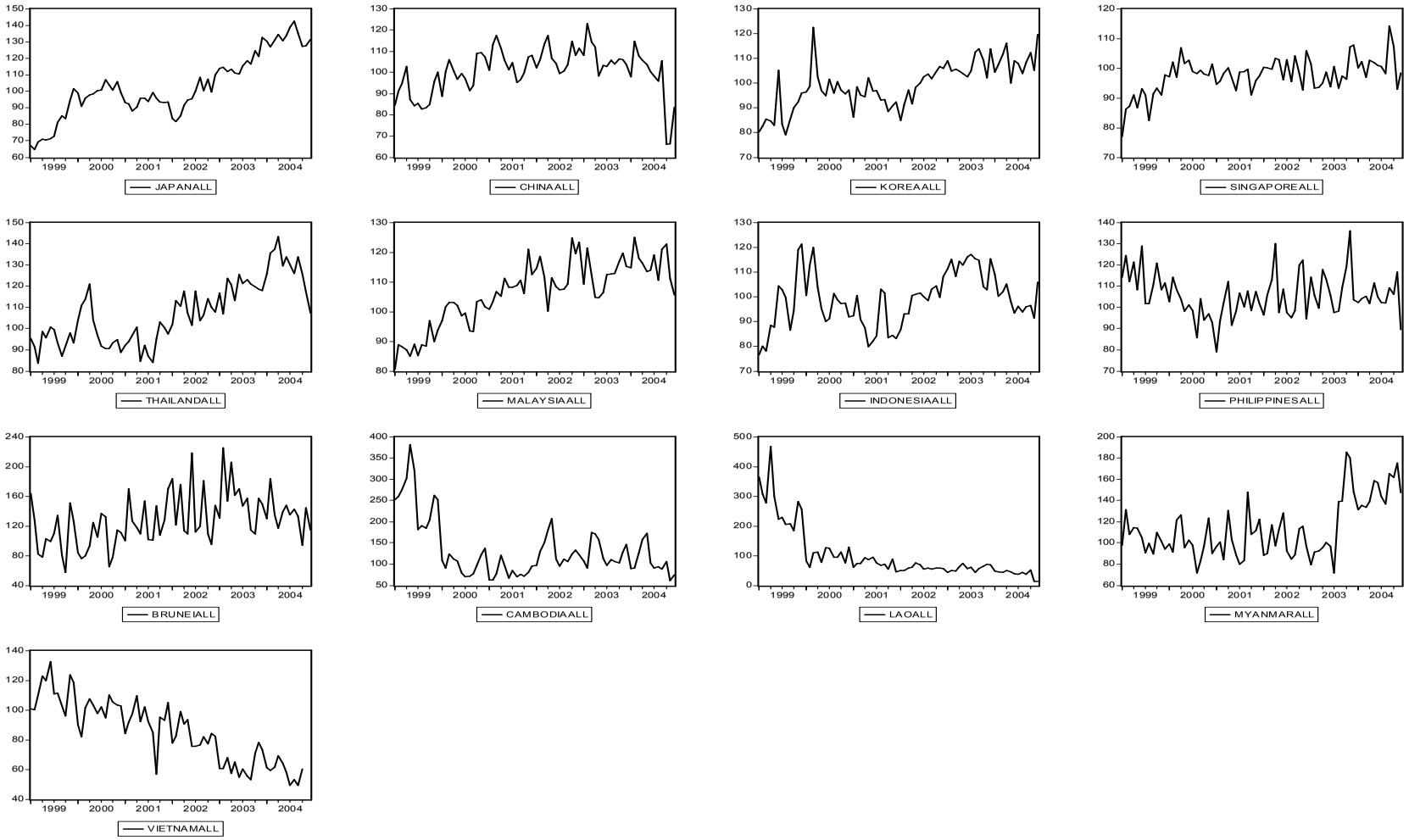
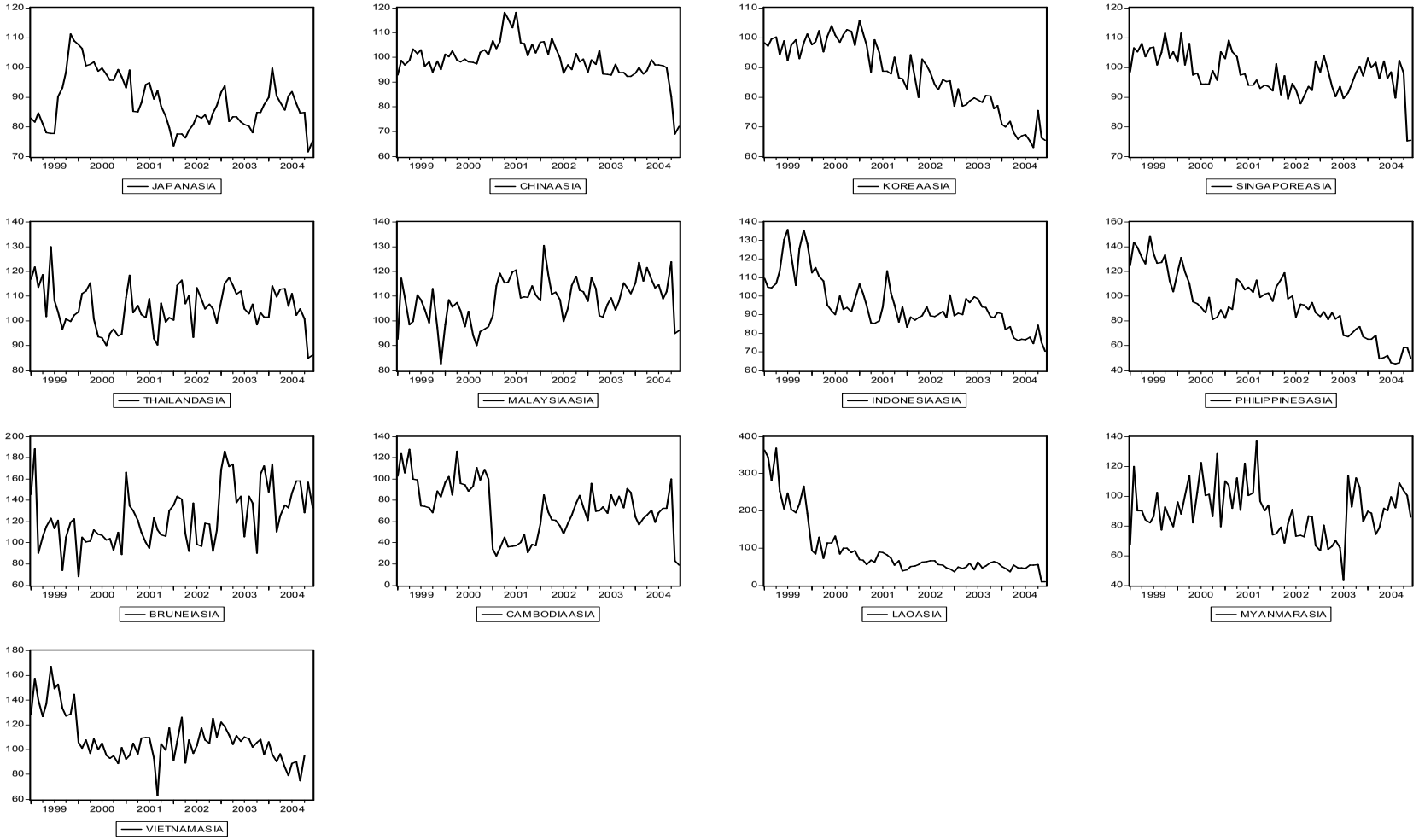


Figure 7. Effective Exchange Rate (in terms of the rest of East Asia, 2000=100)



Appendix:

The relationship between the AMU Deviation Indicator and the real exchange rate