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A Deviation Measurement for Coordinated Exchange Rate Policies in East Asia

Eiji Ogawa and Junko Shimizu

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 estimate an AMU (Asian Monetary Unit) as a weighted average of East Asian currencies according to the method to calculate the ECU used under the EMS before introducing the euro into some EU countries. We consider four types of AMU, which are based on trade volume, nominal GDP, GDP measured at PPP, and international reserves. After choosing both the AMUs based on GDP measured at PPP weight and trade weight from a viewpoint of stability of the AMU value in terms of a currency basket composed of the US dollar and the euro, we calculate the deviation indicators from the benchmark rates for each of the East Asian currencies. We compare both nominal and real deviation indicators by taking into account inflation rate differentials. The real deviation indicator should be adequate for surveillance over effects of exchange rate policy on real economy while the nominal one can be frequently watched in real time.

Keywords: AMU (Asian Monetary Unit), deviation indicator, surveillance process, and regional coordination of exchange rate policies

JEL Classification Codes: E58, F31 and F33

1. Introduction

The monetary authorities in East Asian countries have been strengthening their regional monetary cooperation since the Asian Currency Crisis in 1997. Its representative cooperation is the Chiang Mai Initiative (CMI) that the ASEAN + 3 (Japan, China, and Korea) established as a network of bilateral and multilateral swap arrangements for managing a currency crisis in the member countries. Under the CMI, the monetary authorities should conduct a surveillance process for preventing a currency crisis in the future. However, the monetary authorities have not any standing institution for conducting any surveillance process in East Asia. Instead, they have regular meetings as the Economic Review and Policy Dialogue in the ASEAN+3 Finance Deputy Ministers Meeting for surveillance over their macroeconomic performance.

Taking into account recent movements of intra-regional exchange rates under the US dollar depreciation against major currencies, we found asymmetric response to the US dollar depreciation and, in turn, misalignments among the East Asian currencies. Ogawa (2004) found that East Asian currencies were classified into at least two groups; one group of currencies has been appreciated against the US dollar while the other group of currencies has been pegged to the US dollar. We should consider coordination failure[1] in conducting exchange rate policies among East Asian countries that causes biased change in exchange rates among the intra-regional currencies.

In this paper, we propose some deviation measurements for coordinated exchange rate policies in East Asia to enhance the monetary authorities'

[1] Ogawa and Ito (2002).

surveillance process in terms of regional coordination of exchange rate policies. According to the calculation method in the case of the European Currency Unit (ECU)[2], we estimate four different types of indicators, which are based on trade volume in East Asia, nominal GDP, GDP measured at Purchasing Power Parity (PPP) and international reserves. We choose both the AMUs based on GDP measured at PPP weight and trade weight from a viewpoint of stability in value of the AMU. After we choose them, we measure deviations from estimated AMU based on the GDP measured at PPP weight and trade weight for each of the thirteen East Asian countries (ASEAN10+3). We find the following misalignments among the East Asian currencies that the Korean won had over +10 percent of deviation from the benchmark rate while the Philippine peso had over -15 percent of deviation from the benchmark and the Chinese yuan had about -10 percent of deviation from the benchmark in November 2004. Thus, we have almost 30 percent of deviations among the East Asian currencies in November 2004 comparing with benchmark year of 2001.

The reminder of this paper consists of the following sections. Section 2 describes our method to estimate the AMU in the case of four different patterns of weights and choose two of them from a viewpoint of stability of the AMU value in terms of a currency basket composed of the US dollar and the euro. Section 3 calculates deviation indicators for each of the East Asian currencies from the AMU. The final section offers concluding remarks.

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[2] Tanaka and Jin(2003) used the similar method to calculate the exchange rates of East Asian currencies against a weighted averages of East Asian currencies. Their sampled currencies are ASEAN 4 (excluding Indonesia) plus Japan, China, Korea, Taiwan and Hong Kong. They used nominal GDP and nominal GDP measured at PPP for their weights.

2. Methodology of estimating the AMU

We choose ASEAN10+3 countries which include Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam, Japan, Korea, and China to calculate the AMU that is a weighted average of East Asian currencies. Our sampled period covers from January 1999 to November 2004.[3]

We estimate the AMU according to the method of calculating the ECU under the European Monetary System (EMS) before introducing the euro into some EU countries. The ECU was defined as a basket of currencies of the EU member countries. A share of each currency in the basket was based on some combination of GDP and foreign trade volumes for the relevant country. Representative market exchange rates for the US dollar, as reported by member countries, were used to calculate an ECU equivalent, both in US dollars and in the currencies of the member countries. To follow the methodology of the ECU, one of the most important tasks is to choose the basket weights of AMU. In this paper, we try to use four different kinds of economic size indicators.

(1) Trade volume

(2) Nominal GDP

(3) GDP measured at Purchasing Power Parity (PPP)

(4) International reserves (minus Gold)

The trade volume is calculated as a total of export and import volumes from

[3] We decide our sample period from Jan 1999 because we try to estimate the AMU without any affection of Asian crisis period.

the *Direction of Trade Statistics*, IMF. Both nominal GDP and GDP measured at PPP come from the *World Development Report*, World Bank. We try to use not only nominal GDP but also GDP measured at PPP because the nominal GDP do not always reflect international differences in relative pries. At the PPP, one international dollar has the same purchasing power over domestic GDP. As a result, the PPP allows us to compare GDP levels among all of the sampled countries. [4] Moreover, we assign also the international reserves (minus Gold) as a indicators of basket weights from a viewpoint of financial aspect comparison. The data are from the *International Financial Statistics*, IMF. All of the daily data of exchange rates come from Datastream.[5]

We should use a basket currency composed by not only the US dollar but also other trader partners' currencies for East Asian countries. We use a basket currency composed by the US dollar and the euro rather than only the US dollar. We apply trade shares with the United States and the euro area countries for total of the sampled East Asian countries as basket weights of the basket currency. We use data on exports and imports for each of the countries in 1999 from the *Direction of Trade Statistics*, IMF. We obtained that the basket weights on the US dollar and the euro are 51.7 percent and 48.3 percent, respectively.

At first, we estimate four different types of AMU. We choose January 1999 as a reference period of indicators for country weights. All of the types of AMU are set a unity in the starting point of January 1999.

Table 1 shows the shares in the four types of AMU and their calculated

[4] Due to the data constrains, we do not have GDP data for Myanmar.
[5] As for the exchange rate of Myanmar kyat, data for official rate only could be obtained from Datastream.

weights for each of the thirteen East Asian currencies. The upper part of Table 1 shows the shares based on the four types of indicators. In terms of the share of trade volume, the Japanese yen is 26.94 percent and the highest. There are four currencies whose share is larger than 10 percent, which include the Singapore dollar, the Chinese yuan, the Malaysian ringgit, and the Korean won. Accordingly, the share based on trade volume is relatively balanced among East Asian countries. On one hand, the Japanese yen weight is almost 70 percent in terms of nominal GDP. The second highest one is the Chinese yuan, whose weight is only 16.81 percent and the others are below 2 percent except for the Korean won, which is 5.65 percent. In terms of GDP measured at PPP, the weight on the Chinese yuan is 47.06 percent and the highest. The second highest one is the Japanese yen whose weight is 32.45 percent and the third highest one is the Korean won, which is 5.68 percent. In terms of the international reserves, the share of the Japanese yen is 39.59 percent and the highest, the second highest one is the Chinese yuan whose weight is 27.41 percent, and the third highest one is the Singapore dollar, which is 9.78 percent.

The lower part of Table 1 shows the AMU weights calculated by four types of country weights. By using them, we calculate the four types of AMUs vis-à-vis the basket currency according to the following calculation equation:

(1) AMU based on trade volume weight

AMU= 0.0052BN$ + 13.4707CBR + 1.2484CNY + 303.6043IDR + 32.3517JPY+141.4752KRW + 8.1922LOK + 0.4802MLR + 0.0382MYK + 2.3161PLP + 0.2827SP$ + 2.7391TLB+ 323.7570VTD[6]

[6] BN$=Brunei dollar, CBR=Cambodia riel, CNY=Chinese yuan, IDR=Indonesian

(2) AMU based on nominal GDP weight

AMU= 0.0012BN$ + 2.0832CBR + 1.2484CNY + 150.8786IDR + 83.3317JPY + 70.3876KRW + 1.0089LOK + 0.0513MLR + 0.0000MYK + 0.4675PLP + 0.0258SP$ + 0.7666TLB+ 70.5763VTD

(3) AMU based on GDP measured at PPP weight

AMU= 0.0008BN$ + 6.0301CBR + 4.1321CNY +404.6478IDR + 38.9575JPY + 70.7321KRW + 2.6761LOK + 0.0650MLR + 0.0000MYK + 1.0276PLP + 0.0160SP$ + 1.3300TLB+ 235.8054VTD

(4) AMU based on international reserves weight

AMU= 0.0012BN$ + 2.4205CBR + 2.4068CNY + 374.5547IDR + 47.5370JPY + 84.5175KRW + 0.9173LOK + 0.1893MLR + 0.0038MYK + 0.6905PLP + 0.1740SP$ + 2.0609TLB+ 54.1708VTD

Figure 1 shows the estimated AMUs in terms of the basket currency composed of the US dollar and the euro during a period from February 1999 to November 2004. The four types of estimated AMUs have basically moved similarly and fluctuated within +/- 10 percent band for sample period except for the AMU based on nominal GDP weight. It is clear that the AMU based on nominal GDP weight is the most volatile among the four types of estimated AMUs in terms of the

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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.

basket currency. However, it is difficult to choose which type of AMU is the most stable among the four types. In order to choose the most stable AMU vis-à-vis the basket currency, we compare some statistical indicators of fluctuation for them. The statistical indicators in Table 2 show that the AMU based on GDP measured at PPP weight is the most stable in terms of rates of change as well as levels. The AMU based on trade weight is the second most stable in term of rates of change although the AMU based on international reserve weight is the second most stable in term of levels. Accordingly, we choose both the types of AMU to calculate indicators of deviation from a benchmark rate in the next section because we place more weight on rates of change as a volatility measurement.

3. Deviation of East Asian currency/AMU rates from a benchmark rate

In the previous section, we confirm that both the AMU based on GDP measured at PPP weight and the AMU based on trade weight are more desirable than the other AMUs from a viewpoint of stability of the AMU value. Therefore, we estimate these two types of AMUs, obtain exchange rates of the relevant currency in terms of the AMUs, and calculate deviation actual rates from a benchmark rate for each of the thirteen East Asian currencies.

At first, we have to choose a benchmark period when exchange rate of the East Asian currencies in terms of the AMU should be a benchmark rate. We regard a situation where the total of trade accounts should be balanced or more close to be balanced as a benchmark. In addition, the trade surpluses for the member countries (except Japan) with Japan and the total trade surpluses for the member countries

with rest of the world should be smallest in the benchmark period.[7]

Table 3 shows the trade balances of the thirteen East Asian countries from 1999 to 2003. It indicates that it is in 2001 that the total of trade accounts was the closest to be balanced and that the trade surpluses for the twelve non-Japan East Asian countries with Japan were the smallest. In addition, the total trade surpluses for the thirteen East Asian countries with rest of the world were the smallest in 2001. Therefore, we choose the year of 2001 as the benchmark year in order to calculate the benchmark rate of each East Asian currency in terms of the AMUs. In the benchmark year, the exchange rate of the AMU vis-à-vis the basket currency is set to be a unity. We call exchange rates of each East Asian currency vis-à-vis the AMU in the benchmark year as a benchmark rate.

We use the estimated AMUs to calculate a deviation indicator of each East Asian currency from the AMU according to the following formula:

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

Our sample period covers from January 1, 2002 to November 29, 2004. The deviation indicator should be 0% in the year of 2001 for each of the currencies. According the above formula, we calculate deviation of actual rate from the benchmark rate for both the estimated AMUs based on the GDP measured at PPP

[7] We take into account some time lags in effects of the exchange rates on trade balances to use not month but year as a benchmark period.

weight and trade weight.

3-1. Case of the AMU based on GDP measured at PPP weight

The upper part of Table 4 shows the deviation indicators for each of the East Asian currencies in the case of AMU weight based on GDP measured at PPP. The weight of the Chinese yuan is 48.66 percent and the highest. The second is the weight of the Japanese yen, which is 28.38 percent. The third is the weight of the Korean won, which is 7.14 percent. Thus, the characteristic of the AMU based on the GDP measured at PPP weight is that the Chinese yuan makes up almost 50 percent of weight in the AMU.

The lower part of Table 4 shows deviation indicators from the benchmark rates for each of the East Asian currencies. Figure 2 shows the movement of the deviation indicators from January 2002 to November 2004. We find misalignments among East Asian currencies. The Korean won had over +10 percent of deviation from the benchmark rate in November 2004. On one hand, the Philippine peso had almost -20 percent of deviation from the benchmark rate in November 2004. The Indonesian rupiah had the largest overvaluing deviation from the benchmark rate, which was nearly 18 percent of deviation from June to August 2003 although it has decreased 10 percent of deviation since May 2004. The Japanese yen had over -5 percent of deviation from the benchmark rate at the beginning of 2002 and stayed around 0 percent from July 2002 to September 2003. Then the Japanese yen has had positive deviation or appreciation from the benchmark because it has been appreciating against the US dollar. It had almost +9 percent of deviation from the

benchmark rate in November 2004. The Chinese yuan and the Malaysian ringgit have moved in the same way because they have been pegged to the US dollar. They have about -7 percent of deviation from the benchmark rate in November 2004. The Singapore dollar has had deviated narrow range of +/-2.5 percent of deviation, which is the same range as in the case of the ECU. In summary, the East Asian currencies have almost 30 percent of deviations between the two most undervaluing and overvaluing currencies in November 2004 comparing with the benchmark rates in 2001.

3-2. Case of the AMU based on trade weight

The upper part of Table 5 shows the deviation indicators for each of the East Asian currencies in the case of AMU weight based on trade volume. The weight of the Japanese yen is 29.23 percent and the highest. The second is the weight of the Chinese yuan, which is 17.32 percent and the third is the weight of the Korean won, which is 12.84 percent. The forth is the weight of the Malaysian ringgit, which is 11.14 percent and the fifth is the weight of the Singapore dollar, which is 10.71 percent. Thus, the characteristic of AMU based on trade weight is that the highest weight is smaller than 30 percent and that the weights of the five East Asian currencies are above 10 percent. They are well balanced.[8]

The lower part of Table 5 shows deviation indicators from the benchmark rates for each of the East Asian currencies. Figure 3 indicates the movement of the deviation indicators from January 2002 to November 2004. We find that the Korean won had

[8] The weight of Deutsche mark in the ECU was 33.0 percent when it started in 1979.

over +10 percent of deviation from the benchmark rate while the Philippine peso had over -15 percent of deviation from the benchmark in November 2004. The other East Asian currencies shows the same movements of deviation from the benchmark rate as in the case of the AMU based on GDP measured at PPP weight. However, the Chinese yuan had about -10 percent of deviation from the benchmark rate in November 2004. This deviation was wider than in the case of the AMU based on GDP measured at PPP weight. It is because the weight of the Chinese yuan in the AMU based on trade weight is lower than that in the AMU based on GDP measured at PPP weight. Thus, the East Asian currencies have over 30 percent of deviations between the two extreme currencies. There are misalignments among the East Asian currencies in recent years.

4. Nominal and Real Deviation Indicators

We should take into account inflation rate differentials if we consider real effect of exchange rates on trade, foreign direct investments, and real economic activity (real GDP). We should investigate exchange rate issues not only in nominal terms but also in real terms. For the purpose, we calculate also deviation indicators in real terms by taking into account inflation rate differentials. We call it as a real deviation indicator in order that we should identify it from a nominal deviation indicator.

Because we quote nominal exchange rates nex_i of each East Asian currency i in terms of the AMU, we use the nominal exchange rates nex_i and the relevant ratio of prices P_{AMU}/P_i to calculate their real exchange rates rex_i according to the following definition equation:

$$rex_i = nex_i \cdot {}^{P_{AMU}}\!/_{P_i}$$
$$nex_i \equiv {}^{currency_i}\!/_{AMU} \qquad (2)$$

where P_{AMU} : prices in the AMU area, and p_i : prices in country *i*.

From the definition equation of the real exchange rates, we can calculate them in terms of rates of change according to the following equation:

$$\dot{rex}_i = \dot{nex}_i - (\dot{p}_i - \dot{p}_{AMU}) \qquad (3)$$

where $\dot{nex}$: rates in change of nominal exchange rates, $\dot{rex}$: rates in change of real exchange rates, $\dot{P}_{AMU}$: inflation rate in the AMU area, and $\dot{p}_i$: inflation rate in country *i*.

Given that the deviation indicator is defined as equation (1), we calculate real deviation indicators according to the following equation:

$$real\ \ deviation\ \ indicator_i = nominal\ \ deviation\ \ indicator_i - (\dot{P}_{AMU} - \dot{P}_i) \qquad (4)$$

We use CPI data as both prices and the inflation rate in calculating real deviation indicator. Since CPI data are available not in daily basis but in monthly basis, we calculate the real deviation indicators only in the monthly basis. As for the inflation rates in the AMU area, we calculate weighted CPI for the AMU area by using the AMU weights and CPI in the AMU member countries.[9]

We calculate nominal and real deviation indicators in the case of AMU weight

[9] Each CPI data are downloaded from International Financial Statistics, IMF.

based on both GDP measured at PPP and trade volume in monthly basis.[10] Figure 4 shows the movement of nominal deviation indicators in the case of AMU weight based on GDP measured at PPP. On one hand, Figure 5 shows the movement of real deviation indicators in the case of AMU weight based on GDP measured at PPP. Comparing nominal deviation indicator in Figure 4 with real one in Figure 5, we can find differences between them.[11]

When we look at real 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 watch 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.[12] Furthermore,

[10] For the Myanmar kyat, the differences of CPI between Myanmar and weighted AMU countries are over 70 percent. Since we have explained that our data of Myanmar kyat are not the market rate and they are not reflect the actual movement, therefore we remove the Myanmar kyat from this analysis

[11] Also see the Figure 6 and 7 for nominal and real deviation indicators in the case of AMU weight based on trade volume. The results are almost same.

[12] 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,

both Figure 6 and Figure 7 show that the East Asian currencies have over 40 percent of deviations between the extreme 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 both the nominal and real deviation indicators. From the viewpoint of data frequency, nominal deviation indicators can be watched 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 in monthly basis and there might be some time lags when we obtain the real deviation indicators.

Considering effects of exchange rate on real economic activity such as trade balances and GDP, we should watch the deviation indicators in real term. On one hand, considering effects of exchange rate on monetary aspects, the nominal deviation indicators are enough to be concerned. Accordingly, we could use both nominal and real deviation indicators as an indicator for the surveillance of exchange rate policy and the related macroeconomic variables and, in turn for making coordinated exchange rate policies.

5. Conclusion

In this paper, we estimated the four different types of AMUs. They are based on trade volume in East Asia, nominal GDP, GDP measured at PPP, and international reserves. Among them, we found that both the AMUs based on GDP measured at PPP weight and trade weight were preferable from a viewpoint of

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respectively.

stability of the AMU.

We calculated the deviation indicators from the benchmark rates for each of the thirteen East Asian currencies in the case of estimated AMUs based on the GDP measured at PPP weight and trade weight. We found that only the Singapore dollar and the Brunei dollar had +/-2.5 percent of deviation from the benchmark rates. The East Asian currencies had almost 30 percent of deviations from the benchmark rates between the extreme currencies in November 2004 comparing with the benchmark rates in 2001. The variety of exchange rate systems in East Asia tends to make the large misalignment among the East Asian currencies.

Regarding the deviation indicators, we calculated not only in nominal terms but also in real terms by taking into account inflation rate differentials. From the viewpoint of data frequency, nominal deviation indicators can be watched in real time, and we are able to use them as the indicator of daily surveillance. On the other hand, considering effects of exchange rate on real economic activity, we should watch the deviation indicators in real term. Accordingly, it is necessary to watch both the nominal and real deviation indicators as an indicator for surveillance the coordinated exchange rate policies in East Asia.

Thus, we can use the deviation indicators of East Asian currencies to identify how much each of the East Asian currencies deviates from the AMU which is equivalent to a weighted average of the East Asian currencies. Thus, we propose to use these measurements for active surveillance process in order to make coordinated exchange rate policies among ASEAN+3.

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Table 1. Indicators of AMU weights and calculated AMU weights (AMU vis-à-vis the basket currency*)

	BRUNEI $	CAMBODIA RIEL	CHINESE YUAN	INDONESIAN RUPIAH	JAPANESE YEN	KOREAN WON	LAOS KIP	MALAYSIAN RINGGIT	MYANMAR KYAT	PHILIPPINE PESO	SINGAPORE $	THAI BAHT	VIETNAMESE DONG
Exchange Rate currency units for 1basket currency* ave. of Jan 1999	1.7797	4065.79	8.7800	8974.89	120.07	1246.11	4457.56	4.0316	6.6309	40.7302	1.7800	38.9109	14726.17
<Indicators of AMU weights, %>													
Share of trade volume	0.29	0.33	14.22	3.38	26.94	11.35	0.18	11.91	0.58	5.69	15.88	7.04	2.20
Share of Nominal GDP	0.07	0.05	16.81	1.68	69.40	5.65	0.02	1.27	–	1.15	1.45	1.97	0.48
Share of GDP measured at PPP	0.04	0.15	47.06	4.51	32.45	5.68	0.06	1.61	–	2.52	0.90	3.42	1.60
Share of International Reserves	0.07	0.06	27.41	4.17	39.59	6.78	0.02	4.70	0.06	1.70	9.78	5.30	0.37
<AMU weights>													
Share of trade volume	0.0052	13.4707	1.2484	303.6043	32.3517	141.4752	8.1922	0.4802	0.0382	2.3161	0.2827	2.7391	323.7570
Share of Nominal GDP	0.0012	2.0832	1.4757	150.8786	83.3317	70.3876	1.0089	0.0513	0.0000	0.4675	0.0258	0.7666	70.5763
Share of GDP measured at PPP	0.0008	6.0301	4.1321	404.6478	38.9575	70.7321	2.6761	0.0650	0.0000	1.0276	0.0160	1.3300	235.8054
Share of International Reserves	0.0012	2.4205	2.4068	374.5547	47.5370	84.5175	0.9173	0.1893	0.0038	0.6905	0.1740	2.0609	54.1708

Notes: All figures are calculated by authors. Nominal GDP and International Reserves (minus Gold) data are from International Financial Statistics, IMF. All trade data are from Direction of Trade of IMF. GDP measured at ppp are from World Development Report, World Bank. All exchange rates are from Datastream. Indicators of AMU weights are calculated by the data in 1998.

* The basket currency is composed by the US dollar and the euro. The basket weight is depend on the trade share of each country/area against 13 sampled East Asian countries. Each weights is 51.7% and 48.3% for the US dollar and the euro, respectively.

Table 2. Fluctuation of estimated AMU vis-à-vis the basket currency*

	Share of trade volume	Share of Nominal GDP	Share of GDP measured at PPP	Share of International Reserves
<level>				
max	1.1320	1.1847	1.1519	1.1520
min	0.9463	0.9516	0.9644	0.9590
average	1.0169	1.0345	1.0348	1.0306
std. dev.	0.0486	0.0566	0.0478	0.0481
<rate of change, %>				
max	1.2677	2.3127	1.2113	1.4524
min	−2.0006	−2.5231	−2.0024	−2.1157
average	−0.0021	0.0012	−0.0016	−0.0007
std. dev.	0.3173	0.4718	0.3106	0.3464

Notes: All figures are calculated by authors.

* The basket currency is composed by the US dollar and the euro. The basket weight is depend on the trade share of each country/area against 13 sampled East Asian countries. Each weights is 51.7% and 48.3% for the US dollar and the euro, respectively.

Table 3. Trade account (net) within 13 East Asian countries

	13 East Asian countries				
	1999	2000	2001	2002	2003
with Japan *	−32,065	−37,239	−23,997	−40,027	−55,724
within 13 East Asian countries	4,819	−6,562	1,953	12,289	27,727
with World Total	215,324	180,439	122,893	160,906	187,868

(unit: million of US dollar)

Notes: All figures are calculated by authors. Trade data are from Direction of Trade (IMF).

* The figure of current account with Japan is the total amount of current account(net) with 12 East Asian countries.

Table 4. The deviation indicators for each of the East Asian currencies in the case of AMU weight based on GDP measured at PPP (%)

	BRUNEI $	CAMBODIA RIEL	CHINESE YUAN	INDONESIAN RUPIAH	JAPANESE YEN	KOREAN WON	LAOS KIP	MALAYSIAN RINGGIT	MYANMAR KYAT	PHILIPPINE PESO	SINGAPORE $	THAI BAHT	VIETNAMESE DONG
benchmark rate/AMU*	1.7089	3659.02	7.8933	9723.85	115.80	1229.86	7266.94	3.6237	6.3662	48.5813	1.7087	42.4280	14110.35
2001 GDP measured at PPP (billion of US$)	4.02	19.48	5549.14	630.63	3236.19	813.78	9.63	200.38	–	297.07	92.81	380.63	170.57
share based on GDP measured at PPP	0.04	0.17	48.66	5.53	28.38	7.14	0.08	1.76	0.00	2.60	0.81	3.34	1.50
AMU weights	0.0006	6.2512	3.8407	537.7032	32.8612	87.7596	6.1363	0.0637	0.0000	1.2655	0.0139	1.4161	211.0436
<The deviation indicators from the benchmark rates, %>													
average	−0.6835	−4.4352	−3.5317	9.3854	0.6368	3.7750	−4.6248	−3.5455	0.6050	−9.6048	−0.6886	3.1440	−8.4803
std.dev.	0.9411	4.4572	3.1562	3.8228	3.7882	1.8954	4.6466	3.1676	2.7979	7.0910	0.9345	1.5768	4.6218
max	1.33	3.85	3.71	16.98	7.01	10.34	3.96	3.69	6.07	4.54	1.40	6.70	1.67
min.	−3.66	−13.06	−10.47	−0.23	−7.15	−0.70	−13.68	−10.49	−6.25	−21.87	−3.63	−0.03	−17.84

Notes: All figures are calculated by authors.
*Each currency's benchmark rate/AMU is the average of currency/basket rate in 2001.

Table 5. The deviation indicators for each of the East Asian currencies in the case of AMU weight based on trade volume (%)

	BRUNEI $	CAMBODIA RIEL	CHINESE YUAN	INDONESIAN RUPIAH	JAPANESE YEN	KOREAN WON	LAOS KIP	MALAYSIAN RINGGIT	MYANMAR KYAT	PHILIPPINE PESO	SINGAPORE $	THAI BAHT	VIETNAMESE DONG
benchmark rate/AMU*	1.7089	3659.02	7.8933	9723.85	115.80	1229.86	7266.94	3.6237	6.3662	48.5813	1.7087	42.4280	14110.35
2001 trade volume (billion of US$)	3.82	1.73	152.45	46.47	257.21	112.96	0.78	98.03	2.70	36.21	94.29	58.07	15.30
share based on trade volume	0.43	0.20	17.32	5.28	29.23	12.84	0.09	11.14	0.31	4.12	10.71	6.60	1.74
AMU weights	0.0074	7.1732	1.3674	513.4753	33.8466	157.8660	6.4359	0.4037	0.0195	1.9991	0.1831	2.7998	245.2568
<The deviation indicators from the benchmark rates, %>													
average	0.1510	−3.5483	−2.6577	10.1323	1.4369	4.5631	−3.7343	−2.6714	1.4358	−8.6601	0.1459	3.9445	−7.5570
std.dev.	0.8411	3.8720	2.5342	3.8776	4.3200	2.2830	4.0304	2.5457	2.4803	6.4473	0.8360	1.6512	3.9672
max	2.17	3.32	3.18	17.80	9.15	12.51	3.43	3.16	6.34	4.16	2.23	7.65	1.12
min.	−2.60	−11.12	−7.78	−0.64	−7.61	−1.14	−10.91	−7.80	−3.66	−19.02	−2.56	0.77	−14.97

Notes: All figures are calculated by authors.
*Each currency's benchmark rate/AMU is the average of currency/basket rate in 2001.

Figure 1. The estimated AMU vis-à-vis the basket currency Feb 1999-Nov 2004

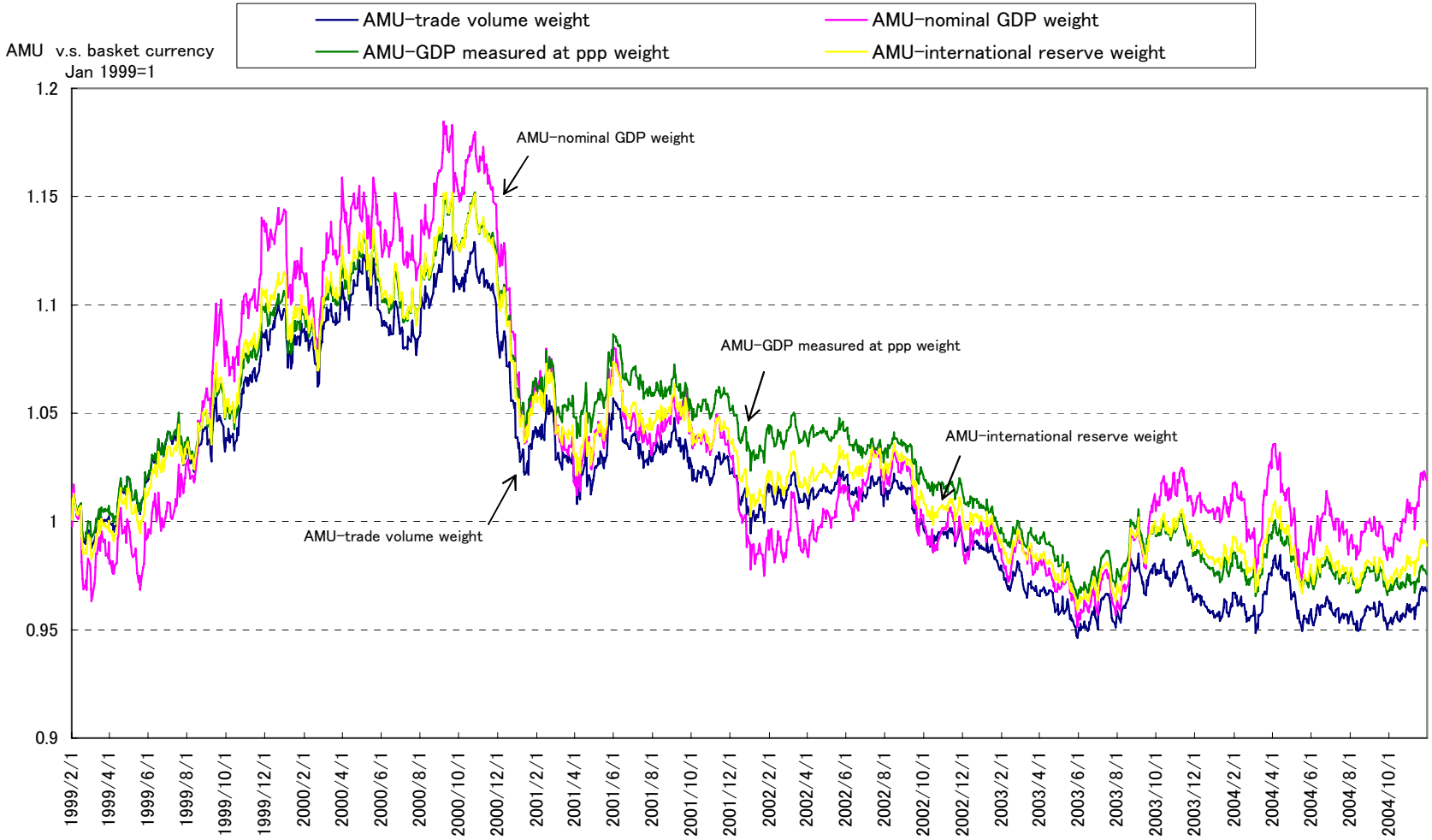


Figure2. The movement of the deviation indicators from January 2002 to November 2004
(in the case of AMU weight based on GDP measured at PPP)

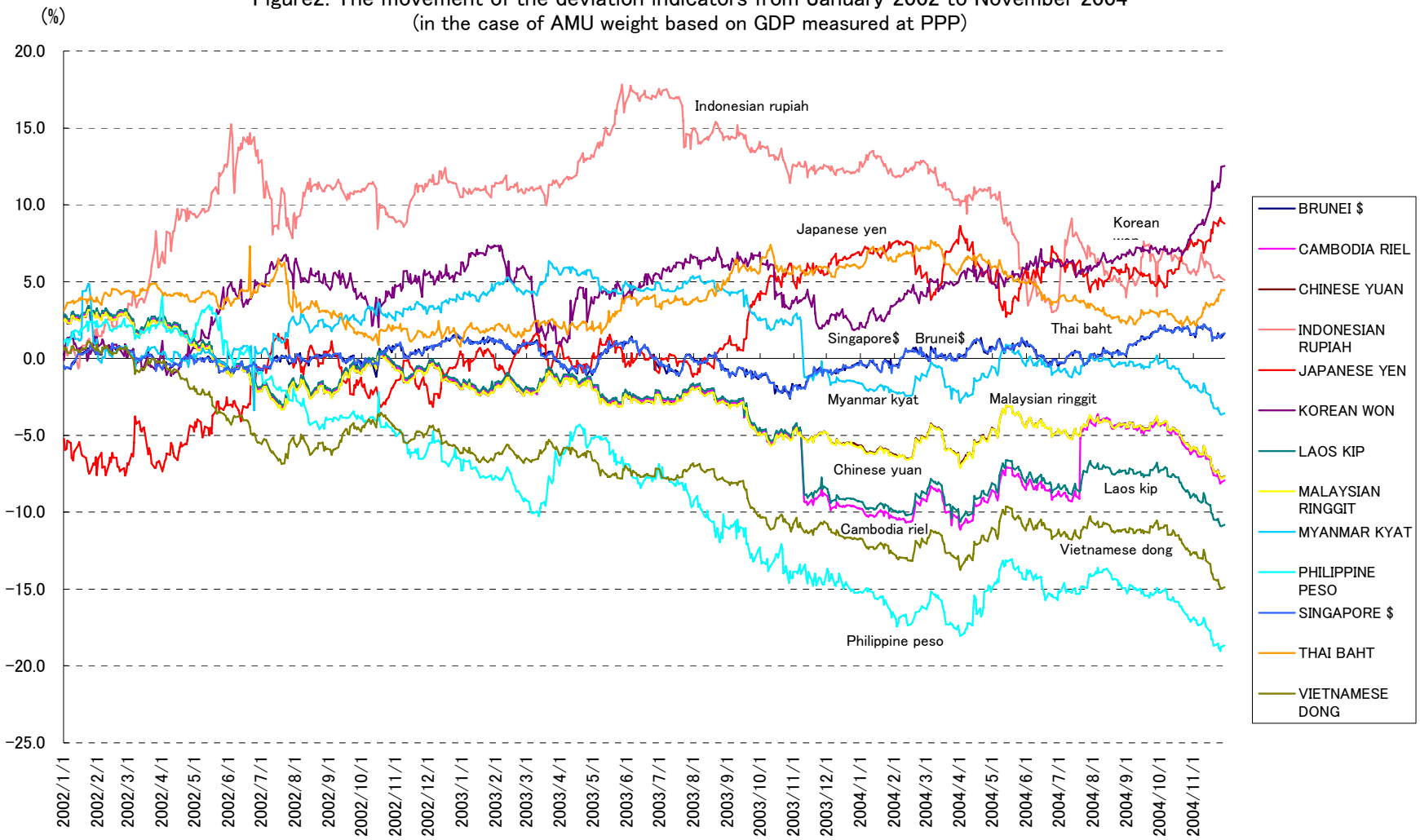


Figure3. The movement of the deviation indicators from January 2002 to November 2004
(in the case of AMU weight based on trade volume)

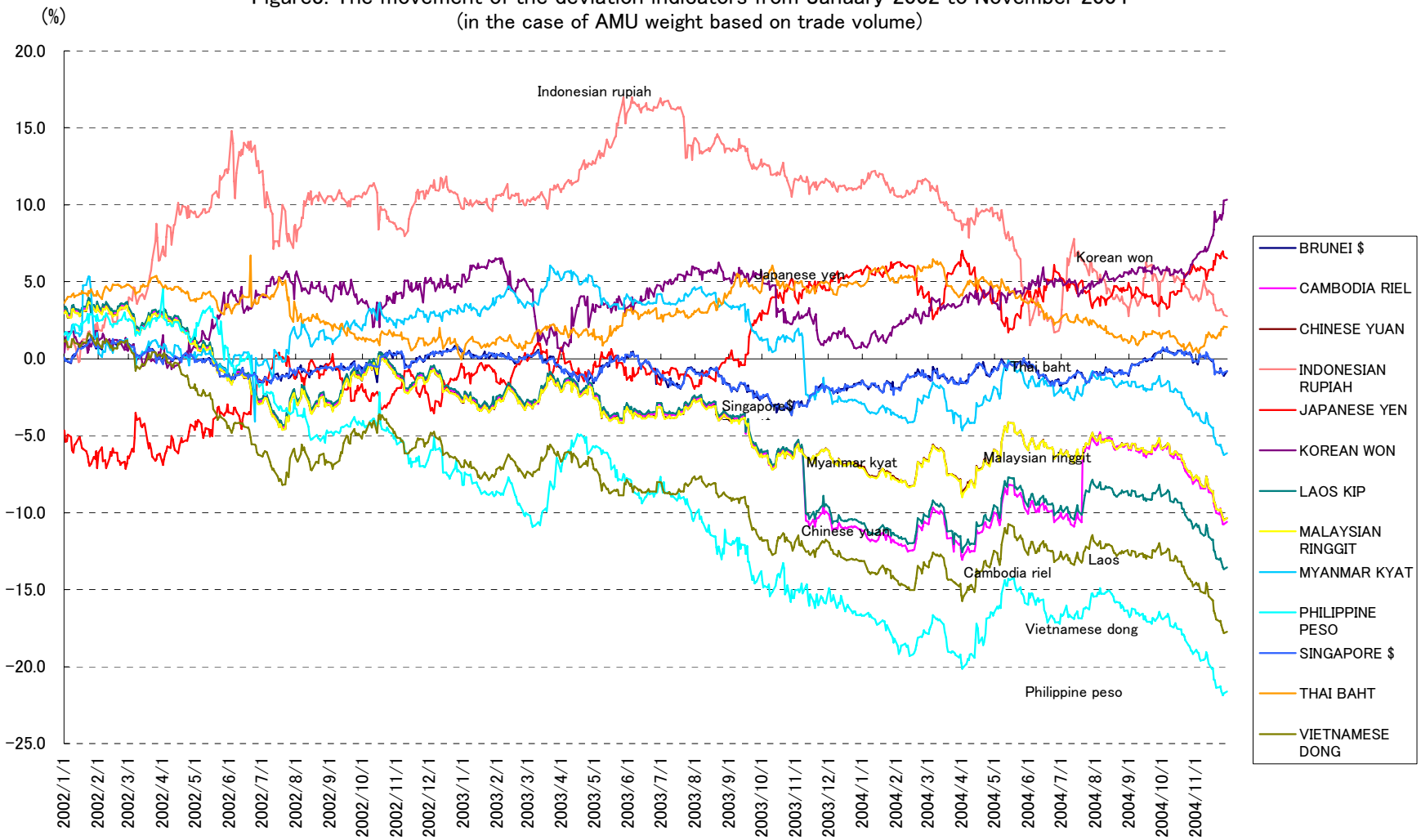


Figure4. The movement of nominal deviation indicators from January 2002 to November 2004
(in the case of AMU weight based on GDP measured at PPP, monthly change)

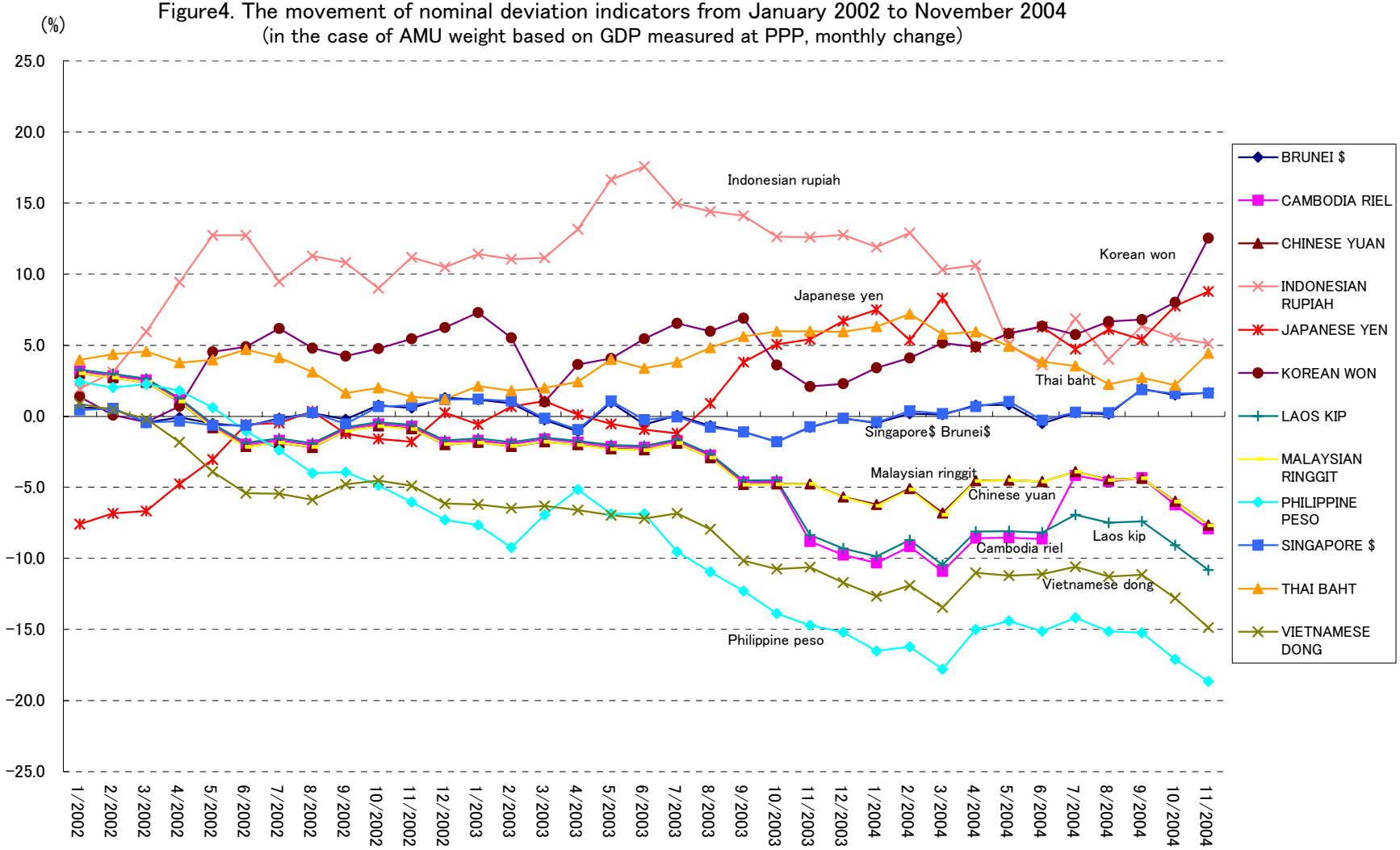


Figure 5. The movement of real deviation indicators from January 2002 to November 2004
(in the case of AMU weight based on GDP measured at PPP, monthly change)

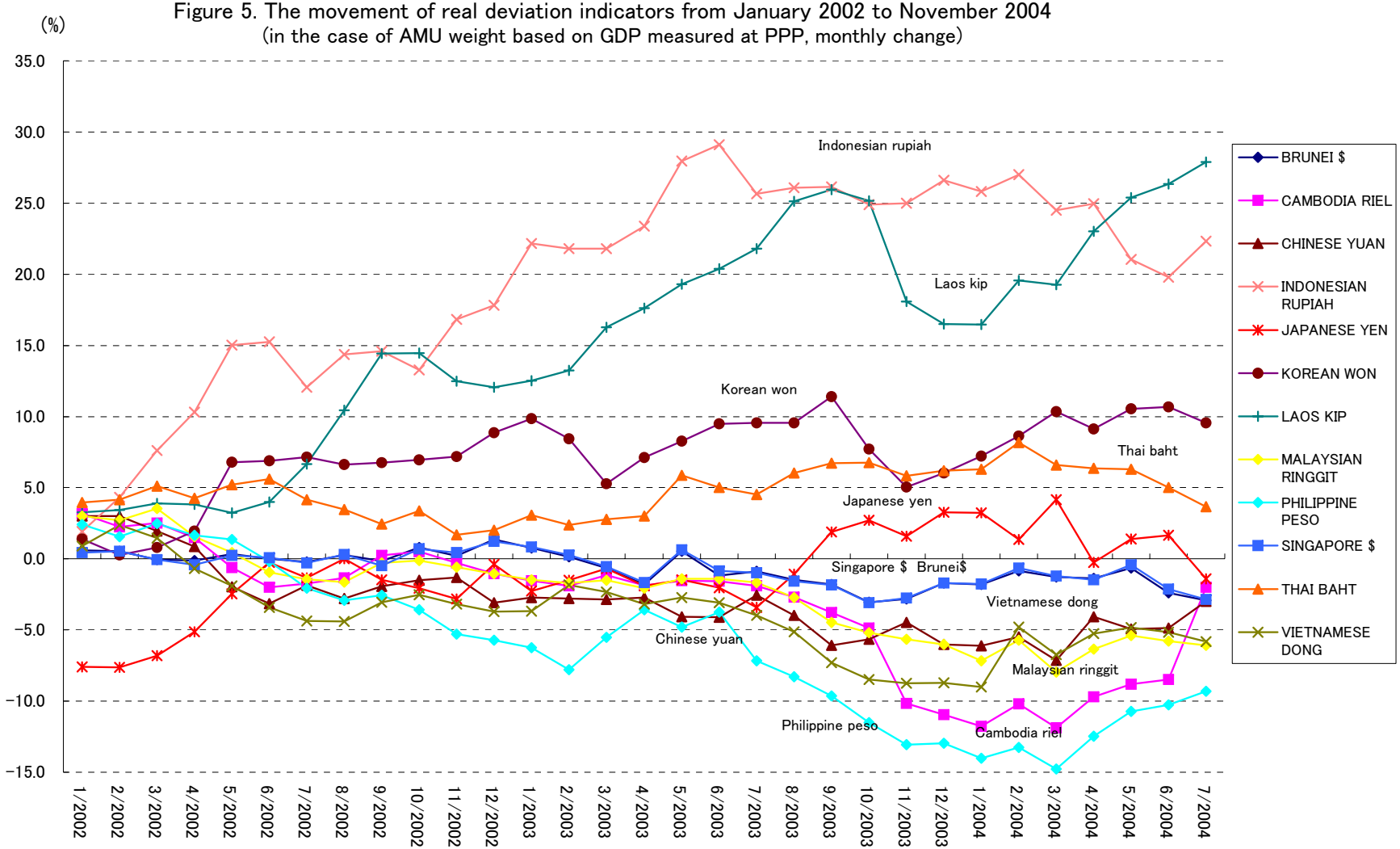


Figure6. The movement of nominal deviation indicators from January 2002 to November 2004
(in the case of AMU weight based on trade volume, monthly change)

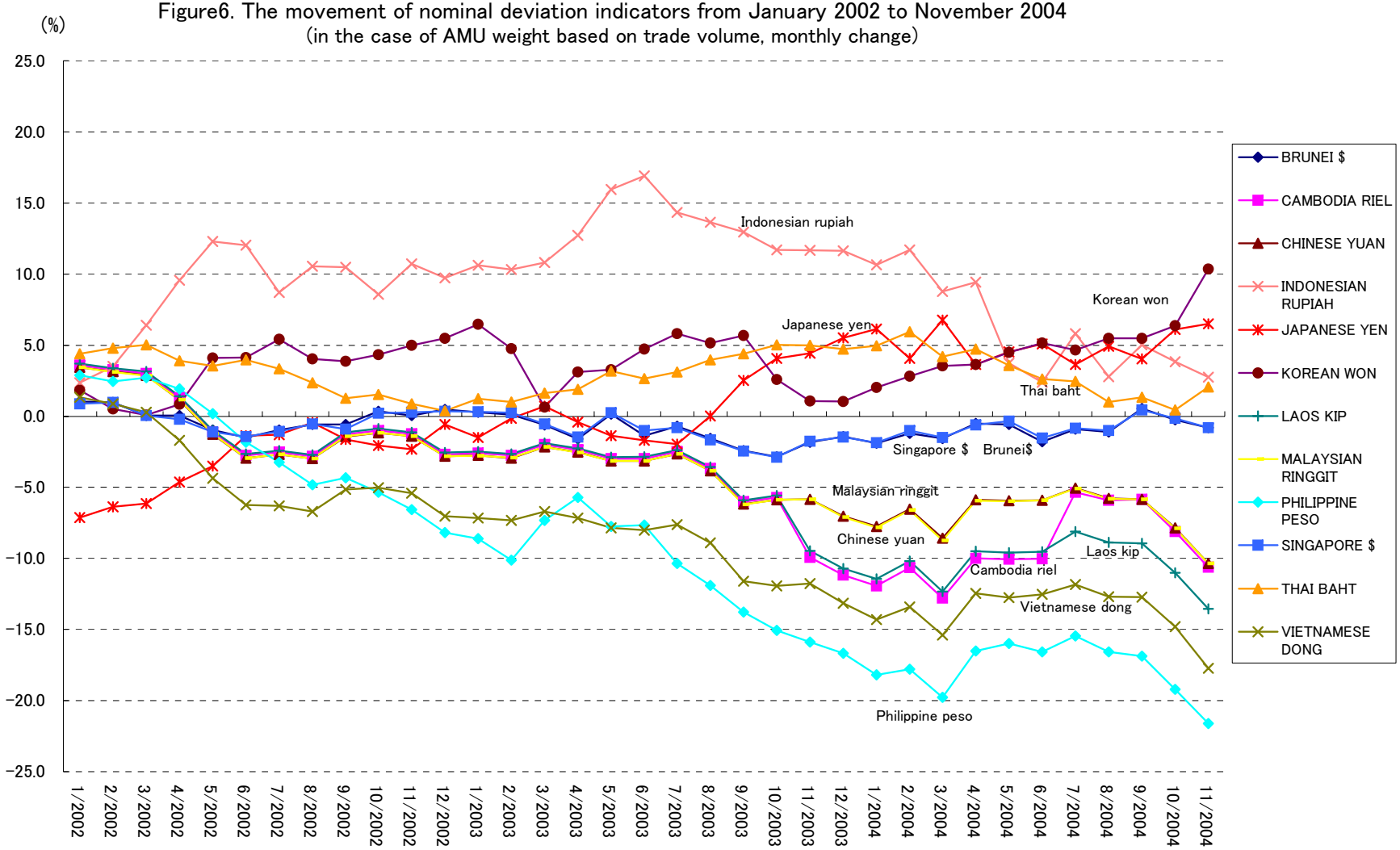


Figure7. The movement of real deviation indicators from January 2002 to November 2004
(in the case of AMU weight based on trade volume, monthly change)

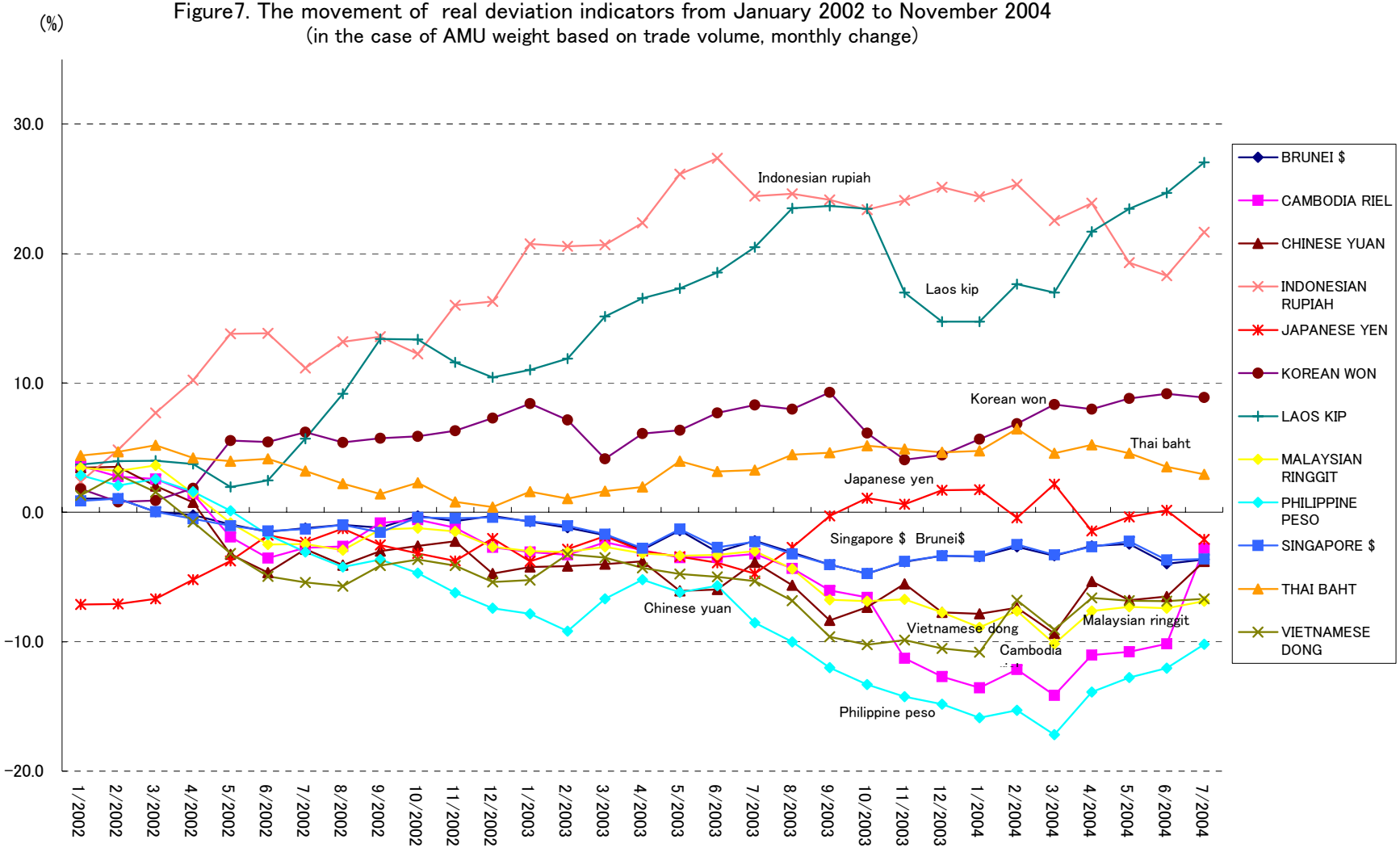


Figure8. Nominal v.s. Real Indicator <Indonesian rupiah>

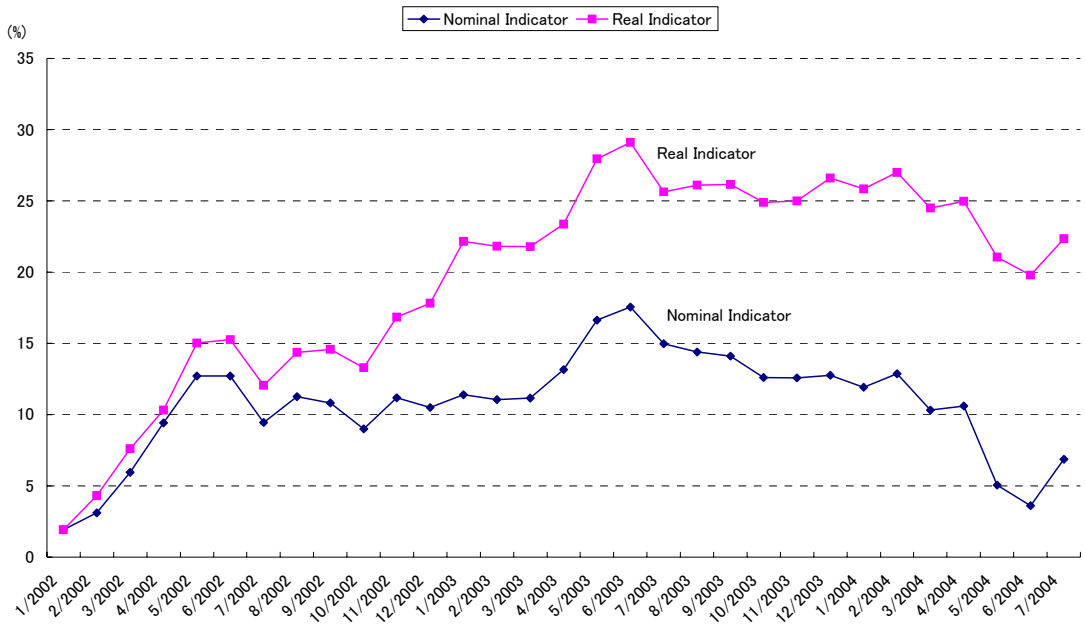


Figure9. Nominal v.s. Real Indicator <Chinese yuan>

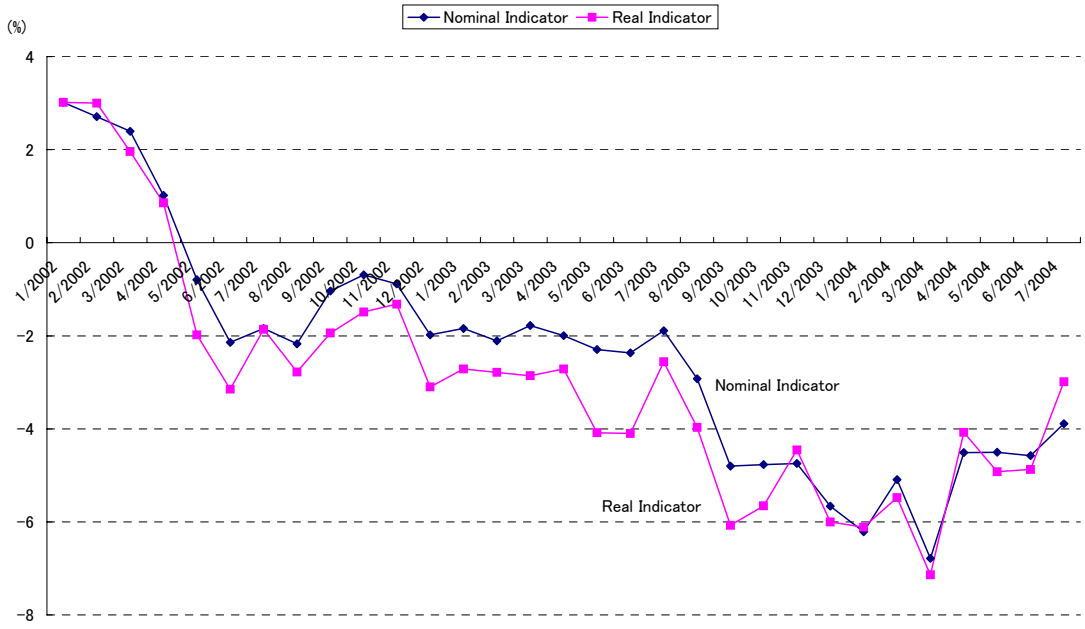
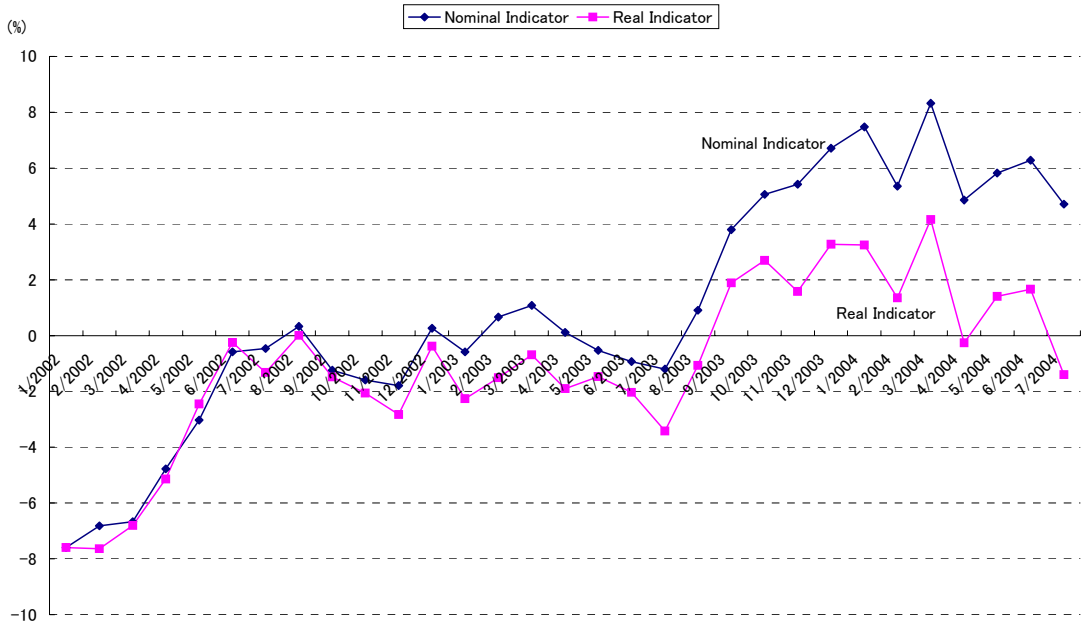


Figure10. Nominal v.s. Real Indicator <Japanese yen>



Appendix: The deviation indicator from benchmark rate (%)