



東アジアの為替政策協調をめざして

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Contents

- Exchange rates movements and exchange rate systems in East Asia
- Empirical research on exchange rate policies in East Asian countries
- Chinese Foreign Exchange System Reform
- Reaction to the US\$ depreciation
- Regional coordination for a desirable exchange rate system
- AMU and AMU Deviation Indicator



IMF's classification for exchange rate regimes

- Free float: Japan, Korea, the Philippines
- Managed float: Indonesia, Singapore, Thailand, Cambodia, Myanmar, Lao, Vietnam
- Fixed (Managed float since 7/21/2005) : China, Malaysia
- Currency board: Hong Kong, Brunei

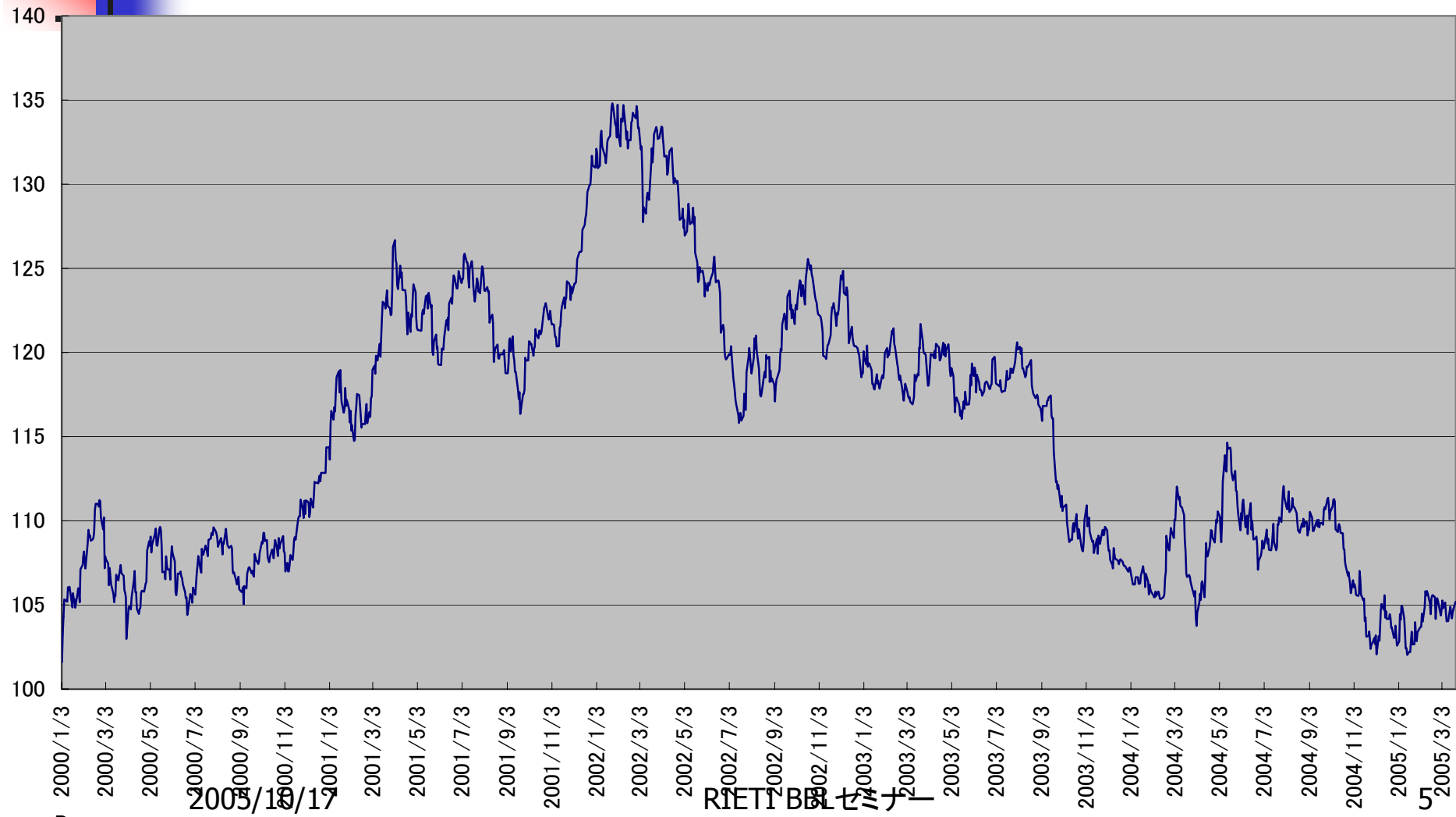


Recent exchange rates of East Asian currencies

- Japanese yen has appreciated against US\$ after 2002.
- Korean won, Thai baht, Singapore\$ have appreciated against US\$ after 2002. They have depreciated against Japanese yen recently.
- Indonesia rupiah has appreciated against US\$ and Japanese yen.
- Philippine peso has depreciated against US\$ and Japanese yen.
- Chinese yuan, Hong Kong\$, and Malaysian ringgit have pegged to US\$. They have depreciated against Japanese yen after 2002.

Fig.1.1 Exchange rate of JPY/US\$

円/米ドル

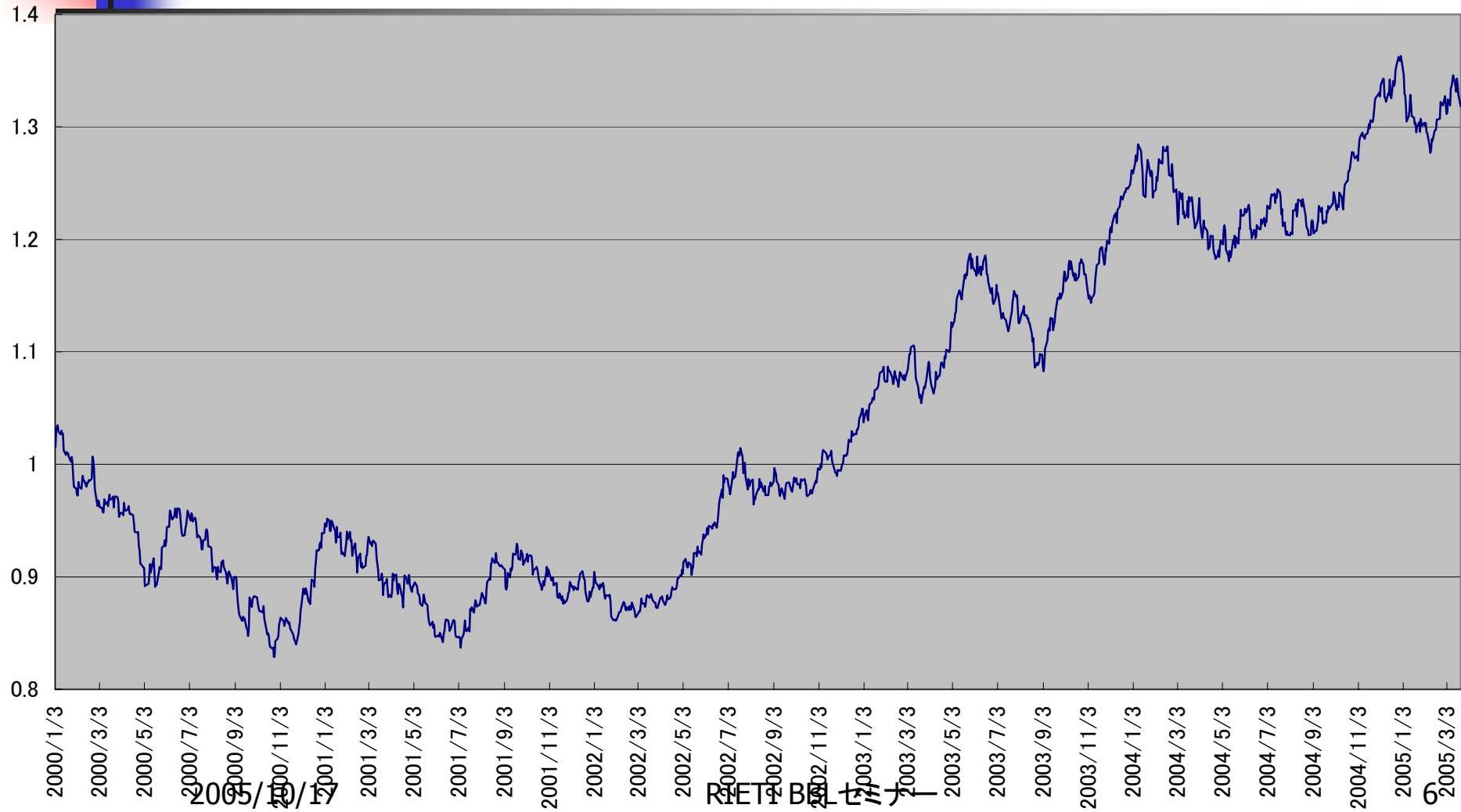


Data:

RIETI BANK センター

Fig.1.2 Exchange rate of US\$/euro

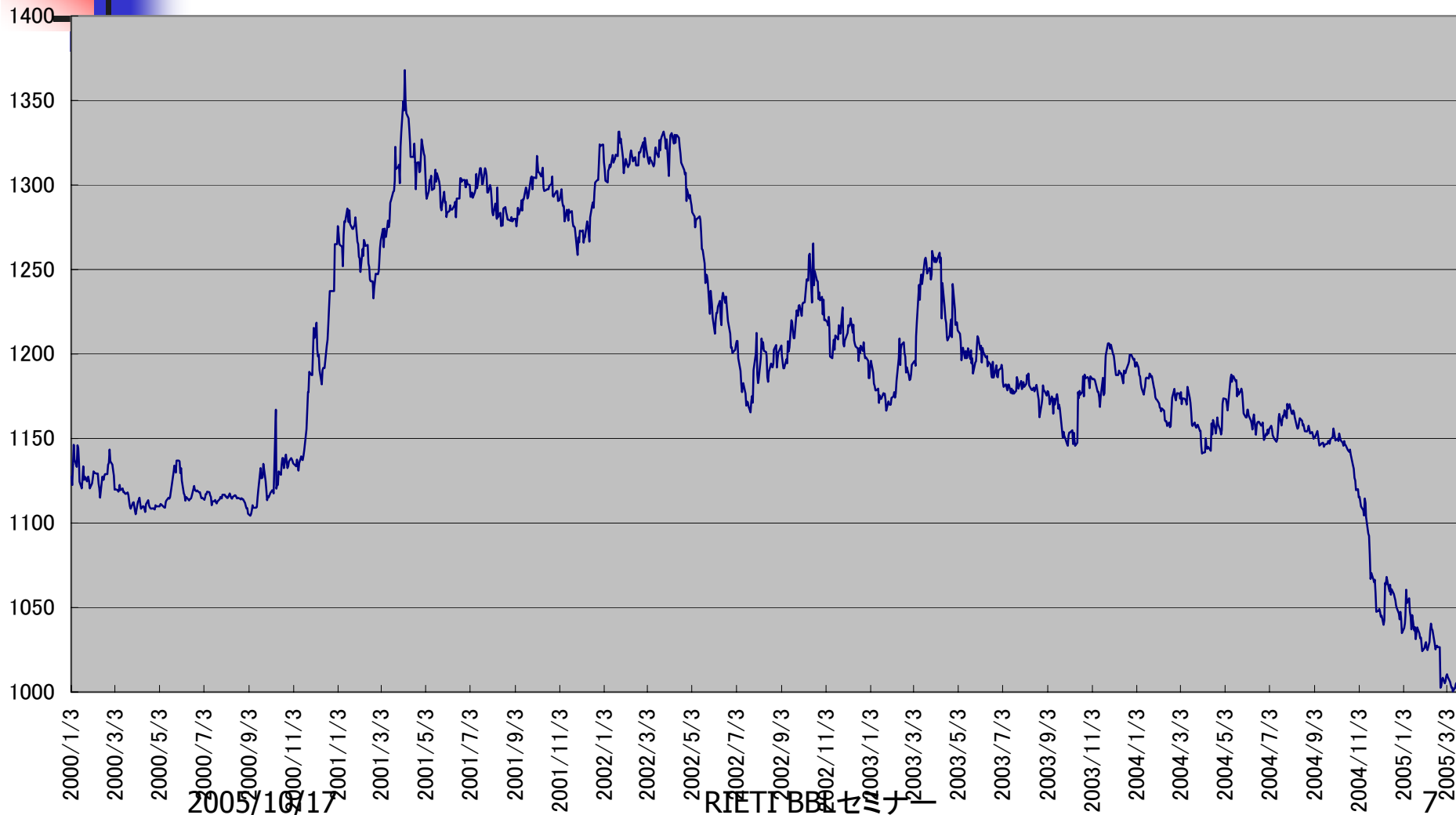
米ドル/ユーロ



Data: Datastream

Fig.1.3 Exchange rate of Korean won/US\$

韓国ウォン/米ドル

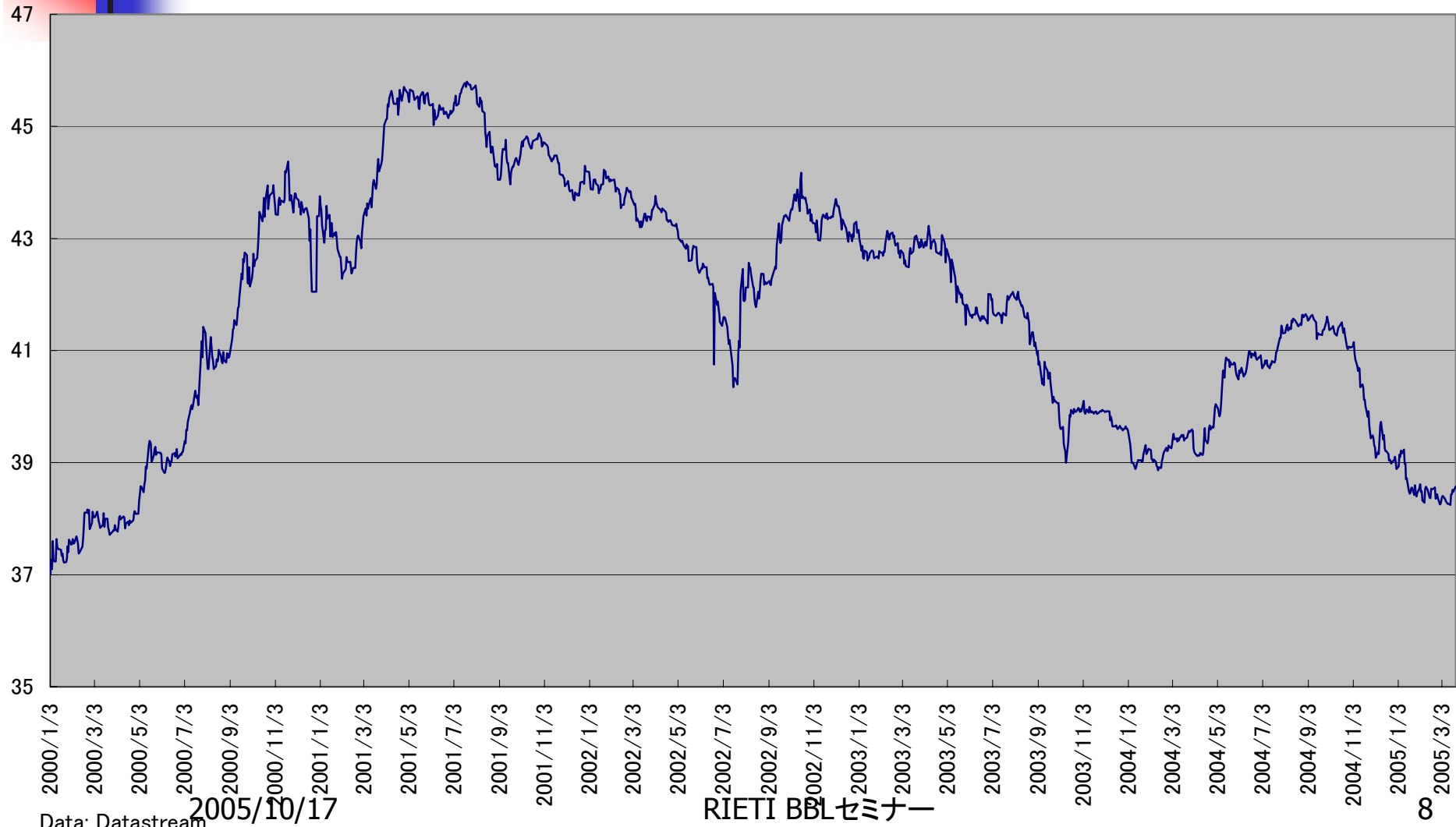


Data: Datastream

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Fig. 1.4 Exchange rate of Thai baht/US\$

タイ・パーツ/米ドル



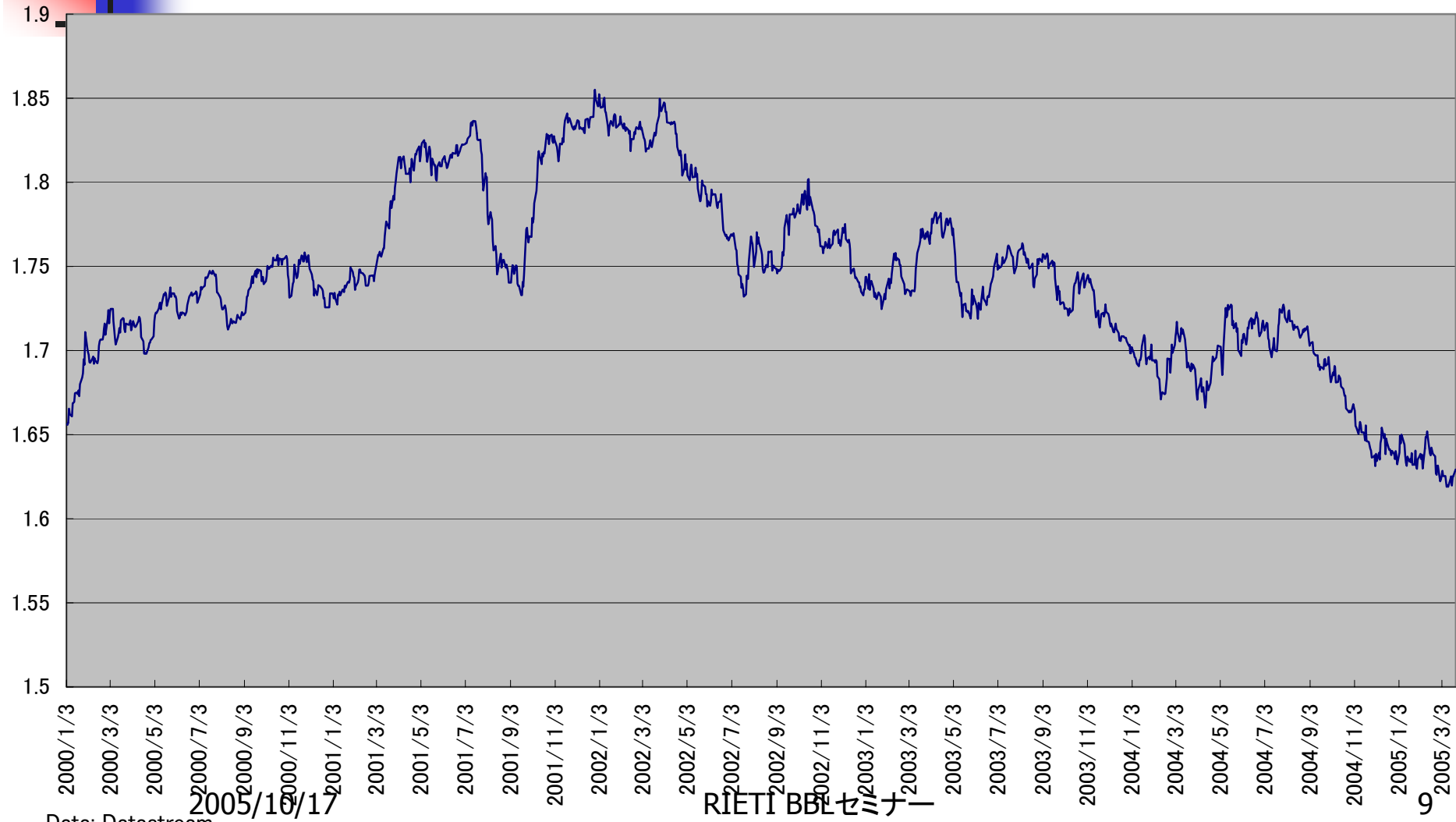
Data: Datastream

2005/10/17

RIETI BBLセミナー

Fig.1.5 Exchange rate of Singapore\$/US\$

シンガポール・ドル/米ドル

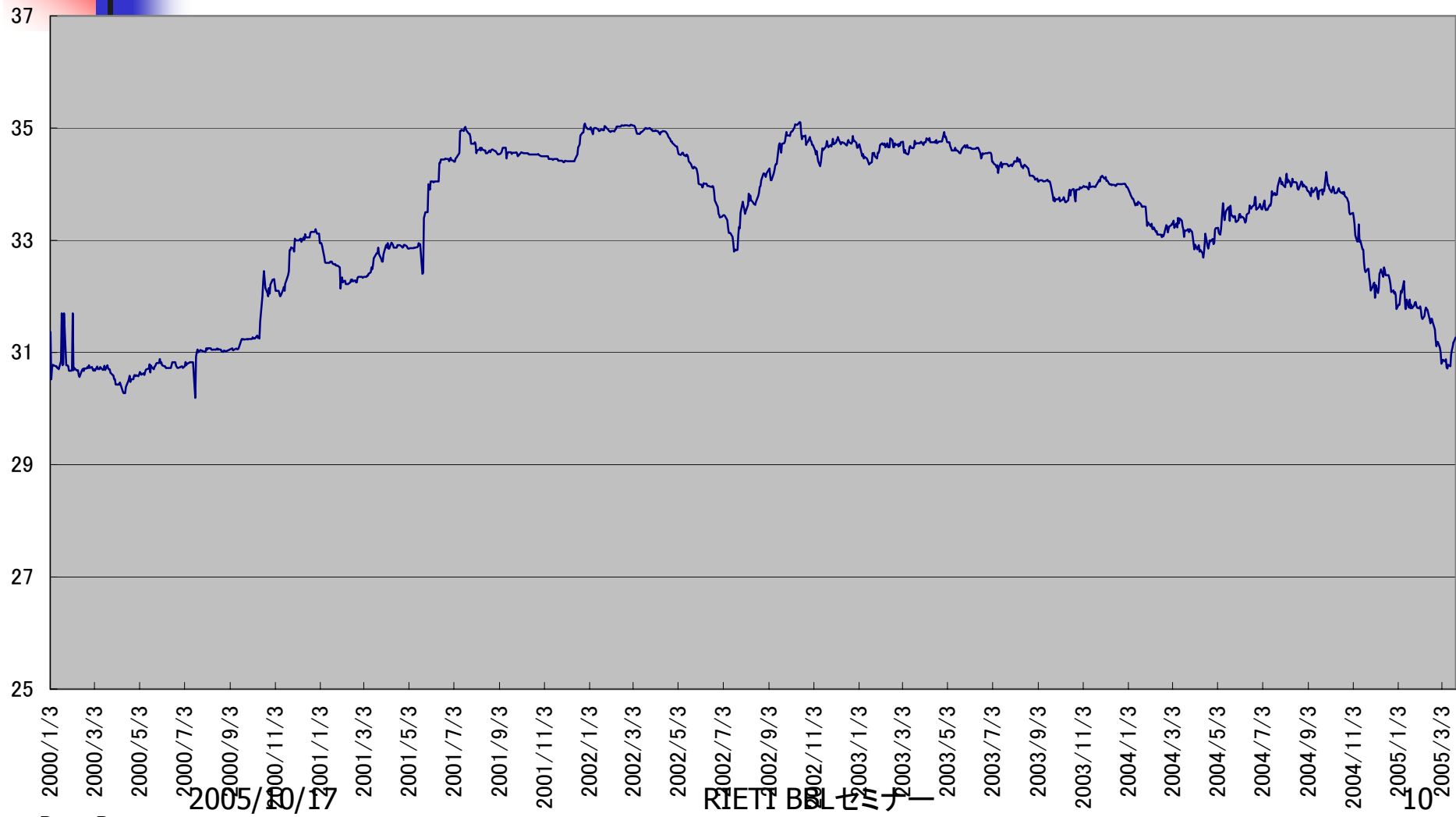


Data: Datastream

RIETI BBLセミナー

Fig.1.6 Exchange rate of Taiwan\$/US\$

台湾ドル/米ドル



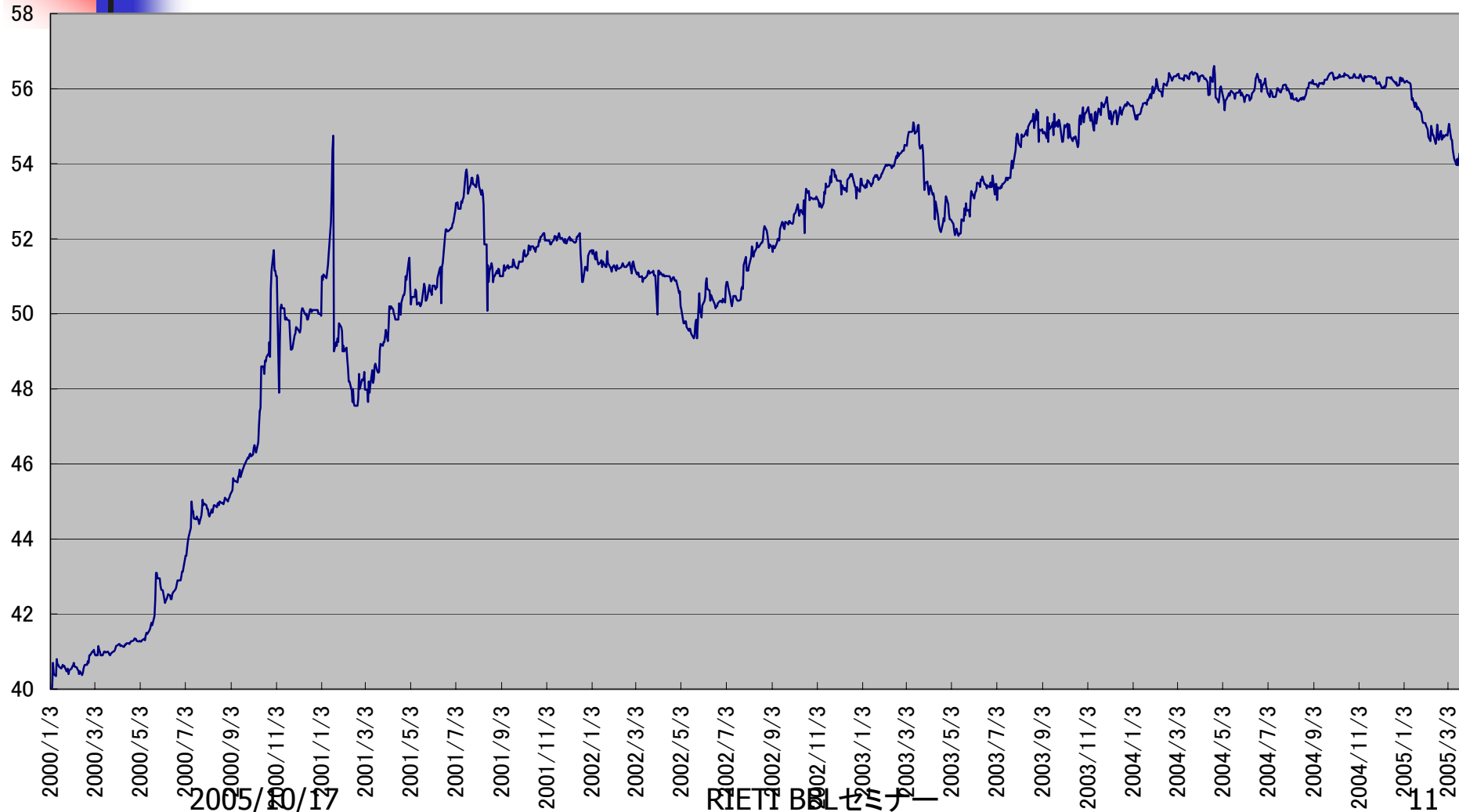
Data: Datastream

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Fig.1.7 Exchange rate of Philippine peso

/US\$

フィリピン・ペソ/米ドル



Data: Datastream

RIETI BLS 7/11

Fig.1.8 Exchange rate of Indonesia rupiah

/US\$

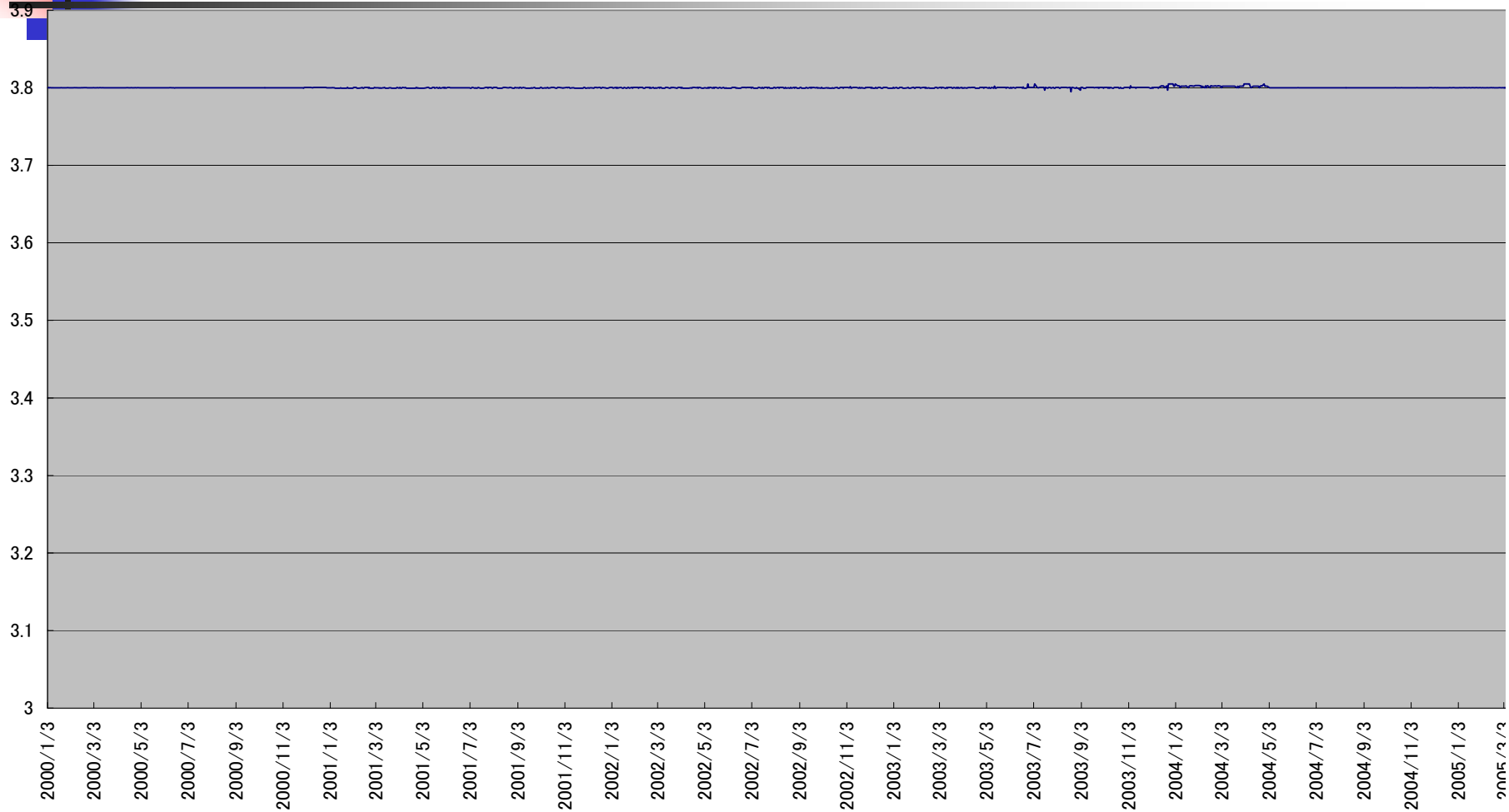
インドネシア・ルピア/米ドル



Data: Datastream

Fig.1.9 Exchange rate of Malaysian ringgit /US\$

マレーシア・リングgit/米ドル



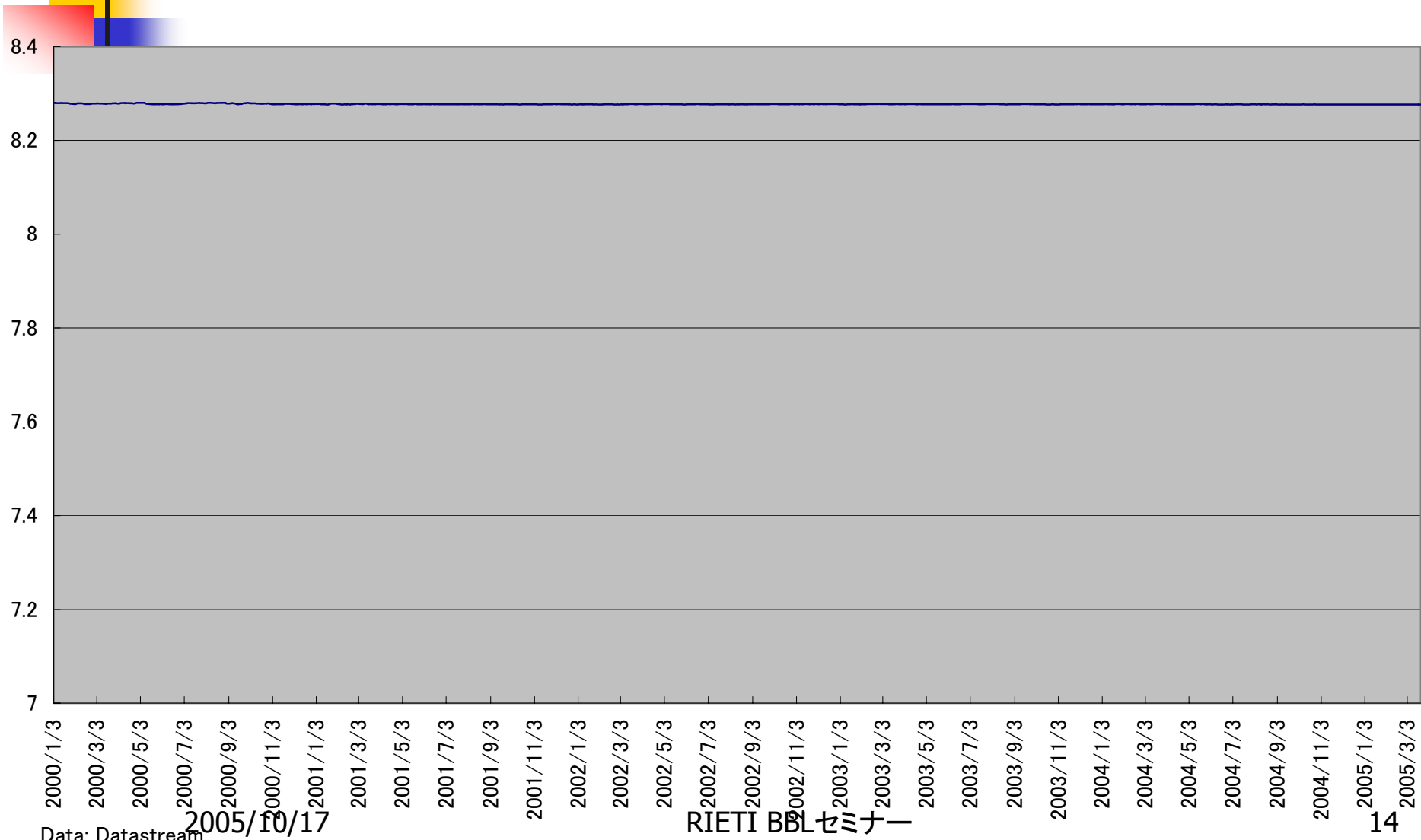
Data: Datastream

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Fig.1.10 Exchange rate of RMB/US\$

人民币/米ドル

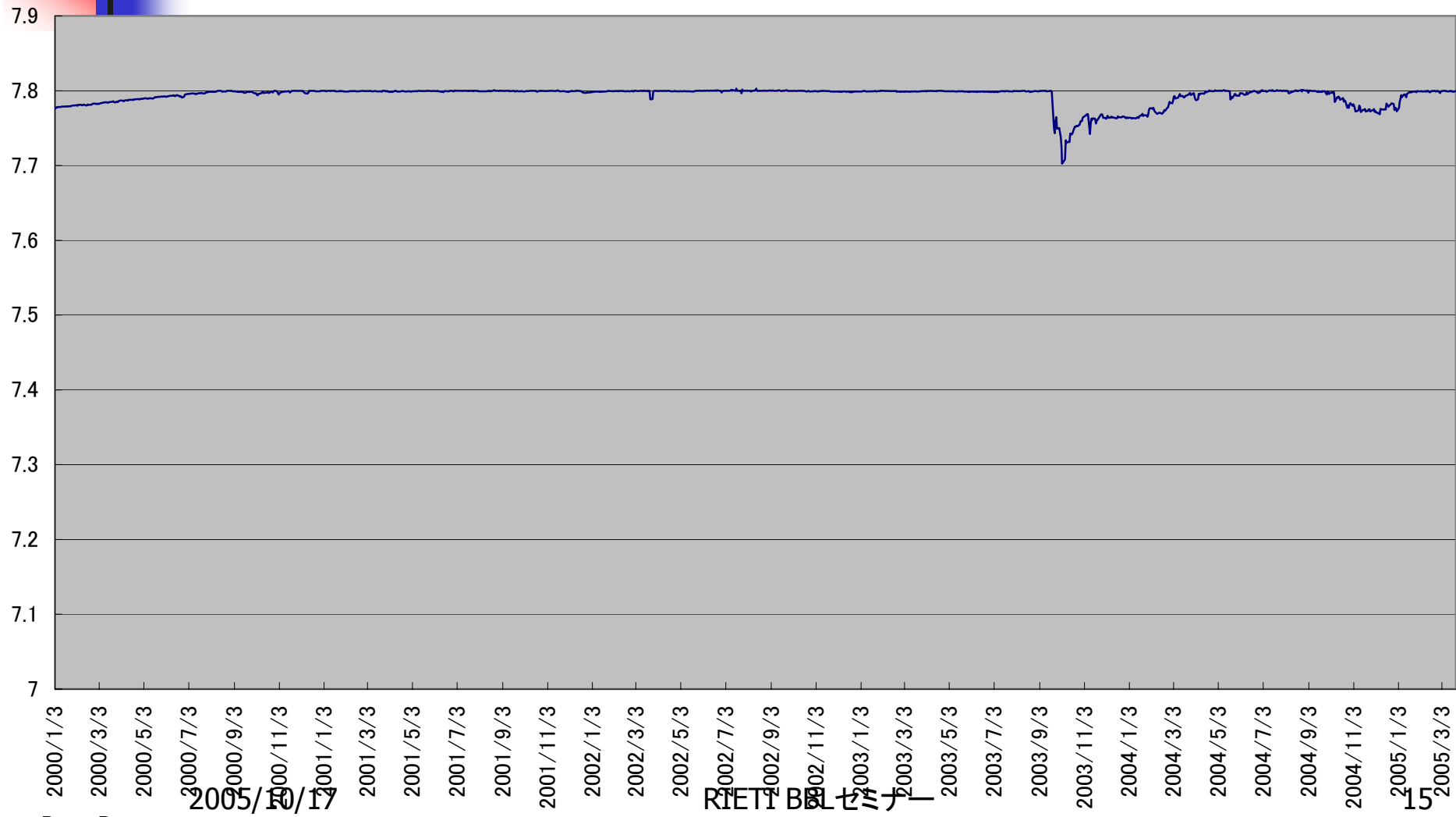


Data: Datastream

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Fig.1.11 Exchange rate of HK\$/US\$

香港ドル/米ドル



Data: Datastream

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Foreign exchange intervention by Japanese Monetary Authorities

- Ministry of Finance, Foreign Exchange Intervention Operations (<http://www.mof.go.jp/english/e1c021.htm>)
- Japanese monetary authorities made larger intervention in the FOREX market in 2003 and early 2004.
- They have made no intervention since April 2004.

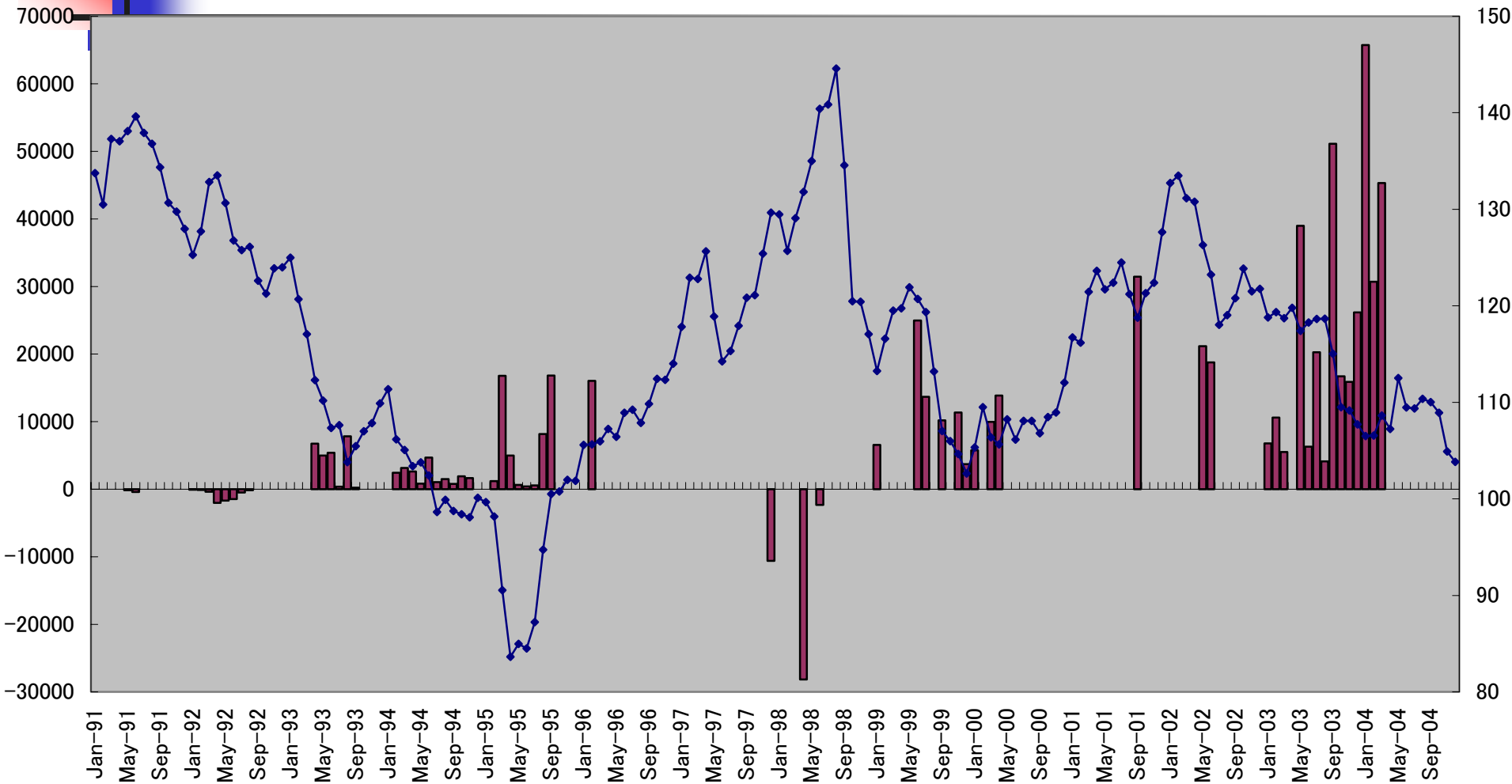
Fig.2 FOREX intervention in Japan

BOJ Interventions and Dollar/Yen Movement (Jan/1991—Dec/2004)

BOJ Intervention
(100Million Yen)

BOJ Intervention (against USdollar : 100Million Yen) — Dollar/Yen (average of month)

Dollar/Yen
(Ave. of month)





Empirical analysis on linkages of East Asian currencies to US\$

Regression equation:

$$\Delta \log e^{\text{home}/SFR} = a_0 + a_1 \Delta \log e^{USD/SFR} + a_2 \Delta \log e^{JPY/SFR} + a_3 \Delta \log e^{euro/SFR} + \varepsilon_t$$

Use daily data to regress the equation for each quarter of the sample period from 1999 to 2003.

a_1 : linkages of home currency to the US\$ or weight on the US\$

Fig.3.1 Thai baht: weights on US\$

Change of the Weight on US dollar – Thai baht, 1999.1Q–2003.4Q –

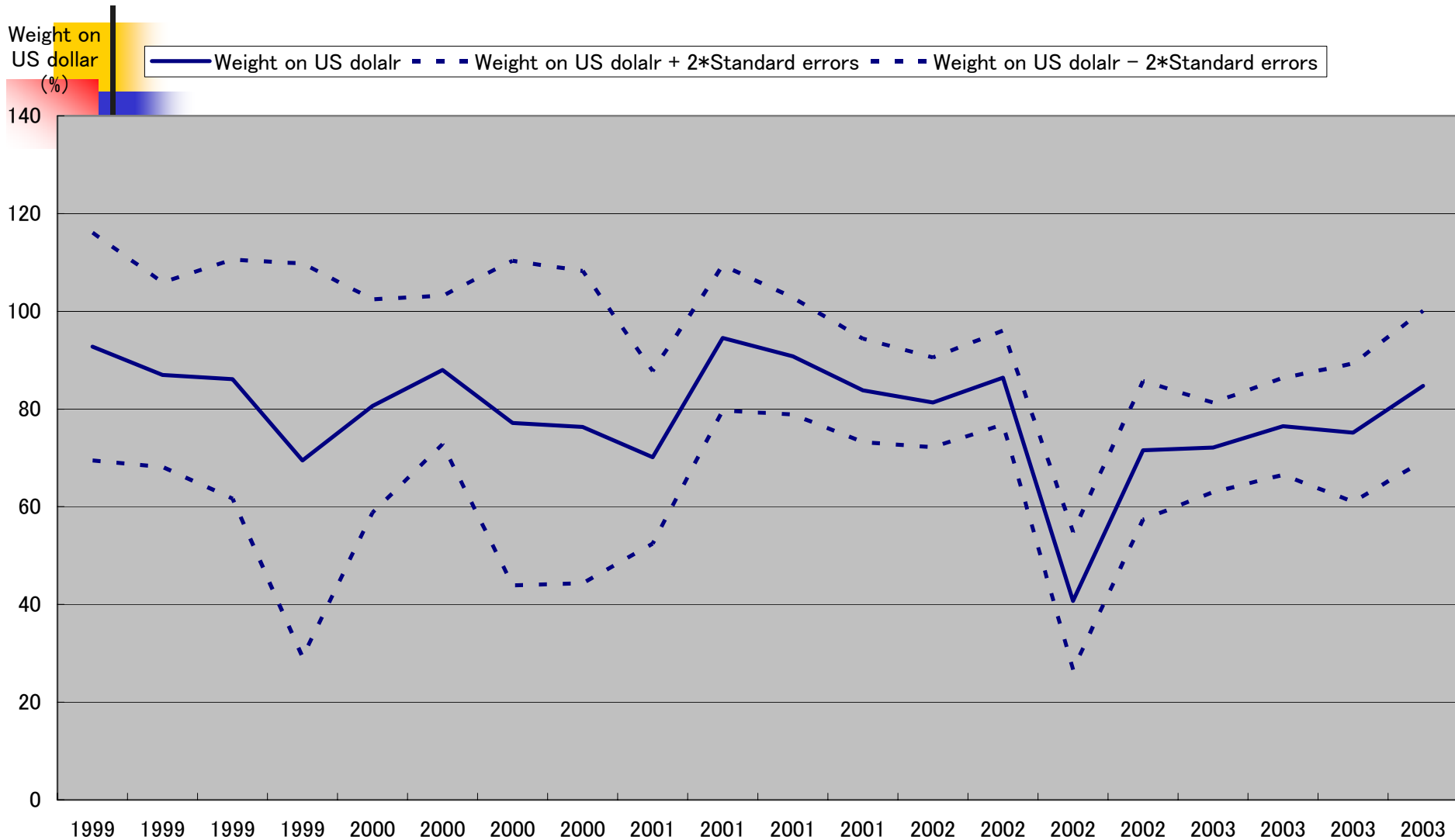


Fig.3.2 Singapore dollar: weights on US\$

Change of the Weight on US dollar - Singapore dollar, 1999:1Q - 2003:4Q

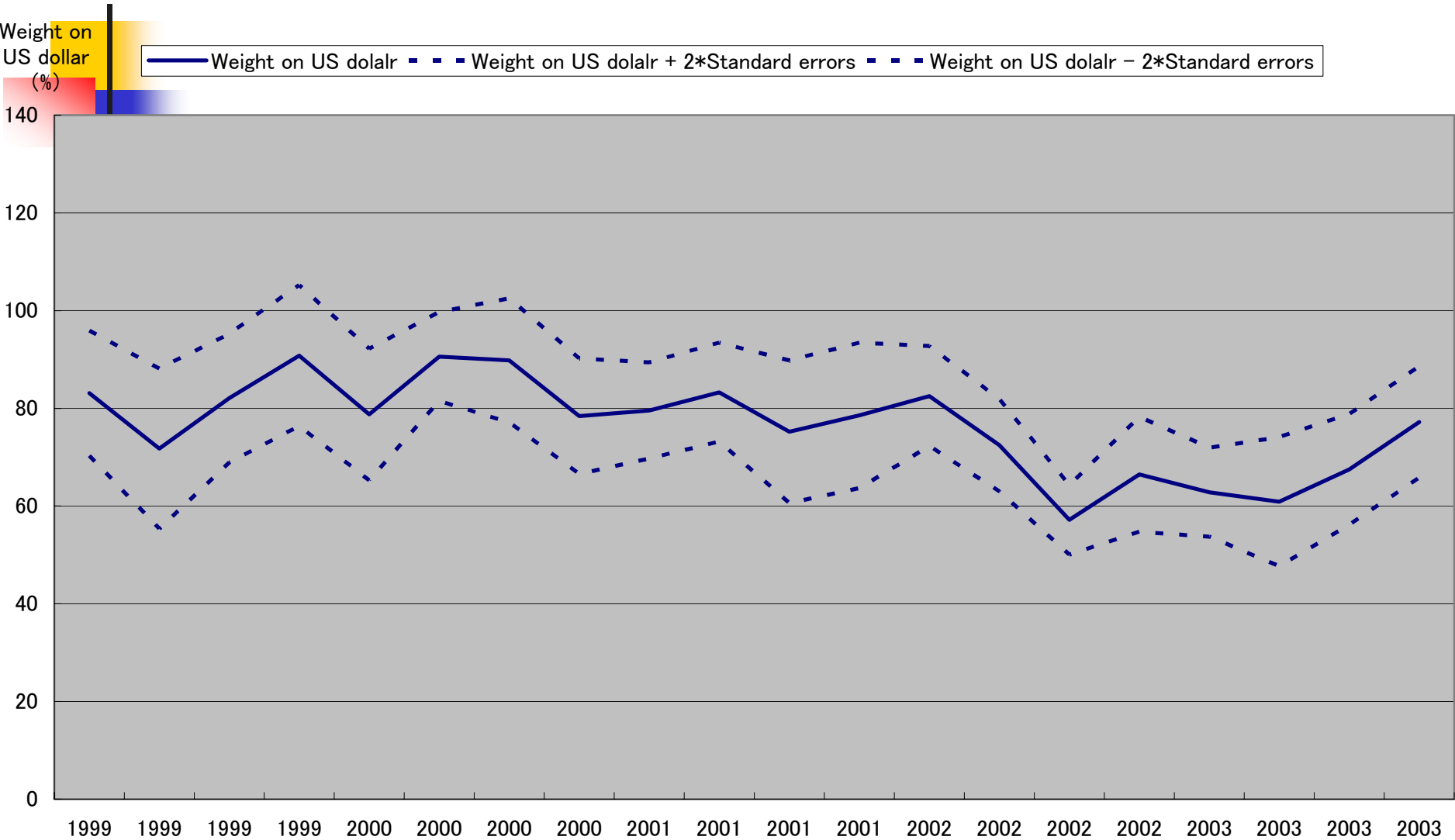


Fig.3.3 Korean won: weights on US\$

Change of the Weight on US dollar – Korean won, 1999.1Q–2003.4Q –

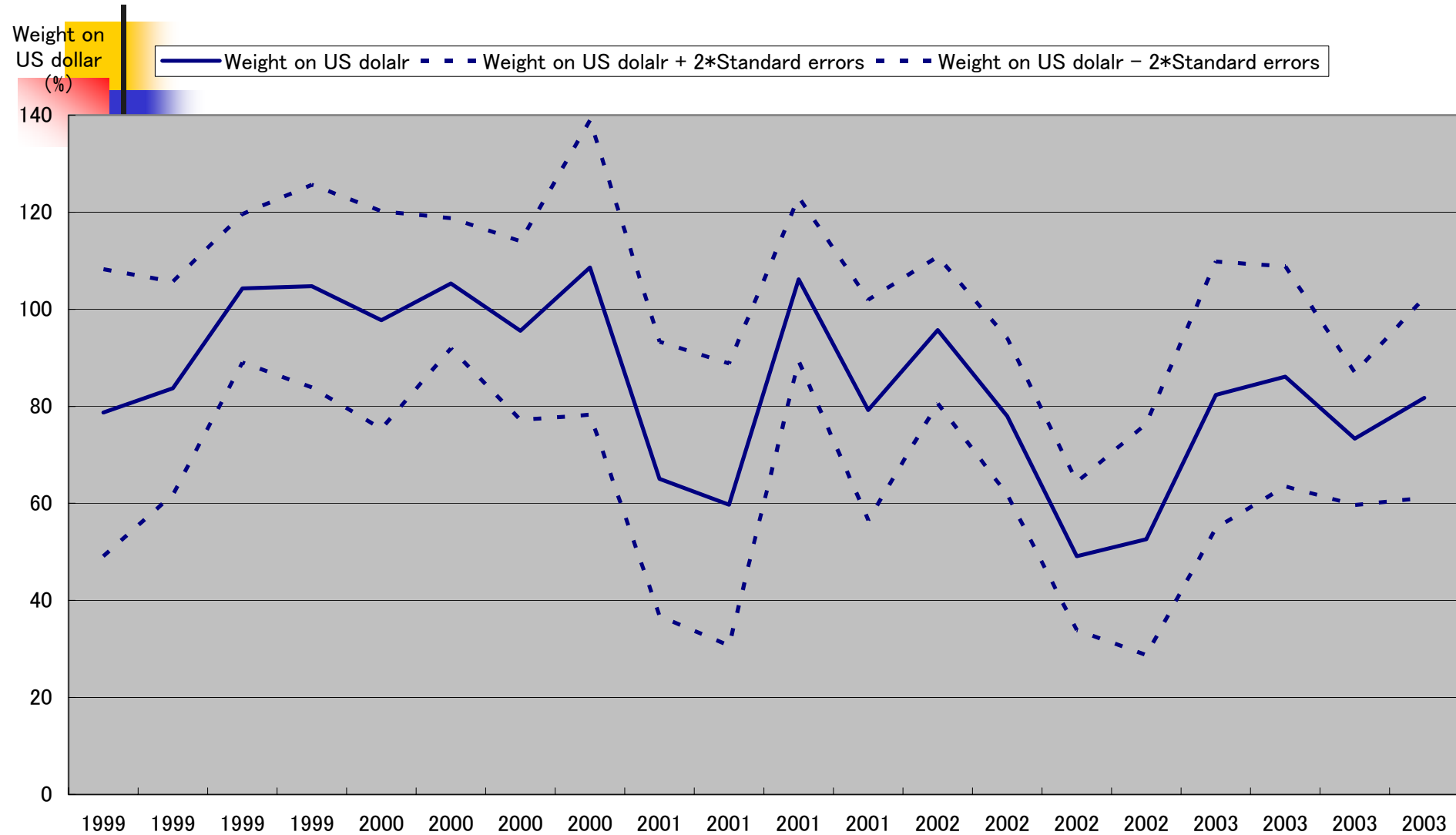


Fig.3.4 Philippine peso: weights on US\$

Change of the Weight on US dollar - Philippine peso, 1999.1Q-2003.4Q -

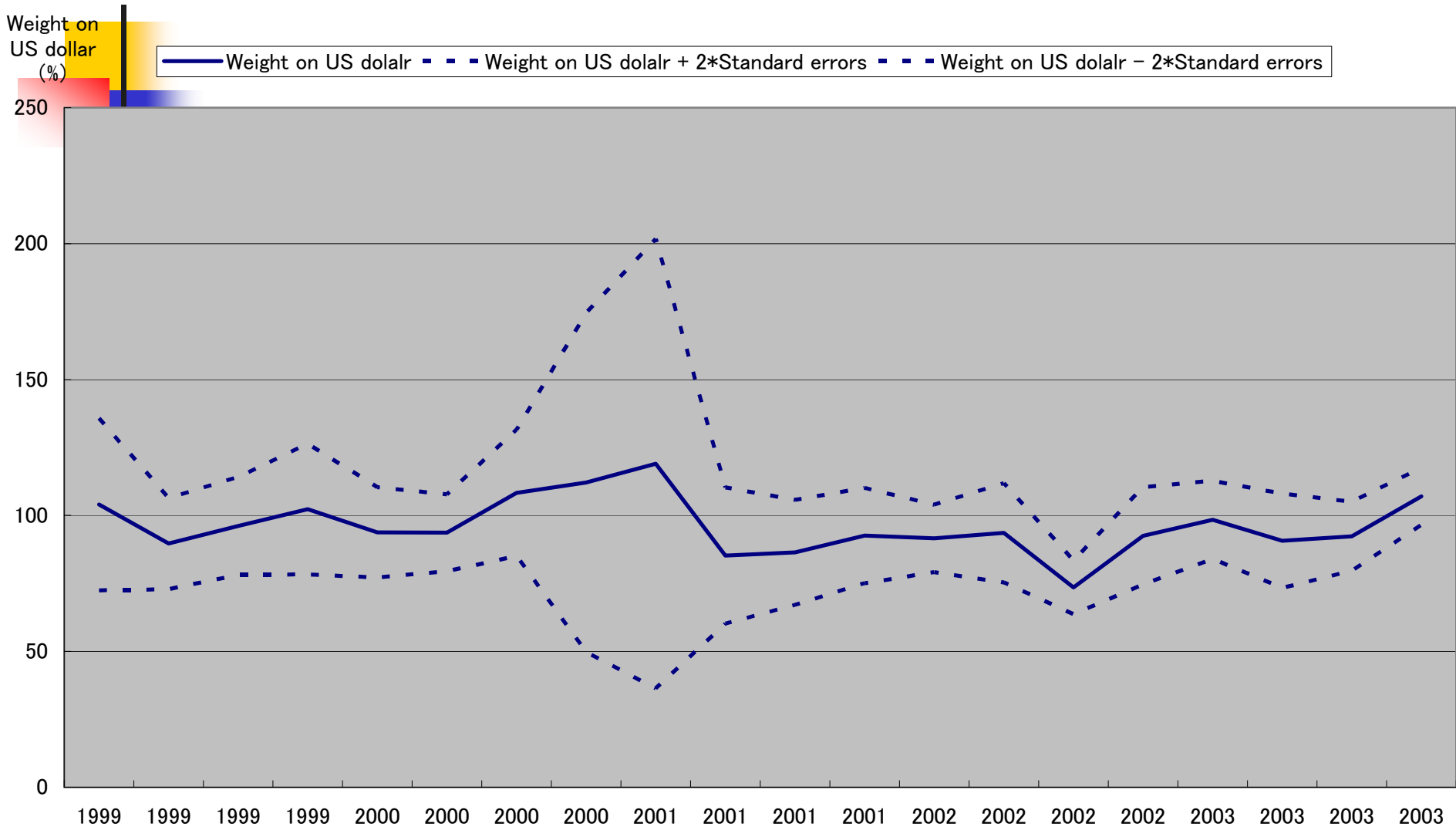


Fig.3.5 Indonesia rupiah: weights on US\$

Change of the Weight on US dollar n- Indonesia rupiah, 1999.1Q-2003.4Q -

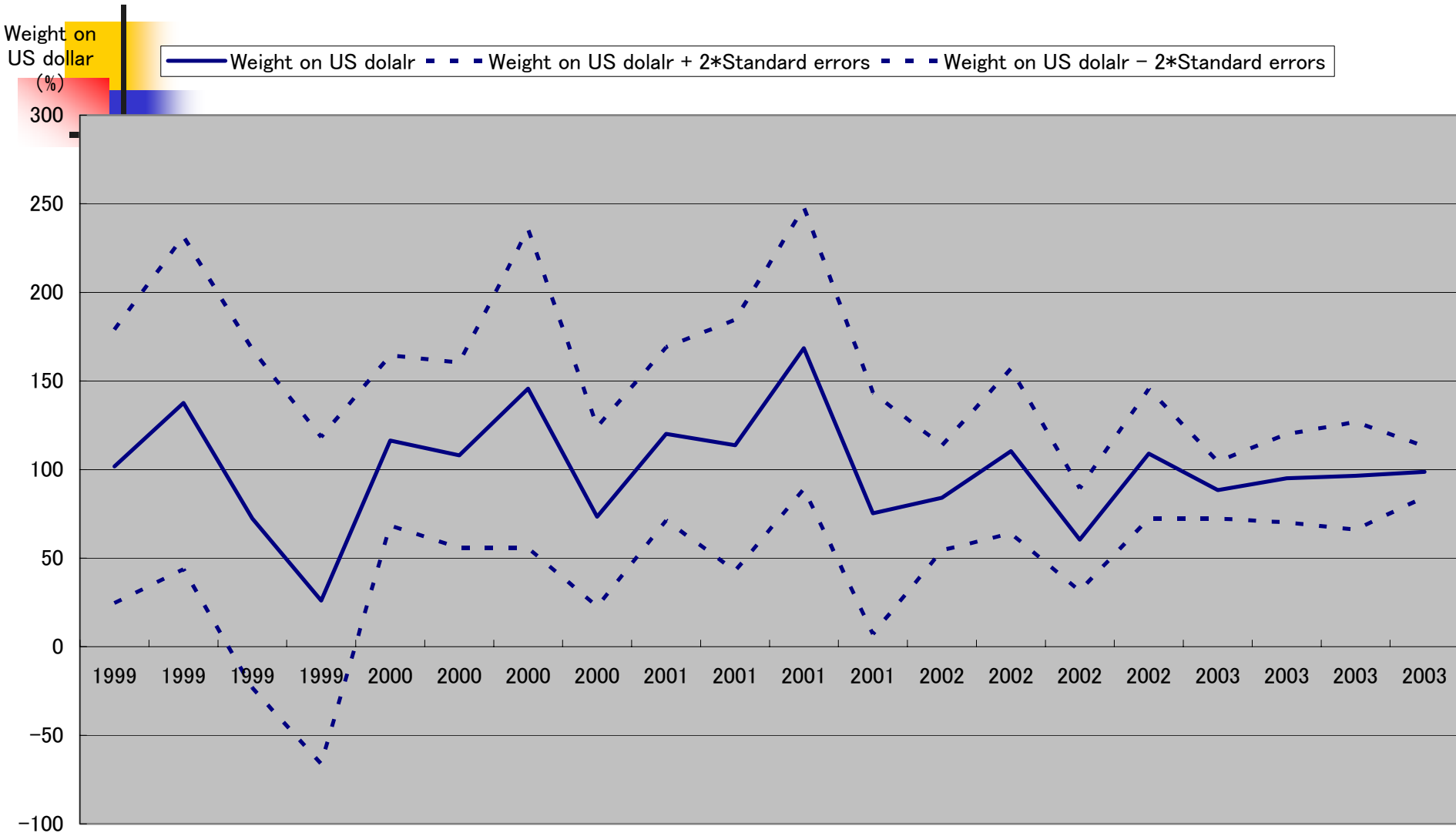


Fig.3.6 Malaysian ringgit: weights on US\$

Change of the Weight on US dollar – Malaysian ringgit, 1999.1Q–2003.4Q –

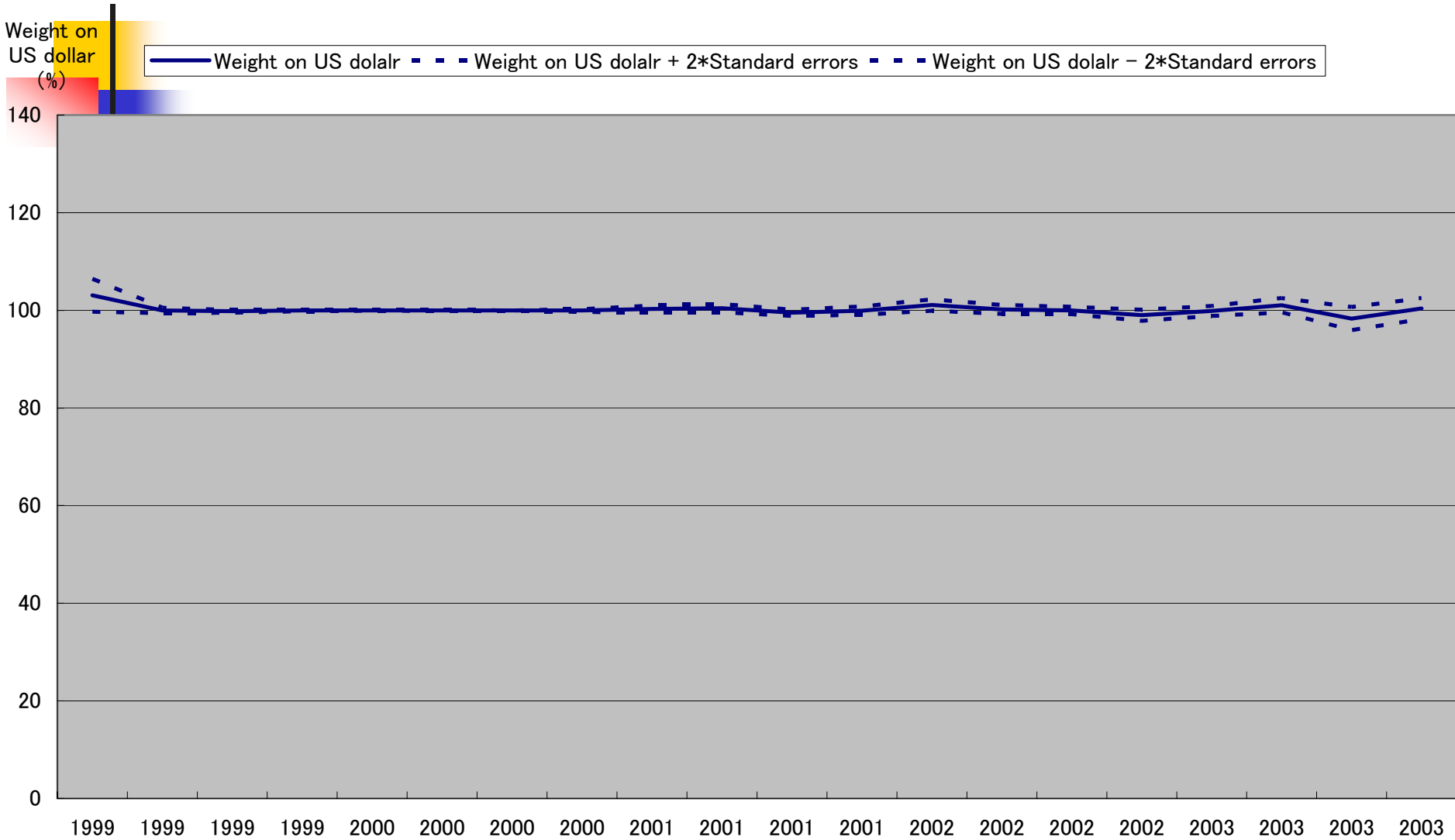


Fig.3.7 HK dollar: weights on US\$

Change of the Weight on US dollar – Hong Kong dolar, 1999.1Q–2003.4Q –

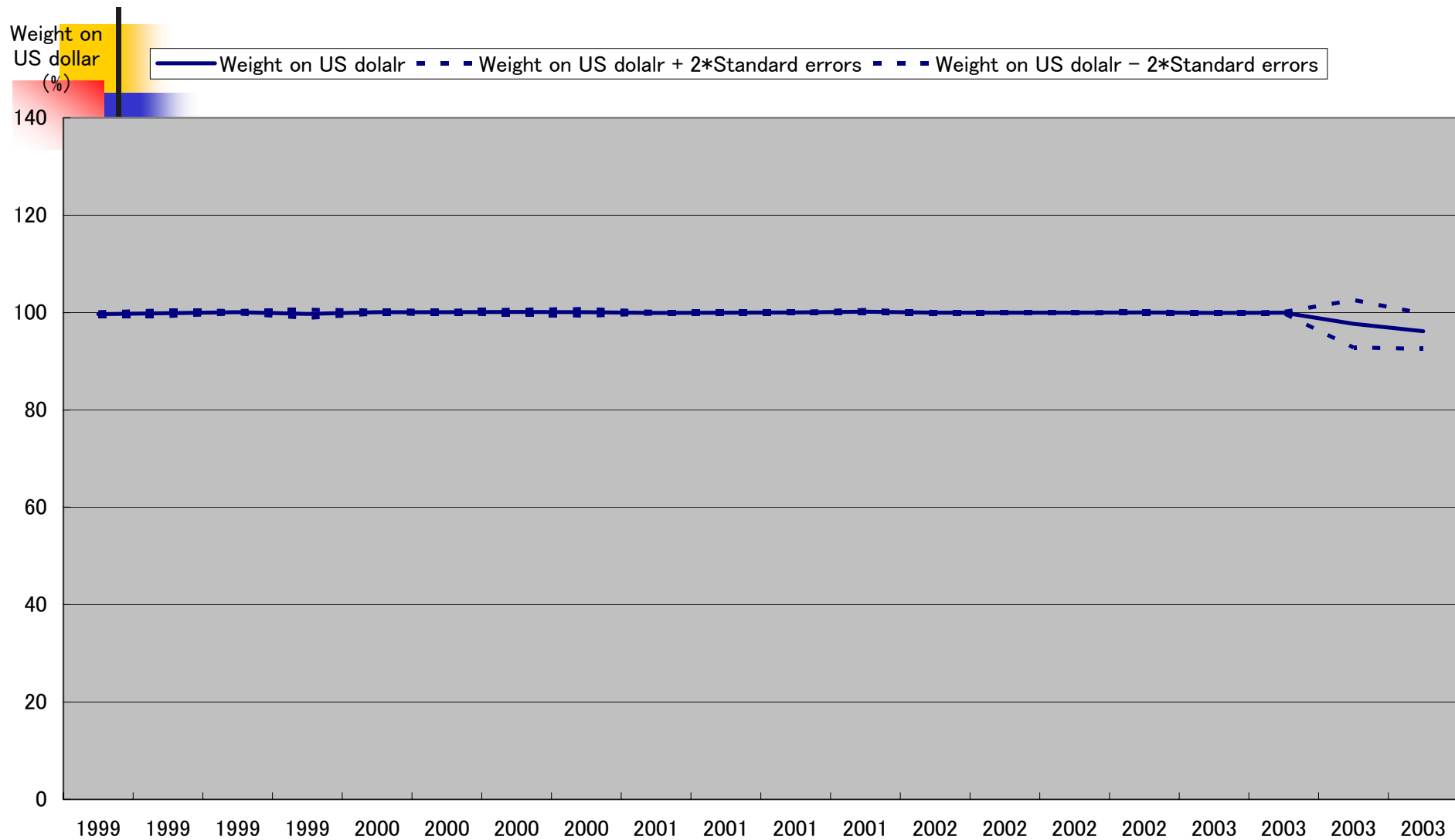
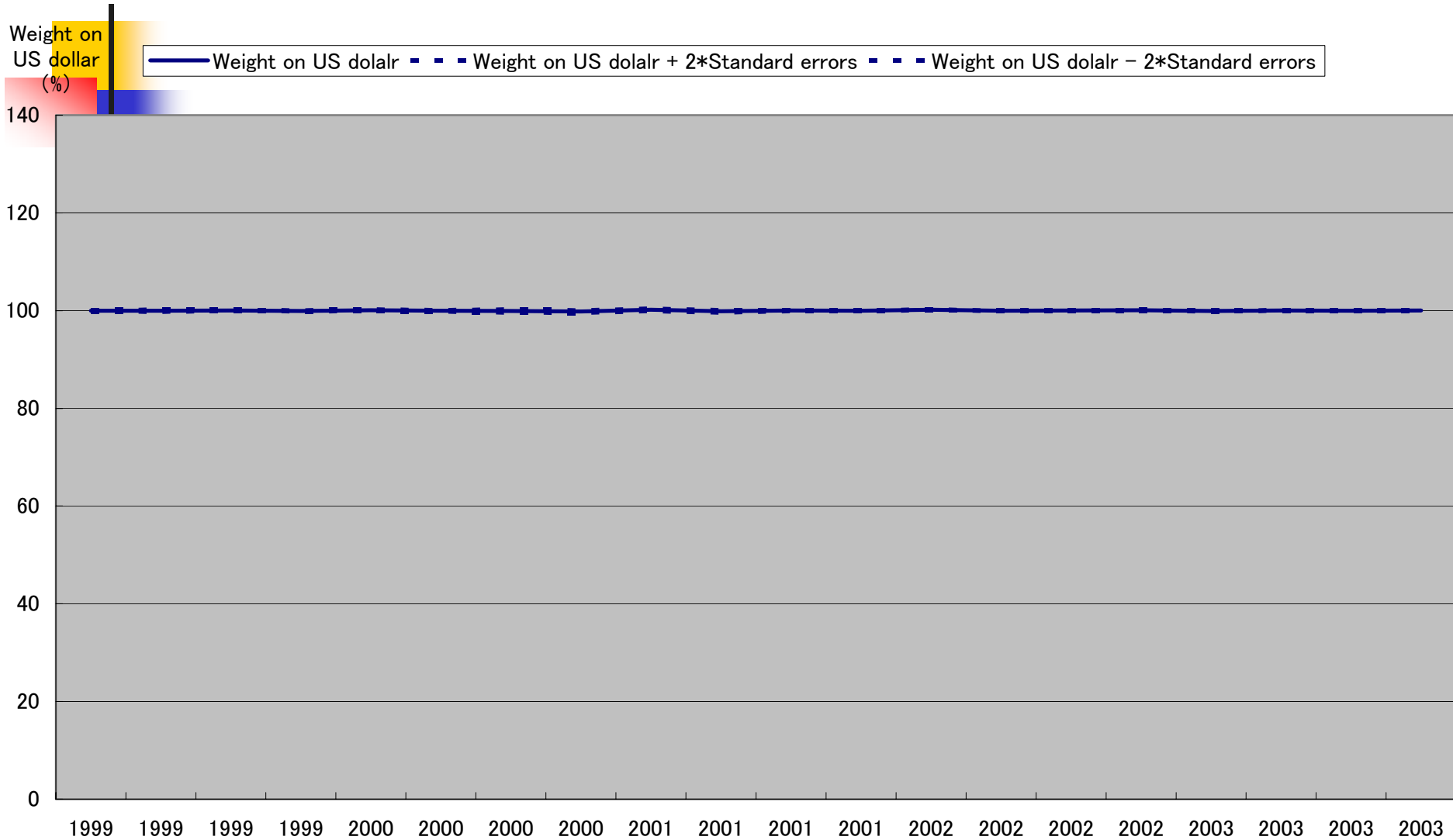


Fig.3.8 RMB: weights on US\$

Change of the Weight on US dollar – Chinese Yuan, 1999.1Q–2003.4Q –





Currency basket system in China

- Managed floating exchange rate system with reference to a currency basket
- Composition of currency basket for China
- Determination of a currency basket for the appreciating Chinese yuan

Managed floating exchange rate system with reference to a currency basket

- “fixed exchange rate system” vs. “managed floating exchange rate system”
 - pre-announce or not
 - transparency and accountability
- “with reference to currency basket” vs. “peg to currency basket”
 - transparency and accountability

Unclear exchange rate policy has stronger or weaker effect on exchange rate

- Unclear exchange rate policy and possibility of making manipulation in exchange rate policy would decrease the credibility of the monetary authorities. Under such a situation, the monetary authorities cannot enjoy the honey moon effects (Krugman(1991)) that market participants follow the monetary authorities' intention of exchange rate policy.
- On the other hand, under imperfect or asymmetric information on the monetary authorities' exchange rate policy, their intervention in the foreign exchange market might have a stronger effect on exchange rates because the monetary authorities give a surprise to market participants in a situation of asymmetric information between the monetary authorities and the private sectors.



Composition of currency basket for China

- In terms of trade volume, Chinese economy has about 15% of its total trade volume with each of the United States, the EU, and Japan. It implies 70%:15%:15% for the US dollar, the euro, and the Japanese yen in the currency basket if currencies of the rest of world have close linkages with the US dollar.



Table 1 Trade shares of China

Exports and Imports of China in 2004 (millions US\$, %)					
(DOTS, IMF)					
		Exports	Imports (CIF)	Total	
World Total		593232	561422	1154654	100%
United States		125155	44772.6	169927.6	14.7%
Japan		73514.3	94372.1	167886.4	14.5%
European Union		107265	70131.2	177396.2	15.4%
Korea		27818.4	62249.8	90068.2	7.8%
China,P.R.:Hong Ko		100878	11800.4	112678.4	9.8%



Frankel and Wey's method

The empirical analytical method of Frankel and Wei (1994) is used to analyze the linkages of RMB to four currencies; the USD, the JPY, the euro, and the KWon.

- Daily data of exchange rates are used to regress log differences of the RMB (in terms of the Sfr) on log differences of the four currencies (in terms of the Sfr) for each quarterly sub-sample period in the sample period.
- Regression equation:

$$\Delta \log e^{RMB/SFR} = a_0 + a_1 \Delta \log e^{USD/SFR} + a_2 \Delta \log e^{JPY/SFR} + a_3 \Delta \log e^{euro/SFR} + a_4 \Delta \log e^{WON/SFR} + \varepsilon_t$$

Table 2 Results of Estimation by using Frankel and Wei method

	Constant	Japanese Yen	US Dollar	Euro	Korean Won	Adj.Rsquared	D.W.Stat
3-2005/3/31	0.0000	0.0002	0.9998 ***	0.0001	-0.0003	1.0000	2.9634
	0.0000	0.0008	0.0009	0.0023	0.0007		
1-2005/6/30	0.0000	-0.0001	0.9998 ***	-0.0044 *	0.0001	1.0000	2.7789
	0.0000	0.0010	0.0011	0.0024	0.0010		
1-2005/7/20	0.0000	0.0005	1.0016 ***	-0.0043	-0.0031 *	1.0000	2.2144
	0.0000	0.0022	0.0016	0.0056	0.0015		
1/22-2005/9/26	0.0000	0.0045	0.9739 ***	-0.0289	0.0234 *	0.9973	2.2656
	0.0000	0.0113	0.0144	0.0387	0.0128		

Exchange rate data are from Datastream.

Standard errors are calculated by OLS of Frankel and Wei Model.

***, ** and * indicate that the estimated coefficients are statistically significant at the 1%, 5% and 10% levels, respectively.



Analytical results

- Coefficients on the USD are nearly equal to a unity even after the exchange rate system reform. However, the weight decreases a little after the exchange rate system reform although it still remains at quite a high level.
- Coefficients on the JPY, the euro, and the KWon are very small and statistically insignificant in many cases. The weights on three currencies increased a little after the exchange rate system reform although these are statistically insignificant.



Kalman Filter Method

- The Kalman filter method is used to estimate time-varying coefficients.
- The regression equation

$$\Delta \log e^{RMB/SFR} = a_0 + a_1 \Delta \log e^{USD/SFR} + a_2 \Delta \log e^{JPY/SFR} + a_3 \Delta \log e^{euro/SFR} + a_4 \Delta \log e^{WON/SFR} + \varepsilon_t$$

$$a_{0,t} = a_{0,t-1} + \eta_{0,t}$$

$$a_{1,t} = a_{1,t-1} + \eta_{1,t}$$

$$a_{2,t} = a_{2,t-1} + \eta_{2,t}$$

$$a_{3,t} = a_{3,t-1} + \eta_{3,t}$$

$$a_{4,t} = a_{4,t-1} + \eta_{4,t}$$

Fig.4.1 Dynamic coefficients on the US\$

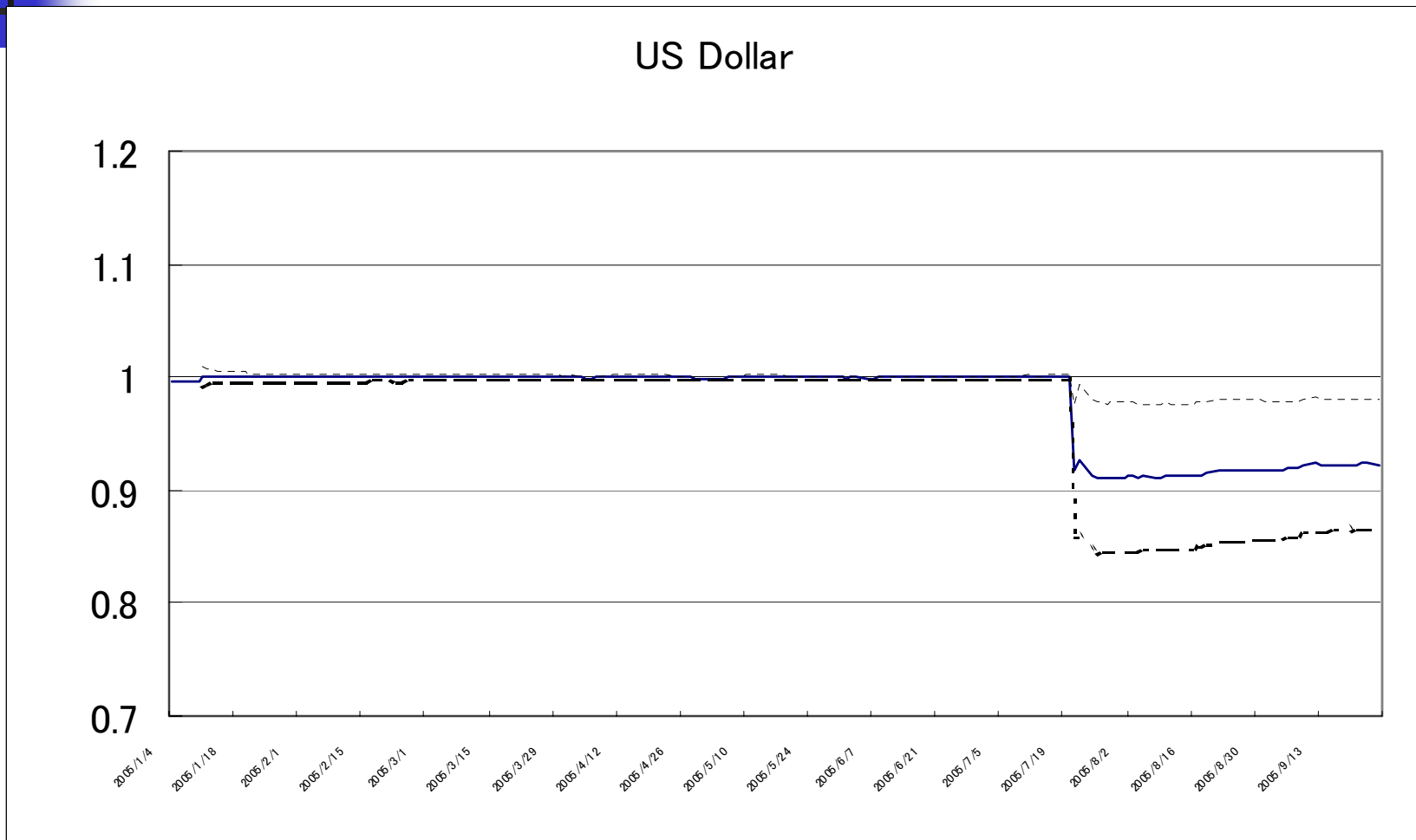


Fig.4.2 Dynamic coefficients on the JPY

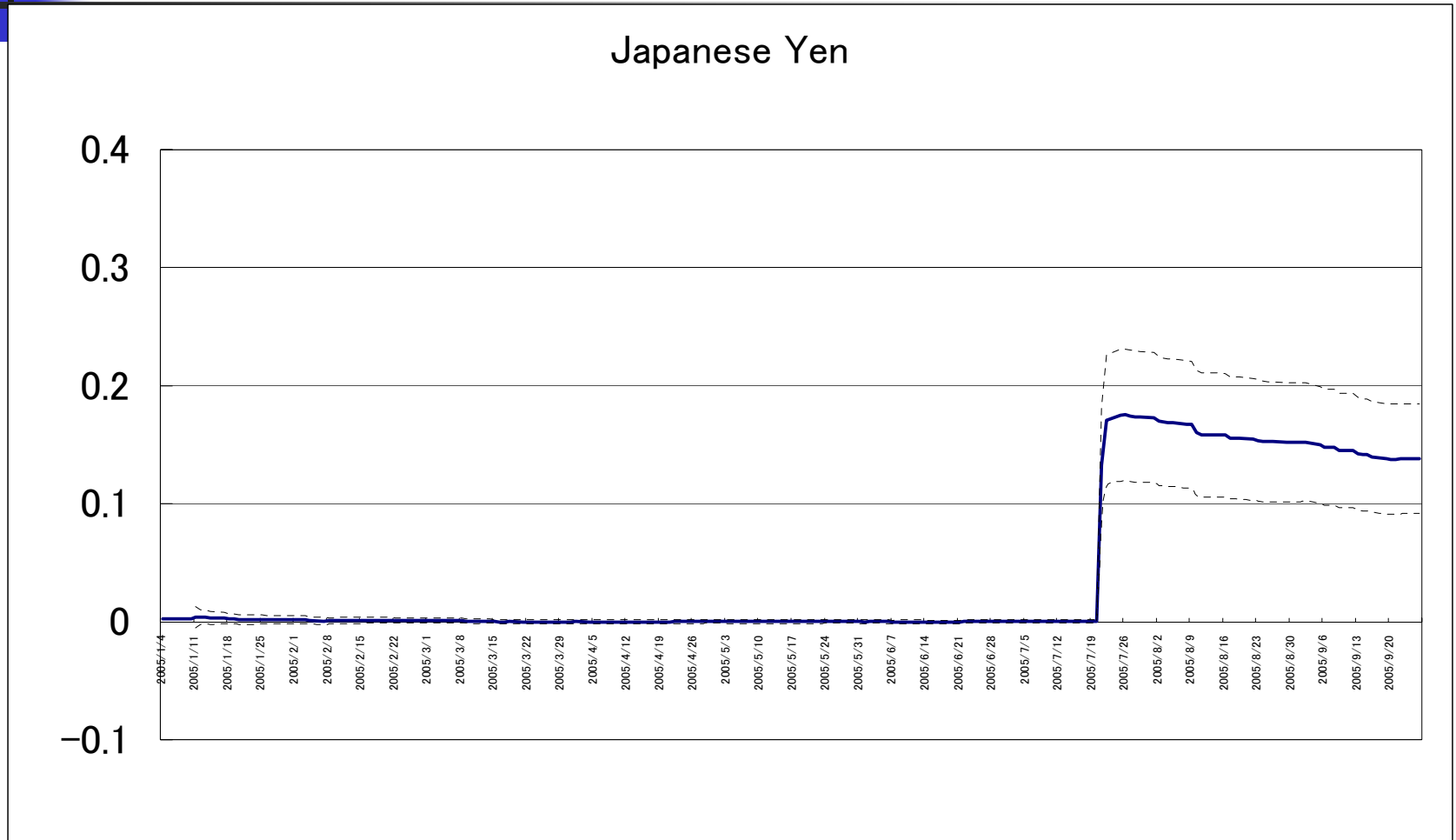


Fig.4.3 Dynamic coefficients on the euro

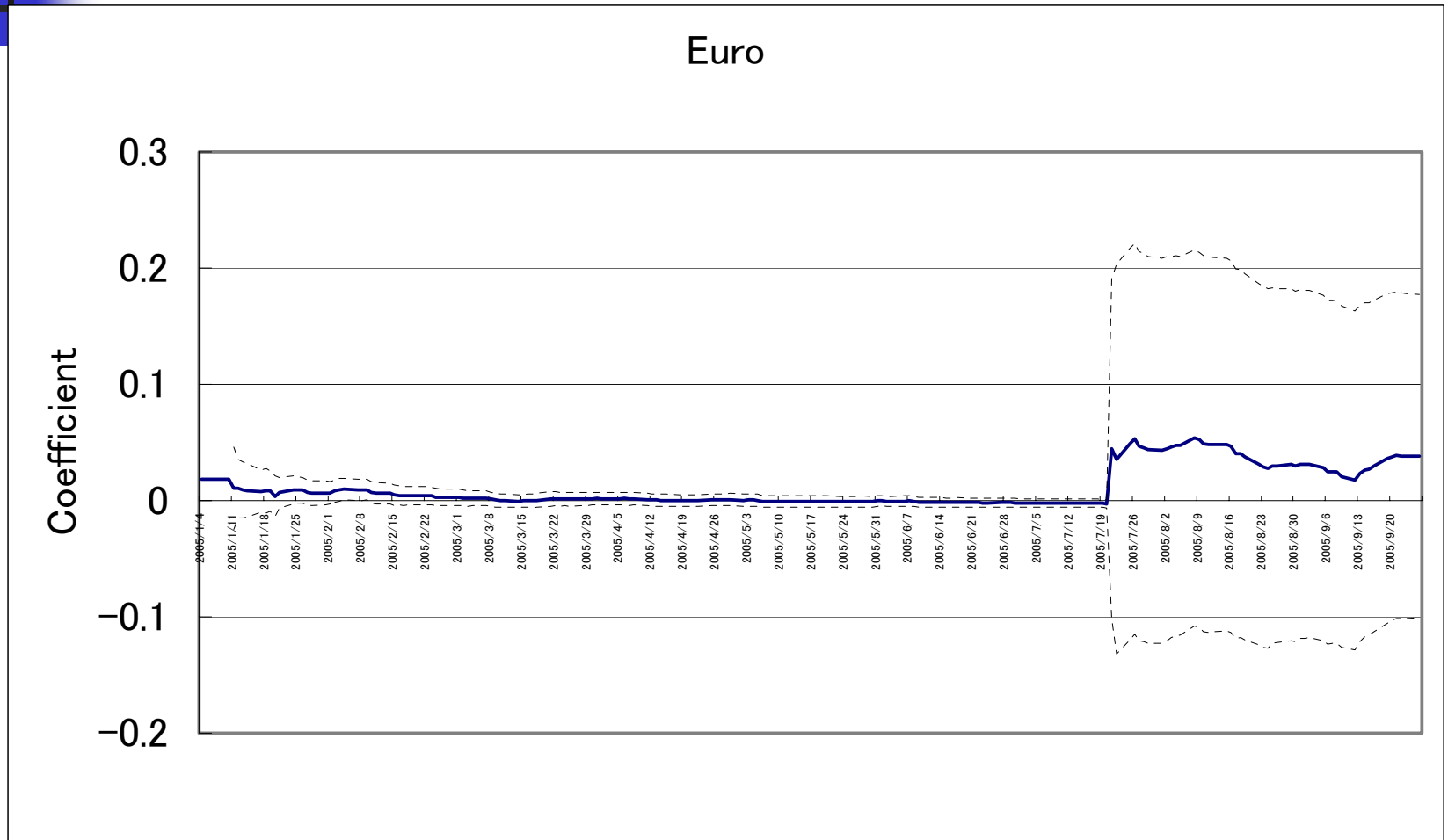
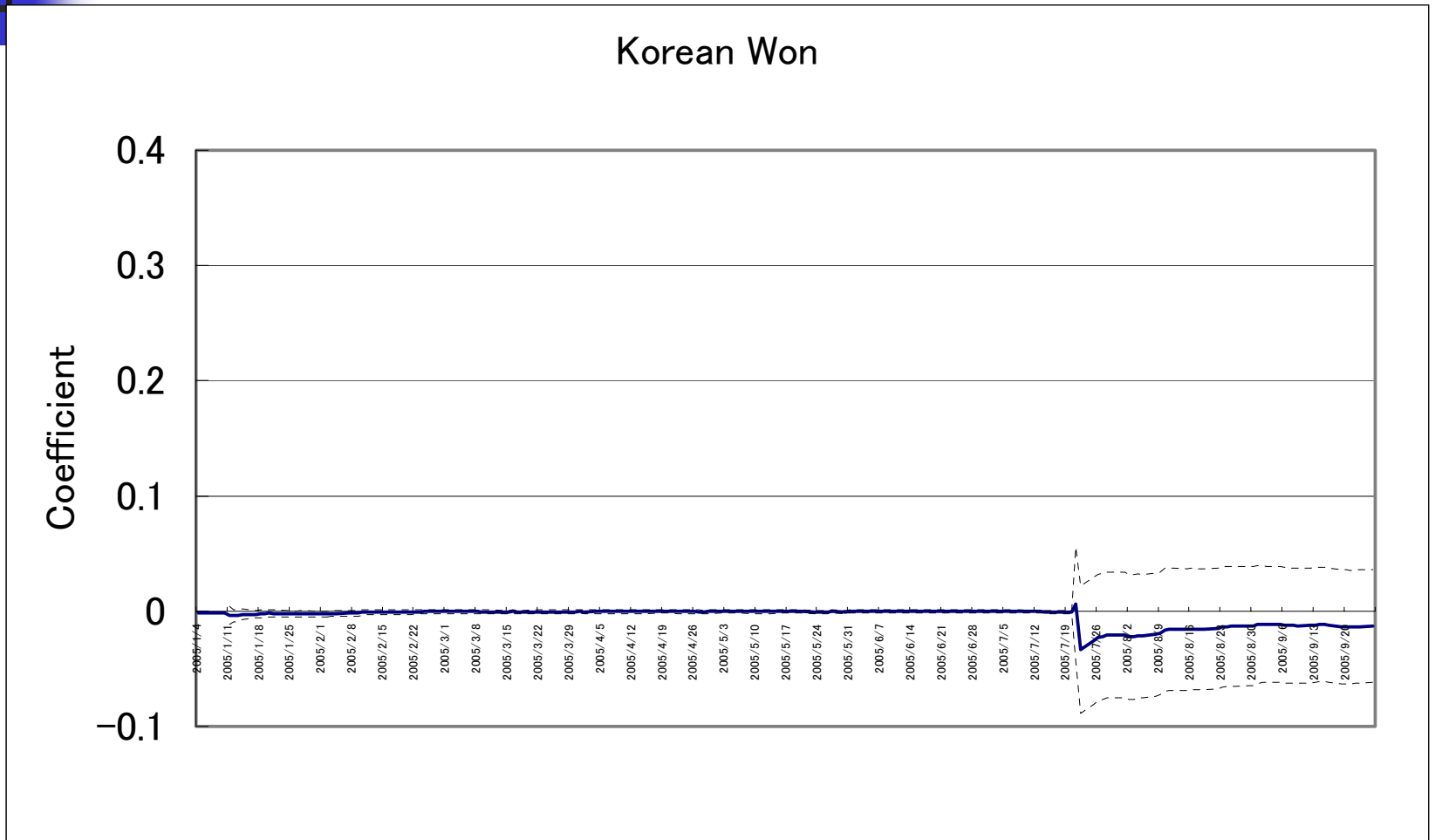


Fig.4.4 Dynamic coefficients on the KRW





Analytical results

- The coefficient on USD was nearly equal to a unity before the exchange rate system reform although it has slightly decreased from a unity after the reform. The increases in the standard errors after the reform imply that RMB has a little less stable linkages with USD compared to the period before the exchange rate system reform.
- The coefficients on JPY and the euro were nearly equal to zero before the exchange rate system reform, although they have risen after the exchange rate system reform. However, standard errors of those coefficients are high

Long-run Effect of productivity on the Chinese yuan



- From a long-run viewpoint, we consider about a possible trend path of the Chinese yuan in the future. We take into account growth rates of productivity when we consider Balassa-Samuelson effects on the Chinese yuan.



Simple model (1)

- prices of the tradable and the non-tradable goods in the domestic economy

$$P_T = \frac{W}{\alpha_T} \quad P_N = \frac{W}{\alpha_N}$$

- prices of the tradable and the non-tradable goods in the foreign economy

$$P_T^* = \frac{W^*}{\alpha_T^*} \quad P_N^* = \frac{W^*}{\alpha_N^*}$$

- law of one price for the tradable goods

$$P_T = SP_T^*$$



Simple model (2)

- Exchange rate determination

$$S = \frac{W}{W^*} \frac{\alpha_T^*}{\alpha_T}$$

- Exchange rate determination in terms of rates of change

$$\dot{S} = (\dot{W} - \dot{W}^*) + (\dot{\alpha}_T^* - \dot{\alpha}_T)$$

Effects of productivity on exchange rate



- Higher growth rate of productivity should appreciate home currency. Higher growth rate of productivity should lead to decrease in price of traded goods. In fact, prices of manufacturing products in China are cheaper than those in the rest of world, especially in developed countries. The decrease in relative prices of tradable goods in China in terms of those in developed countries should appreciate the Chinese yuan.

Table 3: Growth Rate of Productivity and Rate of Change in Nominal Wage

	China		United States		Japan		Korea	
	Tradable	Non-tradable	Tradable	Non-tradable	Tradable	Non-tradable	Tradable	Non-tradable
Growth rate of productivity	8.01% 8.08%	-0.56% 4.17%	5.69% 2.39%	2.39%	5.73% 2.36%	1.50%	3.00% 5.08%	3.39%
Rate of change in nominal wage	11.71% 6.74%	12.20% 8.55%	1.48%	5.89%	-0.91% -0.24%	-2.60% 0.29%	3.91% 8.90%	10.44%
			-0.43%		1.26%		5.25%	

Real GDP divided by employment as productivity here. GDP deflator is used to deflate nominal variables to real variables.

For China, average in a period from 2000 to 2002 because of data constraints. As for nominal wage rate in the United States, average in a period from 2000 to 2001 because of data constraints. For Japanese and Korean nominal wage rate data, we define products of mining and manufacturing omitting sectors of agriculture, forestry, hunting and fishing as tradable good sectors. Thus the data is not consistent with the data of productivity growth.

Source: China: China Statistical Yearbook, United States: OECD STAN Data Base, Bureau of Economic Analysis, and Bureau of Labor Statistics, Japan: OECD STAN Data Base and Basic Survey on Wage Structure, Korea: OECD STAN Data Base and Korea Statistical Yearbook.



Productivity appreciates RMB

- Only growth rate of productivity will contribute to
 - (1) 5.7% p.a. of appreciation of RMB against both the USD,
 - (2) 5.7% p.a. of appreciation of RMB against the JPY, and
 - (3) 3.0% p.a. of appreciation of RMB against the KWon.
- After taking into account increase in nominal wage rates, the RMB will
 - (1) appreciate against the USD by 0.4% p.a.,
 - (2) depreciate against the JPY by 1.3% p.a., and
 - (3) depreciate against the KWon by 3.0% p.a..

Balassa-Samuelson effect

- General price levels

$$P = \omega_T P_T + \omega_N P_N$$

$$P^* = \omega_T^* P_T^* + \omega_N^* P_N^*$$

- purchasing power parity

$$S^{PPP} = \frac{P}{P^*} = \frac{\omega_T P_T + \omega_N P_N}{\omega_T^* P_T^* + \omega_N^* P_N^*} = \frac{\omega_T \frac{P_T}{P_T^*} + \omega_N \frac{P_N}{P_T^*}}{\omega_T^* + \omega_N^* \frac{P_N^*}{P_T^*}} = \frac{\omega_T S + \omega_N \frac{P_N}{P_T} S}{\omega_T^* + \omega_N^* \frac{P_N^*}{P_T^*}} = \left(\frac{\omega_T + \omega_N \frac{P_N}{P_T}}{\omega_T^* + \omega_N^* \frac{P_N^*}{P_T^*}} \right) S$$

in terms of rate of change

$$\dot{S}^{PPP} \approx (\dot{\alpha}_T - \dot{\alpha}_N) - (\dot{\alpha}_T^* - \dot{\alpha}_N^*) + \dot{S} = \left(\frac{\omega_T + \omega_N \frac{\alpha_T}{\alpha_N}}{\omega_T^* + \omega_N^* \frac{\alpha_T^*}{\alpha_N^*}} \right) S$$

Higher growth of productivity in tradable sectors undervalues the currency

- In the long run, the monetary authorities should adjust their target level and target composition of currency basket according to growth rate of productivities that bring about deviation between true equilibrium exchange rate and the PPP based on CPIs. Especially, we should take into account not only domestic productivity growth but also foreign productivity growth.
- On the other hand, it is recognized that wage rates in the tradable and non-tradable goods sector are kept at lower levels because of a plentiful of potential unemployment in rural area in China. The unchanged wage rate in the non-tradable good sector is completely different from the assumption of the Balassa-Samuelson hypothesis.

Table 4: Growth Rate of Productivity and Rate of Change in Nominal Wage

	China		United States		Japan		Korea	
	Tradable	Non-tradable	Tradable	Non-tradable	Tradable	Non-tradable	Tradable	Non-tradable
	3.91%		3.91%	0.00%	3.05%	0.86%	2.22%	1.69%
Growth rate of productivity	8.01% 8.08%	0.56% 4.17%	2.39%	2.39%	2.36%	1.50%	5.08%	3.39%
Rate of change in nominal wage	11.71% 6.74%	12.20% 8.55%	1.48%	5.89%	-0.24%	0.29%	8.90%	10.44%

Real GDP is defined as real production divided by employment as productivity here. GDP deflator is used to deflate nominal variables to real variables.

For China, average in a period from 2000 to 2002 because of data constraints. As for nominal wage rate in the United States, average in a period from 2000 to 2001 because of data constraints. For Japanese and Korean nominal wage rate data, we define products of mining and manufacturing omitting products of agriculture, forestry, hunting and fishing as tradable good sectors. Thus the data is not consistent with the data of productivity growth.

Source: China: China Statistical Yearbook, United States: OECD STAN Data Base, Bureau of Economic Analysis, and Bureau of Labor Statistics, Japan: OECD STAN Data Base and Basic Survey on Wage Structure, Korea: OECD STAN Data Base and Korea Statistical Yearbook.

Undervaluation of the PPP of RMB

- It is estimated that the PPP of the RMB would be
- (1) undervalued against the USD by 3.9% p.a.,
 - (2) undervalued against the JPY by 3.1% p.a., and
 - (3) undervalued against the KWon by 2.2% p.a.
- compared with the exchange rate (in equation (13)) that is realized under the law of one price.



Analytical results

- We found that the Chinese government has a statistically significant but little change in exchange rate policy by using data till September 2, 2005. It is not identified that it is adopting the currency basket system because the change is too small in the economic sense.
- Higher growth rate of productivity will appreciate the RMB vis-à-vis both USD and JPY while increase of nominal wage rates in China and decrease of nominal wage rates in Japan will depreciate RMB against JPY.
- Higher growth rates of productivity in Chinese tradable good sector tend to give the Balassa-Samuleson effect, that is depreciating bias, to the RMB.

What should be next stages of exchange rate system reform?

- At the first step, the monetary authorities should consider how to implement the current managed floating exchange rate system with reference to the currency basket and very small band. They should have ex-post transparency and accountability for their exchange rate policy. They should consider about ex-post announcement of their intervention in forex markets.
- At the next step, they should widen the band in order to make exchange rates of the RMB against each components of the currency basket.
- At the third step, they should go toward floating exchange rate system while they prepare for deregulating capital control such as forward and future foreign exchange transactions, interest rate swap, and domestic firms' borrowing foreign currencies and foreign firms' borrowing the RMB.



Reaction to the US\$ depreciation

- Two groups in terms of reaction to the US dollar depreciation in East Asia
 - (1) Free floating or managed floating: the currencies have appreciated against the US dollar
 - (2) Officially or unofficially dollar pegging: the currencies have been fixed against the US dollar. However, they have been depreciating the former group currencies.
- The latter group carry all of the stress from the depreciation of the US dollar to the former group.



Regional coordination for a desirable exchange rate regimes

- The dollar pegging currencies may have adverse effects on the other East Asian countries' choice of the exchange rate system (which may lead to coordination failure in choosing a desirable exchange rate system).
- East Asian countries needs regional coordination for a desirable exchange rate regime.
- They should adopt a currency basket system with a band.
 1. Target a currency basket (US\$, JPY, euro, other East Asian countries) from a viewpoint of international trade partners and FDI
 2. Band and crawling can afford room for domestic monetary policy to the monetary authorities.



Coordination of exchange rate policy in East Asia

- East Asian countries have strong economic relationships with each other within the intra-region as well as the United States and European countries.
- It is desirable for East Asian countries to stabilize exchange rates among the intra-regional currencies and to stabilize their exchange rates against outside currencies such as the US\$ and the euro.
- The monetary authorities of East Asian countries coordinate their exchange rate policy to their exchange rates against the outside currencies in order to stabilize both intra-regional exchange rates and their exchange rate with outside currencies at the same time.



AMU as a measurement for coordinated exchange rate policies

- East Asian countries faced coordination failure in choosing exchange rate systems. A variety of exchange rate systems in East Asia cause misalignments among East Asian currencies.
- The monetary authorities should stabilize effective exchange rate of the home currency in terms of all of the partner currencies.
- On one hand, they should minimize deviation of the home currency from the AMU for coordinated exchange rate policies in East Asia.



AMU and AMU Deviation Indicator

- Regional Cooperation and Surveillance process
 - Chiang Mai Initiative and Swap Agreement
 - Regular meetings as ASEAN+3 Finance Deputy Ministers Meeting for surveillance
- Ogawa and Shimizu (2005) propose the creation of an Asian Monetary Unit (AMU) and AMU Deviation Indicators for East Asian currencies in order to contribute to coordinated exchange rate policies in East Asia.
- Joint Project of Hi-Stat and RIETI for AMU and AMU Deviation Indicator.
(website <http://www.rieti.go.jp/users/amu/en/index.html> of RIETI)



The basket weights of AMU

- The basket weights based on
 - the countries' respective shares of GDP measured at PPP
 - the trade volumes (the sum of exports and imports) in the total of sampled countries for the relevant country.
- We use the average of both data for the last three years (2001-2003).



Data

- Trade data are from *Direction of Trade Statistics*, IMF.
- GDP measured at PPP are from *World Development Report*, World Bank.
- Exchange rates are from Datastream.



AMU in terms of US\$-euro

- We should use a basket currency composed by the US dollar and the euro (US\$-euro) as a numeraire currency to estimate AMU.
- We apply trade shares with the US and the euro area (EU12) for total of the sampled East Asian countries as basket weights of US\$-euro. (US dollar : euro = 65% : 35%)



Benchmark period for AMU

- The benchmark period is defined as the following:
 - the total trade balance of member countries
 - the total trade balance of the member countries (excluding Japan) with Japan
 - the total trade balance of member countries with the rest of worldshould be relatively close to zero.
- The benchmark exchange rate for each currency is defined in terms of the AMU during 2000-2001.

Table 5: Trade account of ASEAN+3

	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 authors. Trade data are from DOTS, IMF and GDP data are from IFS, IMF.

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

Table 6: AMU weights

	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
Korea	12.86	6.65	9.76	0.0009	113.1459
Lao PDR	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 an average of total export and import volumes in 2001, 2002 and 2003 from the Direction of Trade Statistics, IMF.

** : GDP measured at PPP is the average of GDP measured at PPP in 2001, 2002 and 2003 from the World Development Report, World Bank. For Brunei and Myanmar, we use same share of trade volume since there are no GDP data for Brunei and Myanmar.

*** : Benchmark exchange rate (\$-euro/Currency) is the average of daily exchange rate in terms of \$-euro in 2000 and 2001.

Weights of AMU based on GDP measured at PPP and Trade Volume

- We calculate an AMU with the weights based on “GDP measured at PPP” and “Trade volume” according to the following formula.

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

Fig.5 AMU in terms of US\$-euro

US\$-euro/AMU

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



How to calculate the Nominal Deviation Indicator

- Using the estimated AMU, we calculate the Nominal Deviation Indicator as follows:

benchmark rate : each currency's exchange rate in terms of AMU at the benchmark period

actual exchange rate : exchange rate of each currency in terms of AMU which fluctuates as the each currency actually move

Nominal Deviation Indicator (%)

$$= \frac{\text{actual exchange rate of AMU/a currency} - \text{benchmark exchange rate of AMU/a currency}}{\text{benchmark exchange rate of AMU/a currency}} \times 100$$

(1)

AMU Deviation Indicator from the Benchmark Rate(%)

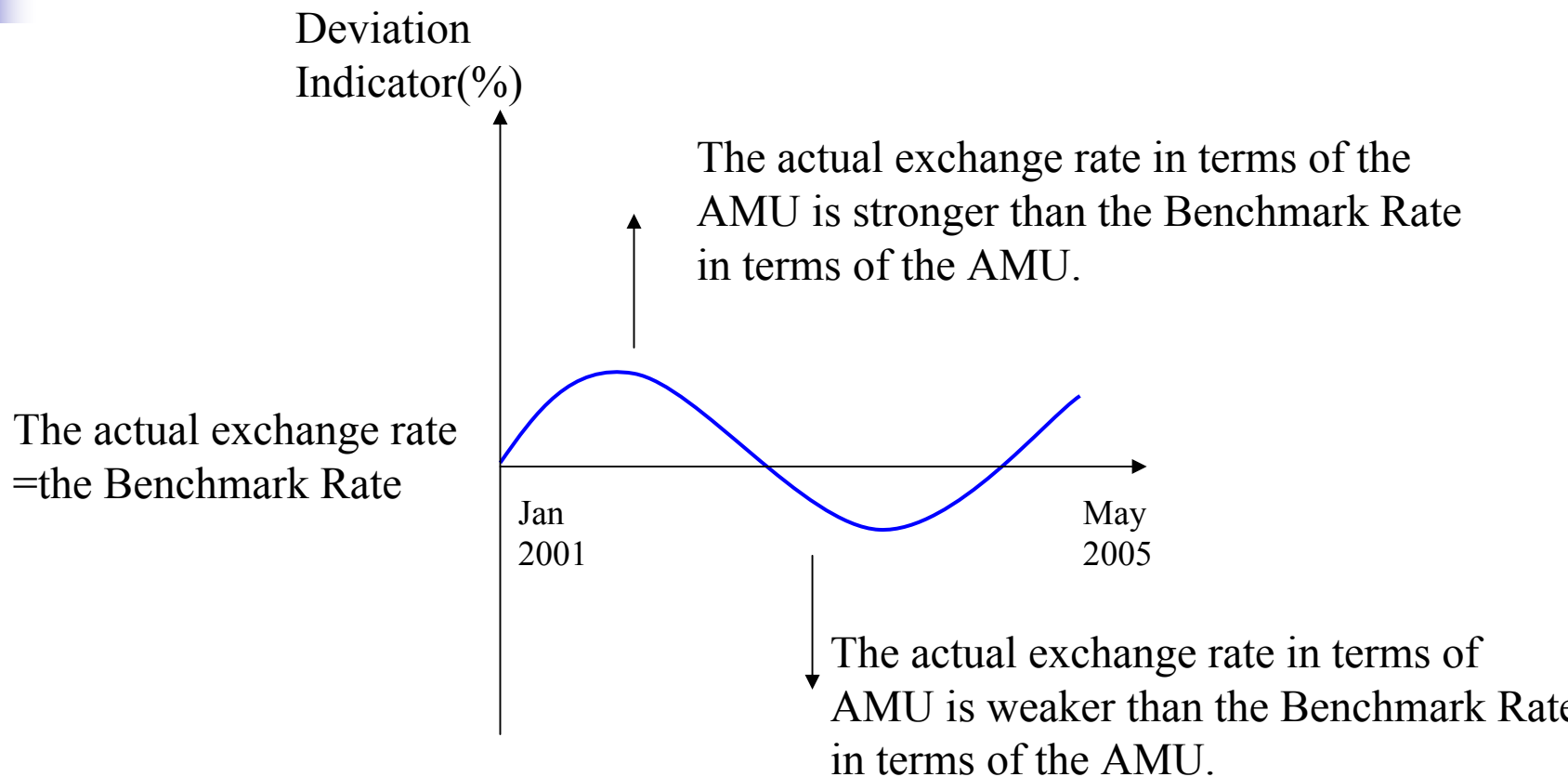
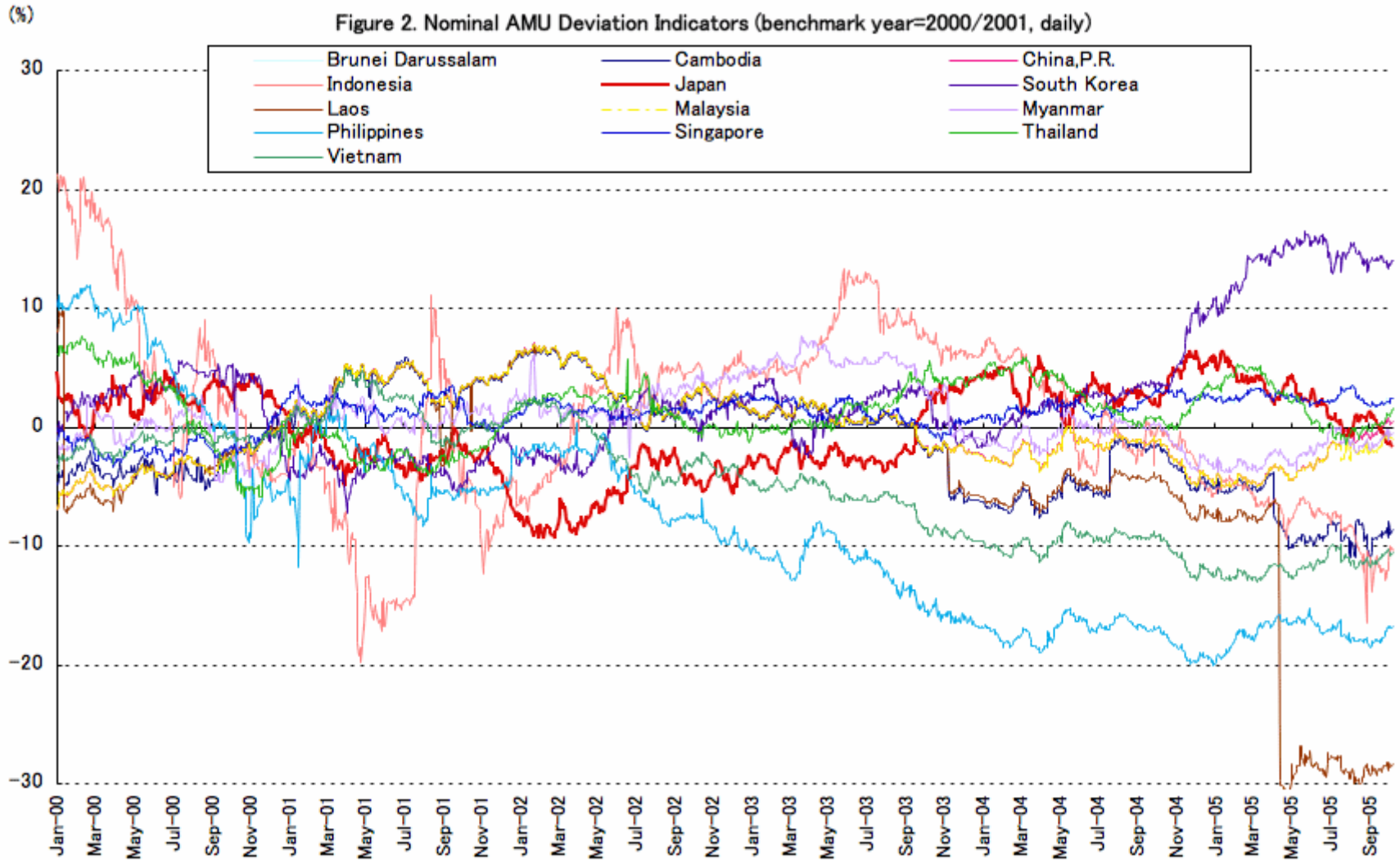


Fig.6 Nominal AMU Deviation Indicators





Nominal and Real Deviation Indicators

- We should take into account inflation rate differentials if we consider real effect of exchange rates on trade, FDI and real economic activities (real GDP).
- We calculate also deviation indicators in real terms by taking into account inflation rate differentials.



How to calculate Real Deviation Indicator

- We can calculate a Real AMU Deviation Indicator as follows:

Rate of Change in Real AMU Deviation Indicator_{*i*}

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

\dot{P}_{AMU} : inflation rate in the AMU area

\dot{P}_i : inflation rate in country *i*.

- We use CPI data to calculate the inflation rates.
- CPI of AMU: weighted CPI of member countries

Fig.7.1 Nominal AMU Deviation Indicators

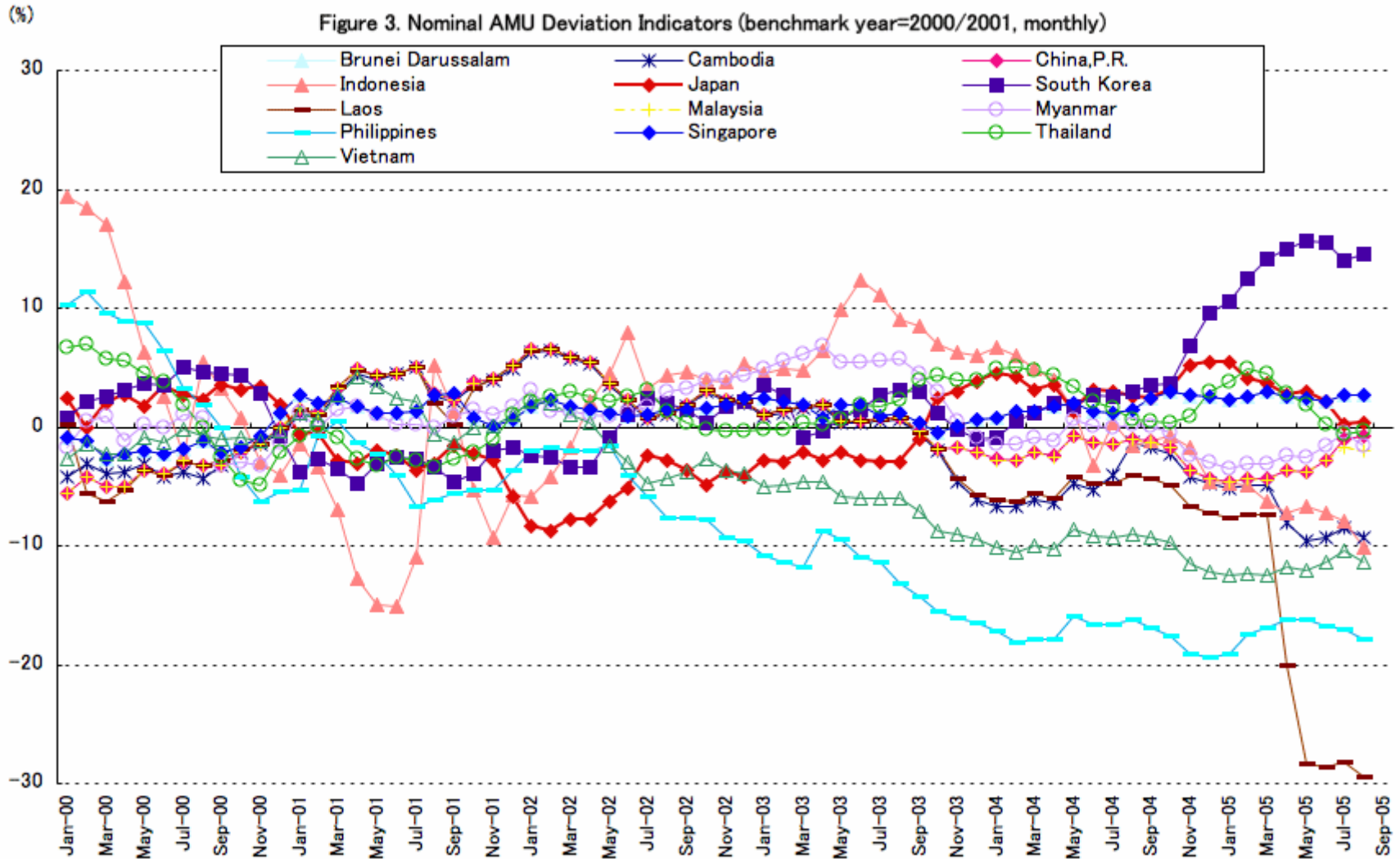
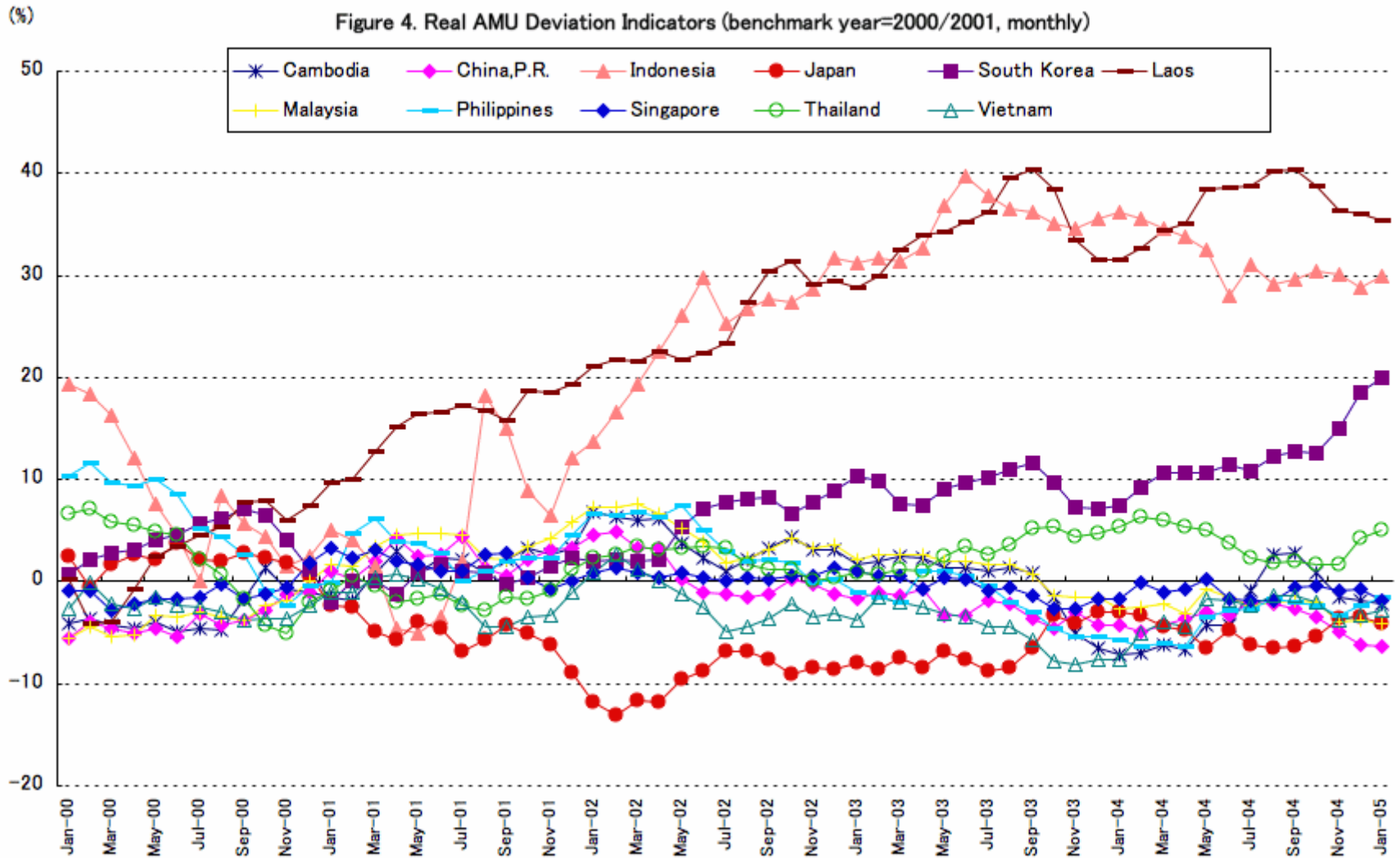


Fig.7.2 Real AMU Deviation Indicators





Merits and Demerits of Nominal and Real indicators

- The nominal deviation indicator can be watched in real time while the real deviation indicator are available only in monthly basis.
- Considering effects of exchange rate on real economic activity, we should watch the deviation indicators in real term.
- Considering effects of exchange rate on monetary aspects, the nominal deviation indicators are enough to be concerned.
- We could use both nominal and real deviation indicators as an indicator for the surveillance.



Conclusion

- We can use our deviation indicators to identify how much each of the East Asian currencies deviates from the AMU.
- 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.