

Part III

Future Exchange Rate Arrangement in East Asia

7. Is East Asia an Optimum Currency Area?

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This is a revised version of papers presented to the Rokko Forum organized by Kobe University and held in Kobe, February 18, 2005, and to the Second KIEP-PRI Seminar on “Financial Interdependence and Exchange Rate Regime in East Asia,” organized by the Policy Research Institute of the Japanese Ministry of Finance and the Korea Institute for International Economic Policy and held in Tokyo, December 2-3, 2004. The authors are grateful to Jonghwa Cho, Shinji Takagi, Deok Ryong Yoon and other participants in these meetings for their constructive comments.

I. Introduction

One of the most noteworthy outcomes of the East Asian financial crisis was the launching of regional financial cooperation by the East Asian economies. The crisis prompted the regional economies to realize the importance of managing financial openness and macroeconomic interdependence, at the regional level, through closer cooperation among their authorities and various initiatives for the institutionalization of regional financial and macroeconomic interdependence. For example, the ASEAN+3 members—comprising ASEAN, China, Japan and Korea—began to undertake the Chiang Mai Initiative, economic surveillance and policy dialogue, and the Asian bond market development initiative.

Recently, key policymakers in East Asia are increasingly vocal about the need to create a monetary union in the region (see, for example, De Ocampo 2004; Kuroda 2004; and Chino 2004). The reason is that there is a strong perception that intra-regional exchange rate stability is desirable for East Asia and a monetary union is the ultimate form to ensure it. Reflecting such calls, this paper asks the following questions.

- Is East Asia ready for a regional single currency, satisfying optimum currency area (OCA) criteria?
- If all of East Asia is not an optimum currency area, are there groups of economies in East Asia that satisfy OCA criteria and are therefore ready to form sub-regional currency areas?

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- What are the most serious impediments to the formation of an East Asia-wide monetary union (AMU)?
- What is the roadmap to a future AMU and what is the agenda?

The organization of the paper is as follows. Section II reviews the optimum currency area literature. Section III measures the extent to which the East Asian economies are linked through foreign trade and direct investment. Section IV examines the degrees and patterns of cross-country co-movements of real macroeconomic-activity variables, real financial variables, and price inflation rates, using the principal component method. It also estimates the structural vector-autoregressive (VAR) model in order to identify fundamental macroeconomic shocks affecting real GDP and the GDP deflator, and investigates cross-country correlations of such shocks. Section V discusses the challenges for monetary and exchange rate policy coordination and recommends immediate policy steps for a future monetary union in East Asia. Section VI provides concluding remarks.

II. What is an Optimum Currency Area?

1. Economic Integration

Without price and wage flexibility, flexible exchange rates usually ensure better macroeconomic outcomes than fixed exchange rates. This was the argument put forward by Friedman (1953) when he made a case for flexible exchange rates for almost any country. Mundell (1961) and McKinnon (1963), however, argued that under certain conditions, fixed exchange rates, rather than flexible exchange rates, can produce better outcomes even without price and wage flexibility. According to their views, intra-area fixed exchange rates are most appropriate for a group of economies that are closely integrated among themselves through international trade of goods and services, international capital flows and labor movements and that are subject to similar economic shocks. If the exchange rate is fixed irreversibly—including the adoption of a common currency—together with free mobility of goods, services, and capital, then such an area is called the “currency area.”

The theory of “optimum currency areas” has thus developed conditions under which a group of economies are better off adopting permanently fixed exchange rates, or forming a currency area. These conditions are often termed as “optimum currency area (OCA) criteria” and they include, among others:¹

- openness to the area members;
- product, factor and financial market integration;
- symmetry of shocks affecting the area members;

¹ See Kawai (1987) and Tavlas (1993).

- similarity of preferences over output-inflation tradeoffs; and
- willingness to coordinate supporting policies such as fiscal transfers.

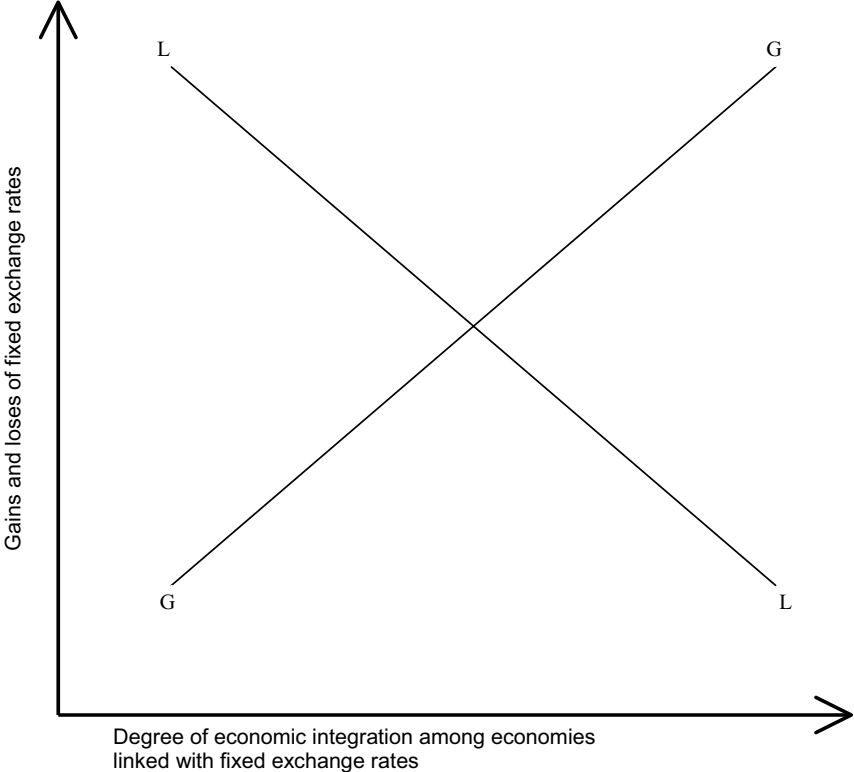
The first three criteria are the most fundamental because they reflect the fundamental nature of the economies, while the last two are additional, weaker conditions. Since these conditions can vary across countries and over time, no single exchange rate regime is right for all countries or at all times, as discussed by Frankel (1999).

2. Benefits and Costs of Forming a Currency Area

Krugman and Obstfeld (2003) argue that each economy would decide whether to join a larger currency area by comparing the benefits and costs of doing so. A high degree of the economy's integration with the larger currency area increases the monetary efficiency gain—benefits from avoiding the uncertainty, confusion, and calculation and transactions costs that can arise under floating exchange rates—for the economy through its fixing of the exchange rate. Essentially, the usefulness of money rises for the economy as the degree of its economic integration deepens. At the same time, a high degree of its economic integration reduces the economic stability loss from joining a fixed exchange rate area—inability to stabilize macroeconomic fluctuations—due to product or factor market shocks. An important cost of adopting fixed exchange rates is the loss of monetary independence, that is, the abandonment of an independent monetary policy for the purpose of macroeconomic stabilization. This loss is large for the economy when the degree of economic integration is low, but it becomes smaller when the degree of economic integration is higher. This implies that once an economy achieves a certain degree of economic integration with a larger currency area in the rest of the world, it is better to fix its exchange rate against the currency of such an area, thus joining the larger currency area (Figure 1).

A similar argument can be made for a group of economies. The benefit of forming jointly a fixed exchange rate area—greater usefulness of money—rises and the cost of fixing their exchange rates—i.e., forgoing an independent monetary policy instrument for macroeconomic stabilization—declines as they achieve higher levels of economic integration. Hence, once the economies have achieved a certain level of intra-group economic integration, they had better fix their exchange rates, thus forming a currency area. In Figure 1 the LL schedule shifts upward when economy-specific shocks become great in size and frequency because, for a given level of economic integration, the economy's stability loss from forming a currency area rises. This shift raises the critical level of economic integration, beyond which the economies are willing to form a currency area.

Figure 1. Decision to Form a Currency Area



Sources: Figure 20-6 in Krugman and Obstfeld(2003)

3. Endogeneity of OCA Criteria

There has recently been a view that OCA criteria can be endogenous (Frankel and Rose, 1998). According to this view, once a group of economies form a currency area by permanently fixing their exchange rates, the degree of intra-area economic integration will become higher and the degree of symmetry of economic shocks will heighten. Essentially, a permanently fixed exchange rate promotes OCA conditions by encouraging trade of goods and services, cross-border capital flows and labor mobility – to the extent that controls on capital and labor mobility are relaxed – and by linking the economies more tightly than otherwise. This view is based on the empirical findings that the act of one economy fixing its exchange rate against the currency of another does stimulate international trade and investment between the two. This impact is more pronounced if the economies adopt a common currency, the strongest form of permanently fixing the exchange rate.

The endogeneity of OCA criteria implies that countries contemplating forming a joint currency area do not have to rigorously achieve economic openness, economic integration and symmetry of shocks in advance. Rather, it implies that if these countries' political commitment to fix the exchange rate and to maintain the fixed regime is sufficiently strong, then their attempt to form a currency area can be successful as long as they satisfy OCA criteria to some extent initially. The reason is that fixing the exchange rate tends to strengthen conditions that support a successful currency area. The proponents of the euro area take this view when critics argue that the launch of the euro zone in January 1999 was largely politically driven rather than reflecting purely economic conditions and, hence, may fail eventually.

III. Trade and Investment Integration in East Asia

Since the mid-1980s the East Asian economies have experienced a rapid expansion of both foreign direct investment (FDI) and FDI-induced manufactured trade.² FDI in East Asia has tended to stimulate trade, particularly intra-industry trade in manufactured products,³ and the region's engagement in foreign trade further stimulated FDI activities. The emergence of the so-called "FDI-trade nexus"—a mutually reinforcing process of trade and FDI flows—is a natural consequence of multinational corporations' efforts to form regional production networks. These networks have deepened regional economic interdependence through market-driven trade and FDI.

1. Expansion of Trade and Investment

Expansion of trade. The volume of East Asian trade has expanded steadily over the last several decades. As a result, the region's economies have achieved high degrees of trade openness as measured by the ratio of total trade (exports plus imports of goods and services) to GDP. Table 1 indicates that the value of total trade in the principal trading countries in East Asia either approaches or exceeds 100% of GDP, with the notable exceptions of Japan and China. Given the high degree of intra-regional trade (see below), the high trade openness of many East Asian economies implies that they are highly open with each other.

² East Asia in this paper includes Japan, the Asian NIEs (Korea, Taiwan, Hong Kong, and Singapore), the middle-income ASEAN-Four (Malaysia, Thailand, Indonesia, the Philippines), low-income ASEAN members (Cambodia, Laos, Myanmar, and Vietnam), and China. So it is ASEAN+3, Taiwan and Hong Kong.

³ In this sense, FDI in East Asia has tended to be complementary to, rather than a substitute for, trade.

**<Table 1> Openness in East Asia and the European Union Countries
(Total Trade as a Percentage of GDP)**

(a) East Asia

	(percent)												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Brunei Darussalam	88.5	88.7	159.6	152.8	141.3	132.5	136.8	157.3	110.2	91.1	107.0	113.4	n.a.
China	24.2	33.9	35.3	32.7	43.7	34.0	35.3	36.0	33.9	35.6	43.0	43.0	49.1
Cambodia	17.4	10.5	12.4	42.1	57.6	60.3	67.3	81.0	64.3	72.7	92.6	96.4	101.8
Hong Kong	218.3	228.1	237.6	232.2	235.1	258.8	242.1	228.3	217.6	219.5	250.1	237.9	248.8
Indonesia	42.2	54.4	56.5	50.5	51.9	43.7	52.3	56.0	86.3	58.5	70.4	65.1	53.6
Japan	19.8	18.3	17.5	16.0	16.0	16.8	18.9	20.4	19.6	18.6	20.2	20.2	21.1
Korea	51.4	52.0	50.3	48.0	49.3	51.9	53.8	58.9	70.2	64.5	72.6	67.6	65.2
Laos	30.5	25.9	34.1	50.7	56.0	43.2	54.0	61.0	62.5	51.3	45.3	43.2	40.9
Malaysia	124.1	144.6	136.1	138.6	158.5	161.4	155.4	156.8	174.4	183.9	195.5	178.9	177.2
Myanmar	3.1	4.4	3.6	3.4	2.9	2.6	2.2	1.8	1.4	1.1	1.0	1.0	n.a.
Philippines	46.0	47.7	47.6	55.1	55.9	59.1	65.8	77.4	90.6	83.3	93.2	87.8	87.7
Singapore	300.8	289.6	271.9	272.6	281.6	281.1	278.0	269.9	251.7	271.7	292.4	275.8	273.7
Taiwan	74.6	77.6	72.4	72.2	73.0	79.0	78.0	81.1	78.6	78.9	90.8	79.6	83.5
Thailand	61.4	67.2	65.6	66.4	69.1	70.9	70.4	78.8	80.0	81.2	101.2	102.1	98.1
Vietnam	54.1	66.9	73.6	66.2	77.5	61.5	92.7	94.3	72.4	77.0	91.4	90.5	115.0

(b) European Union

	(percent)												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Austria	56.4	55.0	52.6	48.6	51.0	52.6	54.1	59.9	61.8	63.7	70.0	72.0	69.7
Belgium	n.a.	n.a.	n.a.	111.1	115.9	121.1	126.0	134.3	135.5	136.9	159.9	162.3	169.1
Denmark	50.3	50.9	51.7	48.8	50.0	52.2	51.7	54.3	53.8	53.6	60.0	59.8	61.0
Finland	39.1	36.2	41.6	48.1	52.4	52.2	53.1	56.5	58.2	57.5	66.3	61.8	59.3
France	37.0	36.6	35.4	32.4	34.6	36.4	36.6	39.9	41.0	41.4	46.7	45.2	43.1
Germany	50.0	44.6	40.8	37.2	38.8	40.1	41.3	45.3	47.3	48.3	56.0	57.0	55.4
Greece	33.6	34.0	32.8	31.8	30.5	32.1	33.5	32.2	32.9	31.2	35.3	33.7	31.1
Ireland	93.7	93.9	95.0	101.9	109.3	117.0	115.8	116.0	126.1	124.2	135.9	130.7	114.2
Italy	31.9	30.2	29.8	31.9	35.1	40.1	37.3	38.6	38.7	38.6	44.5	44.0	41.8
Luxembourg	129.4	125.4	113.0	102.8	100.1	96.7	93.0	93.7	95.9	95.0	95.3	98.6	95.4
Netherlands	87.2	86.1	82.0	80.9	84.2	89.8	91.8	99.0	99.3	97.4	110.0	106.9	99.1
Portugal	60.2	54.5	51.5	47.3	51.2	54.0	54.9	57.8	59.1	56.7	57.7	58.0	52.4
Spain	29.0	28.6	28.5	29.3	34.0	34.9	36.7	40.4	41.1	42.3	47.4	46.0	43.6
Sweden	46.8	42.4	41.5	46.7	52.8	58.1	56.1	60.1	61.9	61.1	66.8	63.4	61.1
United Kingdom	41.2	38.2	38.4	40.2	41.2	44.7	46.1	44.2	41.1	40.1	42.8	41.1	39.1

Note: Openness is defined as a ratio of total trade (exports plus imports) to nominal GDP. n.a.--not available.

Sources: IMF, International Financial Statistics; and Asian Development Bank, Key Indicators.

Adapted from: Table 2 in Kawai and Takagi (2005).

There are several features in East Asia's trade. The first is the rapid expansion of intra-regional trade. The second is the rapid expansion of intra-industry trade in manufactured products. The third is the rapid expansion of vertical type of intra-industry trade. A large part of intra-regional trade in manufactured products in East Asia is of vertical, intra-industry nature. Essentially, countries with high technological capabilities and high human capital tend to specialize in the production of high-tech, high-human capital intensive products, while countries with low technologies and low human capital tend to specialize in the production

of low-tech, labor intensive products. Multinational corporations' FDI activity has generated such trade patterns in East Asia by way of locating different sub-processes of their production in different countries according to the required factor proportions and technological capabilities, thereby promoting intra-firm and intra-industry trade in parts, components, semi-finished products and finished products across these countries. The FDI-trade nexus is the driving force behind the expansion of both trade and FDI.⁴ In terms of product categories, electrical machinery and apparatus is representative of such trade (Kawai and Urata, 2004).

Expansion of FDI. FDI inflows to emerging East Asia grew at a remarkably high rate from the mid-1980s to 2002, significantly faster than trade. As a result of this rapid expansion, the share of emerging East Asia in world total FDI inflows increased from 8 percent in 1985 to 22 percent in the mid-1990s, before declining to 17 percent in 2003. China is the largest recipient of FDI among emerging market economies.⁵ More recently, firms in Asian NIEs and some middle-income ASEAN countries have been active as foreign direct investors, particularly in China. While Hong Kong, Singapore and Taiwan were the first to be hosts to multinationals' FDI in the 1980s, they soon became investors in other parts of East Asia, particularly in the middle-income ASEAN countries, China and Vietnam. With the rise of China as an attractive FDI host in the 1990s, some middle-income ASEAN countries such as Malaysia have also begun to invest in China.

Table 2 indeed shows that Japan, the four Asian NIEs and some middle-income ASEAN countries—such as Malaysia—have emerged as direct investors in the region. China has benefited enormously from this multi-layered development process of the East Asian economies. More recently, large sums of FDI have been directed to Vietnam. FDI activities by developed country multinationals and emerging East Asian firms are now forming a tight web of production networks and supply chains in East Asia.

⁴ See Urata (2001), Kawai and Urata (1998, 2004) and Kawai (2004) for the FDI-trade nexus.

⁵ China was the third largest recipient of FDI in the world, behind Luxembourg and the United States, in 2002 and became the second largest, behind Luxembourg, in 2003.

<Table 2> Inward and Outward FDI Stock as a Percentage of GDP, 1980 - 2002

Economy		1980	1985	1990	1995	2000	2002	2003
Japan	Inward	0.3	0.3	0.3	0.7	1.1	2.0	2.1
	Outward	1.8	3.2	6.6	4.5	5.9	7.7	7.8
Korea	Inward	2.1	2.3	2.1	1.8	7.3	8.0	7.8
	Outward	0.2	0.5	0.9	1.6	5.2	5.7	5.7
China	Inward	0.5	2.0	5.8	19.3	32.2	35.4	35.6
	Outward	n.a.	-	0.7	2.3	2.4	2.8	2.6
Hong Kong	Inward	623.8	525.5	269.6	160.6	275.4	226.8	236.5
	Outward	0.5	6.7	15.9	55.6	234.9	191.6	211.9
Taiwan	Inward	5.8	4.7	6.1	5.9	9.0	11.9	11.9
	Outward	0.2	0.3	8.0	9.5	15.9	21.1	22.8
Singapore	Inward	52.9	73.6	83.1	78.2	121.5	153.9	161.3
	Outward	31.7	24.8	21.3	41.8	61.3	96.7	99.5
Malaysia	Inward	20.7	23.3	23.4	32.3	58.5	59.5	57.2
	Outward	0.8	4.3	6.1	12.4	23.6	29.8	28.8
Thailand	Inward	3.0	5.1	9.7	10.5	24.5	27.7	25.8
	Outward	-	-	0.5	1.4	2.1	2.2	2.3
Philippines	Inward	3.9	8.5	7.4	8.1	17.1	14.5	14.5
	Outward	0.5	0.6	0.3	1.6	2.1	1.1	1.2
Indonesia	Inward	13.2	28.2	34.0	25.0	40.4	33.3	27.5
	Outward	n.a.	0.1	0.1	0.6	1.6	1.5	1.3
Viet Nam	Inward	0.2	1.1	4.0	27.8	48.2	50.2	50.6
	Outward	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cambodia	Inward	2.4	2.0	3.4	10.8	43.3	46.2	46.4
	Outward	n.a.	n.a.	n.a.	4.2	5.4	5.7	5.7
Lao, PDR	Inward	0.3	-	1.5	11.4	31.6	32.9	30.1
	Outward	n.a.	n.a.	n.a.	-	9.7	12.6	14.9

Note: (a) "-" indicates the magnitude is negligible. (b) "n.a." indicates that data are not available.

Source: UNCTAD, World Investment Report 2004 (Annex Table B.6).

Adapted from: Table 2 in Kawai (2004).

2. Regional Integration through Trade and FDI

Market-driven integration. The East Asia region has thus enjoyed market-driven integration through trade and FDI, while embracing a multilateral liberalization framework under the GATT/WTO and open regionalism through APEC and avoiding discriminatory trade practices. FDI flows in East Asia, driven initially by Japanese multinational corporations after the Plaza Accord in the mid-1980s and later by firms from Asian NIEs and some middle-income ASEAN countries, have contributed to deeper economic integration through intra-industry trade within the region. More recently, China's rise as a large trading nation has also strengthened trade—particularly intra-industry trade—linkages among the East Asian economies, many of which are generated by multinationals.

Regional trade integration. The degree of regional economic integration through trade in East Asia has been rising fast over the last twenty years. Table 3a summarizes changes in the share of intra-regional trade for various groupings in the world over the period 1980 to 2003. The table demonstrates that intra-regional trade as a share of East Asia's total trade has risen from 35 percent in 1980 to 54 percent in 2003 (including Japan) or from 22 percent to 44 percent over the same period (excluding Japan). Now about 55 percent of East Asia's trade is with itself. The recent share of intra-regional trade within East Asia is still lower than that in the European Union-15 (64 percent), but exceeds that of the North American Free Trade Area (NAFTA, 46 percent) in 2003.

<Table 3a> Intra-regional Trade Share^(a) (in percentage)

Regions	1980	1985	1990	1995	2000	2001	2002	2003
East Asia-15, including Japan ^(c)	34.7	40.2	45.6	55.5	54.0	55.4	57.3	54.0
Emerging East Asia-14 ^(c)	21.6	29.1	36.4	43.7	43.4	45.6	47.5	44.1
NIEs-4	7.7	10.7	14.3	18.1	16.4	17.5	17.1	16.1
ASEAN-10 ^(c)	18.0	20.3	18.9	24.1	25.7	24.1	24.4	24.0
NAFTA	33.8	38.7	37.9	43.2	48.7	49.0	48.3	46.0
European Union-15	52.4	52.5	58.6	56.8	62.2	62.1	62.4	64.4

<Table 3b> Intra-regional Trade Intensity Index^(b)

Regions	1980	1985	1990	1995	2000	2001	2002	2003
East Asia-15, including Japan ^(c)	2.5	2.4	2.5	2.3	2.2	2.5	2.5	2.2
Emerging East Asia-14 ^(c)	2.9	3.2	3.2	2.7	2.4	2.8	2.8	2.3
NIEs-4	2.0	2.1	2.1	2.0	1.7	2.1	2.1	2.0
ASEAN-10 ^(c)	4.8	5.7	4.4	3.7	4.1	4.1	4.2	4.1
NAFTA	2.1	2.0	2.1	2.4	2.2	2.3	2.4	2.5
European Union-15	1.4	1.5	1.5	1.6	1.7	1.7	1.7	1.7

- Note: (a) The intra-regional trade share is defined as: $X_{ii} / \{(X_{i.} + X_{.i})/2\}$ where X_{ii} represents exports of region i to region i , $X_{i.}$ represents total exports of region i to the world, and $X_{.i}$ represents total exports of the world to region i .
- (b) The trade intensity index is defined as: $[X_{ii} / \{(X_{i.} + X_{.i})/2\}] / [\{(X_{i.} + X_{.i})/2\} / X_{..}]$ where $X_{..}$ represents total world exports.
- (c) East Asia-15 includes Emerging East Asia-14 and Japan. Emerging East Asia-14 includes the Asian NIEs (Hong Kong, Korea, Singapore and Taiwan), nine ASEAN members (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Thailand and Vietnam) and China. ASEAN-10 includes Singapore.
- (d) Computation is based on exporting countries' export data, except for Taiwan where importers' import data are used when necessary.

Source: IMF, Direction of Trade Statistics, CD-ROM.

Adapted from: Table 1 in Kawai (2005).

Table 3b summarizes changes in the intra-regional trade intensity indexes for the same groupings over the same period.⁶ The table demonstrates that within East Asia, whether including Japan or not, the trade intensity index, at around 2.2, is higher than those for the EU (1.7), though it is lower than that for NAFTA (2.5) in 2003. This observation confirms that the degree of regional economic integration through trade in East Asia is quite high and comparable to levels seen in NAFTA or the EU. It must be emphasized that intra-East Asia trade has expanded rapidly but not at the expense of extra-regional trade. This suggests that East Asia continues to maintain export competitiveness vis-à-vis countries outside the region.

Table 4 shows that a number of East Asian economy pairs have intense trade links, with bilateral trade intensity indexes exceeding three for as many as twenty-five pairs out of 105. In Western Europe, in contrast, only ten country pairs have trade intensity indexes exceeding three out of 90. It is interesting to note that the trade link between Japan and Korea (2.51) is as intense as that between France and Italy (2.52) and more intense than that between France and Germany (2.08) or that between Germany and Italy (2.06). The pivotal position of Japan in East Asian trade, at least with high- and middle-income countries, in 2000 appears more significant than the position of either Germany or France in Western European trade. In terms of trade intensity, therefore, East Asia is a highly integrated region.

⁶ The advantage of using trade intensity indexes over trade shares is that the former is a control for a region's relative size in world trade and, hence, presents a better measure of closeness of the economies within a region. However, a small regional group tends to have a high trade intensity index.

<Table 4> Trade Intensity in East Asia and Western Europe, 2000

(a) Trade Intensity Indexes in East Asia, 2000

	Brunei	Cambodia	China	Hong Kong	Indonesia	Japan	Korea	Laos	Malaysia	Myanmar	Philippines	Singapore	Taiwan	Thailand	Vietnam	USA	EU
Brunei Darussalam	--																
Cambodia	0.05	--															
China	0.39	1.51	--														
Hong Kong	0.40	2.96	8.25	--													
Indonesia	1.49	2.29	1.58	0.85	--												
Japan	4.58	0.31	2.37	1.52	3.57	--											
Korea	3.73	1.24	2.48	1.48	3.28	2.51	--										
Lao People's Dem.Rep	0.00	12.99	0.94	0.24	0.26	0.50	0.20	--									
Malaysia	4.05	1.85	0.83	1.12	2.72	2.30	1.50	0.13	--								
Myanmar	0.14	0.10	3.46	0.80	2.37	1.00	2.62	0.00	4.39	--							
Philippines	0.14	0.17	0.62	1.52	1.59	2.95	2.17	0.01	2.62	0.39	--						
Singapore	7.64	6.88	1.13	1.90	3.29	1.83	1.60	1.47	11.50	5.43	3.74	--					
Taiwan	0.17	2.75	2.92	4.28	1.76	2.96	1.74	0.27	1.88	2.45	3.25	2.38	--				
Thailand	11.06	12.01	1.09	1.36	2.48	2.92	1.04	45.14	3.55	15.63	2.75	4.50	1.81	--			
Vietnam	0.21	23.19	2.78	0.98	2.84	2.48	2.87	74.30	2.20	0.84	2.95	5.02	4.26	4.27	--		
United States (USA)	0.75	1.61	1.05	1.02	0.74	1.65	1.33	0.09	1.12	0.63	1.56	1.01	1.38	1.09	0.25	--	
European Union (EU)	0.22	0.30	0.37	0.35	0.37	0.41	0.34	0.39	0.33	0.25	0.36	0.34	0.40	0.37	0.39	0.54	--

(b) Trade Intensity Indexes in Western Europe, 2000

	Austria	Belgium-Luxembourg	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Sweden	UK	USA	Japan
Austria	--															
Belgium-Luxembourg	0.82	--														
Denmark	0.98	0.94	--													
Finland	1.11	0.89	4.83	--												
France	0.87	3.20	1.07	0.95	--											
Germany	4.78	2.13	2.45	1.83	2.08	--										
Greece	0.87	1.04	1.48	1.99	1.54	1.56	--									
Ireland	0.47	1.41	1.33	0.77	1.33	1.17	0.68	--								
Italy	2.30	1.31	1.06	1.03	2.52	2.06	3.61	1.03	--							
Netherlands	0.36	3.97	1.78	1.42	1.66	2.59	1.41	1.31	1.19	--						
Portugal	1.34	1.58	1.20	0.98	2.66	1.91	0.71	0.54	1.77	1.28	--					
Spain	1.07	1.31	1.06	0.97	3.84	1.74	1.57	1.04	2.52	1.22	10.64	--				
Sweden	0.92	1.46	9.82	8.60	1.12	1.71	1.35	1.13	0.99	1.69	1.08	1.09	--			
United Kingdom (UK)	0.85	1.91	1.87	1.60	1.92	1.58	1.17	5.54	1.29	2.09	1.60	1.66	1.86	--		
United States (USA)	0.33	0.45	0.32	0.40	0.49	0.54	0.27	1.06	0.50	0.45	0.24	0.29	0.53	0.90	--	
Japan	0.30	0.32	0.42	0.39	0.30	0.48	0.35	0.61	0.33	0.50	0.24	0.26	0.45	0.51	1.65	--

Source: IMF, Directions of Trade Statistics, CD-ROM.

Adapted from: Table 1 in Kawai and Takagi (2005).

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FDI integration. Table 5 shows the regional breakdown of FDI inflows into East Asia. For the Asian NIEs, about 23 percent of total FDI inflows during 1990-2002 came from the United States, about 15 percent from the European Union and about 14 percent from Japan. For ASEAN (excluding Singapore), 22 percent of the inflows came from Japan, while 18 percent and 16 percent came from the EU and the United States, respectively. In China, the United States accounted for 10 percent of total FDI inflows, while the EU and Japan accounted for 8 percent and 6 percent, respectively. Asian NIEs, including Hong Kong, accounted for 55 percent of inflows to China. All in all, Japan, the United States and the EU are equally important foreign direct investors in East Asia, with Japan being the most significant in ASEAN.

<Table 5> Emerging East Asia's FDI Inflows, 1990-2002 (Million US Dollars)

(a) Asian NIEs

FDI Inflows from:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total (1990-2002)	
														US\$ Mill	%
USA	3,299	2,612	1,410	2,512	5,311	4,364	4,630	4,845	5,139	9,350	13,705	10,797	2,651	70,625	23.5
Japan	2,496	1,990	1,072	1,521	2,403	2,404	3,642	3,313	2,337	3,533	8,765	4,939	3,654	42,070	14.0
EU	1,391	2,081	772	1,499	2,187	2,822	2,781	2,979	5,483	8,425	2,805	6,639	4,323	44,185	14.7
Asian NIES	200	165	254	225	441	242	568	419	847	1,642	9,112	2,117	876	17,109	5.7
Total	7,693	7,338	3,812	6,192	10,735	10,541	13,174	13,177	25,897	42,312	92,656	46,605	19,798	299,930	100.0

(b) ASEAN

FDI Inflows from:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total (1990-2002)	
														US\$ Mill	%
USA	359	758	1,633	1,923	865	1,494	1,782	2,187	3,546	1,872	2,349	422	614	19,805	16.3
Japan	2,061	1,784	1,440	1,999	1,069	2,389	4,052	3,548	2,853	959	1,156	1,644	1,889	26,843	22.0
EU	494	777	2,375	1,505	1,889	1,638	1,653	3,006	2,066	2,852	745	807	1,481	21,288	17.5
Asian NIES	2,183	2,629	1,804	2,334	3,709	2,956	3,681	3,352	2,033	677	1,467	807	1,442	29,074	23.9
Total	6,399	8,038	9,301	10,052	9,408	12,070	15,125	14,930	13,109	7,078	5,222	3,672	7,408	121,814	100.0

(c) China

FDI Inflows from:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total (1990-2002)	
														US\$ Mill	%
USA	189	200	599	1,682	2,456	2,934	3,792	4,282	5,445	5,656	5,222	5,091	5,198	42,746	10.1
Japan	242	296	417	731	1,815	2,982	2,813	2,950	2,308	2,436	2,402	3,572	3,376	26,340	6.2
EU	119	277	185	786	2,301	2,914	3,706	3,668	4,988	3,850	5,780	3,491	2,872	34,937	8.3
Asian NIES	2,081	2,687	9,021	21,831	23,681	22,978	23,959	24,014	21,192	19,220	16,591	22,405	25,496	235,156	55.5
Total	3,487	4,366	11,156	27,515	33,787	35,849	40,180	44,237	43,751	38,753	40,715	46,878	52,743	423,417	100.0

Note: FDI recipient data (compiled by IITI) are adjusted so that they are consistent with BOP figures. Asian NIEs include Singapore and ASEAN excluded Singapore.

Source: Institute for International Trade and Investment; UNCTAD, World Investment Report 2004.

Adapted from: Table 5 in Kawai and Takagi (2005).

3. Labor Market Integration

Labor market integration is not as pronounced as trade and FDI integration in East Asia, particularly in Northeast Asia including Japan and Korea. These two economies have maintained relatively tight restrictions over labor immigration. However, labor mobility is surprisingly high in Southeast Asia, particularly in Singapore, Malaysia and Thailand. Goto and Hamada (1994) presented some evidence to show that labor mobility in Southeast Asia might be as high as that in Europe even in the early 1990s.

Eichengreen and Bayoumi (1999) note that labor markets are more flexible in East Asia than in Europe. Perhaps, reflecting the more flexible labor markets, the speed of adjustment to a shock is much faster in East Asia, indicating that the cost of permanently fixing the exchange rate—and foregoing monetary policy autonomy—is lower. Thus, flexible labor markets in East Asia reduce the importance of labor mobility as one of the OCA criteria. In addition, the recent initiatives for bilateral free trade agreements in the region are expected to stimulate labor mobility, particularly between Southeast and Northeast Asia.

4. Regional Trade Arrangements in East Asia

Emergence of FTA/EPA initiatives in East Asia. Recently, several economies in East Asia have embarked on initiatives for bilateral and sub-regional free trade agreements (FTAs). Notably, Japan implemented a bilateral economic partnership agreement (EPA) with Singapore in November 2002,⁷ and has almost concluded another one with the Philippines (and with Mexico). In response to the Japan-Singapore negotiation, China proposed a free trade agreement (FTA) with ASEAN, resulting in an agreement to complete an FTA by 2010 with advanced ASEAN members and by 2015 with less advanced members. China and ASEAN began official negotiations and have already implemented the so-called “early harvest” measures beginning in January 2004.⁸ Then Japan agreed with ASEAN on an EPA to begin negotiation in the spring of 2005 with a view to achieve free trade by 2012. Korea has also agreed on a similar negotiation with ASEAN to be completed by

⁷ More precisely, the Japan-Singapore agreement is called the “Agreement between Japan and the Republic of Singapore for a New-Age Economic Partnership (JSEPA)” and goes beyond a conventional free trade agreement.

⁸ “Early harvest” refers to provisions of the “Framework Agreement on China-ASEAN Comprehensive Economic Cooperation,” intended to liberalize, before the full completion of the FTA, tariffs in priority sectors of interest and implement other trade and investment facilitation deemed to generate immediate benefits to ASEAN and China.

2009. Japan has begun bilateral negotiations for similar arrangements with Korea, Malaysia, Thailand, and the Philippines—it may also begin a negotiation with Indonesia. In this sense, there have been bandwagon competitions among Japan, China and Korea in their drive for regional FTA/EPA negotiations with ASEAN. Table 6 summarizes the recent initiatives for FTAs and EPAs by the East Asian economies.

<Table 6> FTA/EPA Initiatives in East Asia (as of September 2004)

In Effect	Under Official Negotiation	Under Consultation/Study
Bangkok Treaty (1976)	China-ASEAN	China-New Zealand
Laos-Thailand (1991)	Hong Kong-New Zealand	Japan-Australia
ASEAN FTA (1992)	Japan-Mexico (signed in Sept. 2004)	Japan-ASEAN
Singapore-New Zealand (Jan. 2001)	Japan-Korea	Japan-Indonesia
Japan-Singapore (Nov. 2002)	Japan-Thailand	Japan-China-Korea
Singapore-Australia (2003)	Japan-Philippines (almost concluded)	Japan-Chile
Singapore-EFTA (Jan. 2003)	Japan-Malaysia	Korea-ASEAN
Singapore-USA (Jan. 2004)	Singapore-Canada	Korea-Mexico
China-Hong Kong (Jan. 2004)	Singapore-Mexico	Singapore-Taiwan
China-Macao (Jan. 2004)	Singapore-P3 (Aus, Chile, NZ)	ASEAN-CER (Aus, NZ)
Korea-Chile (April 2004)	Singapore-India	ASEAN-EU
Taiwan-Panama (2004)	Singapore-Jordan	ASEAN (bilateral)-USA
Thailand-Australia (Jan. 2005)	Thailand-Bahrain	
Korea-Singapore (concluded)	Thailand-India	
	Thailand-USA	
	Thailand-Peru	
	ASEAN-India	

Notes: (a) The shaded arrangements are those within East Asia (ASEAN+3, Taiwan and Hong Kong).

Source: Various government publications.

Adapted from: Updated version of Table 7.1 in Fukasaku, Kawai, Plummer and Trzeciak-Duval (2005).

Japan's conclusion of a bilateral EPA with Singapore symbolizes a change in its long-standing policy of pursuing trade liberalization only in a global or trans-regional framework based on the WTO or APEC. Japan has decided to shift its trade policy to a three-track approach based on global (WTO-based) cum trans-regional (APEC-based), regional (within ASEAN+3), and bilateral liberalization. For Japan, regional and bilateral liberalization is an attempt to achieve deeper integration with its trading partners on a formal basis, going beyond reductions in border restrictions—pursuing investment liberalization, promoting greater competition in the domestic market, and harmonizing standards and procedures. Its challenge is to not only maintain consistency with, but also promote, the WTO

liberalization framework, which remains an important element of Japanese trade policy.

RTAs for further trade and FDI integration. These regional trade arrangements are expected to deepen trade-FDI integration in East Asia. The next agenda is to consolidate various bilateral FTAs/EPAs within East Asia to a single East Asia-wide FTA.⁹ This is not an easy task because many different FTAs/EPAs in the region may have different external tariffs, exclusion lists and rules of origin. To make the task easier, each FTA/EPA should have transparent, simple rules with regard to external tariffs, exclusion lists, rules of origin, and harmonization of standards, procedures and regulations. Convergence towards identical rules and common tariff rates, rules and standards is highly desirable. For this purpose, they must establish common grounds for trade and investment facilitation, harmonization of rules, standards and procedures, and dispute resolution mechanisms, particularly in the areas of services, labor mobility, investment, competition policy, intellectual property rights, contingency protection and rules of origin—areas that are difficult to make progress in under the multilateral framework (OECD 2003). This entails the avoidance of the so-called “spaghetti bowl” effect by ensuring consistency and coherence across different trade arrangements.

In addition, East Asian FTAs must be a stepping stone for greater global liberalization. In this respect, it is important for the East Asian approach to regard the WTO principle—and APEC principles—as the basic infrastructure for international trade rules and achieve greater liberalization beyond the commitments of the WTO and APEC.

IV. Macroeconomic Interdependence in East Asia

We next examine the degrees and patterns of cross-country co-movements of major macroeconomic and financial variables—and shocks—in East Asia. We focus on real macroeconomic-activity variables (real GDP, real personal consumption, and real gross fixed capital formation), real financial variables (real money supply, real stock prices, and real exchange rates), and price variables (GDP deflators, consumer price indexes, and wholesale price indexes). We use annual data for

⁹ Although an ASEAN+3 FTA has been proposed, no timeframe is set for negotiation. Japan is indeed cautious about such an arrangement with China at this point. Its view is that before it negotiates on an FTA/EPA with China, it needs to ensure that China comply with all the commitments made in WTO accession negotiations.

analysis, and the sample period is 1980-2002 in most cases but it is shorter for several variables and economies when there are constraints on data availability.¹⁰

1. Cross-Country Correlations of Major Macroeconomic Variables

Tables 7-1, 7-2, and 7-3 respectively summarize cross-country correlation coefficients of real macroeconomic activity, real financial variables, and price variables among the non-East Asian economies and the East Asian economies. Several non-East Asian economies are also included in the table because it is of great interest to compare the degree of macroeconomic interdependence among the East Asian economies with the degree of interdependence between East Asia and non-East Asian economies.

¹⁰ The results in this section largely draw from Kawai and Motonishi (2004). The data are taken from International Monetary Fund, *International Financial Statistics*, and Asian Development Bank, *Key Indicators*, for most Asia-Pacific economies. Those data are supplemented by *World Development Indicators* (World Bank), *Economic Outlook* (OECD), *Brunei Darussalam Statistical Yearbook* (Brunei), *Annual Report on National Accounts* (Japan), the Central Bank of China *Financial Statistics* (Taiwan District, Republic of China), and the Taiwan Stock Exchange homepage.

<Table 7-1> Cross-Country Correlation Coefficient Matrices for Real Sector Macroeconomic Variables, 1980-2002

(a) Real GDP (Annual Growth Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Vietnam	Cambodia	Laos	Myanmar	
USA	1980-2002	1.00																				
EU15	1980-2002	0.42	1.00																			
Australia	1980-2002	0.69	0.27	1.00																		
New Zealand	1980-2002	0.52	-0.11	0.41	1.00																	
India	1980-2001	0.29	0.21	0.33	0.28	1.00																
Japan	1980-2002	0.03	0.35	-0.02	-0.19	0.08	1.00															
Korea	1980-2002	0.17	0.19	-0.16	0.32	-0.01	0.43	1.00														
China	1980-2002	0.36	-0.09	0.22	0.23	-0.03	-0.08	0.14	1.00													
Taiwan	1980-2002	0.46	0.23	0.13	0.35	-0.07	0.46	0.38	0.29	1.00												
Hong Kong	1980-2002	0.12	-0.04	-0.08	0.46	-0.08	0.43	0.50	0.15	0.68	1.00											
Singapore	1980-2002	0.11	-0.00	-0.02	0.23	0.19	0.37	0.34	-0.05	0.47	0.55	1.00										
Malaysia	1980-2002	-0.04	-0.04	-0.18	0.13	0.07	0.41	0.52	0.04	0.35	0.55	0.86	1.00									
Thailand	1980-2002	-0.10	0.05	-0.15	0.11	0.14	0.63	0.71	0.09	0.35	0.50	0.55	0.73	1.00								
Philippines	1980-2002	-0.29	0.08	-0.19	0.11	0.41	0.05	0.09	-0.55	-0.06	0.17	0.40	0.33	0.23	1.00							
Indonesia	1980-2002	-0.13	-0.18	-0.19	0.20	0.02	0.49	0.54	0.06	0.30	0.66	0.55	0.79	0.80	0.24	1.00						
Brunei	1980-2001	0.01	0.40	-0.19	-0.11	-0.20	-0.04	0.32	0.28	-0.01	-0.17	0.01	0.19	0.14	0.02	-0.02	1.00					
Vietnam	1980-2002	0.19	-0.06	0.04	0.04	-0.05	-0.34	0.21	0.34	-0.18	-0.28	0.09	0.22	0.01	-0.04	-0.05	0.55	1.00				
Cambodia	1988-2002	0.19	0.23	-0.02	0.23	0.14	-0.05	0.41	0.46	0.19	0.46	0.15	0.24	0.10	0.13	0.11	0.37	0.17	1.00			
Laos	1981-2002	0.02	-0.30	0.20	-0.07	-0.02	-0.15	-0.15	-0.26	-0.26	-0.18	-0.01	0.05	-0.06	-0.13	0.20	-0.54	-0.07	-0.33	1.00		
Myanmar	1980-2000	-0.03	-0.42	0.02	0.02	-0.08	-0.65	-0.34	-0.09	-0.44	-0.27	-0.01	0.00	-0.35	-0.11	-0.06	-0.13	0.18	-0.20	0.68	1.00	

(b) Real Personal Consumption (Annual Growth Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Vietnam	Cambodia	Laos	Myanmar	
USA	1980-2002	1.00																				
EU15	1980-2002	0.32	1.00																			
Australia	1980-2002	0.11	0.20	1.00																		
New Zealand	1980-2002	0.64	0.09	0.15	1.00																	
India	1980-2001	0.11	-0.06	-0.03	0.19	1.00																
Japan	1980-2002	-0.11	0.25	-0.15	-0.29	-0.08	1.00															
Korea	1980-2002	0.04	0.05	-0.15	0.15	-0.20	0.49	1.00														
China	1980-2001	0.14	-0.41	-0.35	0.10	0.06	-0.31	-0.06	1.00													
Taiwan	1980-2002	0.24	0.42	-0.15	0.00	-0.11	0.58	0.20	-0.28	1.00												
Hong Kong	1980-2002	-0.35	-0.12	-0.54	-0.27	-0.01	0.38	0.40	0.12	0.38	1.00											
Singapore	1980-2002	-0.13	0.08	-0.21	-0.04	0.09	0.22	0.51	-0.13	0.43	0.65	1.00										
Malaysia	1980-2002	-0.31	-0.16	0.07	-0.11	0.12	0.23	0.54	-0.12	0.21	0.36	0.62	1.00									
Thailand	1980-2002	-0.22	-0.05	-0.23	-0.01	0.00	0.55	0.81	-0.15	0.36	0.55	0.65	0.71	1.00								
Philippines	1980-2002	-0.33	0.18	0.18	0.01	0.27	0.06	-0.04	-0.49	0.15	0.09	0.40	0.31	0.26	1.00							
Indonesia	1980-2002	-0.50	-0.54	-0.11	-0.02	-0.03	-0.01	0.34	-0.07	-0.19	0.38	0.25	0.45	0.50	0.22	1.00						
Brunei																	1.00					
Vietnam	1996-2002	-0.59	-0.77	-0.32	0.61	0.22	0.66	0.02	0.29	0.08	0.02	-0.28	0.09	0.16	0.79	0.50		1.00				
Cambodia	1989-2002	0.39	-0.03	0.13	0.43	0.27	-0.37	-0.29	0.60	-0.13	-0.43	-0.34	-0.33	-0.27	-0.31	-0.18		0.06	1.00			
Laos																					1.00	
Myanmar	1980-2000	-0.05	-0.58	0.13	0.03	-0.07	-0.50	-0.09	0.23	-0.61	-0.17	-0.21	-0.06	-0.12	-0.34	0.38		-0.66	0.39		1.00	

(c) Real Gross Fixed Capital Formation (Annual Growth Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Vietnam	Cambodia	Laos	Myanmar		
USA	1980-2002	1.00																					
EU15	1980-2002	0.26	1.00																				
Australia	1980-2002	0.36	0.07	1.00																			
New Zealand	1980-2002	0.32	-0.34	0.49	1.00																		
India	1980-2001	0.09	-0.03	0.06	-0.06	1.00																	
Japan	1980-2002	-0.01	0.54	-0.04	-0.16	0.20	1.00																
Korea	1980-2002	-0.10	0.11	-0.41	0.07	-0.06	0.49	1.00															
China	1980-2000	0.13	-0.35	-0.21	-0.19	0.02	-0.38	-0.09	1.00														
Taiwan	1980-2002	0.10	0.25	0.09	-0.13	-0.09	0.26	0.09	0.06	1.00													
Hong Kong	1980-2002	-0.22	-0.03	0.00	-0.02	0.01	0.34	0.11	-0.09	0.43	1.00												
Singapore	1980-2002	-0.13	-0.26	-0.17	0.19	0.16	0.05	0.17	-0.18	0.30	0.44	1.00											
Malaysia	1980-2002	-0.31	-0.21	-0.11	0.22	-0.11	0.28	0.52	-0.23	0.23	0.54	0.66	1.00										
Thailand	1980-2002	-0.26	-0.06	-0.22	0.14	-0.03	0.45	0.79	-0.12	0.16	0.36	0.26	0.75	1.00									
Philippines	1980-2002	-0.28	0.14	-0.08	0.15	0.08	0.11	0.19	-0.39	0.27	0.32	0.34	0.43	0.32	1.00								
Indonesia	1980-2002	-0.45	-0.20	-0.23	0.14	0.00	0.40	0.55	-0.21	0.09	0.69	0.48	0.81	0.70	0.39	1.00							
Brunei																	1.00						
Vietnam	1996-2002	-0.06	-0.27	-0.11	-0.14	0.45	0.18	-0.21	0.05	-0.02	0.67	0.39	-0.07	-0.15	0.24	0.28		1.00					
Cambodia	1989-2002	-0.02	-0.05	0.28	0.11	-0.58	-0.25	0.01	-0.02	0.19	-0.12	-0.10	0.19	0.02	-0.16	0.04			-0.56	1.00			
Laos																				0.04	1.00		
Myanmar	1980-2000	0.03	-0.15	-0.09	0.31	-0.04	-0.31	0.01	-0.36	-0.29	-0.02	0.31	0.10	-0.10	0.20	0.03					0.57	-0.44	1.00

Source: Computed from IMF, International Financial Statistics; ADB, Key Indicators.

Adapted from: Table 3-1 in Kawai and Motonishi (2004).

<Table 7-2> Cross-Country Correlation Coefficient Matrices for Financial Variables, 1980-2002

(a) Real Money Supply (Annual Growth Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Vietnam	Cambodia	Laos	Myanmar	
USA	1980-2002	1.00																				
EU15	1982-2002	-0.14	1.00																			
Australia	1980-2001	0.11	0.37	1.00																		
New Zealand	1980-2002	-0.02	0.35	0.41	1.00																	
India	1980-2001	0.53	-0.14	0.05	-0.33	1.00																
Japan	1980-2002	0.21	0.43	0.42	0.43	0.01	1.00															
Korea	1980-2002	0.36	0.11	0.07	0.01	0.49	0.22	1.00														
China	1980-2002	0.03	-0.03	-0.16	-0.25	0.13	-0.23	-0.40	1.00													
Taiwan	1980-2002	-0.03	-0.13	-0.06	0.23	0.03	0.34	0.00	0.21	1.00												
Hong Kong	1980-2002	0.19	-0.27	-0.35	-0.05	0.11	0.39	0.32	-0.10	0.53	1.00											
Singapore	1980-2002	0.05	0.13	0.28	-0.08	0.04	0.29	0.12	-0.14	-0.01	0.14	1.00										
Malaysia	1980-2002	-0.25	-0.35	-0.23	-0.21	-0.01	-0.38	-0.18	0.07	-0.04	0.05	-0.19	1.00									
Thailand	1980-2002	-0.30	0.02	0.02	0.10	-0.30	0.22	-0.27	0.11	0.55	0.39	0.11	0.29	1.00								
Philippines	1980-2002	-0.38	-0.07	0.14	0.02	-0.26	0.01	0.03	-0.37	-0.11	0.00	0.06	0.24	0.25	1.00							
Indonesia	1980-2002	-0.38	0.21	0.27	0.19	-0.43	0.16	-0.48	0.08	0.24	0.07	-0.08	0.36	0.65	0.21	1.00						
Brunei																	1.00					
Vietnam	1993-2002	0.54	0.44	0.29	-0.12	0.91	0.54	0.78	-0.60	0.08	0.48	0.06	0.05	-0.15	-0.37	-0.28		1.00				
Cambodia	1994-2002	-0.70	-0.21	-0.13	0.43	-0.23	-0.33	-0.41	-0.36	0.33	-0.21	-0.65	0.39	0.16	0.44	0.65		-0.08	1.00			
Laos	1982-2001	-0.39	0.14	-0.08	-0.09	-0.01	0.10	0.02	-0.10	0.03	-0.15	0.24	-0.09	-0.05	0.18	-0.17		-0.92	0.05	1.00		
Myanmar	1980-2000	0.22	-0.29	-0.47	-0.16	0.04	-0.48	-0.02	-0.08	-0.32	0.04	-0.43	0.34	-0.26	-0.12	-0.05		0.46	0.61	-0.57	1.00	

(b) Real Stock Price (Annual Growth Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia
USA	1980-2002	1.00														
EU15	1980-2002	0.73	1.00													
Australia	1980-2002	0.59	0.48	1.00												
New Zealand	1980-2002	0.34	0.49	0.65	1.00											
India	1980-2001	0.05	0.14	-0.08	-0.02	1.00										
Japan	1980-2002	0.36	0.52	0.40	0.23	-0.08	1.00									
Korea	1980-2002	0.06	0.04	0.13	-0.08	0.09	0.65	1.00								
China									1.00							
Taiwan	1980-2002	0.22	0.24	0.13	-0.05	-0.11	0.59	0.61		1.00						
Hong Kong	1980-2002	0.35	0.28	0.54	-0.11	0.61	0.58	0.51		0.31	1.00					
Singapore	1980-2002	0.36	0.17	0.53	0.19	0.19	0.65	0.68		0.26	0.82	1.00				
Malaysia	1980-2002	-0.06	-0.10	0.36	-0.09	0.44	0.61	0.78		0.35	0.84	0.89	1.00			
Thailand	1980-2002	-0.29	-0.57	-0.13	-0.66	0.62	0.29	0.91		0.24	0.51	0.76	0.84	1.00		
Philippines	1980-2002	0.43	0.36	0.38	0.21	0.19	0.52	0.67		0.41	0.88	0.56	0.82	0.62	1.00	
Indonesia	1980-2002	-0.06	-0.30	0.15	-0.43	0.64	0.49	0.72		0.36	0.70	0.78	0.91	0.97	0.68	1.00

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(c) Real Effective Exchange Rate (Annual Rate of Change)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia
USA	1980-2002	1.00														
EU15	1980-2002	-0.57	1.00													
Australia	1980-2002	0.06	-0.50	1.00												
New Zealand	1980-2002	-0.42	0.29	0.16	1.00											
India	1980-2002	0.32	-0.51	0.21	-0.13	1.00										
Japan	1980-2002	-0.40	-0.02	-0.28	-0.10	-0.13	1.00									
Korea	1980-2002	-0.03	-0.47	0.70	0.15	0.13	-0.06	1.00								
China	1980-2002	0.48	-0.10	-0.40	-0.13	-0.23	-0.16	-0.20	1.00							
Taiwan	1980-2002	-0.01	-0.60	0.59	-0.05	0.34	0.01	0.54	-0.15	1.00						
Hong Kong	1980-2002	0.50	-0.30	0.14	-0.18	-0.01	-0.49	-0.19	0.26	0.06	1.00					
Singapore	1980-2002	0.41	-0.60	0.50	-0.39	0.33	-0.30	0.52	-0.30	0.44	0.26	1.00				
Malaysia	1980-2002	0.46	-0.43	0.23	-0.03	0.39	-0.30	0.41	-0.03	0.21	0.07	0.62	1.00			
Thailand	1980-2002	0.28	-0.54	0.71	-0.02	0.29	-0.23	0.71	-0.24	0.48	0.07	0.72	0.58	1.00		
Philippines	1980-2002	0.23	-0.40	0.51	0.08	0.33	-0.41	0.62	-0.36	0.44	0.21	0.50	0.68	0.57	1.00	
Indonesia	1980-2002	0.06	-0.35	0.39	0.16	0.22	-0.10	0.75	-0.20	0.21	-0.17	0.38	0.59	0.66	0.71	1.00

Source: Computed from IMF, International Financial Statistics; ADB, Key Indicators; and Morgan Stanley (for real effective exchange rates).

Adapted from: Table 3-2 in Kawai and Motonishi (2004).

<Table 7-3> Cross-Country Correlation Coefficient Matrices for Price Variables, 1980-2002

(a) GDP Deflator (Annual Inflation Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Vietnam	Cambodia	Laos	Myanmar	
USA	1980-2002	1.00																				
EU15	1980-2002	0.92	1.00																			
Australia	1980-2002	0.78	0.82	1.00																		
New Zealand	1980-2002	0.65	0.74	0.76	1.00																	
India	1980-2001	0.40	0.40	0.26	0.07	1.00																
Japan	1980-2002	0.81	0.87	0.59	0.59	0.56	1.00															
Korea	1980-2002	0.84	0.78	0.49	0.45	0.68	0.85	1.00														
China	1980-2002	-0.01	-0.02	-0.10	-0.01	0.49	0.12	0.27	1.00													
Taiwan	1980-2002	0.87	0.80	0.49	0.54	0.44	0.82	0.93	0.11	1.00												
Hong Kong	1980-2002	0.63	0.66	0.51	0.37	0.69	0.79	0.75	0.47	0.66	1.00											
Singapore	1980-2002	0.77	0.69	0.60	0.30	0.71	0.65	0.82	0.33	0.73	0.71	1.00										
Malaysia	1980-2002	0.04	-0.02	-0.04	-0.48	0.35	-0.03	0.13	-0.12	0.02	0.12	0.35	1.00									
Thailand	1980-2002	0.61	0.52	0.37	0.24	0.64	0.60	0.83	0.23	0.77	0.65	0.75	0.35	1.00								
Philippines	1980-2002	0.13	0.23	0.12	0.06	0.08	0.35	0.05	-0.05	0.23	-0.02	0.17	-0.10	1.00								
Indonesia	1980-2002	0.07	0.01	-0.09	-0.12	0.02	0.08	0.18	-0.36	0.26	-0.12	-0.01	0.36	0.48	-0.04	1.00						
Brunei	1980-2001	0.56	0.37	0.24	0.01	0.21	0.39	0.58	-0.02	0.58	0.34	0.58	0.48	0.49	-0.04	0.14	1.00					
Vietnam	1980-2002	0.22	0.28	0.55	0.52	0.40	0.24	0.18	0.19	0.08	0.38	0.18	-0.33	0.12	-0.04	-0.21	-0.31	1.00				
Cambodia	1985-2002	0.68	0.72	0.31	0.07	0.66	0.69	0.72	0.33	0.51	0.63	0.52	0.05	0.32	0.39	-0.17	0.05	0.46	1.00			
Laos	1982-2002	0.22	0.29	0.35	0.38	-0.20	0.24	-0.23	-0.35	-0.07	-0.11	-0.33	-0.16	-0.19	0.16	0.29	-0.11	0.14	-0.08	1.00		
Myanmar	1980-2000	-0.46	-0.56	-0.50	-0.62	0.12	-0.35	-0.22	0.28	-0.26	0.06	-0.14	0.24	0.07	-0.30	0.17	-0.07	-0.09	0.03	-0.20	1.00	

(b) Consumer Price Index (Annual Inflation Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Vietnam	Cambodia	Laos	Myanmar	
USA	1980-2002	1.00																				
EU15	1980-2002	0.88	1.00																			
Australia	1980-2002	0.60	0.71	1.00																		
New Zealand	1980-2002	0.63	0.72	0.87	1.00																	
India	1980-2002	0.34	0.42	0.14	0.15	1.00																
Japan	1980-2002	0.88	0.88	0.47	0.54	0.52	1.00															
Korea	1980-2002	0.91	0.73	0.39	0.44	0.54	0.85	1.00														
China	1980-2002	0.00	-0.05	0.04	0.07	0.10	0.02	0.03	1.00													
Taiwan	1980-2002	0.90	0.73	0.38	0.42	0.50	0.82	0.96	0.10	1.00												
Hong Kong	1980-2002	0.64	0.72	0.41	0.40	0.73	0.79	0.65	0.38	0.66	1.00											
Singapore	1980-2002	0.91	0.80	0.36	0.38	0.43	0.85	0.88	0.08	0.90	0.74	1.00										
Malaysia	1980-2002	0.65	0.66	0.14	0.15	0.64	0.66	0.75	-0.11	0.77	0.64	0.79	1.00									
Thailand	1980-2002	0.82	0.66	0.32	0.38	0.59	0.81	0.95	0.09	0.92	0.68	0.81	0.73	1.00								
Philippines	1980-2002	0.35	0.43	0.03	0.15	0.18	0.46	0.20	0.03	0.15	0.36	0.37	0.26	0.15	1.00							
Indonesia	1980-2002	-0.03	-0.08	-0.24	-0.17	0.33	0.02	0.19	-0.35	0.08	-0.12	-0.08	0.34	0.28	0.01	1.00						
Brunei	1980-2001	0.67	0.70	0.44	0.52	0.26	0.56	0.58	0.15	0.66	0.61	0.73	0.64	0.54	0.19	-0.20	1.00					
Vietnam	1986-2002	0.20	0.34	0.75	0.86	0.25	0.12	0.01	0.26	-0.17	0.22	-0.29	-0.46	-0.15	-0.17	-0.23	-0.09	1.00				
Cambodia	1989-2002	0.70	0.85	0.28	0.22	0.41	0.84	0.69	0.09	0.58	0.63	0.65	0.36	0.31	0.75	-0.17	0.12	0.71	1.00			
Laos	1980-2002	0.13	0.11	0.14	0.23	-0.07	0.17	0.03	-0.25	-0.01	-0.15	-0.10	0.02	0.09	0.28	0.52	-0.23	0.01	-0.13	1.00		
Myanmar	1980-2002	-0.56	-0.63	-0.62	-0.57	-0.03	-0.43	-0.29	0.03	-0.36	-0.27	-0.44	-0.21	-0.22	-0.30	0.38	-0.44	-0.26	0.06	-0.14	1.00	

(c) Wholesale Price Index (Annual Inflation Rate)

Countries/ Areas	Data Sample	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia
USA	1980-2002	1.00														
EU15	1983-2002	0.55	1.00													
Australia	1980-2002	0.70	0.64	1.00												
New Zealand	1980-2002	0.66	0.53	0.83	1.00											
India	1980-2002	0.66	0.26	0.40	0.35	1.00										
Japan	1980-2002	0.79	0.54	0.53	0.61	0.69	1.00									
Korea	1980-2002	0.74	-0.10	0.45	0.59	0.71	0.87	1.00								
China									1.00							
Taiwan	1980-2002	0.77	0.29	0.45	0.52	0.70	0.82	0.83		1.00						
Hong Kong	1991-2002	0.44	0.66	0.39	-0.07	0.91	0.53	0.32		0.41	1.00					
Singapore	1980-2002	0.80	0.27	0.40	0.45	0.44	0.70	0.61		0.62	-0.15	1.00				
Malaysia	1980-2002	0.39	0.17	0.02	-0.01	0.50	0.45	0.47		0.54	0.19	0.50	1.00			
Thailand	1980-2002	0.58	-0.06	0.32	0.35	0.66	0.65	0.73		0.74	0.22	0.54	0.73	1.00		
Philippines	1980-2002	0.20	0.63	0.25	0.30	0.20	0.26	0.14		0.16	0.32	0.14	0.25	-0.03	1.00	
Indonesia	1980-2002	-0.02	-0.16	-0.24	0.00	0.06	0.14	0.17		0.19	-0.36	0.19	0.49	0.50	0.10	1.00

Source: Computed from IMF, International Financial Statistics; ADB, Key Indicators.

Adapted from: Table 3-3 in Kawai and Motonishi (2004).

Real macroeconomic activity. Table 7-1 reports cross-country correlation coefficients of the growth rates of real GDP, real personal consumption, and real fixed capital formation (investment). Focusing on large correlation coefficients (those exceeding 0.50, or at least 0.25) reported in the table, we observe the following patterns of cross-country correlations:

- The growth rates of Japan's real GDP, consumption and investment are positively correlated with those of emerging East Asia, particularly Korea, Taiwan, Hong Kong and Thailand, but Japan's real economic activity does not exhibit strong positive correlations with China, the Philippines, or low-income ASEAN countries.
- Surprisingly, the growth rates of U.S. real economic activity are not highly positively correlated with those of the East Asian economies. This is also generally the case for the European Union, Australia, New Zealand and India.
- The growth rates of the Asian NIEs' real macroeconomic activity – except for investment – are positively and fairly strongly correlated with each other. The Asian NIEs' real activity is also positively correlated with those of the middle-income ASEAN-Four, often except for the Philippines.
- The growth rates of real economic activity in the middle-income ASEAN-Four are highly positively correlated with each other, although the Philippines sometimes exhibits weak correlations with other middle-income ASEAN members.

- The growth rates of China's real macroeconomic activity are not strongly positively correlated with those of other East Asian economies and are often negatively correlated with those of high-and middle-income ASEAN members.
- Real economic activity variables of low-income ASEAN countries are not systematically correlated with those of other East Asian economies.

Financial variables. Table 7-2 summarizes cross-country correlation coefficients of the rates of change in real financial variables—real money supply, real stock prices and real bilateral exchange rates vis-à-vis the U.S. dollar, using GDP deflators as relevant price variables. Due to data constraints on real stock price variables, correlation coefficients for China and low-income ASEAN countries are not reported. From the table, one can observe the following.

- There exists a wide variation in cross-country correlation patterns across the financial variables selected. Real money supply exhibits relatively weak correlations among the East Asian economies, while real stock prices exhibit strong positive correlations. Real exchange rates indicate strong positive correlations among some Asian NIEs and the ASEAN-Four.
- This general observation applies well to Japan and Korea. The growth rates of their real money supply do not indicate strong correlations with those of other East Asian economies, while the growth rates of their real stock prices indicate strong correlations with each other and with those of the Asian NIEs and the ASEAN-Four. The real exchange rates of Japan are not positively correlated with those of other East Asian economies, while those of Korea are well correlated with those of Taiwan and the ASEAN-Four.
- Unlike in the case of real economic activity, the U.S. real stock prices are positively correlated with some East Asian economies—such as Hong Kong and Singapore—though the degree of correlation is less than Japan's.
- China's real financial variables again are not strongly positively correlated with those of other East Asian economies.

Inflation rates. Table 7-3 summarizes cross-country correlation coefficients of three measures of inflation rates—GDP deflators, consumer price indexes (CPI) and wholesale price indexes (WPI). Since WPI data for China and low-income ASEAN countries are unavailable, these economies are excluded in the relevant panel. One can make the following observations from the table.

- Inflation rates of the United States, Europe and Japan are equally positively correlated with those of many emerging East Asian economies, except China, Malaysia and Indonesia.
- Inflation rates of the Asian NIEs, Malaysia and Thailand are strongly positively correlated with each other. The Philippines and Indonesia exhibit smaller correlations in inflation rates with other East Asian economies.

- China's inflation rates are not well correlated, or often negatively correlated, with those of the East Asian economies.

To summarize, cross-country correlation analyses of major macroeconomic variables—such as growth rates of real GDP, real consumption, real fixed investment, real financial variables, and price inflation rates—over the last twenty years indicate that macroeconomic conditions of the East Asian economies are generally highly correlated with each other, with the exception of China and low-income ASEAN members. Such deepening macroeconomic interdependence within the region was evidenced by a simultaneous contraction of economic activity throughout East Asia in 1998 and a simultaneous expansion in 1999–2000. Though the regional economies may have been affected by some common global factors such as U.S. economic cycles and information technology (IT) stock price movements, many of the recent, synchronized economic activities in the region can be attributed to strong regional macroeconomic interdependence.

2. The Principal Component Analysis

We next employ a principal component analysis to the real, financial and price variables in order to measure the degree of confluence of these variables within East Asia and vis-à-vis non-East Asian economies.¹¹ In this exercise we group the East Asian economies together and apply the principal component analysis to this group. The principal component analysis aims to explain the variations of a set of variables by a few components without prior knowledge about the determinants of the variations.¹²

Table 8 summarizes for each variable the proportion of its total variation that can be explained cumulatively by the first three principal components. For example, the first principal component of real GDP growth rates explains 41 percent of the total variations of the fourteen East Asian economies, the second principal

¹¹ A study by Goto and Hamada (1994) is an early attempt to examine East Asian economic linkages using principal component analysis.

¹² The actual values of each of the East Asian economic variables can be represented by an $N \times T$ matrix, where N and T are the numbers of countries and years, respectively. The first principal component—that can lead to a linear combination of N series—for each economic variable can be obtained by finding a set of weights, under a certain condition, that can best explain the total variations of the N series over time. The second principal component—another linear combination of N series—can be obtained by finding a set of weights, orthogonal to those of the first principal component, that can best explain the remainder of the total variations. The third principal component can be similarly obtained. The proportions of total variations explained by the first, second and third principal components are the largest, the second largest, and the third largest, respectively.

component explains 19 percent (or 60 percent cumulatively), and the third principal component an additional 15 percent (hence 75 percent cumulatively). The table indicates that the first principal component (PC) can explain between 38 percent (CPI) and 75 percent (GDP Deflator) of total variations of each variable for all East Asian economies. In essence, the first three principal components explain pretty much of the total variations.

<Table 8> Total Variations Explained by First Three Principal Components for Major East Asian Economies (1980-2002)

Countries	Sample Period	No. of Economies	1 st PC	2 nd PC Cumulative	3 rd PC Cumulative
Real GDP	1980-2002	10	0.563	0.702	0.793
Real Personal Consumption	1980-2001	10	0.537	0.679	0.778
Real Fixed Capital Formation	1980-2000	10	0.598	0.740	0.830
Real Money Supply	1980-2002	10	0.281	0.522	0.705
Real Stock Price	1980-2002	4	0.702	0.896	0.964
Real Effective Exchange Rate	1980-2001	10	0.566	0.756	0.839
GDP Deflator	1980-2002	10	0.396	0.665	0.862
Consumer Price Index (CPI)	1980-2002	10	0.361	0.655	0.843
Wholesale Price Index (WPI)	1980-2002	8	0.462	0.710	0.916

Notes: (a) The variables are defined in terms of log first differences.

(b) The analysis typically includes Japan, Korea, China, Taiwan, Hong Kong, Singapore, Malaysia, Thailand, Philippines, and Indonesia. Analysis of real stock prices includes only Japan, Korea, Taiwan and the Philippines, while analysis of the WPI excludes China.

(c) Figures under 1st principal component (PC), etc., are cumulative values of the relative proportion of the variable's total variation that can be explained by the 1st PC, etc.

Adapted from: Table 4 in Kawai and Motonishi (2004).

Table 9 is a summary of correlation coefficients between the first principal component score of each East Asian economic variable and the corresponding, country variables.¹³ The values summarized in the table thus indicate the degree of co-movement of economic variables between East Asia as a group and the individual countries, including non-East Asian economies. The table demonstrates that Japan's real activity variables are more highly correlated with those of emerging East Asia than are U.S. activity variables.¹⁴ Surprisingly, U.S. real activity variables indicate negative correlations with East Asia's first principal component score. Japan's real financial variables are also found to be more correlated with those of emerging East Asia than are the United States'. On the other hand, inflation rates of the United States and Japan are equally highly correlated with those of emerging East Asia. This suggests that the degree of emerging East Asia's real economic interdependence with Japan is greater than with the United States, while the degrees of its nominal interdependence with Japan and the United States are equally strong. Real economic activity of the East Asian economies exhibits strong regional interdependence, with the exception of China.

¹³ The first principal component score is essentially a linear combination of N series obtained from the first principal component analysis. If the correlation coefficients are obtained only for those countries that are the basis of the principal component analysis, they are called the "factor loadings."

¹⁴ Note that in this exercise, Japan is included in the variable set that yields the principal component, while the United States is not. To examine if this is a problem, we also constructed principal components for ASEAN countries and calculated the correlation coefficients between these principal components and Japan's or the United States' variable. Though the results are not reported here, basically the same results have been obtained, namely, Japan is more highly correlated with ASEAN variables than is the United States.

<Table 9> Correlation Coefficients between First Principal Component Scores for East Asia and Individual Economy Data (1980-2002)

Countries/ Regions	Real GDP	Real Con.	Real Inv.	Real Mon. Supply	Real St. Price	Real Eff. Ex. Rate	GDP Def.	CPI	WPI
USA	0.01	-0.32	-0.41	-0.39	0.36	0.48	0.17	0.85	0.30
EU-15	0.01	-0.18	-0.14	-0.15	0.33	-0.33	0.10	0.78	-0.01
Australia	-0.16	-0.15	-0.20	0.02	0.33	0.67	-0.02	0.31	0.00
New Zealand	0.27	-0.04	0.19	0.04	0.11	0.27	-0.07	0.40	0.22
India	0.09	0.01	-0.03	-0.31	0.10	0.40	0.06	0.63	0.34
Japan	0.58	0.39	0.41	0.14	0.71	-0.26	0.15	0.90	0.46
Korea	0.71	0.78	0.67	-0.10	0.86	0.70	0.27	0.89	0.48
China	0.07	-0.14	-0.26	-0.22	--	0.43	-0.40	0.15	--
Taiwan	0.51	0.28	0.28	0.28	0.71	0.72	0.35	0.85	0.50
Hong Kong	0.74	0.63	0.58	0.41	--	0.48	-0.06	0.80	--
Singapore	0.77	0.76	0.59	0.04	--	0.77	0.08	0.87	0.45
Malaysia	0.90	0.87	0.95	0.53	--	0.81	0.40	0.79	0.68
Thailand	0.89	0.92	0.88	0.69	--	0.80	0.54	0.87	0.70
Philippines	0.33	0.31	0.55	0.77	0.91	0.81	-0.06	0.57	0.27
Indonesia	0.89	0.65	0.89	0.61	--	0.86	0.99	0.21	0.92

Notes: (a) The figures are correlation coefficients between the first principal component scores for East Asia and the original, log first-differenced series of individual countries.

(b) In this analysis, East Asia includes Japan, Korea, China, Taiwan, Hong Kong, Singapore, Malaysia, Thailand, the Philippines, and Indonesia.

Adapted from: Table 5 in Kawai and Motonishi (2004).

3. Fundamental Macroeconomic Shocks

Cross-country correlation and confluence analyses of real economic activities, financial variables and inflation rates have revealed the presence of significant real and financial macroeconomic linkages in East Asia, except for a few economies. This sub-section attempts to identify underlying shocks that affect such macroeconomic variables, to assess how these fundamental shocks are internationally correlated across countries, and to investigate how a particular type of shock is transmitted to important economic variables within a country.

Structural VAR model. We attempt to quantitatively identify the underlying shocks affecting East Asia's macroeconomic variables. Such identification is important because it allows us to understand how different types of shocks are internationally correlated within East Asia and what type of exchange rate policy would be most desirable.

For an East Asian economy, we consider the following moving-average (MA) representation of a structural vector autoregression (VAR) model:

$$\Delta \ln Y_t = \sum \lambda_{yj} u_{t-j} + \sum \lambda_{pj} v_{t-j} \quad (1)$$

$$\Delta \ln P_t = \sum \eta_{yj} u_{t-j} + \sum \eta_{pj} v_{t-j} \quad (2)$$

where $\Delta \ln Y_t$ and $\Delta \ln P_t$ are, respectively, the first difference in the logarithm of real GDP and the GDP deflator; and u_t and v_t are, respectively, macroeconomic fundamental shocks to real GDP and GDP-deflators.

Following the procedure suggested by Blanchard and Quah (1989), we identify the underlying shocks by converting the above MA processes, under the restrictions that the sums of the coefficients λ_{pj} is zero, that is, $\sum \lambda_{pj} = 0$. This restriction implies that (a) the real output shock u_t affects both real GDP and the GDP deflator in the long run; and (b) the nominal shock v_t affects only the GDP deflator in the long run. In view of the preliminary information based on AIC and other criteria, lag length is set at one. This estimation is essentially the same as the one applied by Bayoumi and Eichengreen (1994) and Eichengreen and Bayoumi (1999). This estimation provides estimates for two types of shocks, i.e., real GDP shocks (supply shocks) and nominal price shocks (demand shocks).

Table 10 summarizes the cross-country correlations of the two types of shocks, i.e., real GDP (supply) shocks and nominal price (demand) shocks. Focusing on large correlation coefficients (values exceeding 0.50 or at least 0.25), we find the following:

- Cross-country correlations of supply shocks are strong among several East Asian economies. For example, Japan and Korea have strongly positive correlations with each other and with Hong Kong, Singapore and the ASEAN-Four – except for the Philippines. Hong Kong, Singapore and the ASEAN-Four have strong correlations among themselves – except for the Philippines. China is peculiar in that its supply shocks are mostly negatively

correlated with those of other East Asian economies. Noteworthy is the fact that the United States or the European Union does not have strong, positive correlations with the East Asian economies.

- Cross-country correlations of demand shocks in East Asia are not as strong as correlations of supply shocks. Japan has a positive correlation with the Philippines only, and Korea with China, Taiwan, Singapore and Thailand. While the linkages of demand shocks among the ASEAN-Four – except for the Philippines – are pronounced, Singapore does not have strong linkages with the ASEAN-Four. Of interest is the observation that the United States exhibits positive correlations with some East Asian economies.

<Table 10> Cross-Country Correlation Coefficients of the Estimated Shocks (1983-2000)

(a) Real Output (or Supply) Shocks

Countries/ Areas	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Laos	Myanmar
USA	1.00																	
EU15	0.50	1.00																
Australia	0.62	0.22	1.00															
New Zealand	0.42	-0.15	0.16	1.00														
India	0.34	0.29	0.20	0.06	1.00													
Japan	0.07	0.29	-0.01	0.08	0.29	1.00												
Korea	-0.12	0.25	-0.43	0.18	0.09	0.63	1.00											
China	0.18	-0.05	0.11	0.10	-0.22	-0.02	-0.13	1.00										
Taiwan	0.07	0.01	-0.06	0.10	-0.25	0.14	0.21	-0.14	1.00									
Hong Kong	0.03	0.19	-0.47	0.40	0.20	0.35	0.69	-0.01	0.13	1.00								
Singapore	0.15	-0.05	-0.15	0.24	0.21	0.27	0.51	-0.27	0.12	0.35	1.00							
Malaysia	-0.02	-0.11	-0.25	0.16	0.09	0.40	0.63	-0.05	0.11	0.25	0.87	1.00						
Thailand	-0.03	0.21	-0.18	0.23	0.25	0.76	0.77	-0.14	0.09	0.55	0.54	0.64	1.00					
Philippines	-0.46	-0.12	-0.48	-0.22	0.34	0.09	0.03	-0.38	-0.19	0.14	0.02	0.02	0.09	1.00				
Indonesia	-0.06	-0.08	-0.29	0.29	0.01	0.49	0.77	-0.02	0.28	0.36	0.64	0.86	0.66	0.05	1.00			
Brunei	-0.15	0.04	-0.25	-0.21	-0.09	0.15	0.41	0.22	-0.30	0.07	0.53	0.70	0.28	-0.01	0.48	1.00		
Laos	0.05	-0.09	0.20	0.16	-0.13	-0.24	-0.16	-0.11	-0.17	-0.41	-0.13	0.03	-0.13	0.02	0.23	-0.03	1.00	
Myanmar	0.16	-0.39	0.28	0.25	-0.20	-0.47	-0.56	0.12	-0.06	-0.51	-0.13	-0.06	-0.34	0.00	-0.07	-0.10	0.62	1.00

(b) Price Inflation (or Demand) Shocks

Countries/ Areas	USA	EU15	Australia	New Zealand	India	Japan	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Thailand	Philippines	Indonesia	Brunei	Laos	Myanmar
USA	1.00																	
EU15	0.04	1.00																
Australia	0.37	-0.29	1.00															
New Zealand	-0.38	0.41	-0.10	1.00														
India	0.45	0.50	-0.07	-0.01	1.00													
Japan	0.22	0.21	-0.26	0.04	0.21	1.00												
Korea	-0.05	0.60	-0.47	0.07	0.54	0.02	1.00											
China	0.39	0.36	0.04	-0.05	0.56	0.23	0.35	1.00										
Taiwan	-0.29	0.62	-0.53	0.48	0.26	-0.02	0.42	0.05	1.00									
Hong Kong	0.47	-0.19	0.16	-0.12	0.11	0.15	-0.24	0.15	-0.22	1.00								
Singapore	0.28	0.32	0.32	0.28	0.60	-0.30	0.29	0.22	0.23	0.07	1.00							
Malaysia	0.32	-0.30	0.04	-0.69	0.10	0.12	0.06	0.01	-0.31	-0.26	-0.19	1.00						
Thailand	0.09	0.22	0.09	-0.29	0.39	-0.39	0.47	0.09	0.04	-0.42	0.29	0.52	1.00					
Philippines	0.45	0.25	0.29	0.12	0.09	0.48	-0.31	0.06	-0.22	0.43	-0.02	-0.33	-0.36	1.00				
Indonesia	0.26	0.22	-0.27	-0.48	0.19	0.12	0.17	-0.11	0.12	0.08	-0.12	0.48	0.29	0.02	1.00			
Brunei	0.19	0.07	-0.08	-0.08	-0.17	0.03	0.01	0.13	0.32	-0.33	-0.24	0.36	0.18	-0.18	0.03	1.00		
Laos	-0.44	-0.15	-0.25	0.24	-0.26	0.00	0.00	-0.34	0.08	-0.71	-0.12	0.15	0.12	-0.28	-0.32	0.28	1.00	
Myanmar	0.09	0.03	-0.04	-0.26	0.44	-0.23	0.17	0.12	0.19	-0.02	0.17	0.13	0.29	-0.22	0.16	-0.09	-0.10	1.00

Source: Computed from IMF, International Financial Statistics; ADB, Key Indicators.

Adapted from: Table 6 in Kawai and Motonishi (2004).

These observations suggest that deep real economic interdependence that exists among the economies in East Asia, particularly Japan, Korea, other Asian NIEs and some ASEAN countries, is largely due to strong correlations of supply shocks.¹⁵ Supply shocks are more important than demand shocks because the former represent inherent shocks affecting each economy while the latter may reflect the particular policy regime chosen. The absence of real-activity interdependence between East Asia and non-East Asian economies, like the United States and the EU-15—as confirmed in table 7-1—can be explained by the lack of positive correlations of supply shocks. Non-East Asian economies have linkages with East Asia mainly in nominal prices, because demand shocks can be global. This means that cross-country correlations of real macroeconomic activities in East Asia reflect inherent supply shocks affecting the region's economies.

¹⁵ Earlier studies by Eichengreen and Bayoumi (1999) found that, in terms of real (supply) shocks, some East Asian nations were as closely connected with one another as European countries were. In terms of demand shocks, ASEAN countries were also well connected. More specifically, they found that two groups of economies in the region—one for Japan, Korea and Taiwan, and another for Hong Kong, Indonesia, Malaysia, Singapore and possibly Thailand—are natural groups of countries that are closely integrated. See also Bayoumi and Eichengreen (1994) and Bayoumi, Eichengreen and Mauro (2000).

V. Challenges for Regional Policy Coordination

The region has seen not only real but also financial integration through market-driven foreign trade, direct investment, and financial flows. As a result, macroeconomic interdependence has become stronger. The deepening of macroeconomic and financial interdependence suggests a need for concerted efforts to internalize externalities and spillover effects, because macroeconomic/financial developments and policies of one country can easily affect performance and developments in others.¹⁶ It makes sense for such interdependent regional economies to institutionalize *de facto* integration through the establishment of formal cooperative frameworks, such as trade and investment agreements and macroeconomic and financial cooperation arrangements. Policy coordination among such economies would be easier because they are small in number—so the transactions cost for communication and agreements for cooperation is small—and tend to face similar shocks and similar policy challenges.

1. Steps for an Asian Monetary Union

So far no concrete steps have been taken to initiate exchange rate policy coordination, but given the strong economic interdependence of the East Asian economies, intra-regional exchange rate stability is clearly desirable, which calls for closer policy coordination among the financial and monetary authorities in the region. One country's exchange rate adjustment can have serious competitiveness implications for neighboring economies—hence a need for coordination on exchange rate policies. Another good reason for policy coordination is the fact that crisis contagion tends to be concentrated and economic spillovers limited within a region.

The experience from European integration suggests that the formation of a monetary union in East Asia (Asian Monetary Union, AMU) would require monetary and exchange rate policy coordination, which may evolve in three steps:

- loose policy coordination—information and resource coordination;
- tight policy coordination—an Asian “snake” or ERM; and
- complete policy coordination—an Asian Monetary Union (AMU).

First, the regional economies should strengthen information and resource coordination. They must start policy dialogue on exchange rate issues as part of the enhanced surveillance process in order to reduce intra-regional currency volatility and misalignment. This dialogue should focus on exchange market developments,

¹⁶ Given that one country's turbulence, shocks and crises could be easily transmitted to other economies within the same region, it is critical to establish mechanisms for managing such spillovers.

capital flows, foreign exchange reserves, and monetary, fiscal policy and exchange rate policies. In the current context, the regional authorities may discuss such issues as a possible exit of the Chinese RMB and the Malaysian ringgit from a U.S. dollar peg, the impact of possible RMB revaluation, and policies to cope with possible US dollar depreciation reflecting the payments imbalance. Resource coordination involves the creation of a reserve sharing or pooling arrangement—an enhanced version of the Chiang Mai Initiative (CMI) or the creation of an Asian Monetary Fund (AMF)—that can be used to prevent and manage currency crises within the region.¹⁷

Second, as the region becomes more integrated, exhibits greater economic convergence, and hence is better prepared for a more permanent commitment to economic policy coordination, more formal institutions capable of supporting such a commitment need to be built. Indeed, in the second stage of exchange rate policy coordination, several groups of countries in East Asia—like Japan and Korea, China and Hong Kong, or Singapore, Malaysia and Brunei—that are close enough may initiate more aggressive, sub-regional currency stabilization schemes. A multi-track approach would be realistic because economies that are ready can go ahead for closer monetary and exchange rate policy coordination, and latecomers can gradually catch up with the forerunners. At this stage, well-designed financial support mechanisms are needed to help sustain the Asian “Snake” or an Asian ERM through a short-term liquidity arrangement for frequent interventions in the currency market. In addition, intensive macroeconomic policy coordination is needed—particularly monetary and fiscal policy rules—to maintain the “Snake” and make the stabilization system credible.

The final stage is complete monetary policy integration and a full delegation of monetary policy making to a regional supra-national authority. In its ultimate form, a common regional currency may be introduced, but at this point, this is only a long-run possibility for the region.

2. Impediments to Closer Policy Coordination

Impediments. There are three possible impediments to further financial and macroeconomic policy coordination at the regional level:¹⁸

- East Asia’s global orientation in trade, FDI, money and finance—specifically, its openness to North America and Europe;

¹⁷ See Kawai (2002a, 2005), Kuroda and Kawai (2002), Bird and Rajan (2002), and ADB (2004) for a review of the recent initiatives taken by ASEAN+3 Finance Ministers, particularly on the CMI and its policy dialogue and surveillance process.

¹⁸ See Eichengreen (2004a) for some of these impediments.

- lack of integrationist tradition and the supporting, common institutions and the resulting lack of political commitments and mutual trust; and
- diversity of economic and political systems and of economic and financial developments.

First, skeptics might argue that East Asia is more closely integrated with the United States and Europe than with regional economies and that the region can gain more from further integration with the global market than with the regional market. Hence, closer policy coordination in East Asia, with the United States and Europe excluded, is not a commendable idea because these are still important markets for the region's final products. The expansion of intra-regional trade in East Asia, supported by FDI, has been made possible by open markets in the United States and Europe that have been absorbing East Asian finished products. The region's economies are also still highly dependent on the U.S. dollar for exchange rate stabilization, trade invoicing, external asset domination, foreign exchange reserve holding, and external liabilities. This implies that trade and investment liberalization within the WTO, or at least within APEC, would be more desirable than through regional FTAs and that international financial management under the IMF's umbrella, rather than under a regional framework, would be more beneficial to East Asia.

Second, East Asia does not have the kind of integrationist tradition that has long existed in Europe and, as a result, has not developed adequate supporting institutions for regional integration. This is aggravated by the lack of political commitments to economic integration within East Asia due to differences in political systems, "history" issues and the lack of mutual trust. No single economic power plays a dominant role in East Asia similar to that of the United States in the Western Hemisphere, nor does any bipolar relationship exist similar to the Franco-German alliance in Western Europe. Japan has been mired in economic stagnation over the last decade and China, while recently emerging as an economic power, has yet to achieve transition to a market economy and, more fundamentally, political transition.

Finally, diversity and heterogeneity within East Asia in their economic and political systems and stages of economic and social developments –such as per capita incomes, stages of economic and financial market developments, scope and extent of existing exchange and capital controls, institutional and human capacities, and social conditions –can constitute a serious impediment to regional policy coordination.¹⁹ Diversity and heterogeneity imply that low-income countries – where private sector firms are insufficiently developed – will be slow in financial

¹⁹ Ravenhill (2001) argues that diversity of membership and conflicts of power and interest sharply limit potential for cooperation in East Asia, while Terada (2003) provides a constructive and relatively optimistic account of the regional grouping.

liberalization and market opening and, hence, will find it difficult to integrate themselves with the rest of East Asia at a fast pace. Given such economic diversity and heterogeneity, economies in the region have different policy objectives and priorities and desire to maintain national sovereignty over economic policies. In order for the economies to take joint action at the regional level, there must be substantial economic convergence.

Assessments of the impediments. It is useful to point out that some of these impediments are real, but they are not insurmountable. There is no doubt that global frameworks for trade/investment liberalization (WTO) and international financial management (IMF) remain important. Yet there is room for regional frameworks to play complementary roles. In the area of trade and investment, the United States is no longer the most dominant economic partner for many East Asian economies, and the regional markets for final products are expanding fast. A large share of inward FDI flows in East Asia now originates from within the region. In addition, East Asia is in no way inward looking as evidenced by the fact that many regional governments are negotiating FTAs with countries outside of the region and are at the same time focusing on domestic structural reforms, higher productivity and economic growth, thus minimizing trade diversion effects. The East Asian approach is to regard the WTO principle—and APEC principles—as the basic infrastructure for international trade rules and achieve greater liberalization beyond the commitments of the WTO and APEC—called the “WTO-plus” or “APEC-plus” approach.

In the area of money and finance, regional policymakers have found it absolutely necessary to manage financial globalization through various measures, including the strengthening of a regional financial architecture. They have also found the cost of excessive reliance on the U.S. dollar to be very high, so that they have embarked on measures to increase the use of regional currencies through such initiatives as Asian bond market development. These regional efforts are not a substitute for, but a complement of, global and national efforts for crisis prevention, management and resolution. Closer policy coordination is increasingly necessary because of the rising economic interdependence of the East Asian economies.

It is true that East Asia lacks integrationist tradition. Nonetheless, it is important to point out that the region’s governments have initiated efforts to form an “East Asian Community,” whose most important component is an East Asian economic community. The idea of creating an “East Asian Community” was first proposed by East Asia Vision Group (2001). The Vision Group recommended: (1) economic cooperation; (2) financial cooperation; (3) political and security cooperation; (4) environmental cooperation; (5) social and cultural cooperation; and (6) institutional cooperation. A core component of these recommendations is the

creation of an “East Asian Economic Community,” that includes (1) and (2).²⁰ For this endeavor to be successful, Japan and China, as the most important drivers, must form both a solid bipolar alliance and work together with ASEAN. They need to resolve the issues impeding deeper economic integration between them and to re-establish mutual trust.²¹ Without a solid Sino-Japanese relationship, the region cannot make meaningful progress on economic regionalism that may eventually lead to an East Asian economic community.

Diversity and heterogeneity are not the ultimate impediments to economic regionalism, but a lack of political will could be. One clear observation is that, despite heterogeneity and differences in economic and social systems among the countries in the region, they have increasingly come to realize that the economic logic for strengthening regional frameworks for trade/investment integration and regional financial management is overriding. They have found the large benefit of economic integration and its institutionalization to outweigh the costs of not doing so. Needless to say, it is extremely important to raise the economic basis of poor members within East Asia to encourage them to grow. For the time being, a realistic approach would be a multi-track approach: Countries that are ready for deeper integration and closer coordination may pursue RTAs and financial arrangements, while those countries not ready are advised to strive for structural, institutional and governance reforms—with assistance from Japan, Korea, advanced ASEAN members and multilateral development banks—to enable them to benefit from further liberalization and integration. As these low-income countries catch up with their more advanced peers, they can start participating in closer economic regionalism.

3. Immediate Policy Recommendations

Given the increasing degree of economic interdependence in East Asia, closer economic policy coordination is inevitable. It is thus important for the region’s economies to strengthen the current, loose form of policy coordination and to prepare to shift to the next level. There are three immediate policy recommendations

- creation of an East Asia-wide FTA;
- strengthening of the CMI and surveillance; and

²⁰ However, the subsequent East Asia Study Group (2002) comprising government officials did not take a very proactive stance in this direction. Indeed it was as late as November 2004, in Vientiane, when the East Asian Leaders agreed to make efforts to form an “East Asian Community” and hold an East Asian Summit for this purpose.

²¹ Rozman (2002) argues that China continues to see Japan as a partner and a rival, struggling to balance between the two.

- initiation of exchange rate policy coordination.

An East Asia-wide FTA. To support closer policy coordination, real sector integration is essential. The usual sequencing story tells us that trade integration should precede financial integration. This implies that meaningful monetary and exchange rate policy coordination cannot be pursued without real sector integration.

From this perspective, the region's economies should accelerate negotiations on bilateral and sub-regional FTAs—such as a Japan-Korea EPA, Japan-ASEAN EPA, China-ASEAN FTA and Korea-ASEAN FTA—which provide a critical basis for further integration and interdependence. Such regional trade agreements need to avoid the counterproductive “spaghetti bowl” effect, by ensuring that rules, standards and procedures are coherent across different FTAs in the region, and by maintaining WTO consistency—and even by strengthening the WTO framework through the pursuit of an outward-oriented, “WTO-plus” approach. Going beyond such bilateral and sub-regional FTAs/EPAs, the region's economies must create an East Asia-wide FTA, thereby establishing a tariff-free economic zone in East Asia. They should subsequently aim for the creation of a region-wide customs union by adopting a common commercial policy. This requires a substantial effort on the part of all members in East Asia.

Strengthening of CMI and surveillance. The regional economies need to make further progress in the area of liquidity provision mechanism (CMI), the policy dialogue and economic surveillance process, and Asian bond market development initiatives. It is crucial to enhance the functioning of the CMI through: the enlargement of its size by as much as ten times the current commitment; multilateralization and joint activation of the currency swap arrangements; and reduction of its linkage to IMF programs and conditionalities. It is important to link the progress on the part of CMI with the progress on the part of surveillance.²² That is, the enhancement of the CMI—with a larger size, a centrally administered structure, and greater independence from the IMF—must be consistent with the strengthening of the surveillance process. The reason is that the region must address the earlier concern that an AMF that could lend too generously with too little conditionality might create a moral hazard for the government at the receiving end as well as for investors with stakes in the countries in question. It is therefore essential to make the surveillance process effective, improve the regional capacity to formulate appropriate adjustment policy in the event of liquidity crisis and, to the extent necessary, enforce effective private sector involvement. Once these efforts are made, East Asia will have effectively established a *de facto* AMF that can contribute to regional financial stability without creating fears of moral hazard.

²² See Montiel (2004) for an excellent review. Girardin (2004) discusses issues on information exchange and surveillance. Rajan and Siregar (2004) propose to establish a centrally administered reserve pooling system.

Hence, the real challenge is how to transform the current economic review and policy dialogue process under ASEAN+3 into an international-best-practice surveillance with a good surveillance culture—like the G-7 process, European Union processes (Monetary Committee and ECOFIN) and OECD processes (Economic Policy Committee, Economic Development and Review Committee, and Working Party No. 3).

Exchange rate policy coordination. The regional economies must initiate exchange rate policy coordination through:

- introduction of a G-3 currency basket system for emerging East Asia;
- introduction of a regional common currency unit (ACU); and
- adoption of a multi-track approach to an “Asian Snake” or an “Asian ERM.”

First, emerging economies in East Asia should adopt a common G-3 currency basket, comprising the U.S. dollar, the euro and the Japanese yen.²³ The reason is that with the region's diverse economic relationships with the United States, Japan and the European Union, exchange rate stabilization vis-à-vis a well-balanced G-3 currency basket, rather than a single currency like the US dollar, would provide a better buffer to an economy's exposure to yen/dollar and yen/euro rate volatility. It would also provide a benefit of intra-regional exchange rate stability—among emerging East Asia—which is desirable for highly interdependent economies.²⁴ The degree of exchange rate stabilization depends on each economy's specific conditions and preferences.²⁵ Adoption of a common G-3 currency basket among emerging East Asia—and loosely or tightly stabilizing each exchange rate to such a basket—would maintain relative stability of both extra-regional and intra-regional exchange rates.

Second, the region may also create a common unit of account—the Asian Currency Unit (ACU)—in East Asia. One way to do this is to construct a basket of regional currencies that include 13 currencies for ASEAN+3—the Japanese yen, the Chinese renminbi, the South Korean won, the Singapore dollar, the Malaysian

²³ In fact, Kawai (2002b) argues that, in the post-crisis period, Korea and Thailand appear to be shifting to a *de facto* currency basket system, à la Singapore. See also Hernandez and Montiel (2003). McKinnon (2000, 2001), however, takes the view that the East Asian economies have resurrected the U.S. dollar standard system.

²⁴ Actual currency weights in the new basket will depend on the relative importance of the major trading partners and FDI sources for the region; future expectations of trend movements of the yen/dollar exchange rate; the extent of international use of the euro in East Asia; and the success of internationalization of the yen.

²⁵ For countries that do not wish to stabilize the exchange rate, a realistic approach would be what Goldstein (2002) calls “managed floating plus.” This approach is a combination of a “managed float,” i.e., a system with occasional intervention to limit excessive short-term fluctuations in exchange rates without being accompanied by a publicly announced exchange rate target, and a “plus,” i.e., inflation targeting and aggressive measures to reduce currency mismatches. Eichengreen (2004b) also advocates managed floating for emerging East Asia. Williamson (1999, 2000, 2001) has been a long-standing advocate of a managed float, currency basket system for East Asia. Even when a currency basket system is desirable for the region as a whole, however, it is not easy for any single economy to move unilaterally away from the current, U.S. dollar-centered exchange rate arrangement to a new arrangement. When neighboring countries stabilize their exchange rates primarily against the U.S. dollar, there may not be much incentive for any one country to unilaterally alter its exchange rate policy, which demonstrates a potential collective action problem associated with a move to a G-3 currency basket arrangement (Ogawa and Ito 2002). Overcoming this “collective action” problem requires a concerted move to a G-3 currency basket system among the economies concerned.

ringgit, the Thai baht and so forth. Just like the European currency unit (ECU) under the EMS (1979-98), the weights of the regional currencies would reflect the relative importance of the countries in the region. The ACU could be used to denominate economic transactions (trade and capital flows) and asset stocks (foreign exchange reserves and cross-border bonds) and to measure the degree of each currency's exchange rate deviation from the regional average.

Finally, as emerging East Asia and Japan become more integrated and achieve greater convergence and as supporting institutions are further developed, a common framework for intra-East Asia exchange rate stabilization—covering both emerging East Asia and Japan—needs to be established. Essentially, the currencies of emerging East Asia and the yen need to be more tightly stabilized. This can be achieved either through an increase in the yen's weight in the common G-3 currency basket or through the introduction of an "Asian Snake." While the former is *de facto* a formation of a yen bloc, the latter is a more symmetric approach requiring each economy—including Japan—to stabilize its currency to the ACU.²⁶ A multi-track approach may be more realistic here in the sense that countries that are ready can either form a currency union or go ahead with currency stabilization a la an "Asian Snake."

VI. Concluding Remarks

Judging from the OCA criteria, it is clear that the whole of East Asia—the ASEAN+3 group plus Taiwan and Hong Kong—is not an optimum currency area. For example, low-income ASEAN economies have yet to develop their basic institutions and policy frameworks before they become legitimate members to embark on regional monetary policy coordination. Though China is deepening its economic integration with other East Asian economies in terms of trade and FDI, it is not well integrated in terms of financial and macroeconomic activity. China will have to achieve further financial sector reform and capital account liberalization in order to integrate itself fully with other East Asian members. However, several economies in the region, including Japan, Korea, Taiwan, Singapore, Hong Kong, Malaysia and Thailand are well-integrated with each other in terms of trade, finance and macroeconomic activity. Indonesia and the Philippines are close to this league. These economies can form a currency area, at least from economic

²⁶ An alternative approach for the emerging East Asian economies might be to bypass the G-3 currency basket system and to directly adopt the ACU-based system, which would ensure intra-East Asia exchange rate stability. One problem of this alternative approach is that it may not stabilize extra-regional exchange rates. Hence, it may be more desirable for emerging East Asia to begin with a G-3 Currency basket system as a transition arrangement, before achieving more favorable conditions for an intra-regional exchange rate stabilization mechanism.

perspectives. The view that OCA criteria are endogenous would suggest that once these economies fix the exchange rates or form a monetary union, economic integration will deepen and the degree of symmetry of supply shocks will heighten.

The most serious impediments to the formation of an East Asia-wide single currency include: (1) East Asia's global orientation in trade, FDI, money and finance; (2) lack of integrationist tradition, political commitments, mutual trust, and the supporting institutions; and (3) diversity of economic and political systems and of economic and financial developments. Sharing a long-term vision for the future of East Asia helps to strengthen regional economic policy coordination and, in this regard, the recent initiative to create an "East Asia Economic Community" helps greatly. In addition, further economic integration will promote further economic regionalism and trust building.

There are several challenges for the region. First, the regional economies should accelerate institutionalization of trade and investment integration by creating an East Asia-wide FTA, an important basis for the formal institutionalization of financial and macroeconomic integration. For this purpose, regional trade agreements that are currently under negotiation need to avoid the counterproductive "spaghetti bowl" effect and maintain WTO consistency. This requires conscious efforts to maintain consistency and coherence across the multiplicity of bilateral FTAs and to achieve a "WTO-plus."

Second, the regional economies need to make further progress on strengthening liquidity provision mechanisms and economic surveillance. It is crucial to enhance the functioning of the CMI through the enlargement of its size, multilateralization and joint activation of the currency swap arrangements, and reduction of linkages with IMF programs. For this purpose, the region must address the earlier concern that an AMF that could lend too generously with too weak conditionality might create a moral hazard for the government at the receiving end as well as for investors with stakes in the countries in question. It is therefore essential to develop an effective surveillance culture and improve the regional capacity to formulate an independent adjustment policy in the event of a liquidity crisis. Once these efforts are made, East Asia will have effectively established an AMF that can contribute to regional—and, hence, global—financial stability without creating fears of moral hazard.

Third, it is time to initiate exchange rate policy coordination. The first step would be for the regional economies to discuss exchange rate issues as part of enhanced economic surveillance. The next step is the creation of an Asian Currency Unit (ACU) and the adoption of a common G-3 currency basket system based on the Japanese yen, the U.S. dollar and the euro. Then as the region achieves further integration and convergence, the governments must make efforts to ensure intra-regional exchange rate stability through the establishment of such mechanisms as an "Asian Snake." A multi-track approach may have to be taken.

Fourth, it is important to pursue further structural reforms on the part of all economies, particularly in China and ASEAN. China must make efforts to strengthen its financial sector and achieve capital account liberalization at a sequenced pace. The middle-income member states of ASEAN must reform their economies to cope with greater international competition, particularly vis-à-vis China, while its low-income members must pursue institutional and governance reforms to enable them to benefit from real and financial integration.

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8. Is the Pegged Regime a Feasible Alternative in East Asia

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Abstract:

In this paper, the feasibility of pegged regime such as BBC in East Asia is examined by the criteria of economic convergence. In addition, the possible grouping of common peg is analyzed. Examining the inflation convergence, the stationary and cointegration techniques are applied. In the stationary test, it is found that there is less evidence of convergence among East Asian countries after the crisis. In the results of cointegration test, the evidences indicate that there is no shared common trend between most of East Asian countries and several shared common trend for the groups among China, Korea, Japan and ASEAN countries. That is weak convergence of inflation in these groups. This implies that currently the pegged regime might not be feasible in East Asia.

Key Word : Convergence, Pegged Exchange Rate Regime, East Asia

JEL Classification : F33

I. Introduction

It is argued that greater exchange rate volatility and misaligned exchange rates are related to the vulnerability of the current floating exchange rate regime. Dissatisfaction of current floating reflects the development of the basket peg exchange rate regime such as BBC (Basket, Band and Crawl). The BBC regime is argued to limit the volatility of exchange rate by the wide band and to realign the misaligned exchange rate by the frequent change of the parity.

However, a pegged regime could be crisis prone if the monetary and exchange rate policies are not set in a mutually consistent manner.¹⁾ In this case, the system will lose its credibility, and the cost of the regime would be greater. Moreover, it is also subject to the danger of contagion by capital flow.²⁾

Recently, East Asian countries had experienced currency crises. After that, most of the countries in this region except Malaysia have chosen a more flexible exchange rate system and liberalized short term capital flows. As a result, East

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Asian countries have been exposed to foreign shocks. Furthermore, trade integration within East Asia is deeper and there have been increased arguments on the formation of regional trade integration.

In the light of these considerations, there have been increased arguments on a regional monetary arrangement in East Asia. Several alternatives have been proposed and discussed among government officials and economists. One of the most feasible proposals is the BBC regime, which is the common basket peg on the U.S. dollar, euro and yen.

Until recently, the feasibility of the pegged regime has been tested by examining the country characteristics (openness etc.), the existence of asymmetric shocks and the kinds of various shocks, and an affirmative view has been found in East Asia in which the results indicate that East Asian countries satisfy most of the criteria of an optimal currency area.

However, Willett (2003) and Eichengreen and Bayoumi (1999) have argued that without the consistent domestic macroeconomic and exchange rate policies, the system would lose credibility.³⁾ Furthermore, the economic convergence should be important criteria in the choice of the pegged regime. Exchange rates could be unstable when the fundamentals diverge within the region. In fact, East Asian countries have lacked the consistency of macroeconomic policy and coordination of the exchange rate policy within the region.⁴⁾ The policy inconsistency results in the divergence of macroeconomic fundamentals in East Asia.

In this paper, the feasibility of a pegged regime in East Asia is examined by the criteria of economic convergence. In addition, the feasibility of the dollar peg, yen peg in East Asian countries and common basket peg among Asian countries are analyzed through the inflation convergence.

In order to test whether the convergence has been stronger after the Asian crisis in 1997, the period is divided by the two sub-periods, January 1990-November 1997 and December 1998-December 2002. To estimate the degree of convergence, the stationarity and cointegration techniques are used.

The paper is organized as follows. The following section considers the literature of East Asian monetary cooperation and the macroeconomic convergence and econometric methodology. Section III describes the data and then reports the results based on stationarity and cointegration tests. Section IV concludes.

II. Pegged Regime and Economic Convergence

II.1. Monetary Cooperation in East Asia

After the crisis in 1997, Asian countries realized that in order to solve the liquidity problem and assist in bringing stability to Asian currencies and financial markets, they need the establishment of a regional fund. Japan came forward with a plan for an Asian Monetary Fund (AMF), in which it planned to raise \$50-60 billion in contributions from participating countries and another \$50 billion from the Japanese Government. However, the plan was abolished a few months later. It was argued that an AMF will increase the moral hazard problem and create a double standard.

Instead of the AMF, Manila Framework Group (MFG) which is the meeting of finance and central banks from the Asian-pacific region and high level representatives of IMF, ADB and IBRD was established in November 1997. This framework discusses the regional surveillance and economic cooperation for stability of the financial system and cooperative financing arrangement. In October 1998, Japan proposed the bilateral support mechanism in which \$30 billion is funded for the Asian countries to overcome their economic crisis. In 2001, The Chiang Mai Initiative (CMI) was established by the Finance Ministers of ASEAN+3 (Korea, Japan and China) at Chiang Mai in Thailand. CMI is a bilateral swap arrangement (BSA) provided for some degree of collective defense against speculative arrangements.

In June 2003, Asia-pacific economies attempted to set up a \$1 billion fund in a joint bid to promote bond markets in the region and channel official reserves of Asian economies back to the region. The Executives' Meeting of East Asia and Pacific Central Banks (EMEAP) economies established the Asian Bond Fund (ABF) which is invested in a basket of U.S. dollar dominated bonds issued by the EMEAP's sovereign issuer.⁵⁾

On the regional exchange arrangement, two alternatives have been proposed. The First one is pegging to a common basket suggested by Japanese officials⁶⁾ and Williamson (2000).⁷⁾ However, in the composition of the currency basket, there have been several versions. Williamson advocated a common peg system with equal weights of dollar, yen and euro. The other is to include most of East Asian countries' currencies in the basket. Common dollar peg and yen peg are suggested as alternatives.

The second proposal is to maintain the flexible exchange rate system with macroeconomic policy coordination within the region. Willett (2003) suggests that consistent macroeconomic policy and coordination of regional monetary and exchange rate policies could stabilize the exchange rate. Eichengreen and Bayoumi

(1999) also suggested that Williamson's basket system could not be sustainable without policy coordination among the participating countries.⁸⁾

II.2. Macroeconomic Convergence

Theoretical background of pegged regime choice is based on the theory of optimum currency area (OCA). OCA suggests the cost and benefit of a common fixed exchange rate and also describes various OCA criteria to maximize the benefit.

The feasibility of a pegged regime could be examined by testing country characteristics such as openness and trade integration within the region. As intra-regional trade increases, the region seems to be a better OCA. In addition, the various kinds of shocks and dominance of symmetric or asymmetric shocks are the other criteria of OCA.⁹⁾ An alternative approach is to examine the economic convergence among the member countries. Divergent macroeconomic fundamentals result in volatile and misaligned exchange rate and, finally, the pegged system could not be sustained.

One way to examine the convergence is to measure the variance of fundamentals within a member country and region, and compare them with those of other regions. If there exist smaller standard deviations among countries of the region, it could meet the OCA criteria and a pegged regime could be sustained.

The other way to test the economic convergence is to analyze the stationarity and cointegration relationship with a credible benchmark country.¹⁰⁾ A finding of strong convergence in monetary policy with a benchmark country implies that member countries have converged to one common monetary policy. In this case, the group of countries or the region could establish a common pegged regime. Also, the cointegration technique is applied to test for a single common trend among the variables, where convergence is confirmed through the presence of r cointegrating vector among countries.

To test for cointegration consider a p -dimensional vector autoregression :

$$X_t = \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} + e_t \quad (1)$$

where X_t is a sequence of random vectors with components (x_{1t}, \dots, x_{pt}) and $t=1, \dots, T$. The innovations to this process, the e 's are drawn from a p -dimensional i.i.d.

The test procedure examines the $p \times p$ Π matrix. When $0 < \text{rank}(\Pi) = r < p$, there are r cointegrating relations among the elements of X_t and $p-r$ common stochastic trends. Johansen and Juselius(1990) provide two tests for the rank of Π : the trace test and maximum eigenvalue test. Both tests are employed in this study. In the trace test, the null hypothesis that there are at most r cointegrating vectors is tested against the general alternative. In the maximum eigenvalue test, the null hypothesis of r cointegrating vectors is tested against the alternative of at least $r+1$ cointegrating vectors.

A necessary condition for multi-country policy convergence is that there are $p-1$ cointegrating vectors among p policy measures; that is, r should be equal to $p-1$. This fact implies that there is only one common policy trend shared by all countries and there is a complete long-run convergence of policies. When less than $p-1$ but at least one cointegrating vector is found, it implies that there is partial convergence of policies. It means that there is more than one common trend. If the number of cointegrating vector is zero, this indicates that there exist several (p) common trends, but no shared common trends, and suggests no long-run convergence of policies.

With respect to the feasibility of a pegged regime in East Asia, Eichengreen and Bayoumi (1999) find the magnitude of supply shock is similar to those of the EU whereas the demand shock is smaller than the EU. In addition, they also find that the shock is more symmetric than those of the EU. Kawai and Takagi (2001) show that the intra-regional trade during 1990-1998 is 47% of total trade. It means that about half of international trade in East Asia is conducted within the region. Bayoumi, Eichengreen and Mauro (1999) also present that the size of intra-industry trade is similar to the EU and the share of intra-industry trade in GDP is higher than NAFTA.

However, Y.C. Park (2002) states that the intra-regional flow of capital has been smaller than inter-regional flows between East Asia on one hand, and the U.S. and Europe on the other, even though the statistics are not available. That means that East Asian countries have weaker financial links with the neighboring countries within the region.

On the convergence of fundamentals, several studies have analyzed the case of the EU. Koedijk and Kool (1992) investigated nominal interest rate and inflation behavior in the EMS between March 1979 and September 1989, and found a persistent deviating movement in inflation and interest rate. Hafer and Kutan (1994) examined the convergence of EMS members' policies using a cointegration framework, and found that monetary policy convergence has not occurred for the period of March 1979 through December 1990. Westbrook (1998) examined whether the EMS failed to expedite convergence, and found that inflation rates had converged. However, fewer studies have been found in the case of East Asia.

III. Data and Empirical Results

III.1. Data

In order to compare the convergence of fundamentals in 8 Asian countries, the standard deviations of East Asia are compared with those of EU countries.¹¹⁾ The data used is annual data for the period of 1979-2000, and the sample is divided into two sub-periods, pre-Masstricht and post-Masstricht treaty periods.¹²⁾

For estimation of the inflation convergence, the monthly data is used for January 1990-December 2002. In the stationary test, the benchmark deviation of inflation is calculated with respect to the U.S. and other East Asian countries. The Sample period is divided according to pre-and post foreign exchange crisis, January 1990-November 1997 and December 1998-December 2002.

All the data is obtained from the International Financial Statistics database and inflation data is expressed in the year over year growth of the CPI.

III.2. Empirical Results

During the period of EMS, EC countries had experienced unstable exchange rates.¹³⁾ Based on these experiences, they realized that exchange rates are endogenous variables, and the macroeconomic convergence criteria are necessary to maintain for the sustainable currency union and the Masstricht Treaty.

According to the Masstricht treaty's economic convergence criteria, EU member countries should have sustainable price performance and an average rate of inflation that doesn't exceed, by more than 1.5%, the average of the three best performing member countries. In addition, they should satisfy the other macroeconomic convergence criteria, such as interest rate, budget deficit, and government debt, etc. During 1992-1998, most of the EU member countries attempted to meet these convergence criteria and could finally join in EMU.

In East Asia, whatever alternatives will be the regional currency regime, East Asian authorities could learn valuable policy implications from the EU's experience, in which, in order to maintain the stable exchange rate, member countries should prepare the macroeconomic convergence by macroeconomic and exchange rate policy cooperation.

In this section, the economic convergences are examined. First, the macroeconomic fundamentals' convergences are calculated by estimating the average standard deviations of each of the countries and the whole East Asian region, and are compared with those of the EU.

Second, the inflation convergences are examined by examining the stationarity and cointegration relationship among each East Asian country. Furthermore, the inflation convergences investigate for a group of the sample countries, such as Japan, Korea and China. This enables us to assess the possibility of a convergence group or common exchange rate regime.

1) Economic Convergence in East Asia

In Tables 1 and 4, the standard deviation of EU's major macroeconomic indicators in 1986 and 2003 are presented, and those of East Asia in 1996 and 2003 are reported in Tables 5 and 7. In Tables 1, 2 and 3, the average standard deviations of most of EU's economic indicators in 2000 are substantially decreased compared

with in 1986, whereas there are fewer differences between those of 1996, 2000 and 2003 in the case of East Asia. When the magnitudes are compared in 2000 and 2003, the EU's indicators appear much lower than those of East Asia.

In addition, the period averages are also estimated for the two different sub-periods. The first period is before the Masstricht treaty (1979-1990) and the other periods are after the Masstricht treaty (1991-1998, 1999-2003). In the case of the EU, Table 8 shows that the standard deviation of GDP growth rate and inflation during 1991-1998 and 1999-2003 are substantially reduced compared with the pre-Masstricht treaty period, 1979-1990. However, in the case of East Asia, Table 9 indicates that the standard deviation of GDP growth rate is more increased in 1991-1998 than in 1979-1990, and the inflation is a little bit decreased during 1991-1998. When the magnitude is compared between the two regions, most of the variables have higher standard deviations in East Asia than in EU.

In summary, EU's macroeconomic variables had been converged by the Masstricht's treaty's convergence criteria. However, East Asia still has very divergent macroeconomic fundamentals. This implies that the common pegged system in East Asia might not be feasible and sustainable without any macroeconomic policy cooperation.

2) Inflation Convergence among Asian Countries

In this section, the inflation convergences of both each country and several groups of Asian countries are examined by stationary and cointegration methodology. For the measure of the convergence deviation, the most credible country should be a benchmark country. In East Asia, the U.S. Japan, and other East Asian countries could be a benchmark country, whereas in the EU, Germany could be a benchmark country. In addition, the possible convergence groups which have a common currency regime are identified.

(1) Stationarity test

The test results of bilateral inflation convergences of the U.S. and East Asian countries are summarized in Table 10. Table 10 reports that the test statistics with the U.S., Japan and other East Asian countries as a benchmark country provide that at the 5% significance level there is no evidence of inflation convergence in all of the East Asian countries during the whole period. However, when the periods are divided by both pre and post-crisis periods, the results after the crisis point out the existence of more inflation convergence in East Asia by showing more stationary behavior. However, there is little evidence of inflation convergence for Korea/some ASEAN countries and Japan/some ASEAN countries even during the period after the crisis.

These results confirm that a pegged regime which is pegging against the other currencies in East Asia might not be sustainable by pegging their currencies against the U.S. dollar, Japanese yen and other East Asian currencies during the study period.

(2) Cointegration test

From Tables 11 to 14, the cointegration test results between bilateral countries are presented. The results indicate that the cointegration relationship is rejected for the U.S. & Korea, the U.S. & Japan and Japan and China. This indicates that there exist two common trends, but no shared common trends. It suggests no long-run convergence of inflation between these countries.

However, it is found that there is evidence of cointegration between the U.S. & China, Korea & Japan and other some ASEAN countries such as Indonesia and Malaysia during the post-crisis period. This evidence implies that there is long-run convergence of inflation and supports the fact that the behavior of Korean won has been more synchronized with Japanese yen after the Asian crisis, and the Chinese yuan has been pegged to the U.S. dollar. The results suggest that there is some possibility of a sustainable currency peg between Japan & Korea and the U.S. and China, whereas less feasibility is detected on the pegging regime between other East Asian countries.

In Table 15, the results of the cointegration relationship among Japan, Korea and China as a group I is reported. The test results indicate that there is no cointegrating vector. This points out that no shared common trend of inflation exists in this group of countries. This implies that the pegged system might not be feasible among Korea, Japan and China.

Table 16 shows the results of the cointegration relationship among some ASEAN countries such as Indonesia, Malaysia, the Philippines, Singapore and Thailand as a group II. The test results point out that there are three cointegrating vectors, which indicates two common trends shared by all countries. This evidence shows that there is increased partial inflation convergence in this group of countries after the crisis. In Table 17, the group III of China, Korea, Japan, Indonesia, Malaysia, the Philippines, Singapore and Thailand is examined. The test results indicate that there are five cointegrating vectors, which means that there are two shared common trends. This implies the increased partial inflation convergence in this region after the crisis

In Table 18, the results of the cointegration relationship among China, Indonesia, Malaysia, the Philippines, Singapore and Thailand as a group IV are given. The test results also indicate that there are two or three cointegrating vectors

and two or three shared common trends in this region. The evidence also points out that there is partial inflation convergence in this group of countries after the crisis.

Summarizing the test results, even though the convergence has increased since the crisis in East Asia, it is still weak. The results imply that the pegged regime such as a common basket peg might not be sustainable and still not feasible among these countries.

IV. Conclusion

Monetary integration in East Asia has been argued until recently as increasing integration through trade in this region. Eichengreen and Bayoumi (1996) and other studies show that some conditions of OCA criteria are fulfilled in East Asia. Most of the shocks are symmetric and the size of the shock is almost same as in the EU. Intra-regional trade has increased until recently and shows a large share of total trade in this region.

However, low financial integration and convergence in fundamentals have been criticized as a main drawback. In fact, volatile fundamentals in a country and divergent macroeconomic variable in the region could result in an unsustainable pegged regime.

In this paper, the convergence of economic fundamentals and inflation in East Asia are examined. The stationarity and cointegration techniques are used for two sub-periods, pre and post-crisis. Furthermore, inflation convergence of a group of countries is examined in order to identify the possible region or group for the pegged regime.

The results indicate that there exists a non-stationary property and no cointegration relationship in most of the bilateral convergence. In the case of various groups of Asian countries, some partial convergences have been detected. This means that the pegged system might not be sustainable in the sense of stable exchange rates in East Asia. It is shown here that a pegging strategy to yen or the U.S. dollar might not be the right framework and feasible during the study period.

In the light of these test results, lack of macroeconomic policy cooperation or coordination failure could be the main cause of unstable exchange rates in East Asia. The exchange regime choice in this region might not be the main problem. It could be suggested that before choosing a flexible regime with inflation targeting or a pegged exchange rate regime in East Asia, the cooperation in macroeconomic and exchange rate policy could increase the stability of an East Asian monetary regime. However, this cooperation is not an easy task in East Asia. As Eichengreen and Bayoumi (1996) and Willett (2003) pointed out, East Asian countries have different historical and political backgrounds and divergent development stages from the EU.

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<Table 1> Main Economic Indicators of EU (1986)

(unit:%)

1986	Inflation	Government bond yield	Govern surplus or deficit /GDP	(export+ import) /GDP	GDP growth rate	Current account / GDP	Unemployment rate
Belgium	1.3	7.93	-9.6	125.4	1.8	2.5	12.6
Denmark	3.7	9.91	...	66.2	4.0	-5.3	7.9
Germany	-0.1	5.92	-0.9	57.6	2.3	4.6	...
Greece	23.0	15.78	-9.4	46.5	1.6	-4.3	7.4
Spain	8.8	11.36	-4.7	37.5	3.2	1.7	21.2
France	2.5	8.44	-3.3	43.6	2.5	0.3	10.4
Ireland	3.8	11.07	-10.7	103.3	3.7	-3.2	18.1
Italy	5.8	1.52	-11.8	38.7	2.5	0.4	11.1
Luxemburg	0.3	8.67	6.5	...	...	...	1.5
Netherlands	0.1	6.32	-1.5	103.8	3.1	2.4	12
Austria	1.7	7.33	-5.8	71.8	2.3	0.2	5.2
Portugal	11.7	15.54	-10.7	59.5	4.1	3.4	8.3
Finland	2.9	...	0.1	52.6	2.5	-1.0	5.4
Sweden	4.2	10.26	-6.0	63	2.2	-1.0	2.2
U.K	3.4	9.86	-2.3	52.3	4.2	-0.2	11.8
Mean	4.87	9.27	-5.0	65.84	2.85	0.035	9.65
Standard Deviation	5.96	3.69	5.19	26.76	0.86	2.86	5.51

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 2> Main Economic Indicators of EU (1998)

(unit : %)

1998	Inflation	Government bond yield	Govern surplus or deficit /GDP	(export+ import) /GDP	GDP growth rate	Current account / GDP	Unemployment rate
Belgium	1.0	4.72	-0.9	138.7	2.4	4.5	12.6
Denmark	1.9	4.59	...	70.7	2.8	-1.2	6.5
Germany	0.9	4.39	-2.1	56.7	2.2	-0.2	12.3
Greece	4.8	8.48	-5.9	33.5(97)	3.1	-4(97)	10.1
Spain	1.8	4.55	-2.6	58.2	3.8	-0.6	18.8
France	0.7	4.72	-2.7	50.5	3.5	2.8	11.8
Ireland	2.4	4.99	2.1	208.6	8.6	2.5	7.8
Italy	2.0	4.90	-2.8	49	1.8	1.7	12.3
Netherlands	2.0	4.87	-0.7	112.5	3.7	6.8	4.1
Austria	0.9	4.29	-2.3	90.9	3.3	-2.2	7.2
Portugal	2.8	4.09	-2.2	74.8	3.5	-6.8	5.0
Finland	1.4	4.72(99)	1.3	69.1	5.3	5.7	11.4
Sweden	-0.1	4.19(TB)	0.4	80.9	3.0	2.0	6.5
U.K	3.4	5.45	0.8	54.2	2.6	-0.1	4.7
Mean	1.79	4.94	-1.02	90.78	3.64	1.55	8.94
Standard Deviation	1.22	1.04	2.39	55.53	1.66	4.67	4.27

Note: Figures in parentheses denote the Treasury bill rate.

Data: Bank of Korea, Monthly Bulletin, IMF, IFS.

<Table 3> Main Economic Indicators of EU (2000)

(unit : %)

2000	Inflation	Government bond yield	Govern surplus or deficit /GDP	(export+ import) /GDP	GDP growth rate	Current account / GDP	Unemploy-ment rate
Belgium	2.5	5.58	-0.7(99)	150.3(99)	4.0	4.8	11.7(99)
Denmark	2.9	5.54	...	71.7(99)	2.9	2.1	5.3
Germany	1.9	5.24	1.3	57.9(99)	3.1	-1.0(99)	10.7
Greece	3.2	6.10	-5.0	...	4.1	...	...
Spain	3.4	5.36	0.3	56.2(99)	4.9	-2.1(99)	14.1
France	1.7	5.45	-1.3	50.5(99)	3.3	2.6	...
Ireland	5.6	...	4.5	...	...	...	...
Italy	2.5	5.58	-0.3	47.8(99)	2.9	0.7(99)	...
Netherlands	2.5	5.51	2.0	107.5(99)	3.8	5.7(99)	2.6
Austria	2.4	...	-1.1	91.5(99)	3.3	-2.7(99)	5.8
Portugal	2.9	...	-1.4	...	3.3	...	4.4(99)
Finland	3.4	5.48	6.7	67.2(99)	5.9	5.4	9.8
Sweden	1.0	3.95(TB)	6.1	89.5	4.6	2.9	4.7
U.K	2.9	4.68	0.05	56.3	3.1	-1.7	3.8
Mean	2.79	5.31	1.17	81.77	4.05	2.06	6.87
Standard Deviation	1.01	0.56	3.36	50.13	1.31	3.49	3.97

Note: Figures in parentheses denote the statistics of 1999.

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 4> Main Economic Indicators of EU (2003)

(unit : %)

2003	Inflation	Government bond yield	Govern surplus or deficit /GDP	(export+import) /GDP	GDP growth rate	Current account / GDP	Unemployment rate
Belgium	1.6	4.2	-0.3	162.0	2.85	...	12.3
Denmark	2.1	3.5	...	57.1	2.77	2.6	5.7
Germany	1.0	3.8	...	56.2	0.89	2.0	11.7
Greece	...	...	...	...	...	...	...
Spain	3.0	3.5	-1.0	43.3	6.73	-2.5	8.8
France	2.1	4.2	...	41.7	1.98	0.2	n.a.
Ireland	3.5	...	...	95.5	5.31	-1.2	4.7
Italy	2.7	3.4	...	39.8	3.21	-1.3	8.7
Netherlands	2.1	4.2	-2.4	95.8	2.06	2.9	3.4
Austria	1.4	...	...	69.4	2.66	-0.8	7.0
Portugal	3.3	...	...	48.5	0.90	-4.6	6.3
Finland	0.86	4.14	0.02	57.98	2.59	5.13	10.59
Sweden	1.9	4.6	-1.9	60.8	3.90	6.7	4.9
U.K	2.9	4.2	...	38.1	5.34	-1.7	3.1
Mean	2.19	3.97	-1.12	66.63	3.22	0.62	7.27
Standard Deviation	0.85	0.40	1.03	34.31	1.81	3.30	3.14

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 5> Main Economic Indicators of East Asia (1996)

(unit:%)

1996	Inflation	Government bond yield	Govern surplus or deficit /GDP	(export+import) /GDP	GDP growth rate	Current account / GDP	Unemployment rate
Malaysia	3.49	8.89	0.7	180.2	10.0	-4.6	2.5
Singapore	1.38	6.26	14.7	327.7	7.5	15.2	3
Indonesia	7.97	19.21	1.2	51.1	7.8	-3.4	4.0
Japan	0.13	2.65	...	19.9	3.9	1.4	3.4
China	8.32	10.08	-0.7	39.7	9.6	0.9	3
Thailand	5.81	13.39	0.9	85.2	5.5	-8.1	1.1
Philippine	9.00	14.83	0.3	90.3	5.8	-4.8	9.5
Korea	4.92	8.84	0.1	63	6.8	-4.4	2
Mean	4.12	10.51	2.45	107.13	7.11	-7.8	3.56
Standard Deviation	3.28	5.18	5.43	101.4	2.06	7.24	2.55

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 6> Main Economic Indicators of East Asia (2000)

(unit:%)

2000	Inflation	Government bond yield	Govern surplus or deficit /GDP	(export+ import) /GDP	GDP growth rate	Current account / GDP	Unemployment rate
Malaysia	1.53	6.76	-3.1	...	8.5	...	...
Singapore	1.36	5.83	11.3	341.3	9.9	23.6	...
Indonesia	3.72	18.45	-1.1	69.5(99)	4.8	4.1	...
Japan	-0.67	2.06	...	19.8(99)	0.5	2.5(99)	4.7(99)
China	0.25	5.85	-2.7	41.1(99)	8.0	1.9	...
Thailand	1.54	7.83	-2.3	124.3	4.4	7.5	...
Philippine	4.34	10.90	-4.1	104.3	4.0	12.2	...
Korea	2.26	8.5	-4.6	85.5(98)	8.8	12.8(99)	6.3
Mean	1.50	8.27	-0.94	112.25	6.01	9.22	5.5
Standard Deviation	1.65	4.83	5.52	107.1	3.19	7.70	1.13

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 7> Main Economic Indicators of East Asia (2003)

(unit:%)

2003	Inflation	Government bond yield	Govern Surplus or deficit /GDP	(export+ import) / GDP	GDP Growth rate	Current Account / GDP	Unemployment rate
Malaysia	1.06	6.3	n.a	175.76	8.7	7.58(02)	3.6
Singapore	0.5	5.31	6.55	160.14	0.68	30.13	5.4
Indonesia	5.1	16.94	n.a	44.38	10.93	3.57	n.a
Japan	-0.25	1.82	n.a	20.68	-0.09	2.93	5.3
China	1.2	5.31	-2.5	60.25	11.15	3.25	n.a
Thailand	1.8	5.94	0.4	79.09	9.31	5.31	2.2
Philippine	3	9.47	-4.65	71.31	8.59	4.33	11.4
Korea	3.6	6.2	n.a	61.61	5.42	2.04	3.4
Mean	2.12	7.16	-0.05	84.15	6.76	7.37	5.22
Standard Deviation	1.88	4.46	4.86	54.83	4.53	10.09	3.26

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 8> Standard Deviation of Main Economic Indicators in EU

(unit:%)

	GDP growth rate			Inflation		
	1979 ~ 1990	1991 ~ 1998	1999~2003	1997 ~ 1990	1991 ~ 1998	1999~2003
Austria	1.63	1.00	1.07	1.84	1.12	0.83
Belgium	1.68	1.52	1.30	2.65	0.72	0.61
Finland	1.75	4.56	2.66	2.78	1.14	1.04
France	1.17	1.22	1.24	4.31	0.75	0.63
Germany	1.85	4.58	0.73	2.01	1.50	0.52
Ireland	1.96	3.37	4.13	6.57	0.70	1.54
Italy	1.46	1.14	0.96	5.68	1.51	0.44
Netherlands	1.96	1.03	2.57	2.48	0.52	1.02
Portugal	2.77	1.59	2.76	6.55	3.25	0.78
Spain	1.77	1.61	0.57	4.07	1.57	0.49
Denmark	1.86	1.46	1.22	3.32	0.32	0.30
Greece	1.76	1.56	...	3.69	5.19	...
Sweden	0.96	2.42	1.10	2.92	3.05	0.85
U.K	2.27	1.89	0.29	4.45	1.27	0.69
Mean	1.78	2.06	1.59	3.80	1.62	0.72

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 9> Standard Deviation of Main Economic Indicators in East Asia

(unit:%)

		Japan	China	Indonesia	Korea	Malaysia	Philippine	Singapore	Thailand	mean
GDP Growth rate	1979 ~ 1990	1.07	3.95	2.23	3.60	3.25	4.74	3.65	3.18	3.20
	1991 ~ 1998	2.14	2.37	7.14	5.12	5.94	2.68	3.94	6.79	4.51
	1999 ~ 2003	1.10	2.34	2.13	1.86	5.93	2.01	6.67	3.31	3.16
Inflation	1979 ~ 1990	2.06	7.13	4.04	8.71	2.77	12.13	2.97	5.45	5.64
	1991 ~ 1998	1.09	8.41	17.4	1.71	0.84	3.88	1.13	1.39	4.48
	1999 ~ 2003	0.28	1.02	5.64	1.27	0.64	1.73	0.71	0.68	1.5

Data: Bank of Korea, Monthly Bulletin, IMF, IFS

<Table 10> ADF Test for the Inflation Difference

		U.S.	Japan	China	Korea	Singapore	Thailand	Malaysia	Philippine	Indonesia
U.S.	I		-2.16	-1.51	-2.75	-1.31	-1.55	-2.60	-2.08	-2.41
	II		-1.63	-2.25	-1.65	-2.35	-1.58	-2.55	-1.99	-3.26*
	III		-2.26	-3.71**	-1.84	-3.75**	-2.39	-1.95	-1.78	-3.33*
Jpn	I			-1.89	-3.43*	-2.56	-1.88	-3.29	-2.38	-2.87
	II			-2.03	-2.52	-2.09	-2.02	-2.25	-2.72	-1.46
	III			-1.63	-2.99*	-1.50	-2.27	-3.02*	-2.56	-3.45
Chi	I				-2.01	-1.59	-1.67	-1.59	-2.39	-2.02
	II				-2.79	-2.15	-1.58	-1.84	-1.36	-1.08
	III				-1.79	-3.62**	-2.69	-3.42*	-2.83	-3.31*
Kor	I					-2.39	-2.11	-2.65	-1.76	-2.64
	II					-2.82	-1.09	-2.62	-2.52	-2.76
	III					-2.13	-1.60	-2.06	-2.27	-2.02
Sing	I						-1.77	-2.39	-2.69	-2.35
	II						-2.07	-2.55	-2.74	-3.49*
	III						-2.41	-2.74	-1.45	-3.03*
Thai	I							-2.29	-2.23	-2.79
	II							-1.72	-2.36	-0.54
	III							-2.62	-2.70	-3.43*
Mal	I								-2.77	-1.98
	II								-2.39	-1.49
	III								-3.90**	-3.06*
Phil	I									-2.68
	II									-3.10
	III									-2.89*

Note: * (**) denotes rejection of the hypothesis at the 5%(1%) significance level.

I: 1990.1~2002.12, II: 1990.1~1997.10, III: 1997.11~2002.12

<Table 11> Bilateral Johansen cointegration test (1)

	Period	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
U.S. /Korea	1990.1 ~2002.12	None	0.056881	15.72	8.84
		At most 1	0.044526	6.88	6.88
	1990.1 ~1997.10	None	0.079280	11.35	7.43
		At most 1	0.042551	3.91	3.91
	1997.11 ~2002.12	None	0.139575	12.68	9.17
		At most 1	0.055984	3.51	3.51
U.S. /Japan	1990.1 ~2002.12	None	0.063158	15.54	9.98
		At most 1	0.035647	5.55	5.55
	1990.1 ~1997.10	None	0.067795	9.56	6.45
		At most 1	0.033169	3.10	3.10
	1997.11 ~2002.12	None	0.158024	12.19	10.49
		At most 1	0.027501	1.70	1.70
U.S. /China	1990.1 ~2002.12	None	0.041720	7.70	6.48
		At most 1	0.008030	1.23	1.23
	1990.1 ~1997.10	None	0.053203	6.80	5.03
		At most 1	0.019089	1.77	1.77
	1997.11 ~2002.12	None	0.311173	29.15**	22.73**
		At most 1	0.055984	6.41	6.41

Note : * (**) denotes rejection of the hypothesis at the 5%(1%) level.

<Table 12> Bilateral Johansen cointegration test (2)

	Period	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
Japan /Korea	1990.1	None	0.129762	25.99**	21.26**
	~2002.12	At most 1	0.030421	4.72	4.72
	1990.1	None	0.105952	12.74	10.30
	~1997.10	At most 1	0.026151	2.44	2.44
	1997.11	None	0.212721	22.26*	14.59
	~2002.12	At most 1	0.118266	7.68	7.68
Japan /China	1990.1	None	0.044403	8.54	6.90
	~2002.12	At most 1	0.010708	1.64	1.64
	1990.1	None	0.141440	16.13	14.03
	~1997.10	At most 1	0.026151	2.10	2.10
	1997.11	None	0.207542	17.12	13.96
	~2002.12	At most 1	0.051429	3.16	3.16
China /Korea	1990.1	None	0.161172	20.63*	10.72
	~2002.12	At most 1	0.149906	9.91*	9.91*
	1990.1	None	0.036034	6.74	5.58
	~1997.10	At most 1	0.007609	1.16	1.16
	1997.11	None	0.028248	4.01	2.64
	~2002.12	At most 1	0.014816	1.37	1.37

Note : * (**) denotes rejection of the hypothesis at the 5%(1%) level.

<Table 13> Bilateral Johansen cointegration test (3)

	Period	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
Indonesia /Malaysia	1990.1	None	0.080012	16.33	12.76
	~2002.12	At most 1	0.023042	3.57	3.57
	1990.1	None	0.124210	19.05	12.07
	~1997.10	At most 1	0.073893	6.99	6.99
	1997.11	None	0.301226	25.89**	22.22**
	~2002.12	At most 1	0.057468	3.67	3.67
Indonesia /Philippine	1990.1	None	0.078708	19.67	12.54
	~2002.12	At most 1	0.045527	7.13	7.13
	1990.1	None	0.165334	22.32*	16.45
	~1997.10	At most 1	0.062545	5.88	5.88
	1997.11	None	0.242624	27.77**	17.23*
	~2002.12	At most 1	0.156287	10.54*	10.54*
Indonesia /Singapore	1990.1	None	0.091435	19.70	14.67
	~2002.12	At most 1	0.032372	5.03	5.03
	1990.1	None	0.133305	18.91	13.16
	~1997.10	At most 1	0.060583	5.75	5.75
	1997.11	None	0.135754	14.29	9.19
	~2002.12	At most 1	0.077773	5.10	5.10
Indonesia /Thailand	1990.1	None	0.145353	32.54**	24.03**
	~2002.12	At most 1	0.054149	8.52	8.52
	1990.1	None	0.108692	14.99	10.58
	~1997.10	At most 1	0.046742	4.40	4.40
	1997.11	None	0.262134	30.75**	18.84*
	~2002.12	At most 1	0.174732	11.91*	11.91*
Malaysia /Philippine	1990.1	None	0.084564	20.02*	13.34
	~2002.12	At most 1	0.043238	6.67	6.67
	1990.1	None	0.177309	24.69**	17.37*
	~1997.10	At most 1	0.078983	7.32	7.32
	1997.11	None	0.299549	25.37**	22.07**
	~2002.12	At most 1	0.051807	3.30	3.30

Note : * (**) denotes rejection of the hypothesis at the 5%(1%) level.

<Table 14> Bilateral Johansen cointegration test (4)

	Period	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
Malaysia /Singapore	1990.1	None	0.063425	12.13	9.89
	~2002.12	At most 1	0.014706	2.24	2.24
	1990.1	None	0.076863	13.58	7.28
	~1997.10	At most 1	0.066938	6.30	6.30
	1997.11	None	0.133699	13.33	8.90
	~2002.12	At most 1	0.068948	4.43	4.43
Malaysia /Thailand	1990.1	None	0.090053	23.61*	14.44
	~2002.12	At most 1	0.058206	9.18	9.18
	1990.1	None	0.152439	18.96	15.05
	~1997.10	At most 1	0.042086	3.91	3.91
	1997.11	None	0.222146	22.72*	15.57
	~2002.12	At most 1	0.108881	7.15	7.15
Philippine /Singapore	1990.1	None	0.084460	18.13	13.50
	~2002.12	At most 1	0.029824	4.63	4.63
	1990.1	None	0.097932	14.70	9.38
	~1997.10	At most 1	0.056747	5.32	5.32
	1997.11	None	0.123466	13.08	8.17
	~2002.12	At most 1	0.076127	4.91	4.91
Philippine /Thailand	1990.1	None	0.075706	17.82	12.04
	~2002.12	At most 1	0.037015	5.77	5.77
	1990.1	None	0.078506	12.67	7.44
	~1997.10	At most 1	0.055898	5.23	5.23
	1997.11	None	0.159416	19.59	10.77
	~2002.12	At most 1	0.132632	8.82	8.82
Singapore /Thailand	1990.1	None	0.061669	15.86	9.74
	~2002.12	At most 1	0.039241	6.12	6.12
	1990.1	None	0.062056	8.97	5.83
	~1997.10	At most 1	0.033943	3.14	3.14
	1997.11	None	0.198426	23.84*	13.71
	~2002.12	At most 1	0.150707	10.13*	10.13*

Note : * (**) denotes rejection of the hypothesis at the 5%(1%) level.

<Table 15> Johansen cointegration test for Group I

	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
1990.1~ 2002.12	None	0.128244	26.43 (34.91)	20.85 (22.00)
	At most 1	0.025765	5.85 (19.96)	3.92 (15.67)
	At most 2	0.012798	1.93 (9.24)	1.93 (9.24)
1990.1~ 1997.10	None	0.184999	25.64 (34.91)	18.62 (22.00)
	At most 1	0.056052	7.03 (19.96)	5.24 (15.67)
	At most 2	0.019327	1.77 (9.24)	1.77 (9.24)
1997.11~ 2002.12	None	0.304320	33.57 (34.91)	22.13 (22.00)
	At most 1	0.122092	11.43 (19.96)	7.94 (15.67)
	At most 2	0.055654	3.49 (9.24)	3.49 (9.24)

Note : **(**)** denotes rejection of the hypothesis at the 5%(1%) level.
Korea, Japan and China are given as Group I.

<Table 16> Johansen cointegration test for Group II

	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
1990.1~ 2002.12	None	0.207182	81.18* (76.07)	35.06* (34.40)
	At most 1	0.137367	46.12 (53.12)	22.31 (28.14)
	At most 2	0.103376	23.81 (34.91)	16.48 (22.00)
	At most 3	0.031992	7.33 (19.96)	4.91 (15.67)
	At most 4	0.015921	2.42 (9.24)	2.42 (9.24)
1990.1~ 1997.10	None	0.306862	77.82* (76.07)	32.62 (34.40)
	At most 1	0.196479	45.20 (53.12)	19.47 (28.14)
	At most 2	0.153283	25.73 (34.91)	14.81 (22.00)
	At most 3	0.088413	10.92 (19.96)	8.24 (15.67)
	At most 4	0.029706	2.68 (9.24)	2.68 (9.24)
1997.11~ 2002.12	None	0.632804	155.06** (76.07)	62.12** (34.40)
	At most 1	0.545982	92.94** (53.12)	48.96** (28.14)
	At most 2	0.428147	43.98* (34.91)	34.65** (22.00)
	At most 3	0.106618	9.34 (19.96)	6.99 (15.67)
	At most 4	0.037130	2.34 (9.24)	2.34 (9.24)

Note : ** denotes rejection of the hypothesis at the 5%(1%) level.

Indonesia, Malaysia, Philippine, Singapore, and Thailand are given as Group II.

<Table 17> Johansen cointegration test for Group III

	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
1990.1~ 2002.12	None	0.339537	203.80** (165.58)	62.22** (52.00)
	At most 1	0.224477	141.58* (131.70)	38.13 (46.45)
	At most 2	0.195328	103.44* (102.14)	32.59 (40.30)
	At most 3	0.180733	70.84 (76.07)	29.90 (34.40)
	At most 4	0.124743	40.94 (53.12)	19.99 (28.14)
	At most 5	0.067811	20.96 (34.91)	10.53 (22.00)
	At most 6	0.052427	10.42 (19.96)	8.08 (15.67)
	At most 7	0.015521	2.35 (9.24)	2.35 (9.24)
1990.1~ 1997.10	None	0.458733	191.08** (165.58)	55.86* (52.00)
	At most 1	0.338323	135.22* (131.70)	37.58 (46.45)
	At most 2	0.275591	97.64 (102.14)	29.34 (40.30)
	At most 3	0.241145	68.30 (76.07)	25.11 (34.40)
	At most 4	0.172274	43.19 (53.12)	17.20 (28.14)
	At most 5	0.135003	25.98 (34.91)	13.20 (22.00)
	At most 6	0.102880	12.78 (19.96)	9.88 (15.67)
	At most 7	0.031398	2.90 (9.24)	2.90 (9.24)

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	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
1997.11~ 2002.12	None	0.805252	317.92** (165.58)	99.80** (52.00)
	At most 1	0.605466	218.11** (131.70)	56.73** (46.45)
	At most 2	0.558575	161.38** (102.14)	49.88** (40.30)
	At most 3	0.450042	111.50** (76.07)	36.47** (34.40)
	At most 4	0.433040	75.03** (53.12)	34.61** (28.14)
	At most 5	0.315164	40.41* (34.91)	23.09* (22.00)
	At most 6	0.182006	17.31 (19.96)	12.25 (15.67)
	At most 7	0.079675	5.06 (9.24)	5.06 (9.24)

Note : ** denotes rejection of the hypothesis at the 5%(1%) level.
China, Korea, Japan, Indonesia, Malaysia, Philippine, Singapore, and Thailand are in Group III.

<Table 18> Johansen cointegration test for Group IV

	No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eign Statistic
1990.1~ 2002.12	None	0.247783	117.26** (102.14)	42.71* (40.30)
	At most 1	0.157894	74.55 (76.07)	25.77 (34.40)
	At most 2	0.130768	48.77 (53.12)	21.02 (28.14)
	At most 3	0.115954	27.75 (34.91)	18.49 (22.00)
	At most 4	0.051426	9.26 (19.96)	7.92 (15.67)
	At most 5	0.008925	1.34 (9.24)	1.34 (9.24)
1990.1~ 1997.10	None	0.600164	158.69** (102.14)	81.59** (40.30)
	At most 1	0.249023	77.10* (76.07)	25.49 (34.40)
	At most 2	0.229662	51.61 (53.12)	23.22 (28.14)
	At most 3	0.150073	28.39 (34.91)	14.47 (22.00)
	At most 4	0.104488	13.92 (19.96)	9.82 (15.67)
	At most 5	0.045015	4.10 (9.24)	4.10 (9.24)
1997.11~ 2002.12	None	0.718536	206.85** (102.14)	77.33** (40.30)
	At most 1	0.568700	129.51** (76.07)	51.30** (34.40)
	At most 2	0.508385	78.21** (53.12)	43.31** (28.14)
	At most 3	0.311765	34.90 (34.91)	22.79* (22.00)
	At most 4	0.106173	12.11 (19.96)	6.84 (15.67)
	At most 5	0.082692	5.26 (9.24)	5.26 (9.24)

Note : (**) denotes rejection of the hypothesis at the 5%(1%) level.

China, Indonesia, Malaysia, Philippine, Singapore, and Thailand are in Group IV.

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Conference Proceedings

Seminar held December 2-3, 2004 at PRI, Tokyo Japan

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