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Are currency areas feasible in East Asia? A benchmarking approach

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This paper evaluated the feasibility of optimum currency areas (OCAs) in East Asia by benchmarking the characteristics of 16 East Asian economies and India against those of the dollarized countries and the European Economic and Monetary Union (EMU), according to criteria that are most frequently studied in OCA literature, namely synchronization in real business cycle, volatility in real exchange rate, and synchronization in real interest rate cycle. Backed by literature, the U.S. dollar was set to be the reference currency. Data series were divided into different time periods to capture different economic circumstances. A 'dynamic' benchmarking technique was used to ensure robustness of results. Results suggested that the region as a whole does not constitute an OCA at the moment. Nonetheless, a subregional union of a high potential 'Southeast Asian' bloc was put forward. Results serve to be an important reference for both public and private policymakers on matters pertaining to regionalization and international business management.

Key words: Asia, regionalization, monetary union, optimum currency area, OCA, business cycle, dollarization, exchange rate, interest rate, integration.

INTRODUCTION

In October 2008, East Asian leaders agreed to create an $80 billion fund to prepare for the global economic crisis (Esguerra, 2008). The initial agreement called for Korea, Japan, and China to provide 80 percent of the fund, or $64 billion, with ASEAN members providing the remaining $16 billion. This event clearly signifies a heightened awareness on the need for a regionwide monetary and financial cooperation in East Asia.

Among scholarly and policymaker circles, the idea of establishing an East Asian or Asian-Pacific currency area has attracted increasing attention (e.g., Crowley and Quah, 2009; Swofford, 2008; Kuroda, 2004; Kwack, 2004; Dutta, 2000; Kwan, 1998). Existing literature in general favors the formation of currency area in East Asia on several grounds. The first is the continued progression toward openness and interdependence amongst the East Asian economies. The second is that, these countries are vulnerable to economic disturbances from abroad, especially those caused by the high degree of international capital mobility. Third, those disturbances appear to be symmetric among most of the East Asian countries. In effect, based on the symmetry of macroeconomic shocks, Eichengreen and Bayoumi (1999), Loayza, Lopez and Ubide (2001) and Kawai and Motonishi (2005) were able to conclude that East Asia is nearly as good a candidate as the European Union for an internationally harmonized monetary policy. Lastly, emergence of currency blocs elsewhere, intended partly to ward off speculative attacks, has reduced the options available for speculators to prey on.

In practical terms, in May 2007, the ASEAN + 3 (ASEAN plus Japan, Korea, and China) countries have agreed to the Chiang Mai Initiative (The Chiang Mai Initiative (CMI) is an initiative under the ASEAN+3 framework which aims for creation of a network of Bilateral Swap Arrangements (BSAs) among ASEAN+3 countries. After 1997 Asian crisis, member countries started this initiative to manage regional short-term liquidity problems and to facilitate the work of other international financial arrangements and organizations like IMF. In May 2007,

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at the 10th meeting of ASEAN+3 Finance Ministers, further progress was agreed upon) upon a network of bilateral swap agreements that would allow East Asian countries to borrow funds from one another. The proposal of an Asian currency unit (ACU) was also put forward. Recently, the liberalization of foreign exchange, immigration, and trade between China and Taiwan ("NT$-RMB", 2008) has further promoted the prospects of wider integration. As suggested by Shirono (2008), certain regional currency arrangements in East Asia would most probably stimulate regional trade rigorously and generate economically significant welfare gains. In light of the above, it is not unreasonable to envisage a form of monetary integration in East Asia in the 21st century.

Yet, several observers have questioned the feasibility of East Asian monetary union and the ability of candidate countries to adjust to external shocks in the absence of exchange rate flexibility as a policy instrument. The standard tool used in economic literature to evaluate the adequacy of a monetary integration is the optimum currency area (OCA) theory, led by Mundell (1961) and McKinnon (1963), with subsequent refinements by Kenen (1969) and Krugman (1990). The OCA theory compares the benefits and costs to countries participating in a currency area. Benefits include lower transaction costs, price stabilization, elimination of exchange risk, improved efficiency of resource allocation, and increased access to product, factor, and financial markets. The main cost, however, is the country's loss of sovereignty to maintain national monetary and exchange rate policies. Many argue that both costs and benefits depend on the nature of exogenous shocks affecting potential member countries and the speed with which they adjust to them. The costs tend to be lower (higher) if shocks are symmetric (asymmetric) and market mechanisms are quick (slow) to restore equilibrium after the shock.

Much of the literature hinges on the aforementioned issue. For instance, Chow and Kim (2003) investigated the symmetry of shocks and found that East Asian countries are structurally different from each other and thus are likely to be subject to asymmetric shocks. In a related study, Huang and Guo (2006) suggested that there are subgroups among the East Asian countries, of which one is more synchronized and might form a currency union in the first place. While symmetry of shocks is important, other aspects come into play as well.

Another approach, which is direct and pragmatic, is to compare the characteristics of potential countries to those of the countries that have adopted fixed exchange rate regime and those that have successfully formed a monetary union. Accordingly, this paper compares the OCA dimensions of East Asian countries to those of the post-dollarization (Dollarization is an extreme form of fixed exchange rate regim) countries and those of the European Economic and Monetary Union (EMU) founding members. Through this, the feasibility of mone-tary bloc in East Asia can be evaluated empirically. Eva-

luation is based on variables (dimensions) that are widely studied in the OCA literature:

(1) Synchronization in real business cycle,
(2) Volatility in real exchange rate, and
(3) Synchronization in real interest rate cycle.

East Asia in this paper comprises of Brunei, Cambodia, China, Hong Kong, India, Indonesia, Japan, Korea, Laos, Macau, Malaysia, Myanmar, the Philippines, Singapore, Taiwan, Thailand, and Vietnam. Though India is not geographically located in East Asia, it is included here to reflect its rising dominance in Asia and the world (With 17 countries/territories considered, this paper probably offers the widest coverage of the region when it comes to OCA study on East Asia. Country codes used are listed in Appendix).

The results suggest that East Asia as a whole does not constitute an optimum currency area at this moment. Nonetheless, a subregional integration comprises of a high potential 'Southeast Asian' group is put forward. Results are expected to serve public and private policymakers on matters pertaining to regional cooperation and international business management. The remainder of the paper is structured as follows. Section 2 provides some background on monetary arrangement and coope-ration in East Asia. Section 3 presents the selected variables in the scope of OCA theory. Section 4 describes the methodology employed. Section 5 dis-cusses the results. Section 6 concludes and provides the relevant implications of the findings.

BACKGROUND (Motonishi, 2005; Kenen and Meade, 2008)

Before the Asian financial crisis, several exchange rate regimes had existed In East Asia. At one extreme, there was Japan which had a floating regime, although it engaged in substantial intervention to influence the path and rate of change of the yen-dollar rates. At the other extreme, China had a rigid peg to the U.S. dollar whilst Hong Kong and Brunei had and still have strict currency-board systems based on the U.S. dollar and the Singapore dollar, respectively. As for other ASEAN countries and Korea, most of them described themselves officially as having flexible rates though numerous studies have shown that most of them pegged their currencies more or less firmly to the dollar, partaking of what McKinnon (2005) described as the East Asian dollar standard.

During and after the Asian crisis, however, most of the ASEAN countries began to do what they had previously only claimed to do let their exchange rates fluctuate more freely. Malaysia was the clear exception, as it switched to a strict dollar peg backed by the imposition of capital controls. In July 2005, however, Malaysia loosened its ties to the dollar on the same day China revalued the

renminbi by 2.1% vis-à-vis the dollar and announced that its money price would be guided by a multi-currency basket. Meanwhile, India has been found to have adopted de facto dollar peg since 1993 which continued after the crisis (Patnaik and Shah, 2008). Currently, the East Asian region is divided when it comes to exchange rate regimes with most of the exchange rate regimes categorized by the IMF as either managed floating or independently floating rate regimes (McKinnon and Schnabl, 2004), among others, have detected a return to soft dollar pegging in East Asia after the crisis. This is one of the reasons for designating the dollar as a potential anchor currency for the East Asian countries in this paper. See International Monetary Fund (2006) for the de facto classification of exchange rate regimes and monetary policy framework, as of July 31, 2006).

Monetary cooperation in East Asia can actually be dated back to 1967. Brunei and Singapore have a long history of successful, but little known, monetary union (Ngiam and Yuen, 2001). In June 1967, Brunei, Malaysia, and Singapore adopted a system of free interchangeability of their respective currencies. In May 1973, Malaysia quit.

Wider cooperation began in the 1990s when the Japanese government decided to promote the international use of yen. In 1997, having taken the lead in mobilizing financial support for Thailand, the Japanese government proposed the creation of an Asian Monetary Fund (AMF). In 1998, the ASEAN governments agreed to study the feasibility of a common currency system, and in the same year, the Asia-Europe Meeting of finance ministers organized a very ambitious study, the Kobe Research Project, on the feasibility and merits of an Asian monetary union (It is widely agreed that the Asian crisis was the main driver of monetary cooperation. The crisis began in July 1997, when Thailand suffered a massive capital outflow. The East Asian governments had drawn lessons from the nature and virulence of the crisis and from ways in which IMF and the U.S. responded to it). In 2000, Chiang Mai, Thailand, in the first annual meeting of the finance ministers of the ASEAN + 3 countries, participants agreed to exchange data on capital flows whilst Japan proposed the bilateral credit arrangements now known as the Chiang Mai Initiative (CMI). China, Japan, and Korea agreed in principle to negotiate bilateral swap agreements with each ASEAN country, as well as bilateral swap agreements among themselves. In 2005, at the Istanbul meeting of the Asian Development Bank (ADB), four cooperative objectives were agreed upon.

There have been other efforts to foster cooperation in Asia, and some have already borne fruit. The Executives' Meeting of East Asia and Pacific Central Banks (EMEAP) has sponsored the creation of two bond funds. The first, created in 2003, was a $1 billion fund to be used for buying dollar-denominated bonds issued by Asian governments. The second, created in 2004, aimed at financing a set of bond funds to invest and trade in local-currency bonds. In 2008, ASEAN + 3 leaders agreed to create an $80 billion fund in the face of the global financial and economic crisis.

OPTIMUM CURRENCY AREA VARIABLES

This section presents three of the most studied variables in OCA literature. For these variables, the U.S. is nominated a priori as the reference country for several reasons.

First, the dollar is widely accepted as the invoice currency for most of the East Asian trade even though Japanese trade in the region is as large as the American one (McKinnon and Schnabl, 2004). Second, soft pegs against the dollar are still strong and prevalent in East Asia in the post-crisis era despite the Asian crisis (McKinnon, 2005). Dollar pegs are entirely rational from the perspective of East Asian countries to hedge against exchange rate risks and to anchor their domestic price levels. Though many of them have turned from being net debtors to net creditors against the U.S. after the crisis, they still opt to maintain the soft pegs since any devaluation of the dollar would certainly reduce the value of their dollar-denominated assets. At the same time, any revaluation would certainly hamper their exports. This phenomenon is duly labeled as "conflicted virtue". Third, the dollar is also the 'safe-haven' currency into which nationals in emerging markets fly in the face of domestic financial crisis. Fourth, even in wake of the 'U.S. made' global financial crisis, the international reserve currency role of the dollar could hardly be challenged because many countries are still caught by the 'dollar trap' (Krugman, 2009). For instance, China has about 70% of its foreign reserves denominated in dollars.

In another respect, Mundell (2003) has explicitly called for the fixation of the yen-dollar rates as a move to achieve region wide monetary stability in Asia Pacific (For this reason, Japan is regarded as one of the prospective East Asian economies even though its developed status could feasibly support an independent exchange rate. Moreover, it is widely known that the sharp yen-dollar rate fluctuation was one of the culprits behind the Asian crisis. This rate needs to be fixed). If the yen-dollar rates would have to be fixed, then setting the dollar as the anchor currency for the region is absolutely rational.

The following paragraphs delineate the variables proposed. For precise definition and sources of data, see Appendix.

Synchronization in real business cycle

It is clearly understood that when business cycles are synchronized between two economies, the argument for flexible exchange rates that serve as a shock absorber to

resolve asymmetric recessionary or inflationary pressures between the two economies, is thus irrelevant (e.g. Mundell, 1961; McKinnon, 1963). In the case of East Asia for this study, the higher the real business cycle synchronization with the U.S., the stronger the argument to fix exchange rate against the dollar. In terms of measurement, it has become popular to implement this criterion, which is related to symmetry of output shocks, by studying the cross-country correlation of the cyclical components of output. In accordance, the method of Gerlach (1988) and Baxter and Stockman (1989), is adopted. Symmetry in output shocks is identified with cross-correlation with a displacement of zero of the cyclical components of annual GDP series, detrended by applying Hodrick-Prescott (H-P) filter (Artis and Zhang (1997) have assessed the robustness/sensitivity of widely used filters and found no evidence that conclusions are sensitive to the choice of filter. For the dampening parameter, Ravn and Uhlig (2002) suggested 6.25 for annual data and 129600 for monthly data. These parameters are used in this research). This method has been widely utilized in empirical OCA literature (e.g., Artis and Zhang, 1997, 2001; Boreiko, 2003; Bénassy-Quéré and Coupet, 2005).

Volatility in real exchange rate

Real exchange rate variability is a good indicator of synchronicity in terms of economic forces between countries (Vaubel, 1978). These economic forces pertain to inflation rates, openness, economy size, price, wage flexibility, factor mobility, commodity diversification, goods market integration, and fiscal integration (Tavlas, 1993). Artis and Zhang (2001) too, suggested that lower real exchange rate volatility might indicate an absence of asymmetric shocks and greater business cycle conformity, and thus the stronger the case for monetary union. In this respect, volatility in real exchange rate is measured as the standard deviation of log-difference of monthly real exchange rates against the U.S. dollar, where deflation is accomplished using relative consumer prices. In empirical OCA studies, this technique has been used by, for instance, Boreiko (2003), Nguyen (2007), and Tsangarides and Qureshi (2008).

Synchronization in real interest rate cycle

Though not listed as one of the criteria based on traditional OCA theory (Tavlas, 1993), this factor is indicated by a 'revealed preference' argument and is treated as an OCA criterion by, for instance, Artis and Zhang (2001). In our case, if the monetary policy of an East Asian country has historically differed little from the U.S. policy, the cost of relinquishing monetary independence would be accordingly low. Thus, it is assumed here that synchronization in real interest rate cycle with

the U.S. is an indicator of coordination in monetary policy with that reference country. This variable is measured by the cross-correlation of the cyclical components of the real interest rate cycles where detrending is accomplished by applying the H-P filter. Real interest rate is defined as the difference between the discount rate (assumed to be 'set' by the central bank) and the rate of consumer price inflation (When discount rate is not available, equivalent rate is used. See Appendix for details). Recent studies which have linked symmetry in real interest rates to sustainability of monetary union include those by Colciago, Ropele, Muscatelli, and Tirelli (2008), and Arghyrou, Gregoriou, and Kontonikas (2008).

METHODOLOGY

The OCA variables are computed for 17 East Asian (EA) (Also stands for East Asia), four dollarized (DL), and three developed Pacific (DP) countries for three economic periods: the growth period (1981 - 1996), the crisis period (1997 - 2000), the post-crisis period (2001 - 2007), and the long-run period (1981 - 2007). For identification, these periods are referred to as EA and DL periods when EA and DL countries are concerned, respectively. These periods clearly reflect the general economic conditions in both EA and DL countries. As pointed out by Beckerman and Solimano (2002), the 1997 Asian crisis had not only impacted the EA region but had also spilled over to Brazil and the whole Latin American continent (inclusive of the DL countries) in 1998 - 1999.

The segmentation of the time period is justified by the following reasons. The growth period, 1981 - 1996, is part of the period prior to the Asian crisis when the East Asian region was experiencing high economic growth coined by World Bank as the "East Asian Miracle" (e.g., Calomiris and Beim, 2000) (Real GDPs of eight East Asian countries in 1965–1993 grew at an average annual rate of nearly 9 percent, more than twice as fast as those of their Latin American counterparts). This period also takes into account the structural change after the petroleum crises in 1979. The next period, the crisis period, 1997 - 2000, is the period of distress brought about by the Asian crisis. The period thereafter, 2001 - 2007, is the period where many believe that greater regional integration and bilateral cooperation have taken place as a result of the Asian crisis (e.g., Plummer, 2007).

Other than the variable values or cases corresponding to the respective periods, cross-period percent changes are also reported to capture for the trends. Percent change is used so that magnitude of change over initial value can be compared easily amongst the cases. Percent changes are calculated for growth-to-crisis-period (G-C), crisis-to-post-crisis-period (C-P), and growth-to-post-crisis-period (G-P). While the G-C and C-P changes are meant to describe the trends from one economic period to another, the G-P change is, to an extent, intended to look at a longer-run trend minus the Asian crisis effect.

The EA countries are the 17 countries mentioned earlier. The DL countries are Ecuador which dollarized in 2000, El Salvador and Guatemala which dollarized in 2001, and Panama which dollarized in 1904 (Castillo, 2006) (In September 2000, Ecuador replaced its sucre with the dollar. On January 1, 2001, El Salvador followed suit, and on May 1, Guatemala elevated the dollar to equal status with its quetzal). The DP countries are Canada, Australia, and New Zealand. As for the EA countries, the reference country designated for the DL and DP countries is the U.S. The inclusion of DL countries is for benchmarking purpose. Meantime, the purpose of including the DP countries is to introduce a control on the power of the methods adopted. Given our a priori economic knowledge, these countries should possess some characteristics which could

help us to verify the validity of the measurements used.

Also for benchmarking purpose, the variables are also computed for the EMU countries but for periods pertaining only to EMU. The periods are the pre-Maastricht period (1988 - 1993), the post-Maastricht period (1994 - 1998), and the post-euro period (1999 - 2007). These periods shall be called the EMU periods. The periods are structured according to several milestones: July 1, 1987, the effective date of Single European Act; November 1, 1993, the effective date of Maastricht Treaty; and January 1, 1999, the day the euro was launched and adopted. Cross-period percent changes are also computed for the EMU cases. They are the pre-Maastricht-to-post-Maastricht-period change (R-M), post-Maastricht-to-post-euro-period change (M-E), and pre-Maastricht-to-post-euro-period change (R-E).

The EMU countries examined are the founding members, namely Austria, Belgium, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Germany is not included because, as widely accepted in the literature, it is taken as the de facto anchor country, the reference for the EMU countries. Thus, 10 EMU countries are included and of course the reference for them is Germany.

To assess the OCA feasibility of the EA countries, benchmarking against the DL and EMU cases is carried out. By benchmarking against the DL cases, the feasibility of individual hard dollar pegs can be inferred. Besides the DL cases, comparison to Hong Kong, which has an effective hard dollar peg is also done where applicable. Likewise, by benchmarking against the EMU cases, the feasibility of an EMU-like Asian monetary union can be assessed.

Let us now discuss how the benchmarking is done. It is done in a simple manner (The next section provides an illustration of the procedure employed). Every EA case from an EA period is compared to the second least-favorable DL case from each DL period and the second least-favorable EMU case from each EMU period. The second least-favorable case is the benchmark and favorability is based on conformity to the OCA theory. Since the benchmark varies depending on the respective period, the benchmark would be able to reflect a changed environment in that period. A 'dynamic' benchmark in this sense is much better than a static one.

For every EA-DL and EA-EMU 'paired-comparison', if majority of the EA cases are more favorable than the benchmark, then the pair (paired-comparison) is considered to be 'ready'. Of all the EA-DL pairs, if most of them are ready, then the case for individual (hard) dollar pegs is supported. Meanwhile, of all the EA-EMU pairs, a ready majority would support the case for a regionwide monetary union. Both outcomes are independent and are not mutually exclusive.

A similar exercise is carried out using the cross-period percent change. An EA trend that is in accordance with the development of DL and EMU cases would support the case for hard dollar peg and monetary union, respectively.

RESULTS

The analysis for the OCA variables, (1) synchronization in real business cycle, (2) volatility in real exchange rate, and (3) synchronization in real interest rate cycle is discussed in this section.

Synchronization in real business cycle

Table 1 shows the coefficients of real business cycle correlation (BUS) and the corresponding cross-period percent changes. The BUSs range from the lowest -1, in countries where real business cycles are totally different from the U.S. cycle (for EMU, the German cycle), to the highest +1, where real business cycles are identical to the U.S. one. For the percent change, an EA country's increase would indicate that its business cycle has become more convergent to the U.S. cycle whereas a decrease would indicate that the business cycle has become more divergent from the U.S. cycle. Higher BUS and/or higher BUS increase (lower BUS decrease) than the benchmarks are deemed as favorable.

Let us begin looking at the cases for the various periods. If BUS of 0.5 or greater is regarded as substantial, then substantial EA BUS is reported by Taiwan (growth, crisis, and long-run periods); Cambodia, and India (crisis and post-crisis periods); and China, Hong Kong, Singapore, and Japan (post-crisis period). Based on this alone, these countries might be more prepared than the other EA countries for exchange rate fixation in the respective periods. In aggregate terms, however, the BUS means are not substantial.

Some other findings of interest can also be observed from Table 1. First, the validity of the BUS measurement seems to be supported. The long-run cases appear to conform to our general economic knowledge; countries such as Taiwan, Singapore, India, Canada, and Australia which have closer economic ties with the U.S. are found to have relatively high values. Second, as shown by the general direction of the percent change, the EA BUS on the whole had fallen tremendously in the crisis period. The Asian crisis could have diverted the EA cycles away from the U.S. cycle. Third, as indicated by the DP cases, the real business cycles of the developed Pacific countries appear to have diverged from the U.S. cycle-implying weakening linkages between these economies and the American economy. Fourth, the high Japanese BUS in the post-crisis period may well support Mundell's (2003) proposal to lock the yen-dollar rate.

Lastly, substantially (statistically) high and stable BUS through different periods might not be a necessary condition for sustainable hard dollar peg. For instance, Panama, which has dollarized since 1904 has shown negative BUS for the growth period. Likewise, Hong Kong which has effectively locked its rate to the dollar since 1983, has displayed substantially positive BUS only in the post-crisis period.

To assess the feasibility of EA countries for hard dollar peg and monetary union, comparisons to the DL and EMU benchmarks are done, respectively. Results are shown in Table 2. Cells in Table 2 display the number of favorable EA cases for each EA-DL and EA-EMU paired-comparison (pair). To illustrate, the top left-most cell shows that 16 growth period EA cases are more favorable than the same period DL benchmark. Since huge majority of the EA cases are more favorable, this pair is ready. The adjacent cell on the right shows that none of the growth period EA cases are more favorable

Table 1. Real business cycle correlation coefficient (BUS).

		Value (coefficient)				% Change[1]		
		Growth (G) 1981 - 1996	Crisis (C) 1997 - 2000	Post-crisis (P) 2001 - 2007	Long run 1981 - 2007	G-C	C-P	G-P
	East Asia (EA)							
1	CHN	0.324	-0.957	0.707	0.321	-395.37	173.88	118.21
2	HKG	0.201	-0.014	0.950	0.263	-106.97	6885.71[2]	372.64
3	KOR	-0.178	0.048	-0.556	-0.175	126.97	-1258.33	-212.36
4	TWN	0.500	0.916	0.485	0.614	83.20	-47.05	-3.00
5	KHM	-0.007	0.799	0.589	0.398	11514.29[2]	-26.28	8514.29[2]
6	IDN	-0.066	-0.482	0.100	-0.215	-630.30	120.75	251.52
7	LAO	0.068	-0.028	0.310	0.149	-141.18	1207.14	355.88
8	MYS	-0.151	-0.109	0.401	-0.026	27.81	467.89	365.56
9	MMR	-0.100	-0.560	-0.729	-0.311	-460.00	-30.18	-629.00
10	PHL	-0.237	-0.621	0.176	-0.219	-162.03	128.34	174.26
11	SGP	0.125	0.417	0.868	0.431	233.60	108.15	594.40
12	THA	-0.159	-0.163	0.167	-0.205	-2.52	202.45	205.03
13	VNM	0.360	-0.918	0.339	0.094	-355.00	136.93	-5.83
14	IND	0.208	0.661	0.645	0.420	217.79	-2.42	210.10
15	MAC	0.139	-0.616	-0.028	0.021	-543.17	95.45	-120.14
16	BRN	-0.624	-0.403	-0.653	-0.540	35.42	-62.03	-4.65
17	JPN	-0.071	-0.207	0.930	0.022	-191.55	549.28	1409.86
	Dollarized (DL)							
1	ECU	0.150	-0.879	0.670	-0.099	-686.00	176.22	346.67
2	ELS	-0.451	0.788	0.306	-0.108	274.72	-61.17	167.85
3	GTM	0.527	0.863	0.710	0.635	63.76	-17.73	34.72
4	PAN	-0.276	0.663	0.375	0.047	340.22	-43.44	235.87
	Developed Pacific (DP)							
1	AUS	0.777	0.747	-0.083	0.681	-3.86	-111.11	-110.68
2	NZL	0.508	-0.211	-0.375	0.288	-141.54	-77.73	-173.82
3	CAN	0.571	0.922	-0.021	0.546	61.47	-102.28	-103.68
Mean								
East Asia		0.020	-0.132	0.277	0.061	-141.46	110.25	192.66
Dollarized		-0.013	0.359	0.515	0.119	-1.82	13.47	196.28
Developed Pacific		0.619	0.486	-0.160	0.505	-27.98	-97.04	-129.39
		Pre-Maastricht (R)1988-1993	Post-Maastricht (M)1994-1998	Post-euro (E) 1999-2007	Long run 1981-2007	R-M	M-E	R-E
	EMU							
1	AUT	0.983	0.414	0.797	0.770	-57.92	92.81	-18.87
2	BEL	0.583	0.423	0.818	0.697	-27.40	93.28	40.32
3	FIN	-0.230	-0.361	0.935	0.151	-56.50	359.31	505.81[2]
4	FRA	0.437	0.887	0.850	0.604	102.78	-4.17	94.33
5	IRL	0.531	-0.311	0.794	0.591	-158.67	355.13	49.69
6	ITA	0.394	0.166	0.890	0.632	-57.92	436.11	125.60[2]
7	LUX	0.538	0.768	0.835	0.660	42.78	8.72	55.24
8	NDL	0.670	-0.121	0.917	0.788	-118.07	857.03[2]	36.80
9	PRT	0.737	-0.429	0.884	0.534	-158.25	306.00	20.00
10	ESP	0.657	0.393	0.928	0.645	-40.16	135.98	41.20
	Mean	0.530	0.183	0.865	0.607	-52.93	198.13	39.84

Notes: 1 Positive value indicates improvement in coefficient, negative value indicates otherwise.
2 Excluded from mean calculation.
Source: See Appendix for data definitions and sources.

Table 2. EA-DL and EA-EMU paired-comparisons for BUS.

EA	DL				EMU			
	Growth (G)	Crisis (C)	Post-crisis (P)	Long run (LR)	Pre-Maastricht (R)	Post-Maastricht (M)	Post-euro (E)	Long run (LR)
Growth (G)	16	0	1	11	1	16	0	0
Crisis (C)	10	2	4	7	4	10	2	3
Post-crisis (P)	14	4	8	14	8	14	3	6
Long run(LR)	15	0	4	11	4	16	0	1

Table 3. EA-DL and EA-EMU paired-comparisons for BUS change.

EA Change	DL Change			EMU Change		
	G-C	C-P	G-P	R-M	M-E	R-E
G-C	5	8	3	10	7	7
C-P	11	14	6	16	11	11
G-P	11	14	10	15	11	11

than the crisis period DL benchmark. As majority (all) of the EA cases are not favorable, this EA-DL pair is not a ready one.

In fact, results show that majority of the EA-DL and the EA-EMU pairs are not ready. Among the EA-DL pairs, however, those pairs pertaining to the DL growth period are ready. For each of these pairs, majority of the EA cases are higher than the growth period DL benchmark. As for the EA-EMU pairs, all those pairs related to the post-Maastricht period are ready. This reveals that for every EA period, majority of the EA cases are higher than the post-Maastricht EMU benchmark. In brief, the BUS level in EA is, by and large, as good as the DL level in the growth period and the EMU level in the post-Maastricht period.

Table 3 shows the results of paired-comparisons for percent change. Results from the EA-DL pairs reveal that ready pairs are slightly more (5 of the 9 pairs). Particularly, every pair involving the EA G-P change is ready. This may indicate that, minus the Asian crisis effect, the general EA trend is comparable to the DL one. As for the EA-EMU pairs, majority (7 of the 9 pairs) are found to be ready. Except for the change from the growth to the crisis period, the general EA direction is in line with the EMU one. For both EA-DL and EA-EMU pairs, the fewer ready pairs concerning the G-C change clearly signify a diversion trend from the U.S. cycle in the crisis period.

In a nutshell, the East Asian region has shown reasonable prospects for dollar bloc in terms of real business cycle synchronization. Specifically, the situation in the region resembles that in the growth period dollarized countries and that in the post-Maastricht period EMU.

Nonetheless, a general divergent trend from the U.S. cycle can be observed in the crisis period.

Volatility in real exchange rate

Table 4 displays the standard deviations (Standard deviation $(x10^2)$ of the log difference in bilateral real exchange rate against the reference currency) measuring real exchange rate volatility (RER) and the corresponding cross-period percent changes. For EA countries, the lower the RER, the more stable the real exchange rate against the dollar whereas the higher the RER, the more volatile the real exchange rate against the dollar. Accordingly, a decrease in percent change indicates that the real exchange rate has become more stable against the dollar whilst an increase signifies that the rate has become more volatile against the dollar. Lower RER and/or higher RER decrease (lower RER increase) than the benchmarks are consistent with rigid dollar peg. Amongst the EA countries, the lowest RER is reported by Macau for all periods. In this context, Macau might be most prepared for a dollar peg.

Before looking at the readiness of the EA countries, it is essential to note that several findings may confirm the validity of the measurement used. These findings are consistent with our a priori knowledge. First, Australia and New Zealand, the developed countries in the Oceania, have reported consistently high RERs across the periods. Since both are rich advanced economies that are most probably feasible to maintain independent monetary policies, it is not surprising to see them having more volatile rates. Among the developed countries, however, Canada which has been trading heavily with the U.S. has displayed relatively low variability. This is consistent with the OCA theory which says that a country which trades heavily with another country is most likely to have low RER (A quick search on the IMF-DOTS data-base can confirm the huge U.S. share of Canadian total trade). Theoretically, in the absence of capital and trade barriers between the two countries, any asymmetries in the real and monetary sectors would have been resolved.

Second, the RERs, particularly among countries which are severely hit by the Asian crisis (Korea, Thailand,

Table 4. Standard deviation measuring real exchange rate volatility (RER).

		Value[1]				% Change		
		Growth (G) 1981-1996	Crisis (C) 1997-2000	Post-crisis (P) 2001-2007	Long run 1981-2007	G-C	C-P	G-P
East Asia (EA)								
1	CHN	4.435	0.650	0.899	3.084	-85.34	38.31	-79.73
2	HKG	1.453	0.608	0.658	1.201	-58.16	8.22	-54.71
3	KOR	0.944	7.349	2.023	3.082	678.50	-72.47	114.30
4	TWN	1.477	2.079	1.427	1.572	40.76	-31.36	-3.39
5	KHM	2.051	2.415	1.001	1.742	17.75	-58.55	-51.19
6	IDN	3.411	16.519[2]	3.931	7.116	384.29	-76.20	15.24
7	LAO	3.979	11.101[2]	1.308	5.735	178.99	-88.22	-67.13
8	MYS	1.272	5.214	0.790	2.265	309.91	-84.85	-37.89
9	MMR	2.938	3.340	2.307	2.878	13.68	-30.93	-21.48
10	PHL	3.353	4.476	1.693	3.229	33.49	-62.18	-49.51
11	SGP	1.304	2.439	1.451	1.571	87.04	-40.51	11.27
12	THA	1.639	6.645	1.519	2.954	305.43	-77.14	-7.32
13	VNM	3.310	1.464	1.007	2.286	-55.77	-31.22	-69.58
14	IND	2.378	1.571	1.494	2.084	-33.94	-4.90	-37.17
15	MAC	0.476	0.433	0.636	0.580	-9.03	46.88	33.61
16	BRN	1.444	2.358	1.460	1.641	63.30	-38.08	1.11
17	JPN	3.397	4.001	2.592	3.294	17.78	-35.22	-23.70
Dollarized (DL)								
1	ECU	5.689	147.153[2]	0.930	56.520[2]	2486.63[2]	-99.37	-83.65
2	ELS	5.675	0.644	0.532	4.349	-88.65	-17.39	-90.63
3	GTM	7.117	1.501	0.930	5.490	-78.91	-38.04	-86.93
4	PAN	0.336	0.271	0.599	0.421	-19.35	121.03	78.27
Developed Pacific (DP)								
1	AUS	5.020	4.397	5.267	5.123	-12.41	19.79	4.92
2	NZL	5.933	5.245	5.639	5.929	-11.60	7.51	-4.96
3	CAN	1.303	1.547	2.333	1.680	18.73	50.81	79.05
Mean								
	East Asia	2.309	3.003	1.541	2.724	114.09	-37.55	-20.52
	Dollarized	4.704	0.805	0.748	3.420	-46.73	-5.46	-30.77
	Developed Pacific	4.085	3.730	4.413	4.244	-1.76	26.04	26.34
		Pre-Maastricht (R)1988-1993	Post-Maastricht (M) 1994-1998	Post-euro (E) 1999-2007	Long run 1981-2007	R-M	M-E	R-E
	EMU							
1	AUT	0.622	0.470	0.308	0.468	-24.44	-34.47	-50.48
2	BEL	0.622	0.326	0.354	0.659	-47.59	8.59	-43.09
3	FIN	2.819	1.225	0.443	1.697	-56.54	-63.84	-84.29
4	FRA	0.707	0.722	0.348	0.817	2.12	-51.80	-50.78
5	IRL	1.238	1.724	0.455	1.326	39.26	-73.61	-63.25
6	ITA	2.124	2.094	0.329	1.458	-1.41	-84.29	-84.51
7	LUX	0.629	0.341	0.727	0.741	-45.79	113.20	15.58
8	NDL	0.728	0.548	0.602	0.643	-24.73	9.85	-17.31
9	PRT	1.578	1.444	0.504	1.595	-8.49	-65.10	-68.06
10	ESP	2.202	1.146	0.544	1.515	-47.96	-52.53	-75.30
	Mean	1.327	1.004	0.461	1.092	-21.56	-29.40	-52.15

Notes:
1 Standard deviation ($\times 10^2$) of the log difference in bilateral real exchange rate against the reference currency.

Table 5. EA-DL and EA-EMU paired-comparisons for RER.

EA	DL				EMU			
	Growth (G)	Crisis (C)	Post-crisis (P)	Long run (LR)	Pre-Maastricht (R)	Post-Maastricht (M)	Post-euro (E)	Longrun (LR)
Growth (G)	17	7	1	17	9	8	1	7
Crisis (C)	13	4	3	13	6	5	1	5
Post-crisis (P)	17	11	4	17	14	13	0	12
Long run (LR)	15	2	1	15	7	5	1	4

Table 6. EA-DL and EA-EMU paired-comparisons for RER change.

EA Change	DL Change				EMU Change	
	G-C	C-P	G-P	R-M	M-E	R-E
G-C	4	4	1	5	5	4
C-P	13	13	2	14	15	13
G-P	10	10	0	12	13	10

Indonesia, and Ecuador), are generally higher in the crisis period. Laos, given its Lao kip's close link to the Thai baht, was particularly vulnerable to exchange rate volatility (Okonjo-Iweala, Kwakwa, Beckwith, and Ahmed, 1999). All this conforms to our understanding that exchange rates of crisis-stricken countries were more volatile, in nominal and in real terms, during the crisis period. Third, the relatively low Hong Kong RER through-out the periods does fit the currency board system adopted by the territory. The same is true for Macau which ties its pataca to the H.K. dollar.

On another matter, the EA region has appeared to be more homogenous in the post-crisis period with lower RERs. Unlike preceding periods, the post-crisis period is definitely more conducive as far as regional monetary integration is concerned.

Table 5 shows that all those EA-DL pairs related to the DL growth period are ready. It appears that the general RER level in EA is as low as the growth period DL level. Besides, most of the EA-DL and EA-EMU pairs pertaining to the EA post-crisis period are ready. Majority of the post-crisis period EA cases are as low as or lower than the growth and crisis period DL benchmarks, and the pre- and post- Maastricht period EMU benchmarks. This pattern implies that the situation in the post-crisis period EA is comparable to the DL and the EMU ones prior to the introduction of dollarization and euro, respectively.

Table 6 displays the results of paired-comparisons for the percent change. It reveals that two-thirds of the EA-EMU pairs are ready. In contrary, only a slight majority of the EA-DL pairs are not ready. For both types of pairs, most of the pairs related to the EA C-P change are highly ready. It shows that the direction of EA RERs from the crisis to the post-crisis period resembles the development

in the DL and the EMU countries. On the other hand, the pairs concerning the EA G-C change are highly not ready. This is not surprising since the Asian crisis has brought higher volatility to the region.

To put it briefly, of all the periods considered, the general real exchange rate variation in the post-crisis period East Asia is compatible with the path toward a dollar bloc. In particular, the regional setting in the post-crisis period is as good as the ones in the dollarized and the EMU countries in periods preceding the dollarization and the euroization, respectively.

Synchronization in real interest rate cycle

Table 7 shows the coefficients of real interest rate cycle correlation (INT) and the corresponding cross-period percent changes. The INTs range from the lowest, -1, in countries where real interest rate cycles are totally different from the U.S. cycle (for EMU, the German cycle), to the highest, +1, where real interest rate cycles are identical to the U.S. one. For the percent change, an increase from an EA country means that its real interest cycle has become more convergent to the U.S. cycle while a decrease indicates that the real interest cycle has become more divergent from the U.S. one. Accordingly, higher INT and/or higher INT increase (lower INT decrease) than the benchmarks could signify more coordinated monetary policy with the U.S. policy, and hence might bolster the argument for fixed dollar peg.

If INT of 0.5 or higher is regarded as substantial, then in EA, substantial INTs are reported by 10 countries in the growth period, five countries in the crisis period, one country in the post-crisis period, and three countries in the long run period. On the validity of measurement, the results do conform to our understanding of the East Asian monetary arrangement. The generally high INTs shown in the growth period are consistent with the dollar pegging regime adopted in most parts of the region before the Asian crisis. Ever since, almost all the EA INTs have declined tremendously. This decline does fit the more flexible regimes in the region after the crisis. If the 'revealed preference' argument (e.g., Artis and Zhang, 2001) is valid, this finding may undermine the potentiality for hard dollar peg in a more recent EA. Nevertheless,

Table 7. Real interest rate cycle correlation coefficient (INT).

		Value (coefficient)				% Change[1]		
		Growth (G) 1992-1996	Crisis (C) 1997-2000	Post-crisis (P) 2001-2007	Long run 1992-2007	G-C	C-P	G-P
East Asia (EA)								
1	CHN	0.556	-0.559	-0.725	0.051	-200.54	-29.70	-230.40
2	HKG	0.994	-0.785	-0.656	-0.025	-178.97	16.43	-166.00
3	KOR	0.993	0.370	0.985	0.886	-62.74	166.22	-0.81
4	TWN	0.898	0.151	-0.464	0.452	-83.18	-407.28	-151.67
5	KHM	-1.000	-0.993	-0.902	-0.783	0.70	9.16	9.80
6	IDN	-0.922	-0.826	-0.685	-0.227	10.41	17.07	25.70
7	LAO	-0.989	-0.159	0.213	-0.587	83.92	233.96	121.54
8	MYS	0.955	0.921	-0.389	0.500	-3.56	-142.24	-140.73
9	MMR	0.897	-0.353	0.251	0.221	-139.35	171.10	-72.02
10	PHL	0.982	0.405	-0.577	0.397	-58.76	-242.47	-158.76
11	SGP	0.932	0.900	-0.736	0.480	-3.43	-181.78	-178.97
12	THA	-0.976	0.963	-0.390	0.412	198.67	-140.50	60.04
13	VNM	-0.998	0.853	-0.409	0.726	185.47	-147.95	59.02
14	IND	0.678	-0.991	-0.882	-0.296	-246.17	11.00	-230.09
15	MAC	0.983	-0.634	-0.698	0.162	-164.50	-10.09	-171.01
16	BRN	-	0.842	-0.081	-0.057	-	-109.62	-
17	JPN	-0.990	-0.969	-0.699	-0.523	2.12	27.86	29.39
Dollarized (DL)								
1	ECU	0.737	0.791	-0.578	0.024	7.33	-173.07	-178.43
2	ELS	0.231	0.473	-	0.343	104.76	-	-
3	GTM	-0.605	-0.821	0.302	-0.170	-35.70	136.78	149.92
4	PAN	0.449	0.392	0.215	0.222	-12.69	-45.15	-52.12
Developed Pacific (DP)								
1	AUS	0.350	-0.515	0.101	0.158	-247.14	119.61	-71.14
2	NZL	0.391	0.022	0.325	0.251	-94.37	1377.27	-16.88
3	CAN	0.784	0.832	-0.565	0.039	6.12	-167.91	-172.07
Mean								
	East Asia	0.187	-0.051	-0.403	0.105	-41.24	-44.64	-74.69
	Dollarized	0.203	0.209	-0.020	0.105	15.93	-27.15	-26.88
	Developed Pacific	0.508	0.113	-0.046	0.149	-111.80	442.99	-86.70
		Pre-Maastricht (R) 1988-1993	Post-Maastricht (M) 1994-1998	Post-euro (E) 1999-2007	Long run 1981-2007	R-M	M-E	R-E
EMU								
1	AUT	0.561	0.350	0.800	0.578	-37.61	128.57	42.61
2	BEL	0.492	0.695	0.804	0.637	41.29	15.68	63.44
3	FIN	0.291	0.355	0.184	0.252	21.69	-48.14	-36.89
4	FRA	0.615	0.656	0.848	0.479	6.63	29.23	37.79
5	IRL	0.757	-0.389	-0.408	0.126	-151.38	-4.97	-153.93
6	ITA	0.475	-0.516	0.580	0.274	-208.45	212.40	21.89
7	LUX	-0.100	0.439	0.691	0.418	537.81	57.47	789.42
8	NDL	0.709	0.562	0.659	0.539	-20.73	17.21	-7.08
9	PRT	0.083	-0.135	0.312	0.149	-262.82	330.36	275.07
10	ESP	0.665	-0.052	0.549	-0.085	-107.87	1149.39	-17.41
	Mean	0.455	0.196	0.502	0.337	-18.14	188.72	101.49

Note:
1 Positive value indicates improvement in coefficient, negative value indicates otherwise.
Source: See Appendix for data definitions and sources.

Table 8. EA-DL and EA-EMU paired-comparisons for INT.

EA	DL				EMU			
	Growth (G)	Crisis (C)	Post-crisis (P)	Long run (LR)	Pre-Maastricht (R)	Post-Maastricht (M)	Post-euro (E)	Long run (LR)
Growth (G)	10	10	10	10	10	10	10	10
Crisis (C)	7	6	7	8	8	10	7	8
Post-crisis(P)	2	1	2	3	3	5	3	3
Long run (LR)	7	7	8	10	9	14	8	9

Table 9. EA-DL and EA-EMU paired-comparisons for INT change.

EA Change	DL Change			EMU Change		
	G-C	C-P	G-P	R-M	M-E	R-E
G-C	8	8	8	15	8	8
C-P	9	10	10	15	8	10
G-P	7	7	7	14	7	7

the dollarized countries, which are expected to have high INTs, have not been displaying very (statistically) substantial INTs either. Similarly, Hong Kong has shown substantial INT only in the growth period. Nonetheless, the EMU countries in general, do display much higher INTs than the DL countries do. There is a reason to believe that INT has been a crucial dimension for euroization but not for dollarization.

In another aspect, a universal shift in real interest rate cycles, amongst the EA, DL, and DP countries from the U.S. cycle can be observed.

Table 8 displays the number of favorable EA cases for each EA-DL and EA-EMU paired-comparison. From the top to the bottom row, one can notice that the numbers throughout the columns decline gradually. This indicates that as the period moves from the growth to the post-crisis period, more and more EA cases become lower than the DL and EMU benchmarks. It appears that the general development in EA has diverted from those in the DL and EMU countries.

Results of paired-comparisons for INT change are presented in Table 9. Obviously, all the EA pairs pertaining to the EMU R-M change are highly ready, which means that most of the EA shifts are comparable to the EMU change from the pre-Maastricht to the post-Maastricht period. Also, those pairs related to the EA C-P change are slightly more ready. In each of these pairs, at least about half of the EA changes are more favorable than the benchmarks.

All in all, the East Asian real interest rate cycle synchronization levels and their trends do not seem to support the establishment of a regionwide monetary union based on the dollar. At most, the general shifts in the region resemble those of the EMU from the pre-Maastricht to the

post-Maastricht period.

Conclusions

Upon examining the three OCA variables, some conclusions are worth highlighting. Firstly, the findings from the real business cycle synchronization and real exchange rate volatility, to an extent, could substantiate the case for dollar area for most parts of East Asia. The development of these two variables, in one way or another, is comparable to those of the dollarized and EMU countries in periods prior to the implementation of dollarization and euroization, respectively. Secondly, some evidence seems to suggest that consistently high real business cycle synchronization or high real interest rate cycle synchronization in absolute terms might not be a necessary for sustainable strict dollar peg. Thirdly, whilst consistently high real interest rate cycle synchronization might not be a necessary condition for strict dollar peg or dollarization, it could nevertheless be an essential requirement for the formation of (EMU-like) monetary union. But then again, the East Asian region as a whole has not shown real interest rate cycles or trends that can be conducive for a monetary union. In short, using the dollarized and EMU countries as benchmarks, the East Asian region (as defined here) collectively has yet to show convincing evidence for a monetary union based on the dollar.

How do these conclusions compare with those made by others using different methods (and variables)? Based on structural vector autoregression (SVAR) modeling, Chow and Kim (2003) have detected that East Asian countries are likely to be subject to asymmetric shocks, and thus, are not suitable for one region wide currency bloc. In the same vein, Wilson and Choy (2007) who applied the theory of Generalized Purchasing Power Parity (GPPP), have discovered asymmetries in the way East Asian countries adjust to shocks in addition to low or insignificant speeds of adjustment among them. They could not find persuasive evidence that East Asia as a whole constitutes a potential currency area with either the U.S. or Japan.

Despite all this, Zhang, Sato, and McAleer (2004) did suggest that some small subregions could be potential

	BUS								RER								INT								Total	Percent Score
	DL				EMU				DL				EMU				DL				EMU					
	G	C	P	LR	R	M	E	LR	G	C	P	LR	R	M	E	LR	G	C	P	LR	R	M	E	LR		
CHN	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	14	58
HKG	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	15	63
KOR	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1	1	1	1	1	1	1	11	46
TWN	1	0	1	1	1	1	0	0	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	11	46
KHM	1	0	1	1	1	1	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	12	50
IDN	1	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	21
LAO	1	0	0	1	0	1	0	0	1	1	0	1	1	1	0	1	0	0	0	1	1	1	1	1	14	58
MYS	1	0	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	1	0	0	13	54
MMR	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1	9	38
PHL	1	0	0	1	0	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	7	29
SGP	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	14	58
THA	1	0	0	1	0	1	0	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	8	33
VNM	1	0	0	1	0	1	0	0	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	9	38
IND	1	0	1	1	1	1	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	12	50
MAC	1	0	0	1	0	1	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	10	42
BRN	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	1	0	0	0	0	0	1	0	0	7	29
JPN	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10	42

Note: G for growth period; C for crisis period; P for post-crisis period; LR for long-run period; R for pre-Maastricht period; M for post-Maastricht period; E for post-euro period.
Source: Author's calculation.

candidates for monetary union. According to them, the subregional countries' disturbances in East Asia are correlated, small, and can adjust rapidly to shocks. In view of this, though a regionwide monetary integration may be unlikely at this point of time, subregional unions might still be possible.

Against this backdrop, it is valuable to examine the benchmarking results at individual country level. Since the post-crisis period is the most relevant period, the results for this period are detailed. Table 10 exhibits the findings for the three variables by each East Asian country. The results are from the comparison between the post-crisis period East Asian cases with the dollarized and the EMU cases from their periods. If an East Asian case is more favorable than the benchmark, a score of 1 is assigned; otherwise a score of 0 is given. Scores are aggregated and the higher the total score, the higher the suitability for dollar bloc. The percent of total obtained score over total obtainable score is also provided.

Based on the percent score, the East Asian countries can be categorized into four groups. The seven countries of China, Hong Kong, Cambodia, Laos, Malaysia, Singapore, and India which have obtained at least 50% of the total score can be grouped into high potential 'Southeast Asian' bloc. The other groups would be the moderate potential 'Northeast Asian' bloc (40 ≤ percent score <50) comprising Korea, Taiwan, Macau, and Japan; the low potential 'Indochina' bloc (30 ≤ percent score <40)

consisting of Myanmar, Thailand, Vietnam; and the least potential 'Borneo' bloc (percent score <30) containing Indonesia, the Philippines, and Brunei.

The identification of these groupings resembles those found in VAR studies. For instance, Bayoumi and Eichengreen (1994) who studied the symmetry of demand and supply shocks have managed to find a Northeast Asian bloc comprising Japan, Korea, and Taiwan as well as a Southeast Asian bloc comprising Hong Kong, Indonesia, Malaysia, Singapore, and Thailand. From modeling real activity variables, Kawai and Motonishi (2005) managed to find potential candidates of Japan, Korea, Taiwan, Singapore, and Malaysia. Updating Bayoumi and Eichengreen's work, Ngiam and Yuen (2001) proposed three plausible monetary unions: Brunei-Singapore-Malaysia, Japan-Korea, and Taiwan-Hong Kong. Complementing VAR with GPPP model, Ahn, Kim, and Chang (2006) showed that Hong Kong, Malaysia, and Singapore qualify for an OCA in terms of macroeconomic shocks.

Against these studies, it appears that the identification of China, Cambodia, Laos, and India as members of the high potential Southeast Asian bloc in this paper is 'new' in the literature. This group of countries could take the lead in endorsing and fostering a common monetary zone. Other than this, the identification of the 'Indochina' and 'Borneo' blocs, two subgroups in ASEAN is also compa-ratively rare in empirical literature.

To national policymakers, the results certainly matter in the identification of optimal clusters for regional integration. To private policymakers, the findings serve as an essential reference to international strategic decision making concerning international risk diversification and regional operations.

In conclusion, based on the considerations in this paper, East Asia as a whole does not constitute an OCA yet. Nevertheless, subregional groupings can still be detected in which the constituents are comparable to those discovered in the literature.

Certainly, with consideration of only three variables, the results are not definitive. More variables and more comprehensive methods (e.g., cluster analysis, pattern recognition techniques) may help to confirm the results found in this paper.

But then again, the existence of differences or heterogeneities across countries does not necessarily imply that benefits cannot be reaped through monetary union. This follows from the endogeneity argument of the OCA criteria-originally flagged by Frankel and Rose (1996), which suggests that countries become similar when they share a common currency.

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APPENDIX

Data definitions and sources[1]

Table A. Data definitions and sources.

Country	Code	GDP[2], GDP deflator	Exchange rate[3], CPI[4]	Interest rate	Period[5]
Brunei	BRN	81-04	83:1-08:3[6]	Lending rate	98:1-08:3
Cambodia	KHM	88-07	94:10-07:12	Lending rate	95:10-07:12
China	CHN	81-06	87:1-08:4	Discount rate	92:6-08:3
Hong Kong	HKG	81-06	81:1-08:3	Discount rate	92:6-08:3
India	IND	81-07	81:1-08:3	Discount rate	92:6-08:3
Indonesia	IDN	81-07	81:1-08:4	Discount rate	92:6-08:3
Japan	JPN	81-07	81:1-08:4	Discount rate	92:6-08:3
Korea	KOR	81-07	81:1-08:4	Discount rate	92:6-08:2
Laos	LAO	82-07	87:12-01:12, 03:5-08:3	Discount rate	92:6-08:3
Macau	MAC	82-07	88:1-08:3	Interbank rate	92:6-08:4
Malaysia	MYS	81-07	81:1-08:3	Interbank rate	92:6-08:4
Myanmar	MMR	81-03	81:1-07:12	Discount rate	92:6-07:12
Philippines	PHL	81-05	81:1-08:4	Discount rate	92:6-08:4
Singapore	SGP	81-06	81:1-08:3	Interbank rate	92:6-08:4
Taiwan[7]	TWN	81-07	81:1-08:4	Discount rate	92:6-08:6
Thailand	THA	81-07	81:1-08:4	Discount rate	92:6-08:4
Vietnam	VNM	90-07	90:1-08:4	Discount rate	96:1-06:12
Ecuador	ECU	81-06	81:1-08:4	Discount rate	92:6-07:12
El Salvador	ELS	81-06	81:1-08:4	Lending rate	92:6-00:12
Guatemala	GTM	81-05	81:1-08:4	Lending rate	92:6-08:4
Panama	PAN	81-07	81:1-08:4	Lending rate	92Q2-07Q4
Australia	AUS	81-07	81Q1-08Q1	Money market rate	92Q2-08Q1
New Zealand	NZL	81-07	81Q1-08Q1	Discount rate	92Q2-08Q1
Canada	CAN	81-07	81:1-08:4	Discount rate	92:6-08:4

Appendix contd.

United States	USA	81-07	81:1-08:4	Discount rate	92:6-08:3
Austria	AUT	81-07	81:1-08:9	Discount rate	81:1-98:12
Belgium	BEL	81-07	81:1-08:9	Discount rate	81:1-98:12
Finland	FIN	81-07	81:1-08:9	Discount rate	81:1-98:12
France	FRA	81-07	81:1-08:9	Call money rate	81:1-98:12
Ireland	IRL	81-07	81:1-08:9	Discount rate	81:1-98:12
Italy	ITA	81-07	81:1-08:9	Discount rate	81:1-98:12
Luxembourg	LUX	81-07	81:1-08:9	Interbank rate	90:1-98:12
Netherlands	NLD	81-07	81:1-08:9	Call money rate	81:1-98:12
Portugal	PRT	81-07	81:1-08:9	Discount rate	81:1-98:12
Spain	ESP	81-07	81:1-08:9	Discount rate	81:1-98:12
Germany	DEU	81-07	81:1-08:9	Discount rate	81:1-98:12
Euro Area		n.a.[8]	n.a.	Marginal lending facility rate	99:1-08:4

Notes:

Series are from IMF-IFS database except stated otherwise.

GDP for gross domestic product. For EMU countries, real GDP series from OECD database are used.

Data range of exchange rate is tied to the data range of CPI since CPI is needed to compute real exchange rate.

CPI for consumer prices index. For China, Vietnam, and Brunei, CPIs are sourced from ILO-LABORSTA database whenever not available in IMF-IFS database. Cross-validation shows that both sources provide identical data.

The following starting points are selected to cover most of the countries with the most similar data range possible. Marginal lending facility rate is used for euro area after 1998:12.

CPI data after 2005 are sourced from Department of Economic Planning and Development (DEPD) website, retrieved July 17, 2008, from http://www.depd.gov.bn/archive.html. Data should be consistent since data from IFS are sourced from DEPD as well.

Taiwan data are sourced from Bureau of Foreign Trade, Directorate-General of Budget, Accounting and Statistics (DGBAS) and central bank databases.

Not applicable.