

The suitability of East Asia for creating a monetary union

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Abstract

The objective of this paper is to evaluate the suitability of East Asia for potentially creating a monetary union using the criteria suggested by the Optimum Currency Area (OCA) theory and comparisons with the European conditions before the launch of euro. The main finding suggests that from an economic point of view the East Asian countries can form a currency union without so much costs of losing monetary independence and policy autonomy.

Keywords: OCA theory, monetary union, East Asia, Euroland

1. Introduction

For more than a decade before the Asian financial crisis, the East Asian¹ currency arrangements ranged from fixed to floating rates. However, even the managed float system was most closely associated with the US dollar. The 1997 Asian financial crisis has been the most traumatic experience in region and in recent times as well as the single greatest catalyst for faster pace of monetary cooperation in East Asia. It has forced many Asian countries to research and propose more effective firewall mechanisms. There are several suggestions such as a system of collective currency peg to the Yen², to the US dollar³, or a basket of major currencies⁴.

After Asian crisis, many economists have supported the idea of the two-corner solution, which comes from the trilemma that a fixed exchange rate system, a completely free movement of capital and management of an independent financial policy can hardly be achieved simultaneously. The main feature of this solution is that the only exchange rate system can be sustained in an environment where there is free movement of capital is either a free-floating one or a hard-pegged one, such as a currency board or dollarization. Any measure falls in the middle is vulnerable to financial and currency crisis. In the search for alternate models of exchange rate regimes able to provide greater stability, there is an increasing interest in an Asian Monetary Union as a potential solution. Furthermore, the launch of the European Economic and Monetary Union (EMU)- an once considered unrealistic proposal - has ignited an interest from many Asian leaders in the possibility of a similar decision. These new developments have also awakened to the interest in the literature on Optimum Currency Area (OCA) theory, which is generally accepted as a useful tool for analyzing a monetary unification.

The purpose of this paper is to evaluate the suitability of East Asia for potentially creating a currency

¹ East Asian countries include Indonesia, Malaysia, the Philippines, Singapore, Thailand, China, Hongkong, Japan and South Korea, hereafter EA-9.

² See Kwan (1998)

³ See McKinnon (2004), Mundell (2003)

⁴ See Ogawa and Shimizu (2006), Kawasaki and Ogawa (2006)

union using criteria suggested by the theory of Optimum Currency Areas based on the comparisons of the conditions of East Asian countries with those of the Euroland⁵.

The main finding of this paper suggests that from an economic point of view East Asia countries do satisfy the OCA conditions better than the Euroland, therefore, can form a monetary union without incurring so much opportunity costs of losing monetary independence and policy autonomy.

All analyses are conducted using the annual data ranging from 1970 to 2007 drawn basically from the IMF, International Financial Statistics CD-ROM, 2008 and Direction of Trade Statistics CD-ROM, 2008; the WB, Development Indicators, 2005, 2008 and the Penn World Table. As many East Asian countries have liberalized their capital accounts from 1990 so that two sub-periods with the break at 1990 are to be considered together with the whole sample period to give a clearer insight for changes undertaken by the region toward satisfying the conditions for forming a monetary union over the last decade. The sample period for the Euroland, however, is finished by the end of 1998 to examine whether the current East Asia has the similar conditions to those in Euroland before the launching of euro.

Besides an Introduction and Conclusion, the paper involves three more sections. Section 2 provides an overview of the Theory of Optimum Currency Area. Section 3 reviews related literature. Section 4 presents briefly the methodologies and empirical results estimated in the paper.

2. Optimum Currency Theory Overview

The theory of Optimum Currency Areas was developed during the debates of the benefits and the costs of exchange rates regimes after the World War II. In 1961, Mundell published his first article on the Optimum Currency Area (OCA) theory. He immediately ignited deep interests from the academic world. However, the importance of his theory became clearer with the announcement of a three-stage movement toward the European monetary union in 1989. Many researchers contributed to the development of the OCA theory and they identified the set of so-called OCA criteria for forming a currency union. Following is the brief explanation of main OCA criteria.

2.1 Optimum Currency Area criteria

2.1.1 *Mobility of factors of production*

Mundell (1961) chooses a high degree of factor mobility within the area as a basis for a unified currency area. High factor market integration within a group of partner countries can reduce the need to alter factors such as prices and the nominal exchange rate between countries in response to disturbances. On the assumption that a demand shift is the cause of balance of payments disequilibrium, Mundell focuses on the condition under which payments adjustments can be made with minimum burden to the regions affected by the shift.

2.1.2 *Degree of economic openness*

McKinnon (1963) considers a high degree of openness as a criterion for an OCA. The higher is degree of openness the more changes in international prices would influence domestic prices and devaluation would be more rapidly transmitted to the price of tradable and the cost of living, negating its intended effects. Hence, the nominal exchange rate would be less useful as an adjustment instrument.

⁵ The Euroland means 12 original members of the European Economic and Monetary Union, which consists of Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

2. 1. 3 Diversification in production and consumption

The high diversification in production and consumption and correspondingly in imports and exports, reduces the negative impact of shocks specific to any particular sector as well as the need to use the nominal exchange rate for adjustment. More diversified countries are likely to endure small costs from forsaking nominal exchange rate changes and find a single currency beneficial (Kenen (1969)).

2. 1. 4 Flexibility of price and wage

When nominal prices and wages are flexible between and within countries contemplating a single currency, the adjustment process following a disturbance is less associated with sustained unemployment in one country and/or inflation in another. This will in turn diminish the need for nominal exchange rate and other policies such as fiscal tightening or expansion to restore country external balance.

2. 1. 5 Similarity of shocks

If the supply and demand shocks and the speed with which the economy adjusts are similar across partner countries, then the need for policy autonomy is reduced and the net benefits from adopting a single currency might be higher.

2. 1. 6 Similarity of inflation rates

The similarity of inflation rates brings more equilibrated current account transactions and trade to reduce the need for nominal exchange rate adjustments. However, similarities of inflation rates could be a feasible outcome from participating in a monetary union but is not a necessary precondition (Gandolfo (1992)).

2. 1. 7 Integration of financial market

Financial integration can reduce the need for exchange rate adjustments, provide an effective protection against adverse disturbances through capital inflows by borrowing from surplus areas or decumulating net foreign assets that can be reverted when the shock is over. It also helps narrowing the differences in long-term interest rates to encourage the consumptions and investments. However, financial integration is not a substitute for a permanent adjustment when necessary because it can only smoothen the long-term adjustment process.

2. 2 Costs and benefits for forming a Monetary union in East Asia

Economic analysts argue that the East Asian countries are plausible candidates for an OCA as the East Asian countries appear to satisfy major conditions for forming a currency bloc. Although the East Asian countries have small economies, the total output of Asia is relatively high⁶. Trade has expanded at a rapid rate, not only among countries in East Asia, but also between the region and the rest of the world. As the East Asian economies have become more open and interdependent, growth and inflation rates are highly and positively correlated to each other.

The OCA literature has examined benefits and costs from participating in a currency area. Most benefits and costs cannot be judged statically as they can take different profiles over time or across participating countries. The question here is what are the benefits and costs of forming a monetary union for East Asian countries?

⁶ See Kwack (2004)

2.2.1 Benefits of Monetary union

2.2.1.1 *Reducing transaction costs and strengthening price transparency*

Eliminating the costs of exchanging one currency into the other is certainly the most visible and most easily quantifiable gain from a monetary union. These costs disappear when countries move to common currency. The adoption of a common currency would lead to cost savings⁷ and greater price transparency since prices would be denominated in the same currency and can be compared across national markets. This would increase competition across Asia, and exert a downward pressure upon prices to the benefit of Asian consumers.

2.2.1.2 *Stabilizing nominal exchange rate*

Exchange rate uncertainty casts doubt not only on future prices of goods and services but in general, it raises the real interest rate. Higher interest rates make a decision to choose appropriate investment projects more difficult. Those problems usually cause the selection of more risky investment projects and increase the systemic risk. Eliminating that risk by moving toward a common currency reduces the amount of risky projects selected by market.

Because of differences in economic developments in East Asian countries, local firms and Multinational Corporation (MNCs) have to diversify their production processes across various countries in the region to exploit their comparative advantage. Under the monetary union, the stable exchange rates among members would end the uncertainty of nominal exchange rate fluctuations so that the price system becomes a better guide for decision making of MNCs in East Asia. In other words, a common currency would strengthen the regional market for goods and services, promote trade, lower investment risks, enhance resource allocation, and increase cross-area foreign direct investment in Asia, enabling higher growth and employment to be attained in the longer run.

2.2.1.3 *Strengthening defense against currency attacks*

After the painful financial crisis in 1997-1998, Asia has indeed taken measures to guard itself in the form of greater cooperative efforts. However, the current swap arrangements may turn out inadequate and ineffective in critical situation when participant countries would expect larger bailouts with looser conditions and may thus attempt dangerous practices such as undisciplined macroeconomic policies. A monetary union is more adequate as a defense against currency attacks as it imposes transparency and economic discipline. In addition, exchange rate stability within the union will better insulate countries from contagion effect of currency crises within the region.

2.2.1.4 *Avoiding competitive devaluation*

When the currency of an East Asian economy devalues, its neighbors may react against a revaluation of their currencies by countering with their own currency devaluation. During the Asian financial crisis, there were no speculative attacks against the Singapore dollar. However, Singapore has allowed its currency to fall against the US dollar in line with the regional currencies in order to preserve its competitiveness. Such a threat of competitive devaluation can be avoided if East Asian economies move towards greater monetary integration. The adoption of a monetary union and its corresponding system of fixed exchange rates

⁷ The EU reported that savings in transaction costs were likely to be somewhere between one quarter and a half of one per cent of EU income. Although this may not seem a very large sum, it would be enough to justify the change to a single currency- if we could be sure the costs of integration were negligible.

amongst union members would remove the threat of competitive devaluations which East Asian economies might be tempted to undertake against each other.

2.2.1.5 Increasing credibility to the exchange rate system

With a monetary union, members are obliged to maintain the fixed exchange rates amongst the region, thus lending credibility to the region's exchange rate system. Furthermore, fixing exchange rates with other members necessarily entails the strict alignment of inflation rates with one another. Therefore, a country with weak monetary policy credibility will be able to achieve lower inflation rates by joining a union with another country consistently achieving low inflation⁸.

2.2.2 Costs of Monetary Union

2.2.2.1 Losing Monetary Autonomy

The loss of a country's ability to use the exchange rate and monetary policy for stabilization is considered the most important cost of joining a currency area. This implies that an East Asian country joining a monetary union will not be able to change the price of its currency (by devaluation and revaluation) or to determine the quantity of the national money in circulation. However, this loss obviously not very painful for East Asia as many countries in the region are small open economies, whose characteristics is that whether they join the common currency union or not it is impossible for them to maintain free capital mobility and an independent monetary policy together. Such countries link their currencies to their main trading partners in order to gain higher exchange rate stability and hence obviously lower the independence of monetary policy.

2.2.2.2 Slowing down growth rate

Although East Asia is one of the highest growing regions in the world, some countries grow faster than others do and such differences in growth rates could lead to a problem when countries form a monetary union. A monetary union has a cost for the fast growing country, which may find keeping own national currency more advantageous so that option of depreciating currency can be used in the case of unfavorable developments in its trade account.

2.2.2.3 Losing seignorage

Seignorage is the revenue the government obtains by financing its budget deficit through printing money rather than selling debt. In general, most of estimations of seignorage are understated in that they do not consider increases in the monetary base over time, however, the governments have to come rely on seignorage to some extent and the loss of seignorage is another cost of joining a currency area. It is also an important question about how seignorage would be distributed in the case of monetary union.

2.2.2.4 Burdening changeover costs

Joining a monetary union, each of East Asian countries faces changeover costs from switching to a new currency. These costs include administrative, legal and hardware costs such as re-denominating contracts and adapting vending machines. There are also the psychological costs to the public of introducing the new currency and their getting used to it. Furthermore, if a country chooses the wrong nominal exchange rate parity at the onset of a currency area, this country may be too competitive or not competitive at all with respect to the other members. With the introduction of a single currency, a supranational institution might

⁸ This is illustrated in the case of the EMU, where the EMU has allowed countries like Italy and Spain with poor inflationary records to break away from their inflationary past by "Importing" the anti-inflation credibility of Germany.

need to establish and it will result in increased administrative costs for each member country.

In summary, Section 2 provides an overview of OCA theory including brief descriptions of main OCA criteria as well as the benefits and costs for East Asian countries joining the monetary union. The related literature on three OCA criteria used in this paper is presented in the following section 3.

3. Literature review

Section 3 gives a literature survey with the focus on the (1) extent of trade (2) nature of disturbances and (3) financial integration, which are the main criteria to judge the suitability of East Asia for forming the monetary union. The reason for selecting those criteria is because there are a number of researches dedicated to those criteria to prove their reliability as well as the data for long period are available for analysis.⁹

3.1 Extent of trade

3.1.1 Trade indices

Goto and Hamada (1994) investigate the degree of interdependence among East Asian countries in 1990 via trade and factor mobility. The estimated indices of trade intensity measuring the strength of bilateral trade between two countries are very high for many pairs. In particular, Japan's trade intensity with East Asian partners is high and in excess of Germany's with some Euroland partners.

Kawai and Takagi (2000) use 1995 data to confirm Goto and Hamada. Countries in the continental ASEAN as well as Hong Kong and China, are highly interdependent. Japan continues to be extremely important for East Asia and even proves more important in East Asian trade than Germany in Euroland. The authors suggest that a peg to a basket of three major currencies for East Asia-14 makes sense. This idea of forming a basket currencies regime can also be observed in a number of studies carried out by Ogawa and Ito (2002), Ogawa and Shimizu(2006), Kawasaki and Ogawa (2006).

3.1.2 Economic structure

Bayoumi, Mauro, and Eichengreen (2000) have studied political and economic factors to assess whether or not ASEAN can form a monetary union. They believe that economic integration among ASEAN countries is high and conclude that overall, economically, ASEAN economies have a strong case for the formation of an ASEAN monetary union.

Wyplosz (2002) compares East Asia to the euro-area and examines the level of trade integration, capital mobility, existing financial and governmental institutions, and income levels in order to establish the similarities and differences between both regions. He finds that trade integration is significant in Asia, nonetheless, the region lacks a developed framework of trade agreements and other financial and governmental institutions that helped Europe along the pathway of forming a single currency area. However, he also believes that the European approach is not the only viable one for forming a successful monetary union.

Kwan (1998) describes a virtuous circle between interdependence and economic growth in East Asia. Kwan (2001) argues that the East Asian financial crisis revealed the need for regional monetary cooperation to support the economic links. Kwan also suggests creating a yen bloc. Kearney and Muckley (2007) examine the evidence of yen block in North and Southeast Asia and find that the yen influence is

⁹ For more detailed survey on OCA criteria, please refer to Ishiyama (1975), Talvas (1992).

strengthening but it is not enough for forming a de facto yen block.

According to Kwack (2004), East Asian economies grow more open and interdependent. Although the East Asian economies are small, their total output is relatively high. Foreign trade of individual countries accounts for a large part of their GDP. The degree of openness is high. Hence, strong economic forces favor forming a common currency area. However, the lack of political commitment constitutes the strongest factor against the formation of monetary union.

3.2 Macroeconomic disturbances

The methodology here follows Blanchard and Quah's (1989) structural vector-auto regression model, which involves identifying disturbances in output as either demand (temporary) or supply (permanent) shocks using time series of output and prices. The demand shocks have no long run effect on either unemployment or output. The supply shocks have no long-run effect on unemployment, but may a permanent effect on output. The effect of supply disturbances on output increases steadily over time, peaking after two years and reaching a plateau after five years.

Bayoumi and Eichengreen (1994) estimate the correlations of underlying shocks among the East Asian countries. First, they run vector autoregression on real GDP growth and inflation and identify supply and demand shocks. Then, they calculate correlation matrix for supply and demand shocks. Furthermore, they also calculate the relative sizes of disturbances and the speed of adjustment. As a benchmark, they do the same calculations for the United States, dividing it into seven sub regions. The correlations of disturbances for Asian countries turn out to be fairly close to those between the seven sub regions in the U.S. The average size of disturbances is larger in Asia than in the U.S. However, the speed of adjustment is higher in Asia.

Eichengreen and Bayoumi (1999) complement Bayoumi and Eichengreen's (1994) analysis by constructing optimal currency area (OCA) indexes, which include asymmetric shocks, composition of export structures, bilateral trade intensity and country size. Based on those indexes, some pairs of countries in East Asia are found to be somewhat plausible candidates for a monetary union as the members of the EU.

Bayoumi and Mauro (2001) update Bayoumi and Eichengreen's (1994) study using data for 11 East Asian countries over 1968 - 98 as well as the same 15 EU member states over 1969 - 89. Focusing on ASEAN economies, the authors conclude that, while they are less suited for a regional currency arrangement than Europe but the difference is not large.

Similar methodologies but different variables and data sets are used by Changmo et al (2006), Huang and Guo (2006), Kim (2007).

3.3 Financial integration

One of the measures of financial integration is to examine the time paths of consumption within and across economies. A more formal way of testing the simple consumption smoothing called the "risk sharing" hypothesis is to use a regression first proposed by Mace (1991), who tests implications of full insurance behavior for consumption across individuals in the United States. Obstfeld (1995) suggests that the same approach can be used to examine the consumption behavior across countries.

Following the same method Bayoumi (1997) observes the correlations of consumption growth for 21 OECD economies from 1973 to 1990 and finds that the correlations are general quite low. Similar method can be seen in Montiel (1994), which shows that the East Asian economies have quite high capital mobility.

Kim et al (2006) estimate the degree of consumption risk sharing and analyzes the channels of consumption risk sharing among the 10 East Asian countries using data from 1970 to 2000. Compared to the OECD countries, the degree of risk sharing achieved is lower and the potential gains are larger in the East Asian countries, but the degree of risk sharing and the potential gains are similar in relatively more developed East Asian countries.

In short, Section 3 reviews the literature relating to three OCA criteria used to judge the suitability of East Asia for forming a monetary union. The methodologies and empirical results are presented with the similar order in the following section.

4. Methodologies and empirical results

4.1 Extent of trade

4.1.1 *Trade indices*: Three following indices are used to evaluate the degree of trade within East Asia region comparing with the Euroland.

4.1.1.1 *Trade openness index*

The trade openness is measured by the ratio of total trade (exports plus imports of goods and services) to the level of GDP.

Table 1 shows that from 1990, the indices for East Asia are steady increased. For more than three decades, on simple average the EA-9 has higher degree of openness than the Euroland. Its index (146) is

Table 1 : Trade Openness Index

East Asia 9

Countries	1970	1975	1980	1985	1990	1995	2000	2005	2007
Indonesia	23.87	38.97	45.15	33.00	42.83	43.70	75.25	57.60	50.40
Malaysia	79.89	79.53	96.83	88.40	133.30	171.00	192.10	186.00	173.00
Phillipines	31.76	38.21	43.26	32.80	47.80	61.90	101.60	88.00	74.70
Singapore	211.70	239.50	369.90	277.00	306.50	289.00	294.00	368.00	384.00
Thailand	28.34	36.87	48.58	42.10	65.68	75.70	107.00	129.00	119.00
China	na	na	12.67	24.50	31.14	37.00	39.76	60.80	64.40
Hong Kong	143.10	130.60	152.20	171.00	218.60	254.00	245.50	330.00	344.00
Japan	18.74	22.75	25.23	22.40	17.11	14.80	18.40	24.40	30.10
Korea	32.76	57.82	69.50	67.20	54.03	50.50	72.71	68.10	75.70
Average	71.30	80.50	95.90	84.40	102.00	111.00	127.00	146.00	146.00

The Euroland

Countries	1970	1975	1980	1985	1990	1995	1998
Austria	44.30	44.84	51.60	55.30	54.49	51.70	61.07
Finland	44.49	45.67	56.94	49.10	39.03	51.70	57.66
France	25.21	30.56	35.77	37.30	35.62	35.40	39.62
Germany	32.34	36.99	44.20	51.30	47.09	38.60	45.79
Greece	23.05	34.72	35.11	38.20	32.97	29.30	28.09
Ireland	70.46	83.10	101.50	107.00	93.73	117.00	126.10
Italy	26.16	34.48	39.82	38.50	31.90	39.10	38.09
Luxembourg	145.60	152.30	145.60	151.00	125.40	84.60	93.65
Netherlands	82.06	87.82	97.29	114.00	87.35	88.90	96.45
Portugal	37.24	36.52	52.09	61.00	56.83	51.00	59.10
Spain	18.99	22.74	24.86	31.40	27.94	34.20	41.12
Average	50.00	55.40	62.30	66.60	57.50	56.50	62.40

more than twice than that of Euroland (62.4). The value of total trade in many trading countries in EA either approaches or exceeds 100% of GDP. It is worth mentioning that since 1990, most EA countries liberalize their capital accounts, allowing capital to move in and out freely and henceforth increase the degree of openness for those countries.

4.1.1.2 Trade dependency index

As discussed in Goto and Hamada (1994), the trade dependency index is defined as the amount of exports and imports of a country with a particular trading partner as a percentage of the country's GDP.

Table 2 again shows that the indices for the EA-9 are continuously increased from 1990 and on simple average, they are higher than that for the Euroland. The EA-9 also has quicker growth rate of indexes. The indices for Euroland are almost unchanged (from 20.4 to 23.9) while the indices for EA-9 became almost double over the sample period (from 38.5 to 64.4).

Table 2 : Trade dependency index

East Asia-9 countries as a Partner

Countries	1980	1985	1990	1995	2000	2005	2007
Indonesia	26.66	18.03	22.92	22.27	34.12	28.17	34.65
Malaysia	47.59	48.08	68.78	88.55	100.00	98.81	88.71
Philippines	15.84	13.20	19.82	26.34	47.30	45.06	52.56
Singapore	143.80	114.20	128.30	146.20	147.70	197.10	199.40
Thailand	18.93	17.61	28.82	36.78	52.59	65.22	56.70
China	5.32	13.08	17.84	18.09	17.41	23.66	23.29
Hong Kong	62.17	84.05	114.6	145.00	145.50	216.30	232.00
Japan	4.81	4.15	3.77	5.39	6.55	10.22	11.44
Korea	21.71	19.82	18.22	20.16	28.60	29.79	34.05
Average	38.50	36.90	47.00	56.50	64.40	79.40	81.40

Euroland

Countries	1980	1985	1990	1995	1998
Austria	30.36	25.03	31.55	31.80	34.06
Finland	14.15	10.69	12.21	16.02	17.23
France	14.43	12.13	15.00	15.31	16.50
Germany	18.92	16.90	18.50	14.37	16.58
Greece	13.47	16.65	18.52	15.86	14.00
Ireland	26.15	24.70	26.40	34.09	34.94
Italy	17.95	14.04	14.98	17.86	16.56
Netherlands	38.77	36.80	37.59	36.13	32.82
Portugal	21.37	24.02	32.91	33.35	34.61
Spain	8.76	9.89	14.28	18.67	21.50
Average	20.40	19.10	22.20	23.30	23.90

Note : There is no data for Luxembourg

4.1.1.3 Trade intensity index

The trade intensity indexes $I_{i,j}$ are developed by Yamazawa et al. (1991).

$$I_{i,j} = (T_{i,j} / T_i) / (T_{w,j} / T_w)$$

Where, $T_{i,j}$ = trade volume of country i with country j ; T_i = the total trade volume of country i ; $T_{w,j}$ = trade volume of the world with country j ; T_w = the total trade volume of the world.

The index is normalized by dividing by the relative share of the country in the total world trade so that the effect of the mere size of the country is to be eliminated. The higher the index is, the more closely are the two countries interrelated by trade.

In Table 3 the simple average of indexes that adjust for the size effect of trading partners in EA-9 (2.6) is higher than that of the Euroland (2.4) indicating that degree of trade interdependence is stronger within East Asia than within the Euroland.

Table 3 : Trade Intensity Index

East Asia 9 (2007)										
Countries	Ind	Mal	Phil	Sin	Thai	Chi	HK	Jp	Kor	
Indonesia	1									
Malaysia	3.62	1								
Philippines	1.28	3.26	1							
Singapore	11.00	7.88	5.21	1						
Thailand	3.42	4.82	3.50	3.48	1					
China	1.22	1.26	2.36	1.28	1.26	1				
Hong Kong	0.88	2.13	3.49	3.48	1.92	4.23	1			
Japan	2.91	2.28	2.79	1.34	3.34	1.99	1.54	1		
Korea	2.43	1.68	1.62	1.63	1.10	2.40	1.21	2.39	1	
Average	2.60									
Euroland(1998)										
Name	Aus	Fin	Fra	Ger	Gre	Ire	Ita	Net	Por	Sp
Austria	1									
Finland	1.20	1								
France	0.86	0.94	1							
Germany	4.48	1.49	1.85	1						
Greece	0.96	1.94	1.44	1.68	1					
Ireland	0.54	0.85	1.39	0.91	0.70	1				
Italy	2.18	1.01	2.41	1.94	3.88	0.69	1			
Netherlands	0.83	1.23	1.33	2.06	1.51	1.26	1.23	1		
Portugal	0.85	1.08	2.25	1.98	0.64	0.60	1.68	1.22	1	
Spain	0.95	1.00	3.58	1.73	1.55	0.91	2.39	1.30	9.46	1
Average	2.40									

4 . 1 . 2 Economic structure

Kwan (1998) suggests judging the degree of similarity in the economic structures of two countries based on the correlations coefficient between vectors showing their respective share composition of trade (import and export) classified by product. In this paper, the trade composition is based on 3-category classification (primary commodities, other manufactures and machinery)¹⁰ for both exports and imports. This index takes a value between negative one and positive one. The closer the index to plus one, the more similar the trade structures of the two countries. Therefore, the correlation coefficient so calculated can be used as an indicator of the degree of integration in the trade structure of two countries.

¹⁰ Primary Commodities = Food + Agricultural raw material; Other Manufactures = Fuels + Ores and metal; Machinery = Machinery corresponding to Tables 4.5 and 4.6 in WB, Developments Indicators, 2008

Table 4 : Economic structure

East Asia 9 (1990)										
Name	Ind	Mal	Phil	Sin	Thai	Chi	HK	Jp	Kor	
Indonesia	1									
Malaysia	0.84	1								
Philippines	0.79	0.95	1							
Singapore	0.73	0.91	0.84	1						
Thailand	0.60	0.94	0.90	0.88	1					
China	0.70	0.95	0.88	0.96	0.95	1				
Hong Kong	0.62	0.89	0.81	0.97	0.91	0.98	1			
Japan	0.19	0.53	0.46	0.80	0.67	0.74	0.85	1		
Korea	0.44	0.75	0.68	0.93	0.83	0.90	0.96	0.96	1	
Average	0.84									
East Asia 9 (2006)										
Name	Ind	Mal	Phil	Sin	Thai	Chi	HK	Jp	Kor	
Indonesia	1									
Malaysia	0.82	1								
Philippines	0.77	0.98	1							
Singapore	0.85	0.99	0.99	1						
Thailand	0.77	0.97	0.99	0.98	1					
China	0.76	0.96	0.99	0.98	0.99	1				
Hong Kong	0.78	0.99	0.99	0.98	0.98	0.97	1			
Japan	0.69	0.86	0.93	0.92	0.93	0.96	0.87	1		
Korea	0.78	0.90	0.95	0.95	0.95	0.97	0.90	0.99	1	
Average	0.93									
Euroland(1998)										
Name	Aus	Fin	Fra	Ger	Gre	Ire	Ita	Net	Por	Sp
Austria	1									
Finland	0.99	1								
France	0.99	0.99	1							
Germany	0.99	0.99	0.99	1						
Greece	0.99	0.99	0.99	0.99	1					
Ireland	0.90	0.92	0.89	0.91	0.84	1				
Italy	0.99	0.99	0.99	0.99	0.99	0.90	1			
Netherlands	0.98	0.98	0.99	0.99	0.99	0.83	0.99	1		
Portugal	0.99	0.99	0.99	0.99	0.97	0.94	0.99	0.97	1	
Spain	0.99	0.99	0.99	0.99	0.99	0.86	0.99	0.99	0.98	1
Average	0.97									

Table 4 shows that the average of correlations for trade structures of East Asian countries jumped from 0.84 in 1990 to 0.93 in 2006 indicating that EA-9 have become more integrated. Although the trade structures of EA-9 in 2006 are still less similar than that of European countries are but the difference is not big as the average of correlations of Euroland (0.97) is not much higher than that of East Asia region (0.93).

In short, the empirical results of three trade indices and economic structure show that the East Asia countries become more integrated since 1990 and they have higher level of trade integration than the Euroland indicating for trade criteria they have a better condition for forming a monetary union than Euroland before the launching of euro in 1999.

4.2 Macroeconomic disturbances

The methodology suggested by Bayoumi and Eichengreen (1994) is applied in this part. The growth rate

is the change in the logarithm of real GDP and inflation rate is the change in the logarithm of GDP deflator.

The long-run effect on output from the impulse response functions and the sum of the first year's impact on output and prices are considered as the size of supply and demand shocks, respectively. For the speed of adjustment, the response after two years as a share of the long run effect is estimated.

The correlations between Japan and the USA and between Germany and the USA are used as the null hypothesis for assessing the significant level of correlations in EA-9 and the Euroland. For identifying the critical values, the formula of Kendall and Stuart (1967) is applied. The statistic $0.5 \ln[(1+r)/(1-r)]$ is distributed approximately normally, with the mean of $0.5 \ln[(1+\rho)/(1-\rho)]$ and variance of T^{-3} , where r is the estimated correlation coefficient, ρ is the null value of the correlation coefficient and T is the number of observations.

Before estimating and analysing the supply and demand shocks, let's consider the data directly.

Table 5 : Correlations of growth

East Asia 9 (1970-2007)

	Ind	Mal	Phil	Sin	Thai	Chi	HK	Jp	Kor
Indonesia	1								
Malaysia	0.78	1							
Philippines	0.34	0.41	1						
Singapore	0.58	0.83	0.41	1					
Thailand	0.76	0.70	0.27	0.49	1				
China	0.08	0.07	-0.40	0.01	0.08	1			
Hong Kong	0.63	0.59	0.31	0.57	0.51	0.18	1		
Japan	0.49	0.38	0.22	0.39	0.49	-0.20	0.57	1	
Korea	0.57	0.56	0.15	0.36	0.75	0.15	0.50	0.39	1
Average(1970-2007)	0.37								
Average(1970-1990)	0.10								
Average(1991-2007)	0.49								

Euroland

	Aus	Bel	Fin	Fra	Ger	Gre	Ire	Ita	Lux	Net	Por	Spa
Austria	1											
Belgium	0.60	1										
Finland	0.15	0.37	1									
France	0.68	0.77	0.38	1								
Germany	0.53	0.43	-0.20	0.54	1							
Greece	0.27	0.36	0.22	0.45	0.51	1						
Ireland	0.09	0.25	0.38	0.19	0.21	0.22	1					
Italy	0.60	0.79	0.27	0.70	0.36	0.17	0.05	1				
Luxembourg	0.19	0.24	0.09	0.20	-0.10	-0.20	-0.40	0.46	1			
Netherlands	0.42	0.61	0.16	0.42	0.47	0.27	0.43	0.40	-0.03	1		
Portugal	0.59	0.54	0.37	0.56	0.35	0.32	0.34	0.58	-0.20	0.23	1	
Spain	0.57	0.76	0.40	0.73	0.37	0.31	0.37	0.49	0.04	0.51	0.48	1
Average(1970-1998)	0.32											

On simple average the correlations of growth of EA-9 for the whole period (0.37) is higher than that of the Euroland (0.32) as indicated in Table 5. The condition of EA-9 is become better from 1990 as the average of correlations for the 1991-2007 period is the highest (0.49).

Again the simple average of correlations of inflation for East Asia is higher for 1991-2007 period (0.47) than that of the previous period (0.43). For the whole period, both region East Asia and Euroland have similar value of average correlations coefficients as shown in Table 6.

In short, for direct data the East Asia- 9 has more integrated than the Euroland. The degree of integration is higher for the latter sub-period starting 1991.

Table 6 :Correlations of Inflation

East Asia 9 (1970-2007)													
	Ind	Mal	Phil	Sin	Thai	Chi	HK	Jp	Kor				
Indonesia	1												
Malaysia	0.53	1											
Philippines	0.23	0.29	1										
Singapore	0.32	0.5	0.34	1									
Thailand	0.63	0.63	0.29	0.79	1								
China	-0.40	-0.10	0.00	0.30	0.21	1							
Hong Kong	0.17	0.30	0.40	0.67	0.59	0.38	1						
Japan	0.39	0.39	0.51	0.74	0.73	0.18	0.60	1					
Korea	0.31	0.30	0.26	0.65	0.62	0.23	0.65	0.83	1				
Average(1970-2007)	0.47												
Average(1970-1990)	0.43												
Average(1991-2007)	0.47												
Euroland													
	Aus	Bel	Fin	Fra	Ger	Gre	Ire	Ita	Lux	Net	Por	Spa	
Austria	1												
Belgium	0.86	1											
Finland	0.83	0.86	1										
France	0.79	0.76	0.78	1									
Germany	0.57	0.44	0.40	0.31	1								
Greece	0.23	0.28	0.38	0.32	0.21	1							
Ireland	0.74	0.69	0.65	0.82	0.23	0.11	1						
Italy	0.72	0.73	0.80	0.90	0.36	0.54	0.74	1					
Luxembourg	0.58	0.60	0.00	-0.10	0.31	0.27	-0.10	0.11	1				
Netherlands	0.84	0.77	0.75	0.69	0.52	-0.10	0.76	0.58	-0.04	1			
Portugal	0.63	0.63	0.63	0.67	0.09	0.62	0.52	0.65	-0.13	0.18	1		
Spain	0.71	0.69	0.69	0.90	0.29	0.37	0.72	0.90	0.07	0.58	0.73	1	
Average(1970-1998)	0.47												

The next step is to consider whether the two groups experience the same supply and demand shocks and speed of adjustment.

The significant correlations of supply disturbances give a better indicator about that countries would require a synchronous policy response, which is essential because entering the union all countries have to accept a common monetary policy. Comparing with supply disturbances, highly related demand shocks seem to be less important, as they may stem from divergent monetary policies, which would no longer occur after the monetary union.

Table 7 : Correlations of supply disturbances

East Asia 9 (1970-2007)												
	Ind	Mal	Phil	Sin	Thai	Chi	HK	Jp	Kor			
Indonesia	1											
Malaysia	0.76	1										
Philippines	0.32	0.29	1									
Singapore	0.57	0.72	0.27	1								
Thailand	0.68	0.70	0.39	0.5	1							
China	0.17	0.26	-0.20	0.12	0.17	1						
Hong Kong	0.66	0.67	0.18	0.58	0.46	0.22	1					
Japan	0.31	0.27	0.25	0.18	0.42	-0.17	0.15	1				
Korea	0.58	0.65	0.28	0.39	0.73	0.25	0.38	0.34	1			
Average(1970-2007)	0.34											
Average(1970-1990)	0.18											
Average(1991-2007)	0.51											
Euroland(1970-1998)												
	Aus	Bel	Fin	Fra	Ger	Gre	Ire	Ita	Lux	Net	Por	Spa
Austria	1											
Belgium	0.55	1										
Finland	-0.03	-0.10	1									
France	0.63	0.64	0.27	1								
Germany	0.45	0.35	-0.10	0.50	1							
Greece	0.01	0.11	-0.10	0.19	0.43	1						
Ireland	0.10	0.27	0.27	0.36	0.23	-0.10	1					
Italy	0.48	0.67	-0.01	0.63	0.16	0.07	0.16	1				
Luxembourg	-0.20	-0.20	-0.20	-0.30	-0.40	0.11	-0.40	-0.3	1			
Netherlands	0.51	0.74	0.05	0.51	0.47	0.09	0.43	0.43	-0.40	1		
Portugal	0.62	0.38	0.38	0.61	0.37	0.41	0.35	0.36	-0.50	0.41	1	
Spain	0.35	0.65	0.06	0.62	0.20	-0.10	0.42	0.56	-0.70	0.62	0.48	1
Average(1970-1998)	0.21											

Table 7 shows that the EA-9 has higher number of simple average of correlations (0.34) than that of Euroland (0.21). As the critical value at 5% significant level for EA-9 is 0.53 and 0.59 for Euroland, the EA-9 also has the higher number of significant inter-country supply shocks correlations (11 from 36 correlations and equal to 30.55%) while Euroland has only 10 significant correlations from the total of 66 correlations i.e 15.15 %. Within the region, among three sample period, East Asian countries have the highest correlations coefficients for the latter sub-period (0.51).

The same results as in Table 7 are found in Table 8 for demand disturbances. The simple average of correlations of EA-9 (0.25) again has the higher number than that of the Euroland (0.23). The critical value for EA-9 is 0.51 and 6 from 36 correlations of EA-9 are significant meaning 16.7%. Euroland has 0.61 as critical value and only 1 from 66 correlations is significant at 5 % level meaning 1.5%.

Within the East Asian region, the comparisons of simple averages of all three periods again show that the correlations coefficients for period ranging from 1991 to 2007 have the highest value (0.31).

While evaluating the suitable conditions of currency union member, the typical size of disturbances is another important economic characteristic since larger disturbances can have very disruptive effects, and may require policy independence (e.g., monetary policy) to offset them. This is particular true for supply

shocks, which may require painful adjustment. Similarly, if the speed with which the economies adjust to disturbances is slow, then the cost of fixing the exchange rate and losing policy autonomy increases.

Table 8 : Correlations of demand disturbances

East Asia 9(1970-2007)

	Ind	Mal	Phil	Sin	Thai	Chi	HK	Jp	Kor
Indonesia	1								
Malaysia	0.70	1							
Philippines	0.20	0.20	1						
Singapore	0.20	0.42	0.04	1					
Thailand	0.75	0.69	0.18	0.54	1				
China	-0.10	-0.10	-0.10	0.15	-0.10	1			
Kong Hong	0.35	0.22	0.19	0.11	0.34	-0.03	1		
Japan	0.28	0.36	0.30	0.38	0.43	-0.23	0.06	1	
Korea	0.51	0.41	0.09	0.34	0.67	0.19	0.39	0.35	1
Average(1970-2007)	0.25								
Average(1970-1990)	-0.10								
Average(1991-2007)	0.31								
Euroland(1970-1998)									

	Aus	Bel	Fin	Fra	Ger	Gre	Ire	Ita	Lux	Net	Por	Spa
Austria	1											
Belgium	0.49	1										
Finland	0.14	-0.10	1									
France	0.70	0.65	0.22	1								
Germany	0.35	0.37	0.20	0.45	1							
Greece	0.04	0.18	0.17	0.09	0.28	1						
Ireland	0.33	0.28	0.18	0.40	0.33	-0.31	1					
Italy	0.30	0.53	-0.10	0.57	0.06	0.07	0.46	1				
Luxembourg	-0.03	-0.10	0.02	-0.20	0.09	0.01	-0.30	-0.40	1			
Netherlands	0.41	0.56	0.15	0.42	0.41	0.06	0.58	0.31	-0.10	1		
Portugal	0.58	0.46	0.54	0.63	0.30	0.39	0.39	0.39	-0.20	0.31	1	
Spain	0.28	0.65	0.13	0.63	0.11	-0.14	0.40	0.50	-0.70	0.45	0.54	1
Average(1970-1998)	0.23											

Table 9 : Size of shocks and speed of adjustment

	Size	Supply shocks Speed	Demand shocks Speed
East Asia 9			
Indonesia	0.15	0.51	0.07
Malaysia	0.21	0.76	0.04
Philippines	0.08	0.51	0.05
Singapore	0.19	0.63	0.03
Thailand	0.21	0.51	0.02
China	0.22	0.41	0.03
Hong Kong	0.17	0.64	0.02
Japan	0.06	0.60	0.01
Korea	0.13	0.51	0.01
Average	0.20	0.73	0.04

Euroland				
Austria	0.04	0.65	0.00	0.57
Belgium	0.04	0.56	0.01	0.66
Finland	0.07	0.74	0.01	0.40
France	0.04	0.55	0.01	0.56
Germany	0.07	0.66	0.01	0.65
Greece	0.05	0.68	0.01	0.54
Ireland	0.13	0.39	0.03	0.54
Italy	0.05	0.59	0.01	0.58
Luxembourg	0.10	0.89	0.00	1.82
Netherlands	0.07	0.42	0.00	0.45
Portugal	0.03	0.18	0.02	0.02
Spain	0.05	0.63	0.01	0.40
Average	0.06	0.58	0.01	0.60

Table 9 shows that comparing with the Euroland the average size of supply shocks for the EA-9 is larger, however, it has a quicker time of adjustment. For the demand disturbances the two groups show almost the same size of shocks but EA-9 again have much more higher speed of adjustment.

In sum, the empirical results of the macroeconomic disturbances enhance the finding in the previous part on trade that is East Asia has a better condition especially from 1990 for creating a common currency area than the Euroland before joining the European Monetary Union in 1999.

3.3 *Financial integration*

Obstfeld (1995) suggests measuring capital mobility using the following equation

$$\Delta C_{it} = \alpha + \beta \Delta(Y-I-G)_{it} + \Psi \Delta C_{A_t} + \varepsilon_{it} \quad (1)$$

Where, ΔC_{it} is the change in domestic consumption for country i ; $\Delta(Y-I-G)_{it}$ is a vector of domestic explanatory variables measured the change in domestic resources available for consumption, which is defined as total output (Y) less investment (I) and government consumption (G); C_{A_t} is the change in consumption across all other countries in the region under consideration.

The null hypothesis for risk sharing is $\beta = 0$ and $\Psi = 1$. If consumption follows the consumption risk-sharing path, then changes in domestic resources should be zero ($\beta = 0$), while changes in foreign consumption should be unity ($\Psi = 1$).

Table 10 shows that comparing with Euroland, for the whole sample period, EA-9 has smaller average of coefficients on domestic resources and the bigger average of coefficients on foreign resources. In addition, five countries within the EA-9 have insignificant coefficients on domestic resources and significant coefficients on foreign resources satisfying the constraints implied by full international risk sharing of consumption. Only four from 12 European countries have the same feature. Other four countries in the East Asia region have either insignificant coefficients on domestic resources (China and the Philippines) or significant coefficients on foreign resources (Hong Kong and Japan) indicating that their capital markets are partially used to smooth consumption.

The condition for East Asia become better since 1990 as on simple average comparing with the previous period (from 1970 to 1990) and the whole period, the period starting from 1991 has smaller coefficients on domestic resources and higher coefficients on foreign resources.

Table 10: Consumption Correlations

EA-9	1970- 2007		1970- 1990		1991- 2007		Euroland(1970-1998)	D	F
	D	F	D	F	D	F			
Indonesia	0.05	1.22*	0.04	0.42	0.39	1.22*	Austria	0.36*	0.26
Malaysia	0.04	1.46*	0.08	2.17*	0.17	1.25*	Belgium	0.12	0.91*
Philippines	0.03	0.36	0.00	0.45	0.02	0.46	Finland	0.46*	0.62*
Singapore	0.11	0.94*	0.30	0.61	0.14	0.99*	France	0.32	0.62*
Thailand	0.05	1.38*	0.17	0.58	0.04	1.60*	Germany	0.57*	0.31
China	0.06	0.10	0.01	0.59	0.09	0.12	Greece	0.64*	0.48*
Hong Kong	0.77*	0.58*	0.96*	0.47	0.45*	0.71*	Ireland	0.52*	0.89*
Japan	0.54*	0.43*	1.16*	0.14	0.43*	0.38*	Italy	0.26	0.64*
Korea	0.22	1.15*	0.31	0.29	0.24	1.60*	Luxembourg	0.08	0.85*
							Netherlands	0.41*	0.53*
							Portugal	0.83*	0.30
							Spain	0.06	1.29*
Average	0.21	0.85	0.34	0.63	0.21	0.92		0.38	0.64

Notes

D: Coefficient on domestic resources; F: Coefficient on foreign resources

*Significant at 5 percent level

The empirical results in this part show that comparing with the Euroland, the East Asian capital markets are quite integrated and they even became closer since 1990. Those results indicate that the monetary policy might not heavily affect those countries in long run so that an abandon of independent monetary policy instrument to joint a currency union would not so painful.

5. Conclusions

In this paper, the suitability of East Asia for forming a monetary union is examined by using the OCA framework and comparisons between East Asia and the Euroland. The empirical results show that the degree of integration in East Asia has been generally strengthened following the liberalizations of majority countries in the region since 1990. From an economic point of view, the East Asia does satisfy the standard OCA criteria even better than the Euroland before launching the euro in 1999. The inter-regional trade has reached relatively high level. The speed that the economies adjust in the case of shocks is fast. The supply and demand disturbances are small and symmetric by European standards. The degree of financial integration is quite high. All those evidences indicate that the East Asia can enjoy many benefits without suffering serious costs if it decides to form an Asia Monetary Union. Based on those results, it is high time for East Asian countries to initiate a broader and closer cooperation within the region to make more substantial attempt at establishing an Asian Monetary Union.

There are of course still many obstacles to be overcome and questions to be answered such as what is the possible way for Asia to realize its target, whether the European approach for forming an EMU is appropriate for Asian region, or for forming an AMU, which is the best option for Asia to begin with. Those questions are remained as the subject for further research.

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