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Is Monetary Cooperation Among the Four Regions Across the Taiwan Strait Feasible?

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ABSTRACT: Drawing on the optimum currency area (OCA) and exchange rate theories, we use an extended OCA index approach to assess the feasibility of regional monetary cooperation in the four regions across the Taiwan Strait (FRTS). In addition to more common variables, such as differences in economic structure, inflation rates, and interest rates, we find that the asymmetric shock in money supply is an important factor affecting the comprehensive cost of regional monetary cooperation among the FRTS. We conclude that regional monetary cooperation among the FRTS is feasible according to empirical analysis of OCA indexes between the FRTS and a comparison of the OCA indexes between the FRTS and the European Union (EU).

KEY WORDS: four regions across Taiwan Strait, OCA index, regional monetary cooperation

Introduction

Since the Asian financial crisis in 1997, East Asian economies have gradually come to agree on several issues related to regional monetary cooperation and have made corresponding progress in many areas.[1] As part of the trend toward economic and monetary integration, the Chinese government has taken a series of measures to promote the internationalization of the Chinese yuan (CNY), such as issuing CNY-denominated sovereign bonds in Hong Kong, promoting currency swaps, establishing pilot settlement projects for cross-border trade, and so on.

For historical and political reasons, the FRTS (Mainland China, Hong Kong, Macao, and Taiwan) all currently have their own different currencies. Many scholars, however, believe that an unavoidable issue in the promotion of the internationalization of the CNY is the integration of the FRTS currencies; this not only can make up for the defects of the CNY, such as its inconvertibility, and enhance the CNY's dominant power in East Asian monetary cooperation, but can help the CNY to occupy an advantageous position in the current reform of the international monetary system by promoting the internationalization of the CNY. Some scholars have pointed out that the monetary integration of the FRTS is the first stage of the CNY internationalization pattern "three axes and three stages" (such as Li, Zheng, and Zhang, 2011, p. 20). The "three axes" refers to swapping the CNY with other currencies, reforming the financial system, and freely exchanging the CNY. The "three stages" means the integration of the FRTS currencies, regional core currency, and international currency.

According to their empirical study of several East Asian economies using the optimum currency area (OCA) index approach that they pioneered, Eichengreen and Bayoumi (1996) conclude that, on

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standard OCA grounds, the economies of East Asia would seem to be as well suited for internationally harmonized monetary policies as those of the EU members. The corresponding monetary union has not been formed because these countries lack a strong political will. To our knowledge, there is very limited literature on the integration of the FRTS currencies. Based on some criteria of the traditional OCA theory, the existing literature usually includes a qualitative analysis of the feasibility of monetary cooperation in the FRTS. There is also little literature that uses a unified framework to assess this. The differences in the adopted criteria often lead to contradictory conclusions. Some studies argue that the regional monetary cooperation between the FRTS is feasible (Huang 2006; Li, Zheng, and Zhang 2011) while others (Wan and Dai 2005; Zhou 2007; Zhu and Chen 2004) have concluded that regional monetary cooperation among the FRTS is not feasible.

Applying the OCA and exchange rate theories, we use the OCA index approach pioneered by Bayoumi and Eichengreen (1996, 1997, 1998) to investigate whether it is feasible for the FRTS to implement regional monetary cooperation.

This article makes three contributions to the literature. First, unlike prior studies, we use a unified quantitative framework, the OCA index approach, to assess the feasibility of regional monetary cooperation in the FRTS. Second, applying the OCA and exchange rate theories, we extend the traditional OCA index equation (Bayoumi and Eichengreen 1996, 1997) by adding some new variables and find the asymmetric shock in money supply to be statistically significant; this means that the asymmetric shock in money supply can be considered as another proxy for asymmetric shocks and differences in policy preference. Last, by comparing the OCA indexes of core EU members before and after their regional monetary cooperation, we find that monetary cooperation among the FRTS is feasible, a conclusion that is consistent with Eichengreen and Bayoumi's (1996) conclusion about several East Asian economies.

Literature Review

OCA Theory and OCA Index Approach

The theoretical basis of monetary integration is the OCA theory, which was first introduced by Mundell (1961) and has been supplemented and perfected by many scholars from different perspectives. An optimum currency area (OCA) is defined as the optimal geographic domain of a single currency, or that of several currencies whose exchange rates are irrevocably pegged, and the single currency, or the pegged currencies, can fluctuate only in unison against the rest of the world (Mongelli 2002). Scholars have introduced a series of standards, including liquidity of production factors (Mundell 1961), economic openness and scale (McKinnon 1963), economy and product diversification (Kenen 1969), similarity of inflation (Fleming 1971), policy integration (Ingram 1969; Kenen 1969), and financial integration. These standards not only are the core of OCA theory analysis, but also are an important basis for empirical studies. Unfortunately, when empirical tests are based on these standards, one may face a situation in which no country can meet all these standards and most of the standards are incompatible. Due to the diverse standards, it is difficult to decide which standard should be used as the main criterion for making a judgment about monetary cooperation.

Because of the aforementioned limitation, the traditional OCA theory is criticized by many scholars, and this has driven the development and perfection of the OCA theory and the empirical studies. In terms of theory, the development is seen in two main aspects: one is the costs and benefits analysis of the OCA (Krugman 1990); the other is the new generation of the OCA theory (Tavlas 1993), which mainly includes the endogeneity theory of the OCA (Frankel and Rose 1998) and the general equilibrium analysis of the OCA. In terms of empirical analysis, with the development of empirical analysis tools, the empirical study of OCA theory has changed from the empirical analysis of traditional standards to the application of various empirical methods: one is the application of econometric methods such as vector autoregressive (VAR) and structural vector autoregressive

(SVAR), and the other is the OCA index approach (Bayoumi and Eichengreen 1996, 1997, 1998; Joan and Ramon 2003).

Considering the defects of traditional OCA theory, Tower and Willett (1976) argue that the weight of the corresponding OCA criteria should be tested and confirmed by empirical data. Bayoumi and Eichengreen (1996, 1997, 1998) further develop the OCA index model to evaluate the comprehensive conditions for a specified area to meet the OCA criteria; this is called the OCA index approach. Its basic logic is that the variability of exchange rates is an outcome of the chosen exchange rate regime and should contain information about which arrangement to adopt (Bayoumi and Eichengreen 1996, 1997). In other words, the main factors affecting exchange rate regime selection are the same as those affecting exchange rate. One can effectively identify the main factors affecting the regional monetary cooperation of specific economies and construct the OCA index to investigate the comprehensive cost of regional monetary cooperation. The OCA index approach uses the magnitude of the exchange rate variability to measure the comprehensive cost for specific economies in regional monetary cooperation. In theory, the internal exchange rate variability of member economies in the most effective currency union should be zero. Thus, the OCA index approach enhances the operability of the OCA criteria (Zhao, Li, and Wei 2007).

Exchange Rate Regimes of the FRTS and Their Currencies

The legal currency of Mainland China is the Chinese yuan (CNY), and the central bank is the People's Bank of China. Since the country's reform and opening up in 1978, the evolution of the exchange rate institution of the Chinese yuan can be divided into three phases. In the first phase (1981–93), Mainland China implemented a dual exchange rate system that aimed to encourage exports and promote export-oriented economic development. In the second phase (1994 to July 2005), China adopted a unitary and managed floating exchange rate system based on market supply and demand. Since July 2005, Mainland China has practiced a floating exchange rate system that is based on market supply and demand and has controlled this system by consulting a basket of currencies and managing the floating rate system.

The Hong Kong dollar (HKD) is the legal currency of Hong Kong. The Hong Kong Monetary Authority plays the role of the central bank. Since October 17, 1983, Hong Kong has implemented a pegged exchange rate system, which is also a currency board system. Under this system, the issuance and circulation of the HKD is based on the equivalent amount of international reserves. At the end of 2013, only three banks held the authority to issue HKD: Standard Chartered Bank (Hong Kong), HSBC Bank, and Bank of China (Hong Kong).

The Macao pataca (MOP) is the legal currency of Macao. In 1995, the Macao government announced that the authority to issue MOP was shared by Banco Nacional Ultramarino and Bank of China Macao Branch. The Macao Monetary Authority is the institution responsible for supervising and regulating Macao's financial affairs. In October 1983, Macao started using a linked exchange rate system that pegged the MOP to the HKD.

The legal currency of Taiwan is the New Taiwan dollar (TWD), which began to be issued and circulated on June 15, 1949. The Central Bank of the Republic of China (Taiwan) is Taiwan's central bank. Since 1949, the exchange rate system has gone through three stages. In the first stage (1949–78), Taiwan implemented an official exchange rate system in which the TWD was pegged to the U.S. dollar. Due to the severe shortage of foreign exchange, the Taiwan authority simultaneously stipulated that all foreign currency exchange should be settled by the allocated certificate. In the second stage (1979 to April 1989), Taiwan carried out the managed floating exchange rate regime. Since April 1989, Taiwan has implemented a free-floating exchange rate system in which the exchange rate can be listed for trading by all the commercial banks and the exchange rate can float freely.

Literature on Monetary Cooperation of the FRTS

Wan and Dai (2005) point out that there are considerable economic gaps between Mainland China and several East Asian economies stopping Mainland China from being an ideal monetary cooperation partner for them. Zhu and Chen (2004) claim that there are certain foundations on which the FRTS could establish the Chinese yuan area, saying that only staged and hierarchical monetary cooperation could lead to the final establishment of a unified currency area. Drawing on some OCA standards and the convergence criteria of the euro zone, Zhu, Guo, and Wang (2005) analyze the feasibility of a Chinese yuan area. Zhou (2007) investigates the correlation between the degree of trade integration and the degree of symmetry of structural economic shocks and concludes that the FRTS could not satisfy the dynamic constraint conditions for monetary integration. Li, Zheng, and Zhang (2011) analyze the degree of synchronization in the change of economic indicators in the FRTS and conclude that monetary cooperation among the FRTS is necessary and feasible.

In summary, there are few studies on the integration of the currencies in the FRTS. Using some of the OCA criteria, the existing literature usually presents a qualitative analysis of the feasibility of monetary cooperation in the FRTS. There is little literature that uses a unified framework to assess this, and the differences in the adopted criteria often lead to contradictory conclusions. In this article, we will use a unified quantitative framework (i.e., the extended OCA index approach) to assess the feasibility of monetary cooperation among the FRTS.

Theoretical and Conceptual Framework

Drawing on the OCA and exchange rate theories, we introduce a theoretical and conceptual framework for the extended OCA index approach to analyze the feasibility of regional monetary cooperation in the FRTS. The explained variable is the variability of the bilateral nominal exchange rate; namely, the standard deviation of the bilateral exchange rate between the FRTS. We investigate the factors that affect the comprehensive cost of regional monetary cooperation in the FRTS from the following five aspects.

Regional Economic Size

Regional monetary cooperation is feasible and sustainable if and only if the benefit can outweigh the cost, including the loss of independence in macroeconomic policy. The benefits will be greatest for small economies where there is little scope for utilizing a separate national currency in international transactions. That is, small countries should benefit the most from the unit of account, means of payment, and store of value services provided by regional monetary cooperation.

Trade Linkages

We investigate trade linkages from two main aspects: the degree of bilateral trade and the openness of the regional economy. The closer the trade linkages are, the greater the benefits from regional monetary cooperation are. This means that the comprehensive cost of regional monetary cooperation is smaller, which will lead to a smaller OCA index. In terms of the openness of the regional economy, McKinnon (1963) claims that a relatively high openness in the regional economies is a necessary condition for creating a currency area. For a small open economy, a tiny change in the exchange rate causes domestic prices to sharply fluctuate, negatively affecting the citizens' actual income level but only lightly affecting international payments. As a result, the higher the openness of the regional economies is, the more suitable it is for the region to establish a unified currency area.

Asymmetric Shocks

In terms of asymmetric shocks, we mainly focus on the following three aspects: economic structure, output, and money supply. Regarding the difference in economic structure, Kenen (1969) argues that only economies with a highly diversified economic structure are the ideal members of a currency area. A highly diversified economic structure means diversified commodity production that can decentralize and defuse the shocks from the external economic environment on specific domestic economic sectors and allow an interdependent international trading network to be formed in the region. Regarding the asymmetric shock in output, the shock and the degree of asymmetric shock will ultimately affect the variability of the bilateral exchange rate. Generally speaking, the more symmetrical the member economies' output shocks are, the smaller the variability of the bilateral exchange rate and the OCA index are. In addition, the asymmetric money supply shock will have a positive effect on the variability of the bilateral exchange rate and the OCA index.

Differences in Policy Preference

According to previous studies (Ingram 1969; Kenen 1969; Ozdemir 2013), member economies must coordinate their monetary, fiscal, and other policies to achieve monetary cooperation. We mainly investigate the differences in policy preference from three aspects: the asymmetric shock in money supply, interest rate difference, and inflation rate difference. Asymmetric shock in money supply usually leads to variability in the bilateral exchange rate. On the interest rate difference, Ingram (1969) points out that financial integration related to the free flow of long-term capital is the best criterion for determining whether the currency area is optimal. Under the circumstances of high financial integration, any tiny variation in the interest rate would lead to a sufficiently multinational capital flow, and the currency area could avoid having a change of interest rates affect the exchange rate. Ishiyama (1978) believes that the similarity of inflation rates is an important criterion for evaluating whether the member economies could form an OCA. When member economies have substantially different inflation rates, it would be very difficult to achieve policy consistency and maintain the currency area's stability. As a result, the differences in policy preference are an important factor that affects the comprehensive cost of regional monetary cooperation. The smaller the difference in policy preference is, the smaller the comprehensive cost of monetary cooperation is, which leads to a smaller OCA index.

Differences in Financial Development

To maintain a stable exchange rate, regional monetary cooperation requires its members to effectively coordinate monetary policy. Differences in financial development would lead to different coordination costs. A smaller difference in financial development would mean a smaller comprehensive cost of regional monetary cooperation and a smaller OCA index.

Empirical Methodology

Selection of Variables

Drawing on the previous discussion about the theoretical and conceptual framework, we take the standard deviation of the bilateral exchange rate as the explained variable. To identify the main factors affecting the comprehensive cost of regional monetary cooperation in the FRTS and their corresponding coefficients, the explanatory variables are selected as described in Table 1.

Table 1. Definition and calculation method of the explanatory variables

Variable	Definition	Calculation method
SIZE	Regional economic size	Average of logarithm USD-denominated nominal GDP of the bilateral economies
TRADE	Bilateral trade linkages	Average of the proportion of bilateral exports in GDP of the bilateral economies
OPEN	Openness to regional economy	Average of the ratio of total exports and imports to GDP of the bilateral economies
DIV	Difference in economic structure	Sum of the absolute differences in proportion of agriculture, industry, and services
DY	Asymmetric shock in output	Standard deviation of natural logarithm change in relative output of the bilateral economies
DM	Asymmetric shock in money supply	Standard deviation of difference in growth rate of M2/GDP of the bilateral economies
IN	Difference in interest rates	Average of absolute difference in annual average interest rate of the bilateral economies
INFLA	Difference in inflation rates	Average of absolute difference in inflation rate of the bilateral economies
FD	Difference in financial development	Average of absolute difference in M2/GDP of the bilateral economies

Data

Drawing on the previous discussion about selection of variables, we collect the following raw annual data of the FRTS between 1989 and 2009: average exchange rate, gross domestic product (GDP), industry share, imports and exports, inflation rate, average interest rate, and money supply. The main data sources include *Key Indicators for Asia and the Pacific* (Asia Development Bank 1990–2010); *Macao Statistical Yearbook* (Government of Macao Special Administrative Region Statistics and Census Service 1990–2010); *China Statistical Yearbook* (National Bureau of Statistics of China, 1990–2010); and so on. Using these raw data and the calculation method previously discussed, we construct the nine explanatory variables.

To avoid spurious regression, it is necessary to ensure the stationarity of the panel data. We implement the panel unit root test with two different categories: the Levin-Lin-Chu (LLC) test and the augmented Dickey Fuller (ADF) Fisher test. The test results are shown in Table 2. We can conclude that all the variables except *IN* and *FD* are stationary. The variable *IN* and *FD* are first-

Table 2. Results of panel data unit root test

Variable	Type	LLC	ADF-Fisher	Variable	Type	LLC	ADF-Fisher
$SD(e_{ij})$	C	−8.721***	49.538***	*DM*	C	−1.613*	22.153**
SIZE	C, T	−6.365***	52.191***	*IN*	C, T	2.305	23.992**
TRADE	C	−21.915***	287.850***	*INFLA*	O	−5.211***	38.575***
OPEN	C	−3.935***	21.481**	*FD*	C, T	0.272	14.606
DIV	C	−4.820***	42.244***	*DIIN*	O	−10.318***	87.041***
DY	C	−3.241***	27.502***	*DIFD*	C, T	−2.144**	19.920*

Notes: The variables except DIIN and DIFD are defined in Table 1. The variable DIIN refers to the first-order difference of the variable IN, which is defined in Table 1. The Variable DIFD refers to the first-order difference of the variable FD, which is defined in Table 1. The test types of C, T, and O, respectively, represent including a constant item, including a time trend item, and including neither a constant item nor a time trend item. *, **, and *** indicate that the result of panel data unit root test is statistically significant at the 10%, 5%, and 1% level, respectively.

order stationary, so the first-order difference of these two variables, named as DIIN and DIFD respectively, can be included in the OCA index equation.

The Model

Following the OCA index theory and previous studies (Bayoumi and Eichengreen 1997, 1998; Joan and Ramon 2003), we introduce the following panel data model to identify the main factors affecting the comprehensive cost of regional monetary cooperation among the FRTS and their corresponding coefficients:

$$SD(e_{it}) = \alpha + X_{it}^{'}\beta + u_{it},$$

where $u_{it} = \mu_i + \varepsilon_{it}$ in the context of the panel data model with fixed effect; i = MH, MT, MA, HA, HT, AT represent the six respective bilateral economy pairs between the FRTS: Mainland China (M), Hong Kong (H), Macao (A), and Taiwan (T). The explained variable $SD(e_{it})$ is the standard deviation of the bilateral exchange rate. The explanatory variable X_{it} includes the nine variables defined in Table 1 and Table 2: SIZE, TRADE, OPEN, DIV, DY, DM, INFLA, DIIN, and DIFD.

Empirical Results and Analysis

According to the previous econometric literature (e.g., Rogers 1993; Baltagi 2008; Chen et al. 2009), the sample panel data of the FRTS, in which each bilateral economy pair appears more than ten times, usually has the following properties: groupwise heteroskedasticity, within correlation, and cross-section correlation. This conclusion is verified by preliminary statistical tests, which include the F test, the Breusch-Pagan Lagrange multiplier (LM) test, and the Wald test.[2] With such a complex panel error structure, the hypothesis tests including the F test, the Chow test, and the Hausman test are not effective (Baltagi 2008). According to previous studies (such as Rogers 1993), we should use cluster-robust standard errors to modify the traditional estimation methods of panel data models, such as the fixed effect model, the random effect model, and the pooled regression model. The estimation results of these three modified panel data models are shown in Table 3. The FE Model column shows the estimation of the modified fixed effect model, and the test results for the null hypothesis with no individual fixed effect are shown in the last row. This indicates that the

Table 3. Estimation results

Variable	FE model	RE model	Pooled model	Final model
C	−0.0451(0.109)	−0.0416(0.034)	−0.0416(0.034)	−0.0334(0.012)**
SIZE	0.0029(0.015)	−0.0009(0.002)	−0.0009(0.002)	
TRADE($10^{-2)}$	0.0280(0.062)	−0.0024(0.038)	−0.0024(0.038)	
OPEN(10^{-2})	0.0229(0.062)	0.0074(0.007)	0.0073(0.007)	
DIV(10^{-2})	−0.0547(0.058)	0.0361(0.009) ***	0.0361(0.009)***	0.0354(0.008)***
DY	0.0398(0.085)	0.0967(0.083)	0.0967(0.083)	
DM(10^{-2})	0.0831(0.086)	0.1065(0.085)	0.1065(0.085)	0.1347(0.061)*
INFLA(10^{-2})	0.8170(0.511)	0.6860(0.368)*	0.6860(0.368)*	0.7121(0.379)*
DIIN(10^{-2})	1.0801(0.585)	0.9834(0.548)*	0.9834(0.548)*	0.8743(0.371)*
DIFD(10^{-2})	−0.0770(0.064)	−0.0666(0.051)	−0.0666(0.051)	
Observations	108	108	108	108
R^2	0.0453	0.4072	0.4072	0.3892
Prob > Chi2	0.8165	—	—	—

Notes: Variables are defined in Table 1 and Table 2. The "10^{-2}" in the table means that the estimation coefficients and standard errors of the variable have been processed correspondingly. The cluster-robust standard errors are reported in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% level, respectively.

null hypothesis cannot be rejected and the pooled regression model is preferable to the fixed effect model. The estimation results of the random effect model and the pooled regression model modified using cluster-robust standard errors are shown in the RE Model and Pooled Model columns. By comparison, the parameter estimations and the cluster-robust standard errors between the two models are almost consistent. The reason is that the pooled regression model is the special case of the random effect model, and the estimation results tend to be consistent when they are modified using cluster-robust standard errors. Being consistent with previous studies, such as Bayoumi and Eichengreen (1997, 1998) and Joan and Ramon (2003), we gradually eliminate variables that are insignificant and inconsistent with the expected sign from the theoretical analysis. The final estimation results are shown in the last column. Thus, the panel OCA index model of the FRTS can finally be confirmed as follows:

$$SD(e_{it}) = -0.0334 + 0.0354 \times 10^{-2} * DIVit + 0.1347 \times 10^{-2} * DMit + 0.7121 \times 10^{-2} * INFLAit + 0.8743 \times 10^{-2} * DIINit \quad (1)$$

According to the panel OCA index model, Equation (1), the main factors affecting the comprehensive cost of regional monetary cooperation, including differences in economic structure, inflation rates, and interest rates, have significant explanatory power for the variability of the bilateral exchange rate between the FRTS. These findings are similar to the empirical studies by Bayoumi and Eichengreen (1996, 1997, 1998) and other scholars on regional monetary cooperation of Europe, East Asia, and other regions. At the same time, we find that asymmetric shock in money supply is statistically significant, which means that asymmetric shock in money supply can be considered as another proxy for asymmetric shocks and differences in policy preference. From the basic idea of the OCA index approach, the main factors affecting the comprehensive cost of regional monetary cooperation among the FRTS include difference in economic structure, asymmetric shock in money supply, inflation difference, and interest rate difference. The coefficients of these variables are 0.0354×10^{-2}, 0.1347×10^{-2}, 0.7121×10^{-2}, and 0.8743×10^{-2}, respectively.[3]

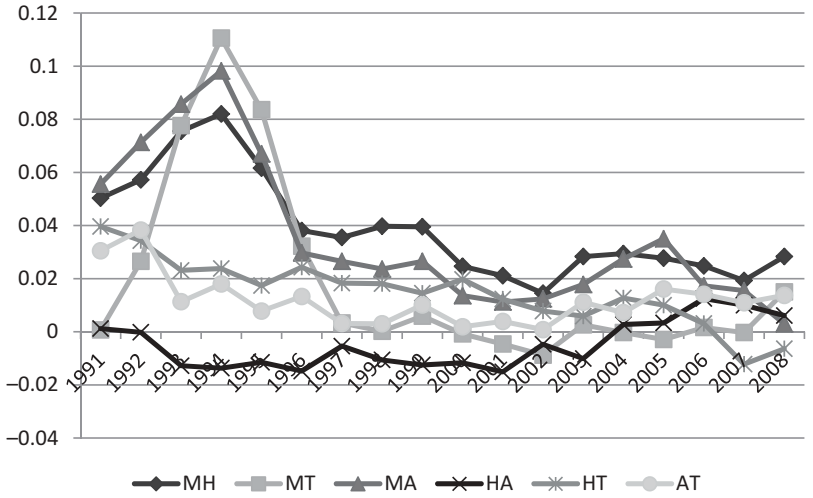

Figure 1. Dynamics of the OCA indexes of the FRTS. The OCA indexes are calculated according to the OCA index equation (1) and the OCA index theory discussed previously. *MH, MT, MA, HA, HT*, and *AT* represent the corresponding bilateral economies between the FRTS: Mainland China (M), Hong Kong (H), Macao (A), and Taiwan (T).

Empirical Analysis on the OCA Index of the FRTS

Based on Equation (1), the OCA indexes of the bilateral economies in the FRTS from 1991 to 2008 are shown in Figure 1, which reflects the dynamic evolution of the comprehensive cost of regional monetary cooperation between the FRTS. From the graph, we can draw the following conclusions.

First, except for the Hong Kong–Macao pair, the OCA indexes of the FRTS generally declined to a relatively lower level during and after the Asian financial crisis.[4] This implies that the comprehensive cost affecting regional monetary cooperation between the FRTS tended to decline to a relatively low level. In addition to the exchange rate reforms implemented in the four economies, there are two important reasons for this: the well-behaved economic interactions between the FRTS and the fact that the four economies began to pay more attention and give more consideration to regional monetary cooperation because of the lessons of the Asian financial crisis.

Second, from the OCA indexes of the three pairs of Mainland China and the other three economies (Hong Kong, Macao, and Taiwan), we find that the comprehensive costs of regional monetary cooperation between Mainland China and the other three economies were relatively high before the Asian financial crisis and relatively low after 1997. Before the Asian financial crisis, the OCA indexes of the MH and MA pairs began to drop from 0.082 and 0.098, respectively, and were maintained at a level less than 0.04. The OCA index of the Mainland China–Taiwan pair maintained the highest level among the OCA indexes for these six pairs for a long time before the crisis, but the index for this pair declined quickly after the crisis and dropped below zero in some periods.

Third, the OCA indexes between Hong Kong, Macao, and Taiwan show a tendency to decline and maintain a level below 0.02; this is strongly related to the similar degree of economic development and the arrangements related to the exchange rates. The important fact is that Macao started implementing the linked exchange rate system that has pegged the currency to the HKD since October 1983.

Finally, as a benchmark for comparison, the OCA indexes between the main EU countries and Germany before and after the establishment of the European Union are shown in Table 4. With the exceptions of Holland and Belgium, the OCA indexes for the main EU members and Germany are located at a level above 0.05. The OCA indexes of the bilateral economies between the FRTS have remained below 0.04 since the Asian financial crisis, and the differences between these OCA indexes show a significant declining trend, which means that a common economic basis for regional monetary cooperation among the FRTS has been gradually formed. From the practical experience of the European Union, we conclude that regional monetary cooperation among the FRTS is feasible. Since the global financial crisis in 2008, an important issue for governments is reducing the effect of financial shocks and improving resistance to risks by means of regional monetary cooperation. This is helpful for promoting regional monetary cooperation among the FRTS.

Conclusions and Policy Implications

Drawing on the OCA and exchange rate theories, we use an extended OCA approach to assess the feasibility of regional monetary cooperation in the FRTS. In addition to more common variables, such as differences in economic structure, inflation rates, and interest rates, we find that the asymmetric shock in money supply is an important factor affecting the comprehensive cost of regional monetary

Table 4. OCA indexes between main members of European Union and Germany

	France	Italy	Holland	Belgium	United Kingdom	Greece	Portugal	Spain	Finland
1991	0.067	0.065	–0.008	–0.008	0.094	0.054	0.066	0.082	0.095
1995	0.074	0.059	0.007	0.013	0.089	0.054	0.062	0.073	0.087

Source: Bayoumi and Eichengreen (1997), p. 765.

cooperation among the FRTS. This means that asymmetric shock in money supply can be considered as another proxy for asymmetric shocks and differences in policy preference. According to empirical analysis of the OCA indexes between the FRTS and a comparison of the OCA indexes between the FRTS and the European Union, we conclude that regional monetary cooperation among the FRTS is feasible.

The current situation of regional monetary cooperation among the FRTS, however, is far from satisfactory. This implies that relying only on spontaneous economic evolution is not enough, an idea which is consistent with the conclusion of Eichengreen and Bayoumi (1996) for several East Asian economies. Additionally, it is necessary to implement corresponding policies to promote regional monetary cooperation among the FRTS. Drawing on these conclusions, we put forward some policy suggestions.

On one hand, the Chinese government should actively promote regional monetary cooperation among the FRTS. According to the conclusions discussed, the Chinese government can implement the following policies: (1) further develop the tertiary industry to promote economic diversification, (2) strengthen inflation management to facilitate the transformation of the macroeconomic policy, (3) establish and perfect the mechanism for issuing the Chinese yuan, (4) boost the marketization reform of the CNY interest rate, and (5) deepen the reform of the Chinese financial system to improve the financial system's stability and the ability to resist risk.

On the other hand, according to the combination of spontaneous economic evolution and policy promotion, the FRTS should absorb the European Union's experiences and lessons to ensure a gradual improvement in the consistency and continuity of monetary and financial policies among the FRTS.

Notes

1. Some scholars (such as Pei 2005) argue that bilateral bond markets are the priority to the Asian financial cooperation.
2. The results of the preliminary statistical tests are available upon request.
3. The magnitude of these coefficients is analogous to those in previous studies such as Bayoumi and Eichengreen (1998).
4. To maintain the existence of the Macao pataca and avoid being completely replaced by the HKD, the Macao government has slightly adjusted its currency and exchange rate systems, but the linked exchange rate system that pegs the pataca to the HKD is still being implemented. This is the main reason for the dynamic evolution of the OCA index of the Hong Kong–Macao pair.

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