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Inter-regional Integration of Metropolitan Cluster among Shanghai, Taipei, Hong Kong, and Macao

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Abstract

The economic integration of the metropolitan cluster of the four cities among Shanghai, Taipei, Hong Kong and Macao have been developed speedily in recent years, especially after both mainland China and Taiwan joined the WTO at the end of 2001. Based on the principle of the law of one price, this paper examines the inflation rate differentials among these four cities to evaluate the degree of economic integration among them. Applying the state-of-the-art time series unit root tests, it was revealed that the degree of real integration among Taipei, Hong Kong, and Macao is higher than that among Shanghai, Hong Kong, and Macao. Shanghai has some economic integration with Taipei, probably it was driven by the complemtarity of the two technology industries across the strait. However, the integration is far from complete within these four cities. This signifies the importance of policy support during the inter-regional integration process. The development of a free trade area among them, and with mainland China and Taiwan as a whole, may also promote the regional integration endogenously.

Keywords: Economic integration, PPP, Shanghai, Taipei, Hong Kong, Macao

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1. Introduction

The metropolitan cluster of the four cities among Shanghai, Taipei, Hong Kong and Macao is one of the most dynamic areas in Asian economy. The real GDP growth rate of Shanghai has been persistently above 10%, which is higher than the average growth rate of mainland China. It is better-known that the success of Shanghai is dependent on the support from both Taiwan and Hong Kong to a large extent.

Nevertheless, Hong Kong's economy has been subject to an important structural change recently. Unlike Taiwan, the hi-tech industry in Hong Kong has never been built up after the whole manufacturing sector moved to the southern part of Guangdong province. The Hong Kong economy is left almost to the service sector with a GDP share higher than 90% (Ma, 2004; Li, 2005). As a major trading partner with mainland China, the share of Hong Kong-mainland trade has been declining incessantly and the Hong Kong's position in mainland economy has been marginalized in recent years.

In contrast, Taiwan's position in mainland has been rising steadily through her investment in Shanghai by the hi-tech industry. As a result, the competition among the Yangtze River Delta, where Shanghai is the centre, and the Pearl Rive Delta, where Hong Kong is the neighbour, has been intensified. For example, only one year after mainland China entered the WTO, the amount of foreign direct investment (FDI) in Yangtze River Delta in 2002 surpassed the Pearl River Delta the first time in history. The north-shift of the FDI from the southern part of mainland will no doubt increase as the information technology (IT) industry from Taiwan will

intensify its investment on Shanghai (Saxenian, 2005). However, due to the lack of the hi-tech industry, Hong Kong is unable to provide what mainland China vitaly needed in the next stage of economic development and therefore may continue to be marginalized in the near future.

To face these challenges, the mainland government has signed two free trade agreements (FTA) with Hong Kong and Macao respectively, i.e., the Mainland and Hong Kong/Macao Closer Economic Partnership Arrangements (CEPAs), which effectively opened up the entire mainland market, including both Yangtze River Delta and the Pearl Rive Delta, to both Hong Kong and Macao. Subsequently, the mainland government also unilaterally opened up some markets such as the fruit and fish markets to Taiwan (Hille, 2005).

Nevertheless, there are two critical questions one must address before going further to discuss the implications of future development of the metropolitan cluster of Shanghai, Taipei, Hong Kong and Macao.

The first question is the current economic interdependence among the four cities. This is important to understand the current situation of the regional cluster and to explore the potential development opportunities within the cluster. The second question is the degree of economic integration between the four cities.

Existing literature have touched upon both questions. However, they have based their research upon some descriptive analysis. For example, Kueh (1992) and Sung (2004) studied the economic interaction among the mainland China, Taiwan, and Hong Kong. Cai and Sit (2003) developed an indicator to measure the world city formation including Shanghai and Hong Kong. Laurenceson and Tang (2005) and Ma (2006) compared roles of Shanghai and Hong Kong as two international financial centers for China. Ma, et al (2007) studied the performance of Hong Kong and

Singapore under different exchange rate systems. Saxenian (2005) explored the technology transfer triangle among Silicon Valley, Hsinchu, and Shanghai.

Other studies are broad analysis to cover the whole mainland China and the world economy. Lo and Chan (1998) discussed the contributions to the trade-growth nexus through imports and non-market institutions. Hu and Ma (1999) studied the intra-industry trade of China with other developed economies. Ma *et al* (1998) built a two-region model of mainland China and Hong Kong to investigate the impacts of China factors on the Hong Kong economy. Tsang and Ma (2004) incorporated a Chinese macroeconometric model (Tsang and Ma, 1997) into the multi-country model of the MULTIMOD (Mark II), developed by the IMF (Masson, Symansky and Meredith, 1990). This integrated global model provided a general vehicle for the analysis of the spillover effects among the economies of China and the rest of the world. Based on some counterfactual simulations conducted on this integrated model, it was found that the Chinese economy is far from full integration with the rest of the world. There are also some researches based on computable general equilibrium model to calculate impacts of China's entrance to the WTO on the ASEAN economies (Tongzon, 2001).

Although the descriptive and model-based analyses are important to discuss and quantify the economic interdependence of the regional economic development, it suffers some serious drawbacks. For example, the economic measures based trade volume cannot signify the distortion came from trade barriers as they are not compared with the benchmark of free market. Therefore, they cannot indicate the *degree* of economic integration among regions under study.

This paper intends to fill in this gap by providing a supplementary price-based measure to investigate the degree of real integration among the metropolitan cluster of Shanghai, Taipei, Hong Kong and Macao. Specifically, the concept of law of one price (LOOP) is applied to study the degree of real economic integration.

If the two economies are fully integrated in goods and (tradable) services markets, then the law of one price should hold for the two economies, as there would have existed risk-free arbitrage opportunities otherwise. The LOOP concept is also regarded as the relative purchasing power parity (PPP) and has been tested extensively for many countries in the world. Although few economists would hold the view that the LOOP hold continuously in the short-run, it has been found among integrated, developed economies that the LOOP holds in the long-run (Rogoff, 1996).

It should point out that the price-based measure also has its own limitations. For example, it could not differentiate whether the cause of integration is due to complementarity or competition among the economies (Ma, 2004), which can be investigated by the volume-based or model-based measures. Hence the price-based measure should be regarded as a supplement to other measures of integration.

Nevertheless, so far as to the author's knowledge, the LOOP concept has not been tested to study the economic integration among the metropolitan cluster of Shanghai, Taipei, Hong Kong and Macao. This paper is the first attempt in the literature to fill in this gap.

The remainder of the paper is organized as follows. Section 2 provides some descriptive analysis of the trade flows among the metropolitan cluster of Shanghai, Taipei, Hong Kong and Macao and presents some volume-based evidence of real economic integrations. Section 3 defines the

parity conditions of the price-based measure utilized in this paper for investigation of the degree of economic integration of the four cities. Section 4 tests the parity conditions. Finally, Section 5 concludes.

2. Volume-based measures of economic integration among Shanghai, Taiwan, Hong Kong and Macao

Table A provides some of the main economic indicators of Shanghai, Taiwan, Hong Kong and Macao for the year 2004 (unfortunately trade and GDP data are unavailable for Taipei city). It shows that the largest economy in terms of GDP and population was Taiwan, which had US$317 billion of output with a population of 22.7 million in total. Hong Kong and Macao were the richest regions with US$23,700 and US$22,600 of GDP per capita respectively. Their incomes per capita were much higher than that of Taiwan (US$14,000) and Shanghai (US$6,700) in 2004.

For the external sector regarding to the international trade, Shanghai, Taiwan, and Macao have a total trade volume of US$187, US$11.1, and US$6.4 billion respectively in 2005(cf. Tables B, E, and D). These figures are well below Hong Kong's trade volume of US$240 billion in 2003. Hong Kong's trade in fact was dominated by re-export (US$208bn), especially by re-export with Mainland China (US$90bn). Parenthetically, however, it should point out that the total export of Shanghai did not include its exports to other regions in Mainland China due to lack of data. Therefore, it might have well under-estimated the actual trade volume of Shanghai city.

Furthermore, if we decompose the total exports into bilateral trade flows, it seems that the trade between Shanghai and Taiwan (US$13bn) was more intensive than the trade between Shanghai and Hong Kong (US$10bn)

(cf. Table B). And the trade between Taiwan and Hong Kong (US$970 mil.) was much more intensive than the trade between Taiwan and Macao (US$10 mil.) (cf. Table E). And the trade volume between Macao and Hong Kong was more than that between Macao and Taiwan (cf. Table D). Unfortunately, there is no bilateral trade volume with Shanghai in the official statistics of Taiwan, Hong Kong and Macao.

To explore why Shanghai has more bilateral trade with Taiwan than with Hong Kong, this paper looks into their technology trade in details.

Table F presents the technology imports by the mainland in 2005. It shows that the EU countries are relative keen to export the technological products and services to mainland China, followed by Japan. The US has certain degree of reservations. It also shows that the imports from Hong Kong declined substantially from the previous year, whilst imports from Taiwan increased dramatically. Furthermore, Table G decomposes the total imports into regional imports by mainland China in 2005. It reveals that Shanghai and Beijing two cities are the biggest importers of technology from overseas, with 28% and 21% share respectively. All the remaining regions have an import share well below 10%.

This seems to imply that the origin of the globalization is the developed economies of the US, EU, and Japan, which controlled the most-advanced technologies. They sell part of the technologies to medium-advanced economies like Taiwan, through which it was sold to less-developed economies such as mainland China. For example, Table E shows that Taiwan's import from Japan is much higher than her export to Japan. And Shanghai's imports from both Taiwan and Japan are much higher than her exports to Taiwan and Japan (cf. Table B). However, the final destination of the

globalization goes back to the developed economies of the US, EU, and Japan as they have the biggest consumer markets (cf. Tables B, C, and D).

From the above analysis, it suggests that the closer trade connection between Shanghai and Taiwan is probably due to the complementarity of the two hi-tech industries across the strait. Whilst Hong Kong, due to her lack of hi-tech industrial sector, trades less with Shanghai.

To conclude, the volume-based measures provide some evidence of real economic integration within the metropolitan cluster of Shanghai, Taiwan, Hong Kong and Macao. However, due to the limitations of the volume-based measures and the lack of detailed data on the bilateral trade flows, it remains uncertain to what extent the integrations have been achieved so far. This important issue is to be investigated by the price-measure in the subsequent analysis.

3. Definitions for integration conditions

The real sector's integration can be considered under the concept of the relative purchasing power parity (PPP) based on the principle of the law of one price (LOOP). If the real sectors of any two economies, namely home and neighbouring economy, are fully integrated, then there should not have any arbitrage opportunity and the law of one price should hold. Due to lack of the data on the absolute price level, consumer price index is usually utilized to proximate the price level (Rogoff, 1996). If the law of one price holds, then the inflation rate differential, after converting into a common currency such as US dollar, of the two integrated economies should converge towards zero. Hence we should expect the relative purchasing power parity (RPPP) differential converge towards to zero:

$$\text{RPPP} \equiv \pi_{t,j}^{e,h} - \pi_{t,j}^{e,n} - \Delta s_{t,j}^{e,h} + \Delta s_{t,j}^{e,n} \quad (1)$$

where $\pi_{t,j}^{e,h}$ and $\pi_{t,j}^{e,n}$ are the j-period ahead, expected inflation rates in home and neighbouring economy, respectively. The superscripts 'h' and 'n' denote home and neighbouring economy respectively. The superscript 'e' indicates the expectation. $\Delta s_{t,j}^{e,h}$ (and $\Delta s_{t,j}^{e,n}$) is expected depreciation of home currency (and neighbouring economy's currency) against US dollar in the next j-period (Meredith and Ma, 2002).

The necessary condition for the time series RPPP to have a zero mean is that RPPP must be stationary. Hence a unit root test on the RPPP should be also conducted after the unit root tests are performed on the individual region's inflation rate to examine the real integration. Finally, the zero-mean test may be carried out on RPPP to test whether the integration is complete or incomplete.

4. Empirical results

In this section, we first test the unit root in each time series of inflation rates, converted into a common currency of the US dollar. Then we apply the unit root tests to the relative purchasing power parity (RPPP) for these economies.

Monthly data on consumer price indices, nominal bilateral exchange rates against the US dollar are collected from February 1988 to July 2006. The monthly series of consumer price index (CPI) of Hong Kong and Macao, and bilateral exchange rates of local currency value per US dollar for mainland China, Hong Kong and Macao were retrieved from the International Financial Statistics (IFS) published by the IMF. The monthly series of consumer price index (CPI) for Shanghai was collected from China

Monthly Statistics. The data source of the CPI of Taipei city and Taiwan-US dollar bilateral exchange rate is from Taipei Monthly Price Statistics. All the CPI series were seasonally adjusted.

The modified form of unit root test developed by Ng and Perron (2001) is applied for all the time series and parity differentials. This test modifies the point-optimal unit root test proposed by Elliott, Rothenberg and Stock (1996), together with the modified AIC lag selection criterion. This modified test dominates the commonly used tests such as the Augmented Dickey-Fuller (ADF) test in terms of asymptotic power to reject the false null hypothesis of unit root. A Monte Carlo experiment conducted by Ng and Perron (2001) also indicates that in small samples the modified test works well in terms of both the power and avoidance of size-distortion of wrong rejection of true null hypothesis of unit root.

Table 1 presents the Ng and Perron (2001) modified unit root test results for the inflation rate of each individual economy calculated in US dollar. It shows that all inflation rates in the four cities have a unit root. Their inflation rates are only stationary after first-difference. This implies each inflation rate has a stochastic trend.

Next we apply the Ng and Perron (2001) modified unit root test to the inflation rate differentials among the four cities (cf. Table 2). It shows that the inflation differentials between Shanghai and Hong Kong, as well as between Shanghai and Macao both still have a unit root, at the 5% significance level. This implies that the stochastic trend of Shanghai's inflation rate is different from that of Hong Kong and Macao. Therefore the relative PPP does not hold among these two pairs of cities. As a result, there is no evidence of economic integration among them.

However, the unit root test for the relative PPP between Shanghai and Taipei rejected the unit root at the 5% significance level. This indicates that the two stochastic trends in the inflation rates of the two cities are the same and therefore there are indeed some long-run real economic integration built-up between these two cities during the sample period of February 1988 to July 2006. This result is probably due to the close complementarity between the technology industries of the two cities (Saxenian, 2005).

Finally, Table 2 also reveals that the inflation differentials among Taipei, Hong Kong, Macao do not have a unit root. This means these three cities have integrated well in the sample period.

However, a complete integration must have a zero-mean for the stationary parity differentials defined in equation (1). Hence the following regression is estimated:

$$\nabla_{i,j}RPPP_t = \alpha + \beta_1 t + \beta_2 t^2 + u_t, \quad (2)$$

where $\nabla_{i,j}RPPP_t$ is the inflation rate differential between region i and j (both in terms of US dollar) [cf. eq.(1)], the constant α is the inflation differential parameter, t is the linear time trend, β_1、β_2 are both parameters u_t is the error term with $u_t \sim ARMA(2,2)$. The t-statistic is computed based on the heteroskedasticity and autocorrelation consistent (HAC) covariance matrix (Newey and West, 1987). A necessary condition of full integration with zero mean of inflation differential is $\alpha=0$.

The regression results are reported in Table 3. It was found that all the inflation differential parameters α are significantly different from zero at the 5% level.

To conclude, the zero-mean test for the inflation differential parity suggested that the economic integration among the metropolitan cluster of Shanghai, Taipei, Hong Kong and Macao is far from complete. The

economic integration will continue in the long-run until all the unit roots among the inflation differentials disappear, and the mean of the inflation differentials passes the zero-mean tests and converges toward zero.

5. Conclusion

The volume-based measures of trade flows reveal that there are certain degree of real economic interdependence already taken place among the metropolitan cluster of Shanghai, Taiwan, Hong Kong and Macao.

Based on monthly data over the sample period of February 1988 to July 2006, the price-based measure is applied to evaluate the degree of the real economic integration of the metropolitan cluster of Shanghai, Taipei, Hong Kong and Macao. The main findings of this paper are that the degree of real integration among Taipei, Hong Kong, and Macao is higher than that among Shanghai, Hong Kong, and Macao. Shanghai has only long-run economic integration with Taipei; probably it was driven by the complemtarity of the two technology industries across the strait. The three cities of Taipei, Hong Kong, and Macao have long-run integration among each other. However, the integration is far from complete within the four cities.

Given the mixed results of our findings, there remains further research to explore how domestic and cross-region governmental policies may help further the integration of these four cities. The real integrations may actually be accelerated within the free trade area (FTA) agreements between mainland and Hong Kong/Macao (CEPAs), similar to the arguments based on the comparative advantage and specialization of free trade developed by David Richard (1817) two hundred years ago. Within a FTA, transaction costs and trade barriers would be reduced. That would enhance real

economic integration (Ma, 2008). This could create a virtuous circle for the regional development. It is however the optimistic view of the FTA. Cautions and serious considerations should also be made to the potential negative effects of the FTA (Ma, 2001; Zhao, Ma, et al, 2003; Sun and Ma, 2005; Ma and Sun, 2007).

For Mainland China, the impacts of her WTO membership are yet to go through fully after the four to five years of the grace period. It is nevertheless unclear whether her relationship with the other three cities of Taipei, Hong Kong and Macao is complementary or competitive, or both. Especially, the future of Hong Kong is undetermined and is full of opportunities and challenges at the same time. Will Hong Kong continue to serve for the giant growth engine of Pan-Pearl River Delta, or develop some new market niches such as the hi-tech industry that is most wanted by the mainland market (Ma, 2004)? All these questions and issues will be very interesting topics for future research to appreciate the implications of real economic integrations of the metropolitan cluster of Shanghai, Taipei, Hong Kong, and Macao, and of its integration with mainland China and global economy.

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Table A. Economic Performance of Shanghai, Hong Kong, Macao, and Taiwan in 2004

Region	GDP (US$, bn)	Real GDP growth rate, %	GDP per capita (US$)	Population (mil.)
Shanghai	90	13.6	6,700	13.5*
Hong Kong	163	8.1	23,700	6.88
Macao	10	28.0	22,600	0.46
Taiwan	317	4.1	14,000	22.7

Note: * Year-end registered population.

Source: China Statistical Yearbook 2005, Shanghai Statistical Yearbook 2005.

Table B. Major trading partners of Shanghai in 2005 (US$, bn)

Region	Exports	Imports
Total	91	96
Hong Kong	9	1
Taiwan	3	10
Japan	13	17
S. Korea	3	8
Singapore	2	3
Other Asian	9	19
Africa	1	1
Europe	22	18
US	23	11
Australia	2	2
Others	5	5

Source: Shanghai Statistical Yearbook 2006, Table 8.7, Table 8.8.

Table C. Major trading partners of Hong Kong in 2003 (US$, bn)

Region	Imports	Domestic Exports	Re-exports
Mainland China	101	4.7	90
US	13	5.0	37
Japan	27	0.4	12
Taiwan	16	0.5	5
Singapore	12	0.3	4
S. Korea	11		4
Malaysia	6		
Germany	5	0.6	7
UK	1		6
Thailand	4		
Philippines	4	0.2	
Netherlands	0		3
Total	232	15.6	208

Source: Hong Kong Census and Statistics Department.

Table D. Major trading partners of Macao in 2005 (US$, 100 mil.)

Region	Imports	% share	Domestic Exports	% share	Re-exports	% share
Total	39.2	100.0	18.0	100.0	6.8	100.0
Mainland China	16.9	43.1	0.3	1.5	3.4	49.9
EU	5.1	13.1	4.2	23.2	0.1	1.0
Japan	4.3	10.9	0.2	1.1	0.0	0.1
Hong Kong	3.9	10.0	0.5	2.8	1.9	28.3
Singapore	2.0	5.2	0.0	0.1	0.0	0.2
US	1.6	4.1	11.9	66.2	0.2	2.5
Taiwan	1.6	4.0	0.2	1.0	0.1	0.8
S. Korea	0.8	2.1	0.0	0.2	0.0	0.0
Thailand	0.6	1.4	0.0	0.2	0.0	0.5
Malaysia	0.4	1.1	0.0	0.2	0.0	0.5
Other Asian	0.4	1.0	0.2	1.3	0.0	0.7
Australia	0.4	1.1	0.0	0.2	0.0	0.3
Indonesia	0.2	0.4	0.0	0.0	0.0	0.0
Others	0.9	2.4	0.4	2.1	1.0	15.1

Source: Macao Statistical Yearbook 2005.

Table E. Major trading partners of Taiwan in 2005 (US$, 100 mil.)

Region	Rank	Total trade	% share	Rank	Exports	% share	Rank	Imports	% share
Total		110.8	100.0		56.6	100.0		54.2	100.0
OtherAsian		1.2	1.1		0.9	1.6		0.3	0.6
EU		11.8	10.6		6.6	11.6		5.2	9.6
Mainland China	1	18.2	16.4	1	12.2	21.6	3	6.0	11.0
Japan	2	18.0	16.3	4	4.3	7.6	1	13.7	25.3
US	3	14.8	13.3	3	8.5	15.1	2	6.3	11.6
Hong Kong	4	9.7	8.8	2	9.2	16.2	19	0.6	1.0
S. Korea	5	5.6	5.1	6	1.7	2.9	4	3.9	7.3
Singapore	6	3.8	3.4	5	2.3	4.0	8	1.5	2.7
Malaysia	8	2.8	2.5	10	1.2	2.2	7	1.6	2.9
Australia	10	2.1	1.9	14	0.7	1.2	9	1.4	2.6
Philippines	11	2.1	1.9	9	1.3	2.2	13	0.8	1.5
Indonesia	12	2.1	1.9	15	0.7	1.2	10	1.4	2.5
Thailand	13	2.0	1.8	12	1.1	2.0	12	0.9	1.6
Vietnam	17	1.4	1.3	11	1.2	2.1	34	0.2	0.4
Macao	54	0.1	0.1	43	0.1	0.2	68	0.0	0.0
Others	15	15.2	13.7	0	4.6	8.1	0	10.6	19.5

Source: Directorate General of Customs, Ministry of Finance, Taiwan.

Table F. Mainland China Technology Imports from Ten Main Suppliers in 2005

(US$, 10 thousands)

	Region	**No. of contracts**	**Amount of contracts**	**Fees & Royalty of Technology**	**% share**	**Growth rate, %**
	Total	9902	1905062.7	1183413.7	100	37.5
1.	EU	2512	906847.7	421640.0	47.6	64.5
2.	Japan	2573	385462.4	322613.2	20.2	31.2
3.	US	1537	339549.1	205159.1	17.8	16.2
4.	S. Korea	617	89268.2	81446.4	4.7	10.6
5.	Hong Kong	1159	55904.6	46071.1	2.9	-17.5
6.	Swiss	121	41673.5	35956.7	2.2	5.0
7.	AEASN	379	26639.0	21025.0	1.4	75.9
8.	Virgin Islands	96	12924.3	10532.3	0.7	53.2
9.	Canada	186	11140.6	5940.8	0.6	56.1
10.	Taiwan	243	9865.6	9684.4	0.5	14.0

Source: Department of Scientific and Technological Development, Ministry of Commerce, Beijing,
http://kjs.mofcom.gov.cn/aarticle/ztxx/dwmyxs/u/200601/20060101418975.html

Table G. Technology Imports by Mainland Regions in 2005 (US$, 10 thousands)

	Region	No. of contracts	Amount of contracts	Fees & Royalty of Technology	% share	Growth rate, %
	Total	9902	1905057.2	1183408.2	100	37.5
1.	Beijing	2013	401684.23	176535.51	21.1	90.9
2.	Tianjin	509	26575.37	24887.39	1.4	-46.0
3.	Hebei	60	6333.77	5478.87	0.3	-42.9
4.	Shanxi	17	744.19	744.19	0.0	-74.6
5.	Inner Mongolia	7	3753.9	450.61	0.2	
6.	Liaoning	123	10402.23	8191.69	0.5	-72.4
7.	Dalian	173	15693.35	15693.35	0.8	27.8
8.	Jilin	206	26157	25321.72	1.4	447.6
9.	Heilongjiang	31	5375.28	4456.2	0.3	-83.9
10.	Shanghai	2878	534217.23	435376.49	28.0	47.3
11.	Jiangsu	512	59432.08	56507.83	3.1	24.5
12.	Zhejiang	335	96989.11	93710.53	5.1	103.9
13.	Ningbo	169	15598.48	15598.48	0.8	58.7
14.	Anhui	184	63329.7	15149.62	3.3	216.3
15.	Fujian	134	6972.55	6972.54	0.4	79.6
16.	Xiamen	207	20396.47	20215.09	1.1	-45.9
17.	Jiangxi	68	7249.19	5018.99	0.4	58.9
18.	Shandong	129	32721.21	15985.51	1.7	160.5
19.	Qingdao	528	10093.09	10093.02	0.5	21.1
20.	Henan	19	3553.94	2516.86	0.2	-40.2
21.	Hubei	111	44488.96	43768.71	2.3	207.4
22.	Hunan	37	19459.17	9995.88	1.0	142.1
23.	Guangdong	154	22142.85	17815.86	1.2	42.5
24.	Guangzhou	228	18437.86	18063.55	1.0	65.4
25.	Shenzhen	155	44127.25	28583.86	2.3	41.6
26.	Guangxi	50	2810.17	2808.62	0.1	25.8
27.	Hainan	9	4369.91	4369.91	0.2	-55.7
28.	Sichuan	245	28743.53	17193.38	1.5	40.6
29.	Chongqing	211	15862.77	15850.27	0.8	-1.6
30.	Guizhou	14	5817.07	5817.07	0.3	83.0
31.	Yunnan	68	4994.3	2900.91	0.3	-20.1
32.	Shaanxi	40	5124.26	5105.68	0.3	11.5
33.	Gansu	7	3765	3765	0.2	-12.1
34.	Qinghai	9	3199.7	1383.04	0.2	1731.9
35.	Ningxia	13	6404.63	4721.65	0.3	89.1
36.	Xinjiang	19	4910.66	1897.75	0.3	138.9

Source: Department of Scientific and Technological Development, Ministry of Commerce, Beijing, http://kjs.mofcom.gov.cn/aarticle/ztxx/dwmyxs/u/200601/20060101418975.html

Table 1. Unit root test for inflation rates (converted into US$ as common currency)

Sample period: Feb. 1988 to July 2006

Region	H_0: I (1) Lags	Test statistic	H_0: I (2) Lags	Test statistic	Conclusion
Shanghai	4	1.3968	8	6.1795	I (1)
Hong Kong	2	2.6230	4	17.5175	I (1)
Macao	2	3.1752	6	8.6671	I (1)
Taipei	6	4.5053	5	15.8778	I (1)

Note: The critical value of the 5% significance level is 5.4800. Lag is the number of augmenting terms included. Time trend is included in the tests. Conclusion is based on the 5% significant level.

Table 2. Long-run bilateral integration test

Region	Unit root test for inflation rates differentials H_0: I (1) Lags	Test statistic (1)	Conclusion	Integration?	Zero-mean test for inflation rates differentials H_0: $\alpha=0$ (2) α	t-stat.	P-value	Complete integration?
Shanghai vs HK	4	1.7124	I (1)	no				
Shanghai vs Macao	4	1.5581	I (1)	no				
Shanghai vs Taipei	14	8.5109	I (0)	yes	-2.554	2.871	0.0045	no
HK vs Macao	9	30.165	I (0)	yes	0.441	4.316	0.0000	no
HK vs Taipei	9	6.7029	I (0)	yes	0.525	1.922	0.0490	no
Macao vs Taipei	9	5.7032	I (0)	yes	0.303	2.158	0.0320	no

Note: (1) The critical value of the 5% significance level is 5.4800 (cf. Table1).

(2) α is inflation differential parameter from regression:

$\nabla_{i,j}RPPP_t=\alpha+\beta_1 t+\beta_2 t^2+u_t$, u_t~ARMA(2,2), where $\nabla_{i,j}RPPP_t$ is the inflation rate differential between region i and j (both in terms of US dollar) [cf. eq.(1)], t is the linear time trend, β_1、β_2 are both parameters u_t is the error term with u_t ~ ARMA(2,2). The t-statistic is computed based on the heteroskedasticity and autocorrelation consistent (HAC) covariance matrix (Newey and West, 1987).

大都市城市群的經濟互動與整合：滬臺港澳的實證研究

馬　躍

摘要

本文通過跨境流量指標和價格差異指標，探討滬港澳及臺北城市群的市場整合程度。從跨境流量指標來看，滬港澳臺地區的貿易已有一定整合。但由于跨境流量指標的局限性，它們難以反應兩地區的整合程度。譬如，貿易量不能揭示貿易壁壘對整合程度的影響。因此本文進一步採用價格差異指標，測量地區間的整合程度。因為在經濟一體化的情況下，價格差異應是零均值的平穩時間序列。通過實證檢驗，本文發現港、澳、臺北市之間的經濟整合程度，高于上海與港澳兩地的經濟整合程度。由于兩岸科技產業的互補性，上海與臺北市有一定的經濟整合。但滬港澳臺北之間的整合，都遠未達到完全一體化的程度。這說明政府政策在區域整合過程中的重要性。大陸與港澳最近簽訂的自由貿易區的協定，也許能進一步推動區域間的內生性的整合過程。

關鍵詞：經濟整合、購買力評價、上海、臺北、香港、澳門