PRICE CONVERGENCE BETWEEN HONG KONG AND THE MAINLAND

(Preliminary draft)

Key points:

- *Hong Kong underwent considerable price deflation in recent years, amid the Asian financial crisis of 1997 and the recent global economic downturn. The deflation coincided with a growing integration of the Hong Kong economy with the Mainland, making it difficult, but increasingly important, to disentangle the factors accountable for the deflation. This paper represents an effort to do so. However, due to the limited number of observations and possible measurement errors of data, a great deal of caution needs to be exercised in interpreting the results, which are summarized below.*

- *Using panel data on commodity prices of Hong Kong and four Mainland cities of the past decade, we find statistical evidence of price convergence between Hong Kong and the Mainland cities, with the average half-life of the price differentials estimated at 6½ years. The speed of convergence differs significantly cross the spectrum of products. Nevertheless, we are unable to find statistical evidence of eventual price equalization between Hong Kong and the Mainland.*

- *The deflationary effect of price convergence, mainly contributed by food and clothing, is estimated to have reduced Hong Kong's price level by about 2% over the past four years, when the consumer price index dropped by over 10%, and the effect diminishes as the price gap narrows over time. Cyclical conditions and shocks to competitiveness play more important roles in determining Hong Kong's inflation dynamics.*

- *Looking ahead, price differentials between Hong Kong and the Mainland will depend importantly on price developments in the latter. Prices in the Mainland could be elevated by rising income as the economy continues to grow rapidly. On the other hand, the increase in productivity and reduction in tariff and non-tariff trade barriers following the WTO accession could exert renewed downward pressures on prices in Hong Kong.*

- *Prices in Hong Kong and the Mainland cities converge more slowly than prices among the Mainland cities do, reflecting differences in the degree of factor mobility, taxes, levels of economic development, and the effect of exchange rate pass-through. Price convergence among the Mainland cities has occurred at a rate estimated to be about the same as that across US cities.*

Prepared by: Jiming Ha and Kelvin Fan
Economic Research Division
Research Department
Hong Kong Monetary Authority

I.   INTRODUCTION

Prices in Hong Kong declined markedly in recent years, with the composite consumer price index (CCPI) falling by more than 10% from the peak recorded in May 1998 (Chart 1). The downward price adjustment has coincided with rising unemployment and falling asset prices, and hence drawn great attention of policymakers and the public alike. An issue arises as to what are the major factors behind the price adjustment observed in recent years. Using macro-level data, our previous studies found that the deflation is largely attributable to cyclical conditions and, to a lesser extent, to changes in import prices in Hong Kong dollar terms (e.g., Ha and Leung (2001)). Like many other economies in the region, the Hong Kong economy was affected by the Asian financial crisis of 1997 and the recent global economic downturn. As a result, a sizable output gap emerged in 1998 and is projected at 2½% of GDP in 2002. During 1998 and 2001, the index of Hong Kong's import prices declined by 12%, reflecting mainly a 10% appreciation of the nominal effective exchange rate.

**Chart 1. Consumer Prices and Nominal Exchange Rate**

(In logarithm)
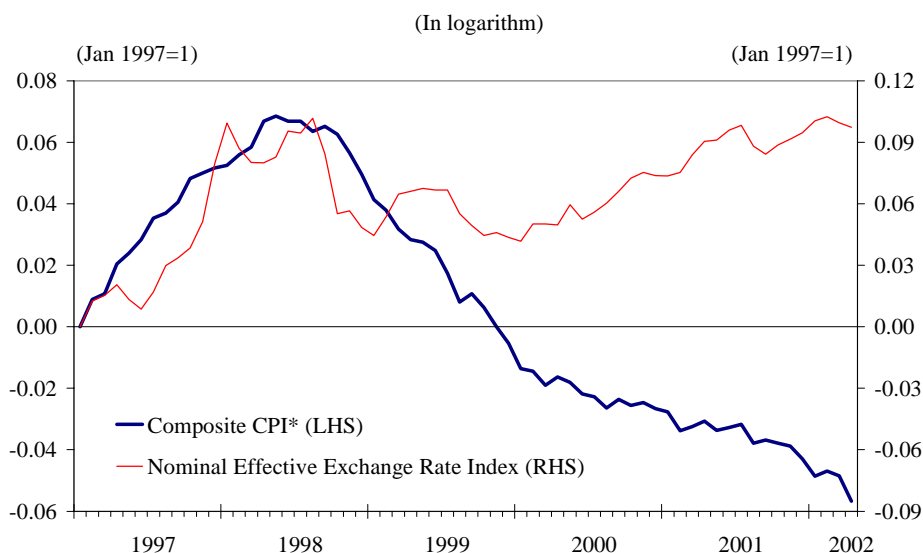
Sources: CEIC and HKMA staff estimates.
*Note: * Composite CPI is adjusted for special one-off factors, e.g. rates concession.*

However, the downward price adjustment has concurred with a growing integration of the Hong Kong economy with the Mainland in the late 1990s, making it difficult to disentangle the forces that might have simultaneously impacted prices in Hong Kong. Consumer prices in Hong Kong are influenced by prices in the Mainland mainly through two channels: trade and cross-boundary consumption, both of which have increased rapidly since 1997. For example, retained imports from the Mainland and Hong Kong visitors to the Mainland surged by over 40% and 50% respectively during 1997-2001 (Chart 2). The increased economic integration has led to a general impression that the downward price adjustment in Hong Kong reflects a tendency of convergence towards the price level in the Mainland and may eventually lead to price equalization. However, a number of important questions need to be answered before that impression can be justified. How fast do prices in Hong Kong move towards those in the Mainland? To what extent has price convergence, if

any, influenced prices in Hong Kong? Is the current deflation process mainly accounted for by price convergence or other factors?

Chart 2. Hong Kong's Trade and Tourism with the Mainland
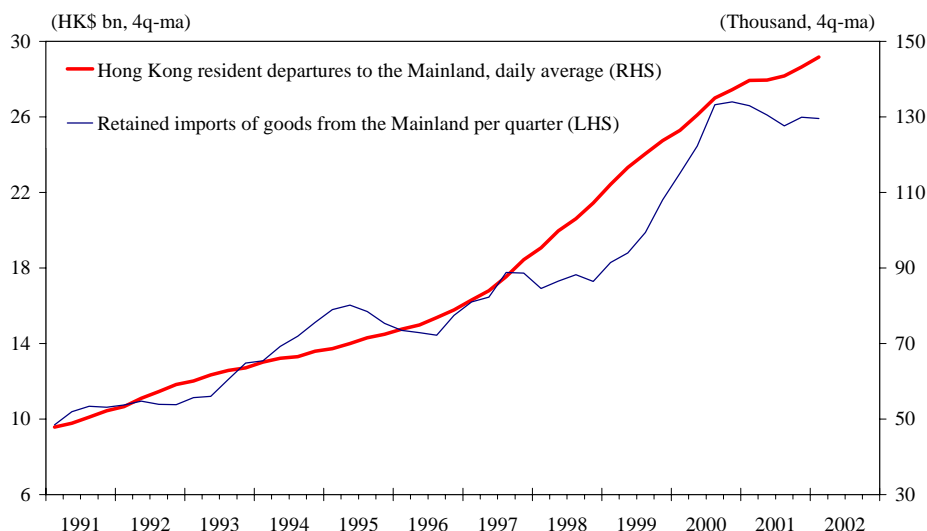
Sources: CEIC and HKMA staff estimates.

Using a panel of city-level commodity prices of the past decade, this paper provides an econometric study on price convergence between Hong Kong and the Mainland, with a view to addressing the issues raised above. This paper represents, to our best knowledge, the first empirical study of price convergence using data on product prices in Hong Kong and the Mainland. The rest of the paper is organized as follows. Section II briefly reviews the literature and methodologies related to studies of price convergence. Section III begins with a statistical analysis of the data and subsequently examines price convergence and its impact on inflation. Section IV looks into price convergence among selected cities in China, and compares it with the result of Section III and the studies on other economies of the world. Section V presents concluding remarks. Finally, the data are described in Appendix.

II.   REVIEW OF LITERATURE AND METHODOLOGY

Studies of cross-city price convergence in the literature so far have focused on the United States and countries of the euro area, largely in the context of testing the law of one price. Engel and Rogers (1994) examine the nature of the deviation from purchasing power parity, using price data for the US and Canada. They find that the distance between cities explains a significant portion of the variation in the prices of similar goods in different cities, but the variation of the price is much higher for two cities located in different countries than for two equidistant cities in the same country. Parsley and Wei (1996) estimate the rate of price convergence within the United States, using a panel of 51 prices from 48 cities in the US. They find convergence rates substantially higher than typically found in cross-country data. They also present evidence that convergence occurs faster for larger price differences and that rates of convergence are slower for cities farther apart, confirming the findings by Engel and Rogers (1994). Using price indices of 19 US cities, Cecchetti, Mark, and Sonora

(2000) find price-level divergences across US cities to be fairly large and long-lasting. They estimate half-life of convergence to be approximately nine years. They also find that the speed of convergence depends positively on the size of price differential. Rogers (2001) finds evidence of price convergence in the 1990s among countries in the euro area. He notes that price dispersion of traded goods across the euro area is now close to that across US cities, but deviations from the law of one price are still large, despite an ongoing process of convergence. However, he finds that factors other than price convergence explain most of the cross-country inflation process.

These authors study price convergence by conducting panel unit-root tests on inter-city price differentials. As the univariate unit-root test often fails to reject the null of a unit root when it is in fact false, due to its low power, one way that researchers have confronted this problem has been to exploit the panel dimension of data. Levin and Lin (1992) show that panel data can dramatically increase the power of the unit-root test, and in contrast to the univariate case, the test statistic in a panel context is asymptotically normal.

Tests of price convergence are typically carried out through estimating the following equation,

$$\Delta q_{i,k,t} = \alpha_{i,k} + \beta q_{i,k,t-1} + \sum_{n=1}^{N_i} \gamma_n \Delta q_{i,k,t-n} + \varepsilon_{i,k,t} \tag{1}$$

where $q_{i,k,t}$ is the log-difference in the price of product i in city k, relative to a benchmark city at time t, and Δ is the first difference operator.[1] The length of lags N_i, used to account for possible serial correlation in the error term as in a univariate augmented Dickey-Fuller test, can be determined by Campbell and Perron's (1991) top-down t-test approach, which involves initially specifying a sufficiently long length of lags to the extent permitted by data and then sequentially eliminating the lags that are not significant.

Central to the test of convergence is the estimated value of β. If $\beta = 0$, the price differential $q_{i,k,t}$ is non-stationary, implying persistent or explosive price divergence. A negative value of β suggests price convergence, and its magnitude determines the speed of convergence. Specifically, the half-life of a shock to the price differential is computed as – $\ln(2)/\ln(1+\beta)$.[2] The estimated value of $\alpha_{i,k}$ can be used to test the hypothesis of long-run price equalization. A value of $\alpha_{i,k}$ not significantly different from zero suggests that the price of product i in the benchmark city will eventually be equal to that in city k. On the contrary, a value of $\alpha_{i,k}$ significantly positive suggests that the price of product i in the benchmark city will be persistently higher than that in city k.

III.   CONVERGENCE BETWEEN HONG KONG AND THE MAINLAND

---

[1] In Rogers (2001) $q_{i,k,t}$ is defined as percentage change in prices.

[2] If equation (1) is estimated using annual data, an estimated value of β, say - 0.5, suggests that the price differential is to be reduced by half in 1 year, other things being equal.

This section begins with a statistical analysis of the data, focusing on changes of price dispersion over time and the current level of average price differential. It then tests the hypothesis of price convergence between Hong Kong and the Mainland and calculates the half-life of convergence. Finally, it examines the impact of the price differential on Hong Kong's price deflation.

a. Basic statistics

The distribution of price differentials across products and cities provide important information about price discrepancies. If price differentials (in percentage terms) differ significantly cross products and cities, the distribution will have a large standard deviation, implying that it takes longer for prices to converge, other things being equal. We use the standard deviation and mean absolute value of price differentials to extract information about the distribution. The price differential $q_{i,k,t}$ is defined as the percentage difference in the price of commodity i at time t between Hong Kong (the benchmark city) and city k in the Mainland; i.e., $q_{i,k,t} = \ln(P_{i,HK,t} / P_{i,k,t})$. At any given point of time, the standard deviation and the mean absolute value of $q_{i,k,t}$ across products and cities provide measures of price dispersion of that time. It is of particular interest to examine the evolution of the two indicators over time.

We first calculate the indicators by pooling data for all cities. Table 1a shows that price dispersion between Hong Kong and the Mainland cities declined during 1994-2001. Note that it is still much greater than that across US cities or countries in the euro area. Macroeconomic differences in the income level, degree of factor mobility, taxes, and exchange rate pass-through are probably the factors behind a larger price dispersion between Hong Kong and the Mainland.

We continue the analysis by examining price dispersion between Hong Kong and each of the four Mainland cities. The two statistical indicators in all cases suggest that price dispersions declined during 1994-2001, and that the price dispersion of the tradables is smaller (Table 1b).

Table 1a. Statistical Measures of Price Dispersion: An International Comparison

	Hong Kong vis-à-vis the Mainland		US cities[1]	Euro countries[1]
	Standard deviation	Mean Absolute value	Standard deviation	Standard deviation
All products				
1994 [2]	0.82	0.63	0.15	0.12
2001 [3]	0.67	0.53	0.17	0.11
Tradable products				
1994 [2]	0.74	0.59	0.04	0.08
2001 [3]	0.63	0.48	0.04	0.06

[1] From Rogers (2001).
[2] 1995 for US and Euro area.
[3] 1999 for US and Euro area.

**Table 1b. Statistical Measures of Price Dispersion between
Hong Kong and Mainland Cities**

	Hong Kong and Shenzhen		Hong Kong And Guangzhou		Hong Kong and Shanghai		Hong Kong and Beijing	
	s.d.[1/]	m.a.v.[2/]	s.d.[1/]	m.a.v.[2/]	s.d.[1/]	m.a.v.[2/]	s.d.[1/]	m.a.v.[2/]
All products								
1994 [3/]	0.80	0.63	0.66	0.56	0.85	0.66	0.82	0.63
2001	0.76	0.59	0.65	0.52	0.61	0.48	0.66	0.53
Tradable products								
1994 [3/]	0.64	0.48	0.61	0.52	0.76	0.60	0.78	0.63
2001	0.59	0.44	0.66	0.51	0.59	0.44	0.67	0.53

[1/] *Standard Deviation of price differentials.*
[2/] *Mean Absolute Value of price differentials.*
[3/] *1999 for Shenzhen due to lack of data for earlier years.*

Although the standard deviation and the mean absolute price differential are useful measures of price variability cross products and cities, they do not provide information about the mean of price differentials, which affects the speed of price convergence as will be shown below. We therefore calculate the mean and median of price differentials. Table 2 shows that the overall average price in Hong Kong is about 20% higher than in the Mainland cities in 2001, with the median being merely 10% higher. The seemingly low average relative price reflects the fact that some products are more expensive in the Mainland cities.

It may be argued that the overall mean of price differentials is not a good forward-looking indicator of deflationary pressure on Hong Kong because of possible asymmetric effects of relative prices. While a lower price in the Mainland relative to Hong Kong may exert a downward pressure on Hong Kong's price, a higher price in the Mainland may not have an opposite effect of an equal magnitude, due to the following reasons. First, the underlying relative prices may be distorted by higher taxes (including import duties and sales taxes) and other distortions in the Mainland. With the accession to the WTO, import tariffs and non-tariff trade barriers in China are expected to be reduced significantly in the years ahead. Hence, current higher prices in the Mainland should not exert an upward pressure on Hong Kong's prices. On the contrary, the expected removal/reduction of trade barriers may place a further downward pressure on prices in Hong Kong. Secondly, Hong Kong residents always have the discretion to purchase products from the Mainland and will only do so if prices are lower there. While increases in the number of Mainland visitors may help elevate Hong Kong's retail prices, the effect is expected to be limited. Therefore, an alternative measure of average price differential, which includes only products that are more expensive in Hong Kong, is probably more relavent than the overall mean for measuring deflationary pressure in Hong Kong.[3] Table 2 shows that the average price differential of these products was about 60% in 2001.

---

[3] The alternative measure is not completely immune to possible distortions of the tax effect mentioned earlier.

Table 2. Price Differentials between Hong Kong and Mainland Cities in 2001

	All cities		Shenzhen		Guangzhou		Shanghai		Beijing	
	Mean	Med	Mean	Med	Mean	Med	Mean	Med	Mean	Med
(All price items)										
Overall	0.21	0.10	0.32	0.15	0.28	0.16	0.21	0.10	0.07	-0.04
Tradable	0.13	0.01	0.11	0.03	0.26	0.11	0.15	0.06	-0.01	-0.14
(For items whose prices are higher in Hong Kong)										
Overall	0.65	0.53	0.73	0.59	0.64	0.50	0.61	0.50	0.63	0.55
Tradable	0.59	0.47	0.51	0.39	0.66	0.49	0.56	0.34	0.64	0.58

Note: Price dispersion is defined as log(P_{HK})–log(P_{CN}), where P_{HK} and P_{CN} are prices in Hong Kong and four Mainland cities respectively.

b.   Price convergence and equalization

We use equation (1) to test the hypothesis of price convergence/equalization between Hong Kong and the Mainland cities, and estimate the rate of convergence. First, we test whether it is possible to reject the unit-root hypothesis for $q_{i,k,t}$ (i.e., absence of price convergence), and ask whether the answer holds for the price differentials with respect to different cities and different types of products. We then test the hypothesis of long-run price equalization. Finally, we estimate the rate of convergence and the long-run price differential.

Using the critical values established by Levin and Lin (1992), the null hypothesis of a unit root for price differentials ($\beta = 0$) is rejected in all cases (Table 3).[4] We therefore accept the hypothesis of price convergence between Hong Kong and the Mainland cities. The point estimates of β, which are around -0.1, suggest that the existing price differentials between Hong Kong and the Mainland cities would be reduced by half in an average of 6½ years, other things being equal. The hypothesis of long-run price equalization ($\alpha_i = 0$) is rejected in all cases except for the prices between Hong Kong and Shenzhen.[5]

Similar results are obtained when the equation is estimated using data on prices of the tradables (Table 4). In particular, the estimated values of β are statistically different from zero but not from -0.1. However, the estimated values of α_i become smaller, pointing to smaller price differentials in the tradables. This is in line with the nature of the tradables.

---

[4] The critical values for the regressions shown in Tables 3 and 4 are around -2.5 at the 1% significance level. A number of authors test unit roots of panel data using the method developed by Im, Peraran, and Shin (1997).

[5] The results for Shenzhen need to be interpreted with extra caution because of limited number of observations.

Table 3. Rate of Price Convergence by City in the Mainland
(All products)

	All cities	Shenzhen	Guangzhou	Shanghai	Beijing
Sample period	1993-2001	1995-2001	1995-2001	1995-2001	1993-2001
Observations	4,305	460	1,328	1,609	1,852
Adjusted R^2	0.09	0.07	0.07	0.11	0.06
D-W	1.92	2.65	2.06	2.07	1.81
α	0.02**	0.02*	0.02**	0.01*	0.02**
	(4.40)	(1.74)	(1.97)	(1.80)	(2.53)
β	-0.10**	-0.09**	-0.09**	-0.12**	-0.08**
	(-16.83)	(-6.13)	(-7.72)	(-13.05)	(-8.27)
γ_1	-0.09**	–	-0.10**	-0.08**	-0.09**
	(-6.90)		(-4.48)	(-3.61)	(-4.14)
γ_2	-0.06**	–	–	–	-0.08**
	(-4.55)				(-3.95)
Half-life (year)	6.5	7.3	7.2	5.3	8.4

*t-statistics are in parentheses, and * and ** denote significance at the 10% and 5% level respectively.*

Table 4. Rate of Price Convergence by City in the Mainland
(Tradable products)

	All cities	Shenzhen	Guangzhou	Shanghai	Beijing
Sample period	1993-2001	1995-2001	1995-2001	1995-2001	1993-2001
Observations	3,102	154	931	1,202	1,338
Adjusted R^2	0.08	0.06	0.05	0.11	0.08
D-W	2.02	2.34	2.02	2.11	1.90
α	0.01**	0.01	0.01	0.01*	0.00
	(3.02)	(0.68)	(1.47)	(1.66)	(0.55)
β	-0.09**	-0.11**	-0.08**	-0.13**	-0.07**
	(-12.51)	(-4.61)	(-5.47)	(-11.05)	(-6.77)
γ_1	-0.13**	–	-0.09**	-0.09**	-0.15**
	(-8.06)		(-3.18)	(-3.62)	(-6.18)
γ_2	-0.07**	–	–	–	-0.09**
	(-4.91)				(-4.28)
Half-life (year)	7.5	5.8	8.6	5.1	9.4

*t-statistics are in parentheses, and * and ** denote significance at 10% and 5% percent levels respectively.*

We carry the study a step further by dividing the products into 13 categories. We carry out unit-root test for price differentials by including product-specific dummies in

equation (1) and estimate the rate of price convergence for different types of products.[6] The estimated values of β are negative and statistically significant for most of the products, particularly for food and clothing among the tradables (Table 5).

Table 5. Rate of Price Convergence by Category

	Overall	Tradable
Sample period	1993-2001	1993-2001
Observations	4,305	3,102
Adjusted R^2	0.11	0.09
D-W	1.93	2.03
α	0.02**	0.02**
	(5.42)	(3.77)
β		
Category 1	-0.09**	-0.08**
	(-9.01)	(-8.94)
Category 2	-0.14**	-0.13**
	(-3.16)	(-3.09)
Category 3	-0.04*	-0.05**
	(-1.68)	(-2.06)
Category 4	-0.08**	-0.11**
	(-3.09)	(-3.70)
Category 5	0.02	0.03
	(0.55)	(0.88)
Category 6	-0.26**	–
	(-4.85)	
Category 7	-0.16**	-0.16**
	(-8.14)	(-8.44)
Category 8	-0.06**	–
	(-2.12)	
Category 9	-0.06**	0.05
	(-2.64)	(0.81)
Category 10	-0.07**	–
	(-4.46)	
Category 11	-0.08	–
	(-1.35)	
Category 12	-0.25**	-0.26**
	(-12.95)	(-2.74)
Category 13	-0.24**	–
	(-5.62)	
γ_1	-0.08**	-0.14**
	(-6.10)	(-8.36)
γ_2	-0.06**	-0.08**
	(-4.47)	(-5.14)

*t-statistics are in parentheses, and * and ** denote significance at 10% and 5% percent levels respectively.*

---

[6] The EIU CityData are classified into 13 categories. They are 1. Food, 2. Alcoholic drink, 3. Household supplies, 4. Personal care, 5. Tobacco, 6. Utilities, 7. Clothing, 8. Domestic help, 9. Recreation, 10. Transport, 11. Housing rents, 12. School, health and sports, and 13. Business trip cost.

Although the unit-root test suggests a broad-based price convergence across products, a number of questions arise regarding its deflationary implication for Hong Kong. Has the price convergence occurred mainly through price declines in Hong Kong or price increases in the Mainland? How much does the price convergence contribute to Hong Kong's deflation?

c.   Deflationary effect of price convergence

While the unit-root test is useful for studying price convergence, it is not the best tool for examining the deflationary impact because it cannot identify the sources of price differences or quantify other factors affecting prices. From a macroeconomic point of view, domestic prices can be influenced by a number of factors including, but not limited to, cyclical conditions, pass-through of exchange rate, effect of world commodity prices, and changes in productivity. Ha and Leung (2001) study inflation in Hong Kong of the past two decades by estimating the Phillips curve for the consumer price inflation. They find that inflation in Hong Kong is affected mainly by cyclical factors, and to a lesser extent, by import prices. However, using macro-level data, they are unable to investigate the effect of price differentials between Hong Kong and the Mainland on prices of the former.

We add the price differential as an explanatory variable to the inflation equation specified is Ha and Leung (2001) to investigate its deflationary effect,

$$\Delta p_{i,t} = \alpha_i + \beta_1 q_{i,t-1} + \beta_2 gap_{t-1} + \beta_3 \Delta x_t + \varepsilon_{i,t} \qquad (2)$$

where $p_{i,t}$ is the logarithm of the price of product i in Hong Kong at time t, $q_{i,t}$ is the price differential defined earlier, gap_t is the output gap, x_t denotes competitiveness as measured by the real effective exchange rate, and Δ is the first difference operator. Equation (2) is essentially an error-correction specification of the Phillips curve, with prices in Hong Kong converging to those in China in the long run (with a drift). In the short run, prices are influenced by the output gap, and the effective exchange rate. Parameters β_1, β_2, and β_3 representing the respective effect.

The estimates of β_1, β_2, and β_3 are of the expected signs and statistically significant in all cases (Table 6).[7] In particular, the magnitude of β_1 suggests that the overall average price differential, which is estimated at 20% as of 2001 (see Table 2), tends to reduce the overall price level in Hong Kong by less than ½% over a one-year period (Column 1).[8] The effect is expected to diminish as price differentials narrow over time. Secondly, the output gap plays an important role in determining Hong Kong's inflation dynamics. Specifically, a negative output gap of 1% is estimated to reduce prices by about a full percent. Thirdly, prices are highly responsive to changes in the real effective exchange rate, pointing to a high degree of price flexibility in Hong Kong—prices fall to recoup competitiveness.

---

[7] Similar results are obtained when the real effective exchange rate is replaced with the import price index.
[8] The overall price level referred here is a different concept from the consumer price index, because the former is an unweighted simple average of products included in the panel while the latter is weighted by the consumer basket and has a different coverage.

For reasons explained earlier in this section, we estimate the price equation using a subset of data, including only observations with higher relative prices in Hong Kong. The results are broadly unchanged. In particular, the magnitude of β_1 suggests that the current level of average price differential, which is estimated at 60% (see Table 2), tends to reduce prices of these products by an average of slightly over ½% over a one-year period.

Table 6. Deflationary Effect of Price Convergence

	All price items		For items whose prices are higher in Hong Kong			
	Overall	**Tradable**	**Overall**		**Tradable**	
Sample period	1992-2001	1992-2001	1992-2001		1992-2001	
Observations	6,550	4,760	3,483		2,292	
Adjusted R^2	0.02	0.04	0.02	0.03	0.02	0.03
D-W	2.22	2.25	2.02	2.04	1.99	2.00
α	0.03** (14.31)	0.02** (9.46)	0.02** (5.05)	0.02** (5.31)	0.02** (3.81)	0.02** (4.30)
β_1	-0.02** (-8.90)	-0.03** (-8.70)	-0.01** (-2.20)	–	-0.02** (-3.04)	–
Category 1	–	–	–	-0.02** (-2.60)	–	-0.02** (-2.36)
Category 2	–	–	–	-0.09** (-2.97)	–	-0.10** (-2.96)
Category 3	–	–	–	0.02 (0.69)	–	-0.04 (-0.75)
Category 4	–	–	–	0.04* (1.85)	–	0.00 (-0.04)
Category 5	–	–	–	0.01 (0.72)	–	0.01 (0.64)
Category 6	–	–	–	-0.01 (-0.42)	–	–
Category 7	–	–	–	-0.04** (-4.25)	–	-0.04** (-4.08)
Category 8	–	–	–	0.00 (0.19)	–	–
Category 9	–	–	–	0.00 (0.12)	–	-0.07 (-0.92)
Category 10	–	–	–	0.00 (-0.44)	–	–
Category 11	–	–	–	-0.02 (-1.54)	–	–
Category 12	–	–	–	0.00 (0.11)	–	-0.06 (-0.90)
Category 13	–	–	–	-0.01 (-0.38)	–	–
β_2	0.87** (8.81)	1.17** (10.36)	0.99** (7.23)	0.98** (7.16)	1.30** (7.72)	1.31** (7.78)
β_3	-0.25** (-4.16)	-0.35** (-5.12)	-0.39** (-4.65)	-0.38** (-4.49)	-0.44** (-4.27)	-0.44** (-4.23)

*t-statistics are in parentheses, and * and ** denote significance at 10% and 5% percent levels respectively.*

Similar results are obtained when the price equation is estimated for the tradables. However, the deflationary effect of a given price differential is estimated to be larger for the tradables, as expected in light of the nature of the tradables. The effect of the effective exchange rate is estimated to be larger for the tradables as well, reflecting a greater exchange rate pass-through. Finally, tradable prices are estimated to be more responsive to the output gap. This may reflect the net effect of a number of countervailing factors. On the one hand, tradable prices should be less sensitive to domestic cyclical conditions, because they are essentially determined by the world price and the nominal effective exchange rate—which depends on the exchange rates between the US dollar and Hong Kong's trading partners. On the other hand, the estimated output gap for Hong Kong may reflect, to a large extent, the cyclical conditions of other economies, because Hong Kong's business cycles are likely to be synchronized with its major trading partners due to the high degree of openness. Furthermore, non-tradable prices such as housing rentals and prices of public utilities, which account for about 35% of the consumer basket, are less sensitive to cyclical conditions due to lease contracts and government regulations.[9]

Finally, we re-estimate the price equation by including 13 product-specific dummy variables. The estimated coefficients for the output gap and effective exchange rate remain virtually the same as in the previous regressions. The coefficients of the product-specific price differentials are not statistically significant, except for prices of food, clothing, alcoholic drink, and to a lesser extent housing rentals (Table 6).

Although the unit-root test suggests price convergence across a broader range of products, it seems that a large portion of the price deflation reflects cyclical conditions and price lexibility which is needed for recouping competitiveness. Furthermore, the price convergence for a large number of products has probably occurred through faster price increases in the Mainland than price declines in Hong Kong. In this respect, it is important to note that prices of services and public utilities in the Mainland increased more rapidly in the past decade, due to the Balassa-Samuelson effect and sizable adjustments of the administered prices. A thorough study on inflation and pricing policies of the Mainland is beyond the scope of this paper. However, it is useful to look into price convergence within the Mainland, to which we turn shortly.

In sum, the price differential between Hong Kong and the Mainland probably has a small effect on prices of the former. Specifically, it is estimated to have reduced Hong Kong's price level by about 2% over the past four years, when the composite consumer price index dropped by over 10%.

IV. CONVERGENCE WITHIN THE MAINLAND

This section studies price convergence among selected cities of the Mainland, and compare the rate of convergence between Hong Kong and the Mainland with that within the Mainland. We find that price dispersion between Hong Kong and the Mainland are larger

---

[9] Discretionary rates rebates and concessions, waivers of public housing rentals, and waivers of other charges for public goods and services have helped reduce the burden of the public, but are not counted as price reductions.

than those across the Mainland cities, and that price differentials among the Mainland cities have been decreasing and the rates of convergence are much larger than the pace, at which Hong Kong's prices converge to the Mainland. We are unable to accept statistically the hypothesis of long-run price equalization within the Mainland.[10] Key empirical results are presented below.

a. Basic statistics

We calculate the standard deviations and the mean absolute value of price differentials between Beijing, which is selected as the benchmark city, and the other cities.[11] Both indicators declined during 1994-2001 for any of the city-pairs (Table 7). The dispersion of price differentials between Shanghai and Beijing are smaller than that between Guangzhou and Beijing, reflecting lower transportation costs. The price differential between Hong Kong and Beijing is distinctly greater than the other two city-pairs. This may reflect a number of economic differences between Hong Kong and the Mainland, including, *inter alia*, the degree of factor mobility, tax rates (sales and excise taxes and import duties), level of economic development, and the effect of exchange rate pass-through.

Table 7. Statistical Measures of Price Dispersion
Using Beijing as a Benchmark City

	Beijing and Guangzhou		Beijing and Shanghai		Beijing And Hong Kong	
	s.d.[1/]	m.a.v.[2/]	s.d.[1/]	m.a.v.[2/]	s.d.[1/]	m.a.v.[2/]
1994	0.60	0.51	0.53	0.40	0.82	0.63
2001	0.51	0.44	0.50	0.39	0.66	0.53

[1/] *Standard Deviation of price differentials.*
[2/] *Mean Absolute Value of price differentials.*

b. Price convergence and equalization

We estimate equation (1) using first data on all products and then the tradables only.[12] The estimated absolute values of β are much larger for cities within the Mainland (Table 8). In particular, the average half-life of price differentials is estimated to be around 3 years, compared with 6½ years estimated for the price differential between Hong Kong and the Mainland cities. The estimated values of α_i suggest that prices in Beijing tend to be higher than in Shanghai and Guangzhou, but lower than in Hong Kong. Similar results hold for the tradables.

---

[10] As the statistical results are derived from the observations of the past, they may not indicate the direction of future developments.

[11] Shenzhen is excluded from the study, as we focus on the most important cities when studying price convergence within the Mainland.

[12] The definition of the tradables within the Mainland cities may cover a wider range of products than the tradables between Hong Kong and the Mainland. However, a uniform definition is applied in this a study, as we are not in a position to make an accurate distinction.

It is interesting to compare the results with the studies on other economies of the world. Engel and Rogers (1994), Parsley and Wei (1996), and Cecchetti, Mark, and Sonora (2000) find evidence of price convergence among US cities. Nevertheless, the results on the rate of convergence are far from conclusive. Parsley and Wei (1996) find that the average half-life of price differentials among a group of 48 US cities is about 1-1¼ years for goods and 5 years for services, whereas Cecchetti, Mark, and Sonora (2000) estimate the half-life convergence among a panel of 19 US cities to be approximately 9 years. Our estimated rate of price convergence within the Mainland is close to Parsley and Wei's estimates for the US.[13]

Table 8. Unit Root Test for Price Dispersion
Using Beijing as a Benchmark City

	Beijing and Guangzhou	Beijing and Shanghai	Beijing and Hong Kong
Overall			
Sample period	1995-2001	1994-2001	1993-2001
Observations	1,251	1,774	1,852
Adjusted R^2	0.12	0.13	0.06
D-W	2.13	1.91	1.81
α	0.04**	0.03**	-0.02**
	(3.91)	(4.19)	(-2.53)
β	-0.20**	-0.23**	-0.08**
	(-10.74)	(-16.47)	(-8.27)
γ_1	-0.09**	–	-0.09**
	(-3.81)		(-4.14)
γ_2	–	–	-0.08**
			(-3.95)
Tradable			
Sample period	1995-2001	1994-2001	1993-2001
Observations	870	1,312	1,338
Adjusted R^2	0.10	0.13	0.08
D-W	1.87	1.95	1.90
α	0.05**	0.04**	0.00
	(4.40)	(4.86)	(-0.55)
β	-0.16**	-0.22**	-0.07**
	(-8.35)	(-14.06)	(-6.77)
γ_1	-0.07**	–	-0.15**
	(-2.35)		(-6.18)
γ_2	–	–	-0.09**
			(-4.28)

*t-statistics are in parentheses, and ** denote significance at 5% percent level.*

[13] The comparison needs to be interpreted with caution, because our sample period is much shorter and the panel includes only three of the most developed cities in China due to a lack of data on the other cities.

V. CONCLUDING REMARKS

We find statistical evidence of price convergence between Hong Kong and the Mainland and within the Mainland during the past decade, using a panel of commodity prices in Hong Kong, Beijing, Shanghai, Guangzhou, and Shenzhen. A measure of price differentials between Hong Kong and the Mainland cities, estimated at 60% on average as of 2001, is expected to converge in the long run to a sustainable level, estimated to be about 20%. But the convergence is taking place at a rate much lower than the speed of price convergence across the Mainland cities. This may reflect a number of economic differences between Hong Kong and the Mainland, including, *inter alia*, degree of factor mobility, taxes, level of economic development, and the effect of exchange rate pass-through. Furthermore, Hong Kong's price deflation of the recent years reflects mainly cyclical conditions and a high degree of price flexibility conducive to recouping competitiveness. Specifically, price convergence is estimated to have reduced the price level in Hong Kong by about 2% over the past four years when the composite consumer price index dropped by over 10%, and the deflationary effect of the price differential is expected to diminish as prices converge to a more sustainable level over time.

Despite this, a number of factors may affect price differentials in the years ahead. On the one hand, growing income in the Mainland is expected to elevate the price level and thereby reduce the price differential with Hong Kong. On the other hand, continued increase in productivity and removal/reduction of tariff and non-tariff trade barriers following the WTO accession could enlarge the price differential.

The findings of this paper are preliminary and need to be interpreted with caution, because of the limited time horizon of and possible measurement errors in the data.

Appendix. The Data Set

The price data used in this paper are taken from the CityData database of the Economist Intelligence Unit (EIU). The EIU CityData contains prices on a wide range of goods and services of major cities in about 80 economies starting from 1990. Most of the data are collected through the EIU's Worldwide Cost of Living Survey, in which local residents visit outlets to record prices. Only outlets where items of internationally comparable quality are available for sale are visited. Prices are collected from two types of outlets—supermarkets and medium-priced retailers—in the first week of September each year. A small number of price data are derived from other sources, for example, office rental costs are based on a biennial survey conducted by CB Richard Ellis/CB Hillier Parker. A total of more than 300 price items is included in the database and classified into 13 categories. They are Food, Alcoholic drink, Household supplies, Personal care, Tobacco, Utilities, Clothing, Domestic help, Recreation, Transport, Housing rents, School, health and sports, and Business trip. A complete list of price items is shown in Table A1.

The panel data for Hong Kong, Shenzhen, Guangzhou, Shanghai and Beijing are on an annual basis and cover the period from 1990 to 2001. In our analysis, the original price data are converted into US dollar terms and classified into tradable and nontradable products. Goods and services are classified as nontradable if they cannot substitute for those that are locally available, for example, most of the service items.

A great deal of caution needs to be exercised in interpreting and applying the panel, due to the limited number of observations and possible measurement errors. Firstly, there are missing values in the panel. For example, most prices for Shenzhen are available only from 1999. This is potentially important, as it would be misleading to measure price level convergence using a group of items whose composition changes substantially from one year to the next. Yet, the changes in product composition of the panel are actually quite smooth as the number of cross-section observations expands over time. Secondly, we assume prices are equally weighted in analyzing deflationary implications of price differentials. Thus, a category with more price items has a relatively higher weight or influence on the overall results. In particular, food items account for one-third of the total and tradable products represent about 70% of the total. Despite this, the price items in the EIU CityData have a different coverage compared to those included in the consumer baskets; it is thereby difficult to assign to them proper weights. Finally, data collected from the survey may not represent the actual prices due to possible sample bias or recording errors.

Table A1. List of Price Items in the EIU CityData database

Items	Classification
1. Food	
White bread, 1 kg (supermarket)	tradable
White bread, 1 kg (mid-priced store)	tradable
Butter, 500 g (supermarket)	tradable
Butter, 500 g (mid-priced store)	tradable
Margarine, 500g (supermarket)	tradable
Margarine, 500g (mid-priced store)	tradable
White rice, 1 kg (supermarket)	tradable
White rice, 1 kg (mid-priced store)	tradable
Spaghetti (1 kg) (supermarket)	tradable
Spaghetti (1 kg) (mid-priced store)	tradable
Flour, white (1 kg) (supermarket)	tradable
Flour, white (1 kg) (mid-priced store)	tradable
Sugar, white (1 kg) (supermarket)	tradable
Sugar, white (1 kg) (mid-priced store)	tradable
Cheese, imported (500 g) (supermarket)	tradable
Cheese, imported (500 g) (mid-priced store)	tradable
Cornflakes (375 g) (supermarket)	tradable
Cornflakes (375 g) (mid-priced store)	tradable
Yoghurt, natural (150 g) (supermarket)	tradable
Yoghurt, natural (150 g) (mid-priced store)	tradable
Milk, pasteurised (1 l) (supermarket)	tradable
Milk, pasteurised (1 l) (mid-priced store)	tradable
Olive oil (1 l) (supermarket)	tradable
Olive oil (1 l) (mid-priced store)	tradable
Peanut or corn oil (1 l) (supermarket)	tradable
Peanut or corn oil (1 l) (mid-priced store)	tradable
Potatoes (2 kg) (supermarket)	tradable
Potatoes (2 kg) (mid-priced store)	tradable
Onions (1 kg) (supermarket)	tradable
Onions (1 kg) (mid-priced store)	tradable
Mushrooms (1 kg) (supermarket)	tradable
Mushrooms (1 kg) (mid-priced store)	tradable
Tomatoes (1 kg) (supermarket)	tradable
Tomatoes (1 kg) (mid-priced store)	tradable
Carrots (1 kg) (supermarket)	tradable
Carrots (1 kg) (mid-priced store)	tradable
Oranges (1 kg) (supermarket)	tradable
Oranges (1 kg) (mid-priced store)	tradable
Apples (1 kg) (supermarket)	tradable
Apples (1 kg) (mid-priced store)	tradable
Lemons (1 kg) (supermarket)	tradable
Lemons (1 kg) (mid-priced store)	tradable
Bananas (1 kg) (supermarket)	tradable
Bananas (1 kg) (mid-priced store)	tradable
Lettuce (one) (supermarket)	tradable
Lettuce (one) (mid-priced store)	tradable
Eggs (12) (supermarket)	tradable

Eggs (12) (mid-priced store)	tradable
Peas, canned (250 g) (supermarket)	tradable
Peas, canned (250 g) (mid-priced store)	tradable
Tomatoes, canned (250 g) (supermarket)	tradable
Tomatoes, canned (250 g) (mid-priced store)	tradable
Peaches, canned (500 g) (supermarket)	tradable
Peaches, canned (500 g) (mid-priced store)	tradable
Sliced pineapples, canned (500 g) (supermarket)	tradable
Sliced pineapples, canned (500 g) (mid-priced store)	tradable
Beef: filet mignon (1 kg) (supermarket)	tradable
Beef: filet mignon (1 kg) (mid-priced store)	tradable
Beef: steak, entrecote (1 kg) (supermarket)	tradable
Beef: steak, entrecote (1 kg) (mid-priced store)	tradable
Beef: stewing, shoulder (1 kg) (supermarket)	tradable
Beef: stewing, shoulder (1 kg) (mid-priced store)	tradable
Beef: roast (1 kg) (supermarket)	tradable
Beef: roast (1 kg) (mid-priced store)	tradable
Beef: ground or minced (1 kg) (supermarket)	tradable
Beef: ground or minced (1 kg) (mid-priced store)	tradable
Veal: chops (1 kg) (supermarket)	tradable
Veal: chops (1 kg) (mid-priced store)	tradable
Veal: fillet (1 kg) (supermarket)	tradable
Veal: fillet (1 kg) (mid-priced store)	tradable
Veal: roast (1 kg) (supermarket)	tradable
Veal: roast (1 kg) (mid-priced store)	tradable
Lamb: leg (1 kg) (supermarket)	tradable
Lamb: leg (1 kg) (mid-priced store)	tradable
Lamb: chops (1 kg) (supermarket)	tradable
Lamb: chops (1 kg) (mid-priced store)	tradable
Lamb: Stewing (1 kg) (supermarket)	tradable
Lamb: Stewing (1 kg) (mid-priced store)	tradable
Pork: chops (1 kg) (supermarket)	tradable
Pork: chops (1 kg) (mid-priced store)	tradable
Pork: loin (1 kg) (supermarket)	tradable
Pork: loin (1 kg) (mid-priced store)	tradable
Ham: whole (1 kg) (supermarket)	tradable
Ham: whole (1 kg) (mid-priced store)	tradable
Bacon (1 kg) (supermarket)	tradable
Bacon (1 kg) (mid-priced store)	tradable
Chicken: frozen (1 kg) (supermarket)	tradable
Chicken: frozen (1 kg) (mid-priced store)	tradable
Chicken: fresh (1 kg) (supermarket)	tradable
Chicken: fresh (1 kg) (mid-priced store)	tradable
Frozen fish fingers (1 kg) (supermarket)	tradable
Frozen fish fingers (1 kg) (mid-priced store)	tradable
Fresh fish (1 kg) (supermarket)	tradable
Fresh fish (1 kg) (mid-priced store)	tradable
Instant coffee (125 g) (supermarket)	tradable
Instant coffee (125 g) (mid-priced store)	tradable
Ground coffee (500 g) (supermarket)	tradable
Ground coffee (500 g) (mid-priced store)	tradable
Tea bags (25 bags) (supermarket)	tradable
Tea bags (25 bags) (mid-priced store)	tradable
Cocoa (250 g) (supermarket)	tradable
Cocoa (250 g) (mid-priced store)	tradable

Drinking chocolate (500 g) (supermarket)	tradable
Drinking chocolate (500 g) (mid-priced store)	tradable
Coca-Cola (1 l) (supermarket)	tradable
Coca-Cola (1 l) (mid-priced store)	tradable
Tonic water (200 ml) (supermarket)	tradable
Tonic water (200 ml) (mid-priced store)	tradable
Mineral water (1 l) (supermarket)	tradable
Mineral water (1 l) (mid-priced store)	tradable
Orange juice (1 l) (supermarket)	tradable
Orange juice (1 l) (mid-priced store)	tradable

2. Alcoholic Drink

Wine, common table (1 l) (supermarket)	tradable
Wine, common table (1 l) (mid-priced store)	tradable
Wine, superior quality (700 ml) (supermarket)	tradable
Wine, superior quality (700 ml) (mid-priced store)	tradable
Wine, fine quality (700 ml) (supermarket)	tradable
Wine, fine quality (700 ml) (mid-priced store)	tradable
Beer, local brand (1 l) (supermarket)	tradable
Beer, local brand (1 l) (mid-priced store)	tradable
Beer, top quality (330 ml) (supermarket)	tradable
Beer, top quality (330 ml) (mid-priced store)	tradable
Scotch whisky, six years old (700 ml) (supermarket)	tradable
Scotch whisky, six years old (700 ml) (mid-priced store)	tradable
Gin, Gilbey's or equivalent (700 ml) (supermarket)	tradable
Gin, Gilbey's or equivalent (700 ml) (mid-priced store)	tradable
Vermouth, Martini & Rossi (1 l) (supermarket)	tradable
Vermouth, Martini & Rossi (1 l) (mid-priced store)	tradable
Cognac, French VSOP (700 ml) (supermarket)	tradable
Cognac, French VSOP (700 ml) (mid-priced store)	tradable
Liqueur, Cointreau (700 ml) (supermarket)	tradable
Liqueur, Cointreau (700 ml) (mid-priced store)	tradable

3. Household Supplies

Soap (100 g) (supermarket)	tradable
Soap (100 g) (mid-priced store)	tradable
Laundry detergent (3 l) (supermarket)	tradable
Laundry detergent (3 l) (mid-priced store)	tradable
Toilet tissue (two rolls) (supermarket)	tradable
Toilet tissue (two rolls) (mid-priced store)	tradable
Dishwashing liquid (750 ml) (supermarket)	tradable
Dishwashing liquid (750 ml) (mid-priced store)	tradable
Insect-killer spray (330 g) (supermarket)	tradable
Insect-killer spray (330 g) (mid-priced store)	tradable
Light bulbs (two, 60 watts) (supermarket)	tradable
Light bulbs (two, 60 watts) (mid-priced store)	tradable
Batteries (two, size D/LR20) (supermarket)	tradable
Batteries (two, size D/LR20) (mid-priced store)	tradable
Frying pan (Teflon or good equivalent) (supermarket)	tradable
Frying pan (Teflon or good equivalent) (mid-priced store)	tradable
Electric toaster (for two slices) (supermarket)	tradable
Electric toaster (for two slices) (mid-priced store)	tradable
Laundry (one shirt) (standard high-street outlet)	nontradable
Laundry (one shirt) (mid-priced outlet)	nontradable
Dry cleaning, man's suit (standard high-street outlet)	nontradable

Dry cleaning, man's suit (mid-priced outlet)	nontradable
Dry cleaning, woman's dress (standard high-street outlet)	nontradable
Dry cleaning, woman's dress (mid-priced outlet)	nontradable
Dry cleaning, trousers (standard high-street outlet)	nontradable
Dry cleaning, trousers (mid-priced outlet)	nontradable

4. Personal Care

Aspirins (100 tablets) (supermarket)	tradable
Aspirins (100 tablets) (mid-priced store)	tradable
Razor blades (five pieces) (supermarket)	tradable
Razor blades (five pieces) (mid-priced store)	tradable
Toothpaste with fluoride (120 g) (supermarket)	tradable
Toothpaste with fluoride (120 g) (mid-priced store)	tradable
Facial tissues (box of 100) (supermarket)	tradable
Facial tissues (box of 100) (mid-priced store)	tradable
Hand lotion (125 ml) (supermarket)	tradable
Hand lotion (125 ml) (mid-priced store)	tradable
Shampoo & conditioner in one (400 ml) (supermarket)	tradable
Shampoo & conditioner in one (400 ml) (mid-priced store)	tradable
Lipstick (deluxe type) (supermarket)	tradable
Lipstick (deluxe type) (mid-priced store)	tradable
Man's haircut (tips included) (average)	nontradable
Woman's cut & blow dry (tips included) (average)	nontradable

5. Tobacco

Cigarettes, Marlboro (pack of 20) (supermarket)	tradable
Cigarettes, Marlboro (pack of 20) (mid-priced store)	tradable
Cigarettes, local brand (pack of 20) (supermarket)	tradable
Cigarettes, local brand (pack of 20) (mid-priced store)	tradable
Pipe tobacco (50 g) (average)	tradable

6. Utilities

Telephone and line, monthly rental (average)	nontradable
Telephone, charge per local call from home (3 mins) (average)	nontradable
Electricity, monthly bill (average)	nontradable
Gas, monthly bill (average)	nontradable
Water, monthly bill (average)	nontradable
Heating oil (100 l) (average)	nontradable

7. Clothing

Business suit, two piece, medium weight (chain store)	tradable
Business suit, two piece, medium weight (mid-priced/branded store)	tradable
Business shirt, white (chain store)	tradable
Business shirt, white (mid-priced/branded store)	tradable
Men's shoes, business wear (chain store)	tradable
Men's shoes, business wear (mid-priced/branded store)	tradable
Men's raincoat, Burberry type (chain store)	tradable
Men's raincoat, Burberry type (mid-priced/branded store)	tradable
Socks, wool mixture (chain store)	tradable
Socks, wool mixture (mid-priced/branded store)	tradable
Dress, ready to wear, daytime (chain store)	tradable
Dress, ready to wear, daytime (mid-priced/branded store)	tradable
Women's shoes, town (chain store)	tradable
Women's shoes, town (mid-priced/branded store)	tradable
Women's cardigan sweater (chain store)	tradable

Women's cardigan sweater (mid-priced/branded store)	tradable
Women's raincoat, Burberry type (chain store)	tradable
Women's raincoat, Burberry type (mid-priced/branded store)	tradable
Tights, panty hose (chain store)	tradable
Tights, panty hose (mid-priced/branded store)	tradable
Child's jeans (chain store)	tradable
Child's jeans (mid-priced/branded store)	tradable
Child's shoes, dresswear (chain store)	tradable
Child's shoes, dresswear (mid-priced/branded store)	tradable
Child's shoes, sportswear (chain store)	tradable
Child's shoes, sportswear (mid-priced/branded store)	tradable
Girl's dress (chain store)	tradable
Girl's dress (mid-priced/branded store)	tradable
Boy's jacket, smart (chain store)	tradable
Boy's jacket, smart (mid-priced/branded store)	tradable
Boy's dress trousers (chain store)	tradable
Boy's dress trousers (mid-priced/branded store)	tradable

8. Domestic Help

Hourly rate for domestic cleaning help (average)	nontradable
Maid's monthly wages (full time) (average)	nontradable
Babysitter's rate per hour (average)	nontradable

9. Recreation

Compact disc album (average)	tradable
Television, colour (66 cm) (average)	tradable
Kodak colour film (36 exposures) (average)	tradable
Cost of developing 36 colour pictures (average)	nontradable
International foreign daily newspaper (average)	tradable
Daily local newspaper (average)	nontradable
International weekly news magazine (Time) (average)	tradable
Paperback novel (at bookstore) (average)	tradable
Three course dinner for four people (average)	nontradable
Personal computer (64 MB) (average)	tradable
Four best seats at theatre or concert (average)	nontradable
Four best seats at cinema (average)	nontradable

10. Transport

Low priced car (900-1299 cc) (low)	nontradable
Low priced car (900-1299 cc) (high)	nontradable
Compact car (1300-1799 cc) (low)	nontradable
Compact car (1300-1799 cc) (high)	nontradable
Family car (1800-2499 cc) (low)	nontradable
Family car (1800-2499 cc) (high)	nontradable
Deluxe car (2500 cc upwards) (low)	nontradable
Deluxe car (2500 cc upwards) (high)	nontradable
Yearly road tax or registration fee (low)	nontradable
Yearly road tax or registration fee (high)	nontradable
Cost of a tune up (but no major repairs) (low)	nontradable
Cost of a tune up (but no major repairs) (high)	nontradable
Annual premium for car insurance (low)	nontradable
Annual premium for car insurance (high)	nontradable
Regular unleaded petrol (1 l) (average)	nontradable
Taxi: initial meter charge (average)	nontradable
Taxi rate per additional kilometre (average)	nontradable

Taxi: airport to city centre (average)   nontradable

11. Rent

Office rent per sq metre per year	nontradable
Typical lease term for office property (years)	nontradable
Industrial space, per sq metre per year	nontradable
Furnished residential apartment: 1 bedroom (moderate)	nontradable
Furnished residential apartment: 1 bedroom (high)	nontradable
Furnished residential apartment: 2 bedroom (moderate)	nontradable
Furnished residential apartment: 2 bedroom (high)	nontradable
Unfurnished residential apartment: 2 bedrooms (moderate)	nontradable
Unfurnished residential apartment: 2 bedrooms (high)	nontradable
Unfurnished residential apartment: 3 bedrooms (moderate)	nontradable
Unfurnished residential apartment: 3 bedrooms (high)	nontradable
Unfurnished residential apartment: 4 bedrooms (moderate)	nontradable
Unfurnished residential apartment: 4 bedrooms (high)	nontradable
Furnished residential house: 3 bedrooms (moderate)	nontradable
Furnished residential house: 3 bedrooms (high)	nontradable
Unfurnished residential house: 3 bedrooms (moderate)	nontradable
Unfurnished residential house: 3 bedrooms (high)	nontradable
Unfurnished residential house: 4 bedrooms (moderate)	nontradable
Unfurnished residential house: 4 bedrooms (high)	nontradable

12. Schools, Health and Sports

French school: annual tuition, ages 5-12 (average)	nontradable
French school: annual tuition, ages 13-17 (average)	nontradable
French school: extra costs, ages 5-12 (average)	nontradable
French school: extra costs, ages 13-17 (average)	nontradable
French school: kindergarten annual fees (average)	nontradable
German school: annual tuition, ages 5-12 (average)	nontradable
German school: annual tuition, ages 13-17 (average)	nontradable
German school: extra costs, ages 5-12 (average)	nontradable
German school: extra costs, ages 13-17 (average)	nontradable
German school: kindergarten annual fees (average)	nontradable
American /English school: annual tuition, ages 5-12 (average)	nontradable
American/English school: annual tuition, ages 13-17 (average)	nontradable
American/English school: extra costs, ages 5-12 (average)	nontradable
American/English school: extra costs, ages 13-17 (average)	nontradable
American/English school: kindergarten annual fees (average)	nontradable
Routine checkup at family doctor (average)	nontradable
One X-ray at doctor's office or hospital (average)	nontradable
Visit to dentist (one X-ray and one filling) (average)	nontradable
Green fees on a public golf course (average)	nontradable
Hire of tennis court for one hour (average)	nontradable
Cost of six tennis balls eg Dunlop, Wilson (average)	tradable
Entrance fee to a public swimming pool (average)	nontradable

13. Business Trip Cost

Business trip, typical daily cost	nontradable
Hilton-type hotel, single room, one night including breakfast (average)	nontradable
Moderate hotel, single room, one night including breakfast (average)	nontradable
One drink at bar of first class hotel (average)	nontradable
Two-course meal for two people (average)	nontradable
Simple meal for one person (average)	nontradable
Fast food snack: hamburger, fries and drink (average)	nontradable

Hire car, weekly rate for lowest price classification (average)   nontradable
Hire car, weekly rate for moderate price classification (average)   nontradable
One good seat at cinema (average)   nontradable

References

Campbell, John. Y. and Pierre Perron (1991), "Pitfalls and Opportunities: What Macroeconomists Should Know about Unit Roots," in O.J. Blanchard and S. Fisher (eds.) *NBER Macroeconomics Annual*, Vol. 6, MIT Press, Cambridge, Massachusetts.

Cecchetti, Stephen G., Nelson C. Mark, and Robert J. Sonora (2000), "Price Level Convergence among United States Cities: Lessons for the European Central Bank," *NBER Working Paper* No. 7681.

Engel, Charles, and John Rogers (1994), "How Wide in the Border?," *NBER Working Paper* No. 4829.

Ha, Jimmy, Cynthia Leung (2001), "Estimating Hong Kong's Output Gap and its Impact on Inflation," *Research Memorandum 17/2001*, Hong Kong Monetary Authority.

Im, Kyung So, M. Hashem Pesaran, and Yougcheol Shin (1997), "Testing for Unit Roots in Heterogeneous Panels," *mimeo*, Trinity College, Cambridge, Massachusetts.

Levin, Andrew and Chien-Fu Lin (1992), "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties," mimeo, University of California, San Diego.

Parsley, David C and Shang-Jin Wei (1996), "Convergence to the Law of One Price Without Trade Barriers or Currency Fluctuations," *The Quarterly Journal of Economics, November 1996*.

Rogers John H. (2001), "Price Level Convergence, Relative Prices, and Inflation in Europe," *International Finance Discussion Paper*, Board of Governors of the Federal Reserve System, Washington, D.C.