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TESTING THE PURCHASING POWER PARITY BETWEEN HONG KONG SAR AND MAINLAND CHINA: EVIDENCE FROM COINTEGRATION TESTS

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TESTING THE PURCHASING POWER PARITY BETWEEN HONG KONG SAR AND MAINLAND CHINA: EVIDENCE FROM COINTEGRATION TESTS

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Abstract

This paper examines whether Purchasing Power Parity (PPP) holds between Hong Kong SAR and Mainland China in the context of their deepening economic integration. The relocation of Hong Kong's manufacturing base to Guangdong and the intensifying cross-border linkages have been highlighted by previous studies. If two economies were fully integrated, PPP would be expected to hold between Hong Kong SAR and Mainland China. Therefore, this study conducts an empirical assessment of the PPP hypothesis. The results of the Engle-Granger test show that a long-run PPP relationship does not hold between Hong Kong and Mainland China over the sample period (March 1995 to February 2025). The Johansen test (Trace test) identifies a single cointegrating vector, suggesting the presence of some long-term association. The evidence overall implies that the economic integration between Hong Kong and Mainland China remains insufficient for the strict validity of the PPP hypothesis.

Keywords: Purchasing Power Parity, Cointegration, VECM, Hong Kong, Mainland China

JEL Classification: C32, E31, F31

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1. Introduction

The purpose of this study is to examine whether the Purchasing Power Parity (PPP) holds between Hong Kong Special Administrative Region (SAR) and Mainland China. This study is motivated by the deepening economic integration between the two economies, particularly following the relocation of Hong Kong's manufacturing sector to Guangdong in Southern China, as noted by Shinohara (2003).

This growing interconnectedness raises an important question: To what extent has Hong Kong economy become integrated with that of Mainland China's economy? If full integration had been achieved, the PPP hypothesis would be expected to hold between Hong Kong and Mainland China.

Despite its strong theoretical foundations, empirical studies have yielded mixed results regarding the validity of PPP. Enders (1988) noted that the results of the ARIMA tests produced mixed support for the PPP hypothesis. Enders further argued that because Canada is a relatively small country compared with the United States, deviations from the PPP-implied bilateral price level would not be expected to induce any meaningful adjustment in U.S. prices.

Similarly, Shirai (2000) found that when comparing the Consumer Price Indices (CPIs) of Hong Kong and its major trading partners, PPP does not hold. Liang (1999) examined the behavior of the long–run real exchange rate of Hong Kong SAR and China by testing the generalized –PPP hypothesis. While Genberg, Liu, and Jin (2006), along with He, Liao, and Wu (2015), observed that Hong Kong's short-term business cycle remains more closely synchronized with the United States due to dominant transitory shocks. In contrast, its long-term output trend is increasingly shaped by permanent shocks originating from Mainland China, reflecting deeper structural integration and cross-border productivity gains.

This study contributes to the ongoing debate by focusing specifically on the Hong Kong–Mainland China relationship and employing cointegration techniques to evaluate the long-run validity of PPP. As Rogoff (1996) aptly noted, "While few empirically literate economists take PPP seriously as a short-term proposition, most instinctively believe in some variant of purchasing power parity as an anchor for long-run real exchange rates." This research therefore aims to determine whether such a long-run anchor exists between these two increasingly interconnected economies.

Motivated by these recent developments, this study undertakes an empirical investigation using time-series techniques, including unit root tests and cointegration analysis. Through this approach, it provides additional evidence on the degree of price convergence between the two economies. The results also offer useful insights into the conditions under which PPP may hold in emerging and highly open economies, especially where exchange rate systems are highly differentiated.

This paper is organized as follows: Section 2 describes the Data Description and Preliminary Analysis; Section 3 presents the empirical results; and Section 4 concludes with a summary of the key findings and their implications.

2. Data Description and Preliminary Analysis

2.1. Data Description

The dataset employed in this study comprises monthly consumer price indices for Hong Kong (p^{HK}), Mainland China (p^{CN}), and the United States of America (U.S)(p^{US}), along with the nominal exchange rate between the Chinese Renminbi and the U.S. Dollar ($e^{(CN/US)}$) and the nominal exchange rate between the Hong Kong SAR Dollar and the U.S. Dollar ($e^{(HK/US)}$). The sample period spans from March 1995 to February 2025, yielding a total of 360 monthly observations for each series. The CPI data for Hong Kong were obtained from the Census and Statistics Department of the Hong Kong SAR Government, while CPI data for the United States were sourced from the U.S. Bureau of Labor Statistics. The CPI data for Mainland China and both exchange rate series were retrieved from the Bank for International Settlements. All data series were seasonally adjusted[2] and converted into natural logarithms prior to analysis.

2.2. Construction of Real Exchange Rates (RER)

Next, we explain how the real exchange rate (RER) of Hong Kong Dollar against the Chinese Renminbi can be obtained as data. Using the respective consumer price indices of the two economies, the RER is defined as follows:

$$RER^{HK/CN} = \frac{e^{HK/CN}\, p^{CN}}{p^{HK}}$$

[2]We used the method of moving average.

We construct the exchange rate data for the Hong Kong Dollar and the Chinese Renminbi using the following formula.

$$e^{HK/CN} = e^{HK/US} \cdot \frac{1}{e^{CN/US}}$$

The following can be obtained from the definition of the real exchange rate:

$$RER^{HK/CN} = \frac{e^{HK/US} \cdot p^{CN}}{e^{CN/US} \cdot p^{HK}}$$

Taking natural logarithms yields a convenient linear form:

$$\ln RER_t^{HK/CN} = \ln\left(e_t^{HK/US}\right) - \ln\left(e_t^{CN/US}\right) + \ln\left(p_t^{CN}\right) - \ln\left(p_t^{HK}\right) \tag{1}$$

This specification provides the empirical foundation for testing the PPP hypothesis between Hong Kong SAR and Mainland China, using unit root and cointegration tests.

2.3. Visual Inspection of Data

Figure 1 presents the logged consumer price indices (CPI) of Hong Kong SAR, Mainland China and the U.S from March 1995 to February 2025. Each series exhibits a clear upward trend over the sample period, reflecting the sustained long-run increases in consumer prices. A visual inspection suggests a potential long-run relationship between the two, a possibility which is examined more rigorously through the formal econometric tests that follow.

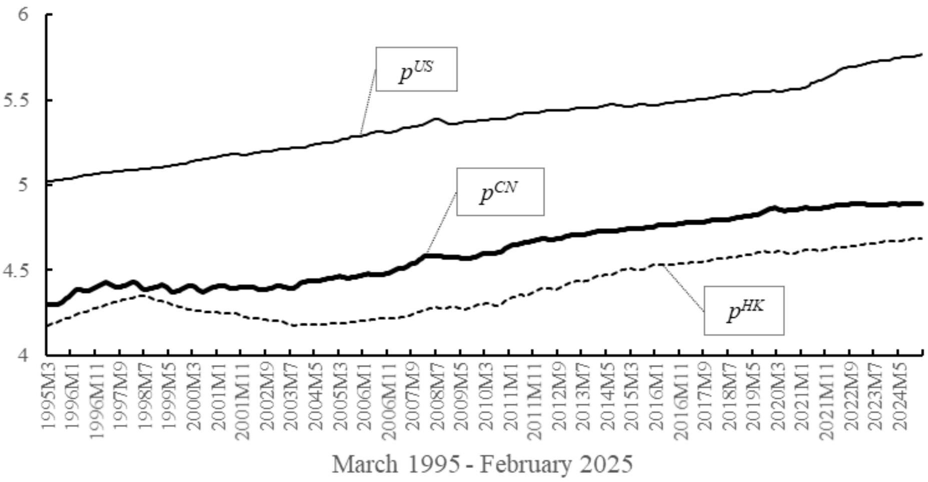

Figure 1: Natural logarithm CPI of Hong Kong SAR, Mainland China and U.S

A notable disruption occurs around the 2008-2009 Lehman shock. During this period, the slope of consumer price of U.S flattens markedly, indicating a sharp deceleration of U.S. inflation, as the financial crisis suppressed aggregate demand. The Chinese CPI series shows only a brief pause before resuming its upward trajectory, consistent with the sizable fiscal stimulus launched by Beijing in late 2008. Hong Kong's price level remains almost flat throughout 2008–2009, indicative of strong disinflationary pressures in its highly open, trade-dependent economy.

Following the crisis, all three series regain their upward momentum, experiencing moderate increases through the early 2010s. This was followed by a temporary slowdown during the COVID-19 outbreak, and a renewed acceleration—particularly pronounced in the United States—during the post-pandemic inflation surge of 2021–2023.

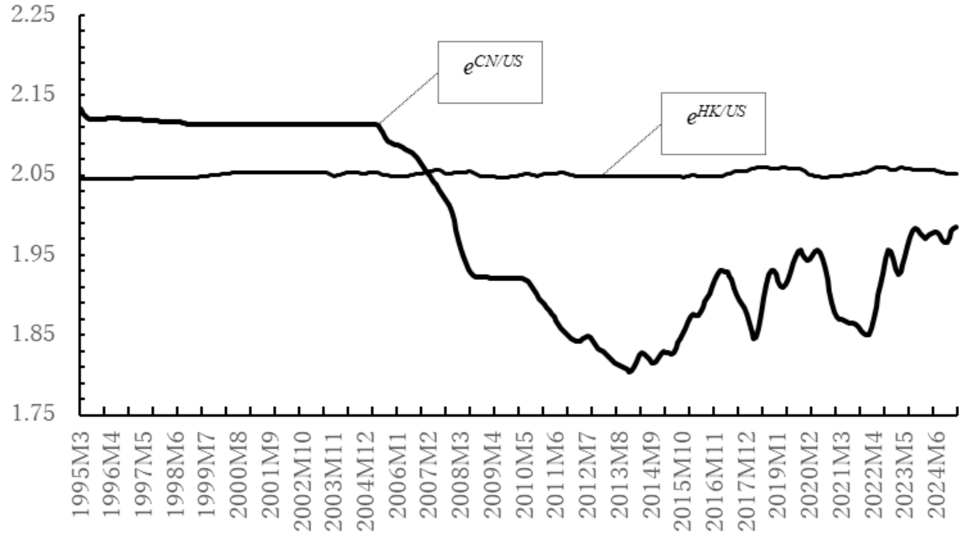

Figure 2: Logarithms of $e_t^{HK/US}$ and $e_t^{US/CN}$ (1995.M3–2025.M2)

Figure 2 plots the logarithms of the nominal exchange rate between the Hong Kong Dollar and the U.S. Dollar ($\ln e_t^{HK/US}$) and the value of the Renminbi in terms of the U.S. Dollar ($\ln e_t^{CN/US}$). The HKD/USD rate remains remarkably stable throughout the sample period, reflecting Hong Kong's currency board arrangement. In contrast, the CNY/USD rate shows significant fluctuations, including gradual appreciation of the Renminbi after 2005, a period of stability during the global financial crisis (2008–2010), and more flexible movements in subsequent years. Based on the research of Shirai (2000), we calculated the real bilateral exchange rates for the Hong Kong Dollar against the Chinese Renminbi and the Hong Kong Dollar against the U.S. Dollar. The results are presented in Figure 3.

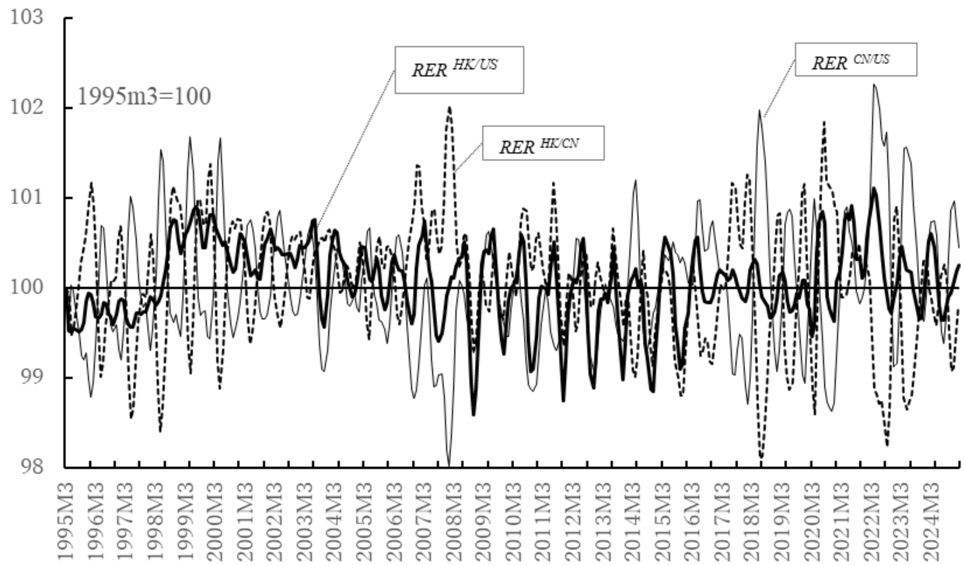

Figure 3: Real bilateral exchange rate between the Hong Kong Dollar/the Chinese Renminbi and Hong Kong Dollar / U.S. Dollar. (1995.M3-2025.M2)

Shirai (2000) reported that the real effective exchange rate of the Hong Kong Dollar, measured against the US dollar, appreciated from 1983, when the currency board system was adopted, until 1998. Such an upward trend, however, was not observed during our sample period (1995.M3–2025.M2). Shirai further noted that the real exchange rate of the Hong Kong Dollar, measured against the Chinese Renminbi, has remained relatively stable since 1995. This observation is consistent with the patterns observed in our sample period as well.

3. Empirical Results

This section presents the empirical analysis of the relationship between consumer prices indices in Hong Kong and Mainland China. The investigation proceeds in three steps: (1) testing the stationarity of the variables using unit root tests, (2) examining the existence of a long-run equilibrium relationship using both the Engle-Granger and Johansen cointegration tests, and (3) estimating a Vector Error Correction Model (VECM) to capture both the short-run dynamics and the speed of adjustment towards the long-run equilibrium.

3.1. Unit Root Tests

We investigate the stationarity properties of the individual time series using the

Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests[3] . The tests are conducted on both the levels and the first differences of the natural logarithm of the variables. The null hypothesis for each test is that the series contains a unit root (i.e., non-stationary). The results of these two tests are presented in Table 1 and 2.

Table 1: Results of ADF test

Variables	**Lag**	**None**	**Constant**	**Constant and trend**	**Decision**
$e^{HK/US}$	14	0.23	-3.29	-3.482	
$\Delta e^{HK/US}$	13	-4.843**	-4.837**	-4.854**	I(1)
$e^{US/CN}$	15	-0.564	-1.508	-1.086	
$\Delta e^{US/CN}$	14	-3.467**	-3.495**	-3.655**	I(1)
p^{CN}	14	3.09	-0.115	-2.087	
Δp^{CN}	13	-3.685**	-4.839**	-4.83**	I(1)
p^{HK}	12	1.23	0.107	-2.409	
Δp^{HK}	11	-2.656	-2.909	-3.154	I(1)

Notes. The lag length is selected based on the Schwarz Information Criterion (SIC). The reported values are t-statistics. Δ denotes the first difference of the corresponding variable. An (**) denotes significance at the 0.05 level.

Table 2: Results of PP test

Variables	**Bandwidth**	**None**	**Constant**	**Constant and trend**	**Decision**
$e^{HK/US}$	5	0.286	-2.681	-2.727	
$\Delta e^{HK/US}$	5	-6.15**	-6.145**	-6.151**	I(1)
$e^{US/CN}$	5	-0.882	-1.35	-0.397	
$\Delta e^{US/CN}$	5	-5.794**	-5.803**	-5.849**	I(1)
p^{CN}	5	4.406	-0.819	-1.671	
Δp^{CN}	5	-6.202**	-6.643**	-6.642**	I(1)
p^{HK}	5	4.167	0.606	-0.785	
Δp^{HK}	5	-5.202**	-5.615**	-5.672**	I(1)

Notes. The reported values are t-statistics. The bandwidth is selected based on Newey and West (1994). Δ denotes the first difference of the corresponding variable. An (*) denotes significance at the 0.01 level.

[3]In deriving the bandwidth,we use the following formula $l = \left\lfloor 4\left(\frac{T}{100}\right)^{2/9} \right\rfloor$, where T denotes the number of observations.

The results presented in Table 1 (ADF test) indicate that all variables in levels are non-stationary. However, most variables become stationary after first differencing, implying that they are integrated of order one, I(1). For Hong Kong's consumer price series, the null hypothesis of non-stationarity cannot be rejected at this level.

The results presented in Table 2 (PP test) show that all variables in levels are non-stationary, while their first differences are stationary at the 1% significance level, indicating that the series are integrated of order one, I(1). These results confirm the robustness of the integration order and provide a valid basis for subsequent cointegration analysis.

3.2. Cointegration Test

Since all variables are confirmed to be integrated of order one I(1), the next step in the analysis is to test for the existence of a long-run equilibrium relationship among them. To ensure the robustness of the findings, we apply a dual approach: (1) The Engle–Granger two-step procedure to test for cointegration between specific pairs of variables of interest. (2) We employ the Johansen (1988) cointegration framework to determine the number of cointegrating relationships.

(1) We follow the empirical approach of Enders (1988), who applied the Engle–Granger two-step method to test PPP among major economies. Following this framework, we examine whether the p^{HK} is cointegrated with the p^{CN}, and $e^{HK/CN}$. Based on the equation (1), the following equation is estimated to peform Engle–Granger test.

$$\ln p_t^{HK} = \alpha + \beta \ln e_t^{HK/US} + \gamma \ln e_t^{US/CN} + \delta \ln p_t^{CN} + \varepsilon_t \tag{2}$$

where $\hat{\varepsilon}_t$ is the residual from the regression equation. The results of the Engle–Granger test are presented in Table 3.

Table 3: ADF test on the residuals of Equation (2)

Variable	**Lag**	**t-Statistic**	**5% Critical Value**
$\hat{\varepsilon}_t$	14	-1.914	-3.772

Note. Lag length for the ADF test was selected by using the Schwarz Information Criterion (SIC).

At the 5% significance level[4], we cannot reject the null hypothesis of no cointegration. Therefore, there is no statistical evidence to support the existence of a long-run PPP

[4]From Table C. Enders, W. (2010), Applied Economic Time Series, Third Edition

relationship between the two economies.

(2) Given that all variables are integrated of order one, I(1), we proceed to examine the existence of a long-run equilibrium relationship using the maximum likelihood cointegration framework proposed by Johansen (1988, 1991) and Johansen and Juselius (1990). The test is conducted on a Vector Autoregression (VAR) model including the four variables. The lag length for the VAR model was selected based on the Schwarz information Criterion (SIC). The result from the SIC[5] indicates that the lag length is 11.

Table 4: Johansen Cointegration Test – Trace Test Statistics

Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Test Statistic**	**5% Critical Value (**)**
None	$r > 0$	0.069	50.907*	47.856
$r \leq 1$	$r > 1$	0.045	26.028	29.797
$r \leq 2$	$r > 2$	0.020	9.873	15.495
$r \leq 3$	$r > 3$	0.008	2.861	3.841

Notes. r is the number of cointegrating vectors. An (*) denotes rejection of the hypothesis at the 0.05 level. An (**) is the critical value of MacKinnon–Haug–Michelis (1999).

Table 5: Johansen Cointegration Test – Maximum Eigenvalue Test Statistics

Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Test Statistic**	**5% Critical Value (**)**
None	$r = 1$	0.069	24.879	27.584
$r = 1$	$r = 2$	0.045	16.155	21.132
$r = 2$	$r = 3$	0.020	7.012	14.265
$r = 3$	$r = 4$	0.008	2.861	3.841

Note. r is the number of cointegrating vectors.
An (**) is the critical value of MacKinnon–Haug–Michelis (1999).

The results of the Johansen test, based on both trace and maximum eigenvalue test statistics, are used to determine the number of cointegrating relationships. In Table 4, the Trace Statistic suggests the existence of at least one cointegrating vector (r=1), whereas the Maximum Eigenvalue test in Table 5 does not confirm the existence of cointegrating vector.

Based on the Lütkepohl, Saikkonen, and Trenkler (2001), the trace tests tend to have more heavily distorted sizes but comparable or even stronger power performance than their maximum-eigenvalue counterparts, and in particular, the trace tests are

[5] See Appendix: Lag Length Selection

preferable when there are at least two more cointegrating relations than specified under the null hypothesis. According to Cheung and Lai (1993), the trace test exhibits greater empirical power and robustness than the maximal eigenvalue test, as it is less sensitive to skewness and excess kurtosis in the innovations. Therefore, we base our inference on the trace test statistics and conclude that there are one cointegrating relationship among the four variables.

3.3. Estimated of VECMs

We estimate the VECM under the assumption that both the cointegrating relation and the short-run dynamics include a constant. It is essential to note that the theoretical long-run Purchasing Power Parity (PPP) requires the domestic price coefficient (often denoted as β) in the cointegrating vector to equal unity ($\beta_1 = 1$), and that μ_t is stationary[6]. (see Enders, 2014). Based on the estimated results, we obtain the cointegrating regression equation as follows:

$$\begin{aligned} p_t^{HK} = 164.968 \quad &+ 2.134\, p_t^{CN} \quad - 1.18\, e_t^{US/CN} \quad - 84.211\, e_t^{HK/US} \\ &\quad (0.538) \qquad\qquad (0.803) \qquad\qquad (17.127) \end{aligned} \tag{3}$$

The numbers reported in parentheses beneath the estimated coefficients correspond to their t-statistics. This equation captures a clear long-run relationship between Hong Kong and Mainland China in terms of consumer prices, incorporating the U.S.–China and Hong Kong–U.S. exchange rates. The estimated cointegrating vector includes a constant term (β_0) that is significantly different from zero and slope coefficients (β_i) that significantly deviate from the theoretical PPP value of unity ($\beta_i = 1$). Furthermore, the residual-based Engle–Granger (EG) unit root test indicates that the real exchange rate is non-stationary, implying the presence of a unit root. Taken together, these results suggest that long-run PPP has failed between Hong Kong and Mainland China.

Our empirical results, most notably that only the $e_t^{HK/US}$ exchange rate coefficient

[6] We use the following formula $f_t = e_t + p_t^*$, and long-run Purchasing Power Parity (PPP) asserts that there exists a linear combination of the form $f_t = \beta_0 + \beta_1 p_t + \mu_t$, where e_t, p_t^*, and p_t denote the logarithms of the price of foreign exchange, the foreign price level, and the domestic price level, respectively (see Enders, 2014).

is statistically significant in the long-run cointegrating vector ($t = 17.127$), while the price coefficient p_t^{CN} is statistically insignificant, firmly support the conclusion that PPP does not hold between Hong Kong and Mainland China.

From this equation, it can be seen that, holding other variables constant, a one-percentage-point increase in China's CPI causes an increase of 2.134 percentage points in Hong Kong's CPI. A one-percentage-point increase in the exchange rate of the Hong Kong Dollar against the U.S. Dollar causes a decrease of 84.211 percentage points in Hong Kong's CPI, and a one-percentage-point increase in the exchange rate of the Chinese Renminbi against the U.S. Dollar causes a decrease of 1.18 percentage points in Hong Kong's CPI.

Our empirical results are closely aligned with the conclusion reached by Shirai (2000), who found that PPP does not hold when examining the CPIs of Hong Kong and its major trading partners. The estimated coefficients of the VECM, together with their t-statistics, are summarized in Table 6.

Table 6: Estimates of Vector Error Correction Model

Variables	Δp_t^{HK}	Δp_t^{CN}	$\Delta e_t^{HK/US}$	$\Delta e_t^{US/CN}$
CointEQ1	-0.00032 [-1.117]	-0.00003 [-0.139]	-0.00021 [-4.453]	-0.00009 [-0.341]
Δp_{t-1}^{HK}	1.470 [25.129]	-0.069 [-1.549]	0.021 [2.218]	0.034 [0.609]
Δp_{t-2}^{HK}	-0.895 [-8.694]	0.164 [2.099]	-0.023 [-1.395]	-0.168 [-1.710]
Δp_{t-3}^{HK}	0.550 [5.121]	-0.076 [-0.936]	0.016 [0.929]	0.151 [1.477]
Δp_{t-4}^{HK}	-1.094 [-10.149]	0.063 [0.769]	-0.013 [-0.717]	-0.083 [-0.806]
Δp_{t-5}^{HK}	1.396 [11.201]	-0.211 [-2.228]	0.023 [1.140]	0.064 [0.536]
Δp_{t-6}^{HK}	-0.825 [-5.775]	0.227 [2.090]	-0.035 [-1.518]	-0.083 [-0.609]
Δp_{t-7}^{HK}	0.303 [2.421]	-0.090 [-0.943]	0.027 [1.337]	0.060 [0.502]
Δp_{t-8}^{HK}	-0.544 [-5.063]	0.033 [0.403]	-0.023 [-1.306]	-0.017 [-0.171]

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Variables	Δp_t^{HK}	Δp_t^{CN}	$\Delta e_t^{HK/US}$	$\Delta e_t^{US/CN}$
Δp_{t-9}^{HK}	0.774 [7.238]	-0.139 [-1.706]	0.013 [0.759]	0.029 [0.282]
Δp_{t-10}^{HK}	-0.401 [-3.865]	0.182 [2.310]	-0.008 [-0.462]	-0.104 [-1.056]
Δp_{t-11}^{HK}	0.149 [2.503]	-0.114 [-2.524]	-0.008 [-0.810]	0.071 [1.248]
Δp_{t-1}^{CN}	0.165 [2.172]	1.841 [31.767]	0.003 [0.280]	-0.010 [-0.138]
Δp_{t-2}^{CN}	-0.185 [-1.214]	-1.407 [-12.137]	-0.021 [-0.853]	0.151 [1.041]
Δp_{t-3}^{CN}	0.170 [1.035]	0.754 [6.048]	0.017 [0.656]	-0.273 [-1.751]
Δp_{t-4}^{CN}	-0.184 [-1.134]	-1.217 [-9.855]	-0.005 [-0.178]	0.368 [2.382]
Δp_{t-5}^{CN}	0.260 [1.418]	1.773 [12.698]	0.009 [0.304]	-0.340 [-1.947]
Δp_{t-6}^{CN}	-0.223 [-1.073]	-1.260 [-7.957]	-0.013 [-0.381]	0.298 [1.502]
Δp_{t-7}^{CN}	0.117 [0.635]	0.532 [3.795]	-0.009 [-0.292]	-0.262 [-1.493]
Δp_{t-8}^{CN}	-0.044 [-0.269]	-0.750 [-6.031]	0.006 [0.229]	0.330 [2.119]
Δp_{t-9}^{CN}	0.132 [0.804]	1.106 [8.875]	0.023 [0.879]	-0.360 [-2.308]
Δp_{t-10}^{CN}	-0.137 [-0.910]	-0.629 [-5.482]	-0.044 [-1.785]	0.292 [2.035]
Δp_{t-11}^{CN}	0.048 [0.633]	0.178 [3.110]	0.023 [1.847]	-0.095 [-1.329]
$\Delta e_{t-1}^{HK/US}$	-0.216 [-0.612]	0.019 [0.072]	1.858 [32.443]	0.249 [0.739]
$\Delta e_{t-2}^{HK/US}$	0.120 [0.161]	0.198 [0.349]	-1.760 [-14.619]	-0.060 [-0.084]
$\Delta e_{t-3}^{HK/US}$	0.086 [0.092]	-0.389 [-0.548]	1.424 [9.425]	-0.433 [-0.487]
$\Delta e_{t-4}^{HK/US}$	0.316 [0.312]	0.528 [0.683]	-1.502 [-9.135]	-0.259 [-0.268]

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Variables	Δp_t^{HK}	Δp_t^{CN}	$\Delta e_t^{HK/US}$	$\Delta e_t^{US/CN}$
$\Delta e_{t-5}^{HK/US}$	-0.513 [-0.462]	-0.240 [-0.284]	1.595 [8.871]	1.128 [1.067]
$\Delta e_{t-6}^{HK/US}$	1.013 [0.865]	0.097 [0.109]	-1.169 [-6.168]	-1.170 [-1.049]
$\Delta e_{t-7}^{HK/US}$	-1.050 [-0.959]	-0.055 [-0.066]	0.891 [5.022]	0.814 [0.781]
$\Delta e_{t-8}^{HK/US}$	0.468 [0.471]	-0.103 [-0.136]	-0.927 [-5.770]	-0.749 [-0.793]
$\Delta e_{t-9}^{HK/US}$	-0.031 [-0.034]	0.352 [0.505]	0.877 [5.914]	0.556 [0.638]
$\Delta e_{t-10}^{HK/US}$	-0.123 [-0.170]	-0.119 [-0.216]	-0.434 [-3.698]	-0.103 [-0.149]
$\Delta e_{t-11}^{HK/US}$	0.054 [0.157]	-0.062 [-0.238]	0.126 [2.276]	-0.373 [-1.143]
$\Delta e_{t-1}^{US/CN}$	-0.020 [-0.340]	0.049 [1.082]	0.016 [1.665]	2.319 [40.886]
$\Delta e_{t-2}^{US/CN}$	0.080 [0.549]	-0.143 [-1.291]	-0.010 [-0.443]	-2.583 [-18.631]
$\Delta e_{t-3}^{US/CN}$	-0.065 [-0.333]	0.188 [1.262]	-0.023 [-0.724]	2.149 [11.503]
$\Delta e_{t-4}^{US/CN}$	-0.044 [-0.206]	-0.178 [-1.091]	0.057 [1.632]	-2.179 [-10.670]
$\Delta e_{t-5}^{US/CN}$	0.181 [0.795]	0.203 [1.172]	-0.081 [-2.203]	2.511 [11.581]
$\Delta e_{t-6}^{US/CN}$	-0.262 [-1.099]	-0.260 [-1.435]	0.090 [2.327]	-2.354 [-10.379]
$\Delta e_{t-7}^{US/CN}$	0.225 [0.963]	0.298 [1.674]	-0.061 [-1.602]	1.826 [8.200]
$\Delta e_{t-8}^{US/CN}$	-0.199 [-0.895]	-0.303 [-1.798]	0.025 [0.700]	-1.629 [-7.709]
$\Delta e_{t-9}^{US/CN}$	0.223 [1.102]	0.254 [1.648]	-0.022 [-0.668]	1.582 [8.203]
$\Delta e_{t-10}^{US/CN}$	-0.191 [-1.267]	-0.154 [-1.343]	0.022 [0.898]	-1.014 [-7.085]
$\Delta e_{t-11}^{US/CN}$	0.071 [1.152]	0.046 [0.987]	-0.009 [-0.874]	0.289 [4.962]

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Variables	Δp_t^{HK}	Δp_t^{CN}	$\Delta e_t^{HK/US}$	$\Delta e_t^{US/CN}$
C	-0.000049 [-0.648]	0.000133 [2.315]	0.000025 [2.027]	-0.000052 [-0.727]
R^2	0.9217	0.9680	0.9303	0.9670

Note. The value in parentheses [ ] is the t-statistic of each parameter estimate.

Regarding the short-run dynamics, only the error-correcting term (ECT) for the Hong Kong Dollar–U.S. Dollar exchange rate ($\Delta e_t^{HK/US}$) is statistically significant ($t = -4.453$). The t-statistics for the ECTs of both consumer prices are insignificant, implying that p_t^{HK} and p_t^{CN} do not adjust to restore the long-run equilibrium. This result further confirms the rejection of the PPP hypothesis.

4. Conclusion and Further Research

This study provides mixed evidence regarding the long-run price relationship between Hong Kong and Mainland China. The Engle–Granger tests do not support PPP, whereas the Johansen cointegration (Trace test) approach suggests the existence of at least one long-run relationship linking Hong Kong prices, Mainland China prices, and the two nominal exchange rates. The result of VECM estimation shows that the adjustment toward long-run equilibrium takes place primarily through the Hong Kong-U.S. exchange rate, whereas the price levels in Hong Kong and Mainland China exhibit little response to deviations from equilibrium. This outcome reflects the institutional reality of Hong Kong's currency board system, under which the HKD-USD exchange rate bears the primary burden of adjustment.

Overall, the findings suggest that some price transmission from Mainland China to Hong Kong is present, but strict PPP does not hold. These results highlight the importance of exchange rate arrangements in shaping the adjustment process and suggest that further research—incorporating structural breaks, alternative price indices, and robustness checks—would be valuable for a more comprehensive assessment of the long-run validity of PPP between Hong Kong and Mainland China.

Monetary policy in Hong Kong is primarily aimed at maintaining the stability of the Hong Kong Dollar against the U.S. Dollar. This implies that Hong Kong's monetary policy is strongly influenced by economic conditions in the United States. If Hong Kong's consumer prices are correlated with its money supply, they may also be significantly affected by U.S. economic fluctuations. Moreover, the Hong Kong CPI may be strongly influenced by movements in the domestic real estate market. In recent years, Hong Kong residents have increasingly purchased goods directly from Mainland China through online platforms. This growing trend suggests that local consumers may, to some extent, be affected by price movements in China's consumer markets. These factors warrant further investigation in future empirical research.

References

Cheung, Y.-W., and Lai, K. S. (1993). "Finite-sample sizes of Johansen's likelihood ratio tests for cointegration." *Oxford Bulletin of Economics and Statistics*, 55(3), 313–328

Enders, W. (1988). "ARIMA and Cointegration Tests of PPP under Fixed and Flexible Exchange Rate Regimes." *The Review of Economics and Statistics*, 70(3), 504–508

Enders, W. (2010). *Applied Econometric Time Series* (3rd ed.). John Wiley & Sons, Inc

Enders, W. (2014). *Applied Econometric Time Series* (4th ed.). John Wiley & Sons, Inc

Genberg, H., Liu, L., and Jin, X. (2006). Hong Kong's business cycle synchronisation with Mainland China and the US. *HKMA Quarterly Bulletin*, 5-12

He, D., Liao, W., and Wu, T. (2015). "Hong Kong's Growth Synchronization with China and the U.S.: A Trend and Cycle Analysis." *Journal of Asian Economics*, 40, 10–28

Johansen, S. (1988). "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control*, 12(2–3), 231–254

Johansen, S., and Juselius, K. (1990). "Maximum Likelihood Estimation and Inference on Cointegration—with Applications to the Demand for Money." *Oxford Bulletin of Economics and Statistics*, 52(2), 169–210

Johansen, S. (1991). "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models." *Econometrica*, 59, 1551–1580

Liang, H. (1999). "Do Hong Kong SAR and China Constitute an Optimal Currency Area? An Empirical Test of the Generalized Purchasing Power Parity Hypothesis." *IMF Working Paper No. WP/99/79.* International Monetary Fund

Lütkepohl, H., Saikkonen, P., and Trenkler, C. (2000). "Maximum Eigenvalue versus Trace Tests for the Cointegrating Rank of a VAR Process." *Humboldt University Berlin Economics Discussion Paper*

MacKinnon, J. G., Haug, A. A., and Michelis, L. (1999). Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied*

Econometrics, 14(5), 563–577

Newey, W. K., and West, K. D. (1994). "Automatic Lag Selection in Covariance Matrix Estimation." *Review of Economic Studies*, 61(4), 631–653

Phillips, P. C. B., and Perron, P. (1988). "Testing for a Unit Root in Time Series Regression." *Biometrika*, 75(2), 335–346

Rogoff, K. (1996). "The Purchasing Power Parity Puzzle." *Journal of Economic Literature*, 34(2), 647–668

Shirai, S. (2000). *Karenshibodo no Keizaigaku (Policy Studies Series).* Nihon Hyoron Sha. (In Japanese)

Shinohara, M. (2003). *Chugoku Keizai no Kyodaika to Hong Kong.* Keiso Shobo. (In Japanese)

Appendix: Lag Length Selection

Table 1: VAR Lag Order Selection Criteria

Lag length	**AIC**	**SIC**
1	-37.0889	-36.8656
2	-42.1548	-41.7528
3	-45.1636	-44.5831
4	-45.6480	-44.8888
5	-45.6574	-44.7195
6	-45.9160	-44.7996
7	-46.5855	-45.2904
8	-46.8417	-45.3680
9	-47.0583	-45.4059
10	-47.4104	-45.5794
11	-47.6686	-45.659*
12	-47.7771	-45.5889
13	-47.7779	-45.4110
14	-47.8279	-45.2823
15	-47.9411	-45.2169
16	-48.0024*	-45.0996

Note. AIC denotes the Akaike Information Criterion; SIC denotes the Schwarz Information Criterion (also known as the Bayesian Information Criterion, BIC). The lag order corresponding to the minimum value of each criterion is marked with an asterisk (*).