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Effects of US–China Inflation on Hong Kong and Singapore

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Abstract

This study examines the extent to which consumer prices in Hong Kong Special Administrative Region and Singapore are influenced by those in the United States and Mainland China, respectively. Previous findings indicate that consumer prices in Hong Kong respond more strongly to US price shocks than those in Singapore. However, the results of this study reveal that consumer prices in Singapore are more responsive to price shocks from both the US and China than those in Hong Kong. This finding contradicts the insulating effect associated with floating exchange rate regimes. When the analysis is extended to three countries using the Johansen cointegration test, only Hong Kong shows a stable long-run equilibrium relationship with the US and China, as indicated by one cointegrating vector. In contrast, Singapore does not exhibit any cointegration with the US and China. The error-correction coefficient is negative and statistically significant only in the US inflation equation, indicating that the US adjusts toward long-run equilibrium. In Hong Kong, the coefficient is insignificant, reflecting weak adjustment dynamics. China's coefficient is significant but positive, indicating divergence from long-run equilibrium.

Keywords: Inflation transmission, cointegration, error-correction model, Hong Kong, Singapore

JEL Classification: C32, E31, F31

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1. Introduction

This study analyzes the influence of inflation shocks from the US and China on price dynamics in Hong Kong and Singapore from 2008 to 2025.

Singapore and Hong Kong are highly susceptible to external shocks. Although they share several similarities, their exchange rate regimes differ. This study focuses on Singapore and Hong Kong to examine the effect of these differences on the transmission of external shocks to the domestic economy.

Cheung and Yuen (2002) examined the relationship between consumer prices in Hong Kong and Singapore and those in the US, concluding that consumer prices in Hong Kong react more strongly to US price shocks than those in Singapore. Their finding supports the insulating property of floating exchange rates: floating regimes can buffer external shocks more effectively than fixed regimes. In contrast, the findings herein reveal that consumer prices in Singapore are more vulnerable to price shocks originating from the US and China than those in Hong Kong. This evidence challenges the insulating effect of floating exchange rate regimes.

The remainder of the study is organized as follows: Section 2 reviews the relevant literature; Section 3 describes the data; Section 4 presents the empirical results; Section 5 concludes.

2. Literature Review

This study first introduces the main views on the similarities between Hong Kong and Singapore. Gerlach and Gerlach-Kristen (2006) remarked that these two economies are "similar in important ways: they are extremely small, highly open to international trade, and very advanced." This characterization is reinforced by subsequent comparative studies describing their structural similarities as small, open metropolitan economies lacking natural resources (Ma et al., 2007). Hong Kong and Singapore are considered particularly vulnerable to price fluctuations in major global economies because they rely heavily on international trade and imported goods.

As noted by Cheung and Yuen (2002), a major difference between Hong Kong and Singapore lies in their exchange rate regimes. Although Hong Kong operators operate under a rigid currency board arrangement as their fundamental framework, these systems differ markedly in design regarding the degree of monetary autonomy and discretionary control over domestic demand they permit (Ma et al., 2007). Since October 1983, Hong Kong has operated under a linked exchange rate system (LERS), maintaining a rigid peg between the Hong Kong dollar and the US dollar. Conversely, Singapore has operated under an exchange-rate–centered framework since 1981, managing the Singapore dollar against a trade-weighted basket of currencies with an explicit emphasis on price stability as the foundation for sustainable growth (Gerlach & Gerlach-Kristen, 2006).

Devereux (2003) noted that under a floating exchange rate regime, as in Singapore, the economy should be effectively insulated from foreign price shocks, but not from real interest rate shocks. However, under a fixed exchange rate regime, foreign price and real interest rate shocks will affect the domestic economy. This provides an argument for the superiority of floating exchange rate regimes over fixed regimes, as monetary policy can be assigned to price stabilization.

Cheung and Yuen (2002) provided empirical evidence that although US inflation transmits to the economies of Hong Kong and Singapore, Hong Kong exhibits a much stronger response than Singapore, a finding consistent with the standard predictions of a fixed exchange rate arrangement. The authors argued that although exchange rate flexibility does not completely insulate Singapore from external price movements, it makes the economy less responsive to US shocks. Accordingly, the Monetary Authority of Singapore effectively employs its monetary policy to absorb some of the impact of foreign price shocks and curb imported inflation. In contrast, Hong Kong remains subject to significant influences from the large economy. Cheung and Yuen's findings indicate that US price shocks exert a dominant and sustained impact on the inflation dynamics of Hong Kong and Singapore.

These monetary frameworks may lead to different responses to external inflationary shocks, underscoring the importance of examining how these economies manage imported inflation in a volatile global market.

Kim and Roubini (2000) applied a structural vector autoregressive (SVAR) model in first differences with short-run restrictions to isolate structural shocks and trace their propagation across economies using impulse response functions (IRFs) and forecast error variance decomposition (FEVD).

Nevertheless, modeling inflation transmission from these major economies is a complex issue. Cheung and Yuen (2002) focused on long-run cointegration among the price indices of the US, Hong Kong, and Singapore. However, using more recent data, our empirical findings provide no evidence of a cointegrating relationship among the variables.

3. Data and Preliminary Analysis

The analysis uses monthly data on consumer price indices (CPIs) for Hong Kong, Singapore, Mainland China, and the US from 2008.M9 to 2025.M9. CPI data for Hong Kong, Singapore, China, and the US were obtained from the website of the Bank for International Settlements[2]. All series were transformed into natural logarithms and seasonally adjusted using the moving-average method. The variables are denoted as $logcpi^{CN}$, $logcpi^{HK}$, $logcpi^{SG}$, and $logcpi^{US}$, and their first differences are denoted as $\Delta logcpi^{CN}$, $\Delta logcpi^{HK}$, $\Delta logcpi^{SG}$, and $\Delta logcpi^{US}$.

Table 1. Descriptive statistics.

Variables	Mean (%)	Maximum(%)	Minimum(%)	Std. Dev.(%)	Coefficient of Variation
$\Delta logcpi^{CN}$	0.151	1.257	-1.285	0.417	2.770
$\Delta logcpi^{HK}$	0.210	2.903	-2.708	0.786	3.746
$\Delta logcpi^{SG}$	0.158	1.700	-1.415	0.450	2.842
$\Delta logcpi^{US}$	0.194	1.294	-1.580	0.310	1.599

Table 1 shows that consumer price fluctuations are smaller in Singapore than in Hong Kong. This finding suggests that Singapore has managed inflation more effectively.

Figures 1 and 2 present the time-series behavior of the CPI variables for Hong Kong, Singapore, China, and the United States. Figure 1 displays the level series in natural logarithms, while Figure 2 shows the corresponding first-differenced series. The level series exhibits clear upward trends over time, suggesting non-stationarity. In contrast to the level series, the differenced series fluctuates around zero without exhibiting a clear upward or downward trend. Although several temporary spikes are observed,

[2] Available from: https://www.bis.org.

particularly for Hong Kong during periods of heightened economic uncertainty, the fluctuations remain bounded and relatively stable over time. These visual characteristics suggest that the first-differenced series are stationary, providing preliminary support for the unit root test results reported in the following section.

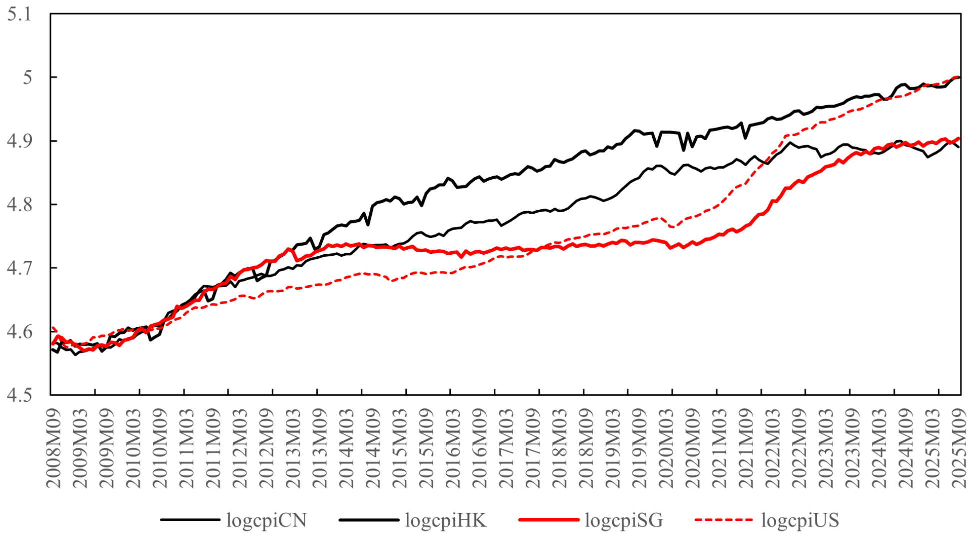

Figure 1. Time series plots of level series (natural logarithms).

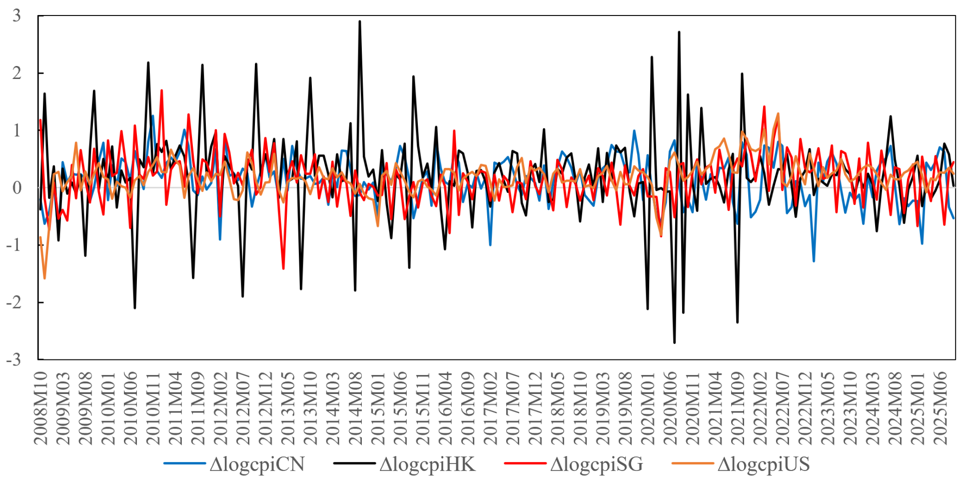

Figure 2. Time series plots of first-differenced series.

Subsequently, this study examines merchandise import trade among Hong Kong, Singapore, China, and the US.

Figure 3 presents the proportion of Hong Kong's imports of goods from the US and China. The data were obtained from the Census and Statistics Department of the Hong Kong SAR Government[3]. Figure 4 shows the proportion of Singapore's imports of

[3]Available from: https://www.censtatd.gov.hk/en/

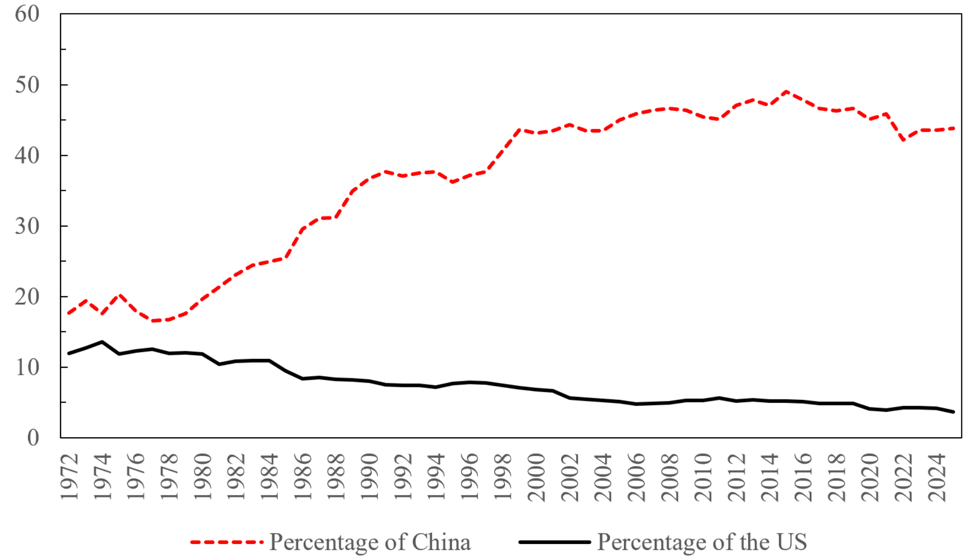

Figure 3. Proportion of Hong Kong's imports of goods from the US and China.

goods from the US and China. The data were obtained from the Singapore Department of Statistics[4].

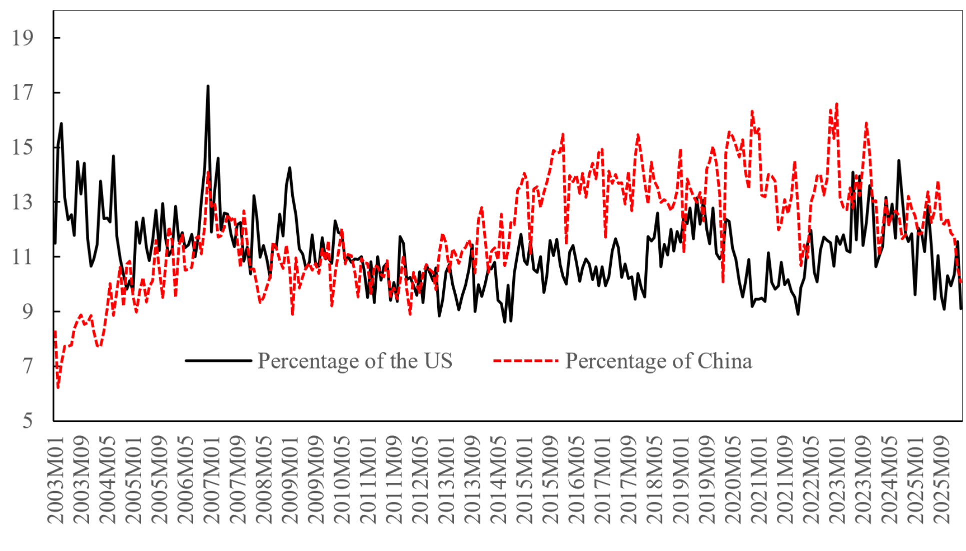

Figure 4. Proportion of Singapore's imports of goods from the US and China.

In Hong Kong, China's share of total imports consistently exceeds that of the US. In recent years, the US share of Hong Kong's total imports has fallen below 5%. Consequently, changes in US consumer prices are unlikely to have a large impact on consumer prices in Hong Kong. In Singapore, the US and China have each accounted for approximately 10%–15% of total imports since 2003. Given the proportion of goods imports,

[4]Available from: https://www.singstat.gov.sg.

the US and China are likely to influence changes in Singapore's consumer prices.

4. Empirical Results

This section presents an empirical analysis of the relationship between consumer price change rates in Hong Kong and Singapore and those in the US and China, respectively. The empirical analysis is conducted in five steps. First, unit root tests are employed to examine the stationarity properties of the variables. Second, the presence of a long-run equilibrium relationship is assessed using the Engle–Granger (EG) method and the Johansen cointegration test. Third, an SVAR model is estimated to capture short-run dynamics and identify structural shocks. Fourth, IRFs and FEVD are used to evaluate the dynamic effects of shocks and quantify their relative contributions to system variability across time horizons. Finally, to evaluate systemic interdependence and assess the robustness of the pairwise results, the analysis is extended to a three-country framework (comprising US–China–Hong Kong and US–China–Singapore) using multivariate cointegration approaches.

4.1. Unit Root Tests

The stationarity properties of the individual time series are examined using the augmented Dickey–Fuller (ADF) and Phillips–Perron tests. These tests are applied to the levels and the first differences in the variables natural logarithms. The null hypothesis in each case is that the series contains a unit root, indicating nonstationarity. The results of these tests are presented in Tables 2 and 3.

Table 2. The ADF test results.

Variables	Constant		Constant, Linear Trend		None		Decision
$logcpi^{CN}$	−1.825	(1)	−0.987	(1)	3.849	(1)	I(1)
$\Delta logcpi^{CN}$	−11.332***	(0)	−11.496***	(0)	−10.287***	(0)	
$logcpi^{HK}$	−2.951	(1)	−1.661	(1)	2.208	(1)	I(1)
$\Delta logcpi^{HK}$	−19.490***	(0)	−19.603***	(0)	−17.755***	(0)	
$logcpi^{SG}$	−1.727	(11)	−3.188***	(11)	1.585	(11)	I(0)
$\Delta logcpi^{SG}$	−2.283	(10)	−2.277	(10)	−1.604	(10)	
$logcpi^{US}$	0.926	(7)	−0.940	(7)	2.966	(7)	I(1)
$\Delta logcpi^{US}$	−3.623***	(6)	−3.827***	(6)	−2.098	(6)	

Notes. The reported values are adjusted t-statistics. Values in parentheses indicate the lag length in the ADF test. The lag length is selected based on the Schwarz Information Criterion (SIC). (***) denotes rejection of the null hypothesis at the 1% significance level.

Table 3. The PP test results.

Variables	Constant		Constant, Linear Trend		None		Decision
$logcpi^{CN}$	−1.761	(2)	−0.703	(1)	4.637	(1)	I(1)
$\Delta logcpi^{CN}$	−11.261***	(4)	−11.293***	(6)	−10.397***	(4)	
$logcpi^{HK}$	−1.694	(4)	−1.494	(4)	5.281	(4)	I(1)
$\Delta logcpi^{HK}$	−20.145***	(4)	−20.458***	(4)	−17.505***	(4)	
$logcpi^{SG}$	−0.246	(7)	−1.118	(7)	4.146	(7)	I(1)
$\Delta logcpi^{SG}$	−16.392***	(8)	−16.372***	(8)	−16.025***	(9)	
$logcpi^{US}$	2.344	(7)	−1.257	(7)	5.277	(8)	I(1)
$\Delta logcpi^{US}$	−8.061***	(0)	−8.154***	(2)	−6.039***	(4)	

Note. The reported values are adjusted t-statistics. Values in parentheses indicate the bandwidth in the PP test. The bandwidth is selected based on Newey and West(1994). (***) denotes rejection of the null hypothesis at the 1% significance level.

The ADF and PP test results reveal that all variables are nonstationary at levels but become stationary after first differencing. This finding indicates that the variables are integrated of order one, denoted as I(1). As indicated in Tables 2 and 3, all series are I(1) variables at the 1% level.

4.2. Cointegration Test

This study conducted cointegration tests for the following pairs of economies: Hong Kong–China, Singapore–China, Hong Kong–the US, and Singapore–the US. Two methodologies were employed: the EG and Johansen tests.

(1) The EG two-step procedure was employed to test for cointegration in each bilateral pair. In the first step, the test was applied to two model specifications: one with only a constant and another with both a constant and a linear trend. The long-run equilibrium equation was first estimated using ordinary least squares. The second step involved applying the ADF test to the residuals to assess stationarity. The lag length for the ADF test was selected based on the Schwarz Information Criterion (SIC). Because linear regression requires specifying a dependent variable and an explanatory variable, this study estimated both directions for each pair. Table 4 reports the first direction, and Table 5 reports the reverse direction.

Table 4. Engle–Granger test (1) (ADF test for residuals).

Pair	**Lag**	**t-statistic**	**Conclusion**
$logcpi^{CN} - logcpi^{HK}$	0	$-3.361(**)$	Cointegration at 5%
$logcpi^{CN} - logcpi^{SG}$	12	-2.133	No cointegration
$logcpi^{US} - logcpi^{HK}$	1	-0.597	No cointegration
$logcpi^{US} - logcpi^{SG}$	9	-1.410	No cointegration

Note. Lag length for the ADF test was selected using the Schwarz Bayesian Information Criterion(SIC). Critical values for the 5% significance level were obtained from MacKinnon (1991). (**) denotes rejection of the null hypothesis of no cointegration at the 5% significance level.

Table 5. Engle–Granger test (2) (ADF test for residuals).

Pair	**Lag**	**t-statistic**	**Conclusion**
$logcpi^{HK} - logcpi^{CN}$	0	-3.368^{**}	Cointegration at 5%
$logcpi^{SG} - logcpi^{CN}$	12	-2.444	No cointegration
$logcpi^{HK} - logcpi^{US}$	1	-1.621	No cointegration
$logcpi^{SG} - logcpi^{US}$	9	-3.044	No cointegration

Note. Lag length for the ADF test was selected using the Schwarz Bayesian Information Criterion (SIC). Critical values for the 5% significance level were obtained from MacKinnon (1991). (**) denotes rejection of the null hypothesis of no cointegration at the 5% significance level.

Based on the EG test results, the empirical findings for each of the four pairs from both estimation directions are analyzed as follows. For the $logcpi^{CN} - logcpi^{HK}$ pair, the ADF test statistics are -3.361 (Table 4) and -3.368 (Table 5). Both values exceed the MacKinnon critical value at the 5% level. Thus, the null hypothesis of no cointegration is rejected in both directions. The results are similar for the remaining three pairs. The test statistics are below the MacKinnon critical values (Tables 4 and 5). This study failed to reject the null hypothesis of no cointegration at any conventional significance level. The results are consistent across both directions.

(2) For the Johansen test, the optimal lag length for the underlying VAR of the pair is selected using the SIC, with detailed results reported in the Appendix (Tables A-1–A-4). Given that price-level data (log CPI) typically exhibit persistent growth and distinct deterministic trends over time, the Johansen cointegration test with the restricted trend specification was employed[5]. However, the restricted trend specification assumes a linear trend directly toward the cointegrating vector. The empirical results are presented in Tables 6–9.

Table 6. Johansen cointegration test results for the China and Hong Kong CPIs.

Lag interval: 1–2				
Unrestricted cointegration rank test (trace)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Trace statistic**	**5% critical value (**)**
None	$r > 0$	0.050172	16.305	25.872
$r \leq 0$	$r > 1$	0.028499	5.885	12.518
Unrestricted cointegration rank test (max-eigenvalue)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Max-eigen. statistic**	**5% critical value (**)**
None	$r = 1$	0.050172	10.419	19.387
$r = 1$	$r = 2$	0.028499	5.885	12.518

Note. r is the number of cointegrating vectors. (**) is the critical value of MacKinnon et al. (1999).

Table 7. Johansen cointegration test results for the China and Singapore CPIs.

Lags interval: 1–4				
Unrestricted cointegration rank test (trace)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Trace statistic**	**5% critical value (**)**
None	$r > 0$	0.038181	9.699	25.872
$r \leq 0$	$r > 1$	0.009518	1.913	12.518
Unrestricted cointegration rank test (max-eigenvalue)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Max-eigen. statistic**	**5% critical value (**)**
None	$r = 1$	0.038181	7.786	19.387
$r = 1$	$r = 2$	0.009518	1.913	12.518

Note. r is the number of cointegrating vectors. (**) is the critical value of MacKinnon et al. (1999).

[5] Following Johansen (1995).

Table 8. Johansen cointegration test results for the US and Hong Kong CPIs.

Lags interval: 1–2				
Unrestricted cointegration rank test (trace)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Trace statistic**	**5% critical value (**)**
None	$r > 0$	0.075134	19.943	25.872
$r \leq 0$	$r > 1$	0.020409	4.165	12.518
Unrestricted cointegration rank test (max-eigenvalue)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Max-eigen. statistic**	**5% critical value (**)**
None	$r = 1$	0.075134	15.778	19.387
$r = 1$	$r = 2$	0.020409	4.165	12.518

Note. r is the number of cointegrating vectors. (**) is the critical value of MacKinnon et al. (1999).

Table 9. Johansen cointegration test results for the US and Singapore CPIs.

Lags interval: 1–4				
Unrestricted cointegration rank test (trace)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Trace statistic**	**5% critical value (**)**
None	$r > 0$	0.067331	21.835	25.872
$r \leq 0$	$r > 1$	0.038699	7.893	12.518
Unrestricted cointegration rank test (max-eigenvalue)				
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Max-eigen. statistic**	**5% critical value (**)**
None	$r = 1$	0.067331	13.941	19.387
$r = 1$	$r = 2$	0.038699	7.893	12.518

Note. r is the number of cointegrating vectors. (**) is the critical value of MacKinnon et al. (1999).

The trace and maximum eigenvalue tests consistently indicate no cointegrating vectors at the 5% significance level for each pair of variables (Tables 6–9). These results suggest the absence of a stable long-run equilibrium relationship among the variables.

The EG and Johansen tests yield different results: EG indicates cointegration for the CN–HK pair, whereas the Johansen test fails to detect cointegration for any pair. This study selected the Johansen results. Johansen uses a system-based maximum likelihood method; it is more efficient and avoids the arbitrary choice of the dependent variable. Consequently, this study concluded that no cointegrating relationship exists among the variables.

Given the absence of cointegration between the variables, a structural VAR (SVAR) model was estimated using the first differences of the natural logarithms with short-run restrictions.

4.3. Structural VAR

An SVAR model was applied to first differences with short-run restrictions. The inflation rates in the US and China were assumed to be more exogenous than those in Hong Kong and Singapore. This approach enabled isolating structural shocks in the US and China and tracing their propagation through the economies of Hong Kong and Singapore using IRFs and FEVD.

4.3.1. Impulse Response Function

Figures 5–8 present the IRFs for each country pair over a 24-month horizon. Figures 5 and 6 display the China–Hong Kong and China–Singapore pairs, whereas Figures 7 and 8 present the US–Hong Kong and US–Singapore pairs. Throughout these figures, the structural innovations are standardized and defined as follows: Shock 1 represents China's inflation shock; Shock 2, Hong Kong's inflation shock; Shock 3, the US's inflation shock; and Shock 4, Singapore's inflation shock.

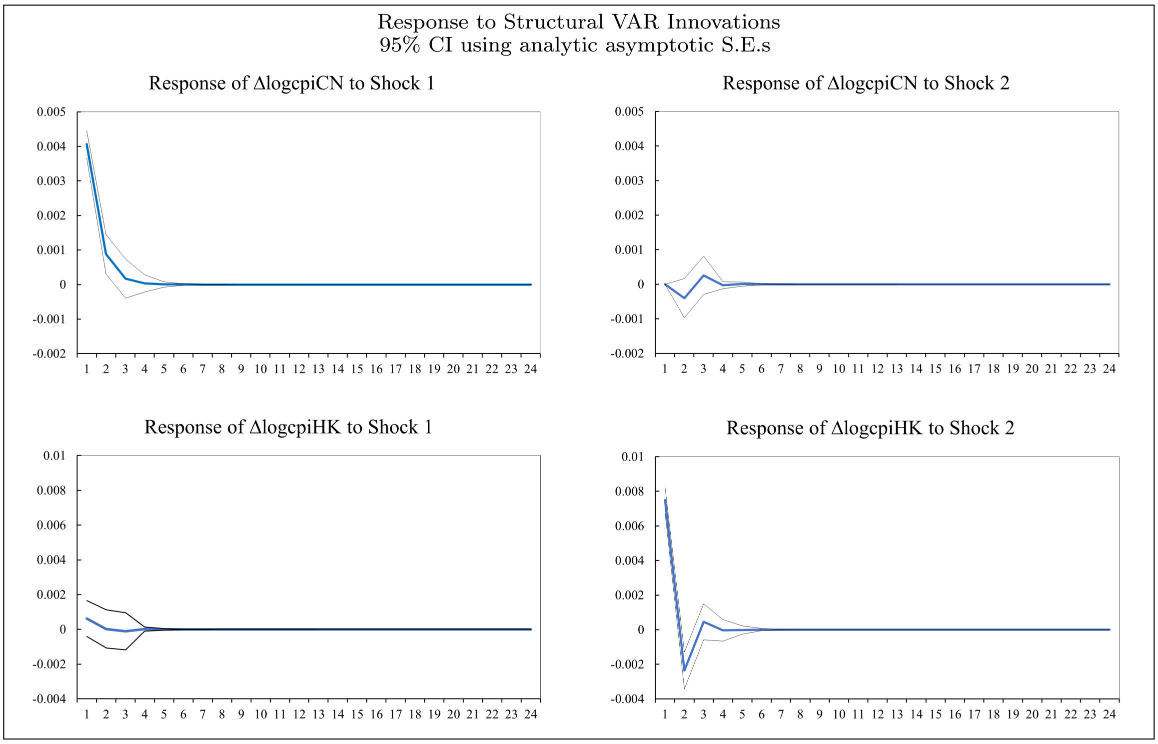

Figure 5. Impulse responses of China and Hong Kong inflation to inflation shocks.

The IRF results reveal a significant asymmetry in how price dynamics in Hong Kong and Mainland China respond to external shocks. $\Delta logcpi^{HK}$ exhibits a sharp and immediate response to Shock 2, peaking at approximately 0.008, followed by a brief period of volatility before converging to the steady state by the sixth period. In contrast, the impact of Shock 2 on $\Delta logcpi^{CN}$ is statistically insignificant. This finding is consistent with the small open economy characteristics of Hong Kong, as domestic shocks there have no feedback effects on Mainland China.

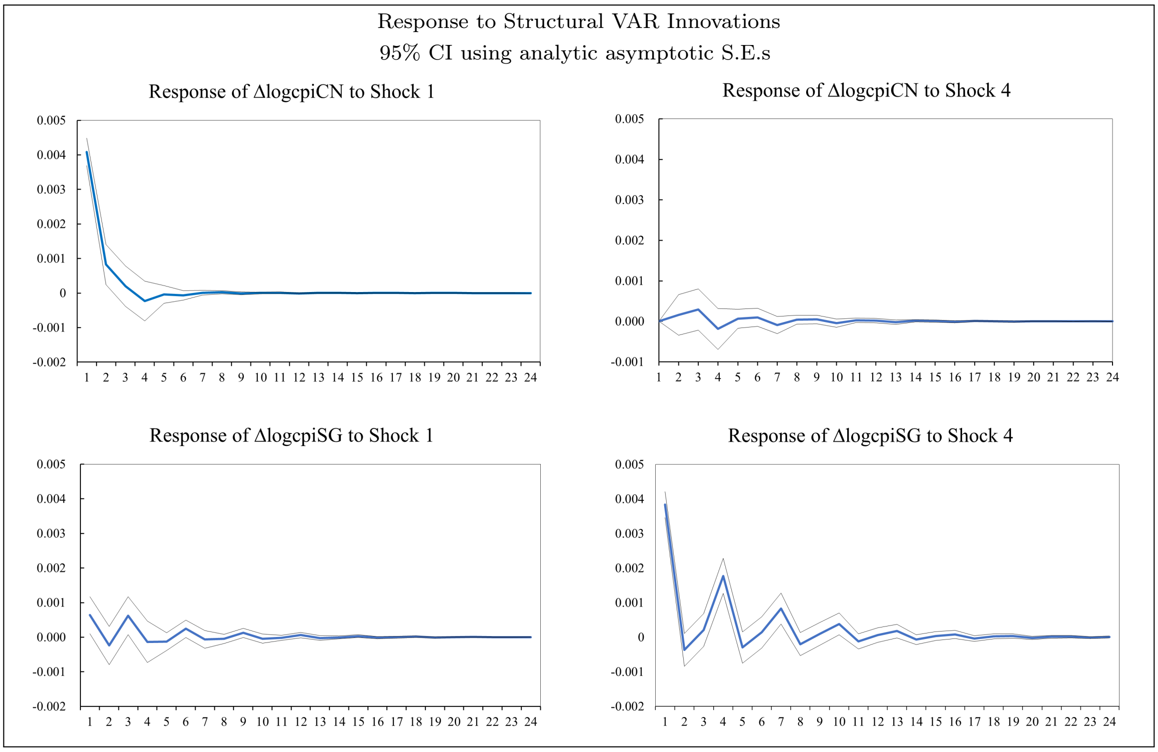

Figure 6. Impulse responses of China and Singapore inflation to inflation shocks.

Although China's inflation ($\Delta logcpi^{CN}$) demonstrates a standard monotonic decay following a 0.004 peak from Shock 1, Singapore's inflation ($\Delta logcpi^{SG}$) exhibits a cyclical adjustment in response to Shock 2. In particular, the response in Singapore peaks at 0.0038 and is characterized by a series of dissipating oscillations.

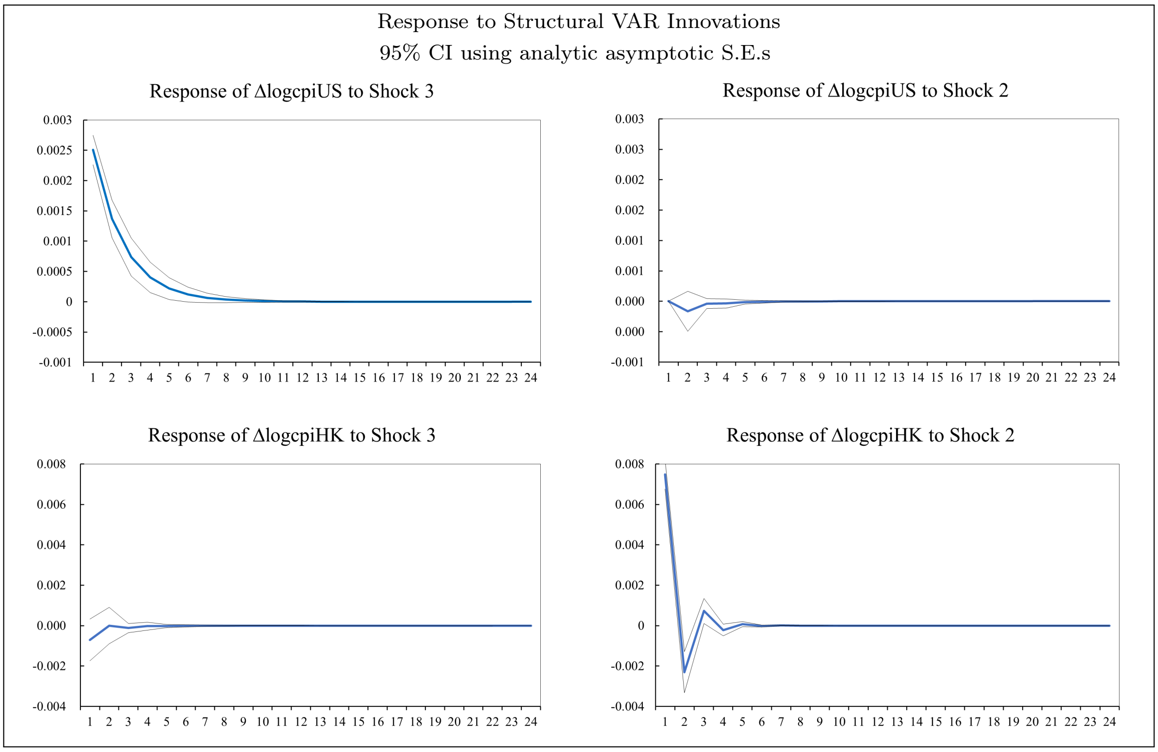

Figure 7. Impulse responses of the US and Hong Kong inflation to inflation shocks.

Based on the IRFs, the US inflation rate ($\Delta logcpi^{US}$) remains largely unresponsive to both shocks, displaying a peak of only 0.0025 and a rapid return to equilibrium. In contrast, Hong Kong's inflation rate ($\Delta logcpi^{HK}$), as illustrated in Figure 4, exhibits a much stronger response to domestic innovations, peaking at a significant level of 0.008.

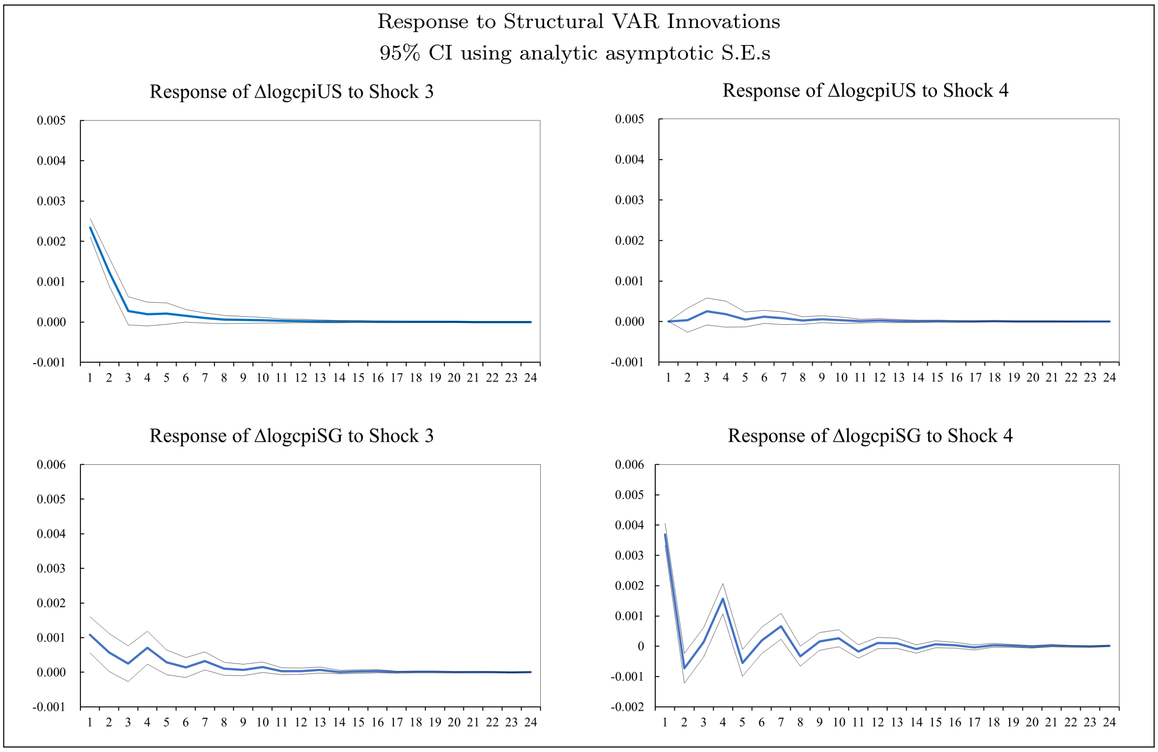

Figure 8. Impulse responses of the US and Singapore inflation to inflation shocks.

Although US inflation ($\mathit{\Delta logcpi}^{US}$) responds to its own domestic shock by 0.0024 and follows a smooth, monotonic decay, Singapore's inflation ($\mathit{\Delta logcpi}^{SG}$) exhibits a more fluctuating adjustment mechanism. Singapore's response to domestic innovations peaks sharply at 0.0038 before immediately reversing to -0.0008 in the second period.

Hong Kong's inflation dynamics closely track the US shock, reflecting the high nominal convergence under the LERS (Figure 7). Conversely, Singapore's managed floating exchange rate framework acts as a partial insulator, allowing domestic inflation to absorb the US shock through a temporary adjustment before both systems stabilize at their initial equilibrium (Figure 8).

4.3.2. Forecast Error Variance Decomposition

The FEVD results indicate the relative importance of each structural shock in explaining inflation volatility across the model economies. Detailed results for time periods 1–24 are reported in Tables 10–13.

Table 10. Variance decomposition of $\Delta logcpi^{CN}$ and $\Delta logcpi^{HK}$.

	$\Delta logcpi^{CN}$ fluctuations (%)		$\Delta logcpi^{HK}$ fluctuations (%)	
Horizon	$\Delta logcpi^{CN}$	$\Delta logcpi^{HK}$	$\Delta logcpi^{CN}$	$\Delta logcpi^{HK}$
1	100.00	0.00	0.68	99.32
4	98.69	1.31	0.64	99.36
8	98.69	1.31	0.64	99.36
12	98.69	1.31	0.64	99.36
16	98.69	1.31	0.64	99.36
18	98.69	1.31	0.64	99.36
24	98.69	1.31	0.64	99.36

China's inflation is almost entirely driven by its own shocks. Hong Kong's shocks contribute only approximately 1.31% from period 4 onward, with no increase over time. Conversely, Hong Kong's inflation is overwhelmingly explained by its own shocks ($\approx$ 99.36%). Chinese shocks play a negligible role ($\approx$ 0.64%), suggesting a limited spillover from Mainland China into Hong Kong inflation.

Table 11. Variance decomposition of $\Delta logcpi^{CN}$ and $\Delta logcpi^{SG}$.

	$\Delta logcpi^{CN}$ fluctuations (%)		$\Delta logcpi^{SG}$ fluctuations (%)	
Horizon	$\Delta logcpi^{CN}$	$\Delta logcpi^{SG}$	$\Delta logcpi^{CN}$	$\Delta logcpi^{SG}$
1	100.00	0.00	2.70	97.30
4	99.17	0.83	4.60	95.41
8	99.04	0.96	4.80	95.20
12	99.01	0.99	4.85	95.15
16	99.00	1.00	4.85	95.15
18	99.00	1.00	4.85	95.15
24	99.00	1.00	4.85	95.15

Singapore shocks explain only approximately 1% of China's inflation fluctuations. China remains largely insulated from this regional transmission channel.

Table 12. Variance decomposition of $\Delta logcpi^{US}$ and $\Delta logcpi^{HK}$.

	$\Delta logcpi^{US}$ fluctuations (%)		$\Delta logcpi^{HK}$ fluctuations (%)	
Horizon	$\Delta logcpi^{US}$	$\Delta logcpi^{HK}$	$\Delta logcpi^{US}$	$\Delta logcpi^{HK}$
1	100.00	0.00	0.90	99.10
4	99.66	0.35	0.84	99.16
8	99.65	0.35	0.84	99.16
12	99.65	0.35	0.84	99.16
16	99.65	0.35	0.84	99.16
18	99.65	0.35	0.84	99.16
24	99.65	0.35	0.84	99.16

Table 12 presents the variance decomposition results for $\Delta logcpi^{US}$ and $\Delta logcpi^{HK}$. Empirical evidence confirms that US inflation is nearly unaffected by domestic shocks from Hong Kong, with Hong Kong contributing a negligible 0.35 to US price fluctuations across all horizons. In contrast, Hong Kong's inflation dynamics remain heavily driven by domestic innovations, accounting for approximately 99.16% of its total variance. However, the direct contemporaneous contribution of US price shocks remains below 1%.

Table 13. Variance decomposition of $\Delta logcpi^{US}$ and $\Delta logcpi^{SG}$.

	$\Delta logcpi^{US}$ fluctuations (%)		$\Delta logcpi^{SG}$ fluctuations (%)	
Horizon	$\Delta logcpi^{US}$	$\Delta logcpi^{SG}$	$\Delta logcpi^{US}$	$\Delta logcpi^{SG}$
1	100.00	0.00	7.94	92.06
4	98.68	1.32	11.03	88.97
8	98.39	1.61	11.53	88.47
12	98.32	1.68	11.57	88.43
16	98.32	1.68	11.58	88.42
18	98.32	1.68	11.58	88.42
24	98.32	1.68	11.58	88.42

Table 13 presents the variance decomposition results for $\Delta logcpi^{US}$ and $\Delta logcpi^{SG}$. At the long-term 24-period horizon, the forecast error variance of US inflation is overwhelmingly driven by US inflation shocks, accounting for 98.32% of its total fluctuations.

Shocks from Singapore have a negligible effect on US prices, accounting for only 1.68% of their variation. This finding confirms that the US remains a dominant, exogenous block in this bivariate setting. The transmission of inflation from the US to Singapore shows the most significant cross-border price spillover in this comparative study. Inflation shocks originating from the US explain 7.94% of Singapore's inflation fluctuations in the first period; this share then steadily rises and stabilizes at 11.58% by period 24.

4.4. Three-Country Cointegration Analysis

The cointegration analysis was extended to a three-country framework to capture simultaneous long-run structural linkages and assess the robustness of the empirical findings across model specifications. In particular, the multivariate Johansen cointegration test was performed under two configurations: Hong Kong–US–China and Singapore–US–China.

4.4.1. Multivariate Johansen Cointegration Tests for Three-Country Pairs

To examine the presence of long-run equilibrium relationships among the three economies, this study applied the Johansen cointegration test to each of the four three-country pairs: US–China–Hong Kong and US–China–Singapore. The optimal lag length for each system was selected using the SIC, with detailed lag-selection results reported in the appendix (Tables A-5 and A-6). The unrestricted constant specification was employed, including an intercept in the cointegrating equation but no linear trend in the level data. The empirical results are reported in Tables 14–15.

Table 14. Johansen cointegration test results for the US, China, and Hong Kong CPIs.

Lags interval: 1–2

Unrestricted cointegration rank test (trace)

Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Trace statistic**	**5% critical value (**)**
None	$r > 0$	0.108	31.169(*)	29.797
$r \leq 0$	$r > 1$	0.039	8.125	15.495
$r \leq 1$	$r > 2$	0.000	0.001	3.841

Unrestricted cointegration rank test (max-eigenvalue)

Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Max-eigen. statistic**	**5% critical value (**)**
None	$r = 1$	0.108	23.044(*)	21.132
$r = 1$	$r = 2$	0.039	8.124	14.265
$r = 2$	$r = 3$	0.000	0.001	3.841

Note. r is the number of cointegrating vectors. (*) denotes rejection of the hypothesis at the 0.05 level. (**) is the critical value of MacKinnon et al. (1999).

Table 15. Johansen cointegration test results for the US, China, and Singapore CPIs.

Lags interval: 1–2

Unrestricted cointegration rank test (trace)

Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Trace statistic**	**5% critical value (**)**
None	$r > 0$	0.080	27.540	29.797
$r \leq 0$	$r > 1$	0.041	10.689	15.495
$r \leq 1$	$r > 2$	0.011	2.156	3.841

Unrestricted cointegration rank test (max-eigenvalue)

Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Max-eigen. statistic**	**5% critical value (**)**
None	$r = 1$	0.080	16.851	21.132
$r = 1$	$r = 2$	0.041	8.533	14.265
$r = 2$	$r = 3$	0.011	2.156	3.841

Note. r is the number of cointegrating vectors. (**) is the critical value of MacKinnon et al. (1999).

As shown in Tables 14 and 15, only the cases that include Hong Kong, the US, and China exhibit one cointegrating vector ($r = 1$). This finding indicates a stable long-term equilibrium in consumer prices across the three countries. Conversely, no evidence of cointegration is observed in any of the cases involving Singapore.

4.4.2. VECM Estimates: Long-Run Equilibrium Among CPIs of Hong Kong, the US, and China

Given the presence of one cointegrating vector ($r = 1$) among the CPIs of Hong Kong, the US, and China, a vector error-correction model (VECM) was estimated to examine the long-run equilibrium relationship and the speed of short-run adjustment. Based on the estimates, the cointegrating regression equation was obtained as follows:

$$\underset{}{logcpi_t^{HK}} = -1.759 + \underset{[-0.972]}{0.084\, logcpi_t^{US}} + \underset{[-12.673]}{1.295\, logcpi_t^{CN}} \tag{1}$$

The numbers reported in parentheses below the estimated coefficients denote t-statistics. The coefficient on China (-1.295) is statistically significant at the 1% level, with a t-statistic of -12.673. In contrast, the coefficient on the US (-0.084) is not statistically significant at the 5% level, as indicated by a t-statistic of -0.972. Despite the insignificance of the US coefficient, the Johansen test confirms a stable long-run equilibrium relationship among the three economies.

Table 16 summarizes the estimated coefficients of the VECM, along with their t-statistics.

Table 16. Estimates of VECM.

	$\Delta \log cpi_t^{HK}$	$\Delta \log cpi_t^{US}$	$\Delta \log cpi_t^{CN}$
COINTEQ1	-0.029	-0.022	0.039
	[-1.147]	[-2.813]	[2.858]
$\Delta \log cpi_{t-1}^{HK}$	-0.303	-0.016	-0.072
	[-4.177]	[-0.740]	[-1.863]
$\Delta \log cpi_{t-2}^{HK}$	-0.024	0.010	0.018
	[-0.331]	[0.464]	[0.467]
$\Delta \log cpi_{t-1}^{US}$	-0.302	0.484	0.163
	[-1.370]	[7.130]	[1.384]
$\Delta \log cpi_{t-2}^{US}$	0.306	-0.126	0.015
	[1.405]	[-1.886]	[0.126]
$\Delta \log cpi_{t-1}^{CN}$	0.075	0.006	0.209
	[0.558]	[0.151]	[2.922]
$\Delta \log cpi_{t-2}^{CN}$	-0.087	-0.067	0.004
	[-0.644]	[-1.628]	[0.059]
C	0.003	0.001	0.001
	[3.755]	[6.442]	[2.511]
R^2	0.115	0.321	0.102

Note. The values in parentheses represent the t-statistics of each parameter estimate.

The error-correction coefficient is statistically significant and negative only in the

US inflation equation (-0.022, t = -2.813), indicating that the US adjusts toward the long-run equilibrium. In Hong Kong, the coefficient is statistically insignificant, suggesting weak adjustment dynamics. Although the coefficient for China is statistically significant, its positive sign (0.039, t = 2.858) implies divergence from the long-run equilibrium rather than convergence.

This study employs the IRF framework within a VEC model, identified via Cholesky decomposition, to examine the dynamic responses of inflation across Hong Kong, the US, and China. The variables are ordered as follows: $\log cpi^{US} \to \log cpi^{CN} \to \log cpi^{HK}$. Figure 9 presents the impulse responses over a 24-month horizon. The results reveal that Hong Kong's CPI responds positively to inflation shocks from China and the US, with the effect of Chinese shocks stronger and more persistent. In contrast, shocks originating from Hong Kong exert relatively limited influence on the US and Chinese CPIs. These findings highlight Hong Kong's vulnerability to external inflationary pressures and its role as a net recipient of inflation transmission within the three-economy system.

Furthermore, the FEVD framework is employed to quantify the dynamic transmission of shocks within the US–China–Hong Kong CPI. The findings are presented in Tables 17, 18, and 19, covering forecast horizons of 1–24 periods, respectively.

Table 17. Variance decomposition of $\log cpi^{US}$

Horizon	logcpi^{US}	logcpi^{CN}	logcpi^{HK}
1	100.000	0.000	0.000
4	98.647	0.023	1.330
8	94.881	0.618	4.501
12	90.003	2.115	7.883
16	85.533	3.736	10.730
18	83.580	4.492	11.929
24	78.822	6.416	14.762

According to Table 17, US consumer prices are also largely driven by their own shocks, with self-influence accounting for 100% in period 1 and declining to 78.82% by period 24. US price shocks explain 14.76% of the variance in Hong Kong consumer

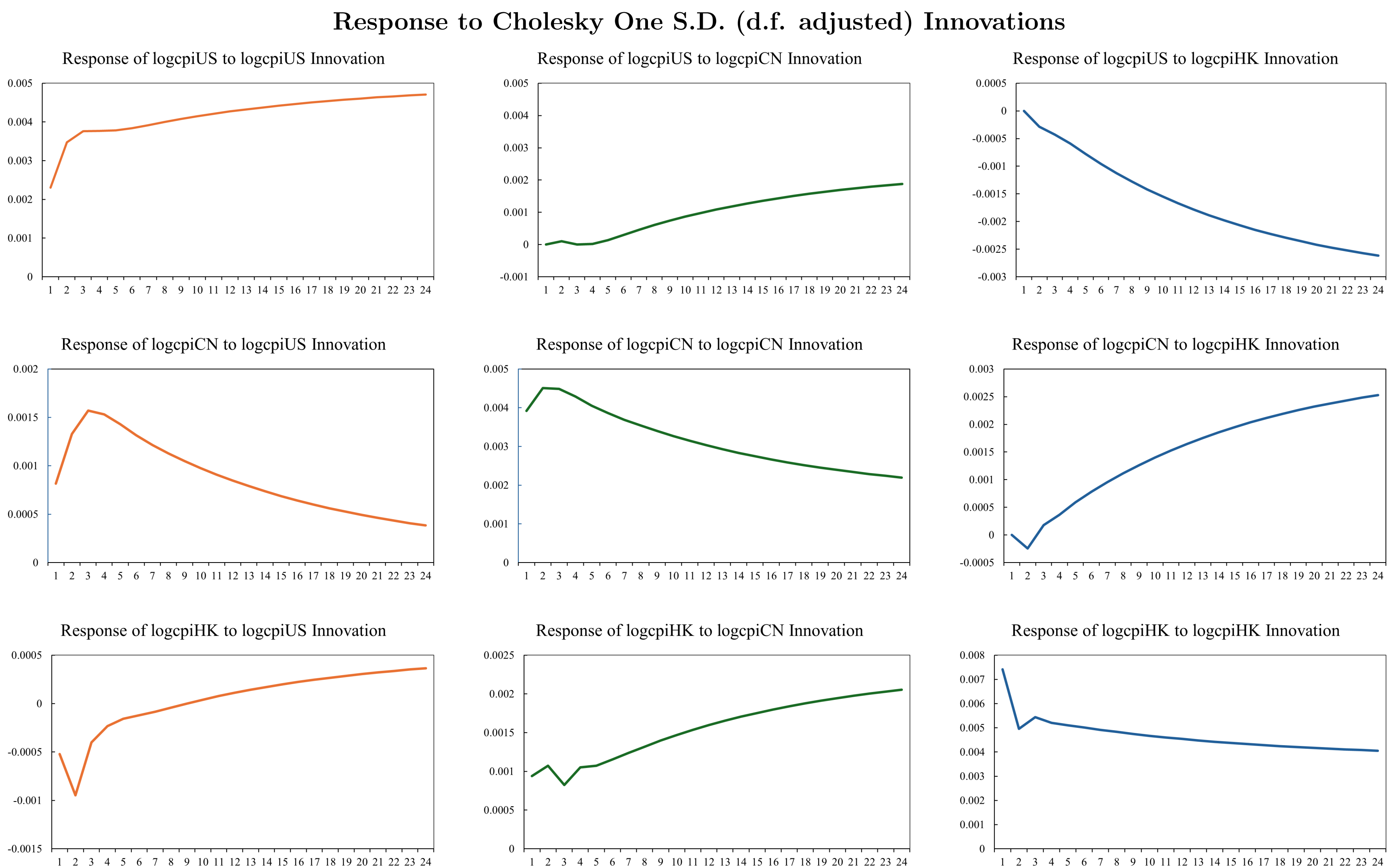

Figure 9. Impulse response functions of CPI shocks among the US, China, and Singapore.

prices by period 24, indicating a surprisingly significant spillover effect from a small open economy.

Table 18. Variance decomposition of $\log cpi^{CN}$

Horizon	$\log cpi^{US}$	$\log cpi^{CN}$	$\log cpi^{HK}$
1	4.151	95.849	0.000
4	8.872	90.855	0.273
8	9.252	88.510	2.239
12	8.585	85.517	5.898
16	7.767	81.680	10.553
18	7.361	79.584	13.055
24	6.253	73.163	20.584

As shown in Table 18, China's inflation is predominantly driven by its own shocks, accounting for more than 85% of the variance even at the 12-month horizon. The contribution of US inflation shocks remains modest, peaking at 9.25% at month 8 and gradually declining thereafter. Notably, the explanatory power of Hong Kong's inflation increases steadily over time, reaching 20.58% at the 24-month horizon, surpassing that of the US.

Table 19. Variance decomposition of $\log cpi^{HK}$

Horizon	$\log cpi^{US}$	$\log cpi^{CN}$	$\log cpi^{HK}$
1	0.484	1.577	97.938
4	0.978	2.700	96.322
8	0.582	3.891	95.526
12	0.426	5.451	94.124
16	0.369	7.094	92.536
18	0.364	7.904	91.732
24	0.396	10.190	89.415

Hong Kong's consumer prices are primarily driven by domestic shocks, which account for 97.94% of the variance in period 1 and remain significant at 89.42% by period 24 (Table 19). In comparison, Chinese price shocks increase steadily over time, from 1.58% at month 1 to 10.19% at month 24, whereas the US contribution remains marginal, staying below 1% throughout. Accordingly, China is the dominant external source of inflationary pressure on Hong Kong, consistent with its close trade integration and geographic proximity.

5. Concluding Remarks

This study estimated an SVAR model with short-run restrictions for the consumer price inflation rates of China–Hong Kong, China–Singapore, the US–Hong Kong, and the US–Singapore. The FEVD results indicate the following:

- Shocks to China's consumer price inflation explain only 0.64% of the variation in Hong Kong's consumer price inflation.
- Shocks to China's consumer price inflation explain 4.85% of the variation in Singapore's consumer price inflation.
- Shocks to the US consumer price inflation explain 0.84% of the variation in Hong Kong's consumer price inflation.
- Shocks to the US consumer price inflation explain 11.58% of the variation in Singapore's consumer price inflation.

Compared with Singapore, Hong Kong's inflation rate is more responsive to US price shocks (Cheung & Yuen, 2002). The findings of this study contradict Cheung and Yuen's conclusion: the Monetary Authority of Singapore has been more successful in stabilizing consumer price fluctuations than Hong Kong, even though Singapore's consumer prices are more susceptible to external shocks. The findings differ from those reported in previous studies, possibly due to differences in empirical methodology and sample period.

The Johansen cointegration test was applied to two pairs to extend the analysis to a three-country framework: the US–China–Hong Kong and the US–China–Singapore. A fundamental asymmetry between Hong Kong and Singapore was observed. Only the case involving Hong Kong exhibited a single cointegrating vector, confirming a stable long-run equilibrium relationship between US, China, and Hong Kong consumer prices. In contrast, no cointegration was identified for any case involving Singapore.

Given cointegration among the US–China–Hong Kong, this study estimated a VECM for this framework. The error-correction terms for the US and China are statistically significant, indicating that both are converging toward, rather than diverging from, the long-run equilibrium. In Hong Kong, the coefficient is statistically insignificant, indicating weak adjustment dynamics. Inflation in a small country (not a large one) adjusts to deviations from the cointegration relationship between the CPIs (Cheung & Yuen, 2002). Our estimates have shown contradicting results. The IRF and FEVD results reveal that Hong Kong's inflation is primarily driven by domestic factors, accounting for more than 90% of its forecast error variance over the long run. Among external sources, China exerts the strongest and most persistent influence on Hong Kong's CPI, reflecting the close economic integration between Hong Kong and Mainland China. Conversely, the contribution of US inflation shocks remain relatively limited. Consequently, while Hong Kong is exposed to external inflationary pressures, the transmission of inflation from China is considerably more important than that from the US.

Overall, the evidence from the bivariate SVAR models indicates that external inflation spillovers to Hong Kong are relatively limited compared with Singapore. Both Chinese and U.S. inflation shocks explain only a small proportion of Hong Kong's inflation variability. In contrast, Singapore's inflation is more responsive to external price shocks, particularly those originating from the United States. Nevertheless, the three-country cointegrated framework (VECM) reveals that China plays a considerably more important role than the United States in explaining Hong Kong's inflation dynamics. Thus, while Hong Kong's inflation remains predominantly driven by domestic factors, China has become the dominant external source of inflation transmission over the long run.

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Appendix

Table A-1. VAR lag order selection criteria: China and Hong Kong CPIs (log levels).

Lag	**Log likelihood**	**AIC**	**SIC**
0	675.3191	−6.9774	−6.9435
1	1,457.536	−15.0418	−14.9404
2	1,471.526	−15.1453*	−14.9762*
3	1,472.533	−15.1143	−14.8777
4	1,474.098	−15.0891	−14.7848
5	1,475.728	−15.0645	−14.6926
6	1,479.377	−15.0609	−14.6214
7	1,480.345	−15.0295	−14.5223
8	1,484.350	−15.0295	−14.4548
9	1,487.239	−15.0180	−14.3756
10	1,490.361	−15.0089	−14.2989
11	1,494.735	−15.0128	−14.2352
12	1,504.988	−15.0776	−14.2323

Note: * indicates the lag order selected by the criterion.

Table A-2. VAR lag order selection criteria: China and Singapore CPIs (log levels)

Lag	**Log likelihood**	**AIC**	**SIC**
0	545.698	−5.6287	−5.5948
1	1,563.801	−16.1430	−16.0416
2	1,569.070	−16.1562	−15.9871
3	1,570.916	−16.1338	−15.8972
4	1,600.996	−16.4041	−16.0998*
5	1,602.426	−16.3775	−16.0056
6	1,604.176	−16.3542	−15.9146
7	1,620.163	−16.4784	−15.9712
8	1,622.604	−16.4622	−15.8874
9	1,623.544	−16.4305	−15.7881
10	1,631.995	−16.4766	−15.7666
11	1,638.389	−16.5014	−15.7238
12	1,649.180	−16.5718*	−15.7266

Note: * indicates the lag order selected by the criterion.

Table A-3. VAR lag order selection criteria: US and Hong Kong CPIs (log levels)

Lag	Log likelihood	AIC	SIC
0	435.4713	−4.4919	−4.4581
1	1,539.426	−15.8904	−15.7890
2	1,576.979	−16.2381	−16.0691*
3	1,581.059	−16.2390*	−16.0023
4	1,583.528	−16.2231	−15.9188
5	1,586.364	−16.2110	−15.8391
6	1,590.324	−16.2106	−15.7711
7	1,591.138	−16.1776	−15.6704
8	1,597.493	−16.2020	−15.6272
9	1,598.627	−16.1723	−15.5299
10	1,603.381	−16.1801	−15.4701
11	1,610.652	−16.2140	−15.4364
12	1,611.662	−16.1830	−15.3378

Note: * indicates lag order selected by the criterion.

Table A-4. VAR lag order selection criteria: US and Singapore CPIs (log levels)

Lag	Log likelihood	AIC	SIC
0	585.7268	−6.0490	−6.0152
1	1,671.122	−17.2552	−17.1537
2	1,698.476	−17.4972	−17.3281
3	1,706.377	−17.5376	−17.3009
4	1,727.769	−17.7178	−17.4135*
5	1,730.009	−17.6996	−17.3277
6	1,732.604	−17.6850	−17.2455
7	1,745.533	−17.7775	−17.2704
8	1,748.270	−17.7645	−17.1897
9	1,750.467	−17.7458	−17.1034
10	1,761.700	−17.8207	−17.1107
11	1,769.255	−17.8576*	−17.0799
12	1,772.098	−17.8456	−17.0003

Note: * indicates lag order selected by the criterion.

Table A-5. VAR lag order selection criteria: US, China, and Hong Kong CPIs (log levels)

Lag	Log likelihood	AIC	SIC
0	979.1734	−10.1158	−10.0651
1	2,347.4079	−24.2011	−23.9983
2	2,382.7990	−24.4746*	−24.1196*
3	2,388.8319	−24.4439	−23.9367
4	2,391.7385	−24.3807	−23.7214
5	2,395.6882	−24.3284	−23.5169
6	2,402.4824	−24.3055	−23.3419
7	2,406.2316	−24.2511	−23.1354
8	2,414.6163	−24.2447	−22.9768
9	2,418.2801	−24.1894	−22.7694
10	2,426.8849	−24.1853	−22.6132
11	2,436.7751	−24.1946	−22.4702
12	2,449.9575	−24.2379	−22.3614

Note: * indicates lag order selected by the criterion.

Table A-6. VAR lag order selection criteria: US, China, and Singapore CPIs (log levels)

Lag	Log likelihood	AIC	SIC
0	938.779675	−9.6972	−9.6465
1	2,469.748725	−25.4689	−25.2660
2	2,501.466616	−25.7043	−25.3493*
3	2,515.426155	−25.7557	−25.2486
4	2,536.428241	−25.8801	−25.2208
5	2,541.534965	−25.8397	−25.0283
6	2,546.175716	−25.7946	−24.8310
7	2,562.350057	−25.8689	−24.7532
8	2,568.532964	−25.8397	−24.5718
9	2,,572.028575	−25.7827	−24.3627
10	2,585.813045	−25.8323	−24.2601
11	2,597.626213	−25.8614	−24.1371
12	2,609.912347	−25.8955*	−24.0190

Note: * indicates lag order selected by the criterion.