Office of the Government Economist
The Government of the Hong Kong Special Administrative Region

Economic Letter 2022/04

Residential property prices and consumer price inflation in Hong Kong

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November 2022

Abstract

This article examines the relationship between residential property prices and consumer price inflation in Hong Kong with quarterly data from 1984 to 2021. In principle, as private residential property prices are asset prices, they should move in advance of private housing rents and may be correlated with other types of expenditures as well. Results from a vector error correction model show that, in the long run, movements in private residential property prices are fully reflected in the private housing rental component of Hong Kong's Composite Consumer Price Index (CCPI). The long-run elasticity of overall consumer prices with respect to private residential property prices is about 0.6.

香港的住宅物業價格和消費物價通脹

摘要

本文利用 1984 年至 2021 年間的季度數據，分析香港的住宅物業價格和消費物價通脹的關係。原則上，由於私人住宅物業價格為資產價格，其走勢應領先私人住宅租金，並可能和其他類別的開支相關。向量誤差修正模型的估算結果顯示，長期而言，私人住宅物業價格的變動會在香港綜合消費物價指數中的私人房屋租金項目完全反映。整體消費物價相對於私人住宅物業價格的長期彈性約為 0.6。

The views and analysis expressed in this article are those of the author and do not necessarily represent the views of the Office of the Government Economist.

I. INTRODUCTION

1. Residential property prices are a key forerunner of inflation. As asset prices, they anticipate movements in rental income—or housing costs, to the end user—which are the most important component of Hong Kong's Composite Consumer Price Index (CCPI)[1]. Residential property prices can also affect consumer prices through broad-based wealth effects, which boost aggregate demand[2]. At the same time, residential property prices are often subject to considerable momentum and volatility[3]. Given recent concerns over global inflation, the extent to which current property prices signal the future path of housing costs or other types of consumer prices is of considerable interest.

2. This article examines the relationship between residential property prices and consumer prices in Hong Kong. It is organised as follows. The next section provides an overview of the data. The third section establishes the time series properties of the variables. The fourth section quantifies their relationship with a vector error correction model, and the fifth section concludes.

II. DATA

3. Data on residential property prices are from the Rating and Valuation Department (RVD)[4]. The residential property price indices are based on stamp duty transactions that take place in the relevant quarter, according to the date on which an Agreement for Sale and Purchase is signed. They are intended to hold quality constant over time. As the underlying denominator of the price indices is based on rateable value for tax purposes[5], they take not only size differences into account, but also qualitative factors such as location, facilities, standards of finish and management[6].

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[1] C&SD. 2021. *2019/20 Household Expenditure Survey and the rebasing of the Consumer Price Indices*. https://www.censtatd.gov.hk/en/EIndexbySubject.html?pcode=B1060003&scode=270

[2] Cheung, L., K. Chow, M. Cheng and P. Ng. 2016. "Inflation mechanism and monetary policy: perspectives from Hong Kong." *BIS Papers* 89, pp. 169-177. https://www.bis.org/publ/bppdf/bispap89k.pdf

[3] Glaeser, E. and C. Nathanson. 2017. "An extrapolative model of house price dynamics." *Journal of Financial Economics* 126(1), pp. 147-170. https://doi.org/10.1016/j.jfineco.2017.06.012

[4] RVD. (n.d.) "Property market statistics." https://www.rvd.gov.hk/en/publications/property_market_statistics.html

[5] RVD. (n.d.) "Technical note." https://www.rvd.gov.hk/doc/en/statistics/15_technotes.pdf

[6] RVD. (n.d.) "Rates." https://www.rvd.gov.hk/en/faqs/rates.html

4. Consumer prices are measured with Hong Kong's Composite Consumer Price Index (CCPI)[7] published by the Census and Statistics Department (C&SD). The CCPI reflects the expenditure pattern of the middle 90 percent of households in Hong Kong. The most important component of the CCPI is housing, which accounts for 40% of the 2019/20 rebased series. Private housing rent, which alone comprises 35% of the 2019/20 rebased series, is the main element of the CCPI housing component. The other elements are public housing rent and management fees and other housing charges, which comprise 2% and 3% of the 2019/20 rebased series respectively[8]. Consequently, notwithstanding that around 30% of Hong Kong households occupy public rental housing[9], housing costs in the CCPI are mainly driven by private housing rent.

5. The theoretical relationship between residential property prices and CCPI housing costs is straightforward. As an asset, the value of a residential property is equal to the net present value of the income it generates[10], either directly from a rent-paying tenant or indirectly by saving its owner the cost of having to rent accommodation elsewhere. Anticipated developments that affect the future income stream—say, a planned MTR station that is expected to raise demand, or a nearby housing estate under construction that would raise supply—thus show up in property prices before they affect rental prices. Moreover, as residential tenancies in Hong Kong are typically fixed for two years, changes in initial rental prices (e.g., as reflected in RVD's rental indices) take even more time to fully filter through to the housing component of the CCPI, which covers all kinds of leases including new, renewed and existing leases[11].

6. Year-on-year changes in residential property prices and housing costs as measured in the CCPI[12] are plotted in **Chart 1**, starting from 1984 (Hong Kong's first full year under the Linked Exchange Rate System). **Chart 1** shows that, as expected, changes in residential property prices, as asset prices, are larger in magnitude than changes in housing costs. Moreover, they tend to occur in advance of changes in housing costs—the income stream, from the asset owner's perspective—which are mainly determined by private housing rent.

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[7] C&SD. (n.d.) "Table 52: Consumer Price Indices (October 2019 – September 2020 = 100)." https://www.censtatd.gov.hk/en/web_table.html?id=52

[8] C&SD. 2021. "Table 5.1: Composite CPI at commodity/service group level (Oct. 2019 - Sep. 2020 = 100)." *Annual Report on the Consumer Price Index 2021*. https://www.censtatd.gov.hk/en/EIndexbySubject.html?pcode=B1060002&scode=270

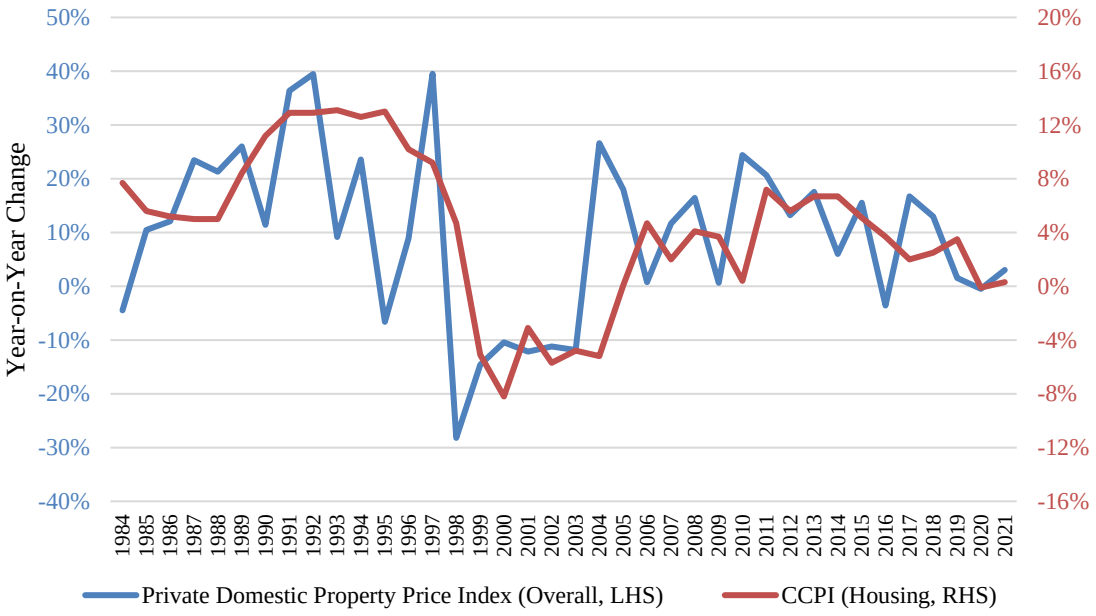
[9] C&SD. 2022. "Table 9.11: Domestic households by type of housing." *Hong Kong Annual Digest of Statistics 2021*. https://www.censtatd.gov.hk/en/EIndexbySubject.html?pcode=B1010003&scode=460

[10] Fisher, I. 1930. *The Theory of Interest*. Macmillan. https://oll.libertyfund.org/title/fisher-the-theory-of-interest

[11] C&SD. 2002. "Rent indices in the Consumer Price Indices." *Hong Kong Monthly Digest of Statistics*, November, pp. FC1-FC9. https://www.censtatd.gov.hk/en/EIndexbySubject.html?pcode=FA100215&scode=270

[12] The more specific private housing rent index is only available since 1994.

Chart 1: Year-on-Year Changes in Hong Kong's Residential Property Prices and Housing CCPI



III. COINTEGRATING RELATIONSHIPS

7. Prior studies have found that property prices and consumer prices in Hong Kong are both non-stationary[13,14]. To confirm this with the current data set, **Table 1** lists the results of Phillips-Perron[15] tests of the key variables. The variables are in natural logarithms and the data are quarterly from 1984 to 2021. The tests, which are based on Newey-West[16] standard errors with four lags[17], are robust to heteroscedasticity and serial correlation. In sum, the hypotheses that residential property prices and the CCPIs are non-stationary in levels cannot be rejected at any significance level. However, the hypotheses that they are non-stationary in first differences are strongly rejected. Consequently, the variables will be modelled as I(1).

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[13] Peng, W. 2002. "What drives property prices in Hong Kong?" *HKMA Quarterly Bulletin* 32, pp. 19-33. https://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb200208/fa2.pdf

[14] Cutler, J., C. Chan and U. Li. 2005. "The relationship between commodity and consumer prices in Mainland China and Hong Kong." *HKMA Quarterly Bulletin* 43, pp. 16-31. https://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb200506/fa2.pdf

[15] Phillips, P. and P. Perron. 1988. "Testing for a unit root in time series regression." *Biometrika* 75(2), pp. 335-346. https://www.jstor.org/stable/2336182

[16] Newey, W., and K. West. 1987. "A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix." *Econometrica* 55(3), pp. 703-708. https://www.jstor.org/stable/1913610

[17] Newey and West suggest setting the number of lags equal to the integer part of $4(N/100)^{2/9}$, where N is the sample size. In this case, N is 152 quarters.

Table 1: Phillips-Perron Stationarity Tests*

Variable	Level		First Difference	
	Z_τ	p	Z_τ	p
Private Domestic Property Price Index (Overall)	−1.703	0.7496	−6.070**	0.000
CCPI (Housing)	−1.550	0.8114	−12.816**	0.000
CCPI (Overall)	−1.698	0.7519	−8.728**	0.000

Notes (*) : Tests are on the natural logarithm of the relevant variable and include a time trend. The null hypothesis is the hypothesis that $\rho = 1$ in the relation $y_t = \alpha + \rho y_{t-1} + \delta t + \epsilon_t$, where y_t is the variable to be tested.
(**) : The null hypothesis is rejected at the 5% level.

8. Present value theory implies that, when an asset price and its income stream are non-stationary in levels, but stationary in first differences, they are cointegrated[18]. However, a working model of inflation necessarily takes other factors into account. For instance, Gordon's "triangle" model of inflation suggests that inflation can be explained in terms of supply, demand, and inertia[19]. In an econometric context, "supply" is a supply shock, like a change in commodity prices; "demand" is a measure of aggregate demand, like GDP; and inertia is captured by lagged variables. Moreover, in a model that includes residential property prices, property-related fundamentals such as interest rates and demand relative to supply (e.g., the number of households relative to the housing stock) are also relevant[20].

9. To explore whether the variables in the analysis are cointegrated, and the extent of cointegration, **Table 2** shows the results of Johansen[21] tests, with time trends, for the following set of variables: the log housing CCPI index; the log overall CCPI index; the log overall private domestic property price index; log real GDP; the seasonally adjusted unemployment rate; the log import-weighted effective exchange rate index for the Hong Kong dollar; the US federal funds rate; the log World Bank "Pink Sheet" commodity price index for agriculture[22]; and the log ratio of domestic households (from C&SD) to domestic living quarters (from RVD, the Hong Kong Housing Authority, and the Hong Kong Housing Society, interpolated as needed).

[18] Campbell, J. and R. Shiller. 1987. "Cointegration and tests of present value models." *Journal of Political Economy* 95(5), pp. 1062–1088. http://nrs.harvard.edu/urn-3:HUL.InstRepos:3122490

[19] Gordon, R. 2011. "The history of the Phillips curve: consensus and bifurcation." *Economica* 78(309), pp. 10-50. https://www.jstor.org/stable/41236106

[20] Duca, J., J. Muellbauer, and A. Murphy. 2021. "What drives house price cycles? International experience and policy issues." *Journal of Economic Literature* 59(3), pp. 773-864. https://www.aeaweb.org/articles?id=10.1257/jel.20201325

[21] Johansen, S. 1995. *Likelihood-based inference in cointegrated vector autoregressive models.* Oxford: Oxford University Press.

[22] World Bank. (n.d.) "Commodity markets." https://www.worldbank.org/commodities

Table 2: Johansen Cointegration Tests*

Hypothesis	Trace Statistic	5% Critical Value
H_0: $r = 0$	443.33**	208.97
H_0: $r \leq 1$	294.02**	170.8
H_0: $r \leq 2$	200.03**	136.61
H_0: $r \leq 3$	114.04**	104.94
H_0: $r \leq 4$	66.43	77.74

Notes (*) : Tests are of the null hypothesis that the cointegrating rank r (number of linearly independent cointegrating vectors) of the system is less than or equal to the number indicated. The cointegrating regression includes a time trend.
(**) : The null hypothesis is rejected at the 5% level.

10. **Table 2** shows that there appear to be at least four linearly independent cointegrating vectors in the system, or at most five common stochastic trends. Generally, given the interrelationships among the variables—e.g., present value theory links residential property prices to housing costs, and other variables relate to supply and demand factors which may have some common components—it is expected that they will be cointegrated to some extent. The system is modelled accordingly.

IV. MODEL

11. The time series properties of the variables from the previous section suggest that the most appropriate starting point for modelling the link between residential property prices and consumer price inflation is a vector error correction model with $r = 4$ (i.e., with four linearly independent cointegrating vectors). Formally, the model is written as

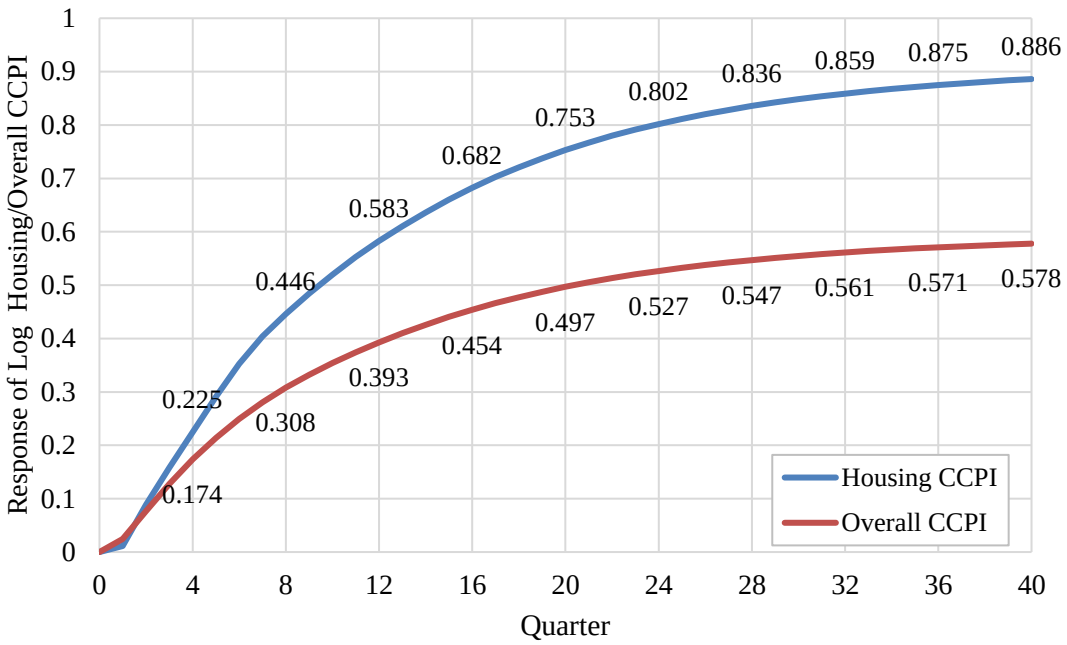
$$\Delta \boldsymbol{y}_t = \boldsymbol{\gamma} + \Gamma \cdot \Delta \boldsymbol{y}_{t-1} + \sum_{i=1}^{4} \boldsymbol{\lambda}_i \cdot \left(y_{i,t-1} + \boldsymbol{\beta}_i \cdot \boldsymbol{y}_{j,t-1} + \mu_i + \rho_i \cdot t \right) + \boldsymbol{\varepsilon}_t$$

where $\boldsymbol{y}_t$ are the variables in the system (as listed in para. 9), split into first four variables $y_{1,t-1}$, $y_{2,t-1}$, $y_{3,t-1}$, and $y_{4,t-1}$ and the remainder $\boldsymbol{y}_{j,t-1}$ as needed. Short-term dynamics are captured by the difference autoregressive component $\boldsymbol{\Gamma} \cdot \Delta \boldsymbol{y}_{t-1}$, with one lag as suggested by the Bayesian information criterion. The summation term captures the long-term relationships represented by the four cointegrating vectors, which are estimated subject to Johansen's (1996) identification restrictions[23].

[23] Johansen, S. 1995. *Likelihood-based inference in cointegrated vector autoregressive models.* Oxford: Oxford University Press.

12. As the dynamics of the model are quite complex, it is difficult to interpret the coefficients directly. In this circumstance, impulse response functions are useful to further explore the effect of one variable on another. To this end, **Chart 2** plots the impulse response function for the effect of a current change in residential property prices on the housing and overall CCPI indices. As implied by present value theory, the elasticity of CCPI housing costs with respect to residential property prices approaches 0.9 over the long term[24]. For instance, a 10% increase in private residential property prices is expected to foreshadow 2.25% higher housing costs one year later, 4.46% higher housing costs two years later, and so on until the full effect is eventually around 9% in the long run.

Chart 2: Impulse Responses of Log CCPI Indices to Log Private Domestic Property Price Index (Overall)



13. As for the overall CCPI, the estimated pass-through of a 10% increase in private residential property prices is 1.74% one year later, 3.08% two years later, and eventually around 6% in the long run. Notably, the eventual effect, a long-run elasticity of about 0.6, is somewhat larger than the expected impact from the rise in housing costs alone[25]. Conceivably, the spillover effects arise because of housing wealth effects or correlations between the demand for housing and the demand for other goods and services.

[24] This is because private housing rent comprises around 88% of the housing component of the 2019/20-rebased CCPI.

[25] Taking the 2019/2020 rebased series as a reference point, if the long-run elasticity of CCPI housing costs with respect to residential property prices is 0.9 and the weight on housing in the CCPI is 40%, then the long-run elasticity of the overall CCPI with respect to private residential property prices without any spillovers should be 0.9 × 0.4 = 0.36.

V. CONCLUSIONS

14. Residential property prices, as asset prices, are key indicators of future trends in housing costs and, by extension, the future path of consumer prices. The channels for predicting consumer prices can be either direct, through private housing rent, or indirect, through wealth effects or correlations with the demand for other types of goods and services. Hong Kong is no exception. Though the process may take years, changes in private residential property prices are eventually fully reflected in the private rental housing component of the CCPI. For the CCPI as a whole, the long-run elasticity of consumer prices with respect to private residential property prices is about 0.6.