



***ESTIMATING THE DRIVERS OF HONG KONG'S HOUSING PRICE  
SHORT-RUN DYNAMICS***

***Key points:***

- *While previous studies had explored the long-term determinants of Hong Kong's housing prices which were useful in assessing the overheating pressures in the housing market, they are less helpful in revealing the drivers of the short-term dynamics of housing prices. This paper attempts to fill this gap.*
- *We estimate a Bayesian Vector Autoregression (BVAR) model to uncover and analyse the influences of five major driving factors of housing prices, namely housing supply, housing demand, mortgage rate, bank credit supply, and market sentiment.*
- *We find that bank credit supply and housing supply were the main drivers of the short-term housing price dynamics in the past two decades. Low mortgage rate was also an important contributor after the global financial crisis. The relatively small contribution from housing demand may reflect the fact that such factor is a driver of housing prices in the long run rather than in the short run. On the other hand, the small influence of market sentiment may be due to the fact that the impact of this factor could be limited in normal periods but far bigger in crisis time.*

- *The findings in this paper suggest that the short-run dynamics of housing prices can be driven by factors other than the long-term fundamentals, and can thus affect the convergence of housing prices toward their long-run levels. Any significant divergence in the short run could result in abrupt future adjustments in house prices and therefore warrants close monitoring.*

*Prepared by : Tommy Wu, Ken Wong and Michael Cheng \*  
Economic Research Division, Research Department  
Hong Kong Monetary Authority*

The views and analysis expressed in this paper are those of the authors, and do not necessarily represent the views of the Hong Kong Monetary Authority.

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## I. INTRODUCTION

The Hong Kong economy is strongly influenced by its housing market. As housing property is an important type of loan collaterals and household assets, boom-bust cycles in housing prices not only pose risks to the financial stability but also to the price stability in Hong Kong.<sup>1</sup> Hence, it is important to have a good grasp of Hong Kong's housing price dynamics to facilitate pre-emptive policymaking. While previous studies had explored the long-term determinants of Hong Kong's housing prices and were useful in assessing the overheating pressures in the housing market, they are less helpful in revealing the short-run drivers of housing prices which could be different from the long-run drivers.<sup>2</sup>

This paper examines the drivers of the short-term dynamics of Hong Kong's housing prices. An empirical model is used to assess the influences of five driving factors, namely housing supply, housing demand, market sentiments, mortgage rate, and bank credit supply. We begin by reviewing Hong Kong's housing market development in Section II. Section III discusses briefly the empirical methodology and presents our results. Section IV discusses Hong Kong's housing market outlook in light of the expected evolution of the driving factors. Finally, Section V concludes.

## II. HONG KONG'S HOUSING MARKET DEVELOPMENT

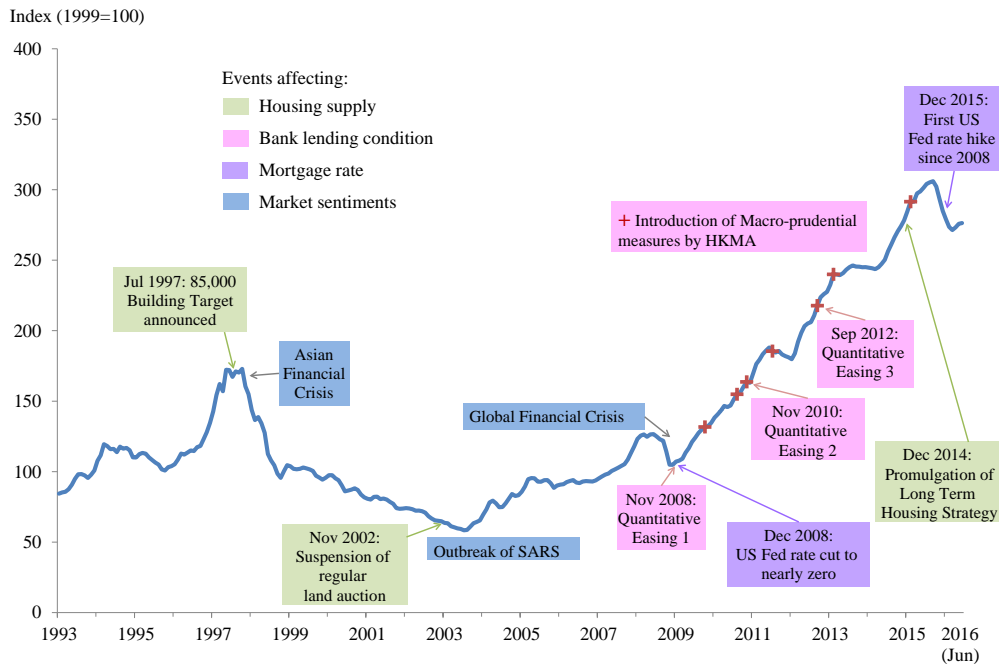
Hong Kong's housing market has been on a long rally after a downturn between the Asian financial crisis in 1998 and the SARS outbreak in 2003. Hong Kong's housing prices have increased nearly four-fold since its trough in 2003, despite occasional declines (Chart 1).

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<sup>1</sup> Housing prices could materially affect banks' asset quality and constitute the key transmission channel of interest rate to the real economy (e.g. Hong Kong Monetary Authority, henceforth HKMA, (2016)). Hong Kong's inflation is also strongly affected by housing prices through the heavily-weighted consumer price index (CPI) rental component, the rental cost effect on services fees and charges, and the wealth effect on aggregate demand. Boom-bust cycles in housing prices would therefore pose risks not only to financial stability but also to price stability in Hong Kong (Cheung et al. (2016)).

<sup>2</sup> Studies on the long-term housing prices include Leung et al. (2008), Craig and Hua (2008), and Chung (2012).

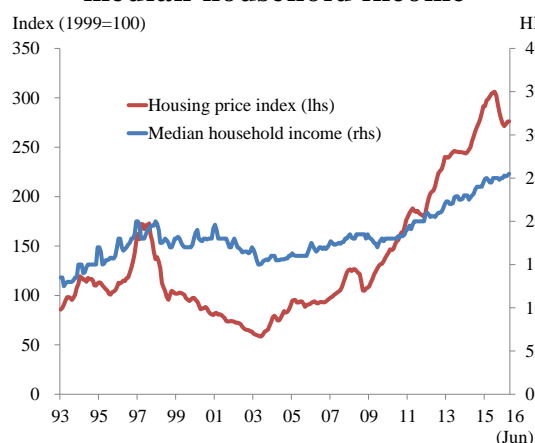
**Chart 1: Housing price index and major market events**



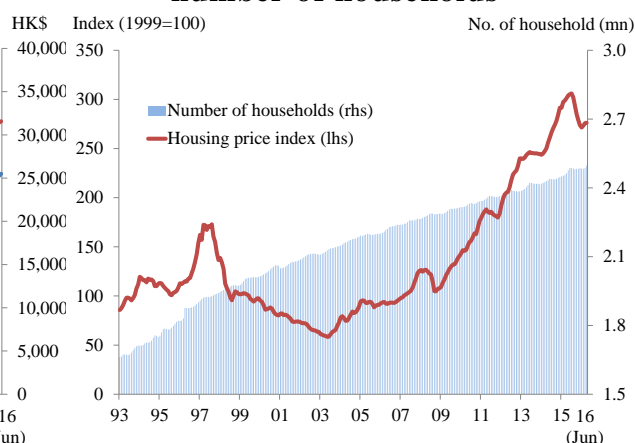
Sources: R&VD and HKMA.

Both demand- and supply-side factors are likely to have contributed to the robust growth of housing prices in Hong Kong. On the demand side, the solid growth in both household income and number of household continued to drive housing needs (Charts 2 and 3). Under the Linked Exchange Rate System (LERS), the movement of Hong Kong dollar interest rates hinges on the US monetary policy. The ultra-low US policy rates since late 2008 have driven Hong Kong mortgage rates to historical low levels, stimulating investors to search for yields (Chart 4). As such, the rent-price ratio, which represents the return on housing, has also declined to the lowest level in recent years (Chart 5). To curb short-term investment activities, the Hong Kong Government has introduced several demand-management measures since 2010. Confirmor transactions and flipping-trade have declined to low levels since then.

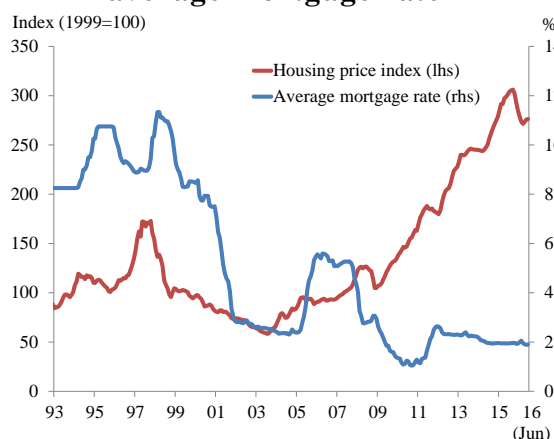
**Chart 2: Housing price index and median household income**



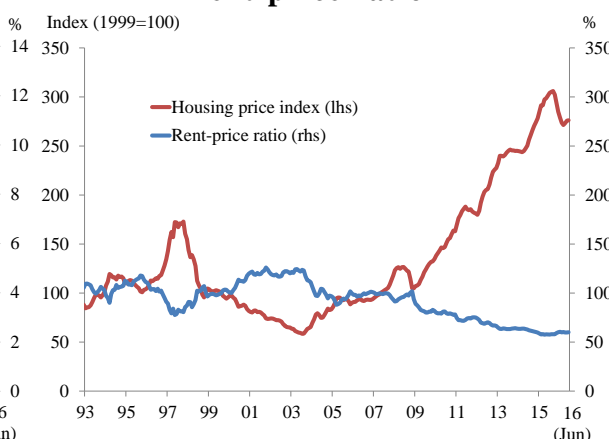
**Chart 3: Housing price index and number of households**



**Chart 4: Housing price index and average mortgage rate**



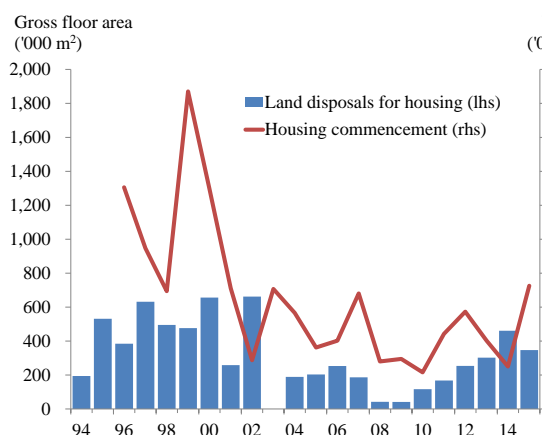
**Chart 5: Housing price index and rent-price ratio**



Sources: C&SD, R&VD and staff estimates.

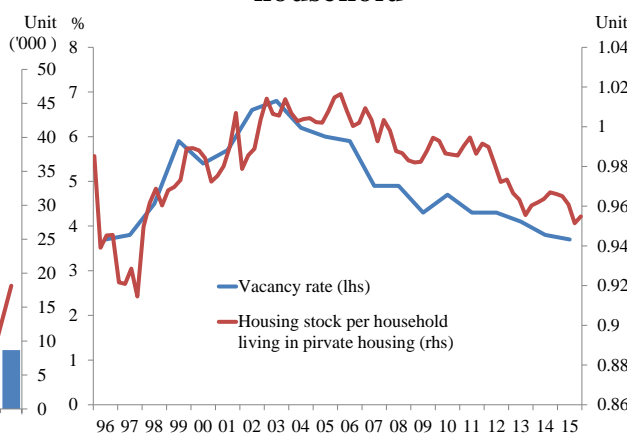
On the housing supply side, the Government once suspended regular land sales in 2003, when housing prices had fallen by more than half from its peak in 1997. In the subsequent years, housing commencement and new housing completion declined to low levels (Chart 6). Even though the Government resumed regular land sales in 2010, housing supply was still tight until more recently, due to the time lag between housing commencement and completion. This, together with the pent-up housing demand and the low-interest rate environment after the global financial crisis, led to a housing demand-supply imbalance, though the gap had narrowed gradually. Meanwhile, housing vacancy rate fell in tandem with the decline in housing supply, and such trend is also seen in the housing stock per household living in private housing (Chart 7).

**Chart 6: Land supply and housing commencement**



Sources: Buildings Department, Lands Department, and staff estimates.

**Chart 7: Vacancy rate and housing stock per private housing household**

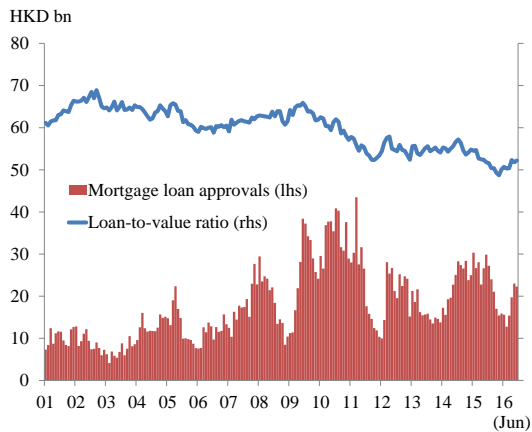


Sources: Buildings Department, R&VD, C&SD and staff estimates.

Bank lending conditions, other than the mortgage rate, may also separately influence the housing price dynamics. Amid ample global liquidity in recent years, the HKMA has introduced seven rounds of macro-prudential measures on new mortgages since 2009 to maintain banking stability and enhance banks' risk management. As such, the maximum loan-to-value (LTV) ratio was lowered according to the value of the houses and applicants' financial conditions. While the amount of new mortgage loans approved have not dropped much due to the increase in housing prices since 2009 (Chart 8), the number of mortgage loan applications have declined quite visibly, and the average LTV ratio had decreased from about 64% before the macro-prudential measures to around 52% in October 2016 (Chart 9). The debt servicing ratio, which measures the monthly debt repayment of the borrower as a percentage of monthly income, also fell from 40% in 2010 to 34%.

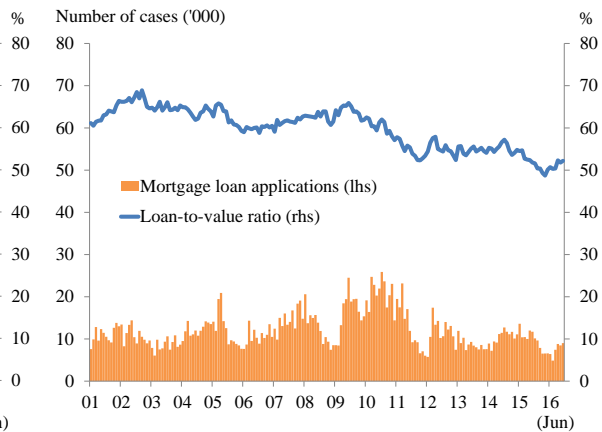
The performance of Hong Kong's housing market is also widely believed to be influenced by market sentiment, given Hong Kong's status as an international financial centre with free capital mobility. As stock market returns often reflect asset market sentiment, it can be seen that sharp falls in housing prices were often associated with plunges in the stock market (Chart 10).

**Chart 8: LTV ratio and the amount of new mortgage loans approved**



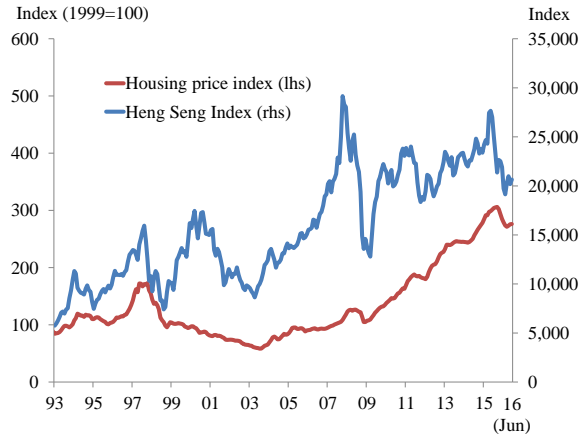
Source: HKMA.

**Chart 9: LTV ratio and the number of mortgage applications**



Source: HKMA.

**Chart 10: Housing price index and the Hang Seng Index**



Sources: R&VD and HKEx.

### III. EMPIRICAL ANALYSIS OF HONG KONG'S HOUSING PRICE DYNAMICS IN THE SHORT RUN

In this section, we use an empirical model to estimate the influences of different driving factors on Hong Kong's short-run housing price dynamics. Specifically, we estimate a Bayesian Vector Autoregression (BVAR) model with a sample period of January 1996—June 2016. The BVAR model is a reduced-form model, in which the supply and demand equations are not explicitly modelled and the variables in the model can reflect the influence of either supply or demand or both. We include eight variables in the model, namely growth in real housing prices, housing commencement, housing vacancy, real mortgage interest rate, the amount of new mortgage loans approved

in real terms, growth in real aggregate household income, rent-price ratio and real stock market return based on the Hang Seng Index (HSI). Using assumptions based on theoretical findings and the estimated empirical model, we apply statistical technique to these eight variables to uncover and analyse the influences of five major driving factors of housing prices. These include supply and demand-side factors from both the housing and credit markets, namely housing supply, housing demand, mortgage rate, market sentiment and bank credit supply.<sup>3</sup>

Among the five factors, housing supply reflects only housing supply-side influence, while housing demand, measuring housing needs arising from demographic and income conditions, only reflects housing demand-side influence. Mortgage rate reflects the price component of mortgage loans, whereas bank credit supply captures the quantity/non-mortgage rate component of mortgage loans. Ideally, bank credit supply capture influences from the mortgage credit supply, which include the effects of macro-prudential measures introduced by the HKMA. In fact, our earlier study (Wong et al. (2016)) finds that the mortgage supply side was the main binding factor on mortgage loan and hence the major driving factor of mortgage loans. But mortgage lending is affected by both the credit demand and credit supply side, as the effects from the two sides may not be disentangled perfectly in practice using the current model. We would therefore like to acknowledge this caveat here that one should not interpret with full confidence that the estimated factor in our model represents solely the supply-side effect. The remaining two factors, namely mortgage rate and market sentiment, reflect the influence of both supply and demand.<sup>4</sup>

We construct the forecast error variance decomposition of real housing prices as shown in Chart 11. The decomposition exercise

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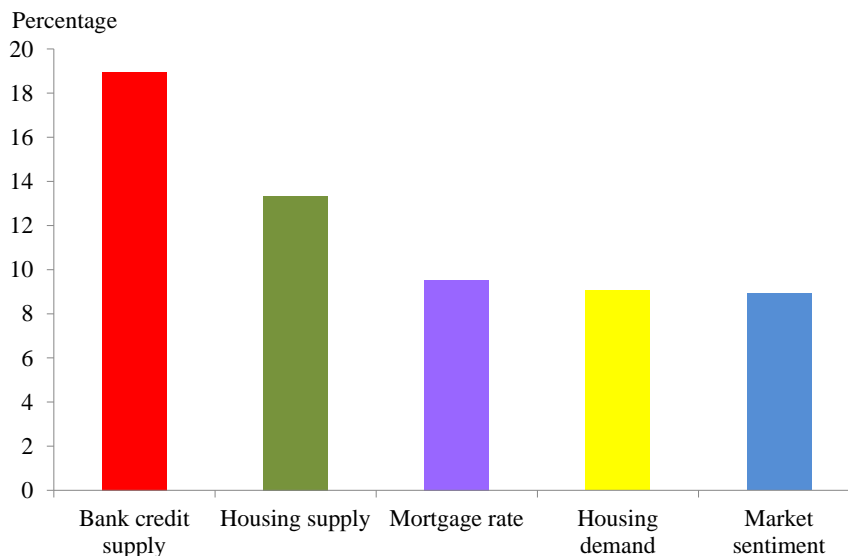
<sup>3</sup> This paper does not specifically take into account the impact of overseas buyers, which importance has faded after the introduction of the Double Stamp Duty. Available statistics on overseas buyers are also not sufficient for our time-series analysis. While acknowledging that big-ticket transactions by overseas buyers can influence housing prices through signaling effect, such effect is hard to capture empirically, particularly in the absence of good micro data. Hence, we leave the impact of overseas buyers on housing prices as a subject for future studies.

<sup>4</sup> Market sentiment represents the overall financial market sentiment, which is found by earlier studies to have driven asset markets in Hong Kong. With simple correlations suggesting that stock and housing prices in Hong Kong are often positively correlated (particularly during a stock market plunge), we use the HSI to capture market sentiment and its influence on housing prices. Ideally, we should instead use expected future housing price movement to capture housing market sentiment, but such data are either of irregular frequency or insufficient for time series analysis.



indicates that bank credit supply and housing supply were the main drivers of Hong Kong's housing price dynamics, contributing 19% and 13% respectively at the four-year horizon (48 months).<sup>5</sup> The important role of bank credit supply reflects the working of changes in banking liquidity or business strategy. On the other hand, given the tight, inelastic housing supply in the past decade, it is reasonable that housing supply would account for a significant portion of housing price variation. Meanwhile, mortgage rate accounts for 10% of housing price variation, while market sentiment and housing demand account for about 8–9% of the variation. The relatively small contribution from housing demand may be somewhat surprising, but it may reflect the fact that such factor drives housing prices mainly in the long run rather than in the short run. On the other hand, the small influence of market sentiment may be due to the fact that the impact of this factor could be limited in normal periods but far bigger in crisis time.

**Chart 11: Contributions to the variations of Hong Kong's housing prices (percentage share)**



Source: Staff estimate.

<sup>5</sup> Identifying bank credit supply using the number instead of the value of new mortgage loans approved for yields similar results. We also used the loan-to-value (LTV) ratio for new mortgages for robustness check. While the results were similar, the analysis would not cover the upcycle prior to the Asian financial crisis given that the sample of LTV ratio starts in June 1998. We have also tried to use the real month-on-month growth in Hong Kong dollar M3 instead of new mortgage loans approved to identify bank credit supply, and the results are robust. While real M3 growth could approximate banks' funding availability and better measure the influences from the bank credit supply side, it is only loosely associated with mortgage lending and would not capture changes in mortgage-specific factors such as the introduction of macro-prudential measures. As such, new mortgage loans approved is the preferred variable to help identify the bank credit supply shock.

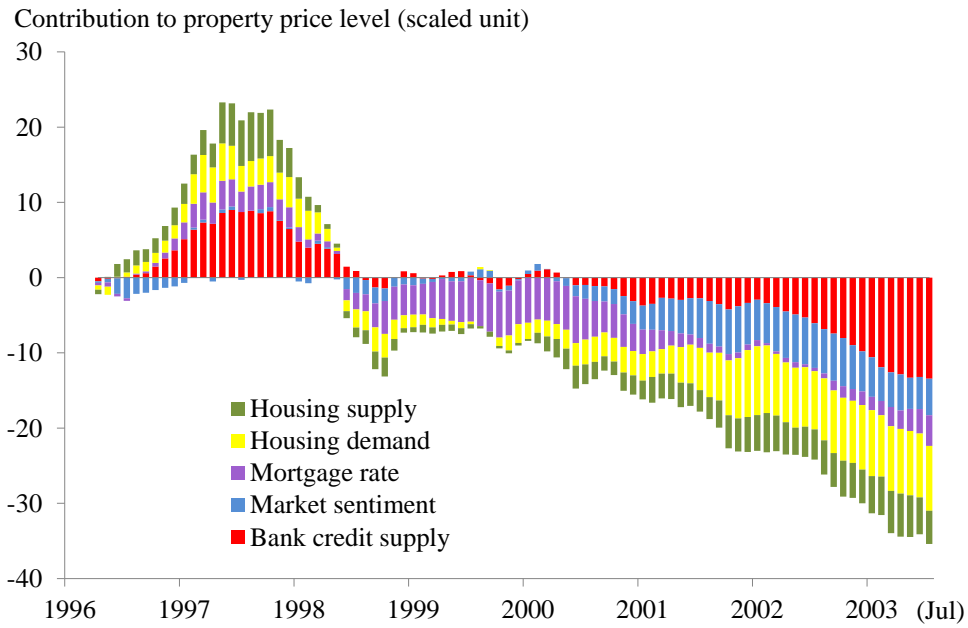
We also use a historical decomposition to examine the role of these factors in past boom-bust episodes. Charts 12 and 13 show the results, with the different coloured bars measuring the cumulative contribution of each factor to the cumulative changes in housing prices at each point in time. The bars can become zero in a given month if the factors have zero cumulative contribution to the housing prices. This can happen either if the factor has zero contribution in each period, or if the sum of all its positive contributions is offset by the sum of all negative contributions.

Our results indicate that bank credit supply, housing supply and housing demand were the main contributors to housing price changes in the Asian financial crisis–SARS episode (Chart 12). In particular, housing supply’s contribution had changed from positive to negative after 1998, while the contribution of housing demand had become more prominent in the down-cycle after 2000. In the post-global financial crisis episode, housing supply continued to be a key driver of housing price changes, while the contribution of mortgage rate was comparatively large and persistent (Chart 13).<sup>6</sup> The role of bank credit supply also remained significant, though its impact had diminished somewhat compared with the earlier episode.

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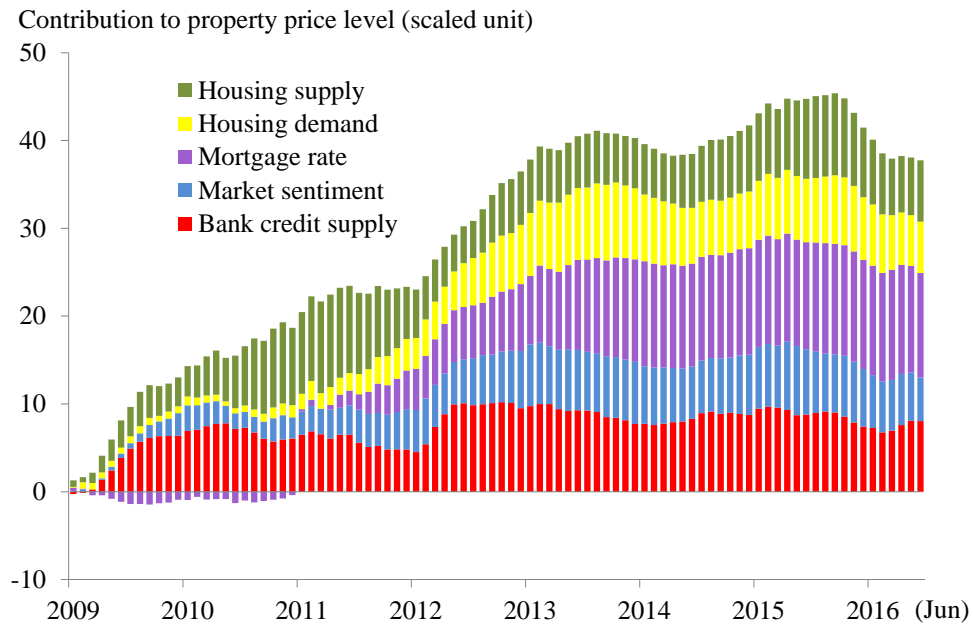
<sup>6</sup> The influence of mortgage rate in this period can stem from the decline in the interest rate spread and risk premium between the benchmark interest rates and the actual mortgage rate as a result of international spillovers of unconventional monetary policy (e.g. Bauer and Diez de los Rios (2012), Chen et al. (2012), Kandrach and Schlusche (2016)).

**Chart 12: Historical decomposition of housing prices  
(the Asian financial crisis – SARS episode)**



Source: Staff estimate.

**Chart 13: Historical decomposition of housing prices  
(the post-global financial crisis episode)**



Source: Staff estimate.

#### **IV. CONCLUDING REMARKS**

Given the strong influences of the housing market on Hong Kong's macro-financial conditions, this paper analyses the role of different factors in driving the short-run dynamics of housing prices. Using an empirical model to assess the influences of different factors, we find that bank credit supply and housing supply were the main drivers of the short-run housing price dynamics in the past two decades. Low mortgage rate was also an important contributor after the global financial crisis, while housing demand and market sentiments also have a role to play.

As some of the drivers are not considered as long-term fundamentals, the results in this paper suggest that it is worthwhile to closely monitor these factors to help assess the short-term outlook for housing prices. Specifically, household income, housing supply and interest rates affect housing prices both in the short and long runs, while market sentiment and bank credit supply are not expected to affect housing prices in the long run as market sentiment is highly fickle and bank credit supply condition is a monetary phenomenon. As such, these two drivers can affect the convergence of housing prices toward its long-run levels as warranted by fundamentals, and should be taken into account when assessing the short-term prospects for housing prices.

### Appendix A: Empirical methodology

To examine the importance of different factors to the housing price dynamics in Hong Kong, we estimate a BVAR model with sign restrictions.<sup>7</sup> We consider the following BVAR model:

$$\mathbf{y}_t = \sum_{i=1}^L \mathbf{A}_i \mathbf{y}_{t-i} + \mathbf{e}_t \quad \text{with} \quad \mathbf{e}_t \sim \mathbf{N}(\mathbf{0}, \boldsymbol{\Sigma}) \quad \forall t = 1, \dots, T \quad (1)$$

where  $\mathbf{y}_t$  is a vector of explanatory variables at time  $t$ .  $L$  is the lag length and  $\mathbf{A}_i$  denotes the coefficient matrix for the  $i^{\text{th}}$  lag.  $\mathbf{e}_t$  is a reduced-form error term with variance-covariance decomposition  $\boldsymbol{\Sigma}$ . The vector of explanatory variables is given by:

$$\mathbf{y}_t = (\Delta P_t \quad H_t \quad V_t \quad i_t \quad M_t \quad \Delta Y_t \quad R_t/P_t \quad \Delta S_t)^T \quad (2)$$

$\Delta P_t$  is the monthly growth of real housing prices as measured by the log difference of the housing price index of R&VD, deflated by the underlying CCPI inflation rate.  $H_t$  denotes housing commencement, which is the log of units of buildings commenced from the Buildings Department. We take the 3-year moving average to reflect the timing of between housing commencement and completion.<sup>8</sup>  $V_t$  denotes housing vacancy. Instead of using the R&VD vacancy data series which is available only in annual frequency, we proxy vacancy by the monthly housing stock per household living in private housing, given the close relationship between the two as shown in Chart 7. The data on housing stock is from the R&VD and the data on household living in private housing is from the General Household Survey data compiled by the C&SD. The real mortgage interest rate  $i_t$  is the difference between HKMA's internal estimate of the average mortgage

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<sup>7</sup> The BVAR is estimated with the Normal Wishart prior implemented using dummy observations, in which extra "data" are added to the sample in order to express prior beliefs about the parameters. We draw the posteriors using Gibbs sampling. The hyper-parameters, which determine the overall tightness of the priors, are chosen based on those suggested in Bańbura et al. (2008). The model is estimated with a lag length of 3 months. Estimation using a lag length of 6 months or more does not alter the results significantly.

<sup>8</sup> Data on housing commencement are based on the Notification of Commencement of Foundation work filed with the Buildings Department. For residential developments atop railway stations or depots, the figures are based on Notification of Commencement of General Building and Superstructure Work because the foundation works have been completed. This data only goes back to April 1995, which means that by taking 3-year moving average the series used for estimation would start only in April 1998. Since it takes about three years for housing commencement to completion, we use housing completion in the 3 years ahead to construct the data on 3-year moving average housing commencement for the months before April 1998.

rate and the inflation rate.  $M_t$  is the log of value of new mortgage loans approved by banks in real terms. The data source of nominal mortgage rate and mortgage loans approved is the HKMA's Residential Mortgage Survey.  $\Delta Y_t$  is the log difference of real aggregate household real income in Hong Kong, constructed using the data on median household income and the number of domestic household from C&SD, adjusted for inflation.  $R_t/P_t$  is the rent-price ratio constructed using nominal housing rent and price data from the R&VD.<sup>9</sup> Finally,  $\Delta S_t$  is the monthly stock market return as measured by the log difference of the Hang Seng Index (HSI), adjusted for inflation.

Table A1 summarises the corresponding sign restrictions, and all signs are restricted in the way that the initial responses of real housing prices to the respective shocks are positive.<sup>10</sup> We highlight some of the key identifications in below.

**Table A1: Shock identifications**

	Housing price	Housing commencement	Vacancy	Mortgage rate	New mortgage loans approved	Household income	Rent-price ratio	HSI
Shocks:								
Housing commencement (-)	+	-	-			-		
Housing needs (+)	+		-	+	-	+		
Mortgage rate (-)	+	+		-	-			
Market sentiment (+)	+		+	+	-			+
Bank credit supply (+)	+	+			+			

A negative housing supply shock represents a reduction in the expected new housing units available due to an unexpected decline in housing commencement, and this would pose upward pressures on housing prices. Housing supply shock reflects changes in the primary market supply that are largely due to changes in land supply, land

<sup>9</sup> Following Towbin and Weber (2015), we include the rent-to-price ratio as motivated by the co-integrating relationship between rents and prices. It helps capture long run dynamics in prices, while only including stationary variables.

<sup>10</sup> Sign restrictions have been used to identify structural shocks following the work of Canova and De Nicolò (2002) and Uhlig (2005) and others in the literature. Comparing to parametric restrictions, sign restrictions could be less stringent (Lütkepohl and Netšunajev (2014)) and more appealing as variables are usually determined in a simultaneous manner (Fry and Pagan (2012)). In particular, Towbin and Weber (2015) applied sign restriction identification schemes to a BVAR model on US housing prices. We modify the sign restrictions in Towbin and Weber (2015) according to the selected variables in our model and the specific features of Hong Kong housing market. We estimate the model with 10,000 iterations and 5,000 burn-ins, in which we accept 5,000 models with impulse response functions being consistent with the specified sign restrictions for all shocks.

regulations, as well as property developers' business strategies.<sup>11</sup> A negative housing supply shock would also drive down vacancy as it would shift the housing supply curve inward.<sup>12</sup> There is also an associated drop in aggregate household income stemming from the decline in residential investment, which is a GDP component.

A positive shock to housing demand comes from an increase in household formation or household income growth, either of which would raise aggregate household income and push up housing prices.<sup>13</sup> We also assume that vacancy would decline as the shock would shift the housing demand curve outward. To help distinguish a shock to housing demand from an easing in bank credit supply, we follow Towbin and Weber (2015) and assume that new mortgage loans approved would fall in response to a positive shock to housing demand. While not very intuitive, such assumption is necessary in order to distinguish the influence of the different factors.

A negative mortgage rate shock reduces the real mortgage rate and increases housing prices. A mortgage rate shock can arise from a change in either the US monetary policy, risk premium due to banks' pricing of risks, the term structure of interest rate, or market competition. We also restrict a decline in the mortgage rate to be associated with a decrease in new mortgage loans approved in order to disentangle a mortgage rate shock from a bank credit supply shock.

Meanwhile, the performance of Hong Kong's property market is widely believed to be influenced by market sentiment. We identified a positive market sentiment shock in which a positive shock pushes HSI and housing prices upward. The increase in housing prices would widen any housing demand-supply gap and increase vacancy. We

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<sup>11</sup> See Leung and Tang (2014).

<sup>12</sup> A negative housing supply shock could also affect secondary-market activities by changing homeowners' willingness to sell as they would raise their offer prices in a search and matching environment. For instance, in a search-theoretic housing model (such as Wheaton (1990) and Head et al. (2014)), one can imagine that an increase in new housing supply can affect housing market tightness and the search intensity of home sellers in the secondary market. Since we do not include any variable that can directly capture buyers and sellers behaviour in the secondary market, we focus on the primary-market channel when interpreting the impact of a housing supply shock.

<sup>13</sup> A positive shock to housing needs would also raise the real mortgage rate due to increased mortgage loan demand. In this regard, even though movements of Hong Kong dollar short-term interest rates largely follow those of the US interest rates under the LERS, banks in Hong Kong could still determine the risk premium and interest rate spreads charged on their mortgage loans.

also assume that the real mortgage rate would rise due to higher demand for mortgage credit, while the new mortgage loans approved would fall. The latter assumption helps distinguish market sentiment shock from bank credit supply shock.

A positive bank credit supply shock captures the non-mortgage-rate component of banks' mortgage loan, and is mainly captured through a positive shock to new mortgage loans approved, which could result from a mix of changes. Generally speaking, a positive bank credit supply shock would support housing prices as more mortgage loans are being made. We also assume that the shock would boost bank lending to property developers and hence housing commencement. On the other hand, macro-prudential policies would be captured by negative bank credit supply shocks.



## REFERENCES

- Bañbura, Marta, Domenico Giannone and Lucrezia Reichlin (2008), “Large Bayesian VARs”, European Central Bank Working Paper Series No. 966.
- Cheung, Lillian, Kevin Chow, Michael Cheng and Philip Ng (2016), “Inflation Mechanism and Monetary Policy Perspectives from Hong Kong”, BIS Paper No. 89.
- Bauer, Gregory H. and Antonio Diez de los Rios, “Global Risk Premiums and the Transmission of Monetary Policy”, Bank of Canada Review, Summer 2012, 12–20.
- Canova, Fabio and Gianni De Nicolo (2002), “Monetary Disturbances Matter for Business Fluctuations in the G-7”, *Journal of Monetary Economics*, 49, 6, 1131–1159.
- Chen, Qianying, Andrew Filardo, Dong He and Feng Zhu (2012), “International Spillovers of Central Bank Balance Sheet Policies”, BIS Papers No 66.
- Chung, Kenneth Hoi-Ki (2012), “Determinants of Residential Property Prices in Hong Kong: A Cointegration Analysis”, *International Research Journal of Finance and Economics*, 96, 55–62.
- Craig, R. Sean and Changchun Hua (2011), “Determinants of Property Prices in Hong Kong SAR: Implications for Policy”, IMF Working Paper WP/11/277.
- Fry, Renée and Adrian Pagan (2011), “Sign Restrictions in Structural Vector Autoregressions: A Critical Review”, *Journal of Economic Literature*, 49, 4, 938–60.
- Head, Allen, Lloyd-Ellis, Huw and Hongfei Sun (2014), “Search, Liquidity, and the Dynamics of House Prices and Construction”, *American Economic Review*, 104, 4, 1172–1210.
- Hong Kong Monetary Authority (2016), “Box 3: Examining the Impact of Interest Rate Hikes on Hong Kong’s Private Consumption”, Half-yearly Monetary and Financial Stability Report March 2016, Hong Kong.

- Huang, Haifang and Yao Tang (2012), “Residential Land Use Regulation and the US Housing Price Cycle between 2000 and 2009”, *Journal of Urban Economics*, 71, 1, 93 – 99.
- Kandrac, John and Bernd Schlusche (2016), “Quantitative Easing and Bank Risk Taking: Evidence from Lending”, Federal Reserve Board manuscript.
- Leung, Charles Ka Yui and Edward Chi Ho Tang (2014), “Availability, Affordability and Volatility: the case of Hong Kong Housing Market”, City University of Hong Kong Department of Economics and Finance Working Paper 2015061.
- Leung, Frank, Kevin Chow and Gaofeng Han (2008), “Long-Term and Short-Term Determinants of Property Prices in Hong Kong,” HKMA Working Paper 15/2008
- Lütkepohl, Helmut and Aleksei Netšunajev (2014), “Disentangling Demand and Supply Shocks in the Crude Oil Market”, *Journal of Applied Econometrics*, 29, 3, 479 – 496.
- Towbin, Pascal and Sebastian Weber (2015), “Price Expectations and the U.S. Housing Boom”, IMF Working Paper WP/15/182.
- Transport and Housing Bureau (2014), Long Term Housing Strategy, The Government of the Hong Kong Special Administrative Region, Hong Kong.
- Uhlig, Harald (2005), “What are the Effects of Monetary Policy on Output? Results from an Agnostic Identification Procedure”, *Journal of Monetary Economics*, 52, 2, 381 – 419.
- Wheaton, William C., (1990), “Vacancy, Search, and Prices in a Housing Market Matching Model”, *Journal of Political Economy*, 98, 6, 1270 – 1292.
- Wong, Eric, Andrew Tsang and Steven Kong (2016), “How Does Loan-To-Value Policy Strengthen Resilience of Banks to Property Price Shocks – Evidence from Hong Kong”, *International Real Estate Review*, 19, 1, 120 – 149.