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Residential Property Prices in China

OHNO, Sanae
Musashi University
sanaeon@cc.musashi.ac.jp

XU, Peng
Hosei University
pxu@hosei.ac.jp

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OHNO, Sanae
Musashi University
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XU, Peng
Hosei University
pxu@hosei.ac.jp

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Abstract

This paper assesses the linkages between economic activity, foreign reserve, money, credit, inflation and house prices in China. The analysis is based on a structural VAR estimated using monthly data spanning the period 2002 January-2015 December. We find a positive impact of capital inflow on national average residential property price index. Also, the growth of bank credit leads to acceleration of residential property price. But response patterns are heterogeneous both across areas and over time. Meanwhile, the national residential property price growth leads to the expansion of business economic activities, the growth in base money and high inflation rate. The decade-long boom in housing sector has been contributing to Chinese economic growth.

JEL Classifications: G21, G15, G28

Keywords: Monetary Policy, Credit Policy, Hot Money, Residential Property Price

1. Introduction

The residential property market has been achieving substantial development since the housing reform in late 1990s. The real estate sector and the construction sector comprised a considerable fraction of Chinese economy. The rapid property price growth and evident expansion of residential property market has been contributing to Chinese economic growth. The increase in housing prices lead to intensive capital investment persuade the monetary authority to expand money supply to satisfy the increased money demand, and stimulate the whole economy. Internationally, the acceleration of residential property prices may attract more capital inflow, though international capital market is regulated.

However, the dynamics of real estate price booms and bursts is broadly compatible with observed movements in income, credit, monetary policy and residential property prices. It is argued that the easing monetary policy in the early 2000s contributed to the real estate price bubble that burst during the recent global financial crisis in the United States (Taylor (2007), Jarocinski and Smets (2008), Bernanke (2010)). On the other hand, Acharya et al. (2011) criticized that poorly designed government guarantees for Fannie Mae and Freddie Mac led to the debacle of mortgage finance in the United States.

With growing incomes, development of residential property market and expansion of mortgage credit easily available, the demand for housing has been expanding and residential property prices have been accelerating. Recently, the housing price is comparable to developed countries, though China is an emerging economy. However, collapses after dramatic asset price increases and rapid expansion of credit have played a central role in many financial crises (see Ahearne et al. (2005), Goodhart and Hofmann (2007, 2008), and Hunter et al. (2003)). China analysts have been wary of the potential of a real estate price bubble and its burst.

Previous studies examined the effects of money supply, stock market returns, inflation, credit policy and hot money on home price in China. China has its managed-floating foreign exchange system. The People's Bank of China has to purchase large amount of foreign currency inflow to China. The money inflow includes inward foreign direct investment and international trade surplus. Though the international capital market is strictly regulated, the interest rate difference and the anticipated appreciation of RMB might attract more and more hot money. Due to the managed-floating foreign exchange system, hot money might have stronger impact on real estate market in China.

Generally, the money inflow results in rapid increases in base money and money

supply unless the central bank successfully sterilizes the foreign exchange. Bouvatier (2007) examine the relationship between real international reserves and real domestic credit in China during the period of January 1997 to March 2006, using a Vector Error Correction Model and the empirical results suggest that the People's Bank of China succeeded in slowing down real domestic credit when real international reserves increased. On the other hand, Ruffer and Stracca (2006) find evidence of a significant spill-over of global liquidity on the euro area economy and in Japan.

Hot money inflow to China was also viewed as an important reason for real estate prices in China in Martine and Morrison (2008). A big concern is that "hot money" may be creating bubbles in its stock and real estate markets, although recent evidence suggests that the "hot money" was being largely deposited into bank accounts in Wright (2008).

The results for the relationship of hot money and real estate price are mixed. Zhang and Fung (2006) find that lag one quarterly hot money flow has a positive effect on residential property price. Xu and Chen (2010), however, show that hot money flow has no significant impact on Chinese estate price after controlling for the money supply price. In addition, Xu and Chen (2010) show that the estimated coefficient on autoregressive lag one of residential property price is insignificant. In their monthly

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regressions on the change in China home price growth, benchmark rate, money supply, credit, consumer price explain 80% of the change in residential property price. Xu and Chen (2010) conclude that monetary policy and credit policy are two driving forces for acceleration in residential property price.

This paper seeks to contribute to this research agenda by shedding light on the multidirectional link between monetary policy, economic activity, credit policy, hot money flow and residential-property in China. We find a positive impact of capital inflow on national average residential property price index. Also, the growth of bank credit leads to acceleration of residential property price. But response patterns are heterogeneous both across areas and over time. Meanwhile, the national residential property price growth leads to the expansion of business economic activities, the growth in base money and high inflation rate. The persistent boom in Chinese housing sector has been contributing to economic growth.

The rest of paper is organized as follows. In section 2, we conduct an empirical analysis to examine the relationships between foreign reserve, money policy, credit, economic activity and residential property prices in China. Section 3 discusses the implication of our empirical analysis.

2. Data and Empirical Analysis

The empirical analysis is based on monthly data for China spanning the period 2002 January till 2015 December. The set of data series used in the empirical analysis comprises Foreign Reserve, Base Money, Credit, Industrial Coincidence Index and nominal Residential Property Price. The data source is ISI Emerging Market, CEIC data. To correctly model the trend characteristics of the data, Kwiatkowski–Phillips–Schmidt–Shin tests, Augmented Dickey-Fuller and Phillips-Perron unit root tests are performed on all variables. Since the level variables are nonstationary with a unit root, we use the first differenced, stationary series. For descriptive statistics, see Appendix 2.

One common way of approximating the flow of "hot money" is to subtract a nation's international trade surplus (or deficit) and its net flow of foreign direct investment (FDI) from the change in the nation's foreign reserves. Because "hot money" flows quickly and is poorly monitored, there is no well-defined, direct method for estimating the amount of "hot money" flowing into a country during a period of time. Hot money flows in the form of short-term foreign portfolio investments in equities, bonds and financial derivatives, short-term foreign bank loans and foreign bank loans with short term investment horizon. In China, however, there are no reasons to deny that that hot money flows in and out disguised as trade under the current international capital market

regulation. Indeed, China said data on trade with Hong Kong were inflated by arbitrage transactions that skirted rules and the data reflected hot money in June 2013[2]. It is speculated that shipments of gold in and out of Hong Kong have been for this purpose, since valuable goods with low transportation costs are "ideal channels" for hot money flows.

Another reason is that not only hot money including disguised international trade flows induced by the anticipated appreciation of RMB but also real international trade flows might have strong impact on base money due to the managed-floating foreign exchange system in China as mentioned above. Considering the substantially accumulated foreign reserve as a result of the twin surpluses (current account surplus and capital account surplus), the foreign exchange intervention might be only partially sterilized, leading to the increased the domestic liquidity. The accumulation of foreign reserve therefore has an inflationary pressure, which should be discriminated from the effect of the autonomous easy monetary policy.

For the above reasons, we use the change of foreign reserves as hot money in our study. In particular, we investigate the impact of foreign reserve on base money as well

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[2] "China Says Trade Figures Inflated by Arbitrage With Hong Kong", *Bloomberg*, June 18, 2013 (http://www.bloomberg.com/news/2013-06-18/china-says-trade-figures-inflated-by-arbitrage-with-hong-kong.html)

as the impact on home prices.

We use a structural VAR described in Appendix. In the first and second equation of the corresponding structural VAR, *COINDEX, Foreign Reserve* is respectively the dependent variable and the regressors are lagged values of all six variables. In the third equation, *Base Money* growth rate is the dependent variable and the regressors are lags of all three variables plus the current values of *Foreign Reserve* growth rate and *CPI*. *Credit* is the dependent variable in the fourth equation, and the regressors are lags of all six variables, the current values of all other variables. In the fifth equation, the regressors are lags of all six variables and the current values of *COINDEX*, *Foreign Reserve*, *Base Money* and *Credit*. Residential property price is the dependent variable and the regressors are lags of all six variables, the current values of all other variables except *CPI*. For details, see Appendix1.

Granger Causality Test

The structural VAR described above is estimated over the sample period from 2002 January till 2015 December with a lag order of eight, which was selected based on the GTOS (general to specific) criterion[3]. the Akaike information criterion, Hannan and

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[3] Although other criterions including the Akaike information criterion, Hannan and Quinn criterion and Schwarz criterion suggest a different lag length, this study applied the longer lag length.

Quinn criterion and Schwarz criterion. All variables are seasonally adjusted by using Esmooth command of the Rats 8.1 econometric software to perform the exponential smoothing methodology.

Table 1 summarizes the Granger-causality tests for the six variables included in the model where the national average residential property price is applied. It shows the *p*-values associated with the *F* test statistics for testing whether the relevant sets of coefficients are zero. As reported in Table 1, *COINDEX* helps to predict *Foreign Reserve* and *Residential Price*. It is also shown that *CPI* was influential to Credit as well as *Base Money* affected *CPI*. Those results are not inconsistent with our expectation.

Table 2 summarizes the Granger-causality tests for Province or Province-Level Municipality Average Residential Property Prices. Here, we estate the above VAR using the Average Residential Property Price in a province or a province-level municipality, instead of the National Average Residential Property Price. Provinces and province-level municipalities consist of Beijing Municipality, Shanghai Municipality, the Eastern Area.

Although any variables excluding own lagged variables does not Granger cause the national average residential property price, tables 2 reports that *Credit* and *Base Money*

When a different lag length was selected to estimate a VAR model, similar results were shown.

help to predict the residential property price of Shanghai and Beijing, respectively. Table 2 suggests that the *Foreign Reserve* does not Granger cause the residential property prices of every areas including those where speculative capital flow was believed to have some influence on instability of housing markets.

Impulse Responses

The cumulative impulse responses for the six variables included in the structural VAR at the 12 month horizon are plotted in Figure 1. In this case, the overall average residential property price is applied. Also plotted are ±1 standard error bands, which yield an approximate 66% confidence interval for each of the impulse responses.

Contrary to the results of the Granger causality tests, it is confirmed that foreign reserve shock has a positive impact on the national average residential property price index. This is also contrary to the results of Ohno and Xu (2013), which implied that, by employing observations for the period to the end of 2011, the speculative foreign capital inflows had an insignificant impact on the nation-wide residential property prices.

In addition to the impact of the Foreign Reserve on the National Average Residential Property Price, the impact of the Foreign Reserve on Base Money is evidently reported. This suggests that the speculative foreign capital inflow including the pseudo exports

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(such as the leads-lags foreign exchange speculations) flowed in the Chinese housing markets though the direct channel (the purchases of Chinese houses by foreign investors) as well as the indirect channel (the increased base money due to the foreign exchange intervention for the purpose to the maintenance of the renminbi exchange rate).

Except for foreign reserve, the bank credit also shows a positive impact on the housing price. Furthermore, several reverse impacts are reported; that is, the increase in the national residential property price lead to the expansion of business economic activities, the increase in base money and the rise in consumer price index. Those results indicate that the increase in housing prices promoted capital investments and other types of investments, persuaded the monetary authority to expand the supply of currency to satisfy the increased money demand, and stimulate the nation-wide demand for goods and services.

Figure 1 also reports that the decrease in CPI causes the increase in bank lending. This evidence is interpreted that banks as creditors preferred to expand their lending under the deflationary condition. It is also reported that a positive shock in base money brings about the increase in *COINDEX* and *CPI*, which are not against our expectation.

Figure 2-1 and 2-2 show the impulse responses of the national and regional

residential property price estimated for the sample period ending at 2015 December and 2011 December, respectively. Interestingly, the foreign reserve shock becomes more influential to Beijing and Shanghai in a case where the model is estimated with the observations until the end of 2011. It is revealed that the magnitude of the response of the Beijing residential price is almost double of that of the national residential price. On the other hand, in a case to estimate the model with the observations ending 2015 December, the impulse response of the Beijing residential price to a shock in foreign reserve is insignificant and the reaction of the Shanghai residential price is smaller than that of the national residential price. This is contrary to the result of Ohno and Xu (2013).

It may be interpreted as follow. Foreign capital tended to be invested in housing markets in Beijing, Shanghai and other major cities. During the course of time, targets to be invested were expanding toward other areas which believed to be undervalued, and the influence of foreign capital spread across regions.

Figure 2-1 also reveals that the increase in base money and the rise in CPI have a positive impact on the Beijing residential price, even though the impact of foreign reserve is not confirmed. It is also reported that the Shanghai residential price positively react to the increase in the bank lending, while the other residential prices did not show

responses to bank lending. It is probable the mortgage loan competition across banks particularly stimulate the Shanghai housing investments.

Forecast Error Decompositions

Table 3 shows forecast error decompositions at the 24 month horizon for the structural VAR using the National Average Residential Property Price in China. Apparently, the movement of the national residential property price was largely attributable to the own shocks. Besides of the own shocks, the 8.36% of the error in the forecast of the national average residential price is attributed to the Coindex shock and 5.44% of the forecast error is attributed to the base money shock. In addition, the hot money flow's percentage error decomposition is 3.26%.

According to the results of variance decomposition, foreign reserve shocks have relatively larger impact on base money. In addition, base money shocks are influential to COINDEX and CPI, and CPI shock has a large impact on credit. Those results are consistent with the results of impulse response analyses.

Table 4 indicates the error decomposition for the structural VAR using a province or province-level municipality Average Residential Property Price. Among them, the residential property price of the Eastern area received a relatively large impact from the

foreign reserve shock and the relative contribution of foreign reserve shock is larger

than that of COINDEX shock. The Shanghai residential property price was likely to be

influenced by credit shocks. Those results are also consistent with the results of the

impulse response analyses. Similarly to the result shown in table 3, it is also reported

that idiosyncratic shocks of those residential property prices are evidently dominant.

Historical Decompositions

In the final subsection, the results of the historical decompositions are revealed to get

some further insights into the response of house prices to different shocks identified in

the VAR model. Figure 3 and Figure 4 present historical decompositions of the national

residential property price and the Shanghai residential property price. They trace the

relative contribution of each shock on the residential property prices during the course

of time. A dotted line represents the one-year average of the actual residential property

price level and column charts signify the one-year accumulated contribution of each

structural shock for the residential property price. The result is a picture that indicates

for every one year period the importance of a specific shock in driving the house price.

Comparison between Figure 3 and Figure 4 indicates that foreign capital inflow had a

larger impact on the Shanghai residential property price during the overall estimation

period. Particularly, in 2004 when foreign reserve sufficiently increased as a reflection of the anticipation for the future renminbi appreciation, the relative contribution of foreign reserve shocks become larger. In 2009 through 2010, base money shock has a larger contribution for the Shanghai residential property index. The period is coincided with the period when the Chinese monetary authority implemented a drastically expansionary monetary policy. Historical decomposition for the residential property prices of Beijing and the Eastern area reveal similar result. As for the features of the Shanghai residential price, it is also evident that a credit shock tends to be more influential for the Shanghai residential price, which is also consistent with the result of impulse response and variance decomposition.

3. Conclusion

The national residential property price growth leads to the expansion of business economic activities, the growth in base money and high inflation rate. The decade-long boom in housing sector has been contributing to Chinese economic growth. Moreover, accelerating property prices attract more capital inflow. Meanwhile, impulse response functions demonstrate a positive impact of capital inflow on national average residential property price index.

Acceleration in residential property price led to rapid expansion of economy, while deceleration in home price growth may lead to weak economic growth. The reliance of economic growth on acceleration of residential property prices can be risky. Due to slower economic growth and slumping stocks, capital inflows turned to capital outflows in the late 2014 and the estimated 2015 total capital outflows is $1 trillion. According to our results, capital outflows would lead to weak or negative growth in residential property prices. Even worse, capital outflows would succeed as residential property prices declining. Furthermore, succeeded capital outflows push down residential property prices. To stabilize economic growth, China needs to halt sharp capital outflows.

Finally, the variance of national residential property price is predominantly due to its own shocks. Thus, an adverse shock in residential property price would hold out and in turn sharp residential property declines would be followed by weak capital inflows or outflows. Recently, Wu, Gyourko and Deng (2015) evaluate the risk of Chinese housing markets and show that the weak housing market fundamentals would lead to weak or negative price growth. In addition, affordability metrics such as price-to-rent and price-to-income measures are very high in comparison with international standard in markets with strong fundamentals. In sum, a downward shift in expectations or a

downshift in income may generate sharp property value declines. Policies such as soft

landing for housing markets are needed

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＜Appendix1＞

This paper presumes that Chinese residential property prices and their determinants are represented with the following structural VAR model.

$$AX_t = B_0 + B_1 X_{t-1} + B_2 X_{t-2} + \cdots + B_k X_{t-k} + u_t \qquad \text{(A-1)}$$

$$X_t = \begin{bmatrix} COINDEX_t \\ FRESERV_t \\ BMONEY_t \\ CREDIT_t \\ CPI_t \\ HOMEPR_t \end{bmatrix} \qquad u_t = \begin{bmatrix} u_{COINDEX,t} \\ u_{FRESERV,t} \\ u_{BMONEY,t} \\ u_{CREDIT,t} \\ u_{CPI,t} \\ u_{HOMEPR,t} \end{bmatrix}$$

Therein, *COINDEX, FRESERV, BMONEY, CREDIT, CPI* and *HOMEPR* specify Coincidence Index, Foreign Reserve, Base Money, Mortgage Credit[6], CPI and Nominal Residential Property Price, respectively. Matrix *A* describes the contemporaneous relationship among the variables to be considered. Vector *u* consists of structural shock of those variables with variance-covariance matrix $E[u_t u_t'] = I$. According to equation (A-1), an idiosyncratic shock of base money is defined as those purely as a result of monetary policy. Similarly, idiosyncratic shocks of mortgage credit are defined as those which are shocks in mortgage credit due to changes in banks' lending strategies and so on.

The reduced form of equation (A-1) is represented as follows.

$$X_t = C_0 + C_1 X_{t-1} + C_2 X_{t-2} + \cdots + C_k X_{t-k} + \varepsilon_t \qquad \text{(A-2)}$$

$$C_k = A^{-1} B_k \qquad \varepsilon_t = A^{-1} u_t \qquad E[\varepsilon_t \varepsilon_t'] = \Sigma_t$$

When each element of vector *X* satisfies stationarity, the VAR model should be invertible and equation (A-2) should be rewritten as a following reduced-form VMA.

$$\begin{aligned} X_t &= \varepsilon_t + D_1 \varepsilon_{t-1} + D_2 \varepsilon_{t-2} + \cdots + D_k \varepsilon_{t-k} + \cdots \\ &= D(L)\varepsilon_t \end{aligned} \qquad \text{(A-3)}$$
$$D(L) = I + D_1 L + D_2 L^2 + \cdots D_k L^k + \cdots$$

Equation (A-3) should be further rewritten as a following structural VMA.

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[6] Because sample of mortgage loan covering the whole sample period is not available, middle- and long-term bank loan is used in place of mortgage loan.

$$X_t = D(L)\varepsilon_t$$
$$= D(L)A^{-1}A\varepsilon_t \qquad\qquad (A\text{-}4)$$
$$= F(L)u_t$$

The estimated impulse response functions are presented according to a sequence of the estimated coefficients of $F(L)$.

Because ε_t is represented as $\varepsilon_t = A_0^{-1}u_t$, the variance covariance matrix of ε_t is implied as follows.

$$\Sigma = E[\varepsilon_t \varepsilon_t'] = E\left[A^{-1}u_t u_t'\left(A^{-1}\right)'\right] = A^{-1}\left(A^{-1}\right)' \qquad\qquad (A\text{-}5)$$

To identify the structural model from an estimated VAR, it is necessary to impose 15 restrictions on the structural model. This paper imposes a following structural specification on matrix A.

$$
A = \begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 \\
-a_{31} & -a_{32} & 1 & -a_{34} & -a_{35} & 0 \\
-a_{41} & -a_{42} & -a_{43} & 1 & -a_{45} & -a_{46} \\
-a_{51} & 0 & -a_{53} & 0 & 1 & 0 \\
-a_{61} & -a_{62} & 0 & -a_{64} & -a_{65} & 1
\end{bmatrix}
$$

According to this specification, production and foreign reserve are defined as the most exogenous variable and credit as the least exogenous variable. In case where an enormous amount of foreign currency is purchased by the monetary authority to mitigate the appreciation pressure for the Renminbi, the sterilization might become imperfect, resulting in the increased domestic liquidity. This is likely to provide an impact similar with that of the easy monetary policy. On the other hand, money supply would be tightened if CPI is going up. Thus base money contemporaneously depends on foreign reserve and current inflation. Under this specification, monetary policy shock is defined as a change in base money after controlling the foreign exchange intervention. Credit simultaneously depends on COINDEX, foreign reserve, base money, inflation and house price. Inflation is driven by COINDEX, foreign reserve, base money, credit

except house price. As mentioned above, recent studies emphasize that collapses after dramatic asset price increases and rapid expansion of credit have played a central role in many financial crises without apparent inflations. For the same reason, the residential property price depends on other variables except CPI. In other words, CPI and house prices are not connected simultaneously. Under the specification, idiosyncratic shocks in residential property price are defined as a change in prices caused by supply side shocks such as construction costs and local government-led urbanization projects, as well as demand side shocks such as population movements and local tax policies.

By rewriting equation (A-4), vector X at time $T+k$ can be formalized as presented below.

$$X_{T+k} = \sum_{s=0}^{k-1} \Psi_s u_{T+k-s} + \sum_{s=k}^{\infty} \Psi_s u_{T+k-s} \tag{A-6}$$

The first sum on the right hand side of equation (A-6) represents the part of X_{t+k} attributable to innovations during periods $T+1$ to $T+k$. The second term is the forecast based on information available at time T. Fluctuations of the six variables in vector X after time $T+1$ are traceable to the time path of the components in the first term. In the Historical Decomposition analysis mentioned the above, the results are shown by specifying January 2001 as $T+1$.

＜Appendix 2＞

Descriptive Statistics

	Mean	Std Error	Max	Min
Coincidence Index	−0.0001	0.006	0.018	−0.023
Foreign Reserve	0.017	0.019	0.063	−0.041
Base Money	0.011	0.012	0.053	−0.029
Credit	0.016	0.010	0.073	−0.004
CPI	0.002	0.006	0.022	−0.013
Residential Property Price				
National	0.007	0.026	0.086	−0.052
Eastern	0.007	0.026	0.098	−0.055
Beijing	0.010	0.038	0.104	−0.084
Shanghai	0.011	0.024	0.116	−0.048

Note 1: Estimation period is from January 2002 to December 2015.

Note 2: Variables listed above are converted as a growth rate from last month.

Table 1.　Granger Causality Tests for Six Variables Included in the VAR Model

| Regressor/Dependent Variable	Coincidence Index	Foreign Reserve	Base Money	Credit	CPI	Residential Price
Coincidence Index	0.000	0.074	0.921	0.912	0.775	0.064
Foreign Reserve	0.935	0.000	0.624	0.681	0.519	0.642
Base Money	0.374	0.615	0.128	0.180	0.031	0.500
Credit	0.426	0.798	0.472	0.000	0.857	0.565
CPI	0.440	0.179	0.510	0.000	0.139	0.866
Residential Price	0.142	0.390	0.299	0.274	0.470	0.001

Notes: The table shows the p value for F tests that lags of the variable in the row labeled regressor do not enter the reduced form equation for the column variable labeled dependent variable. The results were computed from a VAR with eight lags and a constant term over the sample period from January 2002 to December 2015.

Table 2. Granger Causality Tests for Province and Province Level Municipality Residential Property Prices

Regressor/Dependent Variable	Shanghai	Beijing	Eastern	National
Coincidence Index	0.398	0.210	0.451	0.064
Foreign Reserve	0.562	0.990	0.243	0.642
Base Money	0.961	0.029	0.207	0.500
Credit	0.032	0.476	0.915	0.565
CPI	0.219	0.456	0.705	0.866
Residential Price	0.097	0.216	0.001	0.001

Notes: The table shows the p value for F tests that lags of the variable in the row labeled regressor do not enter the reduced form equation for the column variable labeled dependent variable. The results were computed from a VAR with eight lags and a constant term over the sample period from January 2002 to December 2015.

Figure 1. Estimation of Impulse Response Functions for Six Structural Shocks in Using Overall Residential Property Prices
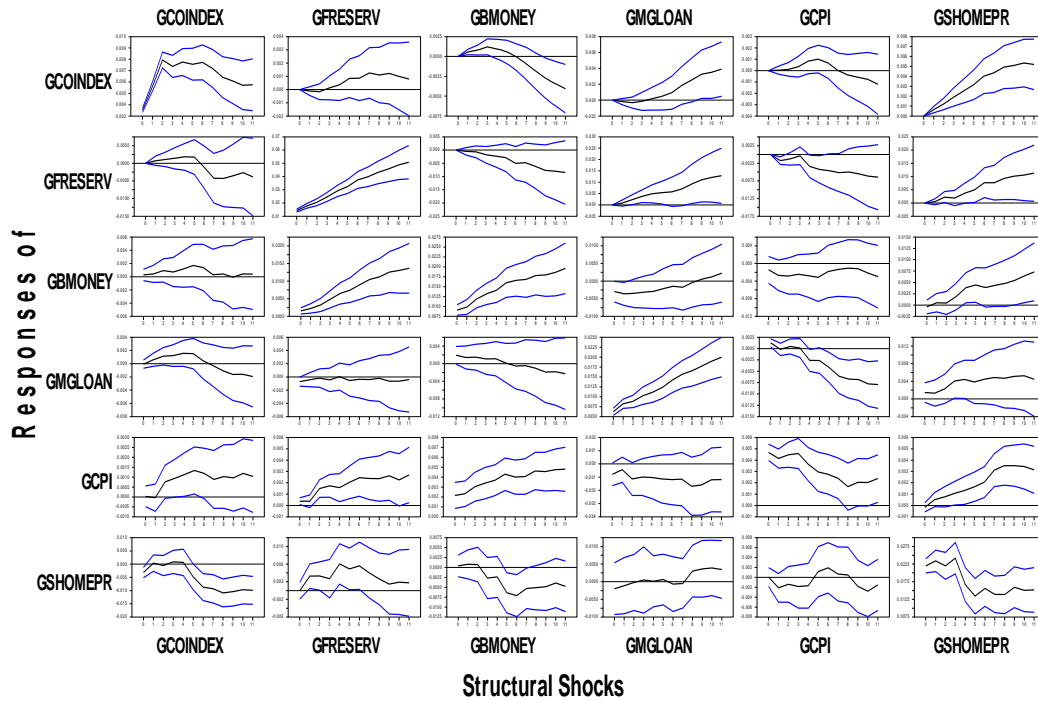
Note 1: The *i*-th row of the matrix shown in Figure 1 represents the i-th dependent
  variable, and the *j*-th column of the matrix represents the j-th structural shock.
Note 2: The black line signifies the estimated impulse response function and the two
  blue lines represents the confidence band calculated with one standard error.

Figure 2-1: Impulse Response Functions of the National and Regonal Residential Property Price (Sample period: 2002 January to December 2015)
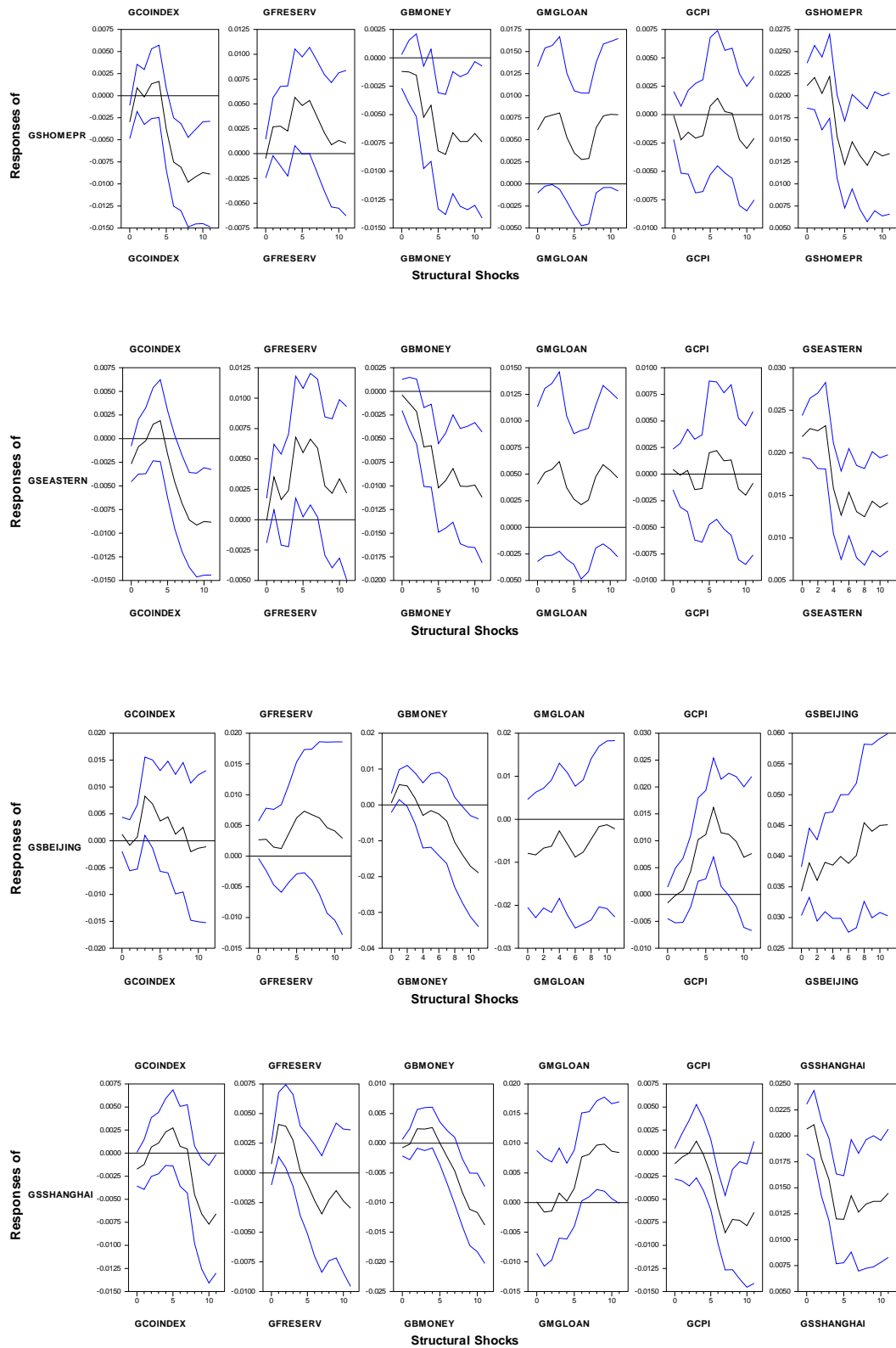
Figure 2-2: Impulse Response Functions of the National and Regional Residential Property Price (Sample period: 2002 January to December 2011)
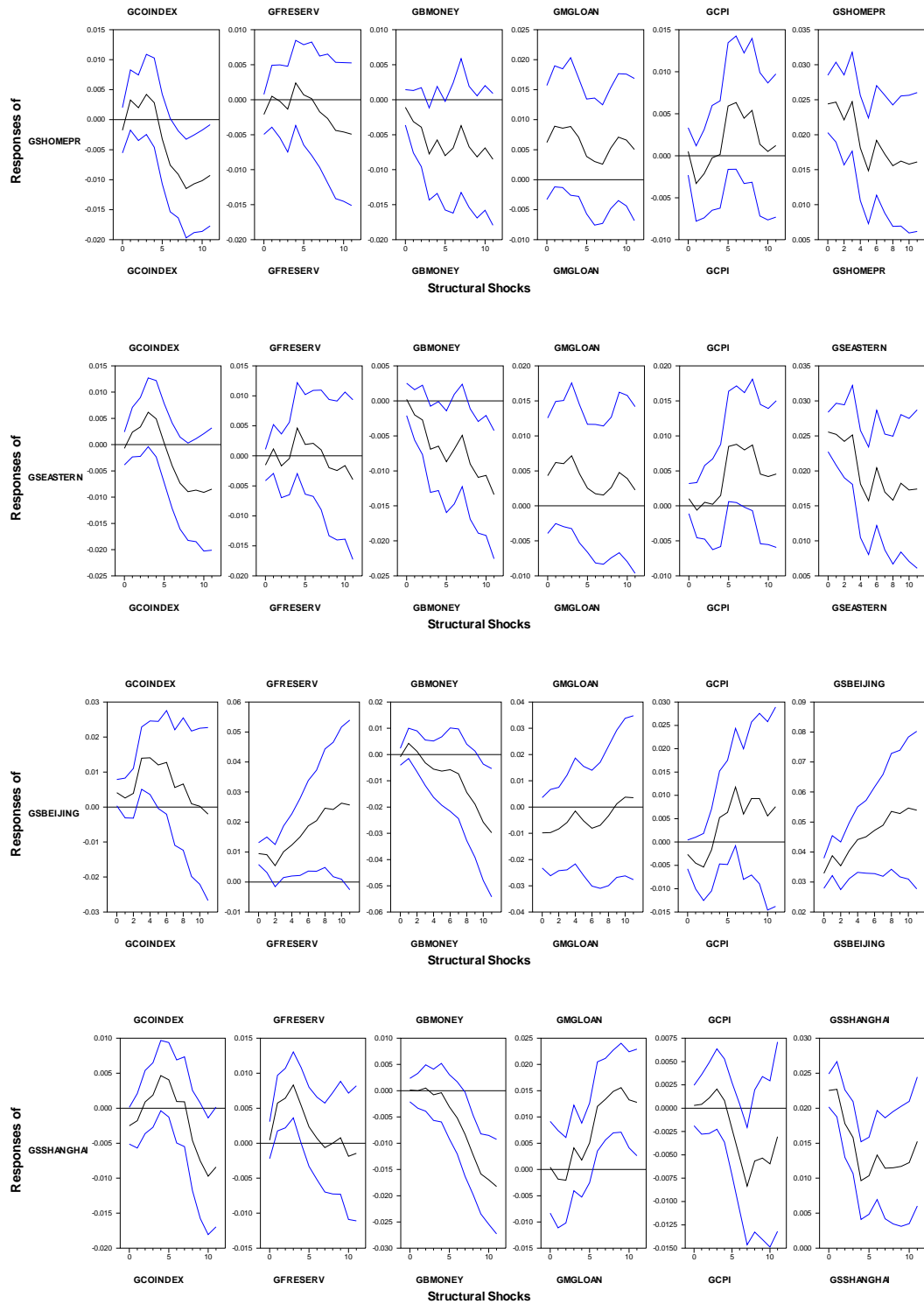
Table 3. Variance Decomposition for Variables Included in VAR Model

	Coindex Shock	Foreign Reserve Shock	Base Money Shock	Credit Shock	CPI Shock	Residential Price Shock
Coincidence Index	70.409	1.622	13.208	2.640	4.480	7.642
Foreign Reserve	3.920	80.075	4.587	3.383	4.977	3.058
Base Money	1.166	9.035	75.299	6.803	3.308	4.390
Credit	2.695	1.274	7.309	65.299	19.050	4.373
CPI	2.594	5.546	11.640	4.142	71.582	4.496
Residential Price	8.345	3.258	5.440	2.612	2.652	77.693

Note 1: The estimation period is from January 2002 to December 2015

Note 2: The numerical values shown in each row are the averaged contribution of variance of the one-step forecast error though that of the twenty-four-step forecast error for each component.

Table 4. Variance Decomposition for Overall and Provincial Residential Property Prices

	Coindex Shock	Foreign Reserve Shock	Base Money Shock	Credit Shock	CPI Shock	Residential Price Shock
Shanghai	4.519	3.865	4.947	6.832	5.127	74.710
Beijing	4.867	1.680	7.127	2.538	4.710	79.078
Eastern	4.481	5.505	5.507	1.360	2.696	80.451
National	8.345	3.258	5.440	2.612	2.652	77.693

Note 1: The estimation period is from January 2002 to December 2015

Note 2: The numerical values shown in each row are the averaged contribution of variance of the one-step forecast error though that of the twenty-four-step forecast error for each component.

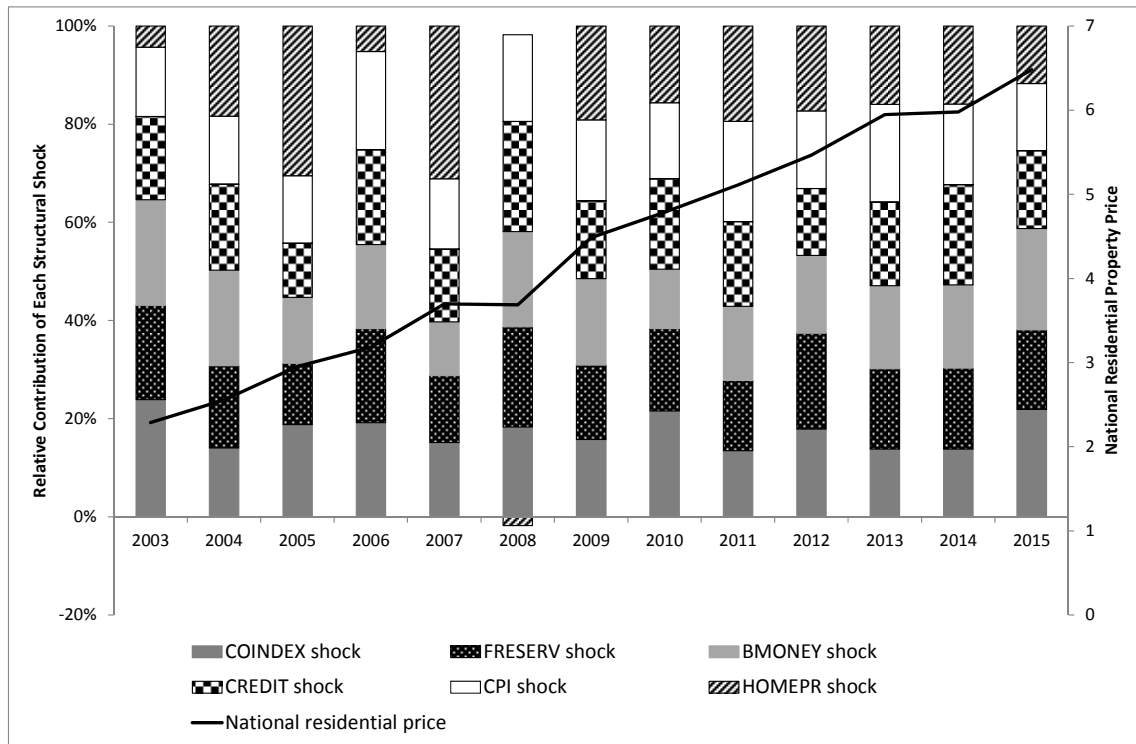Figure 3. Historical Decomposition of National Residential Property Price

Figure 4. Historical Decomposition of Shanghai Residential Property Price