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House Prices as Indicators of Monetary Policy: Evidence from China

by

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Abstract

This paper assesses empirically whether China's central bank should react to house prices and if so how. We use three kinds of VAR models including structural VARs with a combination of short-run and long-run restrictions to solve the endogeneity problem of identifying shocks to monetary policy and house prices. Broader money supply (M2) and the one-year lending rate are used as monetary policy proxies according to the distinctive background in China. The interaction between M2 and house prices is much more evident than the effects of M2 and house prices on GDP and CPI. In the three-variable VARs, GDP reacts to the M2 shock more considerably than it does in the four-variable SVARs. In the structural identification model, M2 and interest rates respond to a house price shock more sensitively than they do in the Cholesky identification. Following a tight money shock, under structural identification, output decreases to a lesser extent and CPI falls slowly, which lessens the negative impact on the macroeconomy compared with the Cholesky identification. Relevant policy implications are also discussed.

Keywords: House prices, Monetary policy, Identification, VAR.

JEL Classification No.: E44, E52, R31.

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I. Introduction

The issue of what role asset prices, especially house prices, should play in monetary policy has gained renewed momentum in the aftermath of the recent financial crisis, and this issue remains far from resolved. In this paper, we consider the linkage in the case of China based on the following research motivations. Firstly, house prices in China increased by 50% from 2008Q4 to 2013Q2 and have risen by over 130% since 1997 as shown in Figure 1, much more sharply than general goods and service prices, as was also the case in the US before the last crisis. Secondly, Chen and Li (2011) show that the proportion of property owned by Chinese urban households is near to 70%. Tan and Wu (2013) point out that the wealth effect of fluctuations in house prices in China is much bigger than that in the US, which will have a more severe influence if house prices in China slump. Thirdly, IMF data shows that China’s share of world GDP increased dramatically from 2% in 1980 to 13.25% in 2010. Its sheer size means that disturbances in China might have significant ramifications in the world now. Barnett (2013) argues that whenever there is any variation in real estate in China, the economic structure will undergo significant change. Hence, it is of vital importance in practice to make sure Chinese monetary policy responds to fluctuations in house prices in order to maintain the stability of house prices and that of the macroeconomy.

There are two distinctly opposing views theoretically about the ongoing debate. For example, Bemanke and Gertler (2001) and Gilchrist and Leahy (2002) argue that monetary policy should react to financial imbalances only insofar as they impact on inflation and output, the primary goals of central banks. Most recently, Machado (2013) also argues that a direct monetary policy response to asset prices is not desirable under common instrumental rate rules by extending the learning model in monetary policy. The other views call for the central bank to take action against imbalances as they build up, even when the outlook for inflation and growth in the near term seems to be sound, as the unwinding of such imbalances can be swift and costly to the real economy (Cecchetti et al., 2000;
Borio and Lowe, 2002). Filardo (2004) points out that if non-fundamental asset price movements can have real economic effects, then they should be incorporated into the central bank’s policy rule. Disyatat (2010) casts the debate regarding the role of asset prices and financial imbalances in the formulation of monetary policy from the perspective of theoretically optimal policy responses and argues that a more practical way to evaluate preventative policy actions against the build-up of financial imbalances is through the inclusion of concerns for financial imbalances explicitly in the central bank’s objective function.

Empirically, Goodhart and Hofmann (2003) find that for the US, the euro area, Japan and the UK, the Financial Conditions Index, also comprising property prices and share prices, would be a better indicator of economic activity than the standard MCI, a weighted average of the short-term real interest rate and real exchange rate. Castro (2008) finds that the European Central Bank is targeting financial conditions, contrary to the Bank of England and FED, and believes that the lack of attention to financial conditions might have been one of the causes of the recent credit crunch that started in the United States. Finally, by performing extensive tests for over-identifying restrictions and instrument relevance, Siklos and Bohl (2009) find that asset prices can be highly relevant as instruments in policy rules in the euro area.

In the majority of the empirical studies mentioned thus far, the monetary policy reaction function is modelled by simple or augmented Taylor rules rather than in the context of parsimoniously restricted multivariate time-series models. In this context, by using structural VARs, Bjørnland and Jacobsen (2010) find that in Norway, Sweden and the UK, the role of house prices in the monetary transmission mechanism increases considerably. In particular, house prices react immediately and strongly to a monetary policy shock. Also by using SVARs, Musso et al. (2010) provide a systematic empirical analysis of the role of the housing market in the macroeconomy in the US and the euro area. However, the above authors’ analyses have discussed the impact between monetary policy and house prices
rather than examining how monetary policy reacts to house prices. Castro and Sousa (2012) assess the response of monetary policy to developments in asset markets in the euro area, the US and the UK by using both a linear and a nonlinear static framework.

By assessing the linkages between monetary policy and house prices dynamically, we improve and extend the existing literature in several directions. Firstly, by closely combining China’s monetary policy practice as well as the evolution of monetary policy rules in developed countries, we use the one-year lending rate and M2 as the proxy for monetary policy and analyze the interaction mechanism of China’s monetary policy and house prices. Secondly, by putting the impulse response curves of the two VARs in the same figure, one of which contains house prices and the other does not, we aim to not only understand the role of house prices in the transmission mechanism of monetary policy but also check whether monetary policy should respond to fluctuations in house prices. Finally, against the backdrop of the SVAR containing house prices, we also put the impulse response curve of the Cholesky identification and structural identification in the same figure. Moreover, under structural identification, we impose both short-term and long-term restrictions to investigate how the central bank responds to fluctuations in house prices. We do so by employing its implied information to facilitate monetary policy rules for a smooth change and to help reduce the impact on the macroeconomy, which is different from Bjønland and Jacobsen (2010).

II. The features and evolution of the monetary policy in China

The main modelling challenge is to find a proxy to adequately represent monetary policy in China, which is more complicated compared with advanced economies in at least two aspects. Firstly, the interest rate plays a very limited role in China because the state-owned sectors remain dominant, which leads to the common soft budget constraint in investment and fundraising. At the same time, commercial banks cannot make completely independent lending decisions and they are more
subject to the official authorities, meaning that lending is less sensitive to inter-
est rates than quantitative tools such as broader money supply, credit line and
administrative instructions. In fact, quantitative tools tend to be more effective
than price tools in macroeconomic regulation and control, and the monetary pol-
icy transmission mechanism through interest rates is not smooth as expected. On
the other hand, China’s economic transition to marketization is actually a mon-
etization process. Money demand is not stable, and the relevance between inflation
measured by the CPI and money supply constantly decreases, meaning it is also
a great challenge for China to use money supply as monetary policy rules, as is
similar to the situation of western countries before the 1980s. Therefore, China’s
central bank has no choice but to adopt both quantitative and price rules, namely
both market-oriented monetary tools and administrative instructions at the same
time.

Secondly, commercial banks still play a dominant role in the financial system,
monopolized by the central government, while the real estate industry is also
a market monopoly. During 1949-1984, the People’s Bank of China was the
country’s central bank and the only commercial bank. From 1984, a series of bank
reforms were implemented to transform the monopolistic banking system into
a decentralized, competitive and profit-oriented system. However, the primary
intermediate target specified from 1998 until now has been on M2, currency in
circulation and credit control, with the latter the key tool during the financial
crisis in 2008-09.

Overall, the reform of China’s monetary policy has been divided into two peri-
ods since 1984. Before 1997, the central bank’s main goal was to curb inflation,
but after that, it has been to maintain currency stability and promote economic
growth, with “the law of the People’s Bank of China” put into practice in 1995.
The evolution of the intermediate target of the corresponding monetary policy
can also be divided into two periods: (i) the target aims at the size of credit and
money supply during 1984-1997 and (ii) from 1998, money supply and interest
rates dominate. Moreover, the central bank of China has officially announced its monetary policy targets on M2 since 1998.

Finally, some authors claim that money supply can be used as monetary policy rules. Taylor (2000) states that quantitative rules can still be relevant for emerging market economies. Burdekin and Siklos (2008) claim that China seems to have followed the so-called McCallum rule. Zhang (2009) explores money supply (quantity) and interest rate (price) rules for China in a dynamic stochastic general equilibrium model and finds that price rules are likely to be more effective at managing border economy than quantity rules are. Sheng and Wu (2008) further show that M2 becomes the monetary policy intermediary target of China’s central bank because it can be more effective at controlling output and inflation than M1 and price tools can, such as inter-bank interest rates, deposit rates and lending rates.

In conclusion, China’s key monetary policy instruments include not only interest rates but also money supply and bank reserve ratios, which are different from most developed economies where interest rates are primarily used to control inflation. Therefore, unlike general studies, besides the one-year lending interest rate (si), we also use M2 as the proxy of monetary policy. We prefer lending rates to inter-bank interest rates because in some part, the lending rate influences China’s real economy whereas inter-bank interest rates can affect neither the lending rate nor the real economy.

1 Although inter-bank rates in China have been market-oriented and have an important influence on the money market, there is neither close linkage nor transmission among different interest rates, such as the inter-bank interest rates, lending rates and deposit rates regulated by the central government. Therefore, inter-bank interest rates can affect neither lending rates nor the real economy, which is very different from the federal funds rate being the benchmark in the US.
III. Data description and Methodology

A. Data description

Based on economic theories and previous empirical evidences in the literature, we appeal to select the following three types of variables in this study. First, according to the above analysis of the particularity of Chinese monetary policy, one-year lending rate (si) and broader money supply (M2) are used as proxies of monetary policy, which are from the people’s bank of China (PBOC). Second, nominal GDP and its real growth rates, Consumer Price Index (CPI) and its seasonal growth rates-referred to hereafter as inflation rates are proxies of macroeconomy, which are from China’s Bureau of Statistics. The last one is house prices (HP), also from China’s Bureau of Statistics. All indexes are quarterly from 1997Q1 to 2012Q4, with seasonal adjustment using CENSUS X12. Real house prices are equal to nominal price divided by cumulative CPI.

As shown in Figure ??, the national house price index in China has increased over 200% from 1997Q1 to 2013Q2, which is much faster than the Case-Shiller home price index (about 130%) since 1997 before the housing market bubble in the U.S. burst in 2007. As shown in Figure 2, the tendencies of GDP and M2 are almost the same, and basically, CPI and M2 reached the valley or peak almost at the same time with consistent tendencies before 2009Q1, when the housing market bubble in 2007 had significant ramifications in China. However, the tendency of one-year lending rate (si) is different from CPI and GDP. The above results imply that M2 plays more effective impact on real economy than interest rate does, just as Koivu (2008) argues that in China, a variety of monetary policy instruments prevent the interest rate channel of monetary transmission from functioning properly and the influence of interest rate on real economy remains weak. The summary statistics of the variables in the study are presented in table 1. The average growth rate of house prices in China from 1997Q1 to 2013Q2 was about 8% with a standard deviation of 7.1% and an autocorrelation coefficient of
0.45, whose standard deviation is the largest among the five variables. In contrast to house prices, the standard deviation of one-year lending rate is the smallest among the variables and its tendency is almost flat (see Figure ??), which implies that it hardly influence the broader economy in China.

<table>
<thead>
<tr>
<th>Table 1—: Summary Statistics of the Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Average Growth Rate</td>
</tr>
<tr>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Autocorrelation</td>
</tr>
</tbody>
</table>

Note: SI is one-year lending rate, and other variables are their growth rates.

B. Methodology

The paper aims to assess whether China’s Central Bank should react to house prices or not and if so how. There are some questions of importance to be answered. Firstly, what do house prices play in the transmission mechanism of monetary policy? If monetary policy has significant impact on house prices along with strong influence on output and inflation, then the monetary policy is supposed to react to house prices. Secondly, if SVAR model contains house prices, is there more endogeneity of broader money supply and does the change of interest rate more smoothly? Thirdly, does monetary policy dash macroeconomic to a small extent? Hence, two different VAR models are employed to answer these questions. The first model contains output, inflation and the proxy of monetary policy as regressors and the second one has house prices as one more regression variable. It is expected to obtain useful information from different VARs if house prices are crucial in the monetary policy indeed. In addition, Cholesky and structural identification are utilized to investigate how PBOC uses information implied by house prices. This procedure overcomes the backdrop of the SVAR containing house prices. Therefore, it is necessary to briefly describe the VAR models.
In general, a vector-autoregression (VAR) model has the following form:

\[ v_t = A_1 v_{t-1} + A_2 v_{t-2} + \cdots + A_k v_{t-k} + \epsilon_t \]

Where \( E(\epsilon_t) = 0, VAR(\epsilon_t) = \Sigma. \)

A VAR is a theory-free econometric model and the components of residuals are not independent each other, whereas a structural VAR is usually based on economic theories and defined as:

\[ B_0 v_t = C_1 v_{t-1} + \cdots + C_k v_k + \epsilon_t \]

Where \( B_0 \) is \( n \times n \) contemporaneous matrix whose diagonals are 1s and \( E(\epsilon_t) = 0, VAR(\epsilon_t) = D, D \) is diagonal matrix.

If \( B_0 \) is non-singular, let \( B = B_0^{-1} \), Model 2 is equivalent to:

\[ v_t = B C_1 v_{t-1} + \cdots + B C_k v_{t-k} + B \epsilon_t \]

Compare two models (Model 1, 3), we have

\[ VAR(\epsilon_t) = VAR(B \epsilon_t) = BDB' = \Sigma \]

Model 1 can be estimated by OLS or MLE method, but Model 2 cannot be identified because of lack of constraints. For sake of identification of Model 2, extra \( n(n - 1)/2 \) restrictions should be opposed for the identification.

VAR Model 1 can be rewritten as following:

\[ \phi(L) v_t = \epsilon_t = B \epsilon_t \]

Where \( \phi(L) = 1 - A_1 L - A_2 L^2 - \cdots - A_k \), \( L \) is lag operator. Thus the VAR
model can be represented by $VMA(\infty)$ model:

$$v_t = \phi^{-1}(L)B\epsilon_t = (1 + A_1^{-1}L + \cdots)B\epsilon_t = B\epsilon_t + A_1^{-1}B\epsilon_{t-1} + \cdots$$

Short-run restrictions assume some spots in $B$ to be equal to 0 and long run restriction is imposed on matrix $C = A_1^{-1}B$. The zeros in $C$ mean economy variable is not affected by corresponding economy variable from a long run perspective.

### C. The identification of SVAR model

To investigate how China’s central bank responds to the fluctuation of house prices, Cholesky and structural identification are used respectively with the same order in the four-variable SVAR model. A combination of short-run and long-run (neutrality) restrictions is used to avoid the endogeneity problem of identifying following earlier work (see, Bjønland and Jacobsen (2010), Aye et al. (2013) and among others),. Furthermore, this method eschews endogeneity of monetary policy and house prices with some modification of existing model. The proxy of monetary policy is put before house prices because the former is more endogenous than the latter in China because China’s money supply especially M2 is not regulated by the central bank completely. On one hand, credit demand will boom and the capital of commercial banks becomes more sufficient with more credit supply when house prices rise (Tan and Wang, 2011). On the other hand, the soaring house prices is due to the excessive speculative behavior of Chinese investors in a large degree (Yao et al 2011), and the monetary policy is the important factor to affect the expectation and speculative behavior of house prices. We use the growth rate of real GDP and real house prices, rather than the logarithm of them because the official authorities in China pay more attention to what extent they rise to rather than magnitude of GDP and house prices themselves. Besides, Tan and Wu (2014) also use growth rate in their VAR to test the role of house prices in monetary transmission mechanism and compare the differences between China
and the US. Following the standard restrictions in closed economy, we place M2 after output and inflation in the ordering, which means that macroeconomic variables do not simultaneously react to policy variables; while simultaneous reaction from macroeconomic environment to policy variables is allowed. In sum, contemporaneous interaction between monetary policy and house prices is allowed without ruling out the possibility that Central banks have responded. The short-run restriction matrix is described in Equation 5. When one-year lending interest rate as proxy of monetary policy is opposed, si in Equation 5 is instead of M2, restriction matrix is exactly the same. Finally, a monetary policy shock has no long-run effects on the level of real output as the long-run restriction, which is plausible neutrality assumption

\[
\begin{bmatrix}
  GDP \\
  CPI \\
  M2 \\
  hp \\
\end{bmatrix} = B(L)
\begin{bmatrix}
  S_{11} & 0 & 0 & 0 \\
  S_{21} & S_{22} & 0 & 0 \\
  S_{31} & S_{32} & S_{33} & S_{34} \\
  S_{41} & S_{42} & S_{43} & S_{44} \\
\end{bmatrix}
\begin{bmatrix}
  \epsilon^{GDP} \\
  \epsilon^{CPI} \\
  \epsilon^{M2} \\
  \epsilon^{RHP} \\
\end{bmatrix}
\]

Where GDP and RHP are growth rates of real GDP, real house prices respectively. CPI and M2 are growth rates of themselves. The Akaike information criterion (AIC) has suggested two lags of model, while the Schwarz information criterion suggests three. As a compromise, we take two lags for the benchmark. Besides, this way also can reduce the parameters to be estimated.

\textbf{D. Confidence band of Impulse Response Function}

To construct the confidence band of impulse response function, it is popular to use Bayesian approach to generate the data for simulation (Gelman 2003). Because the true Covariance matrix and mean vector are unknown, noninformative
prior distribution of Multinomial Vector can represented by

$$\sum |y \sim Inv - \text{Wishart}_{n-1}(S)$$

$$\mu | \Sigma, y \sim N(\bar{y}, \Sigma/n)$$

In our approach, the covariance matrix of $y$ is unknown which can be generated by Inverse-Wishart Prior (Don T.A(2010), Sims and Zha(1999))

$$\hat{\Sigma} \sim IW(\Phi^{-1}, df).$$

This $\Phi = T \ast \hat{\Sigma}$, $\hat{\Sigma}$ is the estimated covariance matrix of residuals. $\beta$ is the all coefficients of the VAR model. And $df$ is the degree of freedom. $\beta$ has the covariance matrix $\Sigma \otimes (X^TX)^{-1}$

$$\hat{\beta} \sim N(\hat{\beta}, \hat{\Sigma} \otimes (X^TX)^{-1})$$

Sims and Zha(1999) gives argument that posterior probability intervals are more useful than confidence interval. Therefore, when simulated $\Sigma$ and $\beta$ are generated, it can use them for variance decomposition to calculate the posterior probability band of impulse response function for our SVAR models. Our paper follows suggestions of Sims and Zha(1999) to use 16% and 84% factiles for posterior probability band of impulse response function. And the following paragraphs refer “posterior probability band” as “confidence band”.

IV. Empirical Results

Figure a and Figure b show the results of the VARs whose monetary policy proxies are M2 and the one-year lending rate, respectively. Because we are mainly interested in whether China’s central bank should react to fluctuations in house prices or not, only the impulse responses to the shock of M2, RHP and si are
presented, whereas those of GDP and CPI are not shown.

A. Monetary policy shock

Figure 3a gives the response of GDP, house prices and CPI to money supply shock (M2). When M2 increases by 1%, there are simultaneous positive responses in all three variables, but their effects are different. House prices rise by about 0.5% compared with CPI by 0.2% and GDP by only 0.05%, the lowest among the three. After about two quarters of shock, all of them reach a maximum and then bottom out around 10 quarters later as the effects die out gradually.

Figure 3b shows the impulse responses of the above three variables, but the shock is from the one-year lending interest rate with one percentage point the first quarter. After about three quarters of shock, GDP, CPI and house prices decrease rapidly, then rise gradually and eventually converge to equilibrium. Although the effects of interest rates on the three variables are negative as expected, they increase sharply in the initial two quarters, which Sims (1992) refers to as the price puzzle. Bjønland and Jacobsen (2010) also find such results when they analyze the role of house prices in the monetary policy transmission mechanism in Norway, Sweden and the UK. The above price puzzle is particularly evident in China and maybe implies that the effect of interest rate on controlling and managing broader economy is very weak, and that money plays much more important role than interest rates does in China, whose reason is very complicated. First, the saving and lending interest rates are regulated by China Central Government and can not change freely, so the channel of interest rate impact on economy is not smooth and through. Secondly, China is the largest developing country and the profit is very high, so people don’t care lending rates are high or low, and they will invest as long as they can lend money from bank. For example, whenever China’s central bank raises interest rates in recent ten years, house prices never fall in China, as many researchers in China argue (see Yao et al., 2011, Xu et al., 2012). There are few investment channels in China, and buying a house or an
apartment has been the most profitable and lowest risk investment in the past years compared with gains in the stock market. So it isn’t surprise that house prices rise sharply initially as shown by figure 3b, though it may be a paradox theoretically. Finally, the real saving rate is negative in most cases. Therefore, according to the Chinese situation, it is reasonable that output and CPI, especially house prices rise sharply following an interest rate shock.

It should be pointed out that the adjustment of house prices is steeper than that of GDP and CPI regardless of a loose or tight monetary policy shock. More specifically, following a constrictive shock, house prices decrease sharpest (about 3%) in structural identification, while the effects of GDP and CPI are quite less, about 1% and 1.5%, respectively (Figure 3b). Figure 3a displays a similar result. Following a loose M2 shock, house prices rise by about 0.5%, whereas GDP and CPI increase by only 0.1% and 0.25%, respectively, which means that house prices respond much more sensitively than GDP and CPI do. The estimated responses are consistent with the effect of the interest rate shock in Goodhart and Hofmann (2008). This evidence is also broadly consistent with previous work showing that the largest effect of a monetary policy shock is on residential investment (see Erceg and Levin, 2006; Vargas-Silva, 2008; Musso et al., 2011). The reason that house prices react more sensitively following a monetary policy shock is that there exists an indirect influence on house prices. For example, when interest rates fall or M2 increases, output increases, which is a direct effect. The indirect effects are that increasing output will lead unemployment and solvency of cooperation to decrease and families with more salary, which increases housing demand.

B. House price shock

Figure 4 plots the responses of GDP, CPI and monetary policy to a house prices shock under structural decomposition. Figure 4a shows that a house prices shock has a similar effect on GDP, CPI and M2: a temporary rise followed by a decrease and finally convergence to zero. However, the impulse of M2 is different to a
certain degree. First, M2 increases by over 0.2% immediately following a house prices shock, whereas GDP and CPI rise from zero. Secondly, the effect on M2 is much larger than that on GDP and CPI (0.45%, 0.1% and 0.25%, respectively), which illustrates that China’s money supply has a certain endogeneity and that fluctuations in house prices are one of the main reasons. Combining the effects of M2 and a house prices shock implies that the interaction between M2 and house prices is much more evident than the effect of M2 and a house prices shock on GDP and CPI. Figure 4b shows similar results to that of Figure 4a. In particular, the one-year lending rate falls by about 0.1%. Therefore, whether using M2 or the one-year lending rate as the proxy of monetary policy, it is clear that house prices play a crucial role in China’s monetary transmission mechanism by their influence on monetary policy and economy, and this influence may be because of the wealth and collateral effect caused by fluctuations in house prices (Tan and Wu, 2013).

In summary, house prices are the most important factor in China’s monetary policy mechanism transmission. The impact of monetary policy on house prices is tremendous, and an unexpected house prices shock influences not only output and inflation significantly, but the monetary policy setting as well. The above fact implies that we cannot exclude the possibility that a systematic monetary policy response to fluctuations in house prices could just reflect the fact that house prices have an important impact on the inflation target, as Bjønland and Jacobsen (2010) put it. In other words, our VAR model has a strong reality basis when introducing house prices into the reaction function of monetary policy.

Castro (2008) shows that the European Central Bank is targeting financial conditions, contrary to the central banks of the UK and the US, and he judges that this lack of attention to financial conditions might have been one of the causes of the recent credit crunch that started in the United States. By combining the study of Castro (2008) with ours and by taking full advantage of the rules of monetary policy with house price information, it would be possible not only
to inhibit the excess accumulation of real estate bubbles and financial imbalance caused by excessive capital inflows, but also to inhibit macroeconomic fluctuations via wealth and collateral effects.

C. The comparison of the three and four variables VARs

Figure 5a and 5b display the results of the three- and four-variable VAR models. Figure 5a shows that M2 in the four-variable VAR model has a little stronger inertia and autoregression than in the three-variable VAR model. The reason is that money is more endogenous after house prices are introduced in the VAR models. Following the M2 shock, in the three-variable VAR model, GDP initially increases by 0.09% and then falls by 0.08% (Figure 5a), whose response has a bigger amplitude and is more volatile than that in the four-variable SVAR model. On the other hand, there are basically similar responses in CPI among the three models. Though we don’t the reason clearly, the above results imply that if flexible inflation targeting is adopted, that is to say China’s central bank is concerned with controlling not only inflation but also output, then it should respond to the fluctuation in house prices in order to stabilize the broader economy, consumer prices and purchasing power of RMB.

In Figure 5b, the interest rate is a little more jagged in the three-variable VAR model imposed by its own impulse, while it looks smoother in the four-variable VAR model, which is more evident under structural identification. Further, GDP and CPI react to a lending rate shock almost in the same way as in the three-variable VAR and under Cholesky identification, and they fall a little more than they do under structural identification. The effect of interest rate on controlling and managing macro-economy is weak in China as we analyze and other researchers in China, but it doesn’t mean that there is no effect. As shown by figure 5b, under structural identification, the smoother interest rate leads to output and CPI fall less than other two cases.

In sum, we don’t know whether China’s Central Bank should respond to house
prices or not from the results of the interest rates shock, whereas the results of money shock imply China’s Central Bank should do so. Considering the more important role of money, we suggest China’s Central Bank responds to house prices.

D. The comparison of Cholesky and Structural decomposition

By comparing the Cholesky identification with structural identification, we find that the results are very similar with a few differences, as shown in Figures 6 and 7, which supports the robustness of our results. Figure 6a shows that following the M2 shock, there is no difference in CPI response under these two identifications, while the responses of house prices and GDP are a little smaller under the structural identification. Figure 6b shows that under structural identification, the interest rate falls faster to equilibrium and is smoother following its own shock, which leads to a smaller fall in house prices than under the Cholesky identification. As a result, under structural identification, output decreases to a lesser extent and CPI falls slowly, while the interest rate shock lessens the negative impact on the macroeconomy compared with the Cholesky identification. The comparison of these two identification methods implies that if the government regulates the economy with the full use of recent and past information rather than only with past information, monetary policy changes are smoother and the negative impact on the economy is smaller under the structural identification. Meanwhile, all these results remind China’s central bank of the danger of swirling changes in house prices, which are caused by the expected effects of house prices from changes in credit, especially the endogeneity of money supply when monetary policy is loose. Finally, we should point out that using an identification that allows for contemporaneous interaction between monetary policy and house prices does not reduce the price puzzle, which is very different from the results of Bjornland and Jacobsen (2010).

Following a house prices shock, both M2 and interest rates show a larger re-
sponse in the structural identification models than they do in the Cholesky identification models, as shown by Figure 7, because the former allows house prices to react to M2 and interest rates contemporarily. The above results are particularly evident in Figure 7b, which shows that under structural identification, the one-year lending rate falls by 0.06% following a house prices shock, whereas it only falls by 0.01% under the Cholesky decomposition. As a result, the responses of GDP and CPI are also bigger under structural identification than they are under the Cholesky identification, while the results are more evident in Figure 7b than they are in Figure 7a. As shown in Figure 7b, GDP and CPI increase by about 0.12% and 0.15%, respectively under structural identification, whereas they only rise by 0.08% and 0.1% under the Cholesky method.

The above results seem to prove that structural identification can capture the wealth effects of house prices and the endogeneity of monetary policy more effectively than the Cholesky identification. As argued by Tan and Wang (2011), demand for money will increase and commercial banks can also provide more loans when house prices rise. In that case, demand for money and its supply are not controlled by China’s central bank completely.

V. Conclusion and Remarks

In conclusion, the paper uses various VAR models and different identification methods to test the role of house prices and monetary policy in China’s broader economy. Especially structure identification of SVAR model captures the feature of backward-looking models accurately. The empirical results are in perfect agreement with monetary policy behavior and economy facts in China.

The main results are as follows. Firstly, fluctuation of house prices has a large effect on output and inflation via wealth effect and collateral effect, and also makes contribution to monetary policy. If house prices are included in VAR model and its implied information is employed, then a monetary policy shock will have less impact on economy and interest rate itself will change smoother. Secondly,
compared to Cholesky identification, a monetary policy shock leads to less prices and output fluctuation under structural identification. The results may imply that if China’s Central Bank takes full advantage of more recent information rather than just past information of economy and change of house prices, monetary policy can balance the economy and control house prices better. Last but not least, house prices play the important role in the transmission mechanism of Chinese monetary policy. It has strong evidence to show that fluctuation of house prices causes wealth effect and collateral effect. However, the insufficient response to change of money supply (especially interest rate) explains the abnormality that house prices should decrease when authorities tighten the monetary policy.

According to above conclusions, there are some policy suggestions.

1. To widen and optimize the framework of monetary policy, and extend the regulation range of monetary policy to economic control. Specifically, China’s central bank should fully utilize such proxy variables as money supply, credit and house prices to measure future inflation pressure or just take these variables as restriction of target function. In addition, the central bank is to take advantage of the recent information of fluctuation of house prices rather than to take advantage of just the past information. The reasons are something as follows. Firstly, based on the empirical results, if monetary policies take response to house prices fluctuation, the change of interest rate itself becomes smoother following an interest rate shock. Furthermore, its impact on marco-economy is smaller too. Secondly, financial crisis took place in other countries verify that price index is not good enough to measure whether a country’s economic situation is healthy or sustainable. More importantly, government should be more concerned with the relative changes of price level, which has closer relationship with resources mismatch and financial crisis. Thirdly, some central banks (e.g. these in Australia, Norway, Israel, etc.) deal in sharp rise of property price by adjusting interest rate upward even if the inflation level is still within target range.

2. To expedite interest rate marketization as to strengthen monetary policy
for better depth and sensitivity of macro-economy control, especially house prices control. In fact, the majority of interest rates including one-year lending rate, have been regulated by central government in China, making the response of interest rate to broader economy much less sensitive to that in the developed countries. Thus, all interest rates marketization must be carried out without delay, especially the lending and saving rates. So that can the regulatory function of interest rate be realized and restored. Though the inter-bank interest rates have been market-oriented, they are segmented from other interest rates and the size is too small. Only the segmentation of different interest rate is suspend, can the channel of interest rate impact on economy be smooth and through, and can interest rate responds to economic situation timely, sensitively and adequately.

3. Empirical results show that money supply has comparatively more sufficient response to economy than interest rate. Therefore, hardly can we give up money supply as the intermediate target recently prior to interest rates have not been marketized and the channel of interest rate affecting economy is not through. Regardless of any regulation tools, it is still necessary for China to carry forward market-based monetary policy, so that monetary policy responds to economy and house prices.

REFERENCES


Barnett, Steven. 2013. “Real estate is crucial for China’s economy.”


Bjørnland, Hilde C., and Dag Henning Jacobsen. 2010. “The role of house
prices in the monetary policy transmission mechanism in small open economies.”


Papers 155.


Gruen, David, Michael Plumb, and Andrew Stone. 2005. “How should monetary policy respond to asset-price bubbles?”


Musso, Alberto, Stefano Neri, and Livio Stracca. 2011. “Housing, consumption and monetary policy: How different are the US and the euro area?”


Figure 1. House Prices Index and Growth Rate 1997Q1-2013Q2

*Note:* This the note of the figure, it should be inputed.

*Source:* This data from www.yahoo.com
Figure 2.: Evolution of Variables and One Year Lending Rate (si)

source: The source of the figure.
Figure 3: Response to monetary policy shock

(a) Response to shock of M2

(b) Response to shock of si (one-year lending rate)
(a) Response to shock of RHP; M2 is the monetary policy proxy

(b) Response to shock of RHP; Si is the monetary policy proxy

Figure 4. : Response to shock of RHP
Figure 5. : Impulse-response function of three and four variable VARs
Figure 6: Impulse-response function of monetary policy under two identification methods.
(a) Response to house price shock under two identification methods and M2 is the monetary policy proxy.

(b) Response to house price shock under two identification method and si(one-year lending rate) is the monetary proxy.

Figure 7: Response to house price shock under two identification methods with different monetary proxies.