【論文】

The Dynamic Effects of Money Supply and Bank Lending on Commercialized Building Prices in China

Fengyun LIU

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1 Introduction

Owing to the introduction of market-oriented housing reforms in 1998, the average commercialized building price in China rose sharply from 2,063 Yuan/square meter in 1998 to 4,681 Yuan/square meter in 2009. The high growth rate of real estate prices, particularly in the recent years, has created the risk of a "bubble" in the Chinese economy. To regulate and control real estate prices, the Chinese government has announced a series of policies, particularly tight monetary policies, since 2003. Despite of these efforts, housing prices remained persistently high until 2011, the year when the most stringent regulatory policies—restrictions on the quantity of houses purchased by per family along with the prohibition of relative loans[1]—were implemented in some cities. Although housing prices finally appeared to be on a downward trend, the policies that forbade the purchasing of houses and lending involved too much administrative power to be sustainable. In the long run, monetary policy is the most effective method to regulate the housing prices. During these years, both long and short-term deposit interest rates (the price of money) have been determined by the central bank, with only limited fluctuations. However, money supply, as the official intermediary target of monetary policy since 1996 (See Xia, 2001), has been drastically increasing. There is apprehension that sharp upswings in the money supply have been driving the increase in housing prices. Therefore, we focus on the quantitative aspect of monetary policy—the money supply—to examine its role in housing price fluctuations. Some problems are imperative and need to be addressed immediately. What were the effects of money supply on housing prices? How did money supply influence housing prices? To what extent were housing prices affected after a shock to the money supply? Consequently,

1 The unified policies issued by the central government are as follows: Local families are not permitted to purchase three or more houses, and non-local families are not permitted to purchase two or more houses. Moreover, loans are not available for a family's third house. Furthermore, some cities announced even stricter policies. For example, only one house is available for each local family in Beijing.

this paper aims to shed light on the dynamic effects of money supply on housing prices in China based on the generalized vector autoregression (VAR) model, and proposes policy suggestions for regulations and controls on housing prices.

Most of the related literature examines developed countries, with a focus on monetary policy shocks rather than money supply shocks, and introduces interest rates as a proxy for monetary policy shocks. For instance, the short-term interest rate is employed by Sims (1992), Carlino and DeFina (1998), Bruneau and Bandt (2003), Yang et al. (2010) and Musso et al. (2011) for the USA and countries in the EU zone, by Sousa and Zaghini (2007) for the G-5 area (the USA, the EU Zone, Japan, the UK, and Canada), and by Bjornland and Jacobsen (2010) for Norway, Sweden, and the UK. Because the nations investigated in these studies are developed countries where the interest rate serves as one of the official intermediary targets of monetary policy, the interest rate flexibly reflects the money supply and demand conditions in these highly market-oriented markets.

On the other hand, money supply, as a quantitative indicator of money, has been considered only by a few international papers with regard to its effects on housing prices. Based on the VAR model, Lastrapes (2002) finds that both real housing prices and housing sales respond positively to money supply shocks in the USA in the short run, on the grounds that the increase in the money supply reduces interest rates and user costs, and results in the promotion of housing demand. Yu and Lee (2010) show that the money supply, corporate bond returns, and the number of building construction permits and orders received for building construction are essential explanatory variables for the instability of housing prices in Korea. Their results are in line with the quantity theory of money, which states that when other factors are fixed, an increase in the money supply will lead to an increase in price levels.

Furthermore, an excessive money supply has been noticed by some studies on China. Yi (1995) uses the logarithmic form of the Fisher equation under the assumption of fixed monetary velocity in the traditional quantity theory of money to prove that "money supply 2" was over supplied by 5.4% from 1984 to 1994. Hu (2011) and He and Fan (2010) state that money has been oversupplied in China in most years since 1980. Xiong (2007) asserts that excessive liquidity leads to the expansion of banking credit, increases investment on the real estate market, and finally generates a surge in housing prices. Moreover, Hu (2009) states that money supply has considerable effects on housing prices. Therefore, it is necessary and appropriate to focus on the influence of money supply on housing prices.

Although some related papers examine the effects of money supply on housing prices in China, most of them focus on monetary policy shocks rather than money supply shocks. Furthermore, money supply is only one of the many proxies for monetary policy, as reported by Han et al. (2007), Wang and Guo (2007) and Gao and Wang (2009). Although transmission from monetary policy to the housing market has been adequately discussed, thus far, the mechanism through which money supply influences housing prices has rarely been studied. Moreover, the Chinese financial system in which most financing activities are conducted indirectly, has rarely been considered. The Chinese financial market has been developing since the establishment of the Shanghai

Securities Exchange in 1990 and participants in economic activities, therefore, mainly rely on banks for financing. The Specialized Statistical Analysis Team of the China Banking Regulatory Commission (2005) declares that approximately 60% of the capital in the real estate industry comes from banks. Moreover, changes in the money supply transmitted from the central bank to the economy mainly flow through the banking system, and the multiplier effect of the banking system could magnify the influence of changes in money supply on economic activities. Wu (2008) asserts that the real economy can be better explained when both the credit scale and the money supply are considered, rather than when only the money supply is considered. Furthermore, many researchers state that the expansion of banking credit causes an increase in housing prices, such as Hofmann (2004) for 20 countries, Kim (2004) for Korea, Liang and Cao (2007) for China, and Davis and Zhu (2009) for 15 industrialized countries. Zhou (2005) proposes that in the context of institutional transition, uncertainty, and information asymmetry, financial institutions provide excessive loans to the real estate industry, resulting inspeculative behaviors from investors and consumers and the subsequent drastic fluctuations in housing prices. Therefore, this paper also adopts a quantitative credit variable—the total lending of financial institutions—to present the money supply process.

To explore how credit variables influence housing prices, this research further discusses banking credit for the suppliers and consumers in the housing market by introducing real estate development loans and house purchasing loans, respectively. This is an innovation because to the best of our knowledge, thus far, the effects of banking credit on housing prices have not been studied in detail. Moreover, bank financing for both housing supply and housing demand has never been empirically analyzed in China. As a result, this paper is meaningful because it fills some gaps in this field of study and provides some guidance on research, quantitative monetary policy, and housing prices in developing countries, especially China.

Furthermore, the interest rate, which is the price index of money, is not completely market-oriented in China and its effects on housing prices have been challenged by many studies. By analyzing empirical data from 1998: 3M to 2004: 8M, Song (2006) finds that interest rate has no significant impact on housing prices. Interest rate leverage is impeded because the regulated interest rate goes against the marketization of economy. Gao and Wang (2009) assert that with the increase in loans flowing into the real estate industry, the rise in interest rates can not reduce housing prices. Xu et al. (2012), however, argue that movements in the real interest rate are negatively related to changes in housing prices, and their effects on housing prices are greater than those of the money supply. Thus, this paper introduces real interest rate into VAR models to determine its role.

The remainder of this paper is organized as follows. Section 2 analyzes the mechanisms of how money supply influences housing prices. Section 3 discusses the general situation of the Chinese financial system and commercialized building market. Section 4 explains the data and methodology. Section 5 presents the results of empirical analysis in different sample periods. Section 6 outlines the conclusions, suggestions, contributions, and limitations.

2 Mechanisms of how Money Supply Influences Housing Prices

In theory, money supply influences housing prices primarily based on the three mechanisms presented below.

2.1 Interest Rate Mechanism

According to Keynesianism, in efficient financial markets, changes in monetary policies influence economic activities through interest rates. The increase in money supply reduces interest rates, which in turn, reduces the financing costs for real estate development companies and housing buyers, and this ultimately affects housing prices. However, in China, interest rates are still largely fixed by the central bank. As a result, the interest rate leverage is hampered and money supply can hardly influence housing prices through the interest rate mechanism, as demonstrated by Song (2006) and Gao and Wang (2009).

2.2 Banking Credit Mechanism

Changes in the money supply could influence commercial banks' abilities to provide loans to real estate development companies and housing buyers, and therefore, influence housing prices. Mohanty and Philip (2008) find that the most effective channel for the transmission of monetary policy in China is the quantitative-based banking credit channel. Leung and Lu (2011) state that the Chinese banking sector holds excessive reserves for loan expansion, which has two main effects: First, these banks can absorb the increase in interest rates by reducing the profit margins on their lending. Second, because of their political and market power, it is easier for the large-scale state-owned enterprises to obtain loans from state-owned banks. Finally, Zhou (2006) states that the money supply is the driver of fluctuations in asset prices in China because it bears a strong influence on loans, which amplifies its influence on asset prices through credit intermediaries.

2.3 Other Mechanisms

Besides the interest rate and banking credit mechanisms, money supply can also influence the housing market directly. As stated in the quantity theory of money, an increase in the money supply will inflate the price levels of both financial and physical assets. Yao and Zhang (2011) find that an increase in money supply, which is also known as excess liquidity, effectively determines the formation of inflation expectations and consequently, inflation. In other words, money supply can directly influence the housing market and housing prices. Moreover, the inflation caused by the increase in money supply amplifies the construction costs for real estate development companies, and thereby reducing housing

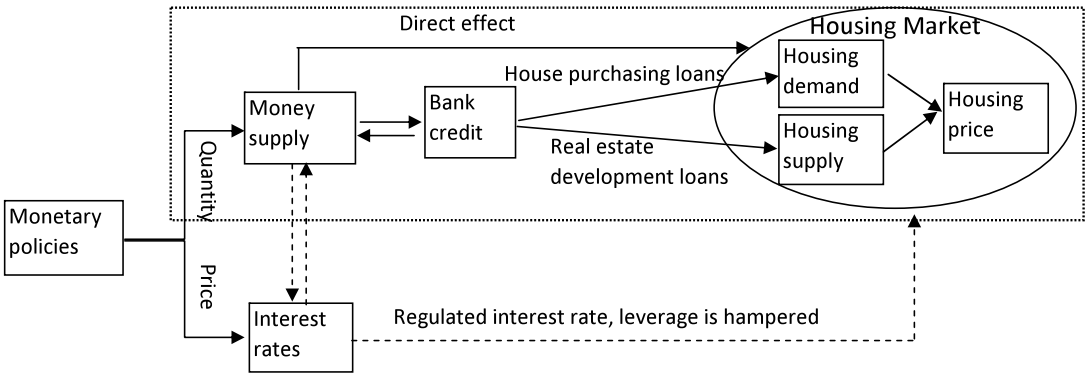

Fig. 1. Mechanism of how Money Supply Influences Housing Prices in China

supply and raising housing prices. Furthermore, an increase in the money supply could encourage investments in the real estate industry, raising the demand for housing and, thus, housing prices.

The mechanisms through which the money supply influences housing prices in China are shown in Figure 1. The field surrounded by the dotted line is the focus of this paper.

3 The Chinese Financial System and Commercialized Building Market

3.1 The Chinese Financial System

3.1.1 Bank-based Financial System

Since the establishment of the People's Bank of China in December 1948, the Chinese financial system has experienced a series of reforms. The banking system is the most important part of the financial system, despite the fact that other financial instruments such as securities have also been developing.

Demirgüç-Kunt and Levine (1999) compare the financial systems of 150 countries, and develope some indicators to evaluate the structure and development of financial systems. They use "Banks Assets/GDP, which is the ratio of the total domestic assets of deposit money banks divided by GDP, to measure the overall size of the banking sector" (P.6), and adopt "Market Capitalization/GDP, which is the ratio of the value of domestic equities (that are traded on domestic exchanges) to GDP to present market size" (P.9). We calculated the Bank Assets/GDP and Market Capitalization/GDP ratios in China based on the definitions of these ratios provided by Demirgüç-Kunt and Levine (1999); these ratios are presented in Table 1. With the development of the market sector, the Market Capitalization/GDP ratio increased from 1994 to 2009 and reached an abnormally high point of 1.23 because of the sharp upsurge in stock prices in 2007, although the average value, 0.36, was low. The Bank Assets/GDP ratio, however, was greater, with an average value of 1.64, which is approximately 4.6 times the value of the Market Capitalization/GDP ratio. These data suggest that although the market continued to account for a small portion, the banking sector accounted for a major portion of the financial system.

Table 2 describes the average values of the Bank Assets/GDP and Market Capitalization/GDP ratios in other countries in the 1990s, as calculated by Demirgüç-Kunt and Levine (1999). In the USA and Great Britain, whose financial systems were market-based, the Market Capitalization/GDP ratio was similar to the Bank Assets/GDP ratio. This shows that the market was similar in terms of size to the banking sector. In contrast, in Germany and

Table 1 Market Capitalization/GDP and Bank assets/GDP ratios in China

Time	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Ave.
M.C./GDP	0.08	0.06	0.14	0.22	0.23	0.30	0.49	0.40	0.32	0.31	0.23	0.18	0.41	1.23	0.38	0.71	0.36
B. A./GDP	1.15	1.17	1.26	1.38	1.46	1.53	1.55	1.54	1.81	1.88	1.88	1.93	1.92	1.85	1.84	2.15	1.64

Source: China's Finance and Banking Almanac (1994-2010)

Table 2 Average Ratios of Market Capitalization/GDP and Bank Assets/GDP in Other Countries in 1990s

Country	USA	Great Britain	Germany	Japan
Market Capitalization/GDP	0.80	1.13	0.24	0.79
Bank Assets/GDP	0.73	1.16	1.21	1.31

Source: Demirgüç-Kunt and Levine (1999).

Japan, which have bank-based financial systems, the Market Capitalization/GDP ratios were approximately 6 times and twice the size of the Bank Assets/GDP ratio, illustrating that the banking sector was larger than the market sector.

Based on the above analyses, the Chinese financial system is similar to those of Germany and Japan, where the banking sector accounts for a much greater portion of the financial system than market. This differs from the financial systems of the USA and Great Britain.

3.1.2 Money Supply

With economic development, a massive supply of money has emerged in the Chinese economy. As described in Figure 2, from 1999 to 2010, the average growth rate of the money supply (M2) (17.57%) was greater than that of the nominal GDP (11.26%). This implies that the supply of money surpassed its demand in the economy. The high money supply resulted in a huge amount of liquidity and strongly stimulated soaring asset prices. Moreover, the growth rate of total lending (with an average value of 16.59%) exceeded the growth rate of the nominal GDP during most years in this period, and experienced similar fluctuations as the growth rate of M2. Xiong (2007) contends that the excessive liquidity leads to the expansion of banking credit, increases investment in the real estate market, and ultimately leads to the surge in housing prices.

Japan experienced high economic growth from 1955 until the burst of the "bubble" in 1989, when the country entered into an era of economic recession. The growth rates of the nominal GDP, M2, and total bank lending in Japan from 1980 to 1998 are shown in Figure 3. Before 1990, the average growth rates of both M2 (9.15%) and total lending (9.04%) were much higher than that for nominal GDP (5.14%). Subsequently, the growth rates of M2 and total lending slowed down and were only slightly higher than the nominal GDP growth rate. Hence, there was an abundant money supply and liquidity in Japan throughout the period of the "bubble" in the 1980s.

Consequently, the situation in China during

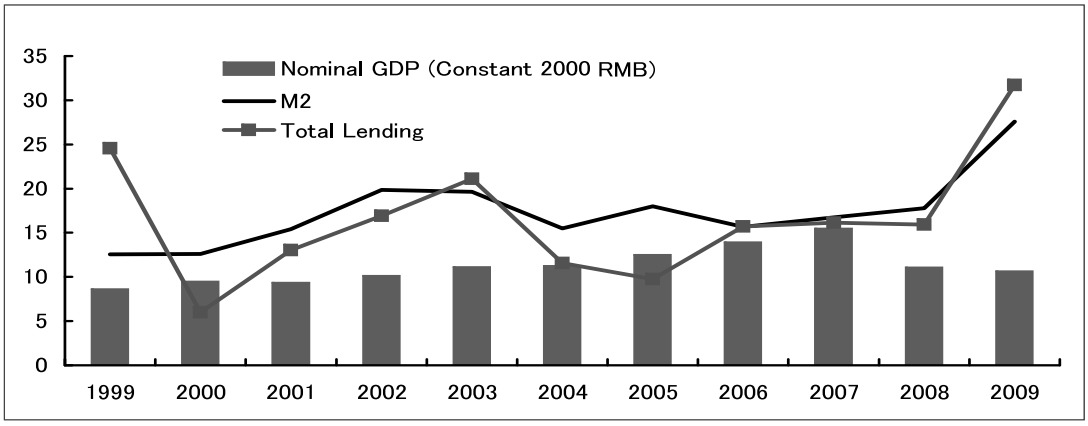

Fig. 2. Growth Rates of Nominal GDP, M2, and Total Lending in China (%)

Notes: 1. M0: Cash currency in circulation; M1: M0 + current deposits; M2: M1 + Quasi-money (time deposits + saving deposits + other deposits).

2. Benchmark year = 2000.

3. Nominal GDP = real GDP+GDP Deflator

Source: The People's Bank of China and the Chinese Statistical Yearbook (2010).

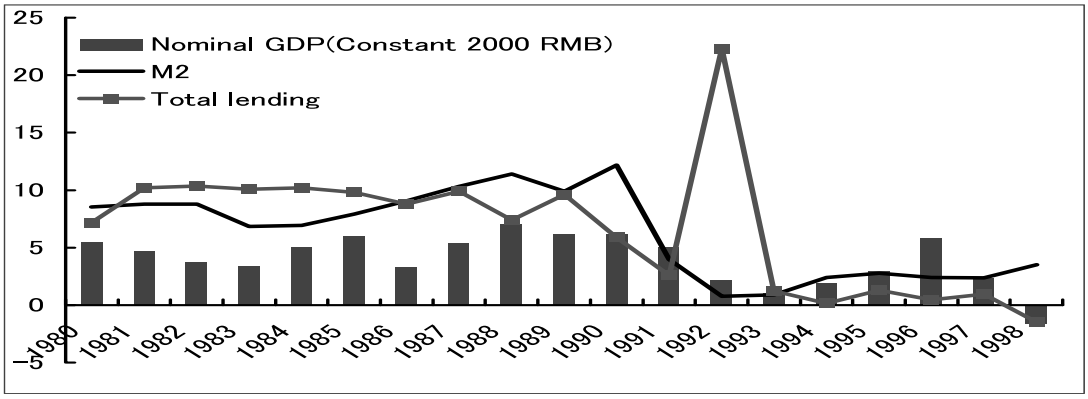

Fig. 3. Growth Rates of Nominal GDP, M2 and Total Lending in Japan (%)

Notes: 1. M0: Cash currency in circulation; M1: M0 + deposit money; M2: M1+ Quasi-money (time deposits + fixed savings + installment savings + non-resident yen savings + foreign currency deposits).

2. Until 1991, excluding trust subsidiaries and foreign trust banks. This is why the growth rate of total lending suddenly rose to 22.33%.

3. Benchmark year = 1990.

4. Nominal GDP = real GDP+GDP Deflator

Source: The Statistical Bureau of Japan.

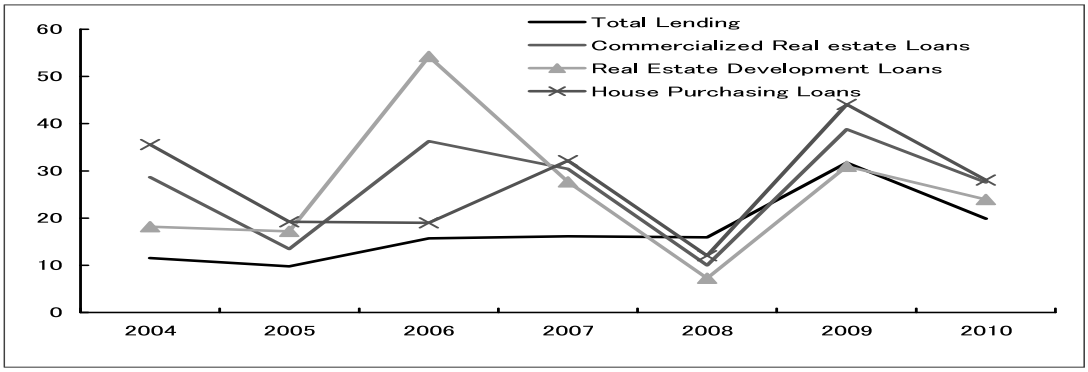

Fig. 4. Growth Rates of Total Lending, Commercialized Real Estate Loans, Real Estate Development Loans, and House Purchasing Loans in China (%)

Source: The People's Bank of China and the Report of Chinese Monetary Policy Performance.

the past decade is similar to that of Japan in the 1980s in terms of excessive money supply. Therefore, it is advisable for China to pay more attention to its high level of liquidity to avoid the formation of an economic bubble, which had occurred in Japan.

3.1.3 Expansion of Banking Credit to the Real Estate Industry

Since China has a bank-based financial system, money supply enters economy mainly through the banking system. Figure 4 shows the growth rates of total lending, commercialized real estate loans, real estate development loans, and house purchasing loans in China from 2004 to 2010. The growth rate of commercialized real estate loans was much larger (with an average difference of 8.38% and a maximum difference of 38.54% in 2006) than the growth rate of total lending during the period, except in 2008. Booms in real estate

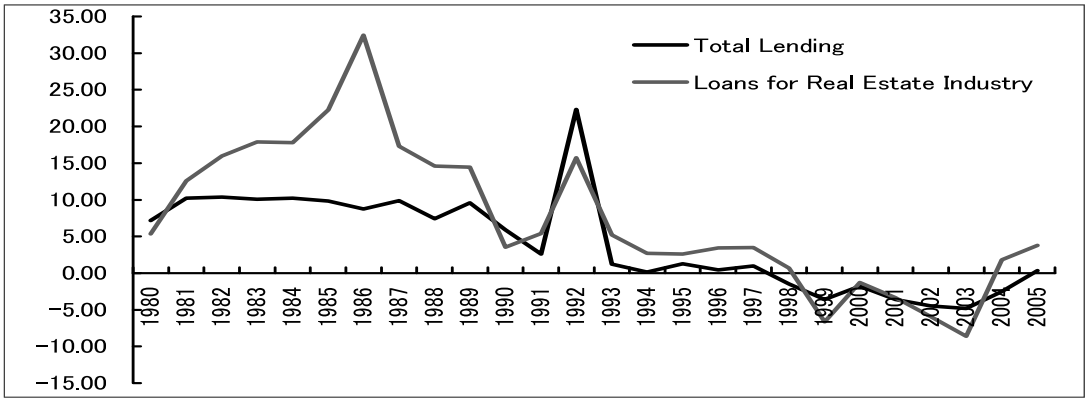

Fig. 5. Growth Rates of Total Lending and Real Estate Loans in Japan (%)
Source: The Statistical Bureau of Japan.

development loans occurred in 2006 and 2009, and booms in house purchasing loans occurred in 2004, 2007, and 2009. It can be concluded that there was an expansion of bank credit to the real estate industry. Many researchers state that the amplification of bank credit causes the increase in housing prices; these researchers includes Hofmann (2004), who discusses the situation for 20 countries; Kim (2004), who studies the case of Korea; Liang and Cao (2007), who study the case of China; and Davis and Zhu (2009), who investigate the case of 15 industrialized countries.

Figure 5 illustrates the growth rates of total lending and real estate loans in Japan from 1980 to 2005. The growth rate of real estate loans was much higher than that of total lending in the 1980s, with an average difference of 9%. In 1986, real estate loans peaked and were 24% higher than the growth rate of total lending. Ultimately, a large amount of bank credit flowed into the real estate industry and stimulated the housing price bubble.

The above analysis shows that China is currently facing a situation that is comparable to that faced by Japan in the 1980s. The large amount of bank credit entering the real estate industry has increased housing prices, which is very risky for China.

3.1.4 Monetary Policies on Housing Price Controls and Regulations

The Chinese government started controlling and regulating the housing market in 2003, and ever since, a series of monetary policies have been issued. Table 3 shows that monetary policy became increasingly constrictive from 2003 to 2011, except in the second half of 2008 to the end 2009, when monetary policies were unrestricted to stimulate the economy to recover from the global financial crisis. The money supply, however, has remained high since 2003 (See Figure 2).

Table 3 Monetary Policies from 2003 to 2011

Time	Monetary Policies
2003	Increase reserve requirement ratios by 1% once; Eliminate the preferential housing interest rate on high-grade housing, villas, and second commercial housing, and appropriately increase down payments.

2004	Increase various deposit and lending interest rates by 0.27% once; Widen the lending interest rate float bands and permit the deposit interest rate to float down; Self-owned funds in real estate development projects should not be smaller than 35% of total investments; Monthly payments should be less than half of the income of the buyers.
2005	Cancel the preferential housing interest rate; Increase the down payments to 30% in regions with soaring housing prices; Restrict loans from the Trust to real estate development corporations.
2006	Increase reserve requirement ratios by 0.5% twice; Raise diverse lending interest rates by 0.27% once; Regulate the details on the area of the housing and increase the percentage of small-size and new housing down payments; Restrict the inflow of foreign funds into the housing market.
2007	Boost reserve requirement ratios by 0.5% 10 times; Raise different deposit and lending interest rates by 0.27% 6 times; Amplify down payments for second houses to 40% and increase mortgage interest rates by 10%.
The first half year of 2008	Raise reserve requirement ratios 5 times; Loosen regulation on development projects for economically affordable housing.
The second half year of 2008	Decrease the reserve requirement ratios and interest rates twice; Reduce various lending interest rates 5 times and various deposit interest rates 4 times; Decrease down payments to 20% and the prescribed minimum mortgage interest rates to 0.7 times the benchmark lending interest rate .
2009	Apply preferential interest rate policies to 4 state-owned banks; Decrease the ratio of self-owned funds to loans on commercial housing projects.
2010	Increase reserve requirement ratios by 0.5% 6 times; Raise various deposit and lending interest rates twice; Secondary housing down payments should not be less than 50% and mortgage interest rates should not be less than 1.1 times the benchmark interest rate; The down payment for first houses above 90 square meters should not be less than 30%; Stop offering mortgages for the purchase of third houses and for non-local residents.
2011	Increase the reserve requirement ratios by 0.5% 6 times, then lower reserve requirement ratios by 0.5% once in November; Boost various deposit and lending interest rates thrice; Forbid the purchase of the third houses for local families and the secondary houses for non-local families, and make the related mortgage loans unavailable; Secondary housing down payments should not be lower than 60%.

Source: The People's Bank of China and Almanac of China's Finance and banking (2003-2010).

3.2 The General Situation of the Chinese Commercialized Building Market

3.2.1 Components of Commercialized Buildings

As reported by the *"Chinese Statistical Yearbook",* commercialized buildings are defined as houses constructed by real estate development companies for selling and renting. They comprise residential buildings, office buildings, houses for business use, and others[2].

Figure 6 provides the total area of commercialized buildings sold in China from 1998 to 2009. The area of sold commercialized buildings has been increasing since 1998, except for 2008, the year of the outbreak of the financial crisis.

2 Because of the characteristics of the Chinese real estate market, houses are not referred to in the same terms as in other countries. Residential buildings in China are commercialized buildings used for living. Office buildings are buildings used for official affairs. Houses for business use are buildings used for sales transactions such as shopping malls or stores. Others include commercialized buildings except residential buildings, office buildings and houses for business use.

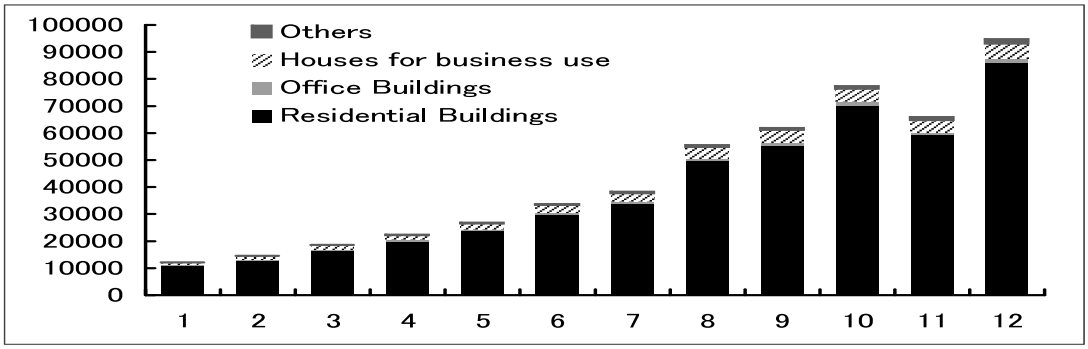

Fig. 6. Area of Commercialized Buildings Sold in China (10,000 sq. m.)
Source: Chinese Statistical Yearbook (2010).

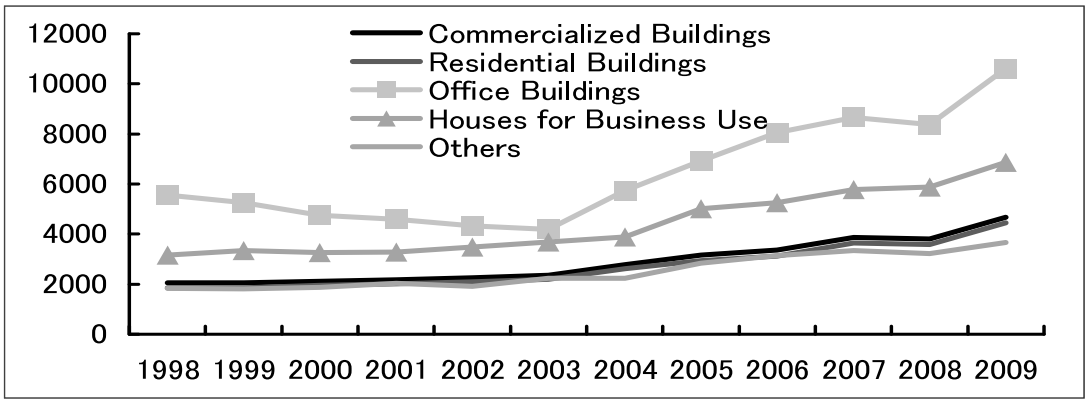

Fig. 7. Average Prices of Commercialized Buildings in China (Yuan/sq. m.)
Source: Chinese Statistical Yearbook (2010).

Notably, the area of sold residential buildings accounted for approximately 90% of the area of sold commercialized buildings.

3.2.2 Prices of Commercialized Buildings

Figure 7 illustrates the average selling prices of commercialized buildings in China from 1998 to 2009. The average prices for all the four types of commercialized buildings began growing at a faster rate in 2003. The average selling price of office buildings was the highest, followed by that of houses for business use, commercialized buildings, residential buildings, and others, in that order.

Figure 8 compares CPI with the growth rates of different types of commercialized building prices in China from 1999 to 2009. The growth rates of the average prices of commercialized and residential buildings fluctuated lesser than those of office buildings, houses for business use and others. The growth rates of the average commercialized building price (17.76%) and the average residential building price (18.71%) from 1999 to 2009 were higher than the corresponding growth rate of CPI (3.9%) except in 2008, and the difference was the highest in 2004. The growth rate of the average price of houses for business use was greater than the growth rate of CPI from 1999 to 2009, except in 2000 and 2008, with the greatest difference of 29.29% in 2005. The growth rate of the average price of office buildings peaked at 36.89% in 2004; ever

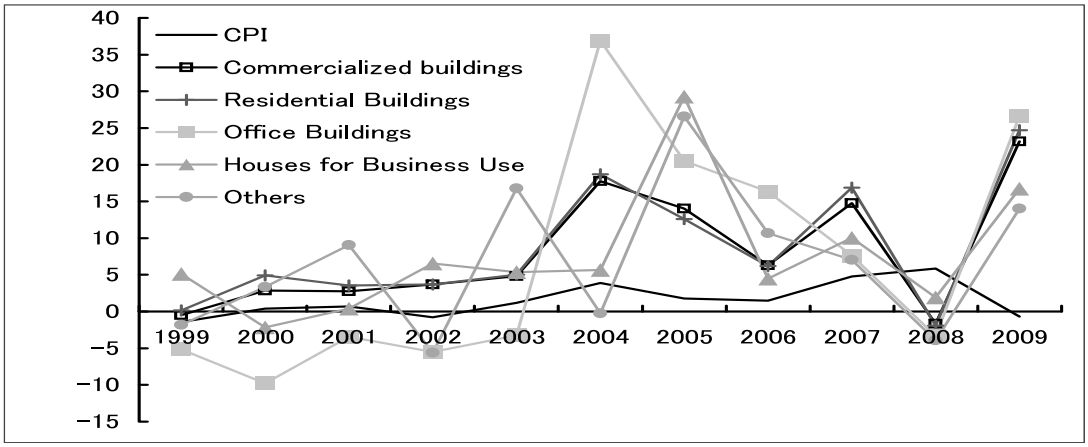

Fig. 8. Growth Rates of Commercialized Building Prices and CPI in China (%)
Source: Chinese Statistic Yearbook (2010).

since the growth rate of office buildings has been higher than that of the CPI. Interestingly, the growth rates of the prices of different types of commercialized buildings increased substantially around 2003 and became much higher than the CPI level.

4 Data and Methodology

The literature review in Section 1 indicates that there is a close relationship among money supply, bank credit, and housing prices in China. The theoretical analysis in Section 2 describes how money supply influences housing prices, and, based on related literature, the bank credit mechanism seems to be significant in China. Section 3 proves that the bank-based financial system, excessive money supply, and expansion of bank credit to the real estate industry accompany the sharp increase in housing prices. Therefore, based on existing literature, theoretical mechanisms, and current Chinese situation, we adopted seven variables (with their abbreviations in parentheses) in our empirical analysis, as illustrated below.

Because the calculation method for the housing price index was reformed twice, in 2005 and 2011, there is no consistent successive housing price index data from 1999 to 2011 in China. Another indicator—the average selling price—could compensate for this shortcoming. The average commercialized building price (AP) and the average residential building price (RP) are used to represent the aggregate commercialized building price level and the residential building price level, respectively. Money supply 2 (M2) represents the total amount of money in the economy. The total lending of financial institutions (TL) encompasses the gross amount of credit issued by banks. Real estate development loans (DL) and house purchasing loans (PL) indicate the financial support of banks to providers and consumers in the real estate market, respectively. This is one of the innovations of this paper because existing studies have not examined the influence of banking credit on housing prices in such detail by empirically introducing these two variables. Because the deposit interest rate is directly controlled by the central bank with limited fluctuations, the real interest rate (RI), which is defined as the one-year deposit nominal interest rate minus the inflation rate (CPI), is adopted to represent the monetary price in the following analysis.

All data are from the official website of the People's Bank of China, Report of Chinese Monetary Policy Performance, Chinese Academy of Social Sciences Database, and the Tsinghua Financial Database. The variables, except for the RI, are expressed in logarithmic form, seasonally adjusted using the X11 method, and expressed as LM2, LTL, LDL, LPL, LAP and LRP.

The sample is divided into two periods, 1999:1M to 2003:3M and 2003:2Q to 2011:3Q (2003:4M to 2011:9M). Many studies were conducted on the Chinese housing market after the market-oriented reforms in 1998. However, this study is the first to attempt to separate the sample into two periods for empirical analysis. There are four reasons for using 2003:3M as a cut-off for the sample period. First, the Chinese financial system has experienced substantial reforms since 2003, evidenced by the establishment of the China Banking Regulatory Commission (CBRC) in April 2003. The importance of these reforms is also proved by the following empirical analysis. Second, the Chinese government began implementing policies to regulate housing prices in the second quarter of 2003. Third, the prices of commercialized buildings in China began increasing sharply since 2003. Fourth, the DL and PL data are only available on a quarterly basis after 2003Q2. The monthly data are used in the models for the earlier sample period to obtain adequate sample size.

The quarterly data for all the variables are available from 2003Q2 to 2011Q3, and their augmented Dickey-Fuller (ADF) tests results on stationary are shown by Table 4. Series RI, LAP, and LRP appear to be I(0), whereas series LM2, LTL, LDL, and LPL appear to be I(1). The log difference of money supply 2 (DLM2), log difference of total lending (DLTL), log difference of real estate development loans (DLDL), log difference of house purchasing loans (DLPL), difference of real interest rate (DRI)[3], log level of average commercialized building price (LAP) and the log level of the residential building price (LRP) then enter the VAR models. The empirical analysis of this sample period is necessary because all available data on these variables is required for exploring the affecting mechanism of M2, TL, DL, and PL on the housing price.

The data on DL and PL are not available from 1999:1M to 2003:3M. Therefore, to obtain

3 Because the monthly series RI is I(1) and DRI enters the monthly models, the quarterly models also use DRI to maintain homogeneity.

Table 4 Results of ADF Test (2003:2Q to 2011:3Q)

The Original Series				First Difference Series			
Series	(C,T,P)	ADF Test Statistic	Prob.	Series	(C,T,P)	ADF Test Statistic	Prob.
LM2	(C,T,1)	-2.387625	0.3786	DLM2	(C,0,0)	-3.217596	0.0281
LTL	(C,T,1)	-2.070502	0.5419	DLTL	(C,0,0)	-3.651415	0.0101
LDL	(C,T,0)	-1.167058	0.9010	DLDL	(C,0,0)	-4.755407	0.0006
LPL	(C,T,1)	-1.814486	0.6741	DLPL	(C,0,0)	-8.412051	0.0000
RI	(C,0,7)	-4.809282	0.0007	DRI	(C,0,0)	-3.378037	0.0194
LAP	(C,T,3)	-3.763212	0.0331	-	-	-	-
LRP	(C,T,3)	-4.090519	0.0161	-	-	-	-

a sufficient sample size, the monthly data on M2, TL, RI and AP are adopted. Table 5 describes their ADF test results on stationary. Although Series LAP is I(0), series LM2, LTL and RI are found to be I(1). As a result, DLM2, DLTL, DRI and LAP enter the VAR models.

To ensure an accurate comparison is made between the two periods, the same variables and data frequency as those for 1999:1M to 2003:3M are employed throughout 2003:4M to 2011:9M. The monthly data on the M2, TL, RI and AP are introduced, and the results of ADF tests on stationary are illustrated by Table 6. Series LM2, LTL, and RI are I(1); however, series LAP is I(0). As a result, DLM2, DLTL, DRI and LAP enter the VAR models.

Sims (1980) proposes VARs to conduct a dynamic analysis of a system in which changes to a particular variable are affected by changes to other variables, the lags of those variables, and changes in its own lags. The VAR technique has been broadly used in the analysis of monetary policy and asset markets (Sims, 1992; Dekker at el., 2001; Lastrapes, 2002; Sims and Zha, 2006). However, the traditional unrestricted VAR has inherent problems. As Pesaran and Shin (1998) contend, "the underlying shocks to the VAR model are orthogonalized using the Cholesky decomposition before impulse responses, or forecast error variance decompositions are computed. This approach is not, however, invariant to the ordering of the variables in the VAR" (P.1). Consequently, the structural VAR model is developed by Bernanke (1986), Blanchard and Quad (1989), Sims (1986), and Blanchard and Watson (1986). Dekker et al. (2001) state "imposing a priori restrictions on the covariance matrix of the structural errors and the contemporaneous and/or long-run impulse responses to themselves" (P.6). Nevertheless, the number of restrictions positively relates to the number of variables, and it is sometimes difficult to impose a priori assumptions because of the complex economic situation. The generalized approach to VAR is advanced by Koop et al. (1996) for nonlinear dynamic systems and by Pesaran and Shin (1998) for linear systems, to

Table 5 Results of ADF Test (1999:1M to 2003:3M)

The Original Series				First Difference Series			
Series	(C,T,P)	ADF Test Statistic	Prob.	Series	(C,T,P)	ADF Test Statistic	Prob.
LM2	(C,T,0)	-2.606334	0.2794	DLM2	(C,0,1)	-7.870254	0.0000
LTL	(C,T,0)	0.601531	0.9993	DLTL	(C,0,0)	-5.089698	0.0001
RI	(C,0,0)	-1.928556	0.3169	DRI	(C,0,0)	-6.482454	0.0000
LAP	(C,T,0)	-6.096147	0.0000	-	-	-	-

Table 6 Results of ADF Test (2003:4M to 2011:9M)

The Original Series				First Difference Series			
Series	(C,T,P)	ADF Test Statistic	Prob.	Series	(C,T,P)	ADF Test Statistic	Prob.
LM2	(C,T,0)	-1.347478	0.8701	DLM2	(C,0,0)	-8.518202	0.0000
LTL	(C,T,1)	-1.332113	0.8741	DLTL	(C,0,0)	-7.270554	0.0000
RI	(C,0,0)	-2.316292	0.1692	DRI	(C,0,0)	-4.534248	0.0004
LAP	(C,T,0)	-5.270226	0.0002	-	-	-	-

overcome the shortcomings of the orthogonalized approach and the structural VAR. It has been employed by various studies such as Wen (2001), Dekker et al. (2001), and Ewing and Thompson (2008). Guided by these scholars, this paper utilizes the generalized VAR technique.

An m-dimensional and p-order vector autoregressive model is presented as follows.

$$y_t = a_0 + \sum_{i=1}^{p} \Phi_i y_{t-i} + u_t, t = 1, 2, \ldots, n \quad (1)$$

where $y_t = (y_{1t}, y_{2t}, \ldots, y_{mt})'$ is an $m \times 1$ vector of endogenous variables, jointly determined by its own lags and the lags of other variables, a_0 is a $1 \times m$ vector for the fixed effects, Φ_i are $m \times m$ coefficient matrices, and u_t is an $m \times 1$ matrix of unobserved shocks (disturbances). The matrix forms of Φ_i are presented below.

$$\Phi_i = \begin{bmatrix} \phi_{11}^{(i)} & \phi_{12}^{(i)} & \cdots & \phi_{1m}^{(i)} \\ \phi_{21}^{(i)} & \phi_{22}^{(i)} & \cdots & \phi_{2m}^{(i)} \\ \vdots & \vdots & \ddots & \vdots \\ \phi_{m1}^{(i)} & \phi_{m2}^{(i)} & \cdots & \phi_{mm}^{(i)} \end{bmatrix}, i = 1, 2, \cdots, p$$

The empirical analysis is conducted in three steps. The first step involves the modeling for the period of 2003:2Q to 2011:3Q. Because the data on all the variables are available, it is possible to analyze the detailed transmission mechanism from the M2 to TL, DL and PL, and finally to AP and RP. There are two VAR models. Model (1) is for the AP, where variables of DLM2, DLTL, DLDL, DLPL, DRI and LAP are introduced. Model (2) is for the RP which comprises the DLM2, DLTL, DLDL, DLPL, DRI, and LRP variables. Both have a 1-lag length [4].

In model (1),

$$y_t = \left[DLM2_t, DLTL_t, DLDL_t, DLPL_t, DRI_t, LAP_t\right], t = 2003Q2, \ldots, 2011Q2$$

In model (2),

$$y_t = \left[DLM2_t, DLTL_t, DLDL_t, DLPL_t, DRI_t, LRP_t\right], t = 2003Q2, \ldots, 2011Q2$$

The second step is the modeling for the period from 1999:1M till 2003:3M. Because of data limitations, only four monthly series are adopted. These are DLM2, DLTL, DRI and LAP. The relationship among them is explained by model (3) using a 2-lag length [5].

In model (3), $y_t = \left[DLM2_t, DLTL_t, DRI_t, LAP_t\right], t = 1999M1, \ldots, 2003M3$

Third, to compare the empirical results of these two periods, VAR model (4) is set using the monthly data of DLM2, DLTL, DRI, and LAP from 2003M4 to 2011M9. Therefore, the results of models (4) and (3) are comparable because they use the same variables and data frequency. Model (4) has the same 2-lag length [6] as VAR model (3).

In model (4), $y_t = \left[DLM2_t, DLTL_t, DRI_t, LAP_t\right], t = 2003M4, \ldots, 2011M9$

The VAR models described above are estimated using the Eviews 6.0 software and successfully pass the AR root test, which implies that the VAR models are stable. The impulse response analysis based on the estimated VARs could be used to trace out the dynamic responses of each variable to the innovations in a particular variable in the system.

5 Results of Impulse Response Analysis

5.1 Period from 2003:2Q to 2011:3Q

The results of the generalized impulse response functions of model (1), in which LAP is introduced and model (2), in which LRP is

4 The principles of LR, FPE, AIC, SC, and HQ hint a 1-lag length for VAR models (1) and (2).

5 The principles of LR, FPE, and AIC hint a 2-lag length for VAR model (3).

6 The principles of LR, FPE and AIC hint a 2-lag length for the VAR model (4).

adopted from 2003:Q2 to 2011:Q3, are shown in Figures 9 and 10, respectively.

Following a 1% positive shock to DLM2, the response of LAP peaks at 2.77% in the third quarter, whereas the response of LRP peaks at 3.31% in the second quarter. When a 1% positive shock to DLTL occurs, the LAP response rises to 1.92% in the third quarter, whereas the LRP response peaks at 2.60% in the second quarter. The responses of LAP and LRP to a 1% positive shock in DLPL reach the highest point in the first quarter at 0.72% and 1.14%, respectively. Nevertheless, the response of LAP (–0.47% in the 7rd quarter) to a 1% positive shock to DLDL is stronger than that of LRP (–0.25% in the 1st quarter). Both LAP and LRP respond negatively to a 1% positive shock to the real interest rate in the first two quarters and reach the lowest points of –1.19% and –1.00% respectively in the first quarter; however, they respond positively after the third quarter, with the largest values of 1.30% and 1.20% respectively in the 7th quarter. Thus, DLM2 has the strongest effects on housing prices, followed by the DLTL, DLRI, DLPL, and DLDL. Moreover, the LRP responds more strongly to shocks in DLM2, DLTL and DLPL than the non-residential buildings price. However, it responds more weakly to shocks in DRI and DLDL.

Furthermore, there is a positive relationship between DLM2 and DLTL. In models (1) and (2), the responses of DLTL to a 1% positive money supply shock[7] are the largest at 1.45% in the first quarter. After a 1% positive shock to DLTL, the responses of DLM2 reach approximately 0.95% in the first quarter. This implies that there is a mutual causal relationship between DLM2 and DLTL. A shock to DLM2 has a positive influence on DLTL, and vice versa.

Moreover, DLPL responds more significantly to a 1% positive shock to the money supply than DLDL, peaking at approximately 1.08% and 1.04% respectively in the second quarter in both models (1) and (2). Moreover, DLPL responds more drastically than DLDL to a 1% positive total lending shock, at approximately 1.23% in the second quarter and 1.07% in the first quarter, respectively. Thus, the upswings in DLM2 and DLTL generate increases in both DLDL and DLPL.

Interestingly, DLM2 and DLTL both respond positively to a 1% positive real interest rate shock, peaking at 0.48% and 0.49% respectively in the second quarter. This suggests that the increase in the DRI causes the growth in the DLM2 and DLTL, which could increase housing prices. This is why a positive real interest rate shock results in an increase in the commercialized and residential building prices from the third quarter onwards.

5.2 The Period from 1999:1M to 2003:3M

The results of the generalized impulse response functions of model (3) for the period from 1999:1M to 2003:3M are described in Figure 11.

The response of LAP to a 1% positive money supply shock is the largest at 0.26% in the third month. LAP peaks at 1.84% in the first month following a 1% positive total lending shock.

The response of DLTL peaks at 0.11% in the second month following a 1% positive money supply shock, and DLM2 has the strongest response of 0.17% in the second month

7 a 1% positive money supply shock in this paper means a 1% positive shock to DLM2, that is, a one- positive- standard- deviation innovation to the increment on the logarithmic money supply. This is also the case for the a 1% positive total lending shock, real estate development loans shock, house purchasing loans shock, and real interest rate shock.

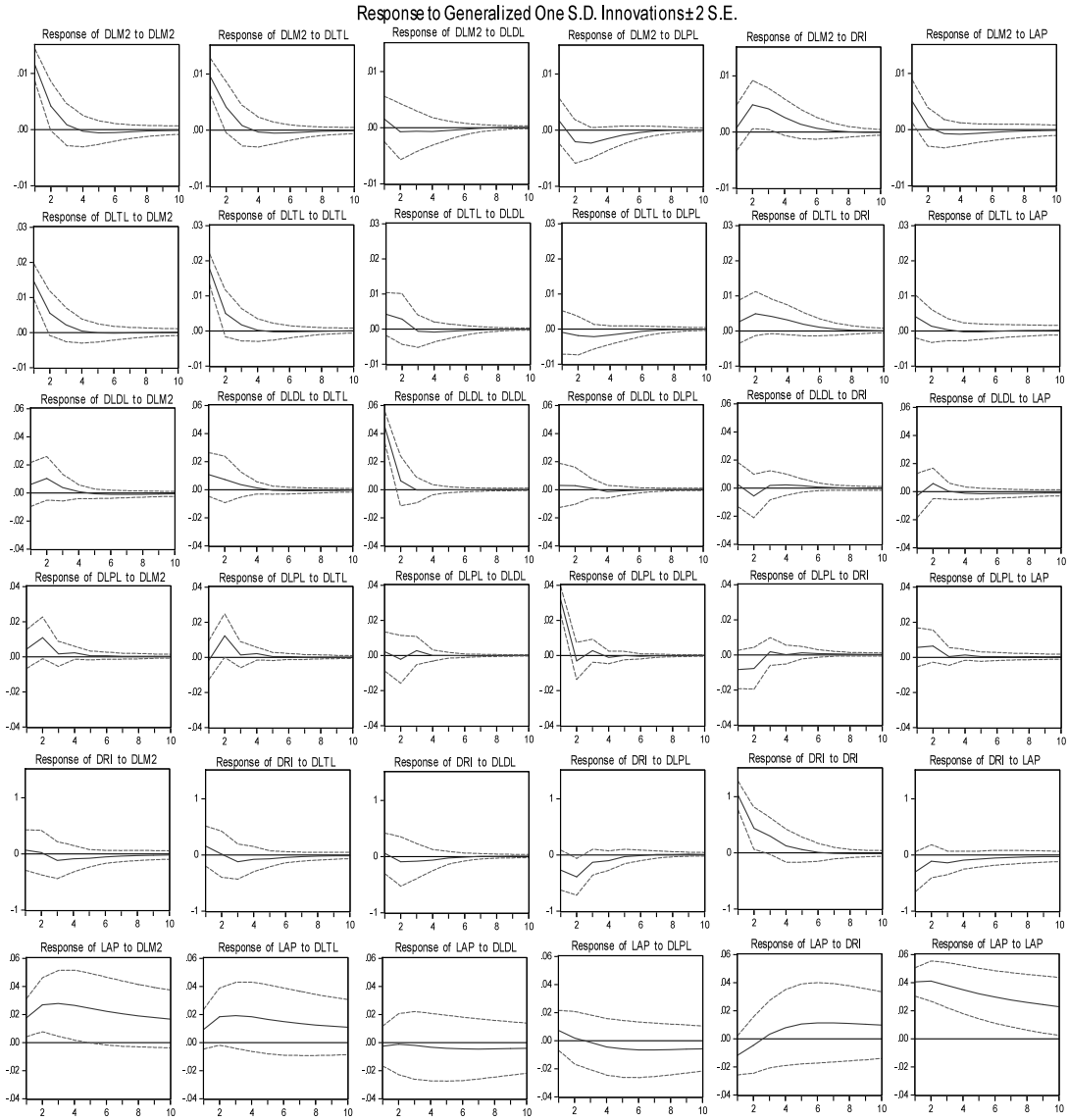

Fig. 9. Results of the Generalized Impulse Response Functions of Model (1) (LAP, 2003:2Q to 2011:3Q)

following a 1% positive total lending shock.

LAP, DLM2 and DLTL respond negatively to the real interest rate shock, and reach the minimum values of –1.02% in the first month, –0.24% in the third month and –0.18% in the second month, respectively. Thus, an increase in DRI could lower LAP, DLM2, and DLTL from 1999 to 2003.

Consequently, the effects of DLTL on LAP are the largest, followed by the DRI, and, finally, the DLM2 from 1999:1M to 2003:3M. Interestingly, compared with model (1), the relationship between DLTL and DLM2 is much weaker, and the response of LAP to a money supply shock is paltrier in model (3). This leads us to believe that the blocked transmission between money supply and bank credit before 2003 led to the minor effects of

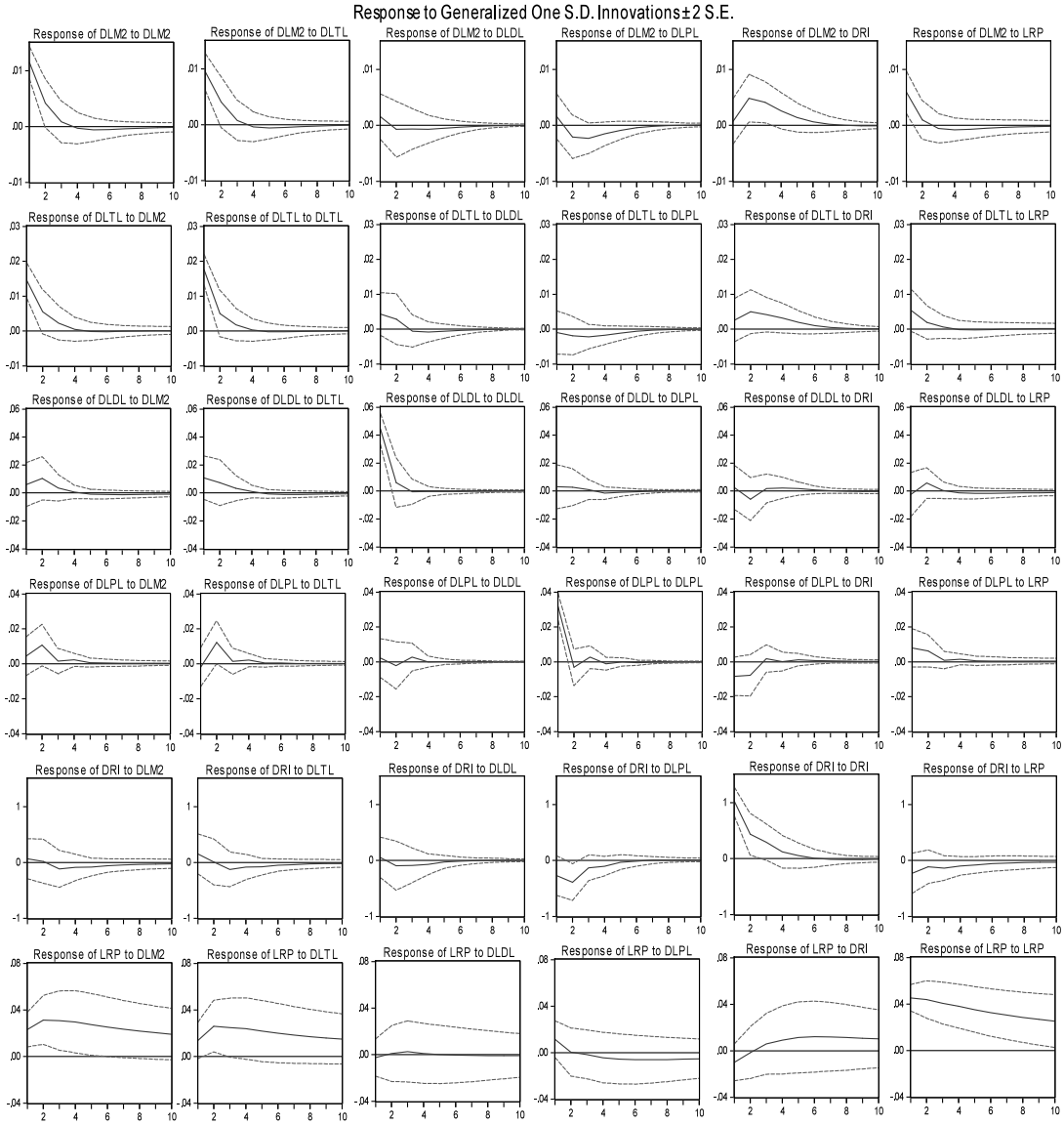

Fig. 10. Results of the Generalized Impulse Response Functions of Model (2) (LRP, 2003:2Q to 2011:3Q)

the money supply on commercialized building prices. However, it is possible that the data adopted in models (1) and (3) differ in frequency and cause the variance in the results. Further analysis is conducted to resolve this problem.

5.3 Period from 2003:4M to 2011:9M

Figure 12 shows the results of the generalized impulse response functions of model (4) for the period from 2003:4M to 2011:9M.

When there is a 1% positive shock to the money supply, the response of LAP peaks at 1.94% in the third month. When a 1% positive total lending shock occurs, the LAP has the strongest response of 1.37% in the third month.

After a 1% positive shock to the money supply, the response of DLTL is largest at 0.62% in the first month. The response of

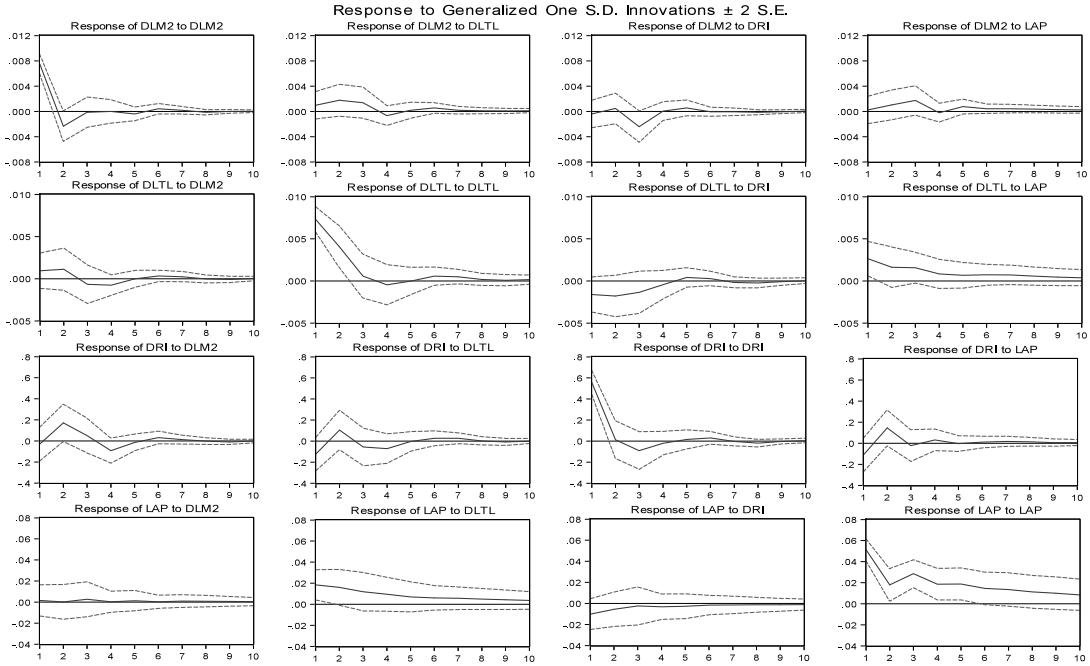

Fig. 11. Results of the Generalized Impulse Response Functions of Model (3) (LAP, 1999:1M to 2003:3M)

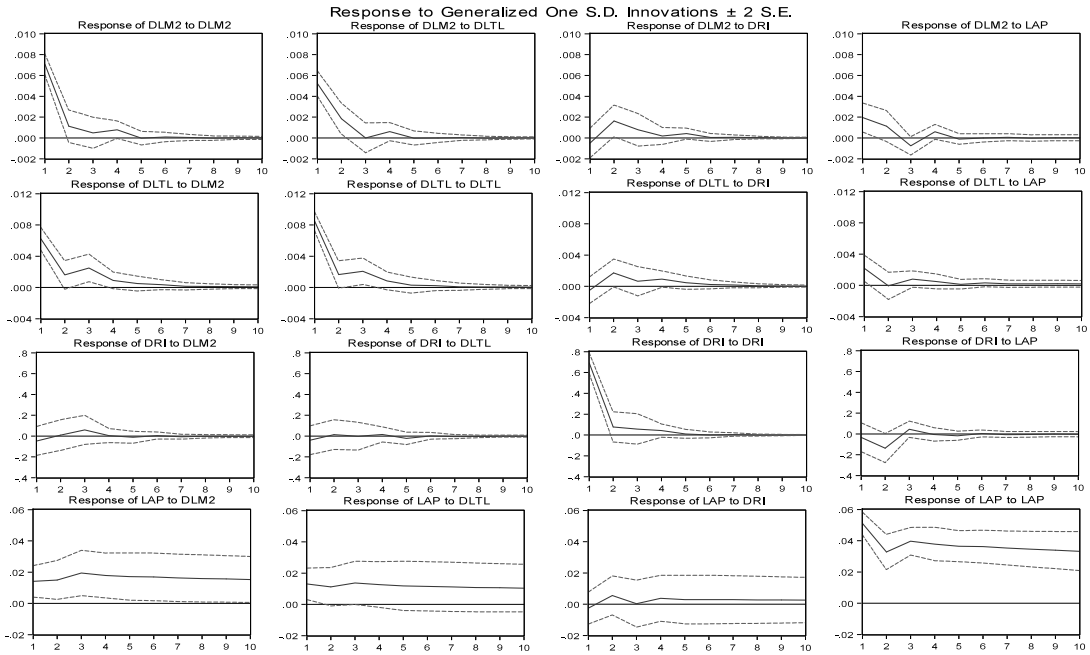

Fig. 12. Results of the Generalized Impulse Response Functions of Model (4) (LAP, 2003:3M to 2011:9M)

DLM2 to a 1% positive total lending shock reaches the highest point of 0.52% in the first month.

Interestingly, following a 1% positive real interest rate shock, the response of LAP is negative (–0.25%) in the first month, but positive after the second month, peaking at 0.56%. Moreover, the responses of the DLM2 and the DLTL to a 1% real interest rate shock are positive after the second month, reaching maximum values of 0.16% and 0.17%, respectively. Therefore, an increase in DRI positively influences the DLM2 and DLTL, and, thus, the prices of commercialized buildings. This is also proved by the former quarterly models (1) and (2).

Accordingly, the DLM2 has the strongest influence on LAP, followed by DLTL and DRI for the period from 2003:4M to 2011:9M. This result is similar to that of models (1) and (2) for the period from 2003:2Q to 2011:3Q.

5.4 Comparison

Tables 7 and 8 compare the key data on the results of the generalized impulse response functions of model (3) with that of model (4). According to Table 7, LAP responds more strongly to a total lending shock than a money supply shock in the model for the period from 1999:1M to 2003:3M. In other words, before 2003, the influence of total lending on commercialized building prices was powerful; however, the effect of money supply on commercialized building prices was limited. Nonetheless, after 2003, the influence of total lending decreased, whereas the effect of money supply became much more significant. These results imply that with the successive reforms in the Chinese financial system, the money supply, which became the official intermediary target of monetary policies, has gained more importance in the commercialized building market. Now, money supply plays a more significant role than the former official intermediary target, that is, total lending. Since China has a bank-based financial system, total lending continues to bear a powerful influence on commercialized building prices, although its significance has decreased slightly.

Table 7 Key Data on the Results of the Generalized Impulse Response Functions in Two Periods (Monetary Quantitative Shock)

Largest Response	LAP to money supply shock	LAP to total lending shock	DLTL to money supply shock	DLM2 to total lending shock
1999M1:2003M3 Model (3), Figure 11	0.26%	1.84%	0.11%	0.17%
2003M4:2011M9 Model (4), Figure 12	1.94%	1.37%	0.62%	0.52%

Table 8 Key Data on the Results of Generalized Impulse Response Functions in Two Periods (Monetary Price Shock)

Largest Response	LAP to real interest rate shock	DLM2 to real interest rate shock	DLTL to real interest rate shock
1999M1:2003M3 Model (3), Figure 11	–1.02%	–0.24%	–0.18%
2003M4:2011M9, Model (4), Figure 12	0.56%	0.16%	0.17%

Moreover, it is worth noting that the response of DLTL to a money supply shock and the response of DLM2 to a total lending shock were much smaller in the period from 1999:1M to 2003:3M. In other words, for the period from 2003:4M to 2011:9M, changes in money supply generated greater movements in total lending, and the variations in total lending caused larger fluctuations in the money supply. Through their consecutive mutual causation circulation, the effects of money supply on commercialized building prices were amplified several times. This process is known as the money creation of bank credit. Apparently, it was a smoother transmission between money supply and total lending that generated the increase in the money multiplier and, in turn, amplified the influence of the money supply on commercialized building prices after 2003. Li (2007) and Lu and Zhu (2011) also indicate that the money multiplier has grown up in recent years.

As described in Table 8, the responses of LAP, DLM2, and DLTL to a real interest rate shock were negative before 2003, and became positive, with a one-month lag, after 2003. This is similar to the results of Wang (2012), who argues that the increase in the deposit interest rate leads to the expansion of bank credit based on data from 2004 to 2010. Because the increase in the deposit interest rate stimulates the growth in deposits and increases the banks' costs, banks have to explore more loans to make profits when other financial products are not sufficient for investment. This process increased the total lending and money supply, and consequently, the influence of RI on commercialized building prices changed from negative to positive after 2003. However, before 2003, the capital adequacy ratio of banks was low because of the insulation of non-performing assets in 1999, and the banking system was facing a very difficult situation (He and Yin, 2010). This explains why the increase in the deposit interest rate failed to increase total lending and money supply, and consequently, housing prices. After 2003, the conversion of state-owned banks into joint-stock companies stimulated business effectiveness. With excessive money, the banks had excess liquidity, which promoted loans to the real estate industry and ultimately stimulated growth in housing prices. Similarly, Shen et al. (2011) find that bank credit has a considerable influence on housing prices, and that the RI for the real estate industry positively influences housing prices. Also, Gao and Wang (2009) suggest that the increases in interest rates accompanied by the expansion of bank credit to the real estate industry can not lower housing prices. Xu et al. (2012) emphasize the minus effects of the RI on housing prices. However, they neglect the relationship between money supply and RI by introducing them into separate models. Consequently, they fail to determine that an increase in RI stimulates growth in money supply and bank lending, and therefore, housing prices. This is the main reason why they obtain the conflicting result that increases in RI generate a considerable decline in housing prices.

The reforms in financial system since 2003 led to the increase in the credit multiplier and the opposite influences of RI on the prices of commercialized buildings between the two periods. The International Monetary Fund (IMF) and the World Bank (2012) report, "The banking system has undergone tremendous change in China in the recent period and this process is still ongoing. The CBRC is a relatively young agency, having been created in 2003 from the PBC as part of the major

banking sector reform instituted by the Chinese authorities. In addition to the strengthening of financial sector regulation and supervision, these reforms have also led to the conversion of four large state-owned banks into joint-stock companies; consolidation of rural credit cooperatives; restructuring of joint-stock banks and securities companies; and reform of the insurance sector … The CBRC was established in 2003 as a stand-alone prudential authority and is widely credited with having made significant achievements in its short existence."(P.5&P.7). Fan (2010) states that the establishment of the CBRC leads to the creation of a new financial regulatory system in which the CBRC, the China Securities Regulatory Commission (CSRC), and the China Insurance Regulatory Commission (CIRC) work in coordination and each body has its own clearly defined responsibilities. Cao (2008) also divides the reform of the Chinese financial system into two periods: from 1978 to 2003 and after 2003. The first stage of the reform focuses on independence from government financing, whereas the second stage focuses on the structural conversion of financial organizations and corporations. Consequently, the financial system reforms after 2003 remarkably improved the credit multiplier and the transmission between money supply and bank lending, which amplified the amount of money flowing into the economy and, ultimately, magnified the effects of the money supply on commercialized building prices.

6 Conclusions

Using four generalized VAR models, this paper empirically analyzed the transmission mechanism of how money supply, bank lending, DL and PL influenced commercialized building prices and residential building prices from 2003:2Q to 2011:3Q. The study also compared the influences of the money supply and total lending on commercialized building prices during 1999:1M to 2003:3M with those during 2003:4M to 2011:9M. The main findings, explanations, and suggestions are provided below.

6.1 Explanations for the Empirical Results

The empirical results suggest that a positive shock to money supply, TL and PL would lead to an increase in commercialized building prices, while a positive shock to DL would decrease the prices of commercialized buildings.

First, as the official intermediate target of monetary policy, money supply has the most significant impact on housing prices among quantitative financial variables after 2003. Therefore, money supply should be the most important long-term consideration. Interestingly, however, from 1999M1 to 2003:3M, the response of commercialized building prices to a money supply shock was minor. The change was caused by the smoother transmission between money supply and bank credit, and the higher money multiplier in the subsequent stage, which amplified the effects of the money supply through the transmission of bank credit. The changes and reforms in the financial system strengthened the transmission between the money supply and bank credit. Consequently, the effects of the money supply on commercialized building prices have largely increased.

Second, the responses of commercialized building prices to a positive total lending shock are large in both sample periods. The expansion of bank credit has been an influential factor for commercialized building price increases since the market-oriented reform of the housing market. Since China has a bank-

based financial system and the funds in the real estate industry come primarily from banking credit, an expansion in banking credit certainly influences housing prices. This is also supported by Liang and Cao (2007), who find unidirectional causality running from bank lending to property prices in China. Therefore, to prevent housing prices from increasing drastically, total lending needs to be controlled.

Third, the effects of a real estate development loans shock are the smallest. The promotion of real estate development loans could reduce construction costs and, subsequently, stimulate growth in the housing supply, which would theoretically lower housing price. However, the conductive effects were not so remarkable. Therefore, it could be illustrated that the housing supply has been much smaller than the housing demand in China. The increase in supply caused by financial support from the banks could not satisfy the demand for housing. To meet the most basic and broadest housing demands, banking credit has to be offered for the development of common housing such as economically affordable housing rather than villas, office buildings and houses for business use.

Fourth, a house purchasing loans shock has immediate effects on commercialized building prices; however, the influences of shocks to money supply, total lending and real estate development loans lag around the 3rd or 4th quarters. As a result, it is most effective to control PL to decrease housing prices in the short run. Liao and Dai (2007) also assert the existence of reinforced interdependency between housing prices and PL. Nevertheless, to ensure that housing prices fluctuate in a safe range in the long run, attention has to be paid to the money supply, TL and DL. Accordingly, when determining monetary policy, it is critical to consider the lags; otherwise, the effects will not be as expected.

Fifth, the influence of the RI on commercialized building prices is smaller than those of the money supply and total lending. After 2003, the rise in the RI even generated increases in the money supply and total lending, thereby increasing commercialized building prices as well. Therefore, the prices of commercialized buildings could not be lowered by increasing interest rates.

Finally, residential buildings prices are more sensitive to shocks in money supply, total lending and PL than the non–residential buildings prices, whereas they are less sensitive to shocks to RI and DL. Therefore, the extent to which the same monetary policy influences different types of houses differs.

6.2 Policy Implications

Although monetary policies have been implemented to control housing prices since 2003, money supply, total loans and commercial real estate loans have still been ascending substantially. A considerable amount of funds and significant liquidity are continuing to flow into the real estate industry, which has largely stimulated the demand for commercialized buildings, thereby increasing their prices. The considerable increase in money supply and expansion of banking credit to the real estate industry is what led to the powerfully growth of commercialized building prices. This explains the strange phenomenon that occurred before 2011: the greater the number of monetary policies on housing prices, the more the upswings in commercialized building prices. Nevertheless, in 2011, the policies forbidding secondary or third house purchases and related loans effectively limited speculative housing demand, which, in turn, led to the slight decrease in commercialized building

prices.

The strict policies with excessive arbitrary political power introduced in 2011 cannot be sustained in the long run because it will threaten the stability of the economy. Therefore, it is vital for the Chinese government to resolve the long-term regulatory and control mechanisms on housing prices and adopt indirect policy instruments rather than arbitrary direct controls.

Because the expansion of funds and liquidity to the real estate industry is one of important reasons for the rise in commercialized building prices, it might be effective to use different types of monetary instruments to decrease it from the source and absorb it by other means. On the one hand, to use different types of monetary instruments to decrease the sharp surges in money supply, total loans, and commercial real estate loans to prevent funds and liquidity from flowing into the real estate industry. According to the monetarists, for example, Friedman and Schwartz (1963), the money supply should be set as the exogenous variable. Bruner and Meltzer (1997) state that the central bank can control the base money and the money supply through flexible institutions and procedures. In China, He (2006) conducts a theoretical analysis and indicates that endogenous money does not represent the uncontrollability of money supply. Moreover, through an empirical analysis, He (2006) finds that the money supply can be controlled in China, and its controllability is even larger than that in Germany and Switzerland. Furthermore, Zeng and Li (2007), Huang (2010), and Zhao (2012) note that money supply is still an effective and competent intermediate target of monetary policy. As a result, we could not exclude the influence of the central bank on the money supply. On the other hand, under the assumption of perfect financial markets, multiple financial instruments ought to be developed to meet the investment needs for excessive liquidity.

Additionally, time lags and differing policies on various commercialized buildings should be considered when monetary policies are used to regulate commercialized building prices.

6.3 Contributions and Limitations

This paper demonstrated the various dynamic influences exerted by different quantitative monetary variables on commercialized building prices. Regarding the analysis of the transmission mechanism on how money supply, bank lending, DL and PL influence commercialized and residential building prices, our study is the first to introduce DL and PL in empirical analysis. Furthermore, the study explains the reasons for the sharp increases in commercialized building prices during the last 10 years; it also explains why monetary policies were ineffective before 2011 but effective in 2011. This might clarify mixed results obtained by former studies in this field. Moreover, this is the first study to determine that the financial system reforms strengthened the transmission between the money supply and banking credit after 2003, and, accordingly, boosted the effects of the money supply on commercialized building prices. However, previous studies do not divide the sample period before and after 2003 and are not concerned with the impact of changes in the financial system on housing prices. Future studies in this area should consider the financial system context such as financial system structure, reforms, and characteristics of financial activities.

Owing to data limitations, the influences of DL and PL are not examined in the earlier stage. Because the money supply is a national variable that cannot be segregated by areas,

this paper did not compare the effects of the money supply on commercialized building prices among different regions and areas in China.

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(Graduate School of Economics,
Ritsumeikan University)

The Dynamic Effects of Money Supply and Bank Lending on Commercialized Building Prices in China

Fengyun LIU (Graduate School of Economics, Ritsumeikan University)

Keywords: Money Supply, Total Lending, Real Estate Development Loans, House Purchasing Loans, Commercialized Building Prices
JEL Classification Numbers: E51, R31, C32

Based on the characteristics of the Chinese financial system, this paper analyzes the transmission mechanism of how money supply, bank lending, real estate development loans, and house purchasing loans influenced the commercialized and residential building prices during the period from 2003:2Q to 2011:3Q. The study also compares the influences of money supply and total lending on commercialized building prices during the period from 1999:1M to 2003:3M with those during the period from 2003:4M to 2011:9M. The impulse response functions of the four generalized VAR models show that, besides different time lags, a positive money supply shock leads to the largest increase in commercialized building prices, followed by a positive shock to total lending and house purchasing loans, whereas a positive real estate development loans shock causes a slight decline in commercialized building prices. Residential building prices are more sensitive to a shock to money supply, total lending, and house purchasing loans than non–residential building price, whereas they are less sensitive to a shock to real estate development loans. The real interest rate shock positively influenced the commercialized building prices after 2003:3M; however its effect was smaller than that of shocks to money supply and total lending. Interestingly, the response of commercialized building prices to a money supply shock was much stronger from 2003:3M to 2011:9M than that from 1999:1M to 2003:3M because the financial system reforms after 2003 strengthened the transmission between the money supply and banking credit and, thus, enhanced the effects of money supply on commercialized building prices.