



## THE EFFECTS OF MONETARY POLICY ON REAL ESTATE INVESTMENT IN CHINA: A REGIONAL PERSPECTIVE

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Received 17 August 2012; accepted 5 July 2013

**ABSTRACT.** Monetary policy on real estate investment in China has had varying impacts across the country due to regional differences. A supply-determined model is used to measure the policy effects on property investment volume based on a set of regional data from 2003 to 2010. This research yields several important findings contributing to an understanding of uneven policy effects on the unbalanced regional markets. Firstly, it is revealed that the eastern coastal provinces in China have a higher dependence on bank loans for housing investment than that of the other inland provinces. Secondly, this research has disentangled the specific transmission channels of monetary policy in the property market. Bank loan supply, instead of interest rates, would be a potentially effective policy tool for the government in making property market adjustment. Thirdly, the eastern coastal provinces are more sensitive in their responses to the changes of monetary stances than the other non-coastal central and western provinces. Therefore, the government must take note of the significant heterogeneity arising from the regional differences in estimating the policy impacts, although monetary policy is uniformly employed in the nation most of the time.

**KEYWORDS:** Monetary policy; Transmission channels; Real estate investment; Unbalanced regional markets; Uneven policy effects

### 1. INTRODUCTION

Through 30 years of successive reforms, China's real estate industry has made remarkable achievements, constituting a prominent sector in the national economy. The emergence of a booming property market is attributable to a fundamental institutional transformation from a long-standing welfare housing allocation system to a 'more market-oriented' mechanism. The property market from 1998 onwards has entered into the "full marketization" stage. In the marketization process, commercial developers, rather than state organs, have been taking a dominant role in housing investment and production.

After the series of housing reforms, a "property bonanza" is observed in the national market, which has attracted an excessive growth of real estate investment. Leveraging on bank loans to carry out investment is the conventional "alchemy of real estate" for developers. The supply of bank

loan underpins property investment in different development stages, namely land acquisition, project development and the subsequent take-up of properties by mortgagors (Zhang 2010). However, interest rates in China are highly regulated and they appear "cheap", since they are far below the returns on capital (Fukumoto, Muto 2012). Therefore, using the low-cost working capitals from bank loans, developers could comfortably reap the extraordinary high returns from real estate development. The situation was exacerbated by banks' predisposition to real estate lending, which fuelled real estate over-investment.

During the periods of 2004–2007 and 2009–2010, the huge investment especially in real estate led to some serious symptoms, such as, an upswing price, an extremely high sale turnover, and a surge in the volume of new construction (e.g. McKay 2011). Responding to the overheated property market, the Chinese government tightened the monetary policy markedly. It discouraged credit from being invested in real estate by implementing credit

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rationing. Credit rationing generally refers to the circumstance when there is an overwhelming credit demand relative to non-price restricted supply at the current loan rates. Tightening of credit conditions was effected through macro-monetary policy and specific lending regulations on the real estate industry. The chronology of detailed regulations pertaining to increasingly stringent lending criteria for development loans is shown in Figure 1 and the exact titles of those regulations are tabulated in Appendix 1.

Against this background, this research investigates the impacts of monetary policy on real estate investment in China. The focus is to demonstrate the uneven effects brought about by China's monetary policy on the real estate markets of the coastal eastern regions and the inland regions. Three hypotheses are examined in turn during the research process, as follows:

Firstly, given the different rates of development in a vast country such as China, one may naturally ask if there is any regional difference in terms of developers' reliance on bank credit. The finding will be instrumental in understanding the regional sensitivity to policy shocks in the market. From this perspective, the first hypothesis is postulated for testing as follows:

*Hypothesis One:* Developers in the eastern coastal provinces are less dependent on bank credit to underpin their investment activities than their counterparts in the inland central and western provinces.

The premises of this hypothesis is that, since most of the developed real estate markets are situated in the affluent coastal eastern regions where the financial market is better developed and hence access to various types of non-bank financing is easier, developers should be less dependent on bank credit.

The second issue of this study stems from Blinder (1987: 327), who posed the question of "how and why does monetary policy affect real economic activity?" As for the real estate sector, there are uncertainties about the transmission channels of monetary policy due to a scarcity of literature on this issue to-date. This research seeks to analyze the impacts of monetary policy on developers, and disentangle the mixed perceptions on the cost-of-capital effect and the credit supply effect. To carry out this analysis, another hypothesis is postulated for testing:

*Hypothesis Two:* The monetary policy exerting its effects on real estate is transmitted through both "the credit channel" and "the interest rate

channel". The monetary policies and their impacts will be expounded.

Following on the last two hypotheses, this research continues to find out the regional difference in the developers' response to the macro-monetary policies applied nation-wide. The third hypothesis is postulated as below:

*Hypothesis Three:* The magnitudes of development activities in the eastern coastal region of China are responding less significantly to monetary policies than those in the inland central and western regions.

Following this introduction, Section 2 provides a retrospective review of the monetary policy in China. Section 3 is a discussion of the causes and conditions of regional differences of the real estate market. Section 4 expounds on the theory of transmission channel of monetary policy. Sections 5 and 6 present the methods and the research findings respectively. Section 7 is a summary of the study, together with the conclusions and areas for the future policy research.

## 2. TIGHTENED MACRO-POLICY

China's real estate market is widely recognized as a bank loan dependent industry. Commercial banks in China are primarily state-owned and state-held (Xu, Chen 2012). Therefore, the real estate market is highly subjective to the centralized monetary policy (Xu, Chen 2012). With a widely held belief that the real estate market is liquidity-driven, the state government implemented tight monetary measures with the aim to cool down the overheated market (Yiu, Xu 2012). Tight credit periods refer to episodes of "relatively high interest rates as well as periods of reduced availability of loans due to stricter non-price credit rationing" (Owens, Schreft 1995: 63). Hence, both investment and consumption are discouraged. The macroeconomic ramifications of "tight credit" are depicted as the shaded periods in Figure 1. The required reserve ratios and the central bank benchmarked lending rates are used as proxies of the stance of monetary policy (Ashcraft 2006). Both these two variables move in tandem. The shaded areas (Sept 2003 to Nov 2008; Dec 2009 to present) represent the "policy windows", indicating that the monetary authorities implemented tight monetary policies. A careful review on the historical movement of reserve ratios and lending rates gives a clear picture that China's monetary policy has gone through persistently "tight episodes", despite the relatively short period of reversal of "easy credit" in 2009 (Fig. 1).

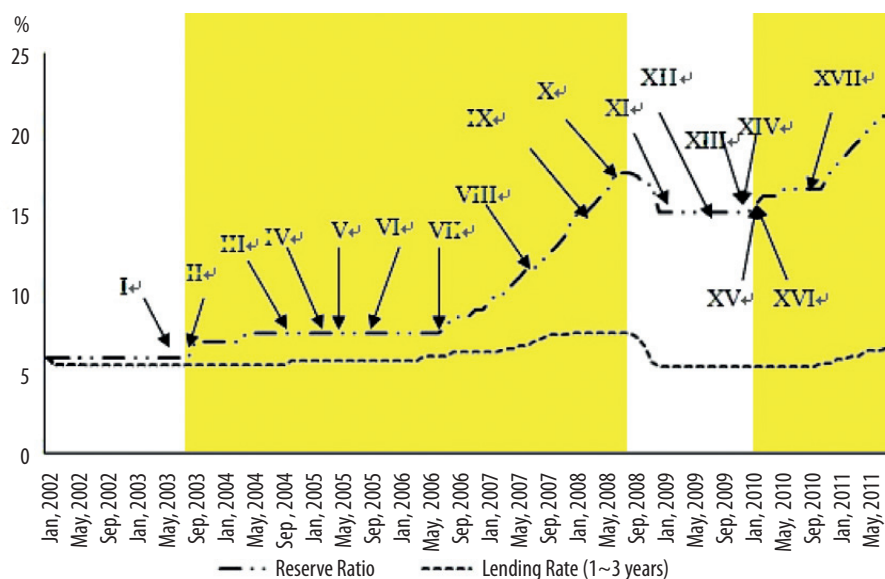


Fig. 1. Monetary policy and real estate lending control in China (see Appendix 1 for policy codes)  
 Source: National Bureau of Statistics of China (2011)

In the tight periods, the People's Bank of China (PBOC), which is the national central bank, adjusted the required reserve ratio upward in 20 occasions from 6% in November 1999 to 17.5% in June 2008, and continually tightened the reserve requirement rate 10 times sequentially from 15% to a record high of 21% in June 2011. Besides the financial measures, the state government tends to administratively intervene the property market by releasing ad hoc comments to the market, the so-called "window guidance". The "window guidance", including the specific directives and policies for monetary control targeting at the real estate industry of China, is marked up in Figure 1, and the detailed contents are presented in Appendix 1. The "window guidance" measures restricted developers' eligibility to borrow from banks and stipulated stringent monitoring requirements on the use of credit. For example, the minimum equity to investment ratio for developers was increased to 30%. According to the guidelines, bank loans for land acquisition should not exceed 70% of the land value; the period for loan repayment should not be longer than two years; and the loans extended for construction cash flow purposes should not be diverted to real estate development. New regulations against credit allocation to property developers were emphatically promulgated. For example, state banks were prohibited from providing overseas real estate developers with initial funds (or downpayment) for land purchases. Banks were ordered to withdraw overdue loans and to sharply curtail future loans for luxury housing, hotels, and office blocks.

However, these "harsh" monetary measures did not halt the overheated market. Housing prices kept surging despite the rise of interest rates and tightening of property credit. Compared with the modest increase of CPI which grew by only 11.69% from 1997 to 2007, housing prices experienced a 52.57% upswing on a national level and over 100% in most developed cities (Xu, Chen 2012). Against this background, it is important to investigate the effects of monetary policy on the regional real estate market and expound its transmission mechanisms as well.

### 3. REGIONAL DIFFERENCES

From the literature, it can be seen that there is a large regional difference of the real estate market in China which may lead to substantial variations in housing policy implementation (e.g. Yiu, Xu 2012). China is conventionally defined as having three economic regions, namely the Eastern region, the Central Region, and the Western region. Prioritization of economic development is the principal driving factor behind the regional differences. Since the opening-up reform in late 1970s, China has been following an export-oriented strategy for economic development (Wang 2010). The ports of the eastern coastal regions have the natural advantages to promote the export economy. With abolition of the former goal of common equality, the central government decided to accord the coastal eastern regions with higher priorities for development (Ma 2002). For example, in April 1987, China initiated the experimental reforms in

transferability and conveyance of land use rights for four coastal eastern cities: Shanghai, Guangzhou, Shenzhen and Tianjin (Tse *et al.* 1999). As a consequence, the declared goal of “supporting some regions to become rich first” has led to significantly uneven paces of development (Ma 2002). Nowadays the three most important economic zones, “Beijing-Tianjin-Tangshan Economic Circle”, “The Yangtze River Delta Economic Circle”, and “The Pearl River Delta Economic Circle” are clustered in the coastal eastern regions. Just these three circles, making up 20.6% of the total population and 1.1% of the nation’s land area, contribute to 85% of the entire foreign investment and 75% of import-export volume (Liu, Meng 2009). In contrast, the inland central and western cities are at the bottom of “the development ladder”. It was until the 2000s that the central authority released a series of stimulatory measures to promote coordinated economic developments between the coastal eastern and other less developed provinces. However, the development levels across regions are showing rising disparity instead of a narrowing gap. For instance, the GDP of the eastern region, which housed 27.1% of the nation’s total population, accounted for 54.7% of the national GDP in 2002. This was in sharp contrast with that of the western region, which housed 22.88% of people but only contributed to 14.4% of the nation’s GDP in the same year (National Bureau of Statistics of China 2003).

Owing to the unbalanced regional economy, remarkable regional variations in urbanization level and the pace of urban housing development continue to exist (Ma 2002; Yu 2011), together with a high regional income inequality, which jointly constitute the different fundamentals of real estate markets across regions. According to “*Notices by the People’s Bank of China on further improvements on real estate credits business management*” implemented in 2003, China stipulated that the property credit issued by each district’s commercial banks can only be invested in that specific region. This regulation prohibited the cross-regional shifts and uses of credit since 2003, which increased the disparities of loan provisions in the regional markets. These regional variations may create different responses relative to the monetary policy.

Apparently, these remarkably different market fundamentals can lead to the heterogeneous monetary policy effects across regional levels. A neglect of the syndrome of regional differences among regions might result in a misleading conclusion (Yiu, Xu 2012). However, monetary policy research regarding China’s real estate mainly

treats the national market as a whole (Wang, Han 2009; Huang, Wang 2010). There is still a paucity of China’s real estate studies adopting a regional perspective to sufficiently evaluate monetary policy influence. As such, a knowledge gap exists in China, in that a regional dimension is needed for a robust and complete study of the monetary policy effects on China’s real estate market, which this paper fills.

#### 4. TRANSMISSION CHANNEL OF MONETARY POLICY

There are two theories regarding monetary policy transmission channels. They differ fundamentally over the different modus through which the effects of monetary policy occur and are transmitted. For the financing factors, Lindbeck (1998) claimed that both interest rate and credit availability are the centrally important factors which borrowers simultaneously take into consideration when they decide on their lending. Yet, the often-heard-of phrase of “cost and availability of credit” in the literature, which “strengthens the impression that cost and availability have separable and independent effects on the decisions to consume or invest” (Meltzer 1974: 763). In terms of the relative importance of the two monetary policy instruments, scholars hold different views.

Some scholars support the role of interest rate as a policy instrument itself. Lindbeck (1998) argued that given the limited supply side of the credit market and the special financial structure of some firms, the interest rate effects may accentuate. Caballero (1999) claimed that investment in general showed extreme sensitivity to the cost of capital. Taking a tight monetary policy as an example, for both developers and homebuyers, a rising lending rate indicates higher costs of borrowing, and thus erodes their willingness for investment and spending, which in a feedback manner discourages borrowing demands. Meanwhile, some research suggests that credit availability is crucial to the real estate market (e.g. Meltzer 1974; PwC 2013). A constrictive policy may drain the bank reserve, weaken bank’s lending capabilities and incentives, and thus lessen loan volume. The reduced amounts of loans available to developers and homebuyers would ultimately depress investment and consumption in the housing market. This research attempts to identify the relative importance of the interest rate channel and the credit channel through an analysis of empirical evidence in mainland China.



## 5. METHODOLOGY

With an aim to explore the developers' financing composition, i.e. the Hypothesis One, as to whether developers in the eastern provinces are less dependent on bank credit to underpin their investment activities than their counterparts in the central and western provinces, the standard scores ( $z$ ) and Mann-Whitney test were used to investigate the regional differences. The calculation procedure of the standard score ( $z$ ) is as follows:

The standard score is

$$z = \frac{x - \mu}{\sigma},$$

where:  $x$  is a raw score to be standardized, the raw score is derived by dividing the bank loan amount by the total investment;  $\mu$  is the mean score of the population;  $\sigma$  is the standard deviation of the population mean score.

Mann-Whitney test uses a non-parametric statistic to compare two independent groups of sampled data. To test Hypotheses Two and Three, the fixed effect models based on China's provincial panel data were then used to study developers' sensitivity to the monetary policy during the period from 2003 to 2010. The estimation equations are based on the theme of housing supply model (e.g. DiPasquale 1999).

To determine the equation variables, it is important to understand the decision-making process of developers in the provision of housing supply. Based on an extensive literature review, housing supply is defined in this paper as a linear function of new property prices, long-term lending interest rate, land areas, construction cost, and credit availability. Apart from these supply-side factors, the estimation models also take into consideration the variables of "floor space waiting for sale" (FSWS) and "floor space sold" (FSSD). The cost of holding unsold housing on the market is an important factor affecting developers' decisions on housing investment (Poterba 1984). However, data on average house selling time is not available in China. Due to the data restriction, FSWS is used as a proxy to reflect this holding cost. FSSD was selected as a barometer to indicate the effective housing demands in the market, which directly affects developers' incentives of housing production. Variables chosen to represent each determinant in the investment decisions are shown in Table 1. The purpose is to use panel estimation model to investigate the policy shock of loan supply and lending rate variations on housing development. Three empirical models with different rotations of variables are developed as Eq. (1), Eq. (2), and Eq. (3). In these models, the effects of interest rate and bank credits were evaluated with different model

Table 1. Variable definitions

Variable	Definition	Abbreviation	Expected coefficient
<i>Dependent variable</i>			
Actual completed investment by enterprises in real estate development (RMB Million)	Measuring the policy responses by developers	INV	
<i>Independent variable</i>			
Domestic loan (RMB Million)	Measuring the bank loans available	LOAN	Positive
Property selling price (RMB/Sq.m.)	Measuring the new property prices	PSP	Positive
Real lending rate (one to three years) <sup>1</sup> (%)	Measuring the cost of borrowing	RLR	Negative
"Dummy 1" for tight episodes "Dummy 0" for easy episode in 2009	Measuring the effects of policy stances	Dummy	Negative
Land area to be developed <sup>2</sup> (Sq.m.)	Measuring the availability of land	LATD	Positive
Cost of construction (RMB/Sq.m.)	Measuring the cost shifters	CBC	Negative
Floor space waiting for sale (Thousand Sq.m.)	Measuring the vacancy of housing spaces and costs of holding property assets in the market	FSWS	Negative
Floor space sold (Thousand Sq.m.)	Measuring developers' expectations of market demand	FSSD	Positive

<sup>1</sup> According to the length of borrowing, the People's Bank of China PBOC classifies three loan categories: short-term loans (less than one year), medium-term (between one and five years), and long-term loans (more than five years). Zhang (2010) argues that as the period for a typical real estate project lasts for 3 years, it supports the use of 1-3 year lending rate as the variables in the estimation model.

<sup>2</sup> The variable of "Land area to be developed" refers to the land banks of developers which have received land use right and are waiting for development.

specifications. More convincing conclusions will be derived, if these three models generate consistent outcomes:

$$\begin{aligned} LOG(INV_{it}) = & \alpha_i + \alpha_1 LOG(LOAN_{it}) + \\ & \alpha_2 LOG(PSP_{it}) + \alpha_3 Dummy_{it} + \\ & \alpha_4 LOG(LATD_{it}) + \alpha_5 LOG(CBC_{it}) + \\ & \alpha_6 LOG(FSWS_{it}) + \alpha_7 LOG(FSSD_{it}) + \\ & \alpha_8 RLR_{i(t-1)} + uit, \end{aligned} \tag{1}$$

$$\begin{aligned} LOG(INV_{it}) = & \alpha_i + \alpha_1 LOG(LOAN_{it}) + \\ & \alpha_2 LOG(PSP_{it}) + \alpha_3 Dummy_{it} + \\ & \alpha_4 LOG(LATD_{it}) + \alpha_5 LOG(CBC_{it}) + \\ & \alpha_6 LOG(FSWS_{it}) + \alpha_7 RLR_{i(t-1)} + uit, \end{aligned} \tag{2}$$

$$\begin{aligned} LOG(INV_{it}) = & \alpha_i + \alpha_1 LOG(LOAN_{it}) + \\ & \alpha_2 LOG(PSP_{it}) + \alpha_3 LOG(LATD_{it}) + \\ & \alpha_4 LOG(CBC_{it}) + \alpha_5 LOG(FSSD_{it}) + \\ & \alpha_8 RLR_{i(t-1)} + uit, \end{aligned} \tag{3}$$

Note: Index *i* represents provinces, and index *t* refers to period. Variable definitions are provided in Table 1.

The panel data sets cover 31 provinces and municipalities. Regarding the model selection between fixed and random effects, a series of Hausman tests are conducted. In five out of nine estimations, test results reject the use of random effects at 1%

significant level (see Table 4). Fixed-effects models are thus considered, facilitating the regional comparisons. As a supplementary task, random-effect models are also performed. The research findings are consistent with the fixed-effect ones, which lead to even more pervasive conclusions.

The variables of nominal investment and prices are transformed by the national CPI deflator, which takes 1999 as 100, to reflect real property price resilience and market activities. All the data in this paper is sourced from census publications, the China Statistics Yearbooks 2004–2011.

## 6. FINDINGS AND DISCUSSIONS

For each province, the standard scores (*Z*) of credit-fund ratio (representing the fund sourced from domestic loan' to the total fund possessed by the real estate enterprises) are compared to reveal the relative importance of bank credit as a source of fund for development. A higher *Z* score indicates a higher dependence on bank credit. The results rank the relative importance of bank loans to real estate financing in different regions in different years (see Appendixes 2 and 3). They show the inherent concentrations of credit in the coastal eastern regions, whilst lagging provinces are mostly from the inland western or central regions of China and there is no apparent difference between the two latter regions.

Table 2. Mann-Whitney tests between Central and Western regions

	Variables	U	W	Mean rank Central/Western	Corrected for ties two-tailed probability
2010	Credit-Fund Ratio	9	10	7.8/12	0.1118
2009	Credit-Fund Ratio	9	10	9/10.9	0.49
2008	Credit-Fund Ratio	9	10	7.3/12.4	0.054*
2007	Credit-Fund Ratio	9	10	7.2/12.5	0.0455**
2006	Credit-Fund Ratio	9	10	8/11.8	0.1527
2005	Credit-Fund Ratio	9	10	8.8/11.1	0.3989
2004	Credit-Fund Ratio	9	10	8/11.8	0.1527
2003	Credit-Fund Ratio	9	10	7.3/12.4	0.0549*

Notes: \*\*\* and \* respectively denote 1% and 10% significance level.

Table 3. Mann-Whitney tests between coastal Eastern and inland Western and Central regions

	Variables	U	W	Mean rank Eastern/Inland	Corrected for ties two-tailed probability
2010	Credit-Fund Ratio	12	19	21.6/12.5	0.0069***
2009	Credit-Fund Ratio	12	19	23/11.6	0.0007***
2008	Credit-Fund Ratio	12	19	22/12.2	0.0037***
2007	Credit-Fund Ratio	12	19	21.7/12.4	0.0061***
2006	Credit-Fund Ratio	12	19	21.8/12.3	0.0051***
2005	Credit-Fund Ratio	12	19	21.3/12.6	0.0099***
2004	Credit-Fund Ratio	12	19	19.7/13.7	0.0784*
2003	Credit-Fund Ratio	12	19	19.1/14.1	0.1389

Notes: \*\*\* and \* respectively denote 1% and 10% significance level.

For a more objective statistical analysis, the Mann-Whitney test was used to compare the degree of developers' reliance on bank credit across regions. Table 2 displays the results regarding the central and western regions which show that there is, in general, no statistically significant difference of the reliance on bank credit between these two regions. This result once again confirms the previous Z score findings. Therefore, this research combines these two regions into one group, i.e., the inland regions as a whole, in proceeding with the following tests. In the next step, this study tests the difference between the coastal eastern and inland regions. Table 3 shows that the eastern provinces have higher mean ranks than other inland provinces. The conclusion that the eastern region in general has a more concentrated use of bank credit is drawn with high statistical significance at 1% level (see Table 3).

The tests indicate a significant heterogeneity across the coastal and inland provinces, in terms of their dependence on bank credit financing. Accordingly, Hypothesis One is rejected. On the contrary, there is an unexpected finding suggesting that the coastal eastern provinces are more reliant on bank loans than the inland region, despite the more developed financial system operating in the former. Particularly, some Tier 1 and 2 cities, such as Beijing, Tianjin and Shanghai, were mostly dependent on the banking system to sustain their investment activities (see Appendixes 2 and 3). The larger size of the property market and hence greater demand for finance may be key explanations for the higher reliance on bank financing in the eastern region. Due to the heavier reliance on the loan market, a higher sensitivity to policy shocks is expected.

To test Hypotheses Two and Three, three panel estimation models (Eqs (1), (2) and (3)) were run respectively with the panel data of the national aggregate, the eastern market, and the inland markets. Table 4 depicts the results for different estimation specifications. The long-term lending rate is considered as a cost for the working capital. Loan is an important component affecting the ability of developers in property development and acquisition. Dummy variables, representing the credit rationing, are included in Models 1 and 2.

Except for the variables of interest rate, dummy, floor space waiting for sale (FSWS), and cost of building, the estimation results in the predicted signs across the three models in both the eastern and inland regions as well as on the national level. All the other variables, including property price, loans, construction cost, land supply, floor

space waiting for sale, and floor space sold (FSSD), have a positive relation with property investment. The findings support the conventional view that house construction is elastic to price in the long run (Blackley 1999), because property price determines the profitability of housing productions. The unexpected sign of building cost, positive rather than negative, is a reasonable finding in China's current booming market, in view of the easy cost transferability to property purchasers in the wake of escalating property prices in China. The cost of holding unsold housing, represented by FSWS, also indicates a positive relation with investment. This finding can be understood from two aspects. On one hand, in such a booming market, the volume of unsold housing remains at a low level and the related holding cost would not lead to a serious cash flow problem for developers. On the other hand, increases in vacant floors (FSWS) resulting from booming investment show positive expectations about the housing price growth. This optimistic psychology widely perceived by developers will further encourage their housing investment. Floor space sold (FSSD) show statistically significant (at 1% confidence level) and positive signs. This evidence shows that the volume of housing sales is an important consideration developers take into account when making future investment decisions.

The interest rate variables exhibit statistically significant and positive signs in the inland regions and also at the national level. The unexpected positive signs contradict the conventional views that rising interest rates dampen investment and spending, and vice versa (e.g. Poterba 1984). Referring to the positive signs in this research, the increase of interest rate cannot constrict the overheated investment but generate a reverse effect. Although a substantial body of literature for real estate debacles has identified low interest rate as the causal factor, China is obviously having a different situation. The findings reveal that the monetary policy of raising interest rates fuels the overheated real estate market in China.

Reasons for the anomaly in the expected effects of interest rates are complicated, with no single satisfactory theory. Some real estate researchers have proposed several reasons for the apparent contradiction. Firstly, referring to the conventional cost of capital view, the shifts of interest rate can affect developers' investment decisions in two ways: (1) the cost of borrowing can be more than compensated for by the return of capital; and (2) there is a change in expectations on future returns (Giuliodori 2005). The increase of interest

rate will raise the expected return (discounting rate) on investment. Incidentally, interest rate often increases with the rise of CPI. In combination, the increased return rate and inflation hedging effects attract more capitals inflows to the real estate industry. Therefore, investment activities are not compressed but instead unexpectedly driven higher. Secondly, from another perspective, the rises in interest rates narrow the profitable investment potentials in the real economy, such as the manufacturing industry. Hence, capital in search of new lucrative investment opportunities will be redirected into the real estate industry, given the sustainable and swift run-ups in property prices in the last two decades. The situation in China fits the views of Livingston (2009: 47) that “a new tidal wave of surplus capital with no place to go except into real estate”, as experienced by some developed economies (such as Hong Kong) during the recent mortgage meltdown originated in the U.S. Thirdly, rising capital costs can be easily transferred to housing purchasers in a booming market. Last but not least, expectations generated by an interest rate policy may lead to effects contradictory

to the policy intentions. Using two psychologists Tversky and Kahneman’s heuristics theory (1974), Wang (2010) explains how market expectation can give rise to games (conflict/inconsistency) between policy and investors. In respect of China’s real estate market, given that there are already series of “harsh” rules, it is widely conjectured that the central authorities do worry about the tremendous damage to the national economy resulting from a potential real estate crash. Knowing that the government was facing a dilemma between real estate and national economy, developers widely hold the belief that any poor performance of the economy will cause an easing of current tight policy control on the property market. This means a tight policy may eventually lead to perverse changes in the expectation among the public (PwC 2013). Consistent hikes in interest rates suggest a signal to developers in that the tight leash on the real estate market may ease in the near future when a turning point would be reached to drive economic growth again. Therefore, these expectation effects add to the difficulties of using interest rate tools to combat the overheated housing investment.

Table 4. Estimates of housing supply

Dependent variable: real property investment (RMB millions)									
Variables	National			Coastal Eastern			Inland Central & Western		
	Eq. (1)	Eq. (2)	Eq. (3)	Eq. (1)	Eq. (2)	Eq. (3)	Eq. (1)	Eq. (2)	Eq. (3)
Constant	-5.738 (-10.830)	-5.687*** (-8.938)	-4.624*** (-9.999)	-3.523*** (-4.188)	-2.905 (-3.28)	-3.303*** (-4.845)	-6.546*** (-10.239)	-7.329*** (-10.075)	-4.943*** (-8.122)
LOG(LATD)	0.034851 (1.419)	0.075** (2.571)	0.046** (2.531)	0.019 (0.507)	0.042 (1.072)	0.029 (1.205)	0.038 (1.245)	0.044 (1.262)	0.070*** (2.799)
LOG(PSP)	0.50822*** (6.189)	0.558*** (5.664)	0.502*** (6.210)	0.156 (1.392)	0.066 (0.563)	0.225** (2.257)	0.827*** (5.146)	1.300*** (7.924)	0.563*** (3.577)
LOG(FSSD)	0.499*** (9.059)		0.612*** (13.653)	0.262*** (3.420)		0.379*** (5.405)	0.509*** (6.178)		0.681*** (11.037)
DUMMY	0.048 (1.442)	0.045 (1.138)		0.130*** (2.831)	0.131*** (2.650)		-0.014 (-0.335)	-0.032 (-0.658)	
RLR <sub>(t-1)</sub>	0.047*** (2.678)	0.036* (1.717)	0.031* (1.900)	0.003 (0.115)	-0.018 (-0.672)	0.035 (1.536)	0.073*** (3.284)	0.094*** (3.675)	0.015 (0.721)
LOG(CBC)	0.423*** (4.118)	0.630*** (5.231)	0.420*** (4.006)	0.331** (2.318)	0.403*** (2.654)	0.366** (2.587)	0.246 (1.614)	0.165 (0.936)	0.406*** (2.618)
LOG(LOAN)	0.185*** (5.007)	0.376*** (10.267)	0.138*** (4.164)	0.495*** (7.158)	0.643*** (11.058)	0.400*** (6.239)	0.106** (2.450)	0.266*** (6.592)	0.073* (1.902)
LOG(FSWS)	0.182*** (5.500)	0.180*** (4.518)		0.111** (2.185)	0.102* (1.869)		0.250*** (6.097)	0.293*** (6.226)	
Hausman Test	24.872***	48.004***	0.000	0.000	0.000	9.262	27.146***	20.748***	34.285***
Adj.R <sup>2</sup>	0.988	0.982	0.986	0.982	0.978	0.981	0.988	0.953	0.985
DW	1.384	1.131	1.546	1.503	1.511	1.807	1.422	1.106	1.521
SSR	3.500	5.086	4.959	0.963	1.31	1.345	1.944	2.644	3.095
SER	0.139	0.167	0.153	0.120	0.129	0.131	0.135	0.157	0.156

Notes: \*\*\*, \*\*, and \* respectively denote 1%, 5%, and 10% significance level.



Referring to the result of testing Hypothesis Two, it is inferred that the “interest rate channel” is not operative in China’s real estate market.

The dummy viable representing credit condition from 2003 to 2010 is only significant in the eastern region. Credit condition is centrally important for developers’ access to bank loans. For instance, the stance of monetary policy often gets tight when the economy is overheated, which increases the difficulties for developers to finance their ongoing projects, given the booming demand for housing in the market. In general, the weak explanatory power of the dummy variable is due to the irresponsive attitudes of banks in their reaction to the central authority’s directives. Banks’ predispositions to real estate lending contradict the macro policy. There are positive rather than negative coefficients in the eastern regions. The findings reveal that developers in the market can maintain “exuberance access” to bank loans during 2003 to 2010, despite of the backdrop of tightening macro-monetary policy.

Housing builders are assumed to be the most affected when loan availability is tightened (Porterba 1984). The results show that property investment is positively and significantly related to credit supply. The testing results also reveal that the monetary effects are mainly dominated by loan availability rather than interest rates, when the coefficients are compared. In addition, the magnitudes of investment responses to loan changes are considerably different in the eastern region than on the national and inland levels. The coefficients of the loan variable of eastern region ranged from 0.4 to 0.64, indicating roughly 2 to 4 times of the inland levels. This finding reveals that the eastern region was affected more by the credit supply and monetary policy stances. Triangulated with findings from the Mann-Whitney test, the higher sensitivity can be safely explained by the higher reliance on bank loans. In general, the research findings reject Hypotheses Two and Three. Only “the credit channel” is functioning in the market, which helps to fulfill the goal of monetary policy. And the eastern coastal regions are more sensitive in terms of responses to monetary policy changes than the other inland regions.

## 7. CONCLUSIONS

This paper analyzes the regional difference in the credit dependence of real estate investment. By using panel data analysis, the impacts of credit channel and money channel on the real estate de-

velopment market have been investigated. There are four important findings: First, the tests indicate a significant heterogeneity across the different provinces, i.e., in general the more developed the real estate market is, the more dependent its investment is on bank lending. It is expected that the impacts of policy shocks are stronger on these cities. Second, an increase of interest rate seems to have positive effects in stimulating investments rather than exert a depressing influence as would be expected. The research outcomes demonstrate the dysfunction of monetary policy operation through interest rate tools. It can be expected that if the high interest rates persist, massive capital will continue to flood into the real estate market to seek for extraordinary returns. Third, shifts of real estate lending can positively affect property investment, which infers that control of banks’ lending activities can be a potentially effective approach to subdue real estate over-investment. Rising interest rate and rapid expansion of credit are attributable for the unbridled real estate investment expansion. It is important for the government to investigate how to improve the efficacy of policy enforcement and the implementations of credit rationings by the commercial banks. Fourth, although the monetary policy is uniformly employed across the country, the remarkable difference in the magnitudes of responses to policy shocks is a good reminder for the government to shift its concerns from national to local levels. Scholars and policy-makers should be fully aware of the potential heterogeneous effects of monetary policy on its implementation over different regions. This study has not investigated the dynamic response to policy shocks. This limitation may be addressed in future research by means of high-frequency data.

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## APPENDIX 1

## Overview of the credit control policies on the real estate industry from 2003–2010 in China

	Date	Bureau	Policies
I	Jun 2003	PBOC	“Directives to further improve the management of real estate credit” – The so-called “121 directives”.
II	Aug 2003	State Council	“Directives to improve the health and sustained development of the real estate industry” – The so-called “18 directives”.
III	Sep 2004	CBRC	“Guidance for commercial banks to improve risks management of real estate lending”.
IV	Mar 2005	State Council	“Directive to stabilize the housing price” – The so-called “Jiuguobatiao”.
V	May 2005	MOHURD	“Directives to stabilize the housing price” – The so-called “Xinguobatiao”.
VI	Aug 2005	CBRC	“Directive to improve the risk management of trusts investment”.
VII	May 2006	MOHURD, etc.	“Directive to stabilize the housing supply structure” – The so-called “Guoliutiao”.
VIII	Sep 2007	PBOC	“China Banking Regulatory Commission’s directive to improve management of the commercial real estate credit”.
IX	Jul 2008	PBOC	“Directives to use financial approaches to improve economical and intensive land use”.
X	Feb 2009	NDRC, etc.	“Directives to improve the healthy development of the real estate industry” – The so-called “131 directives”.
XI	May 2009	State Council	“Circular of the State Council on adjusting the capital propositions of fixed-asset investment projects”.
XII	Sep 2009	CBRC	“Directives to further improve credit management”.
XIII	Jan 2010	State Council	“Directives of the State Council to enhance stable and healthy development of the real estate industry”.
XIV	Jan 2010	CBRC	“Interim measures for the administration of working capital loans”.
XV	Apr 2010		“Premier Wen Jiabao presided the executive meeting to formulate measures intending to suppress the rapid growth of housing prices in specific cities” – The so-called “Xinguowutiao”.
XVI	Apr 2010	State Council	“Directives of the State Council to control the increase of housing price in some cities” – The so-called “Xinguoshitiao”.

Note: PBOC represents the People’s Bank of China; CBRC represents China Banking Regulatory Commission; MOHURD represents the Ministry of Housing and Urban-Rural Development; NDRC represents National Development and Reform Commission.

**APPENDIX 2**

The Z scores of credit relative to real estate enterprises' total fund in different regions in 2010

The description and classification of China's regional real estate market					
Eastern	Z scores	Central	Z scores	Western	Z scores
Tianjin	2.611	Hubei	0.524	Qinghai	0.955
Shanghai	1.54	Hunan	0.061	Chongqing	0.788
Beijing	1.46	Jiangxi	-0.117	Gansu	0.387
Guangdong	0.982	Anhui	-0.602	Guizhou	0.307
Jiangsu	0.55	Shanxi	-0.64	Ningxia	0.05
Zhejiang	0.532	Henan	-0.821	Sichuan	-0.215
Shandong	0.254	Jilin	-1.246	Shaanxi	-0.383
Hainan	0.245	Heilongjiang	-1.622	Xinjiang	-0.392
Fujian	0.175	Inner Mongolia	-1.732	Yunnan	-0.446
Guangxi	0.133			Tebit	-2.251
Liaoning	-0.382				
Hebei	-0.706				

**APPENDIX 3**

The Z scores of credit relative to real estate enterprises' total fund in different regions in 2003

The description and classification of China's regional real estate market					
Eastern	Z scores	Central	Z scores	Western	Z scores
Beijing	2.118	Shanxi	0.421	Shaanxi	1.529
Zhejiang	1.518	Hunan	0.195	Yunnan	0.994
Tianjin	1.474	Hubei	0.139	Ningxia	0.569
Jiangsu	1.151	Anhui	-0.471	Gansu	0.462
Liaoning	0.559	Henan	-0.569	Chongqing	0.269
Guangxi	0.419	Jiangxi	-0.574	Guizhou	-0.291
Guangdong	0.174	Heilongjiang	-1.043	Tebit	-0.333
Shanghai	0.134	Jilin	-1.807	Sichuan	-0.478
Shandong	-0.257	Inner Mongolia	-2.354	Xinjiang	-0.531
Fujian	-0.409			Qinghai	-0.621
Hainan	-1.02				
Hebei	-1.366				