

The Residential Real Estate Market in China: Assessment and Policy Implications*

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China's real estate market rebounded sharply after a temporary slowdown in 2014-2015. This paper uses city-level data to estimate the range of house price overvaluation across city-tiers and assesses the main risks of a sharp housing market slowdown. If house prices rise further beyond "fundamental" levels and the bubble expands to smaller cities, it would increase the likelihood and costs of a sharp correction, which would weaken growth, undermine financial stability, reduce local government spending room, and spur capital outflows. Empirical analysis suggests that the increasing intensity of macro-prudential policies tailored to local conditions is appropriate. The government should expand its toolkit to include additional macro-prudential measures and push forward reforms to address the fundamental imbalances in the residential housing market.

Key Words: China real estate market; Housing bubbles; Macro-prudential policy.

JEL Classification Numbers: E43, E52, E58, F32, R31, C11, C32.

1. INTRODUCTION

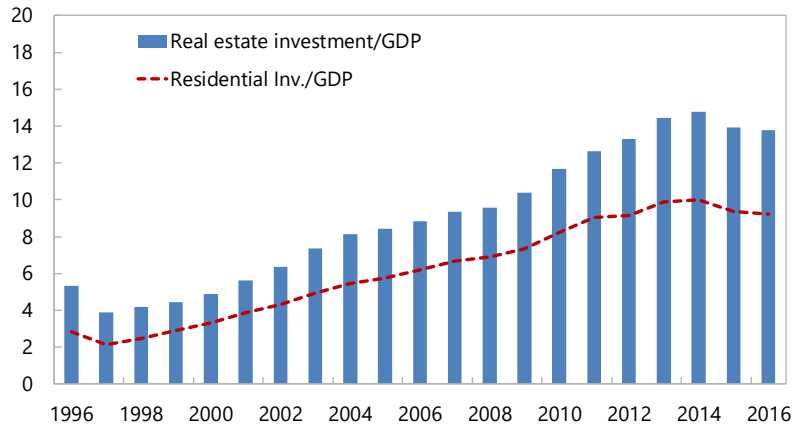
After a temporary slowdown in 2014-2015 China's real estate market rebounded sharply in 2016. As signs of overheating emerged, the government turned to tighten real estate markets through a range of macroprudential and administrative measures. Many empirical studies point out that the house price surge is driven by fundamentals, while others consider the pickup of real estate activity is unsustainable (Fang et al. [2016], Glaeser et al. [2016], and Shi [2017]). This paper uses city-level real estate data to estimate the range of overvaluation of real estate markets across city-tiers, and assesses the main risks of a real estate slowdown and its impact on economic growth and financial stability.

Real estate has been a key engine of China's rapid growth in the past decades. Figure 1 shows that real estate investment grew rapidly from about 4 percent of GDP in 1997 to the peak of 15 percent of GDP in 2014, with residential investment accounting for over two thirds of the total real estate investment. Bank lending to the sector makes up 25 percent of total bank loans, about half of all new loans in 2016, and banks' increasing exposures to real estate, including through property developers and household mortgages, may pose financial stability concerns. Real estate also has strong linkages to upstream and downstream industries (about a quarter of GDP is real-estate related).¹ In addition, land sales are a key source of local public finance, accounting for about 30 percent of local government revenue in 2016, while general government net spending financed by land sales is about 9 percent of the headline revenue in 2016. There has been a rapid expansion of government subsidies on social housing, consisting of nearly 6 million apartment units in 2015-2017.

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¹See Huang, Wu, and Du (2008). Real estate has strong linkages with upstream industries such as cement and steel sectors and downstream industries such as autos, electronics and furniture.

FIG. 1. Real Estate Investment (in percent of GDP)

Sources: CEIC and National Bureau of Statistics (NBS).

Real estate markets vary significantly in China because of its large economic size, economic and social diversity, and fragmented local government policies. The real estate cycles tend to be more pronounced in top-tier cities in terms of price volatility, but they account for a small fraction of real estate inventory and investment.² Smaller cities constitute over half of residential real estate investment, but the price increase on average was much lower during 2013-16 (Table 1).³

TABLE 1.
Tier-1 Cities Catch the Most Attention but Account for a Small Share
of Real Estate Markets

(in percent of total)	2016			2013		
	Tier	Tier	Tiers	Tier	Tier	Tiers
	1	2	3 & 4	1	2	3 & 4
Residential property sales (floor space)	7	55	38	9	53	38
Residential property sales (value)	21	54	26	29	52	20
Inventory (floor space of unsold units)	10	54	36	8	63	29
Real estate investment	8	33	59	7	31	62

Source: National Bureau of Statistics, Local housing bureaus, and IMF staff estimation.

²The real estate sector usually classifies Chinese cities into four tiers. Tier-1 consists of metropolitan cities including Beijing, Shanghai, Shenzhen, and Guangzhou. Tier-2 cities are usually provincial capitals, while Tiers-3 and 4 include smaller cities.

³The empirical study by Huang, Jin, and Zhang (2016) reveals the periodical behavior of the housing price growth across 70 major Chinese cities.

Distortions render China's property market susceptible to both price misalignment and overbuilding. On the supply side, the market is distorted by local governments' control over land supply and their reliance on land sales to finance spending. On the demand side, the market is prone to overvaluation housing is attractive as an investment instrument given a history of robust capital gains, high savings, low real deposit interest rates, a lack of alternative financial assets, as well as capital account restrictions.

The government has closely monitored real estate activity given its importance in the economy. Policies are highly decentralized, with local governments (often with local branches of the financial regulators) deciding land sale and infrastructure development, granting construction and sales permits to developers, and setting purchases restrictions. The central government and financial regulators can also affect the housing market through financing conditions and macro-prudential tools for mortgage lending.

In this paper, we summarize some recent developments in China's real estate market, including the price movements, property sales, real estate investment, housing starts, inventory, mortgage credit growth and so on. We then analyze the risks in the real estate market. We find that risks are significant on the downside. Given the mild recovery in investment, robust underlying demand in major cities, and still solid household balance sheets, the impact should be contained, especially if the government acts promptly. If house prices rise further beyond "fundamental" levels and the bubble expands to smaller cities, it would increase the likelihood and costs of a sharp correction, which would weaken overall growth, undermine financial stability, reduce local government spending room, and spur capital outflows.

The potential risks involved in the nationwide house price rise have drawn the attention of policy makers. The Chinese government has taken a range of measures to curb the rapid house price growth. Using a panel data for 70 major cities between 2005 and 2016, we assess the effectiveness of these tightening measures taken by the government. Our estimation indicates that changes to down payment requirements have been effective in dampening house price cycles especially in tier 1 and 2 cities. A multinomial logit regression is conducted to determine the factors that lead to down payment policy adjustments. We find that the government is more likely to adjust the down payment policy especially in response to price fluctuations in tier 2 cities. Besides changes in house prices, inventory, total credits and mortgage rates are found to have significant impacts on the likelihood of tightening or loosening down payment requirement.

Based on the empirical results, we discuss about the government real estate policies. First of all, the increasing intensity of macro-prudential and city-specific policies seems appropriate, given the diversity in housing conditions, and should continue to be deployed to ensure a smooth adjustment.

Secondly, the government should also expand its toolkit to include macro-prudential measures that have proven to be effective in other countries to complement the existing tools, including more active use of the DSTI (debt servicing to income) caps and capital requirement on banks' exposure to the real estate sector. Finally, a longer-term solution to better manage the frequent house price cycles is to introduce recurrent property taxes, resolve land supply constraints in major cities, mitigate local government reliance on land sales, and accelerate reforms of the social security and "hukou" systems. Policies should be more market oriented and less dependent on administrative measures such as home purchase restrictions and funding restrictions that tend to have abrupt impact on the market.

The remainder of the paper is organized as follows: Section 2 presents the housing market cycles and the recent developments of China's Real estate market. Section 3 analyzes the risks of a housing market correction and its potential impact. Section 4 conducts the empirical analysis. Section 5 provides policy implications and concludes.

2. HOUSING MARKET CYCLES AND THE RECENT DEVELOPMENTS

After a temporary slowdown in 2014-2015 the real estate market rebounded sharply, following progressive policy easing by the government to stimulate the housing market and economic growth more broadly. Measures included loosening financing conditions through lower down-payment requirements and mortgage rates, housing-related tax cuts (both capital gains tax and stamp duties), and greater subsidies for social housing.⁴ Market sentiment was also motivated by official guidance to encourage household leverage. In June 2016, the State Council announced that "the public and household sector can leverage up to some extent to help deleverage the corporate sector", a statement widely interpreted as easing signals for the housing market.

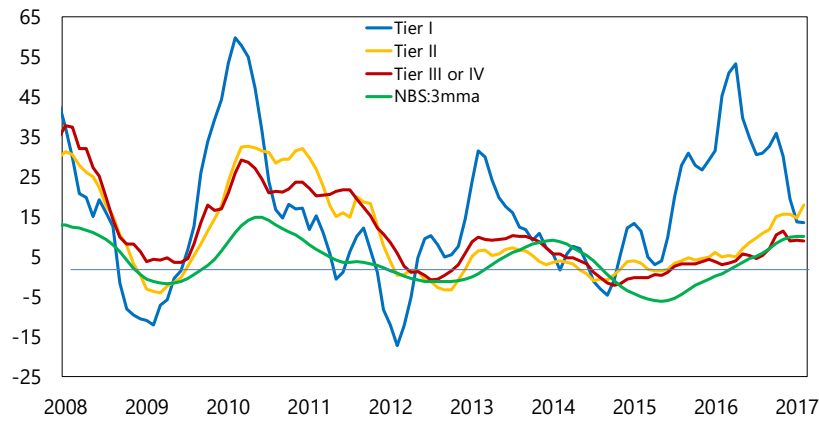
Real estate cycles. China has undergone frequent cycles in real estate markets under a long-term upward trend over the last decade. We identify easing and tightening periods, with peaks and troughs, on year-on-year

⁴In September 2015, the minimum down payment for first-home buyers was lowered from 30 per cent to 25 per cent and a further discretionary cut of 5 percentage points was authorized. Minimum down payments on second properties were reduced from 60-70 per cent to 30 per cent over the same period. Benchmark lending rates have been cut by around 165 basis points since late 2014, and the average effective mortgage rate has fallen by more relative to these benchmarks. Property transaction taxes were reduced and targeted subsidies were provided for certain types of home buyers.

growth of sales, prices, and inventory momentum (Table 2).⁵ For example, the three easing cycles between 2007 and 2016 had an average of about 1-1.5 years in duration and all were affiliated with strong cumulative price and sales growth and an unwinding of inventory. On the other hand, tightening cycles were often associated with a fall in sales growth and a more modest growth in prices. The last cycle in 2015-16 saw a much stronger uptick for top-tier cities in prices (Table 2).

Prices. The price rally in the most recent cycle was concentrated in tier-1 cities, while nationwide prices increased more moderately. Figure 2 shows that the nationwide 70-city new residential property price has risen by about 10 percent y/y in nominal terms in June 2017 (8.5 percent in real terms, 13 percent weighted by population, and 16 percent weighted by sales value at city-tier levels), which represents a moderation in sequential terms from the peak during the summer of 2016. Across city tiers, prices surged in tier-1 cities by as much as 55 percent y/y in early 2016 according to local housing bureau data, higher than the peak of the last easing cycle in 2013. Prices in tier-2 cities also increased by about nearly 20 percent y/y at the peak, while the rise has been more modest in lower tier cities.

FIG. 2. Residential Real Estate Price by Tier
(In percent, year on year growth, 3 month moving average)



Sources: Local Housing Administrative Bureaus and IMF staff calculations.

Property sales. Strong real estate sales were recorded across all city-tiers, rising by 22.5 percent y/y in 2016 and 16 percent in the first half of 2017. In fact, the majority of the sales rebound in terms of floor space and to a lesser extent in terms of value has been in lower tier cities in this

⁵The timing and duration of the cycles are based on levels of peaks and troughs of y/y growth in price, sales, and change of inventory ratios. Some judgment is applied as these series are not necessarily synchronized at the timing of different indicators.

TABLE 2.

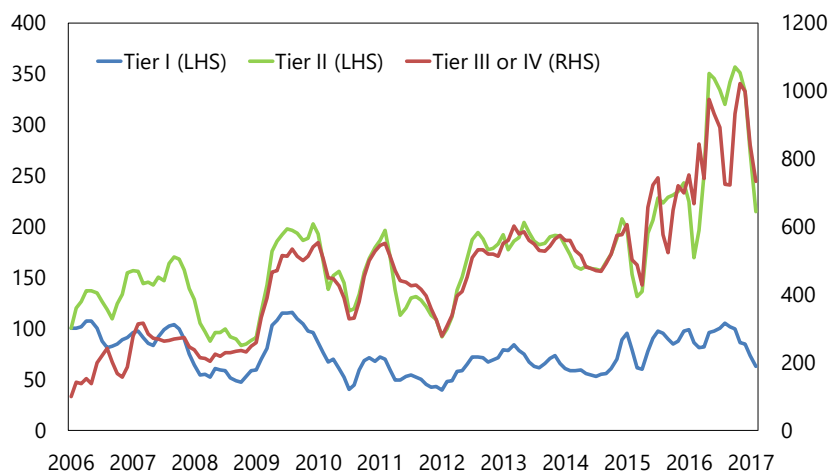
Real Estate Cycles during 2007-2016						
	Jun 07	Mar 09	Jan 11	Apr 12	Oct 13	May 15
	Feb 09	Jun 10	Mar 12	Sep 13	Apr 15	Aug 16
Real estate cycles	Tightening	Easing	Tightening	Easing	Tightening	Easing
Peak	-	Apr 10	-	Mar 13	-	Apr 16
Trough	Jan 09	-	Mar 12	-	Mar 15	-
Duration (in months)	19	9	13	18	16	15
A. Cumulative change between peaks and troughs						
Real estate prices (in percent)						
NBS (nationwide 70 cities)	10	6	2	6	-2	5
Local Housing Bureaus	21	23	6	16	10	20
<i>of which: Tier 1 cities</i>	9	45	-12	32	12	50
<i>of which: Tier 2 cities</i>	18	21	4	10	6	18
<i>of which: Tier 3 / 4 cities</i>	30	21	10	17	16	12
Property sale volume (in percent, floor space sold)						
NBS	11	215	-26	119	-23	43
Local Housing Bureaus	-37	40	-45	60	-13	51
<i>of which: Tier 1 cities</i>	-36	19	-33	33	11	36
<i>of which: Tier 2 cities</i>	-40	42	-47	65	-19	66
<i>of which: Tier 3 / 4 cities</i>	-4	39	-44	56	-8	11
Inventory: floor space unsold (in percent)						
Local Housing Bureaus	43	-30	52	0	49	-19
<i>of which: Tier 1 cities</i>	33	-31	21	-27	48	-17
<i>of which: Tier 2 cities</i>	53	-31	63	9	38	-25
<i>of which: Tier 3 / 4 cities</i>	42	7	62	-3	75	-10
Inventory to sale ratio (in months)						
Local Housing Bureaus	15	-11	20	-13	10	-11
Mortgage rates (in percent)	-	0	1.1	-0.5	-0.8	-1.2
B. Average growth during the cycles (in percent)						
Real estate fixed asset investment growth (in percent y/y)	28	15	31	15	12	2
C. Deviation from HP-filtered trend						
Real estate prices (at peaks / troughs)	-14	8	-5	6	-8	7
Real estate fixed asset investment (average across the cycle)	-5	7	-6	2	-4	3

Sources: NBS, Local Housing Administrative Bureaus, and IMF staff estimation.

Note: The time of the real estate cycles is based on data on sales, prices, and inventory on a 3-month moving average basis. Judgement was applied to determining the timing of the cycles because the peaks and troughs of growth in sales and prices are not necessarily synchronized.

upturn, thanks to credit easing and government measures to unwind excess inventory (Figure 3). Surveys also indicated that almost half of the buyers who bought in the last 12 months brought forward their purchase decision in response to favorable market conditions and expectation of further tightening measures (Wright et al. [2016]). Total sales in this easing cycle have reached near 1.6 billion square meters since May 2015, well beyond the previous peak of 1.3 billion in 2012-13 (Table 2).

FIG. 3. Floor Space Sold by Tier
(Jan 2006 = 100, S.A., 3 month moving average)



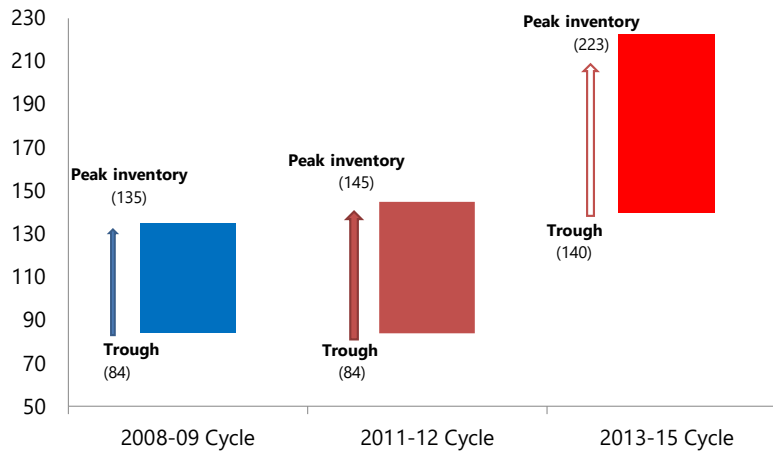
Sources: Local Housing Administrative Bureaus, Wigram Capital Advisors, and IMF staff calculations.

Real estate investment and housing starts. Real estate investment reversed the decelerating trend (with a trough of 1.2 percent y/y in December 2015), albeit much more mildly relative to previous upturns (Table 2). Real estate investment follows generally a six to nine-months lag after price and sales recover and therefore is expected to rise before moderating, if the recent moderation in prices takes hold. Overall, real estate investment currently stands at about 10 percent of GDP, below the historical peak level at 15 percent of GDP in 2014.

Inventory. Strong sales coupled with soft housing starts have led to a rapid destocking across all city-tiers, with a few city exceptions in the Northeast that continued to face significant oversupply. The nationwide housing inventory ratio (measured by unsold units to annualized sales) has declined sharply to about 18-20 months from 30 months at the peak in 2014 (Figure 4), but the unsold volume in square meters remains higher than in previous cycles. Inventory levels varied significantly across city-tiers:

- **Tier-1** cities had no excess inventory to start with in 2014 before sales surged. Supply conditions remain tight with unsold units persistently below a year of sales.
- **Tier-2** cities have seen a notable decline of inventory ratios from its peak, with major ones (e.g., Nanjing, Hangzhou, and Xiamen) starting to face tight supply with limited new real estate completions.
- The large stock of inventory in **tier-3 and 4** cities from previous overbuilding has gradually unwound, partly driven by supportive measures and the shifting focus of the government's social housing initiatives to buying existing properties from developers.

FIG. 4. Real Estate Inventory Development
(Build-up of inventory from starts to peaks, Jan 2007 = 100)

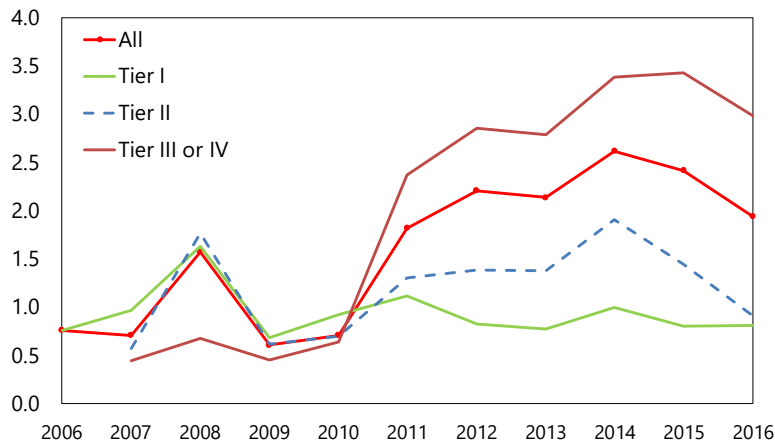


Sources: Local Housing Administrative Bureaus and IMF staff calculations.

The inventory ratio has come down from its peak of 3.5-4 years to now at about 2.5-3 years as of the first half of 2017, which however was still higher than pre-2013 levels and the size of floor space unsold has remained high. For example, some cities in the northeast region continue to face high inventory levels. Overall, the recent round of property upturn differed somewhat from previous real estate cycles, with the investment rebound slower and more modest, and the price surge largely concentrated in tier-1 and a few tier-2 cities. (Figure 5)

Mortgage lending. The strong rebound in the housing market was correlated strongly with the growth of mortgage credit, partly driven by easier financing conditions. Banks saw an unprecedented rise of the mortgage share in total new bank loans from 20-30 percent in 2013-2015 to nearly 50 percent in 2016, with the annual growth rate of mortgage loans

FIG. 5. Residential Real Estate Inventory Ratio by Tiers



Sources: Local Housing Administrative Bureaus, Wigram Capital Advisors, and IMF staff calculations.

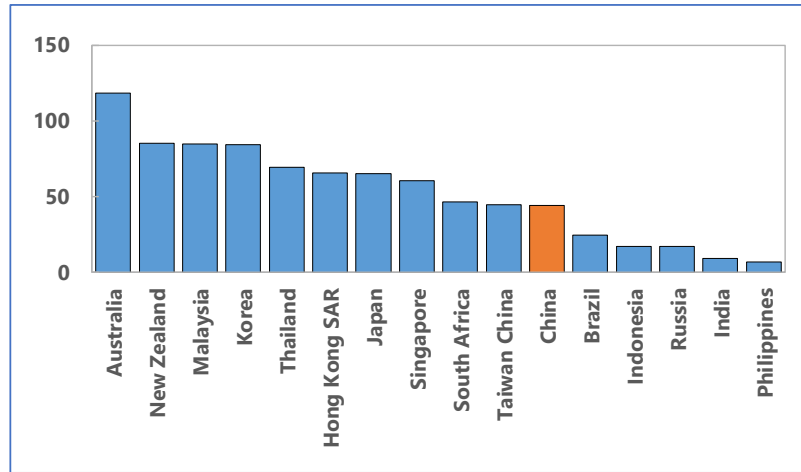
Note: Inventory is measured as floor space unsold. Inventory ratio is measured as floor space unsold/sold.

doubling from 17 percent in 2014 to 35 percent y/y. Down payment ratios have remained high for new mortgages (40 percent of buyers of a first home have a down payment ratio of 25 percent or higher), but the average loan-to-value ratio, calculated as net new mortgage to property sales ratio, has increased from less than 15 percent in 2012 to 48 percent in 2016, suggesting that buyers, particularly first-time home buyers, are using more leverage to purchase properties.⁶

Household balance sheet. Households balance sheets have remained robust, though buffers are eroding. The rapid growth of mortgage borrowing has contributed to an increase of household debt from less than 20 percent of GDP in 2008 to 46 percent by the end of 2016, with mortgages accounting for more than half of outstanding household debt. Although this ratio is still far below the average OECD level of 102 percent of GDP, it is already higher than in some other large emerging economies and economies in Asia.⁷ (Figure 6)

⁶Banks' mortgage rates are usually determined at a discount or premium of 0-15 percent below or above the benchmark lending rate set by the central bank. Banks have the discretion to adjust the discount or premium based on market conditions. Most mortgage contracts have fixed rates for about 10-20 years based on the benchmark lending rates.

⁷Granular data on household debt are not available across household groups (income and age) or regions to provide finer assessment on the soundness household balance

FIG. 6. Household Debt as proportion of GDP across countries (2016)

Sources: OECD, CEIC, Haver Analytics, and IMF staff estimations.

Land supply. Limited land supply particularly in top-tier cities also contributed to the strong rebound of real estate prices (Wu, Gyourko and Deng [2016]). Land sales volume (measured in terms of floor space) by local governments to residential developers has contracted by half since 2014, despite the recent recovery of land sales value this year.

Emerging signs of speculation. Emerging signs of speculation have appeared in the top-tier cities. Market surveys suggest that about 18 percent of residential home sales in 2016 were related to investment demand (buyers of second homes), doubling the average level of 6-10 percent between 2012-2015. This would imply about 10-15 percent of new mortgage borrowing are from buyers of second homes, considering their higher mortgage rates and down payment ratios.⁸ Household mortgage leverage could be even higher if we take into account down payment loans provided by real estate developers or via shadow banking loans, for which no data are available. There is also anecdotal evidence of speculation/excess exuberance, for example, the divorce rate in Shanghai jumped to bypass expected purchase restrictions, while in Shenzhen there were reports of buyers borrowing from real estate agents to finance the down payment for second homes.

sheets. Other alternative indicators such as household debt to income ratio and service capacity are relatively scarce without full time series for cross-country comparison.

⁸Our estimates are based on down payment ratios and real estate sales from 355 bank lending surveys.

Recent tightening measures. As signs of overheating emerged, the government took a range of measures, differentiated across cities (Table 3). Key measures include:

- **Tighter down-payment requirements.** Several tier-1 and 2 cities have tightened down payment requirements for home purchases to at least 30 percent and even higher for second homes, often at 50-70 percent.

- **Home purchase restrictions.** Local governments have reintroduced or reinforced purchases restrictions for non-local residents and for second or third homes in the tier-1 and 2 markets, largely targeted to speculative demand.

- **Financing restrictions.** Financial regulators have increasingly restricted the use of shadow funds and informal lending to finance property developers or the down payment of marginal buyers. They also have tightened significantly bond issuance for property developers. At the same time, the government provided window guidance to banks to limit mortgage lending and enforce better the down payment and collateral requirements.

- **Land supply.** A number of local governments also tightened land bidding requirements to prevent developers from excessive bidding by raising deposit requirements and hoarding of undeveloped land. Some cities (e.g., Tianjin) also considered applying greater flexibility on land use rights in a targeted manner, for example, by relaxing restrictions on land density and by converting land of commercial use to residential use.

- **Others.** The central government also signaled policy intentions to anchor public expectations. For example, recent remarks by officials have warned of a real estate market bubble and indicated the government's priority on reining in asset price risks.

TABLE 3: Recent Real Estate Market Tightening Measures

Date	Measures	Nation- wide		City-Tier	
		1	2	1	2
	Home purchase restriction				
Mar 16	Top tier cities required nonresidents to have a minimum of 3-5 years of social security contributions to be eligible for real estate purchase.				
Aug 16	Two tier-2 cities (Suzhou and Xiamen) reinstated purchase restrictions.			✓	✓
Oct 16	14 cities tightened home purchase requirements, including stricter criteria for nonlocal buyers and setting the maximum number of homes a person can buy.			✓	✓
Nov 16	Tier 2 cities restricted nonlocals to buy second homes if they have properties in Tier 1 cities.				✓
Nov 16	20 Tier 1 and 2 cities were on the watch list for real estate prices by the government.			✓	✓
	Down payment requirements				
Mar 16	Tier 1 cities (Shanghai and Shenzhen) raised the down-payment ratio to 40-50% for second homes.			✓	✓
Jun 16	Tier 2 city Hefei increased down-payment requirement for 40-60% for second and third homes and restricted the use of housing provident fund for mortgages.				✓
Aug 16	Several cities started to raise the down payment requirement.				✓
Oct 16	Fifteen cities increased the down payment requirement, e.g., to 70% for second homes purchase in Tier 1 cities, or tighten the use of housing provident funds.			✓	✓
	Financing restrictions				
Mar 16	Financial regulator prohibited the lending by peer-to-peer (P2P) platforms and real estate agents for down payment of buyers.		✓		
Jul 16	CSRC prohibited the financing of real estate developers in excessive land bidding or bank loan repayments.		✓		

Continued on next page

TABLE 3 – continued from previous page

Date	Measures	Nation- wide		City-Tier	
		1	2	1	2
Oct 16	PBC provided window guidance to 25 local banks on their mortgage lending.		✓		
Oct 16	Financial regulators (CBRC, CSRC, PBC) restricted developers' funding via entrusted loans and brokers' asset management programs.	✓			
Oct 16	Bond issuance threshold was raised for real estate developers.	✓			
Oct 16	CSRC and NDRC tightened direct financing for real estate developers on bond issuance in onshore and offshore markets.	✓			
Nov 16	PBC Shanghai tightened scrutiny on property-related lending. Banks enforced strictly on the minimum down-payment ratio. About 60% of buyers had more than 30% down payment in October.			✓	
Nov 16	NDRC prohibited developers to issue enterprise bond for nonsocial housing projects.	✓			
	Land supply				
Jun 16	Tier 2 city Hefei planned to raise land supply and strengthen the land-bidding mechanism.				✓
Jul 16	Land and Development Bureau of Anhui province required land to be developed within two years after sales.				✓
Aug 16	Tier 2 city Suzhou tightened regulation on land-bidding and planned to increase land supply over the next three years.				✓
Oct 16	Developers were again required to increase supply of mid-sized apartments in Tier1 cities.			✓	
	Several cities committed to raise land supply for residential use.			✓	✓
	Some cities required the reporting of selling price for newly-constructed properties prior granting sale permits.				✓
	Some Tier 2 cities raised the land-bidding deposit requirement and set price ceilings for land auction.				✓

Sources: Government documents and media reports.

The tightening measures have had an impact on real estate markets, as evidenced by the moderation in price rises especially in sequential month-on-month basis, new mortgage loans, and real estate sales. Our empirical analysis also indicates that changes to down payment requirements have been effective in dampening price cycles (see Section 4).

3. RISKS OF A HOUSING MARKET CORRECTION AND THE POTENTIAL IMPACT

3.1. Risks of a sharp correction in the housing market

The main near-term risks of the real estate market are the housing bubble in top-tier cities expanding to smaller cities, increasing the likelihood and costs of a sharp correction in house prices. This in turn would weaken growth through slowing real estate investment and private consumption, and pressure financial stability via developers' funding and mortgages of financial institutions. The standard metrics does indicate some overvaluation in the residential market, especially in the large cities.

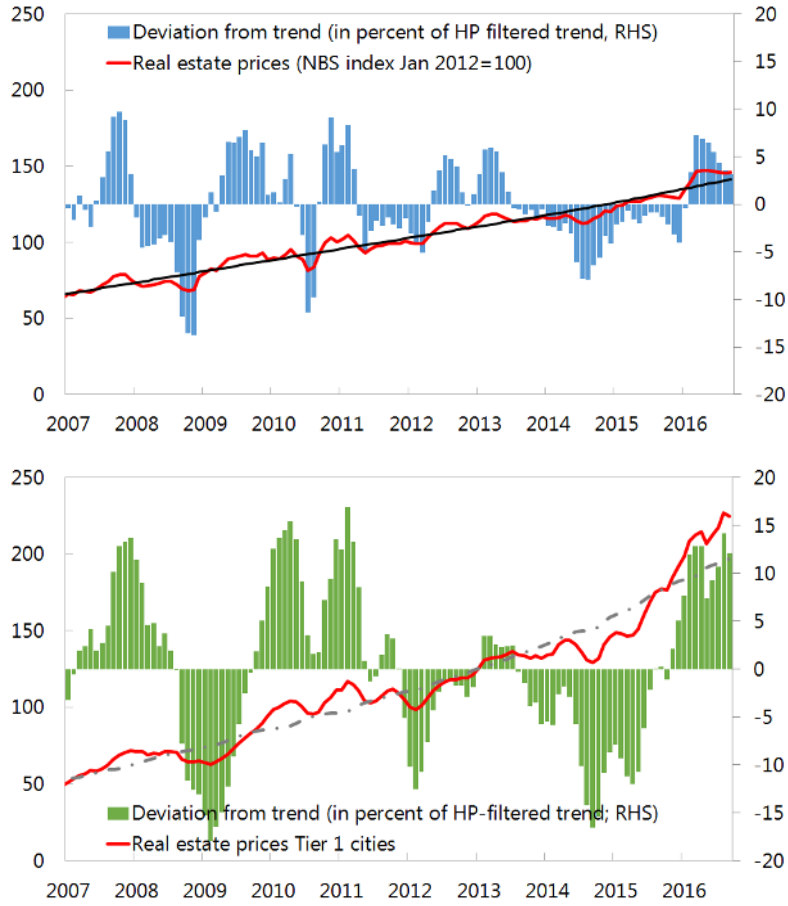
- **Price trend.** Overall nationwide house prices deviate only some 5 percent from their long-term trend (based on HP filtering) and the deviation is broadly similar to previous cycles. However, the deviation for large tier-1 cities is much greater at about 10-15 percent (Figure 7). Previous cycles that saw this level of deviation from trend usually ended with a slowdown in real estate activity.

- **Affordability.** Affordability in terms of price-to-income ratio has deteriorated over the past year, but mainly in the large cities, where house prices stood at over 15-25 times of city-level disposable household income, on par with international major cities. The national average price-to-income ratios have been declining steadily since 2010 and is about half of that in the large cities.⁹ At the same time, rental cost also rose to over one-third of household disposable income but remained low relative to house prices (rental yields for tier 1 cities have been low at less than 3 percent).

- **Debt service to income.** Household debt servicing capacity improved due to lower mortgage rates and rising household income. Successive cuts to benchmark rates since 2014 and the revival of discounted rates on mortgages (10 percent lower than the benchmark rate) have reduced monthly mortgage burden. The effective mortgage rate was 4.49 percent (and 5.4 percent for second-home buyers) in March 2017, about 160 basis points lower than in early 2014. However, aggregate nationwide measures

⁹National average income may not be the best indicators given the unusually wide distribution of labor and household income in China (see IMF [2017]).

FIG. 7. House Price Deviation from Trends
(Property price index: Jan 2012 = 100, 3-month moving average)



Sources: CEIC, NBS, Local Housing Administrative Bureaus, and IMF staff calculations.

Note: The upper panel shows the aggregate house price deviation from trend and the lower panel shows the price deviation for Tier-1 cities.

may have masked the deterioration of debt-service for some new buyers in top-tier cities.

Prices for top-tier cities are increasingly frothy with the sharp rise in prices and deteriorating affordability. Outside of tier-1 and a few tier-2 cities, price deviates little from long-term trend. The sharp gains in tier-1 prices have been partly driven by fundamentals (e.g., limited land supply,

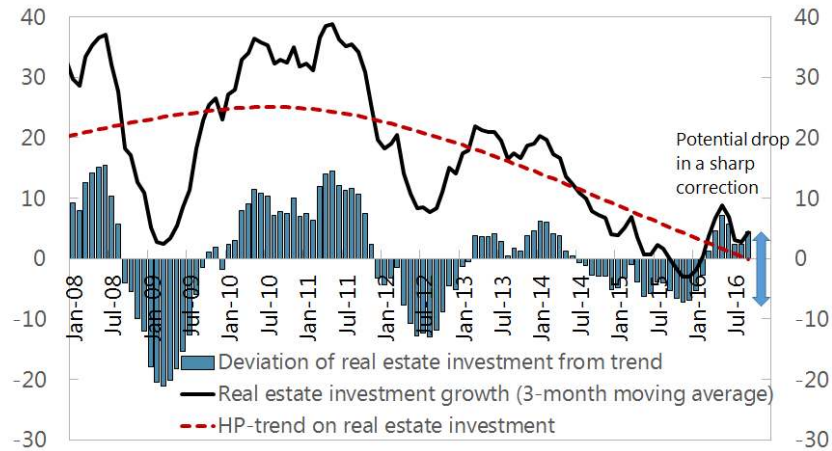
expectation of strong income growth, and ongoing urbanization), though the extent of their contribution to price gains is uncertain. Other recent studies also suggest that the current price level could be consistent with future income growth and limited land supply (Glaeser et al. [2016] and Shi [2017]).

3.2. Impact on economic activities

Growth impact. Although nationwide prices do not seem overvalued as indicated by trend analyses, the recent surges in prices of major cities and mortgage borrowing are unsustainable. Various distortions in China’s real estate market also make it sensitive to policy changes. There is a risk that aggressive attempts to cool house prices could trigger a sharp correction and wider adverse effects. A correction of house prices by 10-15 percent from currently 5 percent above the long-term trend to about 5 to 10 percent below trend (roughly the magnitude in previous cycles) would affect the macro-economy and financial stability through the following channels:

Real estate investment. A sharp price decline would generate a downward spiral on real estate investment, which could put the current above-trend level to the previous trough level, possibly slowing fixed asset investment by about 11 percentage points or about 6 percent in growth of real estate gross fixed capital formation in the national accounts (Figure 8). As residential real estate contributes roughly 9.5 percent of GDP, estimates suggest that the deceleration of real estate investment growth alone would reduce GDP growth by 0.6 percentage points. Upstream sectors, such as steel, cement, and construction machinery, would be more affected.

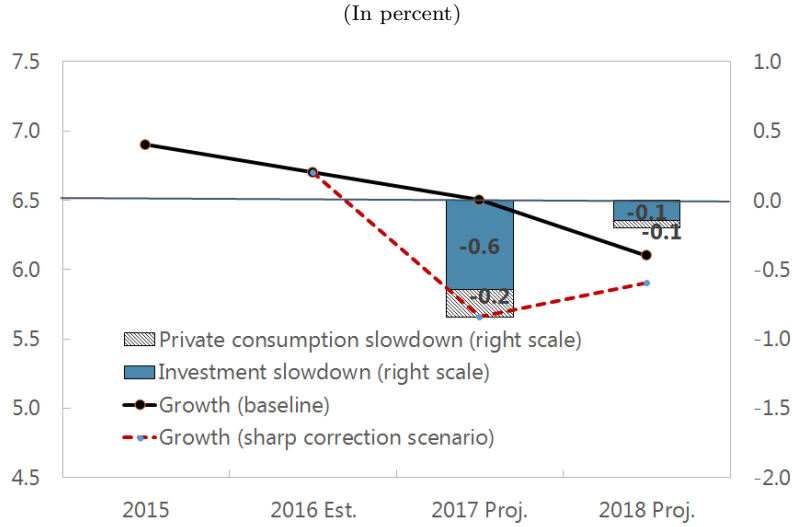
FIG. 8. Real Estate Investment Cycles Facing a Downward Trend
(In percent, year on year growth of real estate investment)



Sources: CEIC and IMF staff estimation.

Private consumption. Changes in house prices could affect household consumption through two main channels: a direct wealth effect and a collateral effect (Flood and Morin [2008]). Given that mortgage refinancing and home equity loans are few in China, the wealth effect is the most important channel through which a price correction would impact consumption, particularly on downstream industries such as autos and electronic appliances. Based on cross country estimates of long run propensity to consume out of housing wealth (e.g., Flood and Morin [2008] and IMF [2008]), a correction of house prices by 10-15 percent is likely subtract 0.1-0.2 percentage points from growth in 2017-18 (Figure 9).¹⁰ Combined with the investment impact, this would reduce growth by some 0.9 percentage points. At the same time, a sharp decline in house prices could dampen confidence in other asset prices. On the other hands, the house price movements also have an impact on the household consumption behavior. Jiang, Sun and Webb (2013) finds that house price appreciation increases non-durable goods consumption of older homeowner. But they are reluctant to reduce their consumption when house prices fall.

FIG. 9. Adverse Growth Impact from a Sharp and Sudden Real Estate Price Correction



Sources: CEIC and IMF staff estimation.

¹⁰The IMF's Global Macro-Financial Model (Vitek [2015]), a structural macro-econometric framework, estimated that a 10 percent reduction of house prices in China driven by a housing risk premium shock can generate a peak output loss of 0.63 percent, considered in isolation. (This estimated peak output loss ranges from 0.40 to 1.05 percent across economies.)

Fiscal impact. An additional channel through which a price correction could affect the macro-economy is local government financing. Local governments have relied heavily on land sales revenue to finance their spending. According to Nitikin, Shen, Wang and Zou (2012), the land transfer total sale price increased from 241.68 billion RMB in 2002 to 1221.67 billion RMB in 2007, and land transfer local government revenue has also experienced significant rise to 454.14 billion RMB in 2007. A sudden sharp correction in prices would weaken local public finances significantly. Even if local governments manage to maintain prices by restricting land supply, tighter government spending would have knock-on effects on growth (IMF [2015]).

Capital outflows. Against the weakening growth trend, the property market has stood out as an asset class that offers continuous positive returns to investors, especially given the recent equity market correction and moderation in bond prices. A sharp weakening of the property market may trigger capital outflows as households switch to foreign assets, adding to depreciation pressures. The pressure could intensify if compounded with weakening growth momentum and a strengthening of the dollar as the result of Fed tightening.

3.3. Impact on financial stability

A sharp correction in the housing market may also pose risks to financial stability through the following channels:

Banking sector. The direct exposure of the banking sector to the real estate market is moderate; household mortgages and loans to property developers represent a total of 15 percent of bank assets. Bank loans to corporates that are collateralized by property or land make up another 10 percent of banks' total assets. China's high savings rate and the relatively large minimum down payment requirements for mortgages mean that households in the aggregate are not highly leveraged, and the possibility of repossession and liquidation is low. But the buffers have eroded for the following reasons.

- *Mortgage delinquency.* Housing credit has increased sharply relative to the value of property sales, suggesting that buyers, especially marginal ones, are using more leverage to purchase property.¹¹ On the other hand, the mortgage default rate has been low in China, possibly reflecting the fact that all household mortgages are recourse loans (Fang et al. [2016]).

- *Linkages with nonbank finance.* Property developers often raise funds outside the banking sector, but the banks are ultimately intermediating

¹¹Data on the distribution of mortgage loans by household income and creditworthiness are not available.

much of this lending and so are also exposed to this risk indirectly (discussed below).

- *Collateral devaluation.* A sharp market correction may also result in revaluation of land and properties that many commercial lending uses as collateral.

- *Concentration risks.* Property sales in the top five provinces (Guangdong, Jiangsu, Zhejiang, Shandong and Shanghai) accounted for 44 percent of the national total, indicating possible concentration risk of banks' loan books.

- *Capital outflows* could put banks and bank-sponsored WMPs under liquidity pressure. The maturity transformation currently performed by the system could unravel, resulting in fire sales of assets, a rise of counterparty risk, and corporate bankruptcies.

Shadow banking sector. In the event of a sharp market correction, shadow bank products that are exposed to the property market may face redemption as they cannot meet the expected returns for investors. Default rates would rise for borrowers that are dependent on shadow bank products as a source of funding as they come under liquidity/cash flow pressures. Liquidity pressure could also cascade down the intermediation ladder, reaching banks and other nonbanks, as well as nonfinancial borrowers. Banks will also have reputational losses more specifically, banks would need to “buy” off balance sheet assets (of deteriorating quality) from shadow products to keep redeeming investors' claims. The recent upswing in household credit has been accompanied by reports of less creditworthy borrowers entering the housing market by obtaining credit through informal channels (such as peer-to-peer lending) to finance down payments. This raises both the risk of loan defaults and the potential size of any financial losses in the event that prices fall significantly.

Real estate developers. Given the large stock of unsold properties especially in lower-tier cities, any slowing in demand from current levels would pose potential risks for property developers.

- Smaller developers are particularly leveraged they often fund land purchases using borrowed funds from shadow banks with the land as collateral and do not have the alternative funding sources that some of the top developers can access (e.g., offshore borrowing and funding from parent companies). A sensitivity analysis by the Deutsche Bank (2016) indicates that a 10 percent decline in housing sales would result in an increase in debt-to-EBITDA ratio of the lowest quartile developers by 14 percentage points to 74 percent, while the top quartile developers will only see an increase of 2 percentage points. Smaller, local and unlisted banks are particularly exposed to the weak real estate developers via both bank loans and shadow funding.

- Large real estate developers would face significant refinancing pressure starting from 2018. Onshore and offshore bond maturing would increase from \$5 billion in 2017 to \$10 billion in 2018 (and \$30 billion by 2020). RMB depreciation would add to the cost of refinancing.

Given these potential channels, a sharp market correction would likely lead to an increase in impaired loans and deterioration in profitability and capitalization of financial institutions. The impact through the mortgage channel is likely to be limited given still low household leverage. The highly leveraged small real estate developers, as well as small city-level banks that are exposed to the weak developers, are likely to be the weakest link in the short run.

3.4. Other impact

Social impact. Housing is the largest component of household wealth (about 60 percent). Along with underdeveloped social housing and the limited role of redistributive fiscal policies, the boom and bust in real estate could also have wider growth consequences that affect disproportionately low-income groups, including job losses in the low-skill construction sector and delinquency on debt service for marginal young buyers, which would intensify already-large income inequality and dampen the rebalancing progress.

Feedback loop. A strong housing market raises real estate collateral, which allows lending to grow, and boosts the overall economy, in turn boosting demand for housing. This feedback loop works in reverse during housing busts. A sharp decline in valuation and household and corporate borrowing would have knock-on effects on the real economy, which would exacerbate asset quality problems and amplify the impact of the initial shock. Banks and other intermediaries would be simultaneously hit by credit and market losses. China has also never experienced a significant decline in house prices over the long term, so there are “unknown unknowns” of how such a scenario would unfold. That said, the government still has much control over the real estate markets and the financial system, and will likely take measures to stabilize if needed (as it did in 2015).

4. EMPIRICAL ANALYSIS

4.1. A Panel Regression of House Price Growth

In this section, we examined quantitatively the effects of key economic variables and the government real estate policy on house prices. We conduct a panel regression using the methodology in Igan and Loungani (2012).

The basic model is specified as follows:

$$\begin{aligned}
& \Delta hp_{i,t} \\
& = \alpha + \beta_i + \beta_1 A_{i,t-1} + \beta_2 \Delta YPC_{i,t} + \beta_3 \Delta WAP_{i,t} + \beta_4 \Delta C_{i,t} \\
& \quad + \beta_5 \Delta DP_{i,t-1} + \beta_6 \Delta DP_{i,t-1} \cdot FT_i + \beta_7 \Delta DP_{i,t-1} \cdot ST_i \\
& \quad + \beta_8 \Delta LS_{i,t-1} + \beta_9 \Delta LS_{i,t-1} \cdot FT_i + \beta_{10} \Delta LS_{i,t-1} \cdot ST_i \\
& \quad + \beta_{11} \Delta LG_{i,t} + \beta_{12} \Delta MR_{i,t} + \gamma Y + \epsilon_{i,t},
\end{aligned} \tag{1}$$

where $\Delta hp_{i,t}$ is the change in the real residential house price in city i over the last year, $A_{i,t-1}$ is the affordability level of housing in the previous year measured by the log of the ratio of house price index to income per capita, $\Delta YPC_{i,t}$ is the change in real income per capita, $\Delta WAP_{i,t}$ is the change in working-age population, $\Delta C_{i,t}$ is the change in bank credit to the private sector, $\Delta DP_{i,t-1}$ is the change in down payment requirement for first homes in the last year, $\Delta LS_{i,t-1}$ is the change in land supply per capita in the last year, $\Delta LG_{i,t}$ is the change in local government fiscal deficit (divided by local GDP), $\Delta MR_{i,t}$ is the change in local mortgage rates, and Y is a vector of macroeconomic variables including stock price, exchange rate, interest rate and a dummy variable for house price downturns. We also include dummy variables FT_i for tier-1 cities and ST_i for tier-2 cities and interact them with the down payment requirement and land supplies.

Our sample includes the annual data for 70 major cities from 2005 to 2016. The house price data is obtained from the National Bureau of Statistics and all the other series is from the Wind and CEIC database. For variables that are not available at the city level, namely, bank credit to the private sector and local government fiscal deficit, we use provincial level data as proxies. All these series are in real terms.

Table 4 shows down payment requirement has a significant impact on house prices, especially in tier 1 cities. An increase of down payment requirement by 10 percentage points in tier 1 cities leads to a decline in real residential house prices by 4-5 percent in the next year, other things being equal. While the down payment requirement measure is not so effective in control house price growth in third- and second-tier cities. Only when we control for the year fixed effects in model (4), the down payment requirement interaction term with tier-2 cities is significant at 5% level. As an increase in affordability implies an increased burden of house purchasing expenditure, the increase of affordability has a significant negative impact on house price due to the demand-side reason.

4.2. A Multinomial Logit Regression of Down Payment Requirement Adjustment

In the previous section, down payment requirement has been proved to be effective in controlling the house price growth, especially in tier 1

TABLE 4.

Modeling Real House Price Changes: Panel Regression

	Dependent Variable: Real Estate House Price, Change			
	(1)	(2)	(3)	(4)
$A_{i,t-1}$	-0.142** (0.062)	-0.157*** (0.055)	-0.172*** (0.046)	-0.211*** (0.056)
$\Delta YPC_{i,t}$	0.022 (0.053)	0.013 (0.055)	0.022 (0.047)	0.142** (0.055)
$\Delta WAP_{i,t}$	0.023 (0.086)	-0.035 (0.068)	-0.022 (0.065)	0 (0.061)
$\Delta C_{i,t}$	0.094 (0.057)	0.090* (0.052)	0.089* (0.051)	0.047 (0.043)
$\Delta DP_{i,t-1}$	-0.071* (0.040)	-0.043 (0.038)	-0.023 (0.037)	-0.131 (0.123)
$\Delta DP_{i,t-1} \cdot FT_i$		-0.353*** (0.080)	-0.467*** (0.171)	-0.436*** (0.150)
$\Delta DP_{i,t-1} \cdot ST_i$		-0.025 (0.026)	-0.024 (0.026)	-0.048** (0.023)
$\Delta LS_{i,t-1}$	-0.002 (0.004)	-0.002 (0.004)	-0.005 (0.004)	-0.002 (0.002)
$\Delta LS_{i,t-1} \cdot FT_i$			0.084*** (0.030)	0.062** (0.029)
$\Delta LS_{i,t-1} \cdot ST_i$			-0.003 (0.008)	-0.002 (0.005)
$\Delta MR_{i,t}$	0.011 (0.007)	0.012** (0.006)	0.012** (0.005)	-0.003 (0.003)
$\Delta LG_{i,t}$	-0.428 (0.316)	-0.4 (0.323)	-0.448 (0.300)	0.006 (0.232)
$\Delta Stock\ price$	0.074*** (0.012)	0.072*** (0.011)	0.071*** (0.010)	
$\Delta RMB\ per\ USD$	-2.065*** (0.290)	-2.114*** (0.265)	-2.141*** (0.234)	
<i>offered rate</i>	-0.017 (0.011)	-0.019* (0.010)	-0.023*** (0.008)	
<i>housing cycle</i>	-0.066*** (0.005)	-0.065*** (0.005)	-0.064*** (0.005)	
<i>Constant</i>	-0.732** (0.292)	-0.802*** (0.263)	-0.870*** (0.222)	-1.026*** (0.279)
Year fixed effects	N	N	N	Y
City fixed effects	Y	Y	Y	Y
<i>N</i>	416	416	416	416
R^2 (overall)	0.297	0.309	0.304	0.393

Note: Standard errors in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

cities. A natural question is: Under what circumstances will the government adjust the down payment policy? In this section, we aim to find out the impacts of different economic variables on the likelihood of tightening or loosening the down payment requirement. Since there are three possible outcomes for down payment ratio adjustment: tightening, loosening, and staying unchanged, we conduct a multinomial logit regression. Our model is specified as follows:¹²

Let $CDP_{i,t}$ be the categorical variable indicating the change in down payment requirement. It takes on three values: 0, 1, and 2, which correspond to the three outcomes of the down payment requirement adjustment, respectively: loosening, staying unchanged, and tightening. In our model, the case of $CDP_{i,t} = 1$, i.e. the down payment requirement staying the same, is set as the reference case. For $m = 0$ and 2, we have

$$\begin{aligned} & \ln \frac{P(CDP_{i,t} = m)}{P(CDP_{i,t} = 1)} \\ &= \alpha_m + \beta_{im} + \beta_{1m} \Delta hp_{i,t} + \beta_{2m} FT_i \cdot \Delta hp_{i,t} + \beta_{3m} ST_i \cdot \Delta hp_{i,t} \\ & \quad + \beta_{4m} \Delta inventory_{i,t} + \beta_{5m} FT_i \cdot \Delta inventory_{i,t} \\ & \quad + \beta_{6m} ST_i \cdot \Delta inventory_{i,t} + \beta_{7m} \Delta C_{i,t-1} + \beta_{8m} \Delta MR_{i,t} + \gamma_m Y_t, \end{aligned} \quad (2)$$

where $\Delta inventory_{i,t}$ is the local housing inventory ratio (measured by unsold units to annualized sales in city i and year t). Other independent variables in Equation (2) are similar to those in the previous regression. The data source and treatment are the same as those in the previous regression. City fixed effects are included in all the regressions, and estimation results are listed in Table 5.

¹²In the panel regression, we included lagged variables to control for endogeneity. The empirical analysis indicates that the current level of ΔLTV does not significantly affect the current level of house prices. Therefore, we can rule out the simultaneous causality by using the current value of house price as a regressor in the logit regression.

TABLE 5: Multinomial Logit Regression of Down Payment Ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Loosening of the down payment requirement: $CDP_{i,t} = 0$							
$\Delta hp_{i,t}$	-14.657*** (2.213)	-18.283*** (2.990)	-17.540*** (4.324)	-12.643** (5.163)	-14.499*** (2.262)	-27.348*** (4.815)	-16.104*** (4.198)
$FT_i \cdot \Delta hp_{i,t}$		9.878** (4.826)					
$ST_i \cdot \Delta hp_{i,t}$		4.889 (4.278)					
$\Delta inventory_{i,t}$			0.800* (0.416)	0.066 (0.528)			0.750* (0.408)
$FT_i \cdot \Delta inventory_{i,t}$				15.213** (6.274)			
$ST_i \cdot \Delta inventory_{i,t}$				8.695*** (2.060)			
$\Delta C_{i,t-1}$					-1.323 (1.201)	2.072 (2.970)	-0.65 (4.975)
$\Delta MR_{i,t}$						-1.335** (0.614)	
$\Delta stock\ price$	1.299*** (0.448)	1.311*** (0.457)	4.294*** (1.370)	9.292*** (2.227)	0.556 (0.443)	19.038*** (3.526)	3.812*** (1.292)
$\Delta RMB\ per\ USD$	14.874*** (2.733)	14.535*** (2.746)	45.643*** (9.681)	60.771*** (13.253)	13.145*** (2.784)	-143.46*** (23.508)	41.028*** (9.541)
$offered\ rate$	0.439*** (0.098)	0.404*** (0.099)	0.569* (0.318)	0.7 (0.446)	0.248** (0.099)	1.106** (0.445)	0.441 (0.342)
Staying unchanged of the down payment requirement: $CDP_{i,t} = 1$ (base case)							
Tightening of the down payment requirement: $CDP_{i,t} = 2$							
$\Delta hp_{i,t}$	3.483** (1.763)	0.766 (2.364)	-2.206 (3.398)	-1.296 (4.217)	6.036*** (2.048)	-4.349 (4.771)	0.485 (3.486)
$FT_i \cdot \Delta hp_{i,t}$		1.817 (4.573)					
$ST_i \cdot \Delta hp_{i,t}$		6.666*					

Continued on next page

TABLE 5 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta inventory_{i,t}$		(3.402)					
			-0.242 (0.390)	-0.498 (0.445)			-0.519 (0.499)
$FT_i \cdot \Delta inventory_{i,t}$				9.754* (5.804)			
$ST_i \cdot \Delta inventory_{i,t}$				2.641* (1.389)			
$\Delta C_{i,t-1}$					7.549*** (1.187)	8.949*** (2.832)	13.218*** (4.183)
$\Delta MR_{i,t}$						2.487*** (0.533)	
$\Delta stock\ price$	4.301*** (0.437)	4.432*** (0.452)	2.682** (1.282)	5.820*** (1.984)	4.765*** (0.534)	20.941*** (3.705)	2.596** (1.299)
$\Delta RMB\ per\ USD$	-16.901*** (3.464)	-18.109*** (3.588)	6.981 (8.466)	14.808 (11.115)	-24.694*** (4.403)	-133.59*** (24.768)	7.252 (9.151)
$offered\ rate$	0.117 (0.083)	0.091 (0.084)	0.223 (0.201)	0.172 (0.225)	0.059 (0.089)	-0.685*** (0.236)	0.661** (0.262)
N	840	840	169	169	763	476	168
City fixed effects	Y	Y	Y	Y	Y	Y	Y
Pseudo R^2	0.295	0.301	0.322	0.49	0.326	0.816	0.405

Note: Standard errors in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table 5 presents the estimation results of different multinomial logit regressions. There are two groups of coefficients which are divided into two parts. The upper part shows the results for the likelihood of loosening the down payment requirement, namely, lowering the down payment ratio. The lower part shows the results for the likelihood of tightening the down payment requirement, or raising the down payment ratio. Under what circumstances will the government adjust the down payment policy? The simplest case is explored in column (1), and we see that changes of house prices have significant impacts on the likelihood of adjusting the down payment requirement. After controlling for key economic variables and the city fixed effects, we see that changes in house prices have significant impacts on the likelihood of adjusting the down payment requirement. Specifically, when house prices go down, the likelihood of loosening the down payment requirement has significantly rise relative to that of the reference case, and vice versa. In column (2), we add interaction terms of city-tier dummies and change in house price. The regression results show that for the first-tier cities, the likelihood of loosening the down payment requirement is not that sensitive to the change of house price, compared to the second- or third-tier cities. And for the second-tier cities, the likelihood of tightening the down payment requirement is much more sensitive to the change of house price, compared to the first- and third-tier cities.

There should be more variables that have impacts on the adjustment of down payment requirement besides the change in house price. From the supply side, for example, the local inventory should have an impact on the down payment policy. The natural question is: Do these variables affect the down payment policy only through the price channel? The estimation results in model (3)-(7) show that they have an impact on the down payment policy directly by themselves besides through the house prices channel. In column (3), an increase in inventory ratio has a positive effect on the likelihood of loosening the down payment requirement relative to the reference case. Furthermore, when inventory ratio goes up, the probability of loosening the down payment requirement is higher. This result coincides with local governments' destocking policy. In column (5)-(7), credit aggregates and mortgage rate are also found to have significant effects on the likelihood of tightening the down payment requirement relative to the reference case. Specifically, increasing credit aggregates and mortgage rates raises the probability of tightening the down payment requirement, which relates to the issue of financial stability.

5. POLICY IMPLICATIONS

From a long-run perspective, continued urbanization and increase in household real incomes should provide support for sustained robust growth

in China's property market. However, the recent excessive increase in house prices and the growing likelihood and costs of a significant correction warrant measures to deflate the real estate market smoothly. Indeed, the policies adopted so far by the authorities are broadly appropriate. They work mainly by introducing macro-prudential measures and mitigating speculative demand via increasing the cost of purchase. Empirical studies also show that the government's housing market policies as a whole have been effective in damping price increases (Wang and Sun [2013]).

Macro-prudential policies

Given the significant divergence in China's housing markets, macro-prudential policies tailored to local conditions should continue to be the first line of defense, although they should be carefully calibrated to address potential leakages in light of the large shadow banking sector and to address the disproportionate adverse effects on younger and poorer households. The literature in general supports the effectiveness of macro-prudential policies (such as LTV limits) in building resilience to financial cycles (for an overview see Claessens [2014]), though the evidence is stronger for reducing loan growth and improving debt-servicing capacity, than curbing house price growth (Jacome and Mitra [2015]).

In China, housing-related macro-prudential policies mainly consist of minimum down payments (LTV requirements) for first and second homes¹³. The differentiated LTV limits by borrowers (first-time home buyers versus investors) and by regions are appropriate as they can be targeted at the riskier segments of the markets. Our empirical analysis in Section 4 also confirmed that changes in down payment requirements have been effective in containing house price cycles, and indeed local governments tend to adjust these requirements in response to changing market conditions.

Changes in the LTV limits can be pro-cyclical and result in higher credit losses in the future by allowing borrowers to borrow more during boom cycles. In this regard, the government should consider expanding the macro-prudential policy toolkit to include measures that have proven effective in containing housing market risks in other countries. Combining different tools can help lessen the shortcomings of any single tool and enable policymakers to use several transmission channels at the same time, thereby promoting effectiveness of policy responses (IMF [2014]).

In particular, the government should make more active use of the DSTI (debt servicing to income) caps. DSTI requirements can restrict the size of debt service payments to a fixed share of household income, thereby ensuring affordability. They can also enhance the effectiveness of LTV limits

¹³The other frequently used tools include the reserve requirement ratio (RRR) and the different mortgage interest rates for first and second homes. Although they can affect housing market through the credit channel, they are generally viewed as a monetary policy instruments.

in addressing excessive credit growth by restricting the use of unsecured loans to attain the minimum down payment. The 2004 CBRC guidelines required a borrower's monthly mortgage payment to income ratio to be less than 50 percent and monthly total debt payment to income ratio to be less than 55 percent. These caps should be adjusted to the international norm of 30-50 percent and extended to other types of household loans including loans from non-bank financial institutions. The calibration of these caps should account carefully for the potential downsides that tend to affect younger and poorer households more adversely. Stress testing of household debt servicing capacity to interest rate and income shocks can also be used to gauge the potential risks in adverse scenarios.

The government should also consider sectoral capital requirements through risk weights or loan given default (LGD) floors on banks' exposure to the real estate sector. These requirements can be tightened during market booms to increase the cost of funding for property developers and build additional buffers (He et al. [2016]). On the other hand, although capital requirements are generally less distortionary as they work through the price of credit, they are often less effective in constraining excessive credit growth than tools such as LTV and DSTI caps, and may lead to arbitrage where loans are provided by domestic nonbanks and off-balance sheet vehicles. They may also be less effective on China's large real estate developers whose reliance on bank funding is limited.

To make better use of macro-prudential policies, the government also need step up efforts in collecting and processing information beyond aggregate credit and house prices. A wide range of indicators on borrowers, speculative activities and other qualitative indicators on risk taking should be analyzed and supported by judgment on the extent of systemic risk. Examples include the growth rate and distribution of mortgage loans by LTV ratios and borrowers' debt servicing capacity, cross-sectional differences in NPLs on loans with specific characteristics, share of banks' and nonbanks' loans to the real estate sector and to households, and qualitative indicators on financial sector risk-taking such as supervisory evaluations.

Administrative and fiscal measures

The government should reduce the reliance on administrative measures such as home purchase restrictions and funding restrictions over the medium term. Although they tend to be effective in suppressing demand in the short run, these measures can have an excessively abrupt impact, resulting in more distortions and circumvention compared to market-based or macro-prudential measures. Moreover, home purchase restrictions tend to affect disproportionately new migrants, thus undermining the efforts in urbanization.

While taxes on housing transactions and capital gains are effective instruments to dampen housing speculation, the government should also in-

roduce recurrent property taxes gradually (but decisively) by overcoming the remaining hurdles on registration of properties and legislation procedures.¹⁴ The benefits are two-fold. First, cross country evidence points to the dampening impact of property taxes on house price volatility (Andrews [2010]). Second, the introduction of recurrent property taxes can provide revenue sources for local governments to finance local public services and avoid excessive dependence on (volatile) land sales, which in turn would dampen the adverse effects of boom bust cycles in real estate. A (partial) decoupling of the house prices and local government financing is also likely to change households' expectation that the housing market is "too important to fail." Overall fiscal policy should support ongoing rebalancing efforts while gradually reducing the "augmented" deficit to its debt stabilizing level (IMF [2017]).

Structural policies

More focus on increasing real estate supply at a pace commensurate with that of demand, especially in higher tier cities where incomes and productivity growth is highest, is welcome. Increasing land supply and building higher-density housing in major cities can attract migrants and facilitate a smooth transition in the housing market.¹⁵ This can be complemented with reforms on social security and household registration (*hukou*) to give migrants from the rural area the full access to public services. Also, reducing China's very high level of domestic savings and gradually opening up the capital account in a well-sequenced and phased manner appropriately in tandem with other reforms would help reduce the propensity for asset price inflation/boom-bust cycles. In that context, greater exchange rate flexibility and a stronger monetary policy framework are essential.

More fundamentally, China should move away from the practice of setting annual growth targets that has fostered an undesirable focus on short-term, low-quality stimulus measures. The government has had the tendency of boosting infrastructure spending, real estate activity and credit during economic downturns to meet growth targets, creating the expectation that housing is an aggregate demand instrument. This expectation can reinforce the role of housing as an asset class and amplify the boom bust cycles. If the importance of growth targets were to diminish, dynamics in the real estate market would be more aligned to fundamental demand

¹⁴Jin et al. (2016) discuss about the functional orientation and path choice of China's real estate tax reform.

¹⁵Population density in Chinese cities is typically much lower than major American metropolitan areas. For example, the first tier cities have population density varying from 1,000 to 2,000 people per square kilometer in 2010, whereas the top 100 American MSAs (metropolitan statistical area) all have density above 4,000 people per square kilometer (Glaeser et al. [2016]).

and supply conditions, which would allow the prudential policies to play the major role in guarding against macro-financial risks.

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