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Abstract

This study investigates the effects of real estate regulatory policies on the real estate risks to banks in China. The study shows that real estate control policies issued by the policy makers in China cannot constrain the risks of the real estate market to banks. Real estate stimulating policies, however, could raise the risks of the real estate market to banks, which mainly results from the effects of tax-related stimulating policies. The study also shows that real estate control policies affect the discount rate risks of the real estate firms to banks, while both the real estate control policies and the real estate stimulating policies show some effects on the overall risks of the real estate firms to banks.

Keywords: Real estate regulation; policy effect; Real estate risks; Banks; Return connectedness

JEL classifications: G21, L52, R38

1. Introduction

Real constant quality house prices in the major cities of China have more than doubled during the first decade of this century (Wu et al. 2012). In particular, following Chinese government's monetary stimulus program after the global financial crisis in 2008, state-owned banks dramatically increased their lending to centrally-controlled state-owned enterprises (CSOEs), and with the abundant funding from the state-owned banks, these CSOEs bid aggressively in residential land sales, contributing to the surge in real estate prices (Deng et al. 2015). Concerned with the rapid real estate price growth, policy makers in China issued a series of regulatory policies aimed at cooling the overheating real estate market.

In this study, we investigate whether the real estate regulatory policies issued by the Chinese policy makers played a role in constraining the real estate risks to banks in China. Specifically, by the framework of Campbell (1991), we first decompose the equity returns of the Chinese real estate firms into a discount rate news component and a cash flow news component, which reflect changes in expectation of future discount rates and changes in expectation of future dividends, respectively. Then, by the connectedness measure of Diebold and Yilmaz (2014), we study the overall return connectedness from the real estate firms to banks, the connectedness of the discount rate news component of the real estate firms to banks, and the connectedness of the cash flow news component of the real estate firms to banks. We argue that the overall return connectedness, the discount rate (news component) connectedness, and the cash flow (news component) connectedness of the real estate firms to banks reflect the overall risks of the real estate firms to banks, the discount rate risks of the real estate firms to banks, and the risks of the real estate market to banks, respectively (see section 5.2). Finally, we examine the effects of real estate regulatory policies on these three types of real estate risks to banks.

Previous studies have investigated the effects of regulatory policies on constraining real estate prices (e.g., Cocconcelli and Medda 2013, Kuttner and Shim 2013, Yu 2010, Crowe et al. 2013, Vandenbussche et al. 2015, Xu and Chen 2012). However, the issue of whether regulatory policies can constrain real estate risks, particularly real estate risks to the banking sector, has been neglected. Previous research suggests that it is difficult to determine whether a real estate price is too high or whether a real estate price bubble exists (Ahuja et al. 2010, Cadil 2009). Previous research also reveals the difficulty in distinguishing a good real estate price boom from a bad real estate price boom: good real estate price booms are benign and thus policy actions could restrict credit unnecessarily, while bad real estate price booms represent real estate bubbles and thus policy actions are needed (Crowe et al. 2013). Regulatory policies that constrain good real estate price booms could unwisely limit economic growth. Since high real estate risks are always bad, it could be more desirable to study the real estate risks, rather than the real estate price, and to examine the effects of regulatory policies on constraining the real estate risks.

This study could also have important policy implications. Firstly, the study analyzes the real estate risks to banks, which are closely monitored by the policy makers. As highlighted by the subprime mortgage crisis in 2008, real estate market plays an important role in financial stability and the real economy. The boom and bust cycles in the real estate market contribute significantly to banking crises (Allen and Carletti 2013). Secondly, dividing the real estate regulatory policies into different types (financial policies, tax policies, land policies, and industrial policies) and investigating the effect of each type of policies, the study provides evidence on which type of real estate regulatory policies would be more effective in reducing the real estate risks to banks. Thirdly, after the global financial crisis, there was a shift of global systemically important banks from the developed economies to the emerging economies, particularly China (Alessandri et al.

2015). Therefore, given the gradually increasing role of the Chinese economy in the world economy, the potential real estate risks to banks in China have great implications for the global financial stability and economic growth.

The remainder of the study proceeds as follows. Section 2 reviews the literature. Section 3 provides an overview of the real estate regulatory policies in China. Section 4 describes the data. Section 5 presents the method. Section 6 shows the empirical results and Section 7 concludes the study.

2. Literature review

Rapid house price growth in the past decade has attracted numerous studies on the existence of potential real estate bubbles in China. For instance, Ahuja et al. (2010) find that except for some large cities which show excessive price growth, as of mid-2010 the overall real estate prices in China appear to be in line with the underlying market fundamentals. Feng and Wu (2015) also do not find evidence of house price bubbles at the national level in China. However, they suggest that the conclusion could be sensitive to the expected income growth rate. Ren et al. (2012) conclude that there are no rational expectation bubbles in the Chinese housing market over the period 1999-2009. Using data from 1998 to 2010, Dreger and Zhang (2013) find some evidence of housing price bubbles in China, particularly in the south-east coastal areas and special economic zones.

One of the concerns about the potential real estate bubble is the risks it may pose to the banking industry. Allen et al. (1995) show that bank returns are positively related to the real estate returns, and this relation is positively related to the bank's real estate exposure. Mei and Saunders (1995) show that real estate market conditions affect the (ex ante) risk premiums on

bank stocks, and the time-varying risk premiums reflect the changes in bank real estate lending. The study by Martins et al. (2016) suggests that real estate factor is a priced factor for the bank stock returns in 15 European countries. Koetter and Poghosyan (2010) conclude that deviations of real estate price from its fundamental value, rather than the real estate price level itself, contribute to bank instability. Focusing on the regional commercial banks in China, Zhang et al. (2016) find that a lower growth rate of real estate investment increases bank instability, and this relation between real estate investment and bank instability is affected by real estate market cycles and the competition level of the regional banks. Li et al. (2016) analyze the full-sample static effect of the systemic risk in the real estate sector on banking return in China and show that higher systemic risk in the real estate sector leads to lower banking return. Jiang and Äijö (2018) study the volatility connectedness across China's real estate firms and financial institutions and find that connectedness from real estate firms to banks decreased over the studied period.

To limit real estate market risk, policy makers have applied various policy measures. Vandenbussche et al. (2015) reveal that some macroprudential policies adopted by countries in Central, Eastern, and Southeastern Europe were effective in curbing housing price inflation. Cocconcelli and Medda (2013) study the Estonian real estate market and find that rigorously implemented land tax policy can reduce the effects of the real estate boom-bust cycle. Crowe et al. (2013) highlight the crucial role of macroprudential measures and the importance of complementing these measures with monetary policy in dealing with real estate booms. Goukasian and Majbouri (2010) show the strong impact of US monetary policy on the stock returns of real estate-related industries. Analyzing the effectiveness of nine non-interest rate policies in 57 economies, Kuttner and Shim (2013) find that only increases in housing-related taxes have significant effects on house prices.

Wang and Sun (2013) maintain that required reserve ratio and house-related policies in China can help to constrain excessive house price growth. Wei et al. (2014) document that rising interest rate or expansion of bank credit stimulates real estate investment in China, and the investment in eastern coastal regions is more responsive to bank credit supply than other regions. Yu et al. (2017) show that regulatory policies in China influence the investment expenditures of real estate enterprises, particularly for the non-state-owned real estate enterprises limited by financing constraints. Xu and Chen (2012) demonstrate the significant impact of Chinese monetary policy on real estate price growth. The analysis of Zhang (2008) suggests the efficacy of land supply policy on the real estate market in China. Yu (2010) finds that variables controlled by real estate policy affect house prices in China. The studies by Li et al. (2017) and Sun et al. (2017) show the profound influence of home purchase restrictions policy on China's real estate market.

In this study, we analyze the effects of real estate regulatory policies on the real estate risks to banks in the case of China. Over different time periods, the objective of real estate regulatory policies by the Chinese policy makers was different: during a controlling period, the objective is to stabilize or slow the housing price growth; during a stimulating period, the objective is to support or stimulate the real estate market. We define a regulatory policy issued during a controlling period as a controlling policy and a regulatory policy issued during a stimulating period as a stimulating policy. Over a given time period (either a controlling or a stimulating period), policy issuers in China may issue various types of real estate regulatory policies (such as financial policies, tax policies, land policies, or industrial policies), which regulate various aspects of the real estate industry (see section 3 and Table 1 in the appendix).

3. Real estate regulatory policies in China

Since the reform of the real estate market during the late 1990s, policy makers in China have carried out several rounds of real estate regulations. A recent report by Ren (2017) divides China's real estate regulatory policies after the real estate market reform into six rounds. Based on Ren's division, the first round of regulations from 2002 to 2004 focused on slowing the gradually overheating real estate market. Although this round of regulations reduced real estate investment, it did not accomplish the goal of slowing real estate price growth. The second round of regulations from 2005 to 2007 further emphasized stabilizing the real estate prices. This round of regulations also did not have the intended effect, and rapid house price growth continued. The year 2008 was a turning point, with housing sales and housing prices starting to decrease. However, the occurrence of the global financial crisis in 2008 shifted the objective of macro-regulations to avoiding a potential dip in economic growth. Hence, the third round of regulations from 2008 to 2009 concentrated on stimulating the real estate market. This round of regulations resulted in a surge in both real estate sales and real estate prices.

Following the unprecedented price growth, the government initiated the fourth round of regulations from 2010 to 2013, which was commonly observed to be the most stringent round of real estate regulations. The growth of real estate prices slowed down after this round of regulations. The fifth round of regulations from 2014 to September 2016 sought to reduce housing inventories. During this period, housing prices in the first and second tier large cities increased significantly, while prices in the third and fourth tier relatively smaller cities were more or less stable. The sixth round of regulations from September 2016 to 2017 highlighted the combination of short-term regulatory policies and long-term regulatory mechanisms. This round of regulations showed some effect of controlling real estate price growth.

The characteristics of these six rounds of regulations indicate that the sample period can be separated into two types of sub-periods: controlling periods and stimulating periods. During a controlling period, the goal of real estate regulatory policies is to stabilize the housing prices or slow the housing price growth. The goal of real estate regulatory policies during a stimulating period is to support or stimulate the real estate market. The report by Ren (2017) suggests that there were three controlling periods (2005-Jul. 2008, Dec. 2009-May 2014, and Oct. 2016-2017) and two stimulating periods (Aug. 2008-Nov. 2009 and Jun. 2014-Sep. 2016) from 2005 to 2017 (see Table 1 in the appendix). We refer to a regulatory policy issued during a controlling (stimulating) period as a controlling (stimulating) policy.

Table 1 in the appendix shows the major real estate regulatory policies in China from 2005 to 2017, which is compiled from three studies by China Index Academy (2017), He (2016, 107–112), and Ren (2017). Since monetary policies commonly aim at regulating the overall macro-economy, we consider only the regulatory policies targeted specifically at the real estate markets and exclude the monetary policies. As in He (2016), we divide the real estate regulatory policies into four categories. The first category of policies is the financial policies mainly regulating the supply of real estate loans by banks. The second category of policies is the tax policies stipulating the tax issues related to housing transactions. Another category of policies is the land policies regulating the land supply, acquisition, usage, etc. The last category of policies is the industrial policies consisting of all the policies targeted at the real estate industry but not included in the other three categories. It should be noted that some regulatory policies might belong to multiple categories, because policy makers in China sometimes issue comprehensive policies to regulate the real estate market from different aspects. We determine the type of a

policy based on the main features of the policy described by the three previous studies (see Table 1 in the appendix).

4. Data

All the equity-related data included in this study were downloaded from Thomson Reuters Datastream. To represent the sector of real estate firms and the sector of banks in China, we use China A-Datastream Real Estate index and China A-Datastream Banks index, respectively.[1] We include the total return index for these two indexes and the dividend yield for the China A-Datastream Real Estate index. We select the total return indexes of MSCI China small growth stocks and MSCI China small value stocks to construct the variable of small-stock value spread. 3-month and 10-year government bond yields were retrieved from the website of China Bond.[2] To control for the impact of the other firms in the Chinese stock market, we compute the value-weighted returns on a portfolio of "other firms", which consists of companies that are constituent of the SSE 50 index, excluding all the real estate firms and banks (as of November 2, 2017).[3] The data of the study are time-series data, and the sample period of the study ranges from January 2002 to October 2017.

5. Method

To analyze the risks of the estate market and real estate firms to banks, we first decompose the total unexpected excess returns of the real estate firms into a component due to news about expected future discount rates and a component due to news about expected future cash flows.

[1] The constituents of the two equity indexes, China A-Datastream Real Estate index and China A-Datastream Banks index, consist of 19 real estate firms and 26 banks, respectively, which include the largest real estate firms and banks in China.

[2] www.chinabond.com.cn

[3] The portfolio of other firms contains 35 stocks. We compute the daily value-weighted returns on the portfolio of these 35 stocks and aggregate the daily returns to obtain the monthly returns. According to the Shanghai Stock Exchange, SSE 50 index includes 50 representative stocks that are large, liquid in the Shanghai stock market.

We then compute the overall return connectedness, discount rate component connectedness, and cash flow component connectedness of the real estate firms to banks. Finally, we examine the effects of real estate regulatory policies on the return and return component connectedness of the real estate firms to banks.

5.1. Return decomposition

Utilizing the log-linear return approximation of Campbell and Shiller (1988), Campbell (1991) presents the following decomposition of unexpected excess returns:[4]

$$r_{t+1} - E_t r_{t+1} = (E_{t+1} - E_t)\Sigma_{j=0}^{\infty}\rho^j \Delta d_{t+1+j} - (E_{t+1} - E_t)\Sigma_{j=1}^{\infty}\rho^j r_{t+1+j} \equiv N_{CF,t+1} - N_{DR,t+1}, \qquad (1)$$

where r_{t+1} is the log excess return from time t to time t+1, E_t is the expectation conditional on the information at time t, ρ is a constant smaller than one, d_t is the log dividend, Δ denotes the one period difference, $N_{CF,t+1}$ represents the cash flow component of the unexpected return, and $N_{DR,t+1}$ denotes the discount rate component of the unexpected return.

Let z_{t+1} be a k-by-1 vector whose first element is r_{t+1} and assume z_{t+1} follows the following VAR(1) model:

$$z_{t+1} = c + Az_t + u_{t+1}, \qquad (2)$$

where c is a k-by-1 vector of parameters, A is a k-by-k matrix of parameters, and u_{t+1} is a k-by-1 vector of errors. Then, Eqs. (1) and (2) can be used to show that

$$N_{DR,t+1} = e1'\rho A(I - \rho A)^{-1}u_{t+1}, \qquad (3)$$

[4] In a more strict sense, the relationship in Eq. (1) holds only for unexpected real returns. When real interest rates are constant, Eq. (1) also holds for unexpected excess returns (see the appendix to Campbell and Vuolteenaho, 2004). As in Campbell and Vuolteenaho (2004), we use excess returns instead of real returns.

$$N_{CF,t+1} = [e1' + e1'\rho A(I - \rho A)^{-1}]u_{t+1}, \qquad (4)$$

where $e1$ is a k-by-1 vector, whose first element is one and zeros elsewhere; I is a k-by-k identity matrix.

Following Campbell and Vuolteenaho (2004) and Engsted et al. (2012), we include the following four variables in the state vector z_{t+1}: log excess return of the real estate firms (monthly log return in excess of the 3-month government bond rate), log dividend yield of the real estate firms, term spread (the difference between 10-year government bond yield and 3-month government bond yield), and small-stock value spread.[5] Due to data availability, we construct the small-stock value spread as the difference between the cumulative returns of the small growth stocks and small value stocks in the previous year (proxied by the return difference between MSCI China small growth stocks and MSCI China small value stocks in the previous year). Eleswarapu and Reinganum (2004) provide evidence that return differences between growth stocks and value stocks in the prior 36 months can predict stock market returns. To construct a comparable measure of small-stock value spread to that of Campbell and Vuolteenaho (2004), we use cumulative returns in the previous year, instead of the prior 36 months. As in Campbell and Vuolteenaho (2004), we set the constant ρ to $0.95^{1/12}$ in this study.

[5] Previous studies suggest that return decompositions could be sensitive to the predictive variables included in the state vector. To alleviate this problem, we follow the recommendations of Engsted et al. (2012) and include the "theoretically correct" variable, dividend-yield, as one of the predictive variables. Moreover, as a robustness check, we also include two additional predictive variables in the state vector: 3-month government bond rate and stock variance of the real estate firms (see Campbell and Vuolteenaho, 2004; Guo, 2006). Stock variance of the real estate firms for a given month is the realized variance over the month calculated based on the daily returns on the China A-Datastream Real Estate index. The results from the robustness check (available upon request) provide very similar trend of discount rate and cash flow connectedness of the real estate firms to banks.

5.2. Return connectedness

The study analyzes the overall return connectedness, discount rate connectedness, and cash flow connectedness of the real estate firms to banks by the method of Diebold and Yilmaz (2014). Based on the forecast error variance decompositions, Diebold and Yilmaz (2014) define the pairwise directional connectedness between any two variables in the system. In this study, we only consider the pairwise directional connectedness from the real estate firms to banks.

To control for the impact of the other companies in the Chinese stock market, we also include the returns of companies that are constituent of the SSE 50 index, excluding all the real estate firms and banks (as of November 2, 2017). Therefore, to obtain the forecast error variance decompositions, our vector for the vector auto-regression contains three variables: one variable is either the overall (excess) returns, the discount rate news component, or the cash flow news component of the real estate firms; the other two variables are the returns of the banks and the returns of the other companies. We use parsimonious VAR(1) models and compute the dynamic connectedness based on forecast error variance decompositions with a rolling window of 36 months and a forecast horizon of 6 months.[6]

We argue that connectedness from the real estate firms to banks provides intuitive ways to measure the risk contribution of the real estate market or real estate firms to banks. The connectedness measures are based on the forecast error variance decompositions that show the fractions of uncertainty (forecast error variance) in a variable due to shocks in other variables in the system. For example, cash flow connectedness of the real estate firms to banks shows the fraction of uncertainty in banks' returns due to shocks in the cash flow news component of the

[6] For the majority of the rolling windows, the optimal lag order selected by AIC is one (with the maximum lag order set to four). We obtain similar trends for all the dynamic connectedness when we change the rolling window length to 48 months or the forecast horizon to 3 months (the results are available upon request).

real estate firms. The cash flow news component of the real estate firms is closely associated with the changes in expected real estate prices, since the expected cash flows (or dividends) of real estate firms are closely related to the expected real estate prices. Hence, the cash flow connectedness of the real estate firms to banks reflects the fraction of uncertainty in banks' returns due to shocks in expected real estate prices, or the risks of expected real estate prices changes to banks.[7] Analogously, the overall return connectedness from the real estate firms to banks reflects the overall risks of the real estate firms to banks, and the discount rate connectedness of the real estate firms to banks reflects the discount rate risks of the real estate firms to banks.

One may notice that the discount rates are the rates that are used to discount the cash flows of real estate firms, in order to obtain the value of these firms. The discount rates are the sum of two parts: risk-free rate and risk premium. The rates of bank loans to real estate firms may be affected by both the risk-free rate and risk premium. In addition, the rates of bank loans to real estate firms are linked to the profitability of banks, which in turn affects the equity returns on banks. Thus, the discount rates of real estate firms could be indirectly linked to the equity returns on banks, and the discount rate connectedness of the real estate firms to banks shows the fraction of forecast error variance of the equity returns on banks that can be attributed to shocks in the discount rates.

5.3. Effects of the real estate regulatory policies

To analyze the effects of the real estate regulatory policies, we use regression analysis. Our main interest is to study whether the real estate regulatory policies affect the risks of the real estate

[7] In this study, we refer to the risks of expected real estate prices changes to banks as the risks of the real estate market to banks.

market to banks. Firstly, we compare the average cash flow connectedness during "controlling periods" and "stimulating periods" by running the following regression:

$$C_{cf,t} = \beta_0 + \beta_1 D_{c,t} + \varepsilon_t \ , \quad (5)$$

where $C_{cf,t}$ is the cash flow connectedness from real estate firms to banks at month t; β_0 and β_1 are the parameters; ε_t is the error term; $D_{c,t}$ is a dummy variable, which is set to 1 during controlling periods; the controlling periods are 2005-Jul. 2008, Dec. 2009-May 2014, and Oct. 2016-2017, and the stimulating periods are Aug. 2008-Nov. 2009 and Jun. 2014-Sep. 2016. In Eq. (5), β_1>0 implies higher risks of the real estate market to banks during controlling periods relative to the stimulating periods, and vice versa.

Secondly, we examine the cash flow connectedness during "controlling months" and "stimulating months", by estimating a similar regression as Eq. (5). Here, we add a dummy variable $D_{s,t}$ and set $D_{c,t}$ and $D_{s,t}$ to 1 during the controlling months and stimulating months respectively. To account for the lag of the policy effect, we also include the month following a policy announcement as a controlling or stimulating month: if a controlling (stimulating) policy were announced before the end of a month, the current month and the next month are defined as the controlling (stimulating) month; if a controlling (stimulating) policy were announced at the end of a month, only the next month is defined as the controlling (stimulating) month. Similar to Eq. (5), a positive coefficient estimate for $D_{c,t}$ ($D_{s,t}$) implies higher risks of the real estate market to banks during the controlling months (during the stimulating months) relative to the months when there were no regulatory policies issued.

Thirdly, we estimate the effects of the four types of real estate regulatory policies by the following regression:

$$C_{cf,t} = \beta_0 + \beta_1 D_{F,t} + \beta_2 D_{T,t} + \beta_3 D_{L,t} + \beta_4 D_{I,t} + \mu_1 D_{F,t}^{+} + \mu_2 D_{T,t}^{+} + \mu_3 D_{I,t}^{+} + \varepsilon_t, \quad (6)$$

where β_i and μ_j (i=0, 1, 2, 3, 4; j=1, 2, 3) are the parameters; $D_{F,t}$, $D_{T,t}$, $D_{L,t}$, and $D_{I,t}$ are the dummy variables for the financial policies, tax policies, land policies, and industrial policies respectively during the real estate controlling periods (see Table 1 in the appendix); $D_{F,t}^{+}$, $D_{T,t}^{+}$, and $D_{I,t}^{+}$ are the dummy variables for the financial policies, tax policies, and industrial policies respectively during the real estate stimulating periods (see Table 1 in the appendix). Similar to the dummy variables for the controlling months and stimulating months above, we set the corresponding type of policy dummy to 1 for the month following the policy announcement and the month when the policy was announced (if the announcement did not occur at the end of the month). In Eq. (6) above and Eq. (7) below, β_i>0 or μ_j>0 (i=1, 2, 3, 4; j=1, 2, 3) indicates higher risks of the real estate market to banks when the corresponding type of policies was issued, relative to the months when there were no regulatory policies issued.

Fourthly, we control for the impact of the market volatilities and real estate prices and re-estimate the effects of the four types of real estate regulatory policies. Previous studies suggest that during market turmoil when the market volatilities are high, assets connectedness tends to be stronger. Moreover, real estate regulatory policies could be correlated with the level of real estate prices, as there is a higher probability that the Chinese government would introduce real estate control policies when the real estate prices are higher. Therefore, we include market volatility and real estate price as two additional control variables and estimate the following regression:[8]

[8] We use the realized volatility of the SSE 50 index (excluding all the real estate firms and banks) to represent the market volatility. For the overall real estate prices, we downloaded from Datastream the real estate transaction data by China Index Academy in 24 Chinese cities: Baotou, Beijing, Changsha, Chengdu, Chongqing, Dalian, Dongguan, Fuzhou, Guangzhou, Haikou, Hangzhou, Ningbo, Qingdao, Shanghai, Shantou, Shaoguan, Shaoxing, Shenyang, Shenzhen, Suzhou, Tianjin, Wuhan, Wuxi, and Xi'an. The transaction data are for the commercial residential buildings (five missing values are replaced by the average of the values in the previous month and the following

$$C_{cf,t} = \beta_0 + \beta_1 D_{F,t} + \beta_2 D_{T,t} + \beta_3 D_{L,t} + \beta_4 D_{I,t} + \mu_1 D^{+}_{F,t} + \mu_2 D^{+}_{T,t} + \mu_3 D^{+}_{I,t} + \Sigma^{2}_{i=1} h_i x_{i,t} + \varepsilon_t, \quad (7)$$

where h_i (i=1,2) is the parameter; $x_{1,t}$ and $x_{2,t}$ are the market volatility and real estate price change (in percentages) at month t, respectively.

In addition, we also examine the effects of the four types of real estate regulatory policies on the overall return connectedness and discount rate connectedness from the real estate firms to banks. In particular, we change the dependent variable to overall return connectedness (or discount rate connectedness) from the real estate firms to banks and re-estimate Eqs. (6) and (7).

6. Empirical results

Table 1 reports the parameter estimates of the VAR(1) model in Eq. (2), which are used to compute the two return components of the real estate firms. Four state variables are included in the VAR model: log excess return of the real estate firms, log dividend-yield of the real estate firms, term-spread, and small-stock value spread. The parameter estimates for the excess return equation show that dividend-yield positively predicts the excess return of the real estate firms. Past excess return of the real estate firms and small-stock value spread have similar levels of predictability for the future excess return of the real estate firms, although the results are not statistically significant. The positive predictive power of the dividend-yield for the returns of the real estate firms is consistent with the result for the aggregate market returns in Engsted et al. (2012). The proportion of return variance explained by the four state variables is 3.8%, which is higher than the corresponding number of 2.57% in Campbell and Vuolteenaho (2004). The coefficient estimates for the dividend-yield equation suggest the high persistency of the

month). We represent the overall real estate prices in China by a weighted value of the average transaction prices in the 24 cities, with the weights being the transaction area in each city. Due to the availability of the real estate price data, the sample period here starts from February 2009.

dividend-yields of the real estate firms. The estimates for the equations of the other two state variables (term-spread and small-stock value spread) indicate that past return and dividend-yield of the real estate firms and past term-spread can predict the future term-spread, while past return of the real estate firms and small-stock value spread have some predictive power for the future small-stock value spread.

[Table 1 near here]

Figure 1 shows the dynamic overall return connectedness, discount rate connectedness, and cash flow connectedness of the real estate firms to banks. The three connectedness measures are computed based on forecast error variance decompositions with a rolling window of 36 months and a forecast horizon of 6 months. Overall return connectedness of the real estate firms to banks showed large fluctuations from 2005 to June 2007 and from April 2012 to November 2013. Following a relatively stable period from July 2007 to April 2008, overall return connectedness gradually increased, reaching a level of around 29% in March 2012. Overall return connectedness showed another rising trend from the beginning of 2014 to September 2015, after which it started to decline slowly until the end of the sample period.

[Figure 1 near here]

In general, overall return connectedness from the real estate firms to banks did not show any distinct trend during the controlling periods, except for the last controlling period from October 2016 to October 2017, during which it decreased slowly. However, the overall return connectedness seems to be increasing gradually during the first stimulating period from August 2008 to November 2009. Over the second stimulating period from June 2014 to September 2016, overall return connectedness also showed a strong increase from October 2014 to September

2015. Therefore, the dynamic overall return connectedness of the real estate firms to banks suggests that real estate regulatory policies aiming at supporting or stimulating the real estate market would likely increase the overall risks of the real estate firms to banks.

Regarding the discount rate connectedness of the real estate firms to banks, during the first controlling period, it first surged in 2005 and then declined rapidly until August 2006. The discount rate connectedness displayed a strong upward trend from April 2008 to May 2010 and a significant downward trend at the end of the sample period from May 2015 to 2017. Overall, the discount rate connectedness intensified during the first stimulating period from August 2008 to November 2009 and slightly decreased during the last controlling period from October 2016 to 2017.

Despite the real estate control policies, cash flow connectedness of the real estate firms to banks increased from 2005 to March 2008. The cash flow connectedness then decreased steadily, reaching the lowest level at the end of 2012. In 2013 and 2015, the cash flow connectedness was largely increasing. After a drop during the first half of 2016, the cash flow connectedness remained stable until the end of the sample period. Overall, during the first controlling period from 2005 to July 2008, the cash flow connectedness was generally increasing (from 2005 to March 2008). However, during the second controlling period from December 2009 to May 2014, the cash flow connectedness was largely decreasing (from December 2009 to December 2012), while during the last controlling period from October 2016 to 2017, the cash flow connectedness was stable. On the other hand, the cash flow connectedness was generally decreasing during the first stimulating period, but it did not display any trend during the second stimulating period. Hence, the dynamic cash flow connectedness of the real estate firms to banks does not provide

clear evidence about the effects of the real estate regulatory policies on constraining the real estate market risks to banks.

To further examine the effects of the real estate regulatory policies, we run a few regressions. Table 2 reports the results of the regression analysis. Our main interest is to study the effects of the real estate regulatory policies on the cash flow connectedness of the real estate firms to banks (or the risks of the real estate market to banks). Table 2 shows that compared to the stimulating periods, the average cash flow connectedness of the real estate firms to banks is lower during the controlling periods, although the difference is not statistically significant. Relative to the months when there were no real estate regulatory policies announced, the average cash flow connectedness of the real estate firms to banks is higher during the months when there were real estate stimulating policies announced. Interestingly, none of the four types of real estate control policies has effect on the cash flow connectedness of the real estate firms to banks. Among the four types of real estate stimulating policies, tax policies appear to increase the cash flow connectedness. Therefore, the results in table 2 suggest that real estate control policies cannot constrain the risks of the real estate market to banks. On the other hand, real estate regulatory policies aiming at supporting or stimulating the real estate market can increase the risks of the real estate market to banks; this increase of risks of the real estate market to banks mainly results from the relaxation of tax policies during the stimulating periods.

[Table 2 near here]

For the discount rate connectedness of the real estate firms to banks, table 2 shows that it is related to two types of real estate control policies: financial policies and industrial policies. Financial control policies increase the discount rate connectedness of the real estate firms to

banks, while industrial control policies decrease the discount rate connectedness of the real estate firms to banks. Financial control policies mainly intend to control the real estate market by increasing the interest rates of the mortgage loans, which would increase the expected future discount rates of the real estate firms and thus the discount rate connectedness of the real estate firms to banks.

Table 2 also shows that two types of real estate control policies (land policies and industrial policies) and two types of real estate stimulating policies (financial policies and tax policies) affect the overall return connectedness of the real estate firms to banks. Similar to the case of cash flow connectedness, tax-type stimulating policies or relaxation of tax policies increases the overall return connectedness of the real estate firms to banks. In contrast, financial stimulating policies or relaxation of financial policies decreases the overall return connectedness of the real estate firms to banks. When the policy makers in China relax the financial policies by decreasing the interest rate and the requirement of down payment for the mortgage loans, financing constraints of the homebuyers and real estate firms are relaxed. Consequently, the overall risks of the real estate firms to banks decrease. This finding is also consistent with the result of Zhang et al. (2016) that a lower growth rate of real estate investment increases bank instability, since real estate investment would likely increase when the relaxation of financial policies leads to less financing constraints for the homebuyers and real estate firms.

Among the four types of real estate control policies, industrial policies increase the overall risks of the real estate firms to banks. Unlike the industrial control policies, land control policies decrease the overall risks of the real estate firms to banks. Land control policies could reduce the supply of land and thus increase the value of the lands and homes held by the real estate firms,

decreasing the risks of the real estate firms to banks. This finding of significant impact of the land control policies is also in line with Zhang (2008).

For all the three connectedness measures, the estimated coefficient for the market volatility is always positive and statistically significant, which is consistent with previous finding that during market turmoil when the market volatilities are high, assets connectedness tends to be stronger. The overall housing price changes, in contrast, do not appear to be related to the overall return connectedness, the discount rate connectedness or the cash flow connectedness of the real estate firms to banks, implying that market participants do not associate high real estate prices with high real estate risks to banks.

7. Conclusion

In this study, we investigate whether the real estate regulatory policies issued by the Chinese policy makers can constrain the real estate risks to banks in China. Specifically, by the framework of Campbell (1991), we first decompose the equity returns of the Chinese real estate firms into a discount rate news component and a cash flow news component. By the connectedness measure of Diebold and Yilmaz (2014), we then study the overall return connectedness from the real estate firms to banks, the connectedness of the discount rate news component of the real estate firms to banks, and the connectedness of the cash flow news component of the real estate firms to banks. We interpret the overall return connectedness, the discount rate connectedness, and the cash flow connectedness of the real estate firms to banks as the overall risks of the real estate firms to banks, the discount rate risks of the real estate firms to banks, and the risks of the real estate market to banks, respectively. Finally, we examine the effects of real estate regulatory policies on these three types of real estate risks to banks.

Our study shows that dynamic overall return connectedness of the real estate firms to banks displayed some rising trend during the real estate stimulating periods, which suggests that real estate regulatory policies aiming at supporting or stimulating the real estate market could increase the overall risks of the real estate firms to banks. The study also shows that two types of real estate control policies (land policies and industrial policies) and two types of real estate stimulating policies (financial policies and tax policies) can affect the overall risks of the real estate firms to banks. The discount rate risks of the real estate firms to banks, however, are only affected by two types of real estate control policies: financial policies and industrial policies. Unexpectedly, real estate control policies do not seem to be able to constrain the risks of the real estate market to banks. Real estate stimulating policies, on the other hand, show some effects of raising the risks of the real estate market to banks, which mainly results from the effects of tax-related stimulating policies.

From the perspective of real estate market regulations, the relaxation of tax-related real estate regulatory policies would increase both the overall risks of the real estate firms to banks and the risks of the real estate market to banks. The relaxation of financial regulatory policies can reduce the overall risks of the real estate firms to banks, while financial control policies would increase the discount rate risks of the real estate firms to banks. Land-related real estate control policies can decrease the overall risks of the real estate firms to banks. Industry-related real estate control policies could lead to higher overall risks but lower discount rate risks of the real estate firms to banks. In this study, we only analyze the effects of real estate regulatory policies on the real estate risks to banks in China. Future research could study the spillovers of the effects of real estate regulatory policies issued by one country to other countries.

References:

Ahuja, A., L. Cheung, G. Han, N. Porter, and W. Zhang. 2010. "Are house prices rising too fast in China?" IMF Working Paper WP/10/274.

Alessandri, P., S. Masciantonio, and A. Zaghini. 2015. "Tracking banks' systemic importance before and after the crisis." *International Finance* 18(2): 157–186.

Allen, F., and E. Carletti. 2013. "Systemic risk from real estate and macro-prudential regulation." *International Journal of Banking, Accounting and Finance* 5: 28–48.

Allen, M. T., J. Madura, and K. J. Wiant. 1995. "Commercial bank exposure and sensitivity to the real estate market." *Journal of Real Estate Research* 10(2): 129–140.

Cadil, J. 2009. "Housing price bubble analysis – case of the Czech Republic." *Prague economic papers* 1: 38–47.

Campbell, J. Y. 1991. "A variance decomposition for stock returns." *Economic Journal* 101(405): 157–179.

Campbell, J. Y., and R. J. Shiller. 1988. "The dividend-price ratio and expectations of future dividends and discount Factors." *Review of Financial Studies* 1(3): 195–228.

Campbell, J. Y., and T. Vuolteenaho. 2004. "Bad beta, good beta." *American Economic Review* 94(5): 1249–1275.

China Index Academy. 2017. *Report on China's real estate policies*. Beijing: China Index Academy.

Cocconcelli, L., and F. R. Medda. 2013. "Boom and bust in the Estonian real estate market and the role of land tax as a buffer." *Land Use Policy* 30: 392–400.

Crowe, C., G. Dell'Ariccia, D. Igan, and P. Rabanal. 2013. "How to deal with real estate booms: Lessons from country experiences." *Journal of Financial Stability* 9: 300–319.

Diebold, F.X., and K. Yilmaz. 2014. "On the network topology of variance decompositions: measuring the connectedness of financial firms." *Journal of Econometrics* 182: 119–134.

Dreger, C., and Y. Zhang. 2013. "Is there a bubble in the Chinese housing market?" *Urban Policy and Research* 31(1): 27–39.

Eleswarapu, V. R., and M. R. Reinganum. 2004. "The predictability of aggregate stock market returns: Evidence based on glamour stocks." *Journal of Business* 77(2): 275–294.

Engsted, T., T. Q. Pedersen, and C. Tanggaard. 2012. "Pitfalls in VAR based return decompositions: A clarification." *Journal of Banking and Finance* 36: 1255–1265.

Feng, Q., and G. L. Wu. 2015. "Bubble or riddle? An asset-pricing approach evaluation on China's housing market." *Economic Modelling* 46: 376–383.

Goukasian, L., and M. Majbouri. 2010. "The reaction of real estate-related industries to the monetary policy actions." *Real Estate Economics* 38(2): 355–398.

Guo, H. 2006. "On the out-of-sample predictability of stock market returns." *Journal of Business* 79(2): 645–670.

He, D. 2016. *Financial security in China: Situation analysis and system design*. Singapore: Springer.

Jiang, J., and J. Äijö. 2018. "Equity volatility connectedness across China's real estate firms and financial institutions." *Journal of Chinese Economic and Business Studies* 16(2): 215–231.

Koetter, M., and T. Poghosyan. 2010. "Real estate prices and bank stability." *Journal of Banking and Finance* 34: 1129–1138.

Kuttner, K. N., and I. Shim. 2013. "Can non-interest rate policies stabilize housing markets? Evidence from a panel of 57 economies." NBER Working Paper No. 19723.

Li, V. J., A. W. W. Cheng, and T. S. Cheong. 2017. "Home purchase restriction and housing price: a distribution dynamics analysis." *Regional Science and Urban Economics* 67: 1–10.

Li, S., Q. Pan, and J. He. 2016. "Impact of systemic risk in the real estate sector on banking return." *SpringerPlus* 5(61).

Martins, A. M., A. P. Serra, and F. V. Martins. 2016. "Real estate market risk in bank stock returns: evidence for 15 European countries." *International Journal of Strategic Property Management* 20(2): 142–155.

Mei, J., and A. Saunders. 1995. "Bank risk and real estate: an asset pricing perspective." *Journal of Real Estate Finance and Economics* 10: 199–224.

Ren, Z. 2017. *1998-2017, real estate regulations in two decades: review, reflection, and choice*. Beijing: Ren Zeping, chief economist of Founder Securities.

Ren, Y., C. Xiong, and Y. Yuan. 2012. "House price bubbles in China." *China Economic Review* 23: 786–800.

Sun, W., S. Zheng, D. M. Geltner, and R. Wang. 2017. "The housing market effects of local home purchase restrictions: evidence from Beijing." *Journal of Real Estate Finance and Economics* 55(3): 288–312.

Vandenbussche, J., U. Vogel, and E. Detragiache. 2015. "Macroprudential policies and housing prices: A new database and empirical evidence for Central, Eastern, and Southeastern Europe." *Journal of Money, Credit and Banking* 47: 343–377.

Wang, B., and T. Sun. 2013. "How effective are macroprudential policies in China?" IMF Working Paper WP/13/75.

Wei, Y., P.T. I. Lam, Y. H. Chiang, and B.Y. P. Leung. 2014. "The effects of monetary policy on real estate investment in China: a regional perspective." *International Journal of Strategic Property Management* 18(4): 368–379.

Xu, X. E., and T. Chen. 2012. "The effect of monetary policy on real estate price growth in China." *Pacific-Basin Finance Journal* 20: 62–77.

Yu, H. 2010. "China's house price: affected by economic fundamentals or real estate policy?" *Frontiers of Economics in China* 5: 25–51.

Yu, S., L. Zhang, Y. Zeng, and H. Zhang. 2017. "Dual influences of regulatory policies on real estate enterprises' investment – based on the perspective of supply-side reform in China." *Finance Research Letters*, http://dx.doi.org/10.1016/j.frl.2017.03.003.

Zhang, H. 2008. "Effects of urban land supply policy on real estate in China: an econometric analysis." *Journal of Real Estate Literature* 16(1): 55–72.

Zhang, D., J. Cai, J. Liu, and A. M. Kutan. 2016. "Real estate investments and financial stability: evidence from regional commercial banks in China." *European Journal of Finance*, DOI: 10.1080/1351847X.2016.1154083.

Appendix:

Table 1. Major real estate regulatory policies in China from 2005 to 2017.

Time	Policy issuer	Main features of the policy
Major real estate regulatory policies from 2005 to July 2008 (controlling period)		
Financial policy:		
Mar. 2005	PBC	Adjusting the interest rates of mortgage loans and housing provident fund loans; increasing the down payment ratio in regions with rapid housing price growth
Sep. 2007	PBC and CBRC	Adjusting the interest rates and down payment requirements of mortgage loans by commercial banks
Tax policy:		
May 2005	SAT, MF, and MoC	Full sales tax payment required when a house bought within 2 years is sold
Land policy:		
Jul./ Aug. 2006	SC and MLR	Regulating the approval of land usage; controlling the transferring of agricultural land to real estate land; prohibiting illegally lowering land sales price; further strengthening the regulations of land sales and usage
Industrial policy:		
Mar. 2005	SC	Emphasizing the importance of stabilizing the housing prices
May 2006	SC	Stabilizing the housing prices from different aspects: loans, construction of economical housing , etc.
Jul. 2006	MoC etc.	Strengthening the management of foreign investments in real estate markets; restricting the housing purchases of foreign organizations and persons
May 2007	MC and SAFE	Strengthening the approval and monitoring of foreign investments in real estate markets
Aug. 2007	SC	Requiring resolution of the housing problems facing urban low-income families

Major real estate regulatory policies from August 2008 to November 2009 (stimulating period)		
Financial policy:		
Oct. 2008	PBC	Decreasing the interest rates of commercial personal mortgage loans and the ratio of down payment
Jul. 2009	CBRC	Strongly supporting the loan demands of borrowers buying the first house or meeting the standards of housing improvement

Table 1 (continued)

Tax policy:		
Oct. 2008	MF and SAT	Reducing the rate of deed tax to 1% for purchasing the first house not larger than 90 square meters
Dec. 2008	SAT and MF	Sales tax is exempted when an ordinary house owned for more than 2 years is sold
Nov. 2009	SAT	When a person subleases a house, the rent income is subject to personal income tax
Industrial policy:		
Aug. 2008	MHURD, NDRC, and MF	Increasing the number of low-rent houses to 3.5 million from 1 million
Dec. 2008	SC	Increasing the construction of low-income housing; further increasing the support of demands for housing loans
Major real estate regulatory policies from December 2009 to May 2014 (controlling period)		
Financial policy:		
Feb. 2010	CBRC	Regulating the use of working capital loans
Apr. 2010	CBRC and SC	Regulations about the issuance of housing loans to speculators, second-house or third-house buyers, and non-local residents
Jun. 2010	MHURD, PBC, and CBRC	Clarifying the criteria for identifying the number of houses of a family

Jul. 2010	CBRC	Emphasizing the strict implementation of differential mortgage policies
Nov. 2010	MHURD, MF,PBC, and CBRC	Ending the provident fund loans for third houses and increasing the down payment for second houses
Jul. 2013	SC	Guidelines for implementing the real estate control policies and differential housing credit policies and preventing real estate financing risks
Tax policy:		
Dec. 2009	SC,MF, and SAT	Regulations about the housing transfer sales taxes, with the exemption period increased from 2 years to 5 years
Land policy:		
Dec. 2009	MF, etc.	Full payment for acquired lands within 1 year (or 2 years for special projects, with the first payment no less than 50% of the total price)
Mar. 2010	MLR	Regulating the supply and inspection of housing land

Table 1 (continued)

Aug. 2010	MLR and CBRC	MLR created a blacklist of 1457 parcels of idle land. Based on the assessment of risks by CBRC, 80% of those idle land could be reclaimed
Sep. 2010	MLR and MHURD	Tightening the management of real estate land and construction; firms with lands idle for more than 1 year cannot bid for new lands
Sep. 2012	MLR and MHURD	Increasing the supply of land; improving the land transaction methods; emphasizing the enforcements of existing policies
Industrial policy:		
Dec. 2009	SC	Regulations about effective supply of housing, housing ownership and speculation, market supervision, and affordable housing construction
Jan. 2010	SC	Calling for further control of the real estate market and highlighting the steady and healthy development of the real estate market

Mar. 2010	SASAC	78 central enterprises whose primary business is not real estate development were required to withdraw from real estate business
Apr. 2010	MHURD and SC	Regulations about construction of affordable housing, curbing price growth, and issues related to housing sale system and housing credit policy
Jun. 2010	MHURD,etc.	Promoting the development of public rental housing
Sep. 2010	Premier Li and several government departments	Regulations about construction of affordable and public rental housing, mortgage loans, restrictions on the number of houses a family or resident can buy in certain cities, and taxes in housing transactions
Jan. 2011	SC	Comprehensive regulations about local government responsibility, affordable housing, tax issues, housing credit policy, etc.
Feb. 2013	SC	Curbing speculative housing demand, increasing housing and land supply, promoting affordable housing, and seeking long-term development mechanism of the housing market
Major real estate regulatory policies from June 2014 to September 2016 (stimulating period)		
Financial policy:		
Sep. 2014	PBC and CBRC	Adjusting the housing credit policy
Mar. 2015	PBC, MHURD, and CBRC	Reducing the ratio of down payment for second house purchases to 40%; for first house purchases, down payment ratio of provident fund loans adjusted to 20%
Tax policy:		
Mar. 2015	MF and SAT	Sales tax exemption period for second-hand house transactions was reduced from 5 years to 2 years

Table 1 (continued)

Feb. 2016	MF,SAT, and MHURD	Reducing the deed tax and sales tax for housing transactions
Industrial policy:		
Jun. 2014	Hohhot government	Hohhot became the first city to lift the restrictions on housing purchases

Major real estate regulatory policies from October 2016 to 2017 (controlling period)		
Industrial policy:		
Sep. 2016	Local governments	20 cities issued real estate control policies, including restrictions on housing purchases and loans
Mar.-May 2017	Local governments	From March to May, many cities introduced regulatory policies, including restrictions on housing purchases, loans and sales.
Sep.-Nov. 2017	Local governments	In September, 11 second tier cities deepened the control policies; From October to November, some third and fourth tier cities regulated the housing market mainly by restrictions on sales

Notes: This table shows the major real estate regulatory policies in China from 2005 to 2017, which is compiled from three previous studies by China Index Academy (2017), He (2016, 107–112), and Ren (2017). Abbreviations of the names of the policy issuers are used for People's Bank of China (PBC), China Banking Regulatory Commission (CBRC), State Council (SC), State Administration of Taxation (SAT), Ministry of Finance (MF), Ministry of Construction (MoC), Ministry of Commerce (MC), State Administration of Foreign Exchange (SAFE), Ministry of Housing and Urban-Rural Development (MHURD), National Development and Reform Commission (NDRC), Ministry of Land and Resources (MLR), and State-owned Assets Supervision and Administration Commission of the State Council (SASAC). The month is shown in boldface when the policy was announced at the end of that month (we define the policy was announced at the end of the month if there were less than 5 trading days in the month after the policy announcement date).

Table 1. VAR parameter estimates for the returns of the real estate firms.

	Constant	$R^e_{RE,t}$	dp_t	TS_t	VS_t	R^2

$R^e_{RE,t+1}$	0.1422	0.1004	0.0323	1.1461	0.1040	0.0380
	(2.0914)	(1.3800)	(2.0166)	(0.8060)	(1.3782)	
dp_{t+1}	-0.1265	-0.0399	0.9689	-1.0759	0.0108	0.9390
	(-1.4162)	(-0.4174)	(46.0908)	(-0.5760)	(0.1093)	
TS_{t+1}	-0.0023	0.0058	-0.0009	0.8432	-0.0005	0.7883
	(-1.2558)	(2.8956)	(-2.0494)	(21.7156)	(-0.2304)	
VS_{t+1}	-0.0328	-0.0451	-0.0064	-0.0471	0.8913	0.8458
	(-1.2829)	(-1.6457)	(-1.0573)	(-0.0880)	(31.3883)	

Notes: The table reports the parameter estimates of the VAR (1) model in Eq. (2) for the returns of the real estate firms. $R^e_{RE,t+1}$ is the log excess return of the real estate firms at month t+1, dp_{t+1} is the log dividend-yield of the real estate firms at month t+1, TS_{t+1} is the term-spread at month t+1, and VS_{t+1} is the small-stock value spread at month t+1. The first row, third row, fifth row, and seventh row show the parameter estimates for the equation of log excess return, log dividend-yield, term-spread, and small-stock value spread, respectively. T-statistics are shown in the parentheses.

Table 2. Estimates of the effects of the real estate regulatory policies.

	CF	CF	CF	CF	DR	DR	RET	RET
Constant	7.97***	7.13***	7.20***	3.40***	15.05***	17.16***	24.35***	25.54***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
C_Periods	-0.69							
	(0.44)							
C_Months		0.44						
		(0.64)						
S_Months		2.45*						
		(0.07)						
C_Financial Policies			-1.46	0.83	3.13	2.38**	0.03	-1.02
			(0.32)	(0.42)	(0.11)	(0.02)	(0.99)	(0.31)
C_Tax Policies			-3.05	1.05	0.80	1.88	-3.75	-2.48
			(0.33)	(0.69)	(0.85)	(0.46)	(0.24)	(0.33)
C_Land Policies			-0.54	-1.55	1.42	0.70	-0.72	-2.76**
			(0.75)	(0.22)	(0.53)	(0.57)	(0.67)	(0.02)
C_Industrial Policies			1.64	1.25	-2.09	-1.52*	0.62	2.16***
			(0.16)	(0.16)	(0.18)	(0.08)	(0.60)	(0.01)
S_Financial Policies			-0.57	0.17	1.37	-1.40	-0.28	-2.60*
			(0.81)	(0.91)	(0.67)	(0.36)	(0.91)	(0.09)
S_Tax Policies			3.29	2.74*	2.23	1.58	3.36	3.35**
			(0.12)	(0.10)	(0.43)	(0.33)	(0.12)	(0.04)
S_Industrial Policies			2.31	-0.29	-1.54	0.31	-1.84	-1.87
			(0.28)	(0.89)	(0.59)	(0.88)	(0.39)	(0.37)
Market Volatility				25.75***		29.65***		22.50***
				(0.01)		(0.00)		(0.01)
House Price Change				0.00		-0.01		0.02
				(0.95)		(0.86)		(0.77)

Notes: The table reports the OLS estimates of the time series regression analysis for the effects of the real estate regulatory policies. The dependent variable, shown in the first row, is the dynamic cash flow connectedness (CF), discount rate connectedness (DR), or overall return connectedness (RET) of the real estate firms to banks. The independent variables are shown in the first column, where "C_" stands for "Controlling" (for example, "C_Periods" is "Controlling Periods"), and "S_" stands for "Stimulating" (for example, "S_Months" is "Stimulating Months"). Due to the availability of the real estate price data, the sample period for the regressions that control for market volatility and overall real estate price changes starts from February 2009. P-values are shown in the parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% significance level, respectively.

Figure 1. Dynamic overall return connectedness (ret_RE), discount rate connectedness (N_dr), and cash flow connectedness (N_cf) of the real estate firms to banks. The three connectedness measures are computed based on forecast error variance decompositions with a rolling window of 36 months and a forecast horizon of 6 months.