

Comparative study on the influence of business cycle and financial cycle on real estate price in China

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Abstract: China's real estate industry has experienced rapid growth since the initiation of economic reforms and opening up. With the real estate sector gaining increasing prominence as a key driver of the national economy, the finance and economy of China have exhibited progressively stronger spillover effects on this industry. This study aims to examine disparities in the extent, intensity, and timing of shocks to real estate prices between China's business cycle and financial cycle. Employing a structural autoregressive vector model, we analyze the spillover effects of China's business cycle and financial cycle on real estate prices from 2006 to 2021. Additionally, we conduct variance decomposition analysis to compare the divergences in shocks between China's business cycle and financial cycle. Our empirical findings reveal that both China's business cycle and financial cycle contribute to fluctuations in real estate prices, with the financial cycle exhibiting an early warning effect for the business cycle. Furthermore, we observe distinct explanatory power of China's business cycle and financial cycle on real estate price fluctuations. Hence, it is imperative for our government to recognize the significance of spillover effects arising from China's business cycle and financial cycle on real estate prices. Effective measures should be taken to mitigate co-shocks resulting from the overlapping of the real estate cycle with the business and financial cycles. Additionally, incorporating real estate macroprudential policy as a vital component within the macroprudential policy framework will facilitate the stable and sustainable development of China's real estate industry.

1. Introduction

Since the initiation of China's economic reforms and opening up in 1978, the socialist market economy with Chinese characteristics has steadily advanced. Despite starting from a relatively low base, China's real estate industry has gained significant momentum during its development phase. In recent years, driven by the vigorous promotion of urbanization, the real estate sector has increasingly become a prominent driver of the national economy, thus fueling economic growth and emerging as one of the primary engines of economic development.

Against the backdrop of China's transition from high-speed growth to high-quality development, the Chinese government has placed greater emphasis on policy supervision and has implemented a two-pillar framework comprising monetary policy and macroprudential policy. Additionally, a macroprudential policy for housing finance has been introduced. Simultaneously, with the evolution and maturation of China's financial sector, as well as the increasing marketization and

internationalization of the financial industry, it is worth exploring to determine whether there will be structural changes in the relationship between the real estate industry and the macroeconomy. To what extent do fluctuations in the business and financial cycles drive changes in real estate prices? Furthermore, do the business cycle and financial cycle exert different effects on real estate prices?

2. Literature Review

Domestic and international scholars have long been interested in the economic, financial, and real estate sectors, and the relationship among these three has been a focal point of academic research. Previous studies have primarily focused on the influence of real estate prices on the business cycle or financial cycle. Among them, past research drew three main conclusions regarding the impact of real estate prices on the business cycle: First, rising real estate prices have been found to have a significant positive impact on economic development.^{[1][2]} Second, an opposing view suggests that real estate growth may crowd out consumption and business investment, thereby having a limited contribution to economic development and, in some cases, even a negative impact^{[3][4]}. Third, a non-linear perspective has been taken to examine the relationship between real estate price fluctuations and economic development. Regarding the impact of real estate price fluctuations on the financial cycle, the literature suggests that the development of the real estate sector has a positive influence on financial development^[5]. However, we think it is equally important to investigate how the business cycle and financial cycle affect real estate prices.

In early studies related to the impact of the business cycle on real estate prices, foreign scholars primarily focused on the influence of macroeconomic factors such as economic growth, inflation, and demographic changes on the real estate cycle. Downs^[6] found that differences in underlying market conditions can lead to variations in real estate cycles, with dynamic markets experiencing more intensive fluctuations than static markets. Pyhrr^[7] analyzed the impact of fundamental economic variables such as interest rates, inflation, and economic growth on real estate prices. Given the relatively late start of the real estate industry in China, research on this topic has been limited by the availability and duration of data on real estate. In domestic research, Zhou Zhichun et al.^[8] identified significant factors affecting China's real estate industry, including economic growth, urban residents' income level, urbanization level, and demographic dividends. Zhang Hong and Yang Fei^[9] studied the relationship between house prices, real estate investment, and inflation. They found that inflation has no significant effect on house prices but does significantly impact real estate investment.

Regarding the impact of the financial cycle on real estate prices, Stein^[10] incorporated credit constraints into a real estate cycle model to investigate the impact of credit on property price volatility and transaction volumes. Empirically, Pavlov and Wachter^[11] examined the impact of options on the real estate market. Domestic scholars have also conducted research in this area, with Zhou Jianjun et al.^[12] analyzed the relationship between real estate and financial policies, highlighting the smoothing effect of credit policies on real estate cycle volatility compared to interest rate policies. Yi Jianhua et al.^[13] found a proportional relationship between money supply and the real estate cycle, achieving synchronization between the real estate cycle and the monetary cycle by monetizing real estate. In summary, existing literature on the spillover effects of China's economy and finance on real estate has often overlooked a comprehensive cyclical perspective for comparative analysis, thereby lacking practical significance and policy guidance. The innovation of this paper lies in investigating the impact mechanisms of the business cycle and the financial cycle on real estate price shocks, as well as exploring the role of financial cycle warning signals through comparative analysis.

3. Theoretical Framework

As the real estate industry's contribution to China's gross national product continues to grow, it has

increasingly emerged as a pivotal sector in the country's economic development, playing a crucial role in driving economic growth. Real estate not only exerts a significant influence on macroeconomic development but is also susceptible to macroeconomic shocks. The determination of real estate prices is based on the net present value of expected returns and the prices of comparable assets, adjusted for market conditions, and is heavily influenced by economic and financial factors. In theory, real estate prices rise when there are indications and expectations of expansion in the business and financial cycles. Conversely, the real estate market cools down when signals of contraction in the economy emerge.

Regarding the business cycle, its impact on the real estate market can be categorized into two mechanisms: the income mechanism and the interest rate mechanism. Firstly, the income mechanism operates as follows: during an upswing in the domestic economy, with an increase in gross domestic product and disposable income, residents have greater asset holdings and purchasing power, resulting in an upsurge in real estate investment and consumption demand. This, in turn, propels real estate prices upward, pushing the real estate economy into an accelerated growth phase. Conversely, during an economic downturn, with a decline in employment rates and a reduction in residents' purchasing power, non-essential real estate investment diminishes, leading to a contraction in the real estate market and a decline in property prices. Secondly, the interest rate mechanism functions as follows: when interest rates are lowered, financing costs decrease, incentivizing real estate companies to ramp up construction investments. Simultaneously, lower interest rates reduce mortgage costs, prompting prospective homebuyers to actively consider purchasing homes. These factors collectively foster a vibrant real estate market (in the Figure 1).

In terms of the financial cycle, its impact on real estate prices can be dissected into four mechanisms. Firstly, the money supply mechanism operates as follows: when the financial sector is robust, with an abundant money supply and financial institutions seeking valuable projects to invest in, commercial banks prefer mortgage loans due to their dual advantage of high yield and protection. As banks increasingly favor mortgage lending, intensified competition among various financial institutions leads to a further reduction in mortgage financing costs. This stimulates real estate demand, resulting in increased house prices. Secondly, the market interest rate mechanism operates as follows: when market interest rates are low, financing costs are significantly reduced. As the cost of financing plays a pivotal role in consumers' decision-making process when considering home purchases, a substantial reduction in financing costs stimulates housing demand and drives up real estate prices. Conversely, high market interest rates dampen demand for home purchases due to increased financing costs and may even trigger defaults among borrowers with weaker asset positions. Such defaults can pose downside risks to property prices. Thirdly, the financial leverage mechanism comes into play: since the inception of housing reforms and the opening-up policy, real estate has proven to be a high-yielding and stable investment due to its investment value and the stability of high-priced properties. Consequently, when financial leverage increases, real estate investments tend to attract new liquidity, triggering significant capital inflows into the real estate sector and fueling a surge in real estate fervor. Finally, the equity price mechanism operates as follows: as stock prices soar, investors' assets appreciate, boosting their purchasing power, thereby stimulating real estate consumption and creating a wealth effect. Simultaneously, stocks can be pledged as collateral, and during a booming stock market, rising stock values facilitate credit financing against pledged stocks, which injects additional funds into the real estate market.

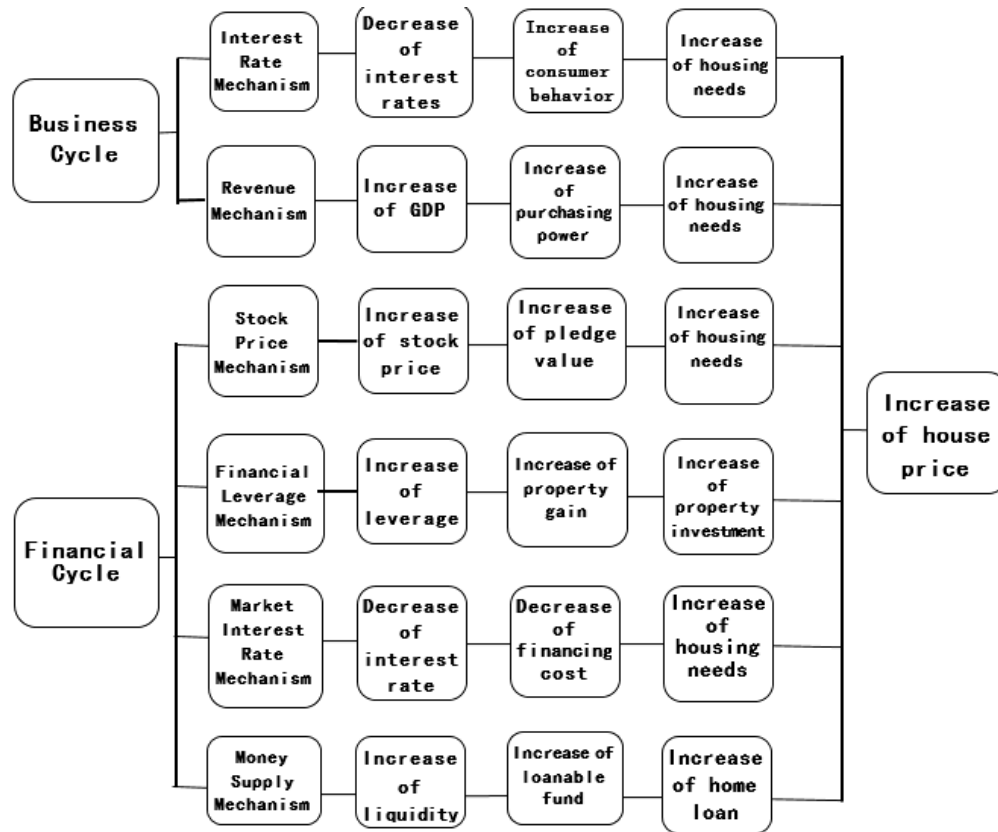


Figure 1 Channels through which the business cycle and financial cycle affect property prices

4. Model Construction and Variable Measurement

4.1 Model Development

According to theoretical analysis, it is evident that the business cycle and financial cycle impact China's real estate market through distinct channels. To address the heterogeneous influence of these cycles on real estate, this study performs an empirical analysis by constructing a structural vector autoregressive (SVAR) model. This approach imposes constraints on the contemporaneous relationships between endogenous variables, resolving the limitations of a general VAR model in handling current period relationships. Additionally, a structured impulse response function is employed to examine the extent to which other variables within the model respond to shocks and the impact of current information on future changes. Consequently, the SVAR model has gained widespread usage in studying the spillover effects of the business cycle and financial cycle.

In this paper, a vector Y is formed, comprising three endogenous variables: China's business cycle (ECI), China's financial cycle (FCI), and China's real estate prices (FDCTB). After subjecting each time series to a data stationarity test, the 3-element p -order VAR model is obtained as Equation(1):

$$Y_t = B_1 Y_{t-1} + B_2 Y_{t-2} \dots + B_p Y_{t-p} + e_t \quad (1)$$

Here, Y_t represents the 3 x 1-dimensional stationary endogenous variable;

B_1, B_2, \dots, B_p is the coefficient matrix of lagged endogenous variables, and e_t denotes the 3-dimensional disturbance term without serial correlation. Let Σ be the covariance matrix of the disturbance term e_t and be a positive definite matrix. To derive the contemporaneous structural

relationship between China's business cycle, financial cycle, and real estate prices, the VAR model is augmented with the structural relationship based on economic theory, resulting in the structural vector autoregressive model SVAR(p) as shown in Equation(2):

$$AY_t = \Gamma_1 Y_{t-1} + \Gamma_2 Y_{t-2} + \dots + \Gamma_p Y_{t-p} + \varepsilon_t, t = 1, 2, \dots, T \quad (2)$$

The coefficient matrix A captures the structural relationship between the three endogenous variables (ECI, FCI, and FDCTB) over the same period. The matrix $\Gamma_1, \Gamma_2, \dots, \Gamma_p$ represents the contemporaneous coefficient matrix of lagged endogenous variables with lags of order p, and ε_t denotes the structural disturbance term.

By left-multiplying Equation (1) with A, Equation (3) is obtained:

$$AY_t = AB_1 Y_{t-1} + AB_2 Y_{t-2} \dots + AB_p Y_{t-p} + Ae_t \quad (3)$$

Comparing Equations (2) and (3), Equation (4) is derived as follows:

$$Ae_t = \varepsilon_t \quad (4)$$

Equation (4) represents a linear combination of structural disturbance terms, representing a compound shock. Through orthogonalization of ε_t to $\varepsilon_t = Bu_t$, the estimated AB-type SVAR model is expressed as Equation (5):

$$Ae_t = Bu_t \quad (5)$$

Equation (5) corresponds to the AB-type SVAR model, satisfying the condition $E(u_t u_t') = I$. To ensure the model's identifiability, constraints must be imposed on the contemporaneous relationship matrix A. For a k-element p-order SVAR model, $k(k-1)/2$ constraints should be applied to the structural formula to estimate the parameters accurately. This paper imposes at least three constraints on the model. Constraints can be categorized into two main types: short-term constraints and long-term constraints. Regarding short-term constraints, two types are considered. Firstly, a recursive form of contemporaneous constraint is established by ordering variables by Cholesky decomposition. Secondly, contemporaneous constraints are imposed on specific variables based on economic theory assumptions. In this study, we adopt the first method to construct the SVAR model, which establishes an organic dynamic linkage system. Once the model is built, the estimation of equation (1) using ordinary least squares provides the parameter B_1, B_2, \dots, B_p , disturbance term e_t , and an estimate of the covariance matrix Σ . This allows for the calculation of the dynamic response of Y_t to the shock e_t . If the inverse matrix A is known, the impulse response function can be calculated by subjecting a unit shock to e_t , thereby determining the dynamic response of Y_t . Based on the results obtained from the impulse response analysis, an in-depth analysis of the impact of China's business cycle and financial cycle on China's real estate can be conducted. Furthermore, by combining impulse response analysis with comparative analysis, a deeper understanding of the relationship between China's business cycle and financial cycle can be explored. Finally, the robustness tests further confirm the explanatory power of the model.

4.2 Sample Selection

The business cycle embodies the ongoing expansion and contraction of a nation's economy as

influenced by positive factors and negative shocks. Its fluctuating trends comprehensively effectively describe macroeconomic movements. In this study, we adopt the approach proposed by Deng Chuang and Xu Man^[14] to measure the business cycle (ECI). The authors utilize the economic sentiment index, treating it as $(\text{economic sentiment Index} - 100)/100$, which serves as a variable for measurement.

The financial cycle refers to cyclical fluctuations resulting from the expansion and contraction of financial variables. In this study, we follow the methodology of Qian Zongxin et al.^[15] to synthesize the financial cycle index (FCI). This index incorporates various base variables, including stock price variables, money supply variables, market interest rate variables, and capital flow variables. We use the year-on-year quarterly average of the Shanghai A-share index as a proxy variable for stock prices. The year-on-year growth rate of the quarterly average of M2 serves as a proxy variable for money supply. Additionally, the quarterly average of the weighted average 7-day interbank lending rate acts as a proxy variable for market interest rates. The ratio of capital and financial item balances to GNP is employed as a proxy variable for capital flows.

For the analysis of real estate prices, this paper utilizes proxy variable derived from the month-on-month 2nd-hand residential price index of 70 large and medium-sized cities. Quarterly data is obtained by averaging the index, allowing us to capture consistent fluctuations in real estate prices. The selected variables cover the quarterly period from 2006 to 2021, and the data are sourced from the Wind Macroeconomic Database.

5. Empirical Analysis

5.1 Data Verification

Based on the non-stationary nature of most macroeconomic time series variables, this study employed the Augmented Dickey-Fuller (ADF) method to test the model data. The results indicated that the business cycle level series exhibited stationarity, while the financial cycle and real estate variables demonstrated stationarity in their first-order and second-order difference series, respectively. Following the Johansen co-integration test for each time series, it was concluded that the variables are stable in the long run. Subsequently, the optimal lag order for the VAR model was determined as a crucial basis for capturing the model's dynamic characteristics. The accuracy of the lag order selection significantly impacts the model's ability to reflect these dynamics. In this study, the optimal lag order was chosen as 2. Moreover, the stability of the model was confirmed through an AR root test, which revealed that the modulus of each unit root was less than 1, satisfying the stability condition.

5.2 Identification of The Structural Vector Autoregressive (SVAR) model

The model utilized in this study incorporates three endogenous variables: China's economic sentiment index, financial cycle index, and the 2nd-hand residential price index of 70 large and medium-sized cities. Consequently, the imposition of $k*(k-1)/2 = 3$ constraints is required. This paper adopts the Cholesky decomposition method for imposing contemporaneous constraints. Under the Cholesky decomposition method, it is important to determine whether the relationship between variables is based on the current or lagged period.

Based on economic theory, variables that exhibit an effect in the current period are ranked first, while those with a lagged period effect are ranked second. In the context of this study, financial cycles display higher responsiveness to shocks of economic and financial variables in the current period, whereas real estate prices respond to shocks in the financial markets with a time lag^[12]. Furthermore, it is noted that the macroeconomy is more significantly influenced by real estate^[16]. Therefore, the variable order in constructing the SVAR model for this study is as follows: business cycle, real

estate price, and financial cycle.

5.3 Impulse Response Analysis

As depicted in Figure 2 (a and b), positive shocks originating from the business cycle and the financial cycle generate an initial upward effect on China's real estate economy. This effect reaches its peak in the 3rd and 5th periods, after which it gradually weakens and eventually turns negative, exerting a downward impact on the real estate economy. The negative effect intensifies, causing the business cycle and financial cycle to exert their lowest influence on the real estate economy in periods 8 and 11, respectively. Subsequently, the influence follows a cyclical pattern of gradual rise and fall, ultimately converging toward zero. The positive effect section of Figure 2(a and b) illustrates that the impact of the business cycle and the financial cycle on the real estate economy is positive and aligned with economic theory. Regarding the business cycle, during economic expansions, the gross domestic product rises, purchasing power strengthens, and per capita disposable income increases. This leads to more capital flowing into the real estate market, resulting in increased popularity and rising real estate prices. Conversely, during economic downturns, reduced employment and decreased non-essential real estate investments lead to a contraction in the real estate market and a decline in prices. In terms of the financial cycle, two noteworthy aspects arise in a flourishing situation. Firstly, abundant liquidity and low market interest rates bring lower financing costs, stimulating credit financing behavior. A significant influx of mortgage loans injects momentum into the real estate market, leading to an increase in real estate prices. Secondly, a thriving stock market, characterized by rising share prices, enhances investor wealth and facilitates pledged financing. As residents' wealth increases, this positive incentive effect stimulates both consumer and investment demand for real estate, ultimately driving up real estate prices. However, the subsequent negative effect shown in Figure 2 (a and b) indicates the implementation of national control policies in the real estate sector, primarily during economic downturns. Due to the asymmetric effect of the business cycle on the efficacy of macroprudential policies, implementing such policies during economic downturns becomes more timely and effective. This effectively prevents excessive tightening in the real estate market, stimulates the real estate economy, and generates a negative impact that stimulates the development of the real estate market. During the 2008 financial crisis, China's real economy experienced a downturn, accompanied by a decline in real estate development and investment. In response to the crisis, China implemented loose macroeconomic policies. Measures such as relaxing the loan-to-value ratio (LTV) from 30% to 20% and relaxing the mortgage policy for second homes were introduced in October 2008. Simultaneously, in 2009, China issued real estate regulation and control policies through "Opinions of the General Office of the State Council on Further Strengthening the Regulation of the Real Estate Market." These policies aimed to increase the effective supply of ordinary commercial housing, promote housing consumption and investment, and support residents' owner occupied and improved housing consumption. They also aimed to facilitate the construction of guaranteed housing projects, intending to promote the healthy development of the real estate industry, activate the market, and stimulate housing consumption and investment. Following the implementation of the aforementioned macroprudential measures, China's real estate prices began to recover in January 2009, with the growth rate increasing from -0.3% in January to 1.9% in December, resulting in a 2.2% increase. Considering the procyclicality of both the real estate industry and the financial sector, as well as the amplification effect resulting from their intersection, the influence of the real estate industry on the stability of the financial system should not be underestimated. To mitigate the procyclicality of the real estate sector, the country must adopt appropriate macroprudential policies pertaining to real estate finance to reduce the possibility of systemic risks arising from real estate-related risks.

As illustrated in Figure 2(a and b), the positive influence section reveals that the financial cycle has a more substantial impact on real estate prices compared to the business cycle. This suggests a significant inflow of financial loans into the real estate industry, indicating a strong siphoning effect. During an upward financial cycle, credit expansion leads to an increase in the macroeconomic leverage ratio. For households without properties, a higher debt ratio necessitates a reduction in consumption to save for down payments. Similarly, households with existing properties that acquire loans for home purchases also experience squeezed consumption. Consequently, the real estate market exhibits a crowding-out effect on consumption. For the corporate sector, a higher debt ratio results in the flow of funds from real enterprises to sectors with higher returns driven by the siphoning effect. The upward movement of the real estate market provides opportunities. For financial intermediaries, they find real estate loans appealing due to the loans' low risk weights, relatively high returns, and good collateral attributes. This demonstrates that resources within the economy shift from the consumer and investment sectors to the real estate sector during an upward financial cycle, reflecting the strong siphoning effect of real estate. Furthermore, in the negative impact section of Figure 2 (a and b), the magnitude of the business cycle's impact on real estate prices is greater than that of the financial cycle. This indicates that real estate prices are driven by demand-side factors. When the business cycle declines, social productivity decreases, leading to a decrease in disposable income for residents. Consequently, real estate consumption and investment decrease, leading to a contraction in the real estate market. Overall, both of these impulse responses align well with the characteristics of China's real estate industry.

Moreover, Figure 2 (a and b) demonstrates that the impact of the financial cycle on real estate prices recovers earlier than the impact of the business cycle. When the real estate price receives a positive shock from the business cycle, the impact tends to zero in the 30th period, whereas the impact tends to zero in the 28th period when the real estate price receives a positive shock from the financial cycle. This indicates that the financial cycle serves as an early warning signal for the business cycle, with its impact on real estate prices preceding that of the business cycle. This finding is consistent with the conclusion of Ma Yong et al.^[17], which suggests that "the financial cycle has a good predictive ability for the business cycle." Changes in the financial cycle not only rapidly affect the financial system itself but also have a further impact on the real economy through market transmission. The financial cycle emerges as a crucial driver of changes in the business cycle, thereby confirming the proposition of an endogenous linkage between finance and the real economy.

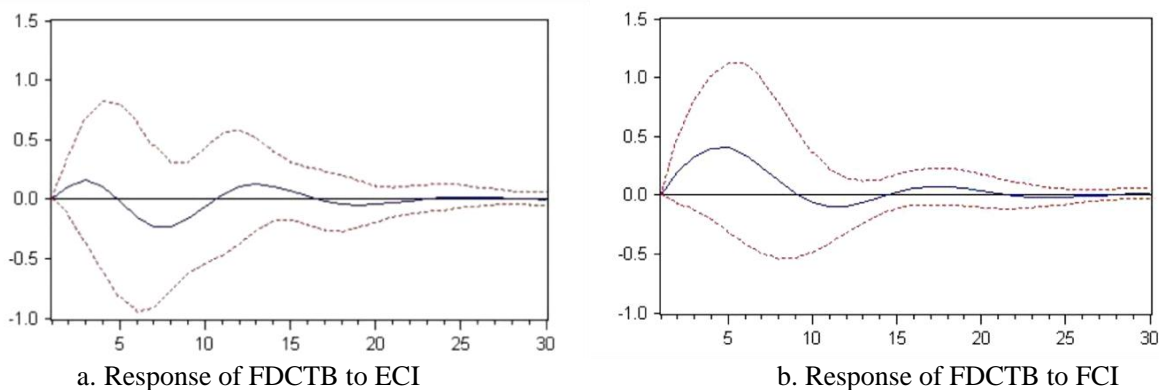


Figure 2: The impact of business cycle and financial cycle on real estate price in China

5.4 Variance Decomposition

To further analyze the differential impact of China's business cycle and financial cycle on its real estate prices, this study conducts variance decomposition based on the analysis of the dynamic impact

of the impulse response function on endogenous variables. The results are presented in Figure 3. Among these variables, the highest degree of impact on China's real estate prices is the variable itself, while the spillover effects of the business cycle and financial cycle gradually reduce its impact. The variance of real estate price forecasts is approximately 2% explained by the business cycle and 5% explained by the financial cycle. These findings support the notion that real estate prices in China are slightly more influenced by the financial cycle than the business cycle, due to the close relationship between real estate prices and money supply.

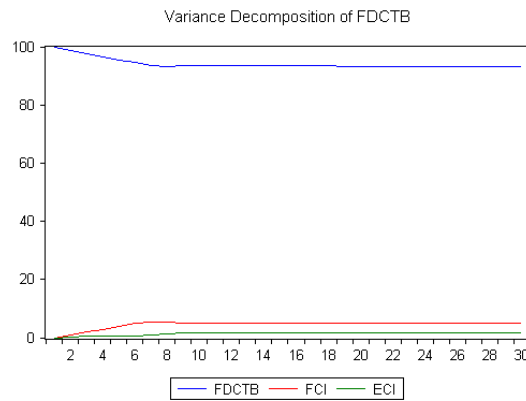


Figure 3: Variance Decomposition of FDCTB.

5.5 Robustness Tests

It is important to note that different time series sample spans may yield varying results and analytical conclusions in SVAR models. To test the robustness of the aforementioned SVAR model and the accuracy of the empirical conclusions, this study extends the sample period to September 2005 to December 2021, in addition to the previous time series sample data. The results, as shown in Figure 4 (a and b), do not exhibit significant changes compared to the original model. This indicates that the SVAR model constructed in this study is robust.

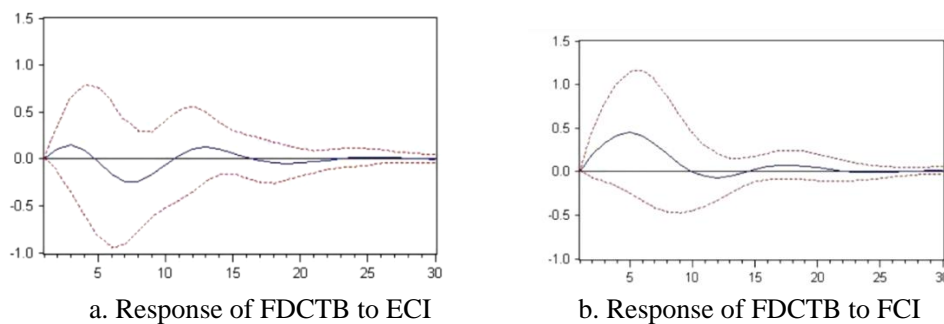


Figure 4: SVAR model robustness test.

6. Conclusion

This paper elucidates the mechanism through which China's business cycle and financial cycle impact real estate prices. Employing the economic sentiment index, financial cycle index, and the second-hand residential price index of 70 large and medium-sized cities, this study conducts an empirical analysis to compare the spillover effects of China's business cycle and financial cycle on real estate prices from 2006 to 2021. The findings confirm that China's business cycle and financial cycle indeed trigger cyclical fluctuations in real estate prices, although their impacts are inconsistent.

Furthermore, the financial cycle acts as an early warning signal for the business cycle, and China's business cycle and financial cycle exhibit differing explanatory abilities for real estate price fluctuations. Amidst the ongoing urbanization process in China, real estate plays an increasingly prominent role in the macroeconomy. Affected by the epidemic and the economic downturn, China's real estate has seen a number of recent crashes and is set to face greater challenges.

In light of the above, it is imperative for China to adopt effective measures to manage and mitigate the co-movements arising from the convergence of the real estate cycle with the business cycle and financial cycle. Real estate macro-control policies should be considered integral to the macroprudential policy framework, aiming to foster a sustainable balance between supply and demand in the real estate market and ensure the stable and healthy development of China's real estate market. First, emphasis should be placed on recognizing the early warning role of the business cycle and financial cycle in relation to China's real estate market. Core indicators capturing changes in the business cycle and financial cycle and their impact on real estate price fluctuations should be quantified, and the early warning mechanism for these indicators should be improved to prevent economic and financial shocks. Secondly, attention should be given to the situation of differentiation between the current business cycle and financial cycle in China. This entails enhancing foresight in formulating and adjusting macroeconomic policies, focusing on the role of finance in serving the economy, and promoting the coordinated development of the financial and economic sectors. Third, adequate attention should be given to the scale and direction of China's macro-policy coordination. Strengthening the effective coordination between monetary policy and macroprudential policy, which constitute the two pillars of the regulatory framework, will create a favorable policy environment for the stable and healthy development of the real estate sector. Finally, real estate planning and development should align with the business cycle and financial cycle. By analyzing the business cycle's status, investment progress and production schedules can be strategically planned to synchronize with the peak phase of real estate sales.

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