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The Property Market and the Macroeconomy of the Mainland:

A Cross Region Study

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Abstract

This paper studies the nexus between the property market and the macroeconomy of Mainland China in 1998-2004, using panel data models covering 31 provinces and major cities. The estimates suggest three main conclusions. First, there seemed to be a two-way linkage between property price and GDP growth. In particular, property price increase had a significant positive impact on investment, but no evidence of a wealth effect on consumption is obtained. Second, credit expansion by the four large state-owned banks did not seem to play an 'accelerating' role in the booming property market, but data limitation prevents an analysis of total bank credit by provinces. Third, land price rise had a much larger 'multiplier' effect on property prices in coastal areas (particularly the Yangtze River Delta) than in the interior provinces.

JEL: C33; E22; R1
Key words: Property Market; Macroeconomy; China

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1. Introduction

The property market in Mainland China has grown rapidly and become an important source of economic growth. The development of the Mainland property market, which started in the late 1980's with a series of gradual reforms on land use and housing systems, has accelerated in recent years. This is helped by the abolition of the administrative housing allocation system in 1998, the quickened pace of urbanisation, strong income growth and the expansion of mortgage loan business by commercial banks, which reduces home buyers' liquidity constraint.

Property prices started to pick up in 2001, following declines in the earlier years. The nation-wide property price index for building has increased by 23% since 2000. Price rises have been sharp in major cities and coastal provinces and in the luxury residential property sector. In particular, the property price index for Shanghai increased by an average of about 13% per annum in 2001-04.

The booming property market has had significant impact on the wider economy. In particular, real estate investment for residential building has grown strongly, by an average rate of about 28% per annum in 2001-04. It is estimated that the real estate industry contributed 1.9-2.5 percentage points to GDP growth in 2004 (Gu, 2005). The strong investment demand has contributed to sharp increases in producer and investment goods price inflation in 2002 -2004. The housing component has also been the second largest contributor (after food prices) to the rise in the consumer price index. Sales of land and property development have become an important source of income for local governments.[1] Moreover, banks' exposure to the property market has

[1] Chan (1999) estimates that sixty per cent of land sales revenue goes to the local governments and the rest to the central government.

increased. It is estimated that about 60% of real estate investment was financed by bank loans in the past five years, with mortgage and development loans accounting for 35% and 25% respectively (Liu and Huang, 2004).

The surge of property prices and rising real estate investment have raised concerns about their macroeconomic consequences and housing affordability for ordinary people. In particular, there is a heated debate about whether a property bubble has developed. Associated with that, some worry about the impact of any sharp swing in the property market on macroeconomic and financial stability on the Mainland. Reflecting these concerns, the authorities have implemented a number of policy measures in order to rein in the booming property market, particularly to curb speculative demand for properties.

Against this backdrop, it would be useful to investigate how property market developments have affected the macroeconomy on the Mainland. However, existing studies are mostly related to the analysis of housing demand and its impact on housing prices and real estate investment.[2] Few studies analyse the nexus between the property market and the macroeconomy in a quantitative and systematic way, partly because of data limitations. Using Granger causality analysis of nation-wide data, Liu, Park and Zheng (2002) find that housing investment has a long-run effect on economic growth whereas economic growth affects both housing and non-housing investment.

[2] In particular, based on the aggregated price data, Liu and Huang (2004) obtain no clear evidence of a property bubble, but Shen and Liu (2004) find that the increase of property prices can only be partially explained by economic fundamentals, using data for 14 cities. Sun (1998) shows marked differences between the coastal and inland areas in property development, with investment from Hong Kong, Macau and Taiwan playing an important role in the coastal areas. Two interesting studies by Huang (2003) and Huang (2004) examine the dynamics of housing demand and residential crowding in urban China. His findings suggest that housing consumption and residential investment are affected not only by demographic and socio-economic factors but also by institutional factors that are unique to Mainland China including the dualism in housing reform and local government behaviour. Based on the "Survey of China Real Estate Industry (1999-2002)" on 35 metropolitan areas, Ping and Chen (2004) try to establish a relationship among real estate financing, land price and housing price.

This paper investigates the relationships between the macroeconomy and the property market in Mainland China in 1998-2004, using data of six major cities and twenty-five provinces. In particular, we consider how property price changes may have affected macroeconomic variables such as GDP growth, investment, consumption and bank credit expansion. The econometric study uses linear panel data models, which have the advantage of increasing the sample size by 31 folds. This reduces the data limitation problem, and allows the analysis to focus on the recent upswing in the property market. The latter differs markedly from the previous cycles in that it has been driven more by private housing demand, in part owing to the abolition of the administrative allocation system of housing in 1998.

However, the pooled estimates using panel data assume that the coefficients on each regressor are the same for all sections (in this case all provinces and cities), and this assumption may not be valid given regional differences in economic structure and development. The validity of the homogeneity restriction will be tested. If it is rejected, we explore how estimates may differ between groups of provinces. First, the sample is divided into a group of 6 cities and coastal provinces and that of interior provinces. Second, provinces in the Yangtze River Delta (Shanghai, Jiangsu, Jiangxi, Anhui and Zhejiang) are grouped to compare with the rest of the sample. An examination of stylised facts suggests that property price have risen faster in metropolitan cities, coastal areas, and particularly the Yangtze River Delta.

The rest of the paper is organised as follows. Section 2 provides stylised facts based on data used in the econometric analysis. Section 3 considers panel data models and some estimations issues, such as heteroskedasticity in residual variances, dynamic GMM methods for models having lagged dependent variable as an explanatory variable and heterogeneity of coefficient estimates. Section 4 presents the empirical results and discusses their implications. The last section concludes.

2. Data and Stylised Facts

Annual data for six cities and twenty-five provinces are selected.[3] The series include property price index for building, land price index, rental price index, real estate investment, fixed asset investment, retail sales of consumer goods, GDP (by industry), bank loans, bank deposits, and 1-year lending and deposit rate.[4] Bank loans and deposits are sums of the four major state-owned banks only, as data on other banks and financial institutions are not available by provinces.[5] Also, data on the outstanding loans of the four banks reflect a reduction associated with the disposal of bad loans to the four asset management companies. It was estimated that loans of about 1.4 trillion renminbi was carved out from the big four state banks in 1999-2000 (Ma, 2002). To derive a proper measure of credit growth, these disposed loans were added back to the total outstanding loans. As the bulk of the disposal took place in 2000 (no information is available on the exact distribution between the two years), it is assumed that 25% of the disposal took place in 1999 and the remainder affected the figures from 2000 onward.

Provincial consumer price indices are used to deflate nominal fixed asset and real estate investment, retail sales, and bank loans and deposits and lending rates to obtain their respective real values. These and real GDP are then transformed into log-first differences (annual growth rates) for the empirical analysis, except the interest rate.

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[3] The sample includes (for cities): Beijing, Chongqing, Shanghai, Tianjin, Shenzhen and Guangzhou, and (for provinces) Anhui, Fujian, Gansu, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan, Zhejiang, and Inner Monogolia.

[4] The data are from the CEIC Data Ltd, a data provider whose data are from official sources. The detailed definitions of these series are provided in Appendix 1.

[5] The four major state-owned banks are the Bank of China, China Construction Bank, Industrial and Commercial Bank of China, and Agriculture Bank of China.

To get a sense of the impact of property market developments on macroeconomic conditions on the Mainland, provinces are grouped according to certain characteristics to derive some stylised facts. One grouping is made into those with above and below average real property price growth. The two groups are then compared in terms of average growth in GDP, real estate investment, fixed asset investment, retail sales and bank loans. To explore the interaction between property price and GDP growth, we also compare real property price inflation between two groups with above and below average GDP growth.

Compared with provinces with below average GDP growth, provinces with above average GDP growth had a much higher average rate of inflation in property prices during 1998-2004 except year 2001 (Chart 1A). In the other direction, provinces with above average property price inflation also had stronger output growth (Chart 1B). This suggests that increases in property prices are generally associated with rises in real GDP.

Four panels of Chart 2 compare growth in real estate investment, fixed asset investment, retail sales, and bank loans between provinces with above and below average property price growth. It shows that provinces with above average property price growth had higher growth in real estate investment in each year of 1999-2004, and also higher fixed asset investment growth during the period except 2001. This suggests that increases in property prices have boosted real estate investment in recent years, which has become an important part of aggregate investment.[6] It is also possible that higher fixed asset investment contributed to property price increases, as it led to higher household income and thus higher demand for housing.

[6] Real estate investment growth may also affect property price inflation. However, this direction of causality would imply a negative relationship as increases in real estate investment would raise housing supply and thus depress property prices for given demand.

Retail sales also appeared to increase at a higher rate in provinces with above average property price inflation than in those with below average inflation. This may reflect some wealth effect arising from housing price increases, but the relationship could also be driven by common factors such as income growth, which tends to raise consumption demand for both goods and housing services. However, the gap in retail sales growth associated with differential property price inflation seems to be smaller than the gap in investment growth. Thus, the booming property market seems to be associated more closely with investment than consumption growth.

Bank loans also increased relatively fast in provinces with above average property price inflation. Caution is required in interpreting credit growth because of data limitation noted above. The relationship could be driven by common factors such as output growth. A proper analysis of the causality between the two variables would thus require control of the influence of other relevant variables.

An examination of data also suggests that property prices increased at a relatively fast rate in cities and coastal areas, and in provinces of the Yangtze River Delta. Thus, it is also useful to group provinces by their geographical locations to explore possible differences in developments. Chart 3 compares growth in property prices, GDP, fixed asset investment, real estate investment, retail sales, bank credit, and land price, and the real lending interest rate between coastal provinces and interior areas, and between Yangtze River Delta provinces and the rest of the country. It shows that real GDP growth and bank credit expansion followed broadly the same trends across provinces, although they were higher in the Yangtze River Delta than in interior provinces. There was no systematic difference in retail sales growth between the groups. Fixed asset and real estate investment growth were higher in the Yangtze River Delta in recent years. The gaps in property and land price inflation were much

greater, however, with the growth rates in coastal areas and Yangtze River Delta several times that in other parts of the country.

While these stylised facts are indicative, they loose information about across province differences due to aggregation and averaging of data. Also the appearing association between property price changes and growth in macroeconomic variables do not provide information on the direction of causality and the size of the effects. To explore these issues, formal econometric analysis is presented in the next two sections.

3. Panel Data Model

To explore the empirical relationships formally, panel data models are used. This raises the sample size sharply. It is also appropriate for our investigation because these provinces have considerable commonality in macroeconomic fluctuations. This section discusses some estimation issues, and the next section presents the empirical results.

3.1 General and Dynamic Panel Models

The general panel model can be expressed in the following linear form:[7]

(1) $$Y_{it} = c + X_{it}'\beta + \alpha_i + \varepsilon_{it}$$

[7] For details of panel data models, see Hsiao (2003) and Baltagi (2001).

where Y_{it} is the dependent variable, X_{it} is a vector of regressors, β is a vector of coefficients which are assumed to be the same across i and t, α_i is individual-specific (fixed) effect to allow for differences across provinces and ε_{it} are the error terms for $i = 1,2,...,M$ cross-sectional units observed for periods $t = 1,2,...,T$.

Some dependent variables may have strong autocorrelation. To account for this, Equation 1 (called static panel equation) is modified into a dynamic panel equation:

$$(2) \qquad Y_{it} = c + \sum_{j=1}^{p} \rho_j Y_{it-j} + X_{it}'\beta + \alpha_i + \varepsilon_{it}$$

3.2 Estimation Issues

A number of estimation issues need to addressed. First, the residuals may be correlated across sections. This cross-section heteroskedasticity can lead to biased estimates. To obtain unbiased estimates, Generalised Least Squares (GLS) estimation is used. For fixed individual effects, GLS is straightforward. Preliminary estimations are performed to produce cross-section specific residual vectors. These residuals are used to form estimates of the cross-specific variances, which are then employed in a weighted least squares procedure to form GLS estimates.

Second, there may be correlation between regressors and the error terms, which will produce biased estimates. Such correlation may be introduced by endogeneity of some explanatory variables. For example, GDP growth may lead to greater demand for housing and thus higher property prices, while higher property prices may raise consumption and investment through wealth

and balance-sheet effects. To test the presence of endogeneity, the residuals from GLS estimates are regressed against the explanatory variables. If evidence of endogeneity is found, the Instrumental Variable (IV) approach will be used, with lagged regressors used as instruments.

Third, the presence of the lagged dependent variable among the regressors in Equation 2 violates the strict exogeneity assumption of regression. As a result, estimates of Equation 2 would be biased and inconsistent, particularly when the panel involves a large number of individuals but over a fixed period of time. One way to obtain consistency is to take the first difference of Equation 2.[8] First-differencing the equation eliminates individual effects and constant terms, and produces an equation of the following form:

$$(3) \qquad \Delta Y_{it} = \sum_{j=1}^{p} \rho_j \Delta Y_{it-j} + \Delta X_{it}' \beta + \Delta \varepsilon_{it}$$

for which Generalised Methods of Moment (GMM) is used to obtain efficient estimates of β and ρ_j.[9]

3.3 Heterogeneity

By pooling the data, it is assumed that the coefficients of the regressors are identical for all provinces. Given the differences in size, economic structure and stage of development, this assumption may not be valid. Neglecting heterogeneity across sections may lead to biased estimates and misleading inference. To guard against this, we test whether the assumption of homogeneity (i.e. identical coefficients across provinces) is valid.

[8] Another approach is to use orthogonal deviations, suggested by Arellano and Bover (1995).
[9] For more details on GMM, please see Hayashi (2000).

If the linear relationship differs between provinces and this is neglected in estimation, spurious non-linearity in the panel estimates may be introduced. This suggests that tests of the homogeneity assumption can be based on tests for the presence of non-linearity in the estimated relationship. This approach is taken by Haque et al. (2000) and Pesaran et al. (1999) who propose to test for neglected heterogeneity by introducing a quadratic term for each regressor and testing whether it is significantly different from zero. If this is the case, then that particular variable may be subject to heterogeneity across section. In order to explore cross province differences while retaining a reasonable degree of freedom for estimation, interactive dummies are applied to different groups of provinces. One comparison is between cities and coastal provinces, and the interior provinces, and another is between Yangtze River Delta and the rest of the sample (see below).

4. Empirical Results

Six models are estimated with real growth in property price, GDP, fixed asset investment, real estate investment, retail sales and bank credit respectively as the dependent variable.[10] The GLS method is used to estimate a benchmark model. It turns out that no instrumental variables need to be employed, as the estimated residuals are statistically uncorrelated with the explanatory variables. However, in some equations, the lagged dependent variable is a significant explanatory variable, and therefore the GMM method is applied. In this case, the elimination of the constant term and fixed effects naturally leads to a sharp decline in adjusted R^2. If evidence of heterogeneity is

[10] To derive the empirical models, we explore and select explanatory variables from a typical set of macroeconomic factors as suggested the general economic theory. For example, to model property price inflation, we use a set of explanatory variables including income growth (proxied by real GDP growth), rental and land price inflation, and indicators of financial conditions such as interest rates and bank credit expansion. Reflecting data limitations as well as our focus on macroeconomic relationships, other variables such as increases in the number of households and the supply of housing units are not captured. The rationale for the final set of explanatory variables in each model will be explained along with the discussion of the results.

detected for a particular explanatory variable (i.e. the restriction of the same coefficient for all provinces may not be valid), a dummy variable is multiplied with that variable and the interactive term is included as an additional explanatory variable. One dummy takes the value of one for coastal provinces and cities, and zero for the rest of the sample. Another takes the value of one for the five provinces in the Yangtze River Delta (including Shanghai) and zero for the remainder provinces. What this effectively does is to allow different coefficients for that explanatory variable between the two groups of provinces.

4.1 Property Price Growth

Equation 1 of Table 1 presents the estimation results of the benchmark model for property price growth, using the GLS method. Real property price growth is found to be positively and significantly related to real GDP and land price increases and the one-year lending rate. Real GDP growth can be regarded as a proxy for income growth, while land price is an important component of construction cost for housing. The positive coefficient of the real lending rate is against the economic intuition, although the economic size of the estimated coefficient is very small. This possibly reflects the cross-section relationship between the two variables: coastal provinces which recorded higher property price increases in recent years also had lower CPI inflation and thus higher real interest rates.[11]

The coefficients on rental price and bank credit growth are of expected, positive sign, but are statistically insignificant. This suggests that property price increases have not been significantly related to rental growth, an important fundamental variable determining housing values. The insignificant coefficient on bank loan growth may reflect the inadequate coverage of the credit data. Anecdotal evidence suggests that in coastal areas and cities, credit

[11] The pick-up in CPI inflation in recent years was mainly driven by food price increases, which tended to be higher and also had a larger weight in the CPI basket in inland provinces.

by other banks and capital inflows from abroad—which are not covered by the credit variable here—have played an important role in financing home purchases and investment.

Tests indicate that the estimated residuals are not significantly correlated with the explanatory variables, implying no concern of endogeneity or reverse causality. Also, the GMM method is not needed as the residuals are not correlated with the lagged dependent variable. However, evidence of heterogeneity is found for land price growth, suggesting that the same coefficient restriction for all provinces may not valid for this variable. Equations 2&3 show that the interactive dummies for coastal areas and the Yangtze River Delta are indeed significant. The estimated coefficients suggest that the elasticity of property price with respect to land price in coastal areas and cities is more than twice that in interior provinces.

4.2 Real GDP Growth

Equation 1 of Table 2 shows the estimated benchmark model for real GDP growth. The coefficient on real property price growth is of the expected positive sign and significant at 1% level. The real lending rate coefficient is also of the expected negative sign and significant, although its economic size is small (implying that a one percentage point rise would reduce real GDP growth by only 0.009 percentage point). The coefficient of bank credit growth has a negative sign and is highly significant, implying that bank credit increase contributed negatively real GDP growth.[12] This seemingly surprising result could be attributable to the incomplete coverage of credit data as noted above. But this result is consistent with other studies using provincial data that find a negative correlation between economic growth and bank credit expansion

[12] In a fully integrated financial system, after controlling for aggregate shocks, lending by a region's banks and local economic performance should be uncorrelated. However, there is evidence of a low degree of capital mobility within Chinese provinces. See Boyreau-Debray and Wei (2002) and Park and Sehrt (2001).

(Boyreau-Debray, 2003). Boyreau-Debray (2003) attributes this mainly to the burden to support the state-owned corporate sector rather than the poor performance of the state-owned banks. In particular, provinces that grew relatively slowly tended to rely more on credit provided by the major state-owned banks, while coastal provinces and major cities had more diversified sources of financing (including foreign direct investment) and faster growth.

No evidence of reverse causality or endogeneity is detected, but the residuals seem to be correlated with the lagged dependent variable. Equation 2 presents a model with lagged real GDP growth as an explanatory variable, using the GMM method. The adjusted R^2 now becomes negative because of the elimination of the constant in the panel model, but coefficients of other explanatory variables are little changed. The homogeneity test indicates possible heterogeneous effects on economic growth of bank credit increase and the lending rate. The inactive dummies are therefore applied, and the results are presented in Equation 3 and 4 respectively. It suggests that bank credit growth and lending rate were more negatively correlated with real GDP growth in provinces in the Yangtze River Delta. This is perhaps not surprising considering more developed market forces and the smaller role of the large state banks in financial intermediation in this region.

In sum, property price growth seems to be significant in explaining real GDP growth over time and its dispersion across provinces. It would be useful to examine the main channels through which property price changes may have affected economic growth. This is done below by studying models of investment and consumption growth.

4.3 Fixed Asset Investment Growth

In the benchmark model of Equation 1 in Table 3, real property price increases and the lagged real GDP growth rate are two most significant explanatory variables for fixed asset investment growth. The lagged rather than contemporaneous real GDP growth was chosen to avoid endogeneity and reverse causality concerns, as fixed asset investment has been the main driving force behind output growth in recent years. This is consistent with the 'accelerator' theory of investment, which implies that increases in output induce increases in investment. The coefficient on land price, an important indicator of construction costs, has the expected positive sign but is insignificant. Bank credit growth has a negative sign but is only marginally significant.

Tests of homogeneity suggest that GDP and bank credit growth might have heterogeneous effects on fixed asset investment across provinces. Equations 2 and 3 present results after adding two interactive dummies to the basic model. In particular, Equation 3 suggests that GDP growth had a much larger impact on fixed asset investment in the Yangtze River Delta than in the rest of the sample. To take the estimate literally, a rise in GDP growth by one percentage point would raise next year's fixed asset investment growth by 2 percentage points in the Yangtze River Delta, compared with less than 1 percentage point in other parts of the country. It is beyond the scope of this study to examine the large 'accelerator' effect of output growth on investment in the Yangtze River Delta. But anecdotal evidence suggests that the region has experienced relatively fast pace of urbanisation and inward foreign direct investment.

It is noted that the size of the coefficient on property price growth in the extended models is little changed from that in the benchmark model. Overall, the results suggest that property price inflation had a significant impact on fixed asset investment growth in recent years. This is not surprising as property development is an important part of fixed asset investment. Moreover, rising property values would improve the balance sheets of the corporate sector and increase its capacity to obtain external financing for investment. It is also noted that the estimated impact of property price inflation on investment growth is larger than that on aggregate output growth.

4.4 Real Estate Investment Growth

Compared with fixed asset investment, real estate investment growth is found to be more closely related to property price changes. Specifically, the coefficient of property price growth is estimated to be around 0.6 for real estate investment (Equation 1 of Table 4), compared with about 0.4 in the fixed asset investment growth model. Real estate investment growth also seemed to be positively correlated with bank credit growth. Land price and GDP growth are of expected positive signs, but statistically insignificant.

The residuals suggest that the relationship may be dynamic in nature. Equation 2 shows the estimated coefficients of a dynamic panel model using the GMM method. In the extended models, the coefficient on property price growth remains significant, but its size increases somewhat. The coefficient on the price of land, perhaps the important input for real estate investment, becomes statistically significant in the dynamic model. However, bank credit growth turns to be an insignificant variable. Overall, it seems that property price and land price changes have been the most important explanatory variables for real estate investment growth over time and its dispersion across provinces.

4.5 Retail Sales Growth

Table 5 presents a model relating retail sales growth to growth in property price, GDP, and bank deposits (to capture possible wealth effect), and the real deposit interest rate. The GLS method is used for estimation.[13] The coefficient on real GDP growth—an indicator of income growth—is of the expected positive sign and statistically significant. The coefficient on real deposit rate is also positive and significant, suggesting that the income effect arising from a change in real interest rate outweighs the intertemporal substitution effect. The economic size of the net impact is small, as implied by the magnitude of the coefficient.

The coefficients on both property price and bank deposit growth are insignificant, suggesting little wealth effect on consumption despite the rises in property prices in recent years. This is perhaps not surprising for the following considerations. First, private home ownership is still a relatively new concept in urban areas, and many households are either yet to get into the private market or want to trade up. Price increases make this group of households financially worse off. Second, for those who already own a private residential unit and thus have benefited from price appreciation, the increased wealth could not be used to finance current consumption unless they are willing to trade down. The underdeveloped mortgage market prevents these households from using equity withdrawal to fund current consumption spending.

[13] No evidence of endogeneity and autocorrelation in the residuals is detected. Thus, the GLS method is sufficient for this model. Tests also suggest that the restriction of homogeneity of coefficients across provinces is not rejected.

4.6 Bank Credit Growth

Equation 1 of Table 6 presents the benchmark model of real bank credit growth, using the GLS method. The coefficient on fixed asset investment growth is of a positive sign and statistically significant, suggesting that investment demand has been an important force driving credit expansion by the large state-owned banks. The coefficient on real GDP growth is of a negative sign and significant. As noted above, provinces with relatively slow economic growth (mainly the interior provinces) tend to rely more on large state-owned banks for financing. The positive correlation between bank credit growth and the real lending rate is counter intuitive, and possibly lends support to the argument that credit demand, at least by state-owned enterprises, is not responsive to changes in interest rates. Tests of heterogeneity suggest that the coefficient on the lending rate may differ across provinces. Models using the interactive dummies (Equations 2&3) indicate that the positive correlation between bank credit growth and the lending rate disappears for the Yangtze River Delta, reflecting possibly a greater role of market forces in economic activity in the area.

The coefficient on property price growth has a positive sign but is statistically insignificant in both the benchmark and extended models. This implies that credit expansion by the large state-owned banks did not have a significant impact on property price appreciation in recent years. This does not mean that credit by other banks did not play a role. This is also consistent with the anecdotal evidence that foreign finance through capital inflows have played an important role in the booming property market in cities and the Yangtze River Delta.

5 Concluding Remarks

The development of the property market has been supported by rising income, the rapid pace of urbanisation, and the expansion of mortgage business by commercial banks. However, the speed and size of increase in property prices in some areas, together with high investment growth has raised concerns about macroeconomic consequences of any sharp swing in the property market.

This paper studies the nexus between the property market and the macroeconomy in Mainland China. To overcome data limitation problems, panel data models are employed, using macroeconomic statistics for thirty-one provinces and major cities. This has the advantage of increasing the sample size by 31-fold. It also allows an analysis of possible differences across regions, given the varied pace of development and different economic structure between provinces. The main conclusions are summarised as follows.

First, there seems to be a two-way linkage between real GDP and property price growth. Thus, property price inflation over time and its dispersion across provinces are at least partially attributable to differentiated income growth.

Second, property price inflation contributed to real GDP growth mainly through the investment channel. Property price growth is found to have a significant and positive effect on fixed asset investment and particularly real estate investment. By contrast, it did not appear to have any effect on retail sales growth. The lack of a wealth effect on consumption spending may reflect the fact that a large number of households have not benefited from house price appreciation. Moreover, those who own a private residential unit have limited means to withdraw housing equity to finance current consumption.

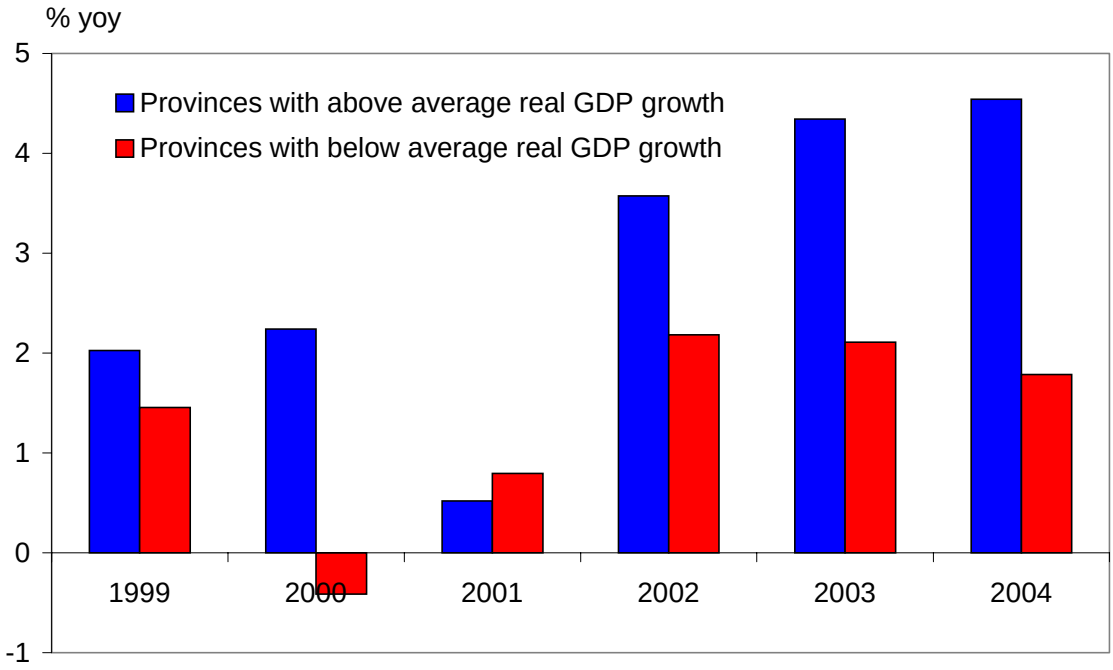
Third, no significant relationship is found between property price growth and bank credit expansion in either direction. This possibly reflects the caveat that data on bank loans by provinces only cover the four large state-owned banks. Anecdotal evidence suggests that credit by other banks and foreign financing have played an important role in coastal cities that have recorded relatively high property price inflation. This result suggests that credit by the large state-owned banks probably did not play an 'accelerating' role in the booming property market in recent years.

Fourth, land price is found to be a significant variable in explaining differences in property price and real estate investment growth over time and across provinces. Moreover, the multiplier effect of land price increase on property prices seems to be much larger in coastal cities and the Yangtze River Delta than in the other parts of the country. This and the insignificance of rental price inflation in explaining property price changes provide potential evidence suggesting that property price growth has deviated from fundamentals in some areas.

Finally, some caveats should be noted. This paper focuses on macroeconomic relationships, and neglect microeconomic aspects of the property market. In particular, the role of local governments in land and property developments is important on the Mainland. Moreover, bank credit data only cover the four large state-owned banks, and this may yield misleading results about the role of bank credit in the rise of the property market in recent years. This issue should be further explored if more data are available.

Chart 1. Property Price and GDP Growth

A. Average real property price growth



B. Average real GDP growth

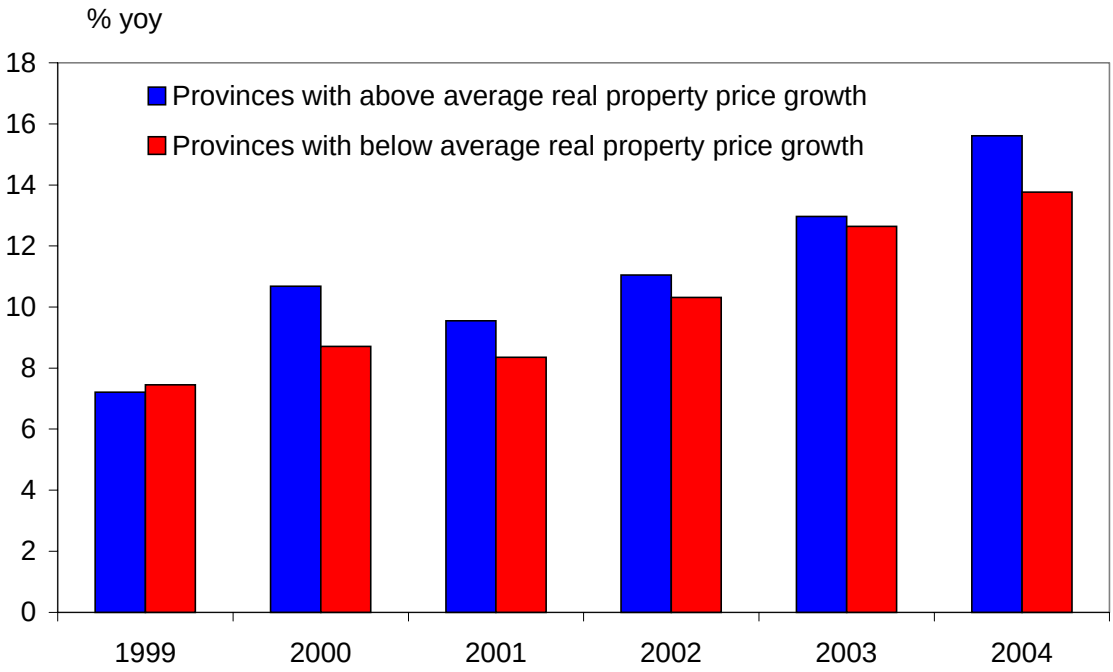
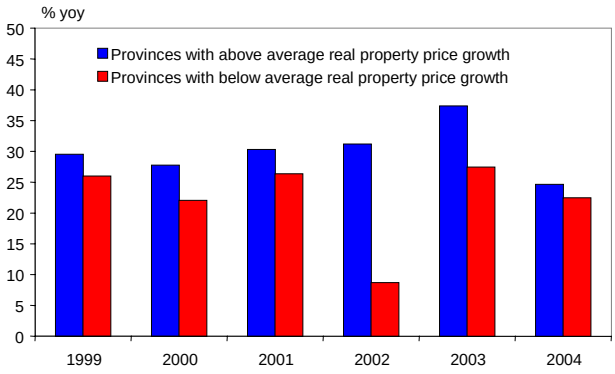
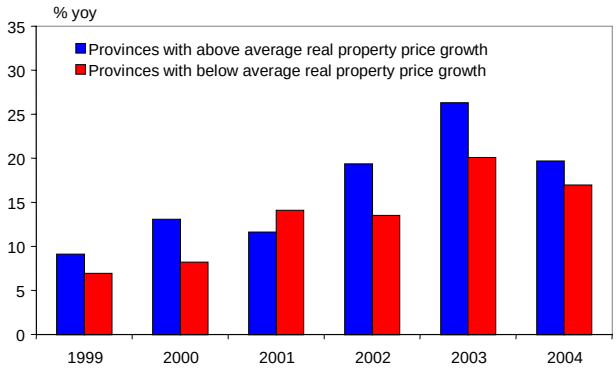


Chart 2. Property Price, Investment, Consumption and Bank Loans Growth

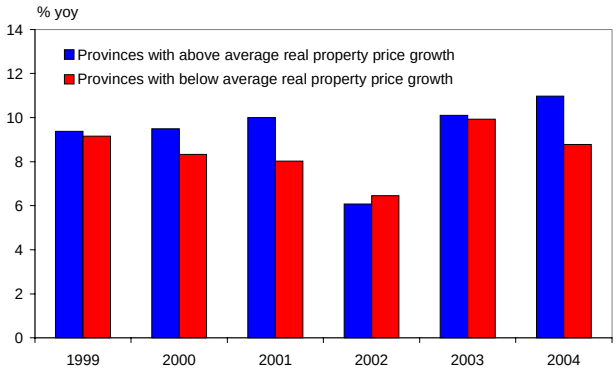
A. Average growth in real estate investment



B. Average growth in fixed asset investment



C. Average growth in retail sales



D. Average growth in bank loans

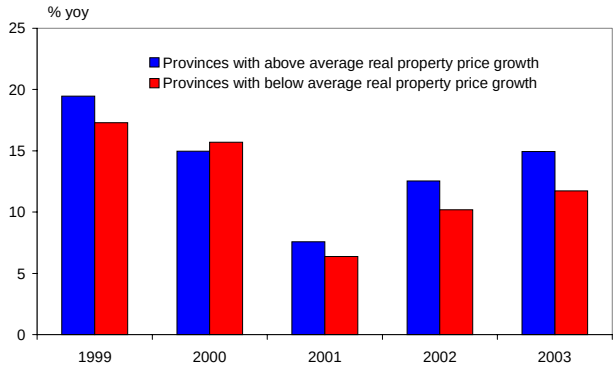
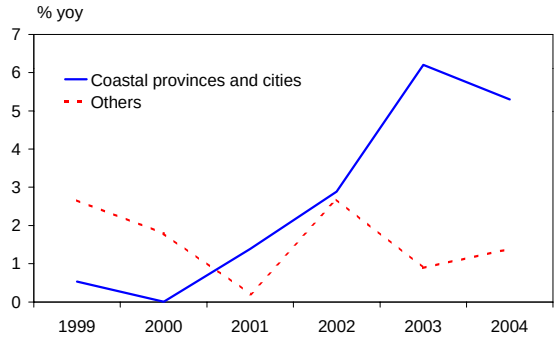
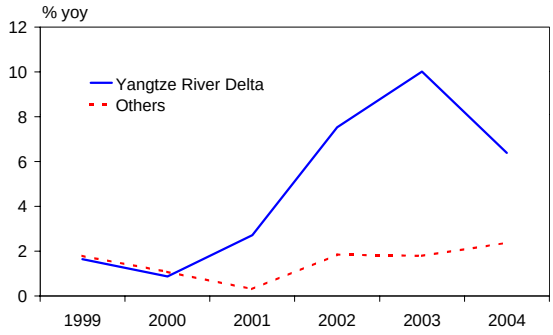


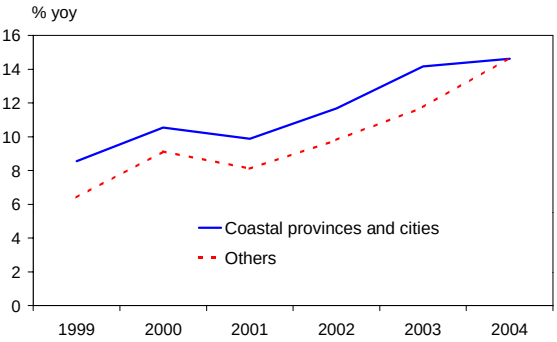
Chart 3. Cross Region Comparisons

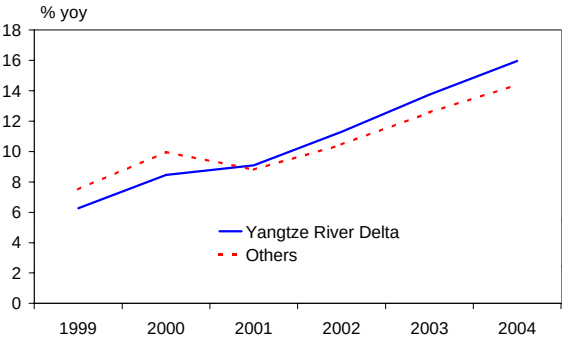
A. Property price growth



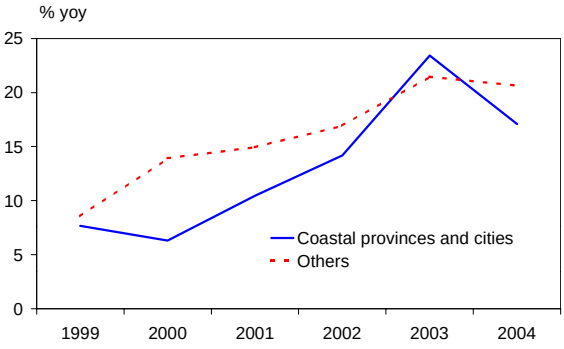


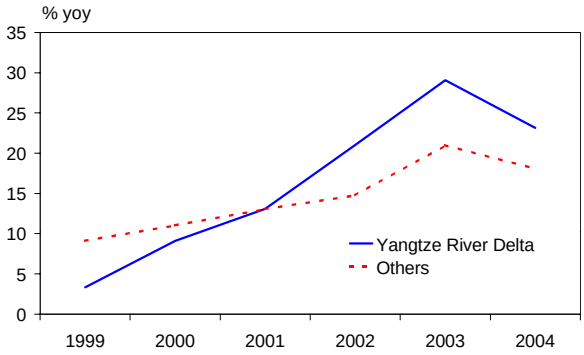
B. Real GDP growth



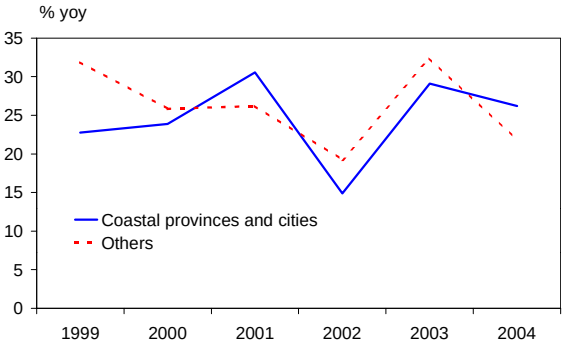


C. Fixed asset investment growth





D. Real estate investment growth



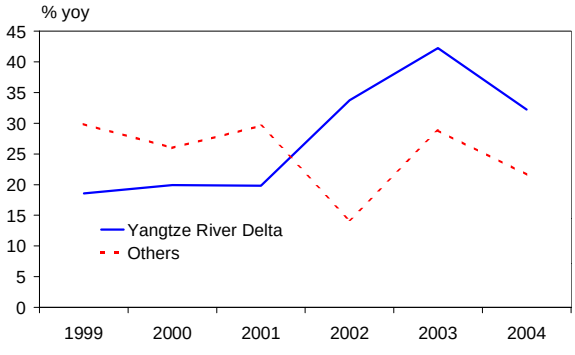
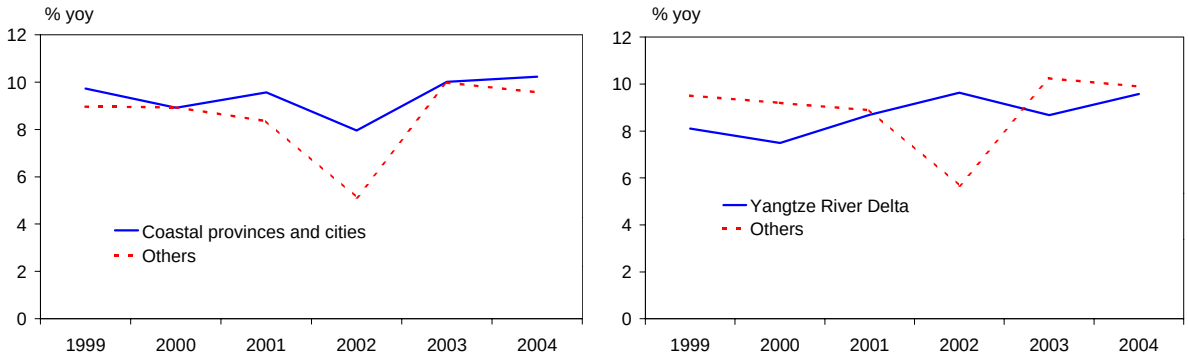
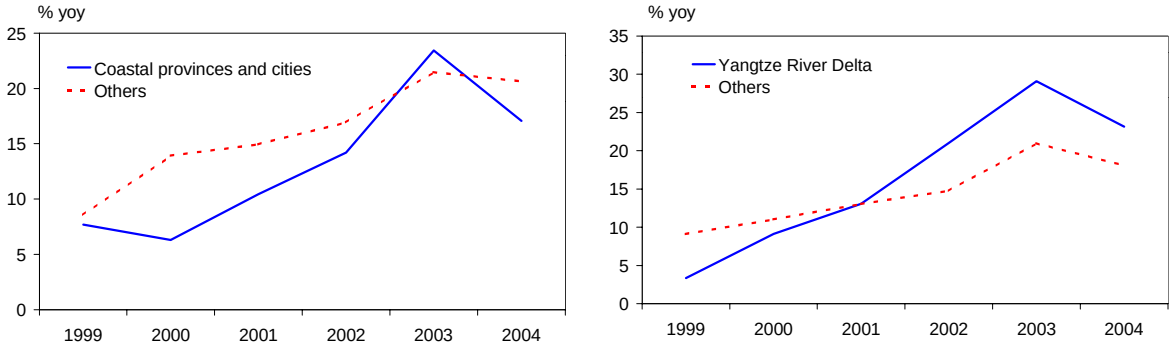


Chart 3. Cross Region Comparisons, continued

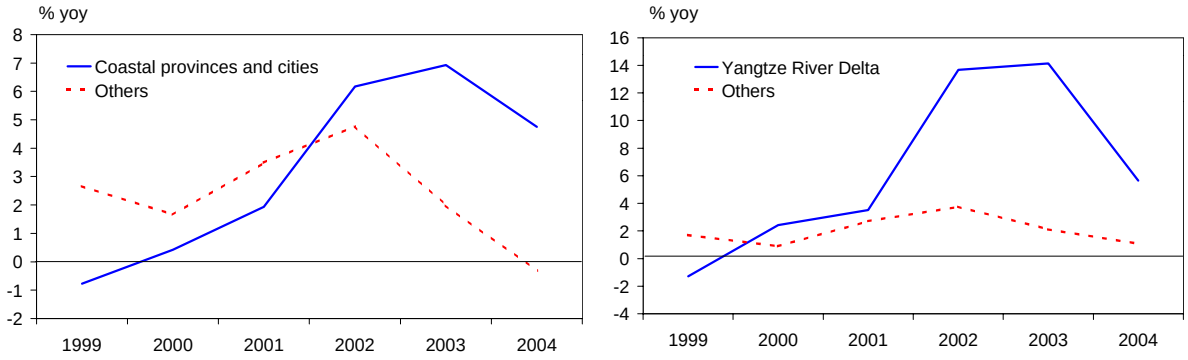
E. Retail sales growth



F. Bank credit growth



G. Land price growth



H. Lending rate

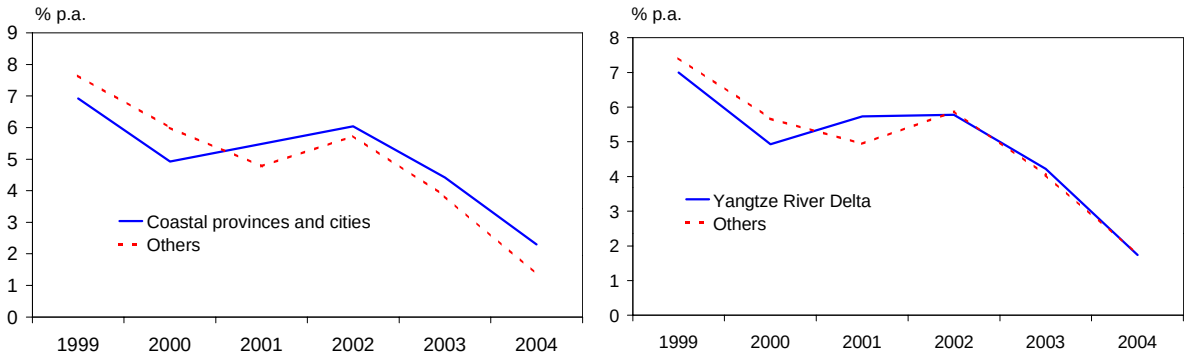


Table 1. Property Price Growth Equation

Dependent variable: Change in property price

	GLS	GLS	GLS
	(1)	**(2)**	**(3)**
Change in rental price	0.011 (0.026)	0.012 (0.024)	0.012 (0.025)
Change in land price	0.226 (0.042) ***	0.123 (0.049) **	0.139 (0.045) ***
GDP growth	0.346 (0.056) ***	0.351 (0.055) ***	0.364 (0.052) ***
Change in bank loan (-1)	0.027 (0.023)	0.020 (0.023)	0.020 (0.022)
Lending rate	0.005 (0.001) ***	0.005 (0.001) ***	0.005 (0.001) ***
Constant	-0.049 (0.009) ***	-0.051 (0.009) ***	-0.052 (0.009) ***
Dummy		**Coastal**	**Yangtze**
Change in land price * Dummy		0.173 (0.078) **	0.217 (0.073) ***
Adjusted R^2	0.461	0.438	0.515
SE of regression	0.030	0.030	0.029
Durbin-Watson stat	1.889	1.975	1.887
Range	99-04	99-04	99-04
Panel observation	186	186	186

Notes: a) All variables in logarithms and in real terms. Figures in brackets are standard errors.
b) The sample size varies for each regression depending on data availability.
c) The estimation assumes fixed effects across sections.
d) Cross section weighting is used to estimate a feasible GLS specification assuming the presence of cross-section heteroskedasticity.
e) *, **, *** denote statistical significance at 10%, 5% and 1% level.

Table 2. GDP Growth Equation

Dependent variable: GDP growth

	GLS	GMM	GMM	GMM
	(1)	**(2)**	**(3)**	**(4)**
Change in property price	0.333 (0.043) ***	0.260 (0.025) ***	0.310 (0.031) ***	0.247 (0.019) ***
Change in bank loans (-1)	-0.073 (0.021) ***	-0.092 (0.014) ***	-0.079 (0.018) ***	-0.087 (0.013) ***
Lending rate	-0.009 (0.001) ***	-0.008 (0.001) ***	-0.009 (0.001) ***	-0.007 (0.001) ***
Constant	0.152 (0.004) ***	-	-	-
Dummy			**Coastal**	**Yangtze**
Change in bank loans (-1) * Dummy			0.008 (0.035)	-0.146 (0.061) **
Lending rate * Dummy			0.003 (0.001) ***	-0.007 (0.001) ***
GDP growth (-1)		0.304 (0.034) ***	0.285 (0.032) ***	0.264 (0.036) ***
Adjusted R^2	0.876	-0.696	-0.618	-0.674
SE of regression	0.027	0.040	0.039	0.040
Durbin-Watson stat	2.122	-	-	-
Range	99-04	00-04	00-04	00-04
Panel observation	186	155	155	155

Notes: a) All variables in logarithms and in real terms. Figures in brackets are standard errors.
b) The sample size varies for each regression depending on data availability.
c) The estimation assumes fixed effects across sections.
d) Cross section weighting is used to estimate a feasible GLS specification assuming the presence of cross-section heteroskedasticity.
e) *, **, *** denote statistical significance at 10%, 5% and 1% level.

Table 3. Fixed Asset Investment Growth Equation

Dependent variable: Change in fixed asset investment

	GLS	GLS	GLS
	(1)	**(2)**	**(3)**
Change in property price	0.423 (0.114) ***	0.407 (0.116) ***	0.416 (0.106) ***
Change in land price	0.066 (0.079)	0.065 (0.081)	0.010 (0.078)
GDP growth (-1)	0.908 (0.131) ***	0.893 (0.145) ***	0.737 (0.120) ***
Change in bank loan (-1)	-0.093 (0.054) *	-0.069 (0.062)	-0.079 (0.051)
Constant	0.063 (0.015) ***	0.064 (0.018) ***	0.075 (0.014) ***
Dummy		**Coastal**	**Yangtze**
Change in GDP(-1) * Dummy		0.112 (0.336)	1.356 (0.330) ***
Change in bank loan (-1) * Dummy		-0.115 (0.133)	-0.669 (0.236) ***
Adjusted R^2	0.800	0.799	0.899
SE of regression	0.068	0.069	0.067
Durbin-Watson stat	1.836	1.846	1.919
Range	99-04	99-04	99-04
Panel observation	180	180	180

Notes: a) All variables in logarithms and in real terms. Figures in brackets are standard errors.
b) The sample size varies for each regression depending on data availability.
c) The estimation assumes fixed effects across sections.
d) Cross section weighting is used to estimate a feasible GLS specification assuming the presence of cross-section heteroskedasticity.
e) *, **, *** denote statistical significance at 10%, 5% and 1% level.

Table 4. Real Estate Investment Growth Equation

Dependent variable: Change in real estate investment

	GLS	GMM
	(1)	**(2)**
Change in property price	0.553 (0.333) *	0.682 (0.362) *
Change in land price	0.011 (0.177)	0.217 (0.116) *
GDP growth (-1)	0.376 (0.408)	-0.042 (0.501)
Change in bank loan	0.387 (0.121) ***	0.029 (0.156)
Constant	0.178 (0.042) ***	-
Change in real estate investment (-1)		-0.120 (0.030) ***
Adjusted R^2	0.375	0.144
SE of regression	0.218	0.282
Durbin-Watson stat	2.154	-
Range	98-03	99-03
Panel observation	186	154

Notes: a) All variables in logarithms and in real terms. Figures in brackets are standard errors.
b) The sample size varies for each regression depending on data availability.
c) The estimation assumes fixed effects across sections.
d) Cross section weighting is used to estimate a feasible GLS specification assuming the presence of cross-section heteroskedasticity.
e) *, **, *** denote statistical significance at 10%, 5% and 1% level.

Table 5. Retail Sales Growth Equation

Dependent variable: Change in retail sales volumn

	GLS
	(1)
Change in property price (-1)	0.022
	(0.026)
GDP growth	0.256
	(0.037) ***
Deposit rate	0.004
	(0.001) ***
Change in bank deposit (-1)	0.001
	(0.008)
Constant	0.055
	(0.004) ***
Adjusted R^2	0.949
SE of regression	0.033
Durbin-Watson stat	2.624
Range	99-04
Panel observation	186

Notes: a) All variables in logarithms and in real terms (except the real deposit rate).
Figures in brackets are standard errors.
b) The sample size varies for each regression depending on data availability.
c) The estimation assumes fixed effects across sections.
d) Cross section weighting is used to estimate a feasible GLS specification assuming the presence of cross-section heteroskedasticity.
e) *, **, *** denote statistical significance at 10%, 5% and 1% level.

Table 6. Bank Loans Growth Equation

Dependent variable: Change in bank loans

	GLS	GLS	GLS
	(1)	**(2)**	**(3)**
Change in property price	0.097 (0.111)	0.040 (0.104)	0.037 (0.103)
GDP growth (-1)	-0.588 (0.182) ***	-0.616 (0.171) ***	-0.536 (0.180) ***
Change in Fixed asset investment	0.194 (0.051) ***	0.205 (0.050) ***	0.174 (0.053) ***
Lending rate	0.013 (0.002) ***	0.016 (0.002) ***	0.015 (0.002) ***
Constant	0.079 (0.023) ***	0.090 (0.021) ***	0.086 (0.022) ***
Dummy		**Coastal**	**Yangtze**
Lending rate * Dummy		-0.010 (0.004) **	-0.016 (0.008) **
Adjusted R^2	0.542	0.608	0.560
SE of regression	0.067	0.067	0.067
Durbin-Watson stat	2.366	2.327	2.351
Range	98-03	98-03	98-03
Panel observation	186	186	186

Notes: a) All variables in logarithms and in real terms. Figures in brackets are standard errors.
b) The sample size varies for each regression depending on data availability.
c) The estimation assumes fixed effects across sections.
d) Cross section weighting is used to estimate a feasible GLS specification assuming the presence of cross-section heteroskedasticity.
e) *, **, *** denote statistical significance at 10%, 5% and 1% level.

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