



***THE PROPERTY MARKET AND THE MACROECONOMY OF THE MAINLAND:
A CROSS REGION STUDY***^{*}

Key points:

- *This paper studies the nexus between the property market and the macroeconomy of Mainland China in 1998-2004. Panel data models are employed, using statistics for 31 provinces and major cities.*
- *Empirical analysis suggests a two-way linkage between GDP and property price growth. In particular, changes in property prices affect GDP growth mainly through the investment channel. Property price inflation in recent years is found to have had a significant and positive effect on growth in fixed asset investment, particularly real estate investment.*
- *By contrast, no evidence of a wealth effect on consumption spending is found. This is possibly because a large number of households have not benefited from house price appreciation. Moreover, households have limited means to withdraw housing equity to finance current consumption.*
- *Bank credit expansion did not seem to play an ‘accelerating’ role in property price inflation, although the latter is found to have contributed to bank credit increase in recent years. Property price growth may have deviated from fundamentals in coastal areas, as evidenced by a negative relationship between housing and rental prices.*

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^{*} This paper was initially prepared for the third HKIMR conference on the Mainland economy, held on 11-12 July 2005. The authors are grateful to Hans Genberg and conference participants for useful comments. The usual disclaimer applies.

I. 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 a 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 raised GDP growth by 1.9-2.5 percentage points in 2002-03 (Gu, 2005). The strong investment demand contributed to sharp increases in producer and investment goods price inflation in 2002-2004. The housing component was also 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 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).

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

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.

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.

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.

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 II provides some stylised facts based on data used in the econometric analysis. Section III considers panel data models and some estimation 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 across sections. Section IV presents the empirical results and discusses their implications. The last section concludes.

II. DATA AND STYLISTED 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 refer to RMB loans in financial institutions, including the four major state-owned banks.⁵ However, 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

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.

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.

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.

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

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.

property price increases, as it led to higher household income and thus higher demand for housing.

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. 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, 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 lose information about across-province differences due to aggregation and averaging of data. Also the apparent 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.

III. 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

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

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 $i = 1, 2, \dots, M$ cross-sectional units observed for periods $t = 1, 2, \dots, T$.

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

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

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

3.2 Estimation Issues

A number of estimation issues need to be addressed. First, the residuals may be correlated across sections, which can lead to inefficient estimates. To obtain efficient 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 (or simultaneity bias), a Hausman test is performed, (Hausman, 1978). If evidence of simultaneity bias 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:

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

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

⁸ Another approach is to use orthogonal deviations, suggested by Arellano and Bover (1995).

⁹ For more details on GMM, please see Hayashi (2000).

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.

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).

IV. 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. In some cases, instrumental variables need to be employed to deal with reverse causality/endogeneity concerns. Also, in some equations, the lagged dependent variable is a significant explanatory variable, and therefore the

¹⁰ To derive the empirical models, we explore and select explanatory variables from a typical set of macroeconomic factors as suggested by 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.

GMM method is applied.¹¹ If evidence of heterogeneity is 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

Changes in real housing prices can be affected by demand and supply-side factors such as income growth, demographic changes, rental yield, mortgage rates and construction costs (Jud and Winkler 2002, Hwang and Quigley 2004). Furthermore, Goodhart and Hofmann (2003) show that in some countries housing prices are affected by the availability of bank credit.

In the benchmark model for property price growth below, we use real GDP growth and changes in real land price to proxy households' income growth and changes in construction cost respectively. Changes in real rental prices are included to capture possible effects of rental changes on housing price inflation. Inflation rates are used to capture variations in real mortgage rates because nominal mortgage rates are the same across all provinces and cities. A variable capturing population growth is also considered but found to have statistically insignificant correlation with real property price movements.

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 growth. As will be shown below, contemporaneous property price growth also has a positive and significant coefficient in real GDP growth equation. Hausman tests suggest that there is evidence of simultaneity bias in the two equations.¹²

¹¹ In this case, the elimination of the constant term and fixed effects naturally leads to a sharp decline in adjusted R².

¹² The Hausman test involves the following procedures. First, an auxiliary regression of GDP growth is estimated on a set of instrumental variables that are likely correlated with GDP growth but not with the error term of the property price growth equation. Next, the property price growth equation is re-estimated by adding the residuals from the auxiliary regression. If the coefficient on the first-stage residuals is significantly different from zero, it is taken as evidence of possible simultaneity bias in the equation. A pedagogic explanation of the testing strategy is given in Pindyck and Rubinfeld (1991)

Therefore, lagged GDP growth is employed as an instrumental variable. As tests suggest that the estimated residuals in Equation (1) are correlated with the lagged dependent variable, Equation 2 shows the estimated coefficients of a dynamic panel model using the GMM method. It is noted that the coefficient on rental price growth increases and becomes significant after the GMM and instrumental variable are used, but coefficients of other variables are broadly unchanged.

The estimated coefficient of the inflation rate is of positive sign and statistically significant. This is consistent with the argument that higher inflation rates lead to lower real mortgage interest rates, and thus higher demand for housing. As the estimated coefficient for bank loan growth is insignificant in the benchmark equation, it is dropped in the extended models. The coefficient on rental price changes is of expected, positive sign and is statistically significant.

Evidence of heterogeneity is found for rental price growth, suggesting that the same coefficient restriction for all provinces may not valid for this variable. Equation 3 shows that the interactive dummies for coastal areas are indeed significant. The estimated coefficients suggest that the elasticity of property price with respect to rental price is around -0.04 for coastal areas and cities, compared with 0.27 for interior provinces. The elasticity is around 0.48 for the Yangtze River Delta, compared with an insignificant figure for other provinces. This suggests that the positive correlation between rental price and housing price inflation does not hold for coastal areas.

The main observations on the property price growth equation are summarised as follows. First, GDP growth, as a proxy for income growth, seemed to have a significant impact on property price inflation in recent years. Second, the rise of land price, which is an important indicator of construction costs of housing, also contributed. Third, The negative correlation between rental price and property price increases suggests that property price growth may have deviated from fundamentals in some coastal areas and cities.

4.2 Real GDP Growth

The macroeconomy is influenced by fluctuations in property prices through a variety of channels. Specifically, changes in property prices generate wealth and balance-sheet effects on consumption and investment (Trichet, 2003). As documented in IMF (2000) and BIS (2001), property price changes tend to lead output growth in industrial countries. The model for real GDP growth includes as

explanatory variables real property price growth, and some other control variables such as bank credit increase and lending rates.

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. 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 0.008 percentage point). The bank credit growth has a positive sign but is not statistically significant.

The Hausman test points to possible simultaneity bias due to the presence of contemporaneous property price growth variable in the equation. Also, the estimated 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 with lagged property price growth as an instrumental variable. The lagged dependent variable is indeed significant, and the estimated coefficients of other explanatory variables (except bank credit) are little changed from the GLS estimates. Bank credit growth is found to be negatively and significantly related to GDP growth.¹³ This seemingly surprising result, however, is consistent with other studies using provincial data that find a negative correlation between economic growth and bank credit expansion (Boyreau-Debray, 2003). Boyreau-Debray attributes this mainly to the burden to support the state-owned corporate sector rather than the poor performance of the banks. In particular, provinces that grew relatively slowly tended to rely more on credit provided by the state-owned banks, while coastal provinces and major cities had more diversified sources of financing (including foreign direct investment) and faster growth.

The homogeneity test indicates possible heterogeneous effects on economic growth of the lending rate. The inactive dummies are therefore applied, and the results are presented in Equation 3 and 4 respectively. It suggests that a rise in the lending rate would have a larger negative effect on real GDP growth in the Yangtze River Delta than in the rest of the country. This may reflect more developed market forces in the region.

¹³ 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 Sehn (2001). Furthermore, the dominance of the banking sector in financial intermediation suggests that a local credit channel is possible. In sum, the inclusion of a credit growth variable would be justifiable.

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

Real estate investment is an important part of fixed asset investment. Furthermore, investment can be affected by changes in property prices since rising property prices improve firms' balance sheets, inducing banks to charge a lower finance premium on loans (IMF, 2000). The accelerator model of investment also suggests a close relationship between the rate of investment spending and changes in aggregate output. In addition, interest rates and bank credit growth, two monetary policy transmission channels in Mainland China, may be important variables affecting investment spending.

The models below for fixed asset investment growth thus includes GDP, property price and bank loan growth as explanatory variables. The real lending rate is also considered, but turns out to be statistically insignificant. Change in land prices is included as a measure of construction cost.

In the benchmark model of Equation 1 in Table 3, changes in real property price and real land price and the lagged real GDP growth rate are significant explanatory variables. 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 also 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 and is significant. The positive (and significant) coefficient on bank credit growth suggests that bank financing supported increases in fixed asset investment.

4.4 Real Estate Investment Growth

Equation 1 of Table 4 presents the benchmark model for real estate investment. 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 0.9 for real estate investment, compared with about 0.5 in the fixed asset investment growth model. The estimated coefficients for land price, bank credit growth, and lagged GDP growth are statistically insignificant.

The residuals suggest that the relationship may be dynamic in nature. Also, the Hausman test suggests possible simultaneity bias in relation to the credit growth variable. Equation 2 shows the estimated coefficients of a dynamic panel model using the GMM method with the lagged change in bank loans as an instrumental variable. In the dynamic model, the coefficient on property price growth is still significant, but its size is reduced. The coefficients on land price and bank credit growth become statistically significant and are of expected sign. Overall, it seems that property price, land price, and changes in bank credit help explain real estate investment growth over time and its dispersion across provinces.

4.5 Retail Sales Growth

There are three possible channels through which property price changes can affect consumption spending (IMF, 2000, and BIS, 2001). First, rising property prices lead to increases of lifetime wealth. Second, consumption is also a function of households' expectations about their future income growth. To the extent that property prices affect such expectations by signalling faster or slower growth of real incomes in the future, they will influence current consumption. Third, an increase in property price reduces households' financing constraints. Because of data limitation, we use retail sales to proxy consumption spending. The explanatory variables include changes in property prices, GDP growth, real deposit rate and changes in bank deposits. Real GDP growth captures possible income effect on consumption. A rise in real deposit rate may defer consumption due to the inter-temporal substitution effect or raise current consumption on increased interest income. The net impact depends on the relative importance of these two effects. Because of limited choice of investment vehicles, bank deposit is the main form of wealth holdings by the household sector.¹⁴ Thus, this variable may also capture possible wealth effect on consumption.

Table 5 presents a model relating retail sales growth to growth in property price and GDP, the lagged growth of bank deposits, and the real deposit

¹⁴ Bank deposits are sums of deposits at the four major state-owned banks only, because data for other banks and financial institutions are not available by provinces.

interest rate. The GLS estimates are presented in Equation 1. 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.

To deal with possible simultaneity bias due to the presence of contemporaneous GDP growth in the equation, lagged GDP growth is used as an instrumental variable, and the results are presented in Equation 2.¹⁵ The coefficients on GDP growth and deposit interest rate become larger, but the coefficients on both property price and bank deposit growth remain insignificant. The latter suggests 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.

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 lagged 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 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 coefficient on property price growth has a positive sign and is statistically significant.

¹⁵ The large Durbin-Watson (DW) statistics in Equations 1 and 2 suggest that the residuals may be autocorrelated. To remove the autocorrelation, AR(1) model is applied to the residuals. The estimation results are shown in Equation 3. The DW statistic is now reduced to 2.437 from 2.563. The estimated coefficients of other variables are not much different from those in Equations 1 and 2.

As tests suggest that the estimated residuals are correlated with the lagged dependent variable, Equation 2 shows a dynamic panel model with lagged bank credit growth as an explanatory variable. It is noted that the coefficient on the lending rate becomes negative and significant, but the coefficient of fixed asset investment growth turns to be insignificant.

Tests of homogeneity suggest that fixed asset investment and lending rate might have heterogeneous effects on bank credit expansion across provinces. Equation 3 presents results after adding an interactive dummy to Equation 2. It suggests that fixed asset investment growth had a significant impact on bank credit growth in coastal areas and cities, although this is not the case for the rest of the provinces. It is noted that the coefficient of property price growth remains significant, and its size is little changed.

V. 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 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 a significant 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, while property price increases are found to be a significant explanatory variable for bank credit expansion, causality in the opposite direction is not supported by data. This suggests that bank credit growth probably did not play an ‘accelerating’ role in property price inflation in recent years. However, there is evidence that bank credit expansion supported to real estate investment growth in recent years.

Property price growth has a perverse (negative) relationship with rental price inflation for coastal provinces. This provides potential evidence 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. This issue should be further explored.

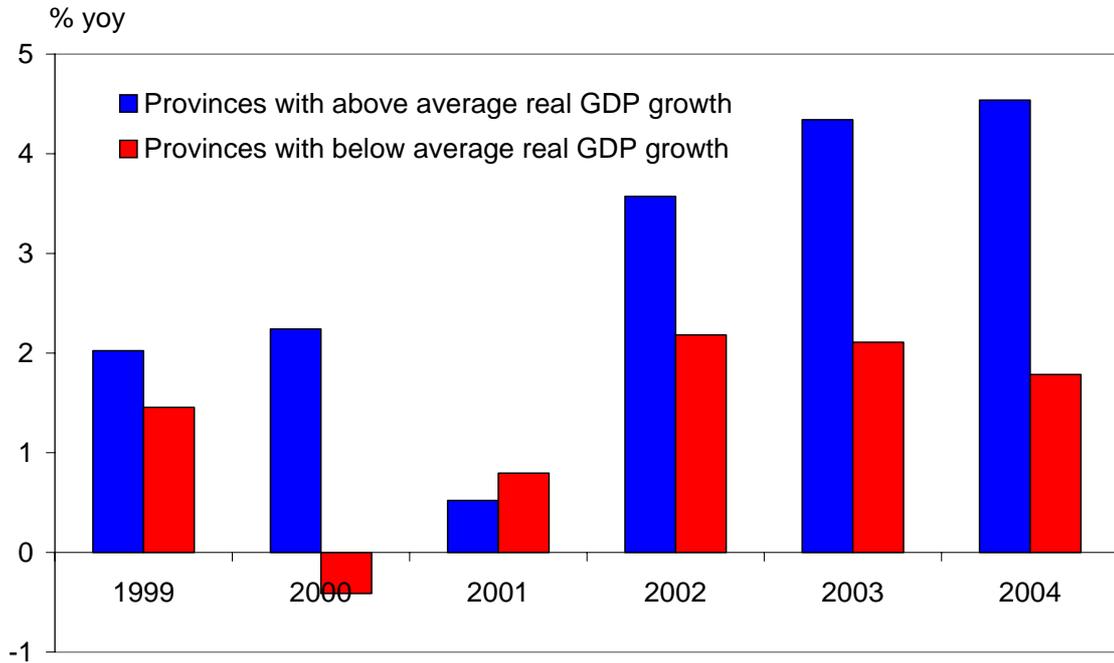
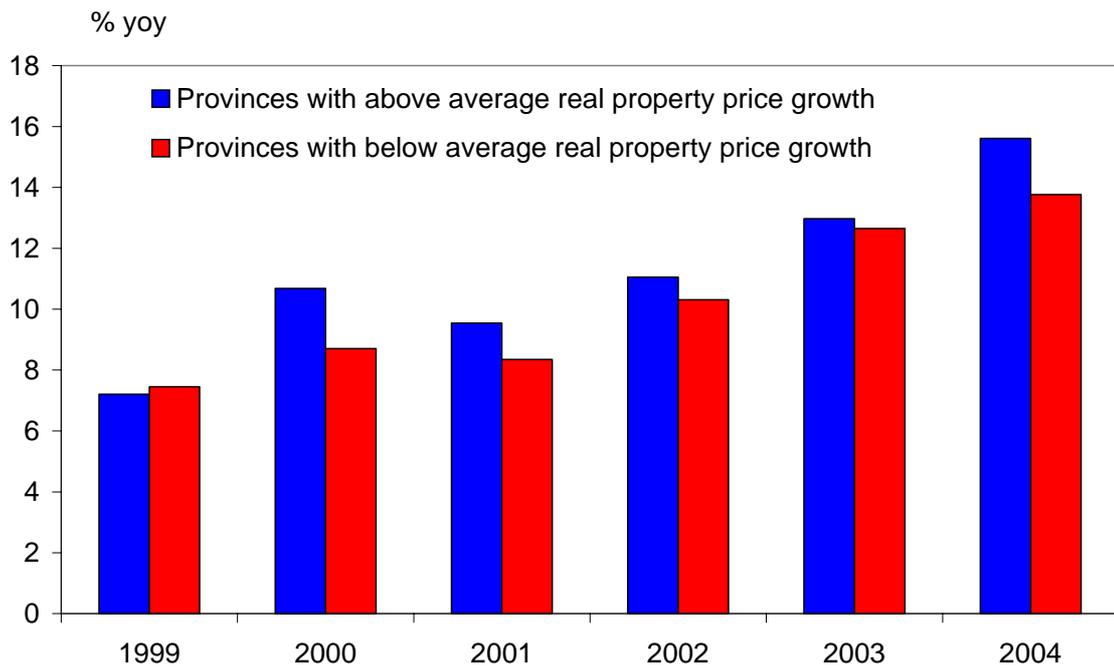
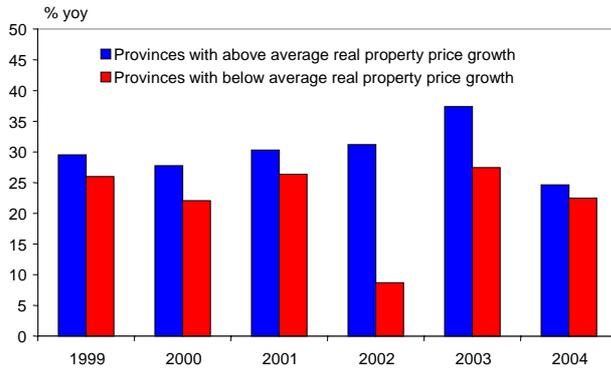
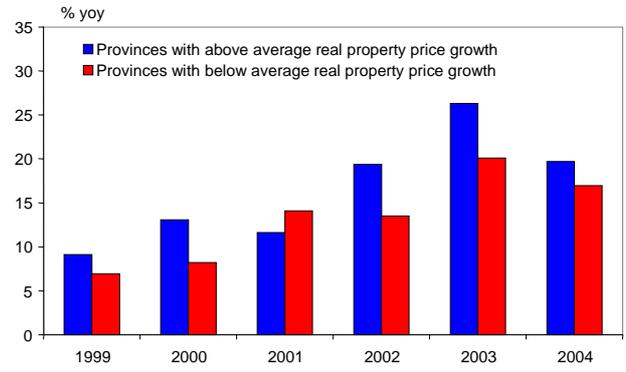
Chart 1: Property price and GDP growth**A. Average real property price growth****B. Average real GDP growth**

Chart 2: Property price, investment, consumption and bank loans growth

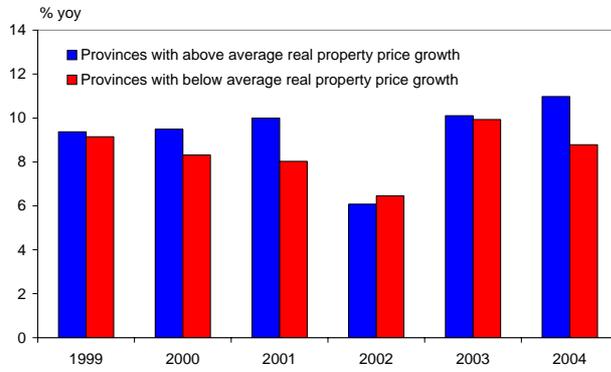
A. Average growth in real estate investment



B. Average growth in fixed asset investment



C. Average growth in retail sales



D. Average growth in bank loans

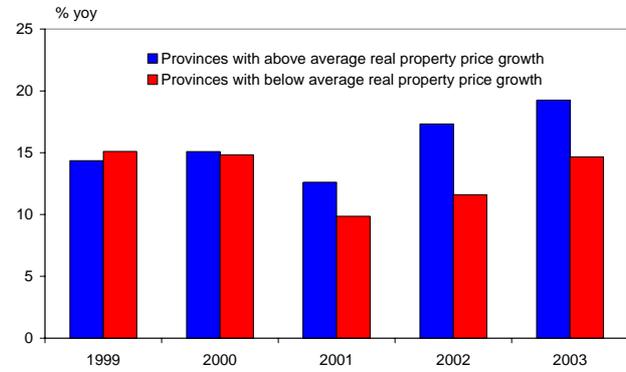
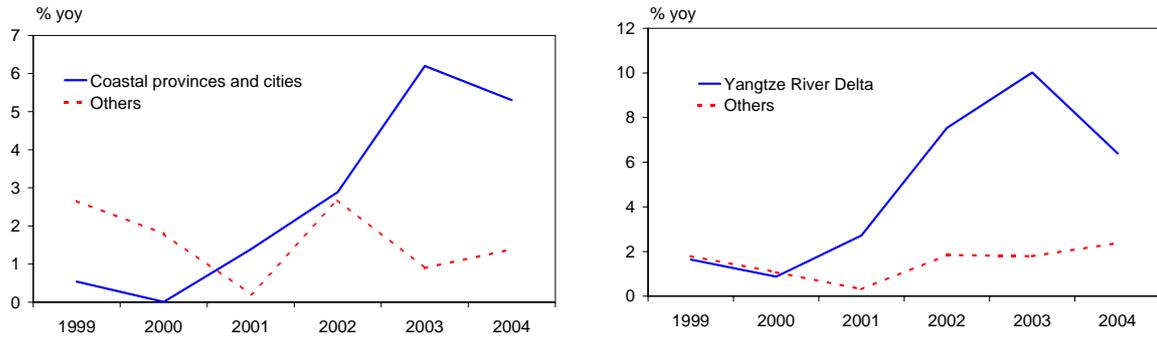
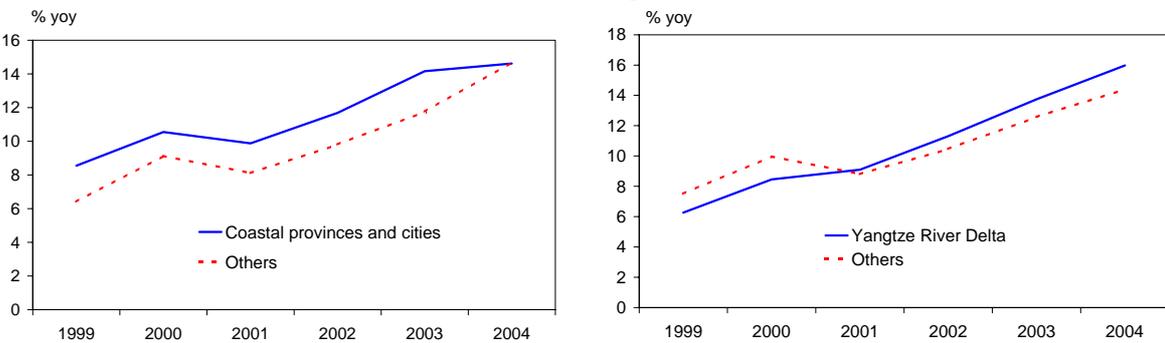


Chart 3: Cross region comparisons

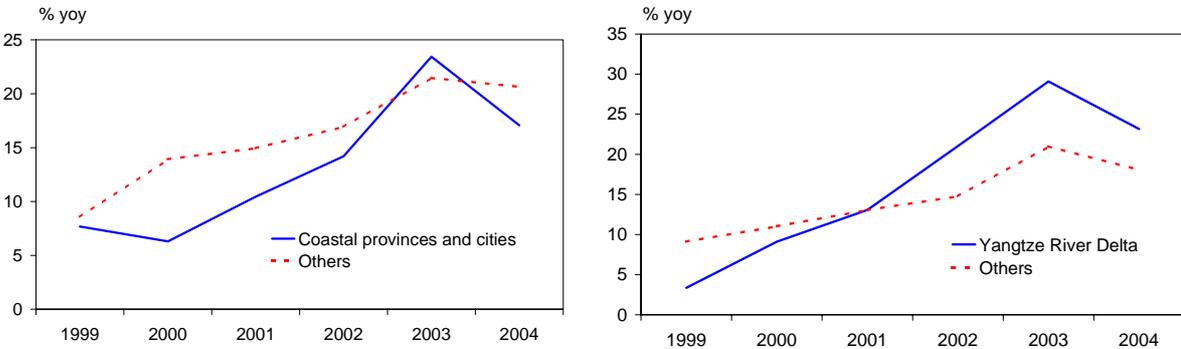
A. Property price growth



B. Real GDP growth



C. Fixed asset investment growth



D. Real estate investment growth

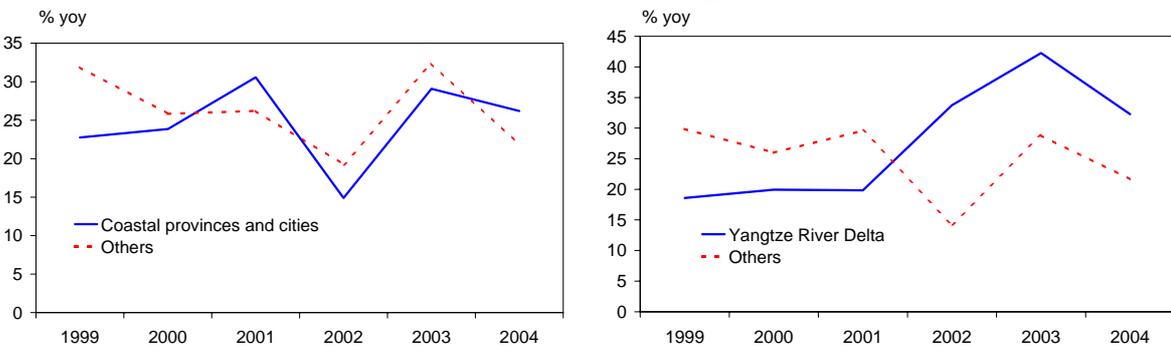
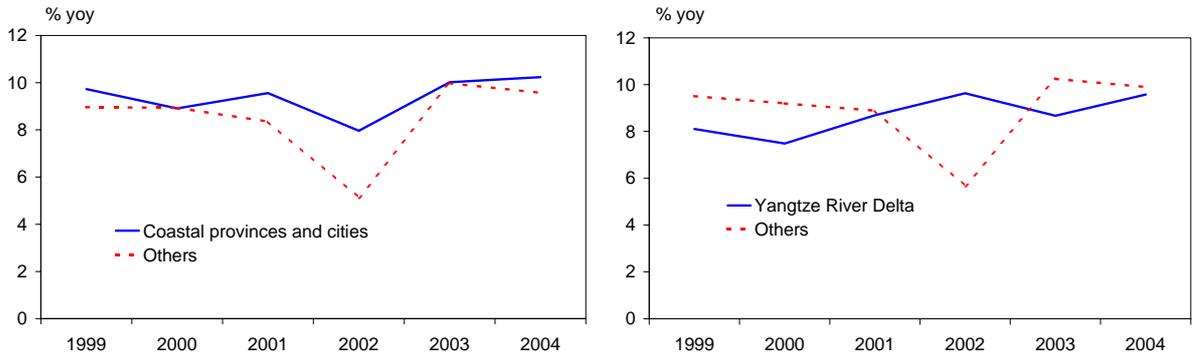
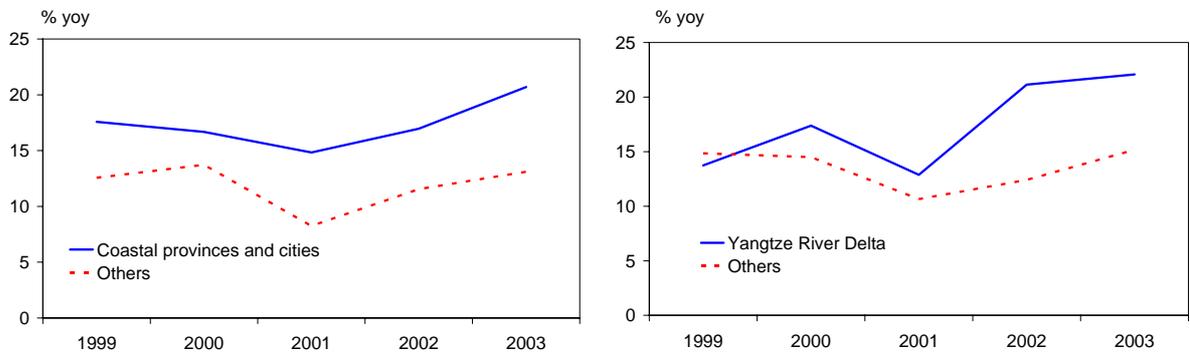


Chart 3: Cross region comparisons (continued)

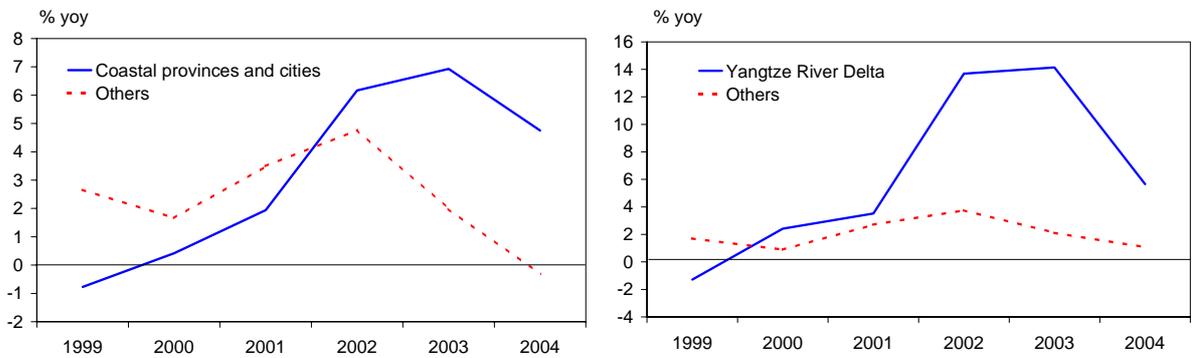
E. Retail sales growth



F. Bank credit growth



G. Land price growth



H. Lending rate

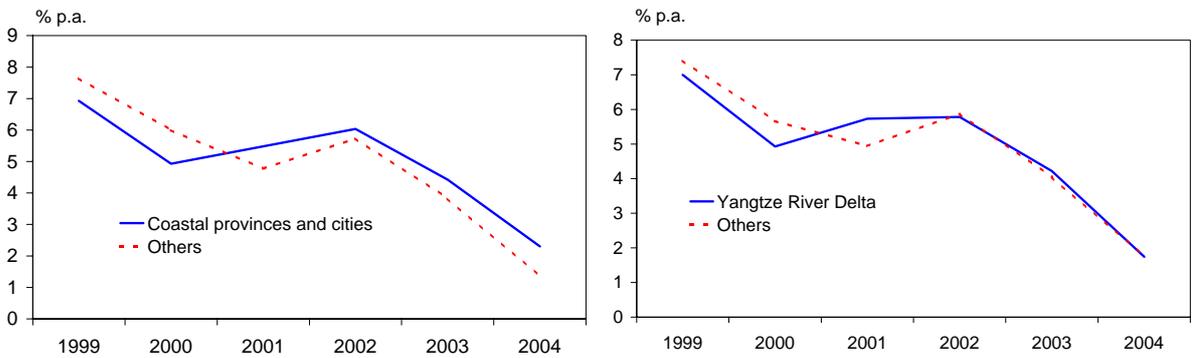


Table 1: Property price growth equation

Dependent variable: Change in property price

	GLS (1)	GMM (2)	GMM (3)	GMM (4)
Change in rental price	0.051 (0.035)	0.084 (0.026) ***	0.273 (0.029) ***	0.044 (0.050)
Change in land price (-1)	0.161 (0.030) ***	0.203 (0.028) ***	0.210 (0.034) ***	0.242 (0.046) ***
GDP growth	0.261 (0.063) ***	0.248 (0.047) ***	0.359 (0.044) ***	0.242 (0.073) ***
Change in bank loan	0.018 (0.029)			
Inflation rate (-1)	0.005 (0.001) ***	0.003 (0.001) ***	0.002 (0.001) ***	0.003 (0.001) **
Constant	-0.013 (0.007) *	-	-	-
Change in property price (-1)	-	-0.082 (0.027) ***	-0.109 (0.022) ***	-0.107 (0.043) **
Dummy			Coastal	Yangtze
Change in rental price * Dummy			-0.316 (0.068) ***	0.432 (0.188) **
Adjusted R ²	0.458	0.065	-0.013	0.012
SE of regression	0.032	0.039	0.041	0.041
Durbin-Watson stat	2.026	-	-	-
Range	99-03	00-04	00-04	00-04
Panel observation	155	155	155	155

Notes: a) All variables in real terms and in logarithms (except the inflation 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 2: GDP growth equation**Dependent variable: GDP growth**

	GLS (1)	GMM (2)	GMM (3)	GMM (4)
Change in property price	0.252 (0.055) ***	0.355 (0.018) ***	0.370 (0.034) ***	0.333 (0.026) ***
Change in bank loans (-1)	0.020 (0.018)	-0.063 (0.010) **	-0.052 (0.009) ***	-0.070 (0.019) ***
Lending rate	-0.008 (0.001) ***	-0.007 (0.000) ***	-0.009 (0.001) ***	-0.007 (0.000) ***
Constant	0.140 (0.005) ***	-	-	-
GDP growth (-1)	-	0.336 (0.031) ***	0.294 (0.037) ***	0.363 (0.054) ***
Dummy			Coastal	Yangtze
Lending rate * Dummy			0.003 (0.002)	-0.004 (0.002) *
Adjusted R ²	0.823	-0.631	-0.561	-0.655
SE of regression	0.028	0.039	0.038	0.040
Durbin-Watson stat	1.905	-	-	-
Range	98-04	99-04	99-04	99-04
Panel observation	217	186	186	186

Notes: a) All variables in real terms and in logarithms (except the lending 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 3: Fixed asset investment growth equation**Dependent variable: Change in fixed asset investment**

	GLS (1)
Change in property price	0.509 (0.097) ***
Change in land price	0.096 (0.050) *
GDP growth (-1)	1.178 (0.138) ***
Change in bank loan	0.151 (0.051) ***
Constant	0.006 (0.015)
Adjusted R ²	0.774
SE of regression	0.066
Durbin-Watson stat	1.883
Range	98-03
Panel observation	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 (1)	GMM (2)
Change in property price	0.920 (0.315) ***	0.510 (0.227) **
Change in land price	-0.104 (0.174)	0.281 (0.126) **
GDP growth (-1)	0.195 (0.373)	0.180 (0.301)
Change in bank loan	-0.080 (0.179)	0.309 (0.039) ***
Constant	0.254 (0.040) ***	-
Change in real estate investment (-1)	-	-0.201 (0.013) ***
Adjusted R ²	0.583	0.204
SE of regression	0.225	0.272
Durbin-Watson stat	2.138	-
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	TOLS	TOLS
	(1)	(2)	(3)
Change in property price	0.002 (0.030)	0.092 (0.302)	-0.099 (0.125)
GDP growth	0.258 (0.041) ***	0.783 (0.128) ***	0.500 (0.149) ***
Deposit rate	0.004 (0.001) ***	0.008 (0.002) ***	0.006 (0.001) ***
Change in bank deposit (-1)	0.003 (0.009)	-0.026 (0.019)	0.002 (0.013)
Constant	0.055 (0.005) ***	-0.004 (0.013)	0.027 (0.015) *
AR(1)			-0.254 (0.068) ***
Adjusted R ²	0.934	0.876	0.900
SE of regression	0.033	0.039	0.035
Durbin-Watson stat	2.613	2.563	2.437
Range	99-04	99-04	99-04
Panel observation	186	186	186

Notes: a) All variables in real terms and in logarithms (except the 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 (1)	GMM (2)	GMM (3)
Change in property price	0.295 (0.087) ***	0.306 (0.099) ***	0.266 (0.098) ***
GDP growth (-1)	-0.313 (0.134) **	-0.450 (0.136) ***	-0.628 (0.135) ***
Change in Fixed asset investment (-1)	0.117 (0.037) ***	0.030 (0.035)	-0.014 (0.069)
Lending rate	0.002 (0.002)	-0.003 (0.001) **	-0.007 (0.003) **
Constant	0.134 (0.019) ***	-	-
Change in bank loans (-1)	-	-0.420 (0.031) ***	-0.377 (0.030) ***
Dummy			Coastal
Change in Fixed asset investment (-1) * Dummy			0.247 (0.128) *
Lending rate * Dummy			0.007 (0.004)
Adjusted R ²	0.820	0.313	0.277
SE of regression	0.063	0.084	0.086
Durbin-Watson stat	2.433	-	-
Range	98-03	99-03	99-03
Panel observation	184	153	153

Notes: a) All variables in real terms and in logarithms (except the lending 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.

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