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Public Expenditure and Property Cycle: The Case in Shanghai

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Abstract: China's economic growth heavily relies on fixed asset investment. Previous studies have demonstrated that GDP growth plays a key role in assessing Chinese local officials' performance and enhancing their chances of political promotion. Thus, local officials have a strong motivation to boost the economy, which also impacts the property market. Based on this notion, the empirical results of this study indicate that public expenditure fluctuations and residential property price movements in Shanghai were positively co-integrated from 1992 to 2009, suggesting that increased public expenditure has reshaped Shanghai's property cycle to have longer booms and shorter busts. The findings also shed light on the nature of property cycles in other large- and medium-sized Chinese cities and developing countries with rampant economic growth, low real interest rates and an increasing urban population.

Keywords: Property cycle, Public expenditure, Co-integration, Shanghai

INTRODUCTION

Is Shanghai building a giant speculative property bubble? Fifteen years ago, approximately 40% of the residential and official buildings in Shanghai were vacant (Jackson, 1997). The factors driving the property boom included abundant foreign direct investment (FDI) and officials' benefits from selling construction rights (Haila, 1999). Five years ago, Shanghai had a bubble that accounted for 22% of the property price (Hui and Shen, 2006). More recently, Shanghai had a residential property price overvaluation exceeding 30% of its equilibrium price, with an estimated vacancy rate of 50% (Ahuja et al., 2010). However, regardless of the warning signals, the "bubble" did not burst. Thus, the term "bubble" is cautiously used in official documents because a prolonged property boom cannot be referred to as a bubble unless it busts.

While it is difficult to gauge the existence of a bubble, previous studies have thoroughly documented macroeconomic variables as determinants of a property cycle, such as income (Dokko et al., 1999; Tse and Raftery, 1999; Bjorklund and Soderberg, 1999; Jud and Winkler, 2002; Andrew and Meen, 2003; Gallin, 2006), inflation (Titman, 1982; Gatzlaff, 1994; Anari and Kolari, 2002), bank lending (Davis and Zhu, 2004; Gerlach and Peng, 2005), and stock prices (Sagalyn, 1990; Wilson and Okunev, 1999; Brown and Liow, 2001). Housing-specific factors have also been discussed, such as the vacancy rate (Wheaton, 1990; Gordon, Mosbaugh and Canter, 1996; Barras, 2005) and construction lags (Grenadier, 1995; Mueller, 1995; Coleman and Gentile, 2001; Spiegel, 2001; Barras, 2005).

Although these studies provide some insights into China's property cycle, the cycle's mechanisms are still not fully understood because China's housing market is frequently affected by the government (Han and Wang, 2003; Zhang, 2006; Li, Chiang and Choy, 2011). This paper thus takes into account another perspective to broaden the discussion and deepen the understanding of the cycle literature,

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using Shanghai as a case study. The research hypothesis is that the imperative of local officials to boost economic growth ultimately affects the property cycle through fixed asset investment in public facilities.

There are three advantages to using Shanghai as the target city for the cycle studies. First, Shanghai enjoys a higher economic autonomy than other cities due to its uniqueness and importance in China. Second, a nascent property market was established in Shanghai in the late 1980s, thus offering a longer time span for analysis compared to other cities. Third, Shanghai's property sector experienced a dramatic boom in the early 1990s and was quickly cooled down by the tightening of bank loans in the mid-1990s (Haila, 1999). Since the late 1990s, the property sector has prospered. The study period is from 1991–2009, during which Shanghai has maintained rampant economic growth, low real interest rates and an increasing urban population.

The remainder of this paper is organised as follows: it begins with the research hypothesis on the interaction between public expenditures and the property cycle. Next, the methodology is explained, and the data are described. The empirical results are then presented, and the policy implications are discussed. Finally, conclusions are drawn.

RESEARCH HYPOTHESIS

The research hypothesis is based on the notion that Chinese local officials feel the need to ensure fast economic growth because it is the primary indicator by which their performance is evaluated and thus determines whether they are promoted in the political system (Blanchard and Shleifer, 2001; Li and Zhou, 2005). In the urban development context, local officials are inclined to increase the investment in public facilities to promote economic growth, which is their winning strategy for regional competition to attract foreign or cross-sector investment (Tao et al., 2010). Continuously increased public expenditure positively impacts the residential property market, thus inducing a prolonged property boom with only minor adjustments in residential property price. Figure 1 plots the co-movements of public expenditure and residential property price in Shanghai.

To further explore the interaction between public expenditures and the property cycle, three pre-conditions concerning the nature of the Chinese property market should be noted. First, the property sector has become a pillar industry and a driver of economic growth (Peng et al., 2008; Chen and Zhu, 2008). Second, increasing fiscal pressure has led to local officials' short-sighted behaviour towards boosting economic growth in recent years (Chen, 2004; Tao and Yang, 2008). Third, most property-related taxes have remained at the local level (Li and Yi, 2007), and most land revenue has been kept for local usage (Tian and Ma, 2009). These facts indicate that local officials are in favour of property booms.

Although the literature has noted the positive effect of infrastructure spending on property price (Voith, 1991; Benjamin and Sirmans, 1996; Yang and Gakenheimer, 2007), it is not clear whether decreases in public expenditure would negatively impact property price. However, public facility construction likely has adverse effects on the housing environment, including noise or pollution, and thus undermines the value of housing. So far, the role of public expenditure on the property cycle has not been theoretically debated or empirically tested in the

existing literature. This paper thus proposes the following **Public Expenditure Hypothesis** to fill in this gap:

> Local government's pursuit for higher economic growth leads to increased public expenditure, which ultimately results in longer property booms and shorter property busts in Shanghai.

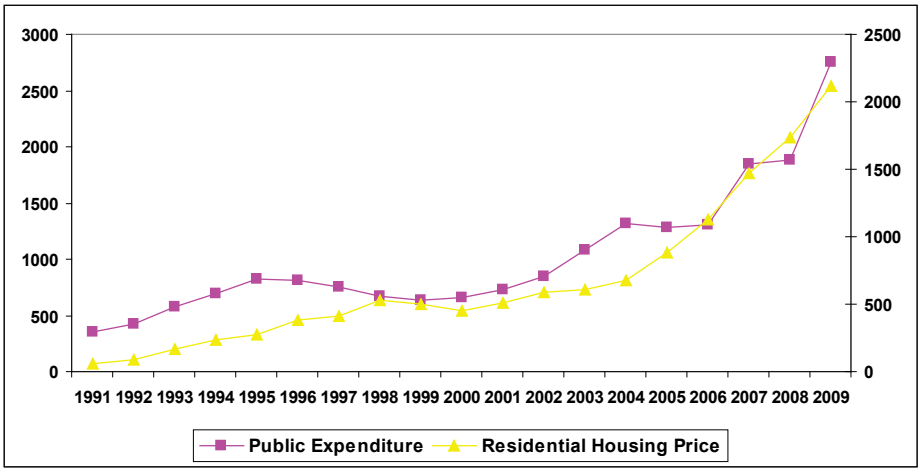

Figure 1. Residential Property Price and Public Expenditure in Shanghai

Source: Shanghai Statistical Yearbook (2010), Shanghai Real Estate Yearbook (2010)

This paper intends to test this hypothesis through the following three propositions:

Proposition 1: Public expenditure and property investment are positively correlated, indicating that Shanghai's property boom is largely investment driven and is thus consistent with China's current economic growth pattern, which relies largely on fixed asset investment.

Proposition 2: Property investment and property price are positively correlated, indicating that Shanghai has sufficient housing demand to absorb its housing supply and thus rendering expansions in both market volumes and prices.

Proposition 3: Public expenditure and property price are positively correlated, indicating that when low real interest rates, rampant business growth and the deepening urbanisation process contribute to sufficient housing demand, the property cycle depends largely on supply side factors such as governments' public spending policies.

If public expenditure and property investment are positively correlated and property investment and property price are positively correlated, **Propositions 1** and **2**, respectively, will be validated. If both of these assumptions are confirmed, **Proposition 3** will be tested for the interaction between public expenditure and property price.

METHODOLOGY AND DATA

This study adopts the co-integration approach to investigate the interaction between public expenditure and property price. If a set of variables is non-stationary but a linear combination of them is stationary, then these variables are said to be co-integrated (Engle and Granger, 1987). Specifically, if X and Y are non-stationary variables with integrations of one (meaning that the variables become stationary after the first differencing) and they are co-integrated [thus being CI (1) series], then there must exist a representation describing the long-run equilibrium dynamics. For example, consider an autoregressive distributed lag model with lagged items of X (t – 1) and Y (t – 1) [the ADL (1,1) model]. For brevity, the co-integration relationship can be expressed as follows:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 X_t + \alpha_3 X_{t-1} + \mu_t \quad (1)$$

where μ_t ~i.i.d.(0,σ^2). Taking the expected value of the above equation, we have

$$E(Y_t) = \alpha_0 + \alpha_1 E(Y_t) + (\alpha_2 + \alpha_3) E(X_t)$$

$$\Rightarrow E(Y_t) = \frac{\alpha_0}{1-\alpha_1} + \frac{(\alpha_2 + \alpha_3)}{1-\alpha_1} E(X_1) \quad (2)$$

When $k_0 = \frac{\alpha_0}{1-\alpha_1}$ and $k_1 = \frac{(\alpha_2 + \alpha_3)}{1-\alpha_1}$,

$$E(Y_t) = k_0 + k_1 E(X_t) \quad (3)$$

where k_1 is the long-run multiplier of X_t on Y_t.

There are two methods for identifying the co-integration relationship: a trace test and a maximum eigenvalue test. Both statistics have an asymptotic distribution, and their critical values are provided by Johansen and Juselius (1990). To capture the short-run dynamics, a number of lags are typically included for variables involved in the model selected by the Akaike Information Criterion (Akaike, 1974) or the Schwarz Criterion (Schwarz, 1978). The selection of lags is more appropriate for lower AIC and SC values.

Time series datasets are collected from two sources: the residential property price index and residential property investment, both of which are available from the Shanghai Real Estate Yearbook. Annual data on public expenditure and residential land sales are collected from the Shanghai Statistical Yearbook. Public expenditure refers to investment in power generation, transportation, post, communication, tap water, gas, parks, green areas, environmental sanitation, and administration of civil utilities. The datasets cover the period from 1991 to 2009.

Before processing the empirical tests, the time series properties of variables are confirmed. Both the augmented Dickey-Fuller test (1979) and the Phillips-Perron test (1988) are run to determine the stationarity of four variables: public expenditure (PE), property investment (INV), property price (HP), and land sale revenue (LR). The results are shown in Table 1.

Table 1. Unit Root Test

Method	**INV**	**PE**	**HP**	**LR**
Null Hypothesis: Contain a unit root (Level)				
ADF Test	2.00 (0.99)	1.90(0.98)	0.29(0.76)	0.46(0.80)
PP Test	1.64 (0.97)	3.50(1.00)	0.29(0.76)	0.77(0.87)
Null Hypothesis: Contain a unit root (1st Difference)				
ADF Test	–3.07 (0.00)	–1.82(0.07)	–3.40(0.00)	–7.40(0.00)
PP Test	–3.04 (0.00)	–1.73(0.08)	–3.41(0.00)	–6.36(0.00)

Note: p-value is contained in brackets, following t-statistics for each variable. When p-value is higher than 0.10, the null hypothesis cannot be rejected, indicating the variable is not stationary. Test Equations do not include trend or intercept.

EMPIRICAL RESULTS

Because all of the variables in Table 1 are I(1) series, first-order differencing will be applied to obtain the stationary time series for an unrestricted co-integration model. The study period for co-integration analysis is 1992 to 2009.

Proposition 1

Table 2 shows the co-integration relationship between public expenditure and residential housing investment (1992–2009). The lag period is set at one, based on the AIC and SC criteria.

Table 2. Co-Integration Test for PE and INV (1992–2009)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesised CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.66	28.77	20.26	0.0026
At most 1	0.21	5.12	9.16	0.2709
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesised CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.66	23.65	15.89	0.0025
At most 1	0.21	5.12	9.16	0.2709

Trace test indicates 1 cointegration at the 0.05 level. Max-eigenvalue test indicates 1 cointegration at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.

$$INV = -0.78 + 0.81PE \quad (4)$$

Eq. 4 suggests that there is a long-term equilibrium between public expenditure and residential housing investment. Three observations emerge from the result.

First, public expenditure and residential housing investment move together. During the study period, residential investment in Shanghai reached its first peak in 1996. It declined for the next three years and then entered another boom after 2000. Meanwhile, public expenditure continued to increase until 1998, fell slightly between 1999 and 2000, and subsequently increased. Before the first booming phase (1993–1996), both residential investment and public expenditure grew moderately. While public expenditure increased drastically to 16.80 billion in 1993, residential investment followed by reaching 30.65 billion in 1994, indicating that the one-year lag effect of public expenditure has not only triggered but also magnified the first property boom (1993–1996) in Shanghai. Increased public expenditure also mediated the recession. Due to the Asian financial crisis, Shanghai's residential investment began to decline in 1997. However, public expenditure continued to increase from 16.80 billion in 1993 to 53.14 billion in 1998. Thus, Shanghai's property market quickly came to a low point in 1999 and revived from 2000 onwards.

Second, better infrastructure and the subsequent property boom caused the urban land market to soar. At the beginning of Shanghai's property boom in 1993, land sales for property development increased by an astonishing 153.2% from 1992. This significant growth rate quickly caught the attention of the central government (Huang and Yang, 1996; Haila, 1999). Policy measures to curb land transactions were immediate and effective. Land sales by area in Shanghai dropped by 62.5% in 1994, and 45.4% in 1995, continuing to decline until 2000. However, it was not surprising that land sales faded ahead of property investment. The decline in land sales indicated that real estate developers anticipated a decrease in market demand; these real estate developers then chose to buy less land to safeguard against economic and political uncertainty, while on-going projects could not be easily deferred or cancelled.

Third, the government's regulative policy on the property sector has been counteracted by increased public expenditure. After 2004, the central government imposed draconian administrative regulations and monetary policies to cool down escalating housing prices. The implemented measures included raising the interest rate and the bank reserve ratio, increasing taxes, restricting the construction period, preventing land hoarding, limiting foreign investment and providing more affordable housing. However, the rampant property market continued to prosper. A Shanghai housing affordability report shows that 54.1% of respondents spend 20%–50% of their monthly income on housing and 31.8% spent over 50%, which is much higher than the expected amount of 1/3 by the central bank in 2004[1]. This property fever forced the central government to take further action, such as restricting second-hand housing transactions and implementing a minimum down payment requirement for self-use housing loans. However, residential housing prices continued to increase, indicating that regulative policies were mediated.

Proposition 2

There is a growing body of literature on the interaction between land sales and housing prices (Peng and Wheaton, 1994; Hui and Lui, 2002; Wu, 2007). Researchers agree that land sales and housing prices are positively correlated in the short term and negatively correlated in the long run. The theoretical explanation for this relationship is that in the short term, a property boom induces land supply, but in the long run, the market adjusts itself due to the increased supply and reaches a new equilibrium at a lower price level. To test whether land sales also affect housing investment, a co-integration test is carried out between land sale revenue in relation to real estate development and residential investment in Shanghai. The lag interval is set at one, according to the AIC and SC criteria. The test results are shown in Table 3.

Table 3. Co-Integration Test for LR and INV (1992–2009)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesised CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.83	32.18	20.26	0.0007
At most 1	0.23	4.18	9.16	0.3865
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesised CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.83	28.00	15.89	0.0004
At most 1	0.23	4.18	9.16	0.3865

Trace test indicates 1 cointegration at the 0.05 level. Max-eigenvalue test indicates 1 cointegration at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.

The test results show that land sale revenue in relation to real estate development and residential investment are positively co-integrated according to the following equation:

$$INV = -2.11 + 0.40LR \quad (5)$$

Intuitively, if residential investment (supply) increases, housing price (demand) will decline. Thus, residential investment and housing price are negatively correlated. However, there is still a possibility that real estate developers may choose to hoard undeveloped land so they can sell property at higher prices due to limited market supply. In that case, residential investment and housing price are positively correlated. The former situation is supported by classical theories in a perfectly efficient market, while the latter situation is supported by empirical evidence. To tests which opinion holds, Table 4 provides the co-integration analysis between property investment and property price.

Table 4. Co-Integration Test for INV and HP (1992–2009)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesised CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.62	27.68	20.26	0.0039
At most 1	0.30	7.57	9.16	0.0994
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesised CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.62	20.11	15.89	0.0102
At most 1	0.30	7.57	9.16	0.0994

Trace test indicates 1 cointegration at the 0.05 level. Max-eigenvalue test indicates 1 cointegration at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.

The results in Table 4 show that residential investment and housing price are co-integrated according to the following equation:

$$HP = 0.80 + 1.07INV \quad (6)$$

Eq. 6 indicates that land hoarding induces a positive correlation between property investment and property price. This argument is supported by the following examples. Document [214] (2008) of the People's Bank of China requires that developers who hold land for more than two years no longer obtain any bank loans in the future. This regulation is designed to restrict land hoarding, as only 43% of the land acquired by 40 major real estate developers in 12 Chinese cities was sold between 2003 and 2008[2]. In Shanghai, major real estate developers have intentionally increased their land reserve in recent years.[3] Among them, Hejihuangpu, the Hong Kong giant under Mr Li-Ka Shing, who is the richest person in China, has enough land reserve available for a striking 19.5 years of development, as estimated based on its sale volume in 2008. China Wanke, the largest real estate enterprise in terms of market capitalisation in Mainland China, has 2,990 thousand square meters of land reserve, the highest among the remaining developers. Most of China Wanke's land was acquired through bidding and auctioning between 2007 and 2008 at record high land prices.

Proposition 3

According to the AIC and SC criteria, the relationship between public expenditure and housing price is tested at 2 lags (Table 5).

Table 5. Co-Integration Test for PE and HP (1992–2009)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesised CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.74	36.86	20.26	0.0001
At most 1	0.34	8.81	9.16	0.0582
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesised CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.74	28.05	15.89	0.0004
At most 1	0.34	8.81	9.16	0.0582

Trace test indicates 1 cointegration at the 0.05 level. Max-eigenvalue test indicates 1 cointegration at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.

The test results in Table 5 suggest that public expenditure and housing price are co-integrated at two lags according to Eq. 7.

$$HP = -0.46 + 0.67PE \quad (7)$$

To demonstrate the relationship shown in Eq. 7, the impact of public expenditure on housing price is traced through historical changes that have taken place in Shanghai's Eastern District (Pudong). Pudong was just one of the suburban areas of Shanghai before the 1990s, at which point Shanghai was well known for its Western District (Puxi). However, Pudong has experienced dramatic economic growth during the past two decades due to policy deregulation and increased fixed asset investment. In accordance with China's "Five-Year Plan",[4] the analysis of Pudong's case can be classified into the following three stages from the early 1990s onwards.

During the eighth "Five-Year Plan" between 1991 and 1995, infrastructure spending in Pudong reached its twin peaks in 1993 and 1994. The most influential infrastructure spending projects were part of the so-called "Seven Roads plus Three Bridges Plan" (*qilusanqiao*) in 1993 and the "Five Roads plus One Bridge Plan" (*wuluyiqiao*) in 1994. These transportation projects made Pudong and Puxi more connected, led a large number of enterprises to flock into Pudong between 1993 and 1994, including a good proportion of foreign investors (Pudong New Area Statistical Yearbook, 1995). Pudong was especially attractive to enterprises that wanted to climb further up the career ladder, and these enterprises induced the middle-income population to move from Puxi to Pudong. The larger population, increased income and enhanced surrounding all led to the property boom, causing the housing prices in Pudong to reach an initial peak in 1996.

During the 9th "Five-Year Plan" between 1996 and 2000, the most influential events that disturbed infrastructure investment in Pudong included the Asian financial crisis and the central government's rigid regulation of the property sector. The market calmed down for fear that the deflationary pressure and uncertain policy changes could be detrimental to what would otherwise be profitable investment opportunities. Even the Shanghai government became more conservative. Between 1990 and 1995, public expenditure multiplied by 5.8 times, whereas in the 9th "Five-Year Plan", public expenditure was only multiplied by 1.19 times from 1996 to 2000. In addition to this decrease in the rate at which public

expenditure increased, housing prices declined between 1997 and 1999. However, there were still a number of infrastructure projects in Pudong, including the Pudong Airport, Underway Line 2, Century Venue, and Central Park. During this period, the most influential event occurred on 1 May 2000, when the Shanghai government abolished tunnel tolls from Puxi to Pudong. As expected, this waive quickly ended the property lull around 2000. This transportation enhancement immediately initiated another property boom in Shanghai that is still on-going.

During the 10th "Five-Year Plan" between 2001 and 2005, the Shanghai government continued the "Infrastructure First" development strategy in the Pudong District. The primary goal of this plan was to better manage and protect the Suzhou River, which is a major river across Shanghai. The Suzhou River was seriously contaminated by over-industrialisation during the early rise of the Pudong District. However, in the 10th "Five-Year Plan", their riversides were assigned to provide "suitable residence for the increasing population in Shanghai". The first stage of the "Suzhou River Renovation" began in 1999, when 7 billion (RMB) was invested to dredge the river courses. In 2003, the second stage added an additional 4 billion (RMB) to construct riverside landscapes. Frequent resettlements were performed to meet the goal. For example, 76% of resettlements in Pudong were related to the renovation plan in 2005. During this period, the housing price index in Pudong more than doubled from 1039 in 2000 to 2572 in 2005 (Pudong New Area Statistical Yearbook, 2006).

Summary of Results

The empirical results of the three propositions amend or respond to previous studies. Deng (2003) suggests that public land leasing helps include private firms in the local government's alternative revenue sources but does not provide empirical evidence. The test result of *Proposition 2* supports his conclusion with an empirical positive co-integration between land leasing revenue and property investment in Shanghai. Because land bidding and auctioning allow more private developers to participate in the process, the local government's revenue increases and property development is encouraged. The results of *Proposition 1* and *Proposition 3* support the conclusion that infrastructure projects do not only serve as public goods; they also induce higher property investment and support local economic growth. This result corresponds with those of other studies (Demurger, 2001; Ding, 2003; Lichtenberg and Ding, 2008).

CONCLUSION

In a transitional economy, the state and the market play simultaneous roles in China's economic development and property market development. While numerous studies have looked into the market forces impacting China's property cycle, this study substantiates previous studies by exploring the impacts of planning forces. The results showed that local officials play a decisive role in shaping Shanghai's property cycle into a pattern of longer booms and shorter busts by increased public expenditure.

Rampant economic growth, low real interest rates and a deepening urbanisation process have been prevalent in most major Chinese cities over the

past two decades, apart from Shanghai. While strong economic growth provides local government officials higher fiscal revenue to invest in public facilities, low financing costs and a growing urban population contribute to the surging housing demand. Therefore, the research findings can be applied to other cities in China and shed light on the nature of China's seemingly unrelenting property boom in recent years. For example, due to the "financial tsunami" triggered by the sub-prime property mortgage crisis in the US, China faced a great economic challenge in 2008. To overcome this difficulty and sustain economic growth, the central government announced a RMB 4-trillion (or USD 500-billion) stimulus package to increase government spending on 5 November, 2008.[5] Approximately 40% of the expenditure (1.5 trillion) is earmarked for infrastructure spending. In line with the central government's policy changes, the Shanghai government also authorised an additional investment of RMB 140 billion for transportation from 2009 to 2012.[6] On average, an additional increase of 35 billion (RMB) is anticipated over the next four years. Thus, Shanghai's housing price is expected to continue to increase in the near future. In fact, increased public expenditure has already had positive and long-lasting impacts on property prices in Shanghai and other cities, as indicated by the upward housing price indexes of 70 large- and medium-sized Chinese cities from 2010 to 2011 (National Bureau of Statistics of China, 2011).

The findings have international implications for other developing countries as well. Developing countries such as Brazil and India are simultaneously speeding up their public expenditure to support their economic development (World Bank, 2006; IMF, 2007). Investigating the relationship between public expenditure and property price in these developing countries will enhance the understanding of their property cycles' mechanisms and provide policy implications for the governments when pursuing sustained yet balanced development strategies. For example, India is the second largest country in the world by aggregate population. Indian house prices have been rising rapidly since 2002 due to strong economic growth and quickened urbanisation. However, in Mumbai's city centre, a housing bubble was encouraged by inadequate infrastructure, from 2008 to 2010 in particular[7]. Thus, a more adequate infrastructure spending plan would alleviate the problems of home ownership and housing affordability in India.

There are certain limitations of this research. The hypothesis and propositions are based on the assumptions of rampant economic growth, a low real interest rate and a deepening urbanisation process, which have been the cases in Shanghai and most other large- or medium-sized Chinese cities during the study period. However, these conditions may change in the future, in which case the findings would need to be re-examined. In addition, while co-integration is valid for investigating the interactions among endogenous variables, changes in exogenous variables, such as demographic, financial or economic factors, may affect the long-term relationships observed in the current co-integration equations. Future research will focus on two areas to address these limitations. First, a longer time series analysis will be carried out to determine whether the observed co-integration relationships remain valid. Second, with data from more cities, the panel data model will be used to examine whether the interactions between fluctuations in public expenditure and property price are still significant after controlling for these economic, demographic and financial fundamentals.

NOTES

1. Price-to-income ratio is 12:1 in heated cities of real estate industry, *China Youth Daily (Zhong guo qing nian bao), 14 August 2006.*
2. National Land Resource Bureau regulates land hoarding, *Law and Regulation Daily (fazhiribao), 14 September 2009*.
3. Major developers hold land in Shanghai, *Morning Oriental (dongfangzaobao), 7 May 2009*.
4. China's "Five-Year Plan" refers to the development plan designed in one period of official's positions because Chinese officials are reelected every five years. Dividing the property cycle and public expenditure interaction by the "Five-Year Plan" is most applicable for taking local officials' incentives into consideration.
5. Fiscal and financial policy changes: 4 trillion investment plan to stimulate domestic demand, *Xinhua News Daily (xinhuaribao), 10 September 2008*.
6. 140 billion investment for transportation, *Morning Oriental (dongfangzaobao), 13 November 2008*.
7. India housing bubble trouble, Retrieved from: http://www.globalpropertyguide.com/Asia/India/Price-History.

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