

Lingnan University

## Digital Commons @ Lingnan University

---

Centre for Public Policy Studies : CPPS Working Centre for Public Policy Studies 公共政策研究中心  
Paper Series

---

2003

### The nexus between housing and the macro economy : Hong Kong as a case study

Lok Sang HO  
lsho@ln.edu.hk

Wai Chung, Gary WONG  
wongwc@ln.edu.hk

Follow this and additional works at: <https://commons.ln.edu.hk/cppswp>

---

#### Recommended Citation

Ho, L. S., & Wong, W. C. G. (2003). The nexus between housing and the macro economy: Hong Kong as a case study (CPPS Working Paper Series No.143). Retrieved from Lingnan University website: <http://commons.ln.edu.hk/cppswp/66/>

This Paper Series is brought to you for free and open access by the Centre for Public Policy Studies 公共政策研究中心 at Digital Commons @ Lingnan University. It has been accepted for inclusion in Centre for Public Policy Studies : CPPS Working Paper Series by an authorized administrator of Digital Commons @ Lingnan University.



Working Paper Series

Centre for Public Policy Studies

No. 143 (10/03) CPPS

The Nexus between Housing and the Macro Economy:  
Hong Kong as a Case Study

Lok Sang Ho and Gary Wai-chung Wong

Lingnan University  
Hong Kong

The Nexus between Housing and the Macro Economy:  
Hong Kong as a Case Study

Lok Sang Ho and Gary Wai-chung Wong

November 2003

© Lok Sang Ho and Gary Wai-chung Wong

Professor Lok Sang Ho is Professor of Economics, Head of Department of Economics and Director of Centre for Public Policy Studies, Lingnan University, Hong Kong.

Mr. Gary Wai-chung Wong is Research Assistant of Centre for Public Policy Studies, Lingnan University.

Centre for Public Policy Studies  
Lingnan University  
Tuen Mun  
Hong Kong  
Tel: (852) 2616 7182  
Fax: (852) 2591 0690  
Email: [cpps@LN.edu.hk](mailto:cpps@LN.edu.hk)  
<http://www.LN.edu.hk/cpps/>

CAPS and CPPS Working Papers are circulated to invite discussion and critical comment. Opinions expressed in them are the author's and should not be taken as representing the opinions of the Centres or Lingnan University. These papers may be freely circulated but they are not to be quoted without the written permission of the author. Please address comments and suggestions to the author.

# **The Nexus between Housing and the Macro Economy: Hong Kong as a Case Study**

Lok Sang Ho\*  
Economics Department and  
Centre for Public Policy Studies  
Lingnan University

Gary Wai-chung Wong  
Centre for Public Policy Studies  
Lingnan University

## *Abstract:*

This paper presents the theory and the evidence showing the close relationship between the performance of the macroeconomy and housing. Focusing on the Hong Kong experience, it is found that exports and the interest rate were two key variables that can explain the movement of housing prices over a long period. A structural break is identified in the first quarter of 1998. Using the cointegration framework, the paper highlights the importance of housing to both the economic health of the domestic sector and the fiscal health of the economy.

JEL Classification Number: E32, R21, R31

November, 2003

\*Support from the RGC Grants Committee of Hong Kong (LU3008/00H) is gratefully acknowledged. We thank Xiang-dong Wei, Charles Leung, Francois Ortalo-Magne, and other participants at the Housing-Macroeconomy Workshop at the Chinese University of Hong Kong on August 24-25 for valuable comments and suggestions.

## I. Introduction

Expenditures on housing represent the single largest item of expenditures for most households in any economy. Expenditures on housing purchases, in particular, amount to many years of income. Clearly, the housing market and the macroeconomy must be closely related. The purpose of this paper is to present a theory and some evidence for this relationship.

The Hong Kong economy went into tailspin in 1998, declining by 5 per cent. This was unprecedented: there was not a single year of negative growth in all of Hong Kong's history since 1962—the first year official GDP growth data is available. The official explanation was the Asian Financial Crisis, but this explanation is not convincing because it is not clear why and how an attack on Asian currencies could lead to a crisis that is worse than the Cultural Revolution of the sixties or the oil price shocks of the seventies or the real banking crises that had actually caused multiple bank failures in the sixties and in the eighties.

Hong Kong's persistent economic growth prior to 1998 is nothing short of a miracle. Hong Kong's economy grew at a compound annual rate of 7.48 percent for four decades up till 1997,<sup>1</sup> a record that is not surpassed by any other economy. Even the Chinese Mainland, which boasts very high growth and certainly presents another economic miracle, has a history of credible economic growth that benefits the masses only since 1979. What is the impetus behind this record growth in Hong Kong? Why did things change so dramatically after 1997? Was it because Hong Kong's "exclusive franchise" as the linkage between the mainland and the world has eroded or expired?<sup>2</sup> Hong Kong's doom, according to Richard Hornik, was because China "has made huge strides toward opening itself to the global economy." But China's opening up did not start from 1997, whereas the economic downturn was immediate. Hong Kong before and after 1997 is like night and day. The dramatic and immediate reversal throws Hornik's hypothesis into doubt. The inability of Hong Kong to revive notwithstanding strong pickups in exports is puzzling.

We need to identify a number of relationships:

Was Hong Kong's pre-1998 property market boom a result of underlying

---

<sup>1</sup> Hong Kong started reporting official GDP statistics in 1961. It never reported a single year of negative growth until 1998. The average compound growth rate over the 1961 to 1997 period was 7.48%.

<sup>2</sup> "Who Needs Hong Kong? *Fortune*, May 2, 2002.

economic fundamentals? What explains the movement of the housing market then, and what explains the major decline in the housing market after 1997?

Does housing market drive domestic demand (defined as domestic consumption plus domestic investment)? Or does domestic demand drive housing prices?

How does the movement of housing prices affect government revenues and government expenditures? What are the causal directions?

It is said that because Hong Kong is now gripped in a serious deflation, real interest rates are very high and that depresses housing prices. Without downplaying the depressing effects of high real interest rates on housing prices, we need to find out if it is high real interest rates that caused the housing market weakness, or alternatively a decline in housing prices that triggered the deflation and caused high real interest rates.

We found evidence for a property price bubble that began to emerge around the second quarter of 1996 and peaked in the third quarter of 1997. Roughly speaking, around 23 per cent of the peak price in 1997 could be due to the bubble. Thus, most of the price increases that took place prior to 1998 was more a reflection of Hong Kong's prosperity, low taxes, and wealth than a speculative bubble. Given a regime of low tax rates, social and political stability, free market institutions, the respect for the rule of law, and benefiting from rapid growth on the mainland, housing prices had been buoyed up by strong economic growth.

A statistical model shows that exports growth was really the driving force behind housing prices. Alternative time series models, using the autoregressive distributive lag (ARDL) framework as well as the Granger-Johansen cointegration framework,<sup>3</sup> show that a model with exports, interest rates, and the inflation rate as key variables track housing prices really well. It can be used to identify the bubble and predict much of the significant price decline after 1997. The model also predicts that housing prices should have peaked in 1996 and should have picked up well before 2002.

The inability of the housing market to pick up from 2001 as predicted by our model may be attributable to a policy to produce a major increase in the supply of housing implemented after 1997, and may also be partly attributable to a structural break reducing the "pull" effect of exports for

---

<sup>3</sup> Results from the Johansen/Granger model are similar and not reported on space considerations.

housing prices, which was found to have occurred from 1998Q1. We will offer some discussion about the possible causes behind this structural break. Because of space limitations, readers may refer to Ho, Haurin, and Wong (2003) and Ho, Wong, and Tse (2003) for further evidence about possible explanations for the structural break.

It is common for people to say that housing price bubble was partly due to a provision in the Annex to the Sino-British Joint Declaration, which restricted the annual land grant to no more than 50 hectares (excluding land to be granted to the Hong Kong Housing Authority for public rental housing) unless a relaxation to the limit is approved by the Land Commission consisting of equal members from the British and Chinese sides.<sup>4</sup> We will present evidence that such a restriction notwithstanding, there is no apparent shortage of housing prior to 1997. The housing market was essentially in balance during the run-up to the handover. Housing prices can rise when the housing market is in a moving equilibrium, much as wages and salaries can rise when the labor market is in a moving equilibrium.

We do not dispute that housing prices in Hong Kong in 1997 were due for a major correction. Indeed our model predicted the major correction. But without the structural break and the policy-driven increase in housing supply the housing market would have picked up long time ago. Further, it is likely that government intervention to curb speculation in 1994 may well have played a role in the formation of the bubble prior to 1997. Thus we conclude that Hong Kong's demise was home-made and indeed caused by a miscarriage of housing policy, in particular inappropriate intervention in the market to curb demand during the 1994-95 episode and then to boost supply after 1998, and accentuated by the launch of the Tenants Purchase Scheme (TPS) that offered even well-to-do sitting tenants the opportunity to buy their subsidized rental flats at deeply discounted prices.

An important and extremely robust result is that domestic demand is always driven by the housing price index. Causation does not run from domestic demand to housing price. This explains why the domestic economy fell so sharply after 1997, and why increases in unemployment was concentrated in the domestic sector such as finance and real estate, retail sales, and construction and decoration. However, there is a bi-direction effect between employment weakness and housing market weakness.

We found that although Hong Kong's exports growth declined after 1997, the degree of decline was in line with that for the world as a whole and

---

<sup>4</sup> See <http://www.hkbu.edu.hk/~pchksar/JD/jd-full1.htm>



actually smaller than that experienced by such economies as South Korea, the United Kingdom, and the U.S. There was little evidence that the integration with the Mainland played an important role in Hong Kong's decline, and little evidence that the opening up of China caused the Hong Kong economy to shrink. The decline of the economy came just too suddenly for Hornick's hypothesis to hold, given that the opening up of China and the integration with the Mainland had gone on for a long time and continuously.

We found the plunge in property prices the key to the huge budget deficit that emerged after 1997. We present evidence that the Hong Kong fiscal system was highly dependent on land-based revenues and indeed was probably the closest model to the Henry George "single tax" ideal. Henry George (1839-1897) was a social reformer who argued that the only tax (hence "single tax") that is required to finance the working of a government is a tax on land rent. By eliminating taxes on incomes and all other taxes, the incentive to invest and to work will be enhanced. The progress of society will be reflected in higher land values, and the government can tax land to fund all worthwhile government expenditures. It was no accident that Hong Kong's land cost was probably the world's highest and Hong Kong's taxes were probably the lowest in the world prior to 1998.

Section II will provide some background to the Hong Kong housing market, the policies in the 1994-95, and the policies under the Tung Chee-hwa Administration. Section III will present the theory and evidence about what drives Hong Kong's housing prices and the relationship between domestic demand and the housing market. Section IV will present the evidence about fiscal policy and the housing market. Section V will examine the relationship between real interest rates and the housing market. Finally, Section VI will provide the conclusions.

## **II. Hong Kong's Housing Market and Policies**

Public housing has traditionally played a key role in Hong Kong's housing market. To deal with the rapidly expanding population, Governor MacLehose announced in October 1972 an unprecedented public housing programme. 72 public housing estates were to be constructed, to provide decent housing to a total of 1.8 million people. These estates offer cheap rents to qualified means-tested households. Then in 1978, the Home Ownership Scheme (HOS) was launched, offering an opportunity for those who were not qualified for low cost rental housing to buy their own flats at prices lower than private flats. Most buyers of HOS housing were public rental tenants, who were given a more favorable quota than others in periodic

lotteries set up to allocate the limited supply of new HOS flats among eligible buyers.

Because of continuous economic growth and inflation, Hong Kong's housing prices had been climbing secularly for decades, though not smoothly. Particularly after 1987, following the implementation of a policy to make the richer public housing tenants pay higher rent, participation among public housing tenants in the housing market rose. *A priori*, one could predict that this inflow of cash into the housing market would drive housing prices as well as housing transactions up. By 1992/93, it was found that 13 per cent of public housing tenants owned a flat and as much as 24 per cent of housing transactions were due to purchase by public housing tenants (Hong Kong Housing Authority, 1993). Subsequently, a Task Force on Land Supply and Property Prices found 10% of sale and purchase agreements presented for stamping in the two years between February 1992 and March 1994 involved short-term resales. Deciding that there was *prima facie* evidence for hoarding the Task Force recommended a series of anti-speculation measures in June 1994. Among such measures, the initial deposit was to be fixed at 10% of the purchase price and 5% would be forfeited if the purchaser fails to sign the formal sale and purchase agreement or enters into a Cancellation Agreement with the developer. Stamp duties were also made payable at the time a provisional sale and purchase agreement was signed and not at the time the transaction was completed.

Apart from worrying about speculation, the government also had a long history of worrying about the homeownership rate. In 1987, The Long Term Housing Strategy: A Policy Statement, already made it clear that the government wanted to encourage home ownership. Since then there had been a number of attempts to sell public housing to tenants, but they had failed because they were not attractive. Tenants' tenure had been protected and had been transferrable to future generations, while worn-down estates were automatically replaced with modern ones. Tenants therefore needed much more sweetener to find such schemes attractive. The Tenants Purchase Scheme (TPS), announced in December 1997, finally made tenants the irresistible offer of as much as 88 % off the estimated market value and permission to resell after two years. TPS would play a strategic role in Mr. Tung Chee-hwa's vision of increasing homeownership from 50% to 70% in ten years, as announced in his first policy address of October 1997.

The scheme immediately reduced the attractiveness of Home Ownership Scheme flats, which looked ridiculously expensive in comparison.<sup>5</sup> HOS homeowners suddenly found a dearth of buyers. Turnover in the second-hand market dropped precipitously, and developers had to by-pass existing homeowners in order to find buyers. After they have exhausted one “crop” of buyers, in the following year they must further cut prices in order to reach buyers with lower purchasing power. This was why home prices kept falling even in 2000, when economic growth was actually quite high.

Interpreting the run-up in property prices prior to 1997 as resulting from a shortage, Mr. Tung in 1997 announced a new policy of increasing the supply of homes to 85000 unit a year (from an average of about 53,000 units a year over the 1987-1997 period). From 1998 on through late 1999 the government used every means within its control to boost housing supply.<sup>6</sup> The surge in housing supply after 2000 reflected the result of this policy, which was seen as the natural response to the surge in housing prices prior to 1997.

## **II. A Model of Housing Price Determination in a Small Open Economy and the Exports Multiplier on Domestic Economy**

### ***A. Model***

In principle, many factors determine housing prices, and they include both demand side and supply side factors. These factors include demographic variables, incomes, interest rates, mortgage loan ratios, and expectations about inflation, expectations about supply and income trends, and the completion rate, etc. However, *when the policy environment is stable, and when the housing market is more or less in equilibrium, incomes and interest rates should be the predominant factors.* Since in an open economy incomes are closely tied to exports, we hypothesize that exports and interest rates were the fundamental variables driving housing prices.<sup>7</sup> Table

---

<sup>5</sup> For this hypothesis to carry weight, public housing tenants have to be active in the housing market prior to the announcement of the TPS. This was vindicated as a survey by the Housing Authority in 1992/93 found that public housing tenants were responsible for 24 per cent of housing transactions. Watanabe(1998) found public housing tenants had huge savings compared to private housing tenants or owners.

<sup>6</sup> Mr. Tung in an interview with reporters in June 2000 unexpectedly made the statement that the 85000 a year production target was no longer government policy. Earlier on, a story in Apple Daily(July 6, 1999) reported that land lease conversions and land exchange in the first half of the year would provide 16785 housing units, a new record in recent history. Plot ratios were also increased over the years.

<sup>7</sup> We exclude other sources of incomes on the ground that these are endogenously induced.

1 presents a comparison between the housing stock and the number of households in Hong Kong from 1987 to 2001. It provides some evidence that the housing market prior to 1997 was more or less in equilibrium notwithstanding the run-up in prices.

**Table 1 : Number of Households and Housing Stock (1987-2001)**

Thousands									
No. of Households	Private Housing		Public Housing			Total Housing		Households minus Housing Stock	
	Private Housing	Increase in private housing	Subsidized Sale Flats	Public Rental Housing	Increase in public housing	Increase in Housing Stock	Total stock		
1987	1496.1	770	-	79	580	-	-	1429	67.1
1988	1532.6	804	34	84	596	21	55	1484	48.6
1989	1549.0	832	28	94	620	34	64	1548	1.0
1990	1559.0	864	32	114	651	51	82	1630	-71.0
1991	1603.1	884	20	131	667	33	52	1682	-78.9
1992	1640.0	919	35	147	680	29	62	1744	-104.0
1993	1677.7	946	27	162	673	8	37	1781	-103.3
1994	1729.1	962	16	182	679	26	41	1822	-92.9
1995	1783.0	1003	41	192	689	20	62	1884	-101.0
1996	1864.5	1030	27	210	693	22	48	1932	-67.5
1997	1922.8	1040	10	224	698	19	29	1961	-38.2
1998	1961.5	1056	16	242	706	26	42	2004	-42.5
1999	1998.9	1072	16	288	682	22	38	2040	-41.1
2000	2037.0	1099	27	327	688	45	72	2114	-77.0
2001	2078.4	1153	54	377	694	56	110	2224	-145.6

Sources: Data on the number of households are obtained from “Hong Kong Social and Economic Trends, Census and Statistics Department, various years. Data on the housing stock can be downloaded from <http://www.cityu.edu.hk/hkhousing/hs/figures/index.htm> “Private housing” include privatized public housing/HOS flats. Data on the number of households are the averages of the statistics for the four quarters of the years obtained from the General Household Survey. Stock of permanent residential flats are as at end March.

If exports are the main driving force behind housing price, and if housing price movements in turn drive domestic demand, we will have a model about an “exports multiplier” linking exports to domestic demand. In this picture the housing market provides a “transmission mechanism” whereby the primary engine of exports gives rise to the secondary effects of “non-basic” sector activities.

These basic relations can be summarized by the following equations:

$$\text{LnPPI} = \alpha_1 + \beta_1 \text{LnEX} + \gamma \text{PR} + \lambda \text{INFL} + \epsilon_t \quad \text{----- (1)}$$

(  $\alpha_1 > 0$ ,  $\beta_1 < 0$  and  $\lambda > 0$  )

$$\text{LnD} = \alpha_2 + \beta_2 \text{LnPPI} + \epsilon_t \quad \text{----- (2)}$$

(  $\beta_2 > 0$  )

where PPI is the property (housing) price index, EX is total exports, PR is prime rate and INFL is inflation rate.

To establish the long-run relations for these equations, we employ the autoregressive distributed lag (ARDL) approach to cointegration introduced by Pesaran *et. al.* (1996). This approach, unlike the Johansen's procedure which requires all the series are integrated of the same order, provides an alternative for examining the cointegrating relation of the underlying variables regardless of whether the series are I (0) or I (1) and so we can dispense with the need for pre-testing for unit roots. The error correction version (EC) of the ARDL model for Equation (1) and (2) are given by:

$$\Delta \text{LnPPI}_t = \alpha_o + \sum_{i=1}^n \delta_i \Delta \text{LnPPI}_{t-i} + \sum_{i=1}^n \beta_i \Delta \text{LnEX}_{t-i} + \sum_{i=1}^n \gamma_i \Delta \text{PR}_{t-i} + \sum_{i=1}^n \lambda_i \Delta \text{INFL}_{t-i} + \theta_1 \text{LnPPI}_{t-1} + \theta_2 \text{LnEX}_{t-1} + \theta_3 \text{PR}_{t-1} + \theta_4 \text{INFL}_{t-1} + \varepsilon_t \quad \text{-----(3)}$$

$$\Delta \text{LnD}_t = \alpha_o + \sum_{i=1}^n \delta_i \Delta \text{LnD}_{t-i} + \sum_{i=1}^n \beta_i \Delta \text{LnPPI}_{t-i} + \theta_5 \text{LnD}_{t-1} + \theta_6 \text{LnPPI}_{t-1} + \varepsilon_t \quad \text{-----(4)}$$

Another advantage of the ARDL framework over the Johansen approach is that there is no need to impose a uniform lag structure in the error correction model.

The ARDL approach consists of several steps. To begin with, we carried out a stability tests for investigating the existence of a long run relationship. The null hypotheses for the statistical tests, namely that no cointegrating relationship exists between the variables, can be stated as follows:

$$H_{01}: \quad \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

$$H_{02}: \quad \theta_5 = \theta_6 = 0$$

The null hypotheses can be tested by the F-statistic. Note that this statistic has a non-standard distribution irrespective of whether the series are I (0) or I (1). Two sets of asymptotic critical values (CV) - the lower bound CV (assuming all the variables are I (0) and the upper bound CV (assuming all the variables are I (1) ), have been computed by Pesaran *et. al.* (1996). If the computed F-statistic for the test lies above the upper bound, then the null of no cointegration can be rejected and we can conclude that a long-run relationship between the variables does exist. If the test statistic falls below the lower bound, then the null cannot be rejected. If the test statistic falls in between the bounds, then the result is inconclusive. Once the existence of long-run relationship is confirmed, the ARDL model is then applied to estimate the coefficients of this long-run relation and we can derive the associated ARDL error correction model based on different lag selection criterion.

## ***B. Estimation Results:***

### **1. Relationship between Property Price (*LnPPI*), Export Performance (*LnEX*), Prime Rate (*PR*), and Inflation (*INFL*), 1984Q1 – 1994Q2**

In the first instance, we estimate the parameters in the basic housing price model for the interval 1984 to 1994:Q2. This is a period with stable monetary regime, a period of relative political stability after the signing of the Sino-British Joint Declaration removing much of the uncertainty about Hong Kong's future, one with relative balance in supply and demand, and relative stability in housing policy.<sup>8</sup>

As the estimation results may be sensitive to different lag orders in VAR, to avoid this, we try different lags (2, 4, 6 and 8 lags on the first difference of each variable) and see whether or not these could yield consistent results. As can be seen in the Table 2.1, the computed F-statistic  $F(\text{LnPPI} | \text{LnEX}, \text{PR}, \text{INFL}) = 5.00$  when lags = 8 when the PPI is taken as the dependent variable. Since the value exceeds the upper bound of the critical value bound, we can reject the null of no long-run relationship between *LnPPI*, *LnEX*, *PR* and *INFL*.

In the next stage, we have to determine the lag order of ARDL model. The maximum lag orders set at 6 and the optimal lag structure is determined by the AIC information criteria. The selected ARDL model is (6, 0, 6, 0). The analysis then moves to estimate the coefficients of the long-run relationship and also the associated ARDL error correction model. The estimated coefficients are reported in the Table 2.2. All the explanatory variables carry a significant expected sign. The estimate of the error correction model is reported in the Table 2.3. The error term is negative and highly significant which also confirms our earlier findings that cointegration exists between the variables.

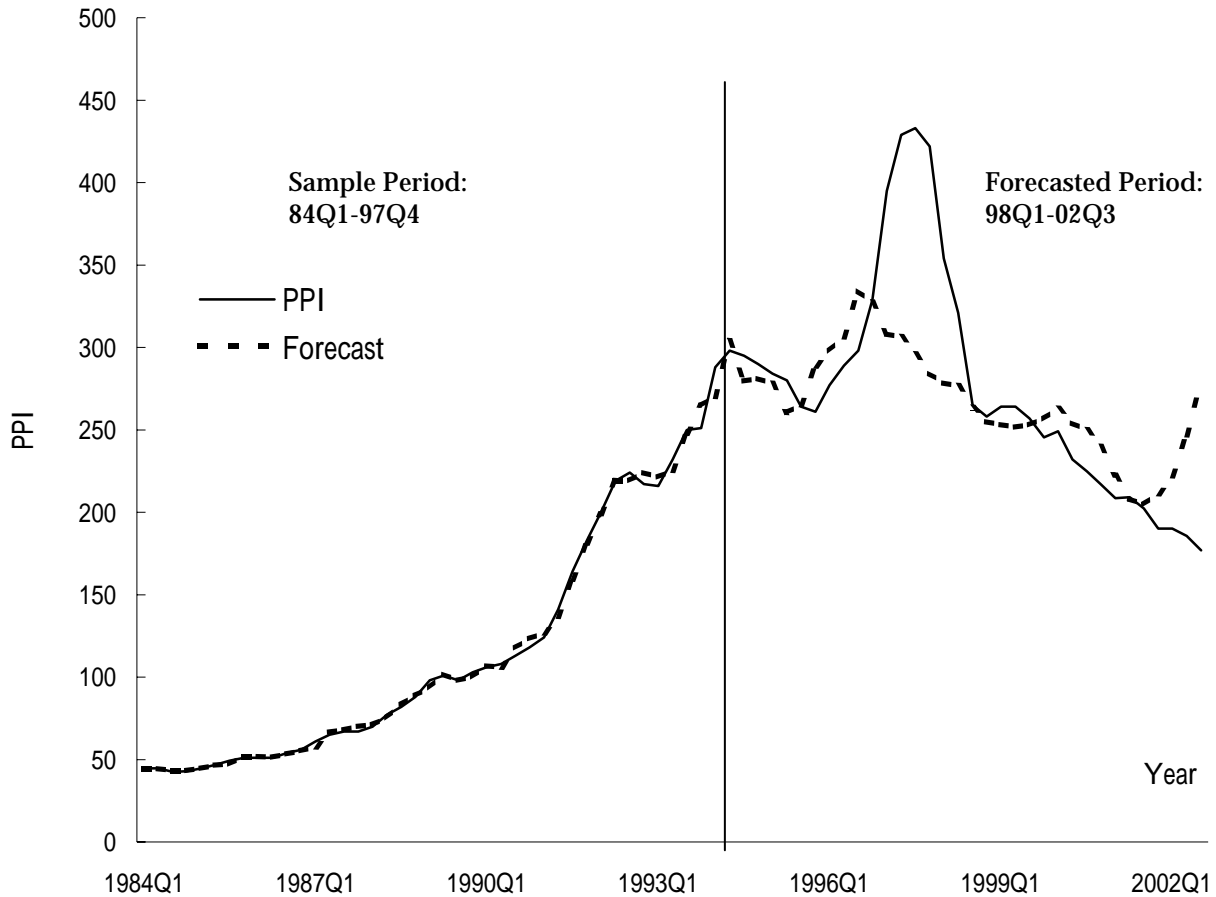
Using the parameters estimated for this period, and inserting the realized values for total exports, inflation rates, and interest rates, both the fitted and the forecast housing price indices from mid 1984 through 2002 are presented in Figure 1. Amazingly, we found that the model forecasts housing prices quite well. We also found that there was apparently a bubble from 1996 to 1997, which appears to have emerged precisely because housing prices were suppressed prior to 1996. We discover that housing prices should have peaked in 1996 at a much lower level. Some 23 per cent of the peak price in 1997 may represent the bubble. Moreover, housing prices should have

---

<sup>8</sup> Throughout this period, an annual 50 hectare land sale limit applies, unless special approval to relax the limit was given by the Land Commission.

bottomed out in 2001 and rebounded strongly with the recovery of exports. Housing prices in mid 2003 should have been some 40 per cent above realized values.

Figure 1. Fitted Values and Dynamic Forecasts for the Level of PPI



**Table 2.1 : F-Statistics for Testing the Existence of a Long-Run Relationship Between Property Price, Total Export and Prime Interest Rate, 1984Q1 to 1994Q2**

Dependent Variables:	Lag=2	Lag=4	Lag=6	Lag=8
LnPPI	1.5841	1.3143	2.6849	4.9991**

Note:

1. The critical value bounds for the test are 3.79-4.35 at the 95% significance level, which are given in Table C1.iii (with an unrestricted intercept and no trend; number of regressors=3), Shin and Smith (1999).
2. \*\* denotes 95% significance level and      denotes first difference.

**Table 2.2 : Estimated Long-Run Coefficients (Dependent variable: LnPPI)**

Regressors	Coefficient (t-ratio)
Intercept	-8.1132 (-8.2318)***
LnEX	1.0720 (13.0848)***
PR	-0.4547 (-2.3117)**
INFL	0.0429 (2.6215)**

Note:

1. Optimal Lag: ARDL (6,0,6,0) selected based on AIC Information criteria
2. \*\*\* denotes 1% significance level

**Table 2.3 : Error Correction Representation of ARDL Model  
(Dependent variable: LnPPI<sub>t</sub>)**

Regressors	Coefficient (t-ratio)
Intercept	-2.8177 (-4.0731)***
LnPPI <sub>t-1</sub>	0.5014 (2.9518)***
LnPPI <sub>t-2</sub>	-0.1792 (-0.9082)
LnPPI <sub>t-3</sub>	0.3968 (1.8762)*
LnPPI <sub>t-4</sub>	-0.2535 (-1.2435)
LnPPI <sub>t-5</sub>	-0.3209 (-1.7659)*
PR	-0.0158 (-2.0824)
INFL	-0.0089 (-0.4357)
INFL <sub>t-1</sub>	0.0047 (0.1922)
INFL <sub>t-2</sub>	-0.0456 (-2.1219)**
INFL <sub>t-3</sub>	0.0083 (0.3920)
INFL <sub>t-4</sub>	0.1470 (0.6966)
INFL <sub>t-5</sub>	-0.0397 (-2.2290)**
lnEX	0.3723 (4.2933)***
ECM <sub>t-1</sub>	-0.3473 (-4.1336)***

Note:

1. Optimal Lag: ARDL (6,0,6,0) selected based on AIC Information criteria
2. \*, \*\* and \*\*\* denotes 10%, 5% and 1% significance level respectively

## 2. Estimation Results with Policy Variables Built In: 1984Q1 – 2001Q1

In this section, we will try to identify if there was a structural change in the statistical relationship between housing prices and exports that occurred some time between the Asian Financial Crisis and the end of 1998 to the underlying relationship determining housing prices. To do this we avoid making any prior assumptions about whether a structural change had occurred and when it had occurred. We just let the data tell the story. Since we know that considerable over-supply emerged after the first quarter of 2001 we end the estimation period to avoid invalidating the model, since as we have explained, the analysis presumes that demand and supply are roughly in balance.

To test if there was a structural change in the statistical relationships that occurred during or after transition to Chinese sovereignty we introduce an intercept dummy variable “D” (all values being equal to zero prior to the structural change and equal to zero after the structural change) and an interactive dummy variables (a binary 0,1 dummy multiplied to key explanatory variables) in the ARDL model.. The coefficient on the intercept dummy would capture any shift in the relationship. The coefficients on the



interactive variables would capture any change in the slopes of the key explanatory variables.

**Table 2.4 : F-Statistics for Testing the Existence of a Long-Run Relationship Between Property Price on the one hand, and Total Export and Prime Interest Rate (with interactive dummy), on the other hand, 1984Q1 to 2001Q1**

Dependent Variable:	Lag=2	Lag=4	Lag=6	Lag=8
LnPPI	3.9049	2.9570	9.2365**	8.5862**

Note:

1. The critical value bounds for the test are 4.04 – 4.78 at the 90% significance level, 6.84 – 7.84 at the 99% significance level which are given in Table C1.iii (with an unrestricted intercept and no trend; number of regressors=1), Shin and Smith (1999).
2. \* and \*\* denote 90 and 99% significance level respectively and  $\Delta$  denotes first difference.
3. D98Q1 (prior 98 Q1=0, =1 onwards), LnEX \* D98Q1 are included in the model.

As can be seen in the Table 2.4, the null hypothesis of no cointegration can be rejected for the lag = 6 and 8 when LnPPI is the dependent variable. Since the value exceeds the upper bound of the critical value bound (particularly when a higher order of lag is included in the model), it indicates that the inclusion of the interactive variables retain the long run relation between the LnPPI, LnEX, PR and INFL.

Without prejudging the timing of a structural change that may occur, and mainly for illustration purposes, Table 2.5 and Table 2.6 present the estimates for the long run coefficients and the error correction model when the dummy variables are switched from 0 to unity in the first quarter of 1998. The estimated long-run coefficients and the error correction representation have been selected by the AIC information criteria (the maximum lag orders set at 6). Coefficients on LnEX and PR carry the significant expected sign, and the error term in the EC-ARDL model is negative and highly significant which also confirms our earlier findings that cointegration exists between the variables. As Table 2.5 shows, the estimated coefficients for the export interactive dummies is significant indicating that some structural change has reduced the positive effects of exports growth on housing prices. We must now conduct a timing test to reveal whether 1998 Quarter One was indeed the time a structural change occurred and explore the reasons causing the structural change.

**Table 2.5 : Estimated Long-Run Coefficients (Dependent variable: LnPPI)**

Regressors	Coefficient (t-ratio)
Intercept	-8.2364 (-17.6958)***
PR	-0.0527 (-3.7096)***
INFL	0.0105 (1.2329)
LnEX	1.1168 (31.6069)***
D98Q1	13.4904 (1.6832)*
LnEX * D98Q1	-1.0546 (-1.7029)*

Note:

1. Optimal Lag: ARDL (4, 0, 4, 6) selected based on AIC Information criteria
2. \* and \*\*\* denotes 10% and 5% significance level respectively

**Table 2.6 : Error Correction Representation of ARDL Model (Dependent variable: LnPPI<sub>t</sub>)**

Regressors	Coefficient (t-ratio)
Intercept	-3.2554 (-4.8622)***
LnPPI <sub>t-1</sub>	0.5376 (4.3806)
LnPPI <sub>t-2</sub>	0.2391 (1.54131)
LnPPI <sub>t-3</sub>	0.1766 (1.3336)
PR	-0.0208 (-2.8030)***
INFL	-0.0587 (-2.7256)***
INFL <sub>t-1</sub>	0.0588 (2.4474)**
INFL <sub>t-2</sub>	0.0042 (0.1587)
INFL <sub>t-3</sub>	-0.0260 (-1.3848)
lnEX	-1.1149(-0.5510)
lnEX <sub>t-1</sub>	-0.6283 (-2.5454)**
lnEX <sub>t-2</sub>	0.2453 (1.0486)
lnEX <sub>t-3</sub>	-0.0492 (-0.2162)
lnEX <sub>t-4</sub>	-0.7518 (-3.2528)***
lnEX <sub>t-5</sub>	-0.3476 (-1.4823)
D98Q1	5.3320 (1.5479)
LnEX * D98Q1	-0.4168 (-1.5658)
ECM <sub>t-1</sub>	-0.3953 (-5.0971)***

Note:

1. Optimal Lag: ARDL (4, 0, 4, 6) selected based on AIC Information criteria
2. \*\* and \*\*\* denotes 5% and 1% significance level respectively

Under this timing test, we switch the dummy variables from zero to unity in different quarters, and observe the changes in the coefficients estimates and the test statistics. Table 2.7 shows an obvious jump in the t statistic between 97Q4 and 98Q1 and a discrete sizeable increase in the key coefficients, suggesting that something rather sudden occurred shortly before 1998 Quarter One. The sudden nature of the change suggests some kind of policy-triggered “regime shift.”

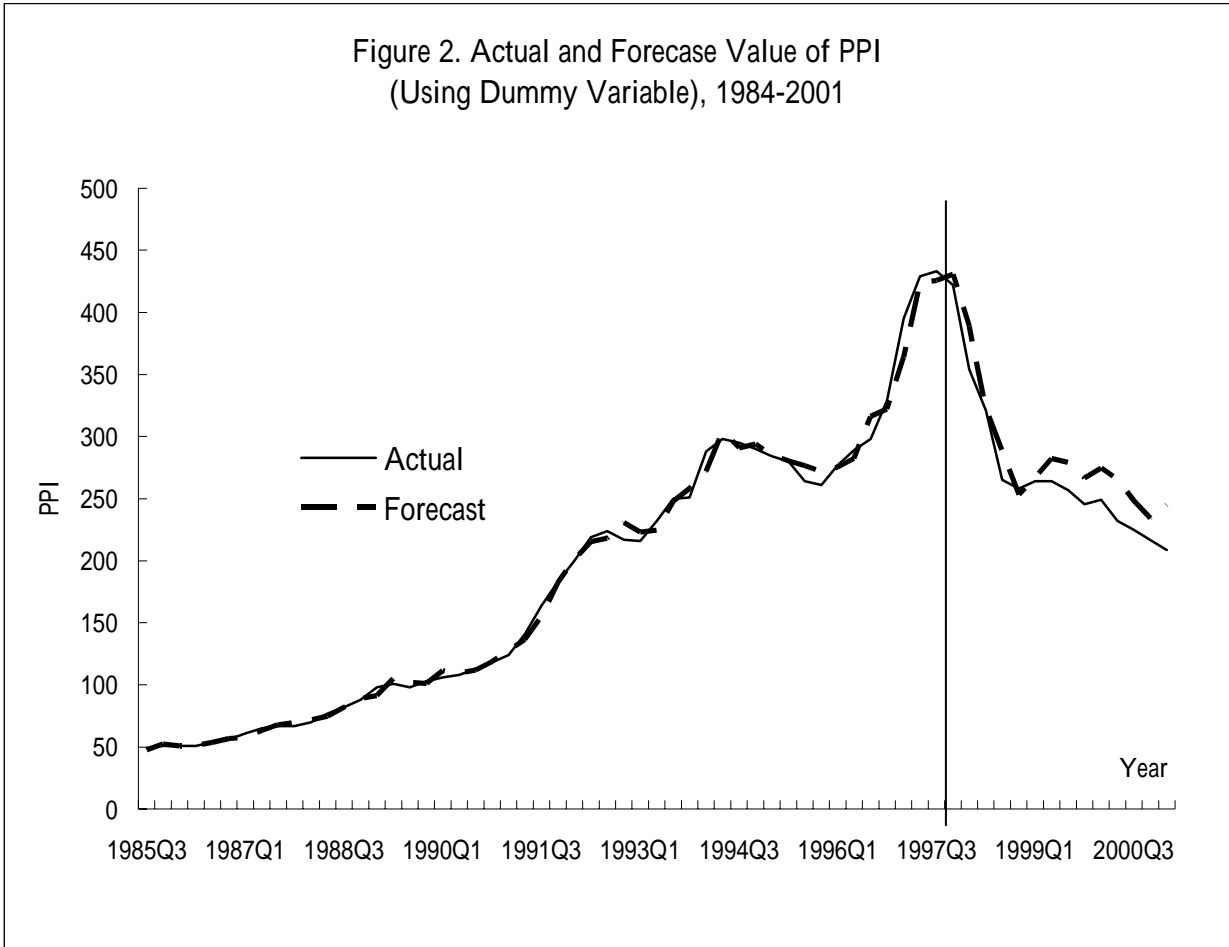
As it happens, a major housing policy change, in the form of the Tenants Purchase Scheme, was announced on December 8. Given that public housing tenants had been active in the home purchase market, the attractiveness of the TPS can indeed be very disruptive of the housing market, as private homeowners who had been dependent on them to buy their properties so they could trade up could no longer do so after they disappeared. Table 2.7 shows the results of this timing test. It shows that the best goodness of fit and the best test statistics occur when the dummies switch to unity in 1998Q1.

**Table 2.7 : Timing Test With Dummies Switching to Unity in Different Quarters**

<b>Quarter with Value of Dummy Switching to Unity</b>	<b>Intercept Dummy, D</b>	<b>LnEX * D</b>	<b>Adjusted R2 in ECM model</b>
1997Q1	-9.9555 (-0.6221)	0.7909 (0.6367)	0.6425
1997 Q2	0.9158 (0.0726)	-0.0758 (-0.0778)	0.5990
1997 Q3	6.6088 (0.6014)	-0.5204 (-0.6128)	0.6143
1997 Q4	13.7312 (1.3308)	-1.0762 (-1.3500)	0.6300
<b>1998 Q1</b>	<b>13.4904</b> <b>(1.6832)*</b>	<b>-1.0546</b> <b>(-1.7029)*</b>	<b>0.6604</b>
1998 Q2	12.8367 (1.3410)	-0.9982 (-1.3486)	0.6139
1998 Q3	12.7548 (1.4839)	-0.9998 (-1.5053)	0.6325

Note: Figures are estimated coefficients and the adjusted R2 for the error correction models. T statistics are in brackets. D is a dummy variable that switches to unity in the quarter on the left column.

In addition, using the parameters estimated, and setting the time-based dummy variable to zero, we can project what the housing prices would have been, had policies triggering the structural break not been implemented. The results of this exercise is presented in Figure 2. Just as before we predict a major decline in housing prices early 1998 but housing prices should have picked up, especially after 2001. The failure of housing prices to pick up notwithstanding a rebound in exports may be partly due to over supply after 2001 and partly due to the diminution of the “exports multiplier” after 1998. For the first quarter of 2001, forecast prices without the structural change were 17.3 per cent higher than actual prices. After 2001, the excess supply would further weigh down upon actual prices, while the strong exports would lift up housing prices, but this is not shown in the diagram.



Note: Housing prices are in their natural scale. Anti-logarithms have been taken.

### 3. Relationship between Domestic Demand ( $LnD$ ) and Property Price ( $LnPPI$ ), 1984Q1 – 2002Q3

It is important to identify the direction of causality between domestic demand and property price. As can be seen in Table 3.1, the null hypothesis of no long run relationship can be rejected, under the ARDL approach, for the lags=2 when  $LnD$  is the dependent variable. Since the value exceeds the upper bound of the critical value bound, we can reject the null of no long-run relationship between the  $LnD$  and  $LnPPI$ . On the other hand, when we turn the  $LnPPI$  around to serve as the dependent variable all the corresponding F-statistics fall below the lower bound critical value (4.94 and 4.04 at 5% and 10% significance level respectively). Therefore the null hypothesis of non-existence of cointegration cannot be rejected. The above results indicate that only  $F(LnD | LnPPI)$  is significant. A long-run-relationship exists with the  $LnD$  as the dependent variable and housing price index (in logarithms)  $LnPPI$  as the driving variables for the explanation of  $LnD$ .

**Table 3.1 : F-Statistics for Testing the Existence of a Long-Run Relationship Between Private Domestic Demand and Property Price, 1984Q1 to 2002Q3**

Dependent Variables:	Lag=2	Lag=4	Lag=6	Lag=8
LnD	4.83*	3.46	3.17	3.33
LnPPI	1.70	0.65	0.32	0.75

Note:

1. The critical value bounds for the test are 4.94 – 5.73 at the 95% significance level and 4.04 - 4.78 at the 90% significance level, which are given in Table C1.iii (with an unrestricted intercept and no trend; number of regressor=1), Shin and Smith (1999).
2. \* and \*\* denotes 10% and 95% significance level respectively.

**Table 3.2 : Estimated Long-Run Coefficients (Dependent variable: LnD)**

Regressors	Coefficient (t-ratio)
Intercept	8.6597 (22.1448)***
LnPPI	0.6878 (9.9381)***

Note:

1. Optimal Lag: ARDL (2, 0) selected based on AIC Information criteria
2. \*\*\* denotes 1% significance level

**Table 3.3 Error Correction Representation of ARDL Model (Dependent variable: LnD<sub>t</sub>)**

Regressors	Coefficient (t-ratio)
Intercept	0.7668 (3.7053)***
LnD <sub>t-1</sub>	-0.3619 (-3.6092)***
LnPPI	0.2430 (3.6875)***
ECM <sub>t-1</sub>	-0.0886 (-3.4313)***

Note:

1. Optimal Lag: ARDL (2, 0) selected based on AIC Information criteria
2. \*\*\* denotes 1% significance level respectively

The estimated long-run coefficients and the error correction representation selected by the AIC information criteria are reported in the Table 3.2 and 3.3 respectively (the maximum lag orders set at 3). The *LnPPI* carries the significant expected sign (Table 2.2), and the error term in the EC-ARDL model is negative and highly significant (Table 2.3) which also confirms our earlier findings that cointegration exists between the variables. The size of the error term is 0.09 which indicates that once the domestic demand has experienced an external shock, it takes around 2.5 to 3 years for the domestic demand to return its equilibrium.

A related result is the relationship between employment changes and housing price movements. A bi-directional relationship was found using the Johansen-Granger technique and was reported in Ho, Tse, and Wong (2003).

### III. Relationship between Fiscal Variables and Housing Price

Two simple hypotheses to be tested is whether housing prices drive government expenditures, and whether housing prices drive government revenues. Mathematically, that housing prices drive government expenditures and government revenues can be represented by the following equations:

$$\text{LnG} = \beta_3 + \beta_3 \text{LnPPI} + \epsilon_t \quad \text{-----(5)}$$

( $\beta_3 > 0$ )

$$\text{LnGR} = \beta_4 + \beta_4 \text{LnPPI} + \epsilon_t \quad \text{-----(6)}$$

( $\beta_4 > 0$ )

These relationships are estimated under the ARDL framework. The above long run relationship is estimated by the ARDL model. For the government revenue relation, we need to add two dummies variables (1999=1, other=0 and 2000=1, other=0) to capture the effect of one-time increase of government revenue resulting from sale of stocks in 1999 and 2000.<sup>9</sup> The data are annual from 1984 to 2001.

**Table 4.1 : F-Statistics for Testing the Existence of a Long-Run Relationship Between Government Expenditures and Property Price, 1984Q1 to 2002Q3**

Dependent Variables:	Lag=2	Lag=4	Lag=6	Lag=8
LnG	5.21*	1.37	0.85	0.56
LnPPI	1.99	2.10	2.77	2.46

Note:

1. The critical value bounds for the test are 4.94 – 5.73 at the 95% significance level and 4.04 - 4.78 at the 90% significance level, which are given in Table C1.iii (with an unrestricted intercept and no trend; number of regressor=1), Shin and Smith (1999).
2. \* denotes 10% significance level respectively.

**Table 4.2 : Estimated Long-Run Coefficients (Dependent Variable: LnG)**

Regressors	Coefficient (t-ratio)
Intercept	5.7429 (14.590)***
LnPPI	0.9108 (12.1273)***

Note:

1. \*\*\* denotes 1% significance level
2. Optimal Lag: ARDL (2, 0) selected based on AIC Information criteria

<sup>9</sup> The HKSAR government spent some 120 billion dollars in the summer of 1998 buying stocks to counteract what was described as the “double play” of some hedge funds: making money from index futures by depressing stock prices. This yielded a huge profit as the government sold them in stages to Hong Kong people in the form of a “tracker fund.”

**Table 4.3 : Error Correction Representation of ARDL Model (Dependent variable: LnG<sub>t</sub>)**

Regressors	Coefficient (t-ratio)
Intercept	0.4803 (4.7506)***
LnG <sub>t-1</sub>	-0.3449 (-3.2888)***
LnPPI	0.0762 (4.2381)***
ECM <sub>t-1</sub>	-0.0836 (-4.6156)***

Note:

1. Optimal Lag: ARDL (2, 0) selected based on AIC Information criteria
2. \*\*\* denotes 1% significance level respectively

As can be seen in Table 4.1, the null hypothesis of no long term relationship between government expenditures and housing prices can be rejected for the lags = 2 when *LnG* is the dependent variable. When we then turn the *LnPPI* as the dependent variable and then test the joint significance of the lagged level variables in the EC version of the ARDL model, on the contrary, Table 4.1 shows that all corresponding F-statistic fall below the lower bound critical value (4.94 and 4.04 at 5% and 10% significance level respectively). We cannot reject the null hypothesis of non-existence of cointegration. Thus only F (*LnG* | *LnPPI*) is significant. Housing price movements are an important determinant of government expenditures and this relation holds in the long term.

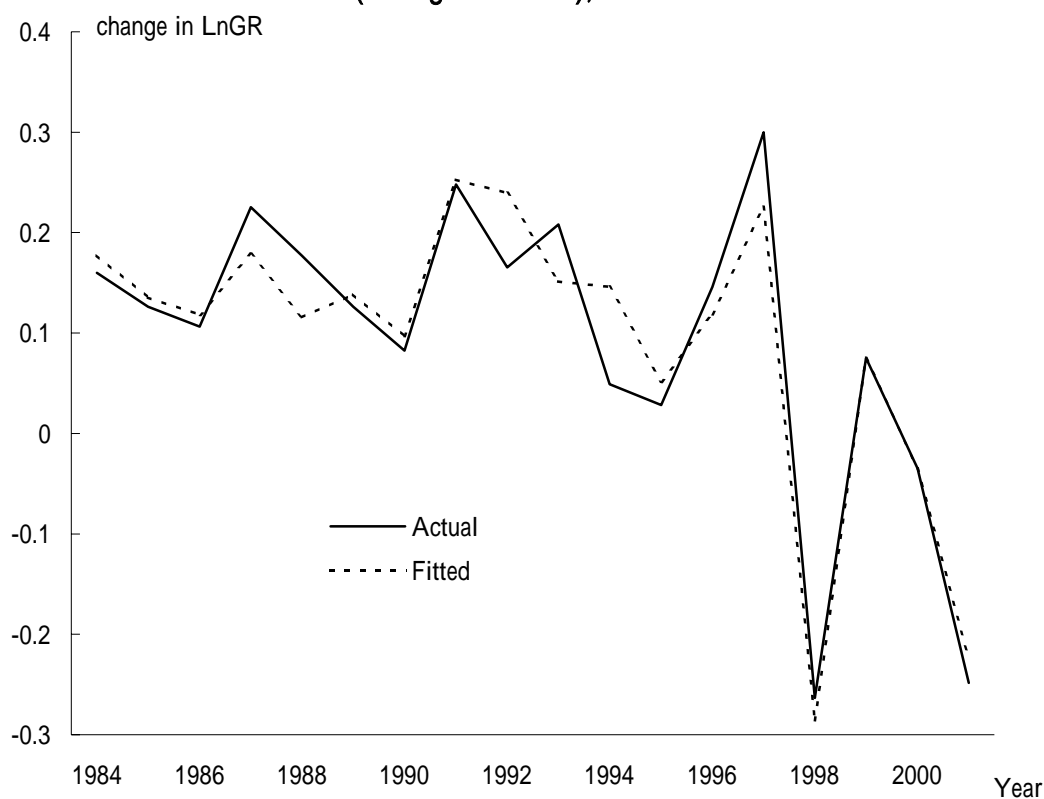
The estimated long-run coefficients and the error correction representation selected by the AIC information criteria are reported in the Table 4.2 and 4.3 respectively (the maximum lag orders set at 2). The *LnPPI* carries the significant expected sign, and the error term in the EC-ARDL model is negative and highly significant which also confirms our earlier findings that cointegration exists between the variables. The size of the error term is 0.08 which indicates that once the *LnG* experiences an external shock, it takes around 2.5 to 3 years for the domestic demand to return its equilibrium.

We now turn to the relation between government revenues and housing prices. As can be seen in the Table 5.1, the null hypothesis can be rejected for the lag =4 when *LnGR* is the dependent variable. Since the value exceeds the upper bound of the critical value bound (at 10% significant level), we can reject the null of no long-run relationship between the *LnGR* and *LnPPI*. Similarly, we then turn the *LnPPI* as the dependent variable and then test the joint significance of the lagged level variables in the EC version of the ARDL model. The results in Table 5.1 show that all corresponding F-statistic fall below the upper bound critical value (4.78 at 10% significance level), and therefore the null hypothesis of non-existence of cointegration cannot be rejected. The above results indicate that only F (*LnGR* | *LnPPI*) is significant

and therefore there exists a unique long-run-relationship when the  $LnGR$  as the dependent variable and  $LnPPI$  can be treated as the “long-run” forcing variables for the explanation of  $LnGR$ .

The estimated long-run coefficients and the error correction representation selected by the AIC information criteria are reported in the Table 5.2 and 5.3 respectively (the maximum lag orders set at 4). The coefficient for  $LnPPI$  carries the expected positive sign and is statistically significant giving an estimated long run elasticity of revenue with respect to the housing price index at 0.80. The error term in the EC-ARDL model is negative and highly significant confirming our hypothesis that cointegration exists between the variables. Moreover, based on the estimated ARDL model (Table 6.3), we plot the actual and fitted values of the change in  $lnGR$  in Figure 3. We can see that the model fits quite well within the sample period.

**Figure 3. Plot of Actual and Fitted Value  
(Change in  $LnGR$ ), 1984 - 2001**





**Table 5.1 : F-Statistics for Testing the Existence of a Long-Run Relationship Between Government Revenue (LnGR) and Property Price (LnPPI), 1984 to 2001 (Annual Data)**

Dependent Variables:	Lag=1	Lag=2	Lag=3	Lag=4
LnGR	0.5548	1.9868	1.8528	5.5478*
LnPPI	1.0665	1.7969	2.7855	4.1540

Note:

1. The critical value bounds for the test are 4.94 – 5.73 at the 95% significance level and 4.04 - 4.78 at the 90% significance level, which are given in Table C1.iii (with an unrestricted intercept and no trend; number of regressor=1), Shin and Smith (1999).
2. \* denotes 10% significance level.

**Table 5.2 : Estimated Long-Run Coefficients (Dependent Variable: LnGR)**

Regressors	Coefficient (t-ratio)
Intercept	7.7094 (41.14)***
LnPPI	0.8025 (22.37)***
D99 (Dummy 99=1, others=0)	0.2196 (1.4093)
D00 (Dummy 00=1, others=0)	0.2920 (2.7762)***

Note:

1. \*\*\* denotes 1% significance level
2. Optimal Lag: ARDL (2, 1) selected based on AIC Information criteria

**Table 5.3 : Error Correction Representation of ARDL Model (Dependent variable: GR)**

Regressors	Coefficient (t-ratio)
Intercept	4.3990 (5.1194)***
LN <sub>GR</sub> (-1)	-0.1984 (-1.2418)
Ln <sub>PPI</sub> (-1)	0.6861 (8.5122)***
D99	0.1253 (1.4488)
D00	0.1666 (2.5008)**
ECM <sub>t-1</sub>	-0.5706 (-4.8711)***

Note:

1. Optimal Lag selected based on AIC Information criteria
2. \*\* and \*\*\* denotes 5% and 1% significance level respectively

#### **IV. Relationship between Real Prime Rate (RPR) and Property Price (LnPPI), 1997Q1 – 2002Q3**

It is sometimes argued that Hong Kong's depressed housing market after 1997 has to do with high real interest rates. While there is little doubt that high real interest rates hurt the housing market it is important to find out whether high real interest rates was mainly a cause or a result of the collapse in housing prices.

For this exercise we look specifically at data from 1997 to 2002. Because we hypothesize that the relationship after 1997 runs from housing prices to real interest rates through the deflationary effects of a collapse in the housing market, we want to focus on period after 1997. However, the time

series after 1997, even though we are using quarterly data, is a bit short. So we include 1997 data as a compromise.

As can be seen in the Table 6.1, the null hypothesis can be rejected for the lag =3 when *RPR* is the dependent variable. Since the value exceeds the upper bound of the critical value bound, we can reject the null of no long-run relationship between the *RPR* and *LnPPI*. We then take the *LnPPI* to be the dependent variable and test the joint significance of the lagged level variables in the EC version of the ARDL model. The results in Table 6.1 show that all corresponding F-statistic fall below the upper bound critical value (4.78 at 10% significance level). Therefore the null hypothesis of non-existence of cointegration cannot be rejected. The above results indicate that only F (*RPR* | *LnPPI*) is significant and therefore there exists a unique long-run-relationship when the *RPR* as the dependent variable and *LnPPI* can be treated as the “long-run” forcing variables for the explanation of *RPR*.

The estimated long-run coefficients and the error correction representation selected by the AIC information criteria are reported in the Table 6.2 and 6.3 respectively (the maximum lag orders set at 4). The *LnPPI* carries the significant expected sign, and the error term in the EC-ARDL model is negative and highly significant, confirming our earlier hypothesis that cointegration exists between the variables.

**Table 6.1 : F-Statistics for Testing the Existence of a Long-Run Relationship Between Real Prime Rate and Property Price, 1997Q1 to 2002Q3**

Dependent Variables:	Lag=1	Lag=2	Lag=3	Lag=4	Lag=5	Lag=6
RPR	1.83	2.20	5.19*	3.03	1.82	3.54
LnPPI	0.47	1.90	0.18	2.20	3.22	4.23

Note:

1. The critical value bounds for the test are 4.94 – 5.73 at the 95% significance level and 4.04 - 4.78 at the 90% significance level, which are given in Table C1.iii (with an unrestricted intercept and no trend; number of regressor=1), Shin and Smith (1999).
2. \* denotes 10% significance level.

**Table 6.2 Estimated Long-Run Coefficients (Dependent Variable: RPR)**

Regressors	Coefficient (t-ratio)
Intercept	53.82 (3.66)***
LnPPI	-8.18 (-3.07)***

Note:

1. \*\*\* denotes 1% significance level
2. Optimal Lag: ARDL (4, 0) selected based on AIC Information criteria

**Table 6.3 : Error Correction Representation of ARDL Model (Dependent variable: RPR)**

Regressors	Coefficient (t-ratio)
Intercept	16.0188 (2.1711)**
RPR(-1)	0.1236(0.7416)
RPR(-2)	0.2460(1.4104)
RPR(-3)	0.6705(3.8501)***
LnPPI	-2.4347(-1.988)**
ECM <sub>t-1</sub>	-0.2977(-3.2169)***

Note:

1. Optimal Lag: ARDL (4, 0) selected based on AIC Information criteria
2. \*\* and \*\*\* denotes 5% and 1% significance level respectively

## V. Conclusions

It is widely believed that Hong Kong's housing market boom before 1997 is in part due to the restriction of land supply under the Sino-British Joint Declaration, and in part due to the inflow of Chinese capital, particularly illicit capital, searching for short term speculative profits. It is also widely believed that "factor price equalization" played a role in the collapse of the housing market after 1997. But none of these theories had been tested statistically or even examined carefully.

The collapse of Hong Kong's housing market is too sudden for the factor price equalisation theory to hold, and there is just no evidence that there was an artificially created shortage of housing before 1997. For obvious reasons there is no data on the amount of illicit capital that came to Hong Kong from the Mainland. But according to Mr. Wong Leung Sing of the Research Department of Centaline Property Agency Ltd., a name search among home buyers had produced only a very low percentage of names with Putonghua spelling. Mainlanders could, of course, participate in the local housing market under the guise of registered Hong Kong companies. But the percentage of buyers in the housing market that are companies have always been well below 10 per cent, and that includes mostly genuine Hong Kong-based companies. So while Mainland buyers were indeed a player, particularly in the luxury homes market, there was little evidence that at any given time they were major players. In any case one cannot identify a reversal in Chinese capital after 1997 that could compare with the reversal following the 16-point austerity programme of Premier Zhu Rongji in 1993.<sup>10</sup>

<sup>10</sup> According to the Hang Seng Monthly Economic Report of February 1996, "Over the past two years, the severe austerity measures taken by China has resulted in a dramatic shrinkage in the flow of funds to Hong Kong. Early 1990s, investors from the Mainland were active in Hong Kong's property market, bolstering housing prices and rents. With the departure of this capital activity in the property market has slowed down...."

In this paper, we have presented a model that explained the movement in housing prices very well. Not only did the model track movements before 1998 but it also predicted a major correction to take place in 1998. However, we identified a structural change in the first quarter of 1998, which is in agreement with our hypothesis as to how the public housing privatization programme called the Tenants Purchase Scheme damaged the flow in the housing market.

We found housing providing a key transmission mechanism between exports performance and the domestic economy. Movements in housing prices directly drive domestic demand, as well as government revenues and government expenditures in Hong Kong. We have also found a close, bi-directional relationship between employment growth and housing prices.

It will be useful to test this framework on the data in other countries to assess if it has generality.

## Appendix 1. Variable Definition

<b>Variables</b>	<b>Description</b>	<b>Data Sources</b>
INFL	Inflation Rate (CPI A, year on year change, 3 month moving average)	Monthly Statistical Bulletin, various issues, Hong Kong Monetary Authority
LnD	Log of domestic private demand = Log of (Private Consumption + Private construction + Machinery & Equipment) (current price)	Hong Kong GDP estimates 2001, Hong Kong Census and Statistics Dept
LnEX	Log total exports of goods and services	Hong Kong GDP estimates 2001, Hong Kong Census and Statistics Dept
LnG	Log of government consumption expenditure (current price)	Hong Kong GDP estimates 2001, Hong Kong Census and Statistics Dept
LnPPI	Log property price index (overall private domestic housing market) 1989=100	Hong Kong Monthly Digest of Statistics, Hong Kong Census and Statistics Dept
PR	Prime Rate (3 month period moving average)	Monthly Statistical Bulletin, various issues, Hong Kong Monetary Authority
RPR	Prime Rate – Inflation Rate (CPI A, year on year change)	Monthly Statistical Bulletin, various issues, Hong Kong Monetary Authority, and; Hong Kong Monthly Digest of Statistics, Hong Kong Census and Statistics Dept

## Appendix 2. Summary of Statistical Results from Tests Performed

Test	Before 1997	After 1997	Where reported
Test relationship between exports and home prices	Exports drive home prices, ARDL model	Actual values diverge from predicted values increasingly over time	See Appendix available from the author.
Test relationship between domestic demand and home prices	Domestic demand movements do not cause home price movements.  Home price movements cause domestic demand swings. (Granger/Johansen and ARDL)		See Appendix available from the author.
Test relationship between government expenditures and home prices	Home prices drive government expenditures, ARDL model.		See Appendix available from the author.
Test relationship between lower tier home prices and higher tier home prices	Lower-tier home prices typically drive higher tier home prices but not the other way round.		Ho, Haurin, and Wong (2003).
Test relationship between lower tier home transactions and higher tier home transactions	Lower-tier home transactions typically drive higher tier home prices but not the other way round.		Ho, Haurin, and Wong (2003)
Test relationship between Second Hand Private Home Transactions and Home Ownership Scheme “free market transactions”	Very significant positive relation found.		Yeung (2001), p.65.
Test causes of plunge in second hand home transactions	Regression shows Tenants Purchase Scheme has more significant and greater impact on second hand home transactions than the Asian Financial Crisis, lending credence to the hypothesis that TPS played a key role in “freezing” the housing market turnover.		Ho, Tse, and Wong (2003)

### Appendix 3. Relative Trade Performance of Hong Kong before and after 1997

	Merchandise Exports		Cumulative	Services Exports		Cumulative
	1998-2001	1994-1997	Growth Rates % of Prior Performance	1998-2001	1994-1997	Growth Rates % of Prior Performance
<b>Hong Kong</b>	9.27%	24.25%	38%	18.93%	23.67%	80%
<b>Japan</b>	4.01%	6.03%	67%	3.03%	20.01%	15%
<b>Korea</b>	13.70%	41.82%	33%	19.23%	56.71%	34%
<b>Malaysia</b>	19.94%	33.81%	59%	23.11%	69.23%	33%
<b>Philippines</b>	9.24%	87.03%	11%	-58.51%	124.18%	-47%
<b>Singapore</b>	10.79%	29.08%	37%	38.36%	32.53%	118%
<b>Taipei</b>	10.85%	30.37%	36%	21.88%	29.78%	73%
<b>USA</b>	7.13%	34.35%	21%	10.66%	28.29%	38%
<b>Canada</b>	21.24%	29.66%	72%	7.88%	32.37%	24%
<b>France</b>	0.38%	20.58%	2%	-5.13%	7%	-73%
<b>Germany</b>	5.02%	20.13%	25%	-1.38%	34.23%	-4%
<b>UK</b>	-0.13%	36.73%	0%	2.84%	41.91%	7%
<b>Brazil</b>	13.85%	21.70%	64%	23.10%	13.93%	166%
<b>World</b>	12.11%	30.00%	40%	8.74%	27.61%	32%

Source: World Trade Organization, *International Trade Statistics: Exports 1991-2001*.  
[http://www.wto.org/english/res\\_e/statis\\_e/statis\\_e.htm](http://www.wto.org/english/res_e/statis_e/statis_e.htm)

## References:

Chou, Win Lin and Kar-yiu Wong (2001) Economic Growth and International Trade, *Pacific Economic Review*, 6 (3), October, 313-329.

Ho, Lok Sang (1994) Financial Structuring in 1993, *China Review*, Hong Kong: Chinese University of Hong Kong Press, pp.10.1-10.15.

Ho, Lok Sang (1995) Inflation: New Risks for the Hong Kong Economy, in Stephen Cheung and Stephen Sze (eds.) *The Other Hong Kong Report*, HK: Chinese University of Hong Kong Press, 1995.

Ho, Lok Sang (2001) *Principles of Public Policy Practice*, Boston: Kluwer Academic Publishers.

Ho, Lok Sang, Raymond Y.C.Tse, and Gary Wong (2003) Privatization of Public Housing: How it Caused a Deep Recession in Hong Kong: mimeo.

Jao, Y.C. (2001) *"The Asian Financial Crisis and the Ordeal of Hong Kong"*. By Y. C. Jao. Westport: Quorum Books, 2001.

Okina, Kunio, Masaaki Shirakawa, and Shigenori Shiratsuka (2001) "The Asset Price Bubble and Monetary Policy: Japan's Experience in the Late 1980s and the Lessons" *Monetary and Economic Studies (Special Edition)*, February, 19 (0): 2001, 395-450.

Pesaran, M. H., Y. Shin, and R.J. Smith (1996) Testing for Existence of Long-Run Relationship, *DAE Working Paper No. 9622*, Department of Applied Economics, University of Cambridge.

Pesaran, M.H. and B. Pesaran (1997) *Microfit 4.0: Interactive Econometric Analysis*, Oxford University Press.

Pesaran, M. H., Y. Shin, and R.J. Smith (2001) Bounds Testing Approaches to The Analysis of Level Relationships, *Journal of Applied Econometrics*, 16, 289-326.

Task Force on Review of Public Finances (2002) Final Report to the Financial Secretary, February.

Watanabe, Mariko (1998) *The Impact of the Public Housing Policy on Household Behaviour in Hong Kong*, M.Phil. thesis, University of Hong Kong.

Young, A (1992) A Tale of Two Cities: Factor Accumulation and Technical Change in Hong Kong and Singapore, in O.J.Blanchard and S.Fischer (eds.) *NBER Macroeconomics Annual*, 1992, Cambridge, MA: MIT Press, 13-54.

-- (1994) Lessons from the East Asian NICs: A Contrarian View, *European Economic Review*, 38, 964-73.

-- (1995) The Tyranny of Numbers, Confronting the Statistical Realities of the East Asian Growth Experience," *Quarterly Journal of Economics*, August, 641-80.