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Lok Sang HO
lsho@ln.edu.hk

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

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Lok Sang Ho and Gary Wai-chung Wong

Lingnan University
Hong Kong

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

Mr. Gary Wai-chung Wong is Research Development Officer of Centre for Public Policy Studies, Lingnan University, Hong Kong.

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

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Privatization of Public Housing: Did It Cause the 1998 Recession in Hong Kong*?

Lok Sang Ho
Department of Economics
& Centre for Public Policy Studies
Lingnan University

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

Abstract

This paper finds evidence that a public housing privatization program produced adverse effects on housing transactions and the economy in Hong Kong. A scheme announced in December 1997, offering tenants an opportunity to buy their units at deeply discounted prices, reduced public housing tenants' bids for private homes and adversely affected home transactions. This effect is more pronounced than the effects of the Asian Financial Crisis. An effect on housing prices is also indirectly demonstrated though a demonstration that a structural break in the housing price relationship occurred at the time the privatization program is introduced. Declines in housing prices further eroded employment and set off a vicious circle.

JEL Classification Number: E32, R21, R31

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1. Introduction

Privatization is often believed to be conducive to economic efficiency. Even though this effect is still controversial, any suggestion that privatization could lead to the erosion of wealth and economic inefficiency would seem ludicrous to economists.

This paper presents evidence that suggests such a possibility. A privatization scheme, if managed poorly, could lead to counter-intuitive results. Working through the "housing ladder effect," or otherwise called the equity effect or the downpayment effect, such as described by Stein(1995), Bardhan, Datta, Edelstein, and Kim(2003), Ortalo-Magne and Rady(2003), privatizing public housing cheaply could lead to the erosion of equity values among homeowners, which could spread throughout the housing market through the housing market quality continuum. The erosion of wealth works dynamically, and wipes out any static efficiency gains that could result from the privatization.

Hong Kong's plunge into a major recession in the wake of the Asian Financial Crisis (AFC), which broke out in October 1997, is a mystery. The Hong Kong economy had been well known for its legendary resilience. Despite a number of momentous setbacks, which included the Great Proletariat Cultural Revolution in 1966 through 1976, two major oil crises that plunged most countries of the world into recession during the 1970s, and several episodes of financial and banking crises, not a single year since 1961 was there recorded negative economic growth (See Table 1). Indeed the Hang Seng Index plunged from over 1,700 in 1973 to little more than 150 in 1975 without causing an economic decline in any of these years. The banking crises of 1965-66 "at a point posed a threat to the entire banking system in Hong Kong,"(Jao, 1993, p. 242), while those of 1982 to 1986 "were even bigger in scale and produced more far-reaching repercussions."(Jao, *op.cit*.).

In sharp contrast, the years during and following the Asian Financial Crisis were far less tumultuous. Hong Kong's major trading partners, the US and Mainland China, continued to grow

rapidly during the time, while stock market declines were far milder than what happened from 1973 to 1975. Moreover, not a single bank failed. Yet the Hong Kong economy shrank by 5 per cent in 1998. This turnout deviated so much from predictions that Jao referred to it as "one of the most bizarre and egregious failures in the history of economic forecasting."(Jao, 2001, p.140)

Table 1 also shows that the rebound in 1999 is extremely weak, quite unlike the rebounds that followed earlier recessions.

The dramatic and sudden reversal of economic fortunes in 1998 was also strange. In a matter of a few months, Hong Kong's unemployment zoomed from 2.2 per cent in the last quarter of 1997 to 4.3 per cent in the second quarter of 1998. By the end of 1998, the unemployment rate had reached a high of 6 per cent(Table 2).

The often-cited explanation for Hong Kong's deep recession, that the AFC burst the property price bubble and thus produced a gigantic negative wealth effect, is simply unconvincing(Jao, 2001, p.140). The transmission mechanism whereby the AFC burst the property price bubble is not clear. First, although foreign participation in the office building sector was indeed quite significant, foreign participation in the housing market has never been significant. There is no evidence that a big withdrawal of foreign capital from the housing market produced a collapse. Second, although inter-bank interest rates went up in the wake of the currency troubles in South East Asia, mortgage rates had been relatively stable. Hong Kong had seen bigger mortgage rate hikes before but had never encountered such serious depression in the housing market[1]. Third, it is not true that confidence collapsed overnight. Indicators suggest that people had regained confidence not long after the Asian Financial Crisis(Table 3).

It is sometimes thought that with the opening up of China Hong Kong's middleman role, which had been important in supporting the

[1] Some commentators cited high real interest rates as the culprit, but the deflation that caused high real interest rates did not occur until late 1998, AFTER the major collapse of housing prices.

entire economy, was diminished. But China did not start opening up in 1997 or 1998. The *suddenness* of the reversal suggests that there may be other reasons. Moreover, an examination of trade data, including service trade and merchandise trade, suggests that Hong Kong's decline in exports in the period after 1997 was in line with decline in global trade, and was actually smaller relative to Korea, Taiwan, the UK, or the US.

This paper offers an alternative explanation to Hong Kong's 1998 recession. The hypothesis is that a public housing privatization scheme introduced by the government played an important role in reducing existing home transactions and home prices. The large increase in housing supply since 2000 also played an important role in the deflationary process that started late 1998. This hypothesis will be substantiated both by theory and by statistical evidence.

The theory consists of two components. The first is that the housing market is a continuum with a full range of qualities and prices and that homeowners trade up to a better quality when they have accumulated sufficient equity in their current homes. The ability to trade up depends crucially on the prices of existing homes. When prices collapse at the lower end of the market, they transmit readily to higher quality homes with a noticeable shrinkage in transaction volumes. We hypothesize that the very attractive prices offered by the Housing Authority for sitting tenants to buy their own units under the "Tenants Purchase Scheme,"(TPS) offering up to 88% discount on the estimated market price for buyers making a quick decision to buy, made it unattractive for them to buy other kinds of homes. Given their earlier documented significant participation in the housing market this unavoidably caused home prices to decline.

The second component points to home values as the most significant form of asset for the community. A decline in home values leads to a shrinkage in domestic consumption and domestic investment, and hurts employment. Employment declines further hurts home values in a vicious circle.

This paper introduces a new methodology that throws light on the relative influence of the public housing privatization program and the Asian Financial Crisis on housing transactions in Hong Kong. We present indirect evidence that the housing privatization program also adversely and significantly affected home prices through demonstrating that a structural break in the housing price relationship occurred at exactly the time the TPS policy took effect. Finally, a decline in home prices is found to both Granger-cause and be Granger-caused by a decline in employment.

Section 2 presents a review of Hong Kong's housing market and the public housing privatization program. Section 3 provides the data description and outlines the statistical tests to be conducted. Empirical evidence is presented in Section 4. The final section presents the conclusions.

2. The Public Housing Privatization Program

Economists normally expect that a privatization program would make the economy more efficient. The experience in Hong Kong shows that this cannot be taken for granted. The circumstances in which a privatization program is conducted, as well as how the privatization takes place, play an important role in determining the outcome.

On December 8, 1997, the Housing Authority in Hong Kong announced that sitting tenants in designated public housing estates could buy their own flats at up to 88% discount off the estimated market price. The move was cheered by the local press and thought to engender a large positive wealth effect that would boost consumption and give Hong Kong's economic growth a big push.

However, what transpired was a big and immediate economic slump. In the first quarter of 1998, the Hong Kong economy declined sharply by an unprecedented 12 per cent on a quarter-to-quarter basis(not seasonally adjusted) and Hong Kong suffered a loss of 80,000 jobs—a sharp reversal from the 77,000 job growth in the preceding quarter.

The first quarter GDP decline was puzzling not only because of its magnitude but also because of the apparent favorable circumstances of the economy. The currency turmoil had shown signs of stabilizing, to the extent that it actually allowed one interest rate drop. The HK Policy Research Institute's housing property confidence index shot up from 35.5 in January to 94.2 in March 1998. The Heng Seng index rose 7.4 per cent in the quarter.

What explained this sudden and dramatic reversal amid signs of revival of investor confidence? The hypothesis that we advance in this paper, to be tested using various statistical tests, is that the public housing privatization scheme actually severed the housing ladder that had been in effect for years prior to the announcement of the TPS. There was evidence that public housing tenants had been important players in the housing market. In a survey in 1992, which was conducted by the Housing Authority, it was found that 24 percent of all housing transactions were due to public housing tenants and that 13 per cent of all public housing tenants already owned at least one residential property. Starting in April 1987, the Housing Authority had been implementing a policy to make the richer tenants with at least 10 year residence in the public rent housing estate to pay higher rent[2]. This provided a big incentive for the better-off tenants to buy homes as a back-up in the event they were asked to pay higher rent. The TPS effectively reversed this policy, for from now on rich tenants needed not leave. They were offered an opportunity to capitalize all their future rental subsidies through a purchase decision.

As expected, the demand for Home Ownership Scheme(HOS) housing—a government subsidized homeownership scheme—suddenly collapsed. HOS housing used to attract many

[2] In essence, the policy requires that tenants who have been accommodated for over ten years be subjected to a means test. If the household income exceeds three times that of the maximum eligibility limit, it will have to pay double the standard rent. Those who have breached stipulated income and asset thresholds are required to pay market rent. See "Safeguarding Rational Allocation of Public Housing Resources: A Consultation Document" published by the Hong Kong Housing Authority in December 1995.

public housing tenant to buy. Indeed they were always many times oversubscribed ever since the scheme started in 1978. Disappointed buyers would have to buy in the open market, where HOS units fetched very high prices, reflecting again the strong buying power enjoyed by the richer tenants. Starting in June 1997, the Housing Authority allowed HOS owners to resell, after two years from their dates of original purchase, their units to public housing tenants and other Green Form Applicants without having to repay the land premium. Records of such transactions indicate that public housing tenant buyers were paying very high prices for these flats, indicating their strong purchasing power.[3] With the announcement of the TPS, HOS units suddenly lost their appeal, because in comparison they were ridiculously expensive. Some 250,000 HOS owners suddenly found that their units could hardly find buyers. Immediately they found difficulty trading up to better homes in the private housing market. Transactions in the existing home market plunged, in turn freezing transactions in the new homes market, which at the time almost exclusively depended on buyers trading up (see Table 4).

Since public housing tenants were the primary source of buyers for HOS housing, the effect of TPS on HOS housing market was immediate. HOS housing owners found that buyers had suddenly disappeared and were no longer able to trade up. Similarly, other homeowners who depended on HOS buyers as their principal buyers also could not trade up because they also could not find buyers.

Notwithstanding a highly stimulative budget in 1998 providing generous tax relief, generous home starter loans, and an unprecedented tax allowance given to homeowners for the mortgage interest payments, the housing market continued to fall. By 1999

[3] Transactions with prices were downloadable from the Housing Authority webpage but the information is all in Chinese. Starting in 2003 data earlier than 2002 were no longer downloadable. However, we had examined the earlier records and found one transaction at 3.95 million Hong Kong dollars for a 644 square feet flat in Kowloon in September 1997. This was not an exceptional case in 1997. Watanabe(1998) provided figures showing that public housing tenants generally saved much more than either HOS or private housing owners as well as private housing tenants, particularly in 1994/95.

the Asian Financial Crisis was over. There was no longer any premium on Hong Kong dollar's forward exchange rates, and real estate prices had risen markedly in Singapore[4]. Hong Kong's housing prices, however, continued to decline. Even the 10.2 per cent growth in 2000 failed to lift prices, as home prices continued to slip by another 14 to 15 per cent. By September 2001 they had fallen back to levels reached 10 years ago. By 2003 housing prices generally had lost over 65 per cent or more of their 1997 values.

3. The Statistical Tests

Three statistical tests provide support to our theory. The first one (the "effect on transactions" test) is to show that TPS was the key factor behind the big drop in existing home transactions. In a multivariate regression controlling the effects of various factors on existing home transactions, the TPS dummy was found to explain the decline in home transactions far better than the Financial Crisis dummy. The second test(the "timing test") shows that, while exports had been the driving factor behind housing prices this relationship between exports and housing prices showed a structural change after 1997. Using the Johansen co-integration model with both an intercept and an interactive TPS/exports dummy, we found a structural break at the time of the announcement of the TPS. This suggests that housing probably serve as a transmission mechanism between the external (the exports) sector and the domestic sector, but this mechanism appears to have been severed by the TPS policy. Finally, the third test(the "effect on employment" test) shows that housing prices and employment are co-integrated so a collapse in housing prices would have a serious effect on employment. Our statistical results indicate that the reverse causality also holds, so that a vicious circle forms, rendering it difficult to launch a convincing recovery.

The Data

In the first test, the focus of analysis is second-hand transaction volume for private sector residential properties. This variable is of

[4] Singapore housing prices fell again subsequent to the bursting of the IT bubble.

great interest because normally when a homeowner sells his property he would buy another. In contrast, to the extent that new housing has already been produced and a new home purchase represents only a transfer from the developer's inventory to the homebuyer, buying an existing home generates more additional economic activities than when a household buys a new unit from the developer[5].

The housing price of private domestic flats is treated as a variable to explain second-hand transactions. The data on this variable is the monthly housing price index of private domestic units, which is supplied by the Rating and Valuation Department of the Government. The period covered in this study is from July 1995 to March 2004. Second-hand transaction data is not available before July 1995. The period covered both the Asian Financial Crisis and the Tenants Purchase Scheme(TPS)—the public housing privatization program of the Housing Authority.

Besides, dummy variables are used to capture the effects of key changes in the environment, namely the Financial Crisis Dummy(FCD) and the Tenants Purchase Scheme (TPS) - as well as a dummy to control the first quarter effect of home purchase pattern (FQR) which may affect transaction volume[6]. During times of acute loss of confidence such as resulting from the Asian Financial Crisis, the local currency is subjected to tremendous pressures to depreciate. While the spot exchange rate holds its place a considerable discount in the value of the local currency appears in the forward market. We therefore find it convenient to use the forward market premium of the US dollar over the spot market exchange rate as an instrument to measure the degree of the financial crisis. An important advantage of using this dummy over an "on-off" dummy is that there is no need to make arbitrary decision as to when the financial crisis is "switched on" and when it is "switched off." In order to facilitate interpretation, we normalize this variable to set *the maximum value of this dummy within the*

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5 A "tree" of second hand transactions usually ends up in a first hand high end property. On the other hand, if a first time buyer buys a new home the economic stimulation is more limited.

6 This effect has to do with the fact that Chinese New Year falls in the first quarter.

observation period to unity[7]. FCD is therefore a non-binary, continuous dummy free from arbitrary assumption about when the financial crisis set in and when it phased out. Since the TPS was announced by the Hong Kong Housing Authority on December 8 1997 we assign the value of '0' to months prior to December 1997 and assigned the value of unity for months from December 1997 onwards.

Employment and total exports statistics are based on official seasonally adjusted data. The real prime rate is simply defined as nominal prime rate minus the rate of inflation for the comprehensive consumer price index. For the list and definition of variables that are analyzed, please refer to Table 9.

Empirical findings

Test One: The Relative Effects of TPS and Financial Crisis on Transactions

In this test we attempt to assess the relative impacts of the introduction of the TPS and the Asian Financial Crisis on second-hand transaction volume. The length of the time series allows us to use the Johansen cointegration method to test the long term relationships of the key variables. The dependent variable for the first test is the logarithm(log) of the second-hand home transaction volume (LTRAN). The explanatory variables include the log of the housing price index (LPPI), the log of the nominal prime rate (LPR), the financial crisis dummy FCD, which is proxied by the difference between the spot exchange rate and the one-year forward rate, normalized as discussed above), and binary dummy variables TPS(unity from 1997:12, 0 prior to this[8]), and FQR(1 for first 3 months every year). It is expected that any increase in

[7] The value of this dummy is therefore 1 at the point of most intensive pressure for the currency to devalue and 0 when there were no such pressures. More recently there were some episodes when the sign became negative so there was an expectation for the currency to *appreciate*.

[8] In November 2002 the Government announced a plan to terminate the TPS, but termination will not be effective until after 2004, when the last batch of TPS units have been sold.

housing prices will allow homeowners to trade theirs for better ones and thus tends to drive up transactions. On the other hand an increase in interest rates will dampen transactions because this will increase the costs of owning a new home or a better home.

We begin the analysis by examining the stationarity properties of the variables using the Augmented Dickey-Fuller (ADF) Test (Dickey and Fuller, 1981). The optimal lag in the test is chosen by the Akaike Information Criterion (AIC). Table 5.1 shows that the test statistics for all the series in level form and in their first differences, respectively. The null hypothesis of unit root cannot be rejected when the series are in level but can be rejected when the series are in first differences, showing that all the series are integrated of order one.

Since the variables are integrated of the same order (I(1)), we can use the Johansen procedure(1988). Under this procedure, we first identify the long-run relationship among LTRAN, LPPI, and LPR. Following the common practice, the dummy variables FCD, TPS and FQR are all treated as exogenous I(0) variables in the VAR and the error-correction model.

The co-integration test results are presented in the Table 5.2. The number of co-integrating vectors r is determined by reference to the λmax and trace statistics. The lag specification for the Johansen test is determined by Akaike's Information Criterion (AIC). The results show that TRAN, LPPI and LPR are cointegrated with only one conitegrating vector..

Table 5.3 reports the normalized cointegrating coefficients that will be interpreted as long run equilibrium coefficients. Coefficients on both LPPI and LPR are significant with the expected signs. In general, price appreciation provides an incentive and a greater ability for homeowners to trade up, thus pushing up second hand transaction. The interest rate, on the other hand, discourages home purchases and tends to dampen transactions. In addition, given that the variables are cointegrated, we then estimate the error correction model as shown in Table 5.4. The ECM coefficient enters

significantly with negative sign. The significant negative ECM coefficient confirms our earlier findings that cointegration exists between them. It is noteworthy that the dampening effect of the Tenants Purchase Scheme (TPS dummy) is greater than that of the Asian Financial Crisis (AFC dummy) and is statistically much more significant. (See Table 5.4 coefficients of the TPS and AFC dummy). Because both the TPS dummy and the financial crisis dummy have values between 0 and 1 their coefficients can be directly compared with each other. We can see that the effect of the TPS is much bigger and more significant than that of the financial crisis.

Test Two: Structural Break and Timing

In this test we identify the timing and the magnitude of a structural break in the housing price equation. The housing price equation is based on the assumption that the housing market was essentially in equilibrium over the test period. When the housing market was in equilibrium, housing prices reflect the bids from buyers which increase when their incomes rise. We write a housing price equation with two explanatory variables: exports of goods and services which represents the key exogenous determinant of incomes for a small open economy, and interest rates. We dropped the inflation rate variable in the equation because this variable did not carry a statistically significant coefficient. Separate testing also shows that property price affects inflation rather than inflation affects property price. Dropping the inflation variable and testing alternatively timed dummy variables will allow us to identify the timing and the magnitude of any structural change.

Two kinds of dummy variables—one for the intercept and one "interactive dummy"—are used to capture any shift and change in the magnitudes of key coefficients in the relationship. We switch the dummy variables from 0 to unity in different quarters and assess the t statistics on the coefficients. We found that a structural break occurred in the first quarter of 1998. Interestingly, this coincides with our priors, since the Tenants Purchase Scheme—which we have reason will have significant structural changes on the housing market, was announced on December 8.

We use a fairly standard time series technique in this statistical analysis, the Johansen co-integration procedure. We first check the stationarity properties of the variables. The ADF test results show that the null hypothesis of containing a unit root can only be rejected when the series are first differenced. Thus the series are all integrated of order one I(1)[9]. Since the variables are integrated of the same order I(1), we can apply the Johansen procedure (1988). The lag length of the VAR is determined by Akaike's Information Criterion (AIC). As is standard, both the slope and the intercept dummy variables are treated as exogenous I(0) variables in the co-integrating equation and the error correction model.

The cointegration test results for the model incorporating the most significant dummy variables—switching to unity in the first quarter of 1998—are presented in Table 6.1 through Table 6.4. Table 6.1 presents evidence that *LnPPI* is cointegrated with the *LnEX* and *LnPRI*. Table 6.2 shows that the normalized cointegrating coefficients on LnEx and LnPR carry the expected signs and are statistically significant. The error correction model, reported in Table 6.3, showing a statistically significant negative coefficient on the ECM term, confirms the earlier findings that cointegration exists between the variables.

Table 6.4 shows that the key coefficients, t statistics, and adjusted R-squared for models with dummies switched on in different quarters. Readers can testify that there is an obvious jump in the t statistic and the goodness of fit when the switch occurred in 98Q1 rather than 97Q4. Since TPS was announced on December 8 this result is just right. The negative coefficient on the interactive term for exports shows that exports growth no longer provided the housing market the kind of support it used to; the positive coefficient on the interactive term for the interest rate shows that a decline in interest rates would not provide much stimulation either. The positive intercept dummy term probably catches the effects of various stimulative policies introduced by the government to counteract the effects of the Asian Financial Crisis.

[9] Test results are not reported on space considerations.

Based on the estimated error correction model reported in Table 6.3, we have plotted the fitted values against the actual ones in the Figure 1. The model tracks the actual data very well indeed.

Conclusion from the test: *We found a structural break that occurred in the first quarter of 1998, which is consistent with the hypothesis that TPS caused the structural break. The stimulative effects of exports on Hong Kong's housing prices were reduced significantly from the first quarter of 1998.*

Test Three: Relationship between Housing Market and Employment

We investigated the long run relationship and causality between employment ***(LnEMP)*** and residential property price ***(LnPPI)*** using the Johansen procedure. The analysis began by examining the stationarity properties of the variables using Augmented Dickey-Fuller(ADF) Test. The test results show that the null hypothesis of containing a unit root can only be rejected when the series are in first differences indicating the both series: LnEMP and LnPPI are integrated of order one I(1)[10].

Since the variables are integrated of the same order I(1), the next step is to carry out co-integration analyses of the variables. We first identify the long-run causal relationships by using the Johansen procedure (1988). The lag length of the VAR for each case is determined by Akaike's Information Criterion (AIC).

The cointegration test results are presented in Table 7.1. The results show that the *LnPPI* is cointegrated with the *LnEMP*. Table 7.2 reports the normalized cointegrating coefficients which indicate that the *LnPPI has* a positive and significant impact on the *LnEMP*. It also confirms that the vector error correction model (VECM) is appropriate for examining their long run causal relationships. The coefficients of the error correction terms (ECM) and their t-statistics are shown in Table 7.3. The ECM coefficients turn out to be significant with negative sign when either LnPPI or LnEMP is

[10] The test results are not reported here for space considerations.

treated as the dependent variable. The significant negative ECM coefficient, which indicates the channel of causality in the long run, also confirms the earlier findings that cointegration exists between them. Based on these results, we can conclude that there exists a bi-directional causality between employment and property price.

Conclusion from the test: *There is bi-directional causality between housing price and employment.*

4. Conclusions

Our empirical findings have shown that residential property price, interest rates, the Asian Financial Crisis, and the implementation of the Tenants Purchase Scheme are important determinants of the second-hand home transaction volume. Price appreciation allows existing homeowners to trade up for better homes and boosts confidence. Interest rate increases are found to have clearly dampening effects on housing market transactions. Of particular interest is the finding that the Tenants Purchase Scheme is found to have a significant and a greater negative effect on the housing transactions than the Asian Financial Crisis.

During the mid-1990s, Hong Kong house prices appreciated rapidly as funds poured in from among the richer public housing tenants. After the Asian Financial Crisis, housing transactions have eased and house prices have slipped. At the eve of the announcement of the TPS on 8 December 1997 housing market transactions had appeared to have stabilized (Table 4), while indicators of confidence in November appeared to be momentarily restored (Table 3). Yet in December home transactions unexpectedly plunged to new lows, and home prices began their dramatic downturn (Table 8).

Notwithstanding Hong Kong's rapid economic growth in 2000 at 10.2 per cent home prices continued to fall, losing over 14 per cent in the year. Our theory is that this has to do with the immobilization of the existing homeowners as a result of TPS. Because land developers from now on could only depend on

first-time buyers to buy their homes, they needed to keep reducing their asking prices in order to reach potential buyers with a lower purchasing power. This inevitably worsened the negative equity problem, both by dragging more homeowners into the trap and deepening the trap.

This has resulted in a serious credit crunch particularly for small and medium enterprises who had now lost a collateral against which they could get loans. This caused business activities to slow down and certainly worsened the decline of commercial properties. Our tests indicate that as housing prices decline employment falls. A fall in employment in turn affects housing prices adversely creating a vicious circle.

Although our hypothesis that TPS played an important role in Hong Kong's economic slump in 1998 stands, it does not follow that privatization of public housing must necessarily cause such problems. All the negative effects of the TPS may well have been avoided if the government had adopted the Ho(1995) model of privatization of public housing. Under that model, only those who are poor enough to qualify for housing assistance could buy, while resale of any sold units are restricted to "eligible" households. Ho's stipulation would have disqualified the richer tenants from buying their units and would have retained the attractiveness of HOS housing thus maintaining the liquidity that had been flowing into the housing market. Given the huge linkage effect on the economy of the housing market(Case,2000), governments pondering privatization schemes need to learn from the experience in Hong Kong.

Table 1: Hong Kong's Economic Growth 1961-2002(GDP % change)

Year	% change	Year	% change	Year	% change	Year	% change	Year	% change
1961	n.a.	**1971**	7.1	**1981**	9.2	**1991**	5.1	**2001**	0.5
1962	14.2	**1972**	10.3	**1982**	*2.7*	**1992**	6.3	**2002#**	2.3
1963	15.7	**1973**	12.4	**1983**	5.7	**1993**	6.1	**2003#**	3.3
1964	8.6	**1974**	*2.3*	**1984**	10.0	**1994**	5.3		
1965	14.5	**1975**	*0.3*	**1985**	0.4	**1995**	3.9		
1966	1.7	**1976**	16.2	**1986**	10.8	**1996**	5.3		
1967	*1.7*	**1977**	11.7	**1987**	13.0	**1997**	5.1		
1968	*3.3*	**1978**	8.5	**1988**	8.0	**1998**	-5.0		
1969	11.3	**1979**	11.5	**1989**	2.6	**1999**	3.4		
1970	9.2	**1980**	10.1	**1990**	3.4	**2000**	10.2		

Source: Gross Domestic Product 1961-1999, Government of HKSAR, plus updates from: http://www.info.gov.hk/hkecon/gdp/index.htm

Preliminary

Table 2: Employment Situation 1997:4 to 1999:4

Period	Labour Force	Employment	Jobs Gained or Lost ('000)	Unemployment Rate
1997:4	3.297	3.2214	77.7	2.2
1998:1	3.247	3.1414	-80.0	3.3
1998:2	3.258	3.1177	-23.7	4.3
1998:3	3.290	3.1143	-3.4	5.2
1998:4	3.310	3.1154	1.1	5.9
1999:1	3.297	3.0928	-22.6	6.3
1999:2	3.326	3.1235	30.7	6.1
1999:3	3.316	3.1016	-21.9	6.3
1999:4	3.340	3.1313	29.7	6.3

Source: Census and Statistics Department

Note: This Table shows that even after the Asian Financial Crisis, in the last quarter of 1997, employment grew by 77,700. In the following quarter 80,000 jobs were lost. The loss of housing market turnover as well as the decline in housing prices subsequent to TPS translated into a loss of jobs.

Table 3: Indicators of Changes of Confidence 1997:4-2000:4

Quarter or Month	Hang Seng Index At End of Period	The US$ Premium on the HK Dollar in the 1-Year Forward Market
2000:4	15095	-154
2000:3	15649	-142
2000:2	16156	-9
2000:1	17406	48
99:4	16962	396
99:3	12733	909
99:2	13532	959
99:1	10942	1547
98:4	10049	1512
98:3	7883	4235
98:2	8543	4201
98:I	11519	2396
97:Dec	10723	4036
Nov.	10527	4055
Oct.	10624	2336

Source: Hong Kong Monetary Authority and http://finance.yahoo.com/q/hp?s=^HSI
Note: Negative values suggest an expectation that the Hong Kong dollar would appreciate in a year.

Table 4: Monthly Transactions of Private Homes

Year/Month	First Hand Homes	Second Hand Homes
9707	2,147	17,227
9708	2,044	8,595
9709	1,396	7,800
9710	2,174	8,315
9711	1,343	8,653
9712	364	3,804
9701-9712	**20,380**	**133,555**
9801	2,334	3,598
9802	868	2,883
9803	2,636	5,501
9804	649	4,683
9805	2,429	4,364
9806	3,871	3,413
9807	1,880	3,337
9801-9812	**31,599**	**48,110**
9901	1,999	5,012
9907	1,394	4,317
9901-9912	**21,557**	**46,565**
0001	695	4,000
0007	2,400	2,929
0001-0012	**17,830**	**39,089**
0101	857	2,364
0109	1,109	3,221

Source: Centaline Property Agency Ltd.

Table 5.1 Augmented Dickey-Fuller Test of Unit Root (Period: 1995 to 2004)

Variable name	Test on	No Trend	Trend	Conclusion
TRAN	Level	-1.9880	-2.4257**	I(1)
	1st diff	-13.1256	-13.0912***	
LPPI	Level	-0.7822	-5.6593**	I(1)
	1st diff	-2.8597	-5.6401**	
LPR	Level	-0.5627	-4.6590**	I(1)
	1st diff	-1.8002	-4.6917**	

Note:

1. 95% critical value for the augmented Dickey-Fuller tests that include constant; and constant plus
   trend = 2.8900 and -3.4552 respectively.
2. The number of lags in the two unit root tests are determined by the AIC
3. ** indicates 5% significance level.

Table 5.2 Testing Cointegration using the Johansen Procedure

Cointegrating Relation	Null Hypothesis	Alternative Hypothesis	Test Statistics	Critical Values (5%)	Critical Values (10%)
TRAN	Trace tests:		Trace Value		
$= f$ (LPPI, LPR)	r = 0	r > 0	79.0994***	31.54	28.78
With exogenous	r≦1	r > 1	5.4318	17.86	15.75
dummy variables					
FCD, TPS and FQR					
	λ max tests:		λ max Value		
	r = 0	r = 1	73.6676***	21.12	19.02
	r = 1	r = 2	5.0776	14.88	12.98

Notes:

1. *** denotes significance at 1% level
2. r indicates the number of cointegrating vectors
3. As individual series clearly exhibits trending pattern, we consider regressions with unrestricted constant and restricted trend

Table 5.3 Normalized Cointegrating Coefficients Using the Johansen Procedure

Variables	Coefficient	t-statistic
LPPI	1.0114	7.0094***
LPR	-0.2155	2.0917**

Note: ** and *** denotes significance at 5% and 1% level respectively

Table 5.4. Error Correction Model (Dependent variable: Δ TRAN)

Regressors	Coefficient (t-ratio)
Δ TRAN(-1)	-0.0263 (-0.2474)
Δ TRAN(-2)	-0.02818 (-0.3036)
Δ LPPI(-1)	3.3477 (4.1674)***
Δ LPPI(-2)	2.0245 (2.3967)**
Δ LPR(-1)	-1.7724 (-1.7189)*
Δ LPR(-2)	0.7121 (0.6895)
Constant	0.2291 (4.6053)***
FCD	-0.1603 (-1.6199)*
TPS	-0.2233 (-3.7519)***
FQR	-0.0993 (-2.2092)**
ECM_{t-1}	-0.8351 (-6.6350)***
Adj R-squared: 0.4347	

Note: *, ** and *** denotes 10%, 5% and 1% significance level respectively

Table 6.1 Testing Cointegration between LnPPI, LnEx and LnPR using the Johansen Procedure with dummy variables, 1984Q1 to 2002Q3

Explanatory Variables	Null Hypothesis	Alternative Hypothesis	Test Statistics
LnPPI = f (LnEx, LnPR)	Trace tests:		Trace Value
	r = 0	r > 0	42.33**
	r≦1	r > 1	17.30
	λ max tests:		λ max Value
	r = 0	r = 1	25.02**
	r = 1	r = 2	16.74*

Notes:

1. ** denotes significance at 5% level
2. r indicates the number of cointegrating vectors.
3. VAR = 2 is determined by AIC criterion

Table 6.2 Normalized Cointegrating Coefficients Using the Johansen Procedure

Cointegrating equation: LnPPI = f (LnEX, LnPR)	Coefficient	t-statistic
LnPR	-0.5224	-1.9180*
LnEX	0.6986	2.6890**

Notes:

1. ** and * denotes significance at 5% and 10% level respectively.
2. optimal lags are determined by AIC criterion
3. LnEx*D98q1, LnPr*D98q1 and D98q1 are treated as exogenous I(0) variables in the cointegrating equation

Table 6.3 Error Correction Representation of Johansen Model (Dependent variable: $\Delta LnPPI_t$)

Regressors	Coefficient (t-ratio)
Intercept	-0.4652 (-3.6727)***
Trend	0.0028 (3.3701)***
$\Delta LnPPI_{t-1}$	0.4504 (4.2074)***
$\Delta LnEX_{t-1}$	-0.3313 (-1.7721)*
$\Delta LnPR_{t-1}$	0.0278 (0.4618)
ECM_{t-1}	-0.1669 (-3.9358)***
LnEX * D98Q1	-0.3622 (-1.9930)**
LnPR * D98Q1	0.1636 (2.3551)**
D98Q1	4.2173 (1.8136)*
Adj R-squared: 0.5300	

Note:
1. optimal lags are determined by AIC criterion
2. * , ** and *** denotes 10%, 5% and 1% significance levels respectively
3. Δ denotes first difference.

Table 6.4 A Timing Test by Switching Dummy Variables to Unity in Different Quarters

Quarter with Value of Dummy Switched to Unity	LnEX * DQ	LnPR * DQ	Intercept Dummy DQ	Adjusted R^2 in ECM model
1997 Q2	-0.0036 (-0.0213)	-0.0187 (-0.3253)	0.0254 (0.0114)	0.4399
1997 Q3	0.0040 (0.0235)	-0.0206 (-0.3616)	-0.0716 (-0.0322)	0.4408
1997 Q4	-0.0116 (-0.0679)	-0.0054 (-0.0904)	0.1015 (0.0452)	0.4350
1998 Q1	**-0.3622 (-1.9930)****	**0.1636 (2.3551)****	**4.2173 (1.8136)***	**0.5300**
1998 Q2	-0.2483 (-1.3515)	0.1335 (1.9677)**	2.8794 (1.2134)	0.4520
1998 Q3	-0.2829 (-1.5453)	0.1435 (2.1206)**	3.2985 (1.3943)	0.4634

Note: Figures are estimated coefficients and the adjusted R^2 for the error correction models. t-statistics are in brackets. DQ is a dummy variable that switches to unity in the quarter on the left column.

Table 7.1: Testing Cointegration between LnEMP and LnPPI using the Johansen Procedure, 1984Q1 to 2002Q3

Explanatory Variables	Null Hypothesis	Alternative Hypothesis	Test Statistics
LnEMP = *f* (LnPPI)	Trace tests:		Trace Value
	r = 0	r > 0	20.14**
	r≦1	r > 1	3.05
	λ max tests:		λ max Value
	r = 0	r = 1	17.09***
	r = 1	r = 2	3.05

Notes:
1. ** denotes significance at 5% level.
2. r indicates the number of cointegrating vectors.
3. optimal lags are determined by AIC criterion

Table 7.2 Normalized Cointegrating Coefficients (Bivariate Estimates) Using the Johansen Procedure

Cointegrating equation: LnEMP = *f* (LnPPI)	Coefficient	t-statistic
Intercept	0.8081	6.1108***
LnPPI	0.0633	2.4376**

Notes:
1. ** and *** denote significance at 5% and 1% respectively.
2. optimal lags are determined by AIC criterion
3. ** and *** denote significance at 5% and 1% level.

Table 7.3 Causality Tests Using the VECM Approach

Dependent Variable	Null Hypothesis	Coefficient for ECM(-1)	t-statistics for ECM(-1)
DLEMP	LnPPI *does not cause* LnEMP	-0.0684	-3.3752**
DLPPI	LnEMP *does not cause* LnPPI	-0.1777	-2.4483**

Notes:
1. ** denotes significance at 5%.
2. D denotes first difference
3. optimal lags are determined by AIC criterion

Table 8: Housing Price Index(Overall)

Year & Month	Price Index	Percentage Change
9701	142.7	6.1
9702	154.3	8.1
9703	162.2	5.1
9704	157.0	-3.2
9705	172.3	9.7
9706	172.0	-0.2
9707	167.2	-2.8
9708	171.1	2.3
9709	170.3	-0.5
9710	172.9	1.5
9711	160.5	-7.2
9712	155.0	-3.4
9806	*112.5*	*-27.4*
9812	*104.6*	*-7.0*
9906	*102.3*	*-2.2*
9912	*95.7*	*-6.5*
0006	*86.0*	*-10.1*
0012	*81.8*	*-4.9*
0106	*80.9*	*-1.1*
0112	*73.8*	*-8.8*

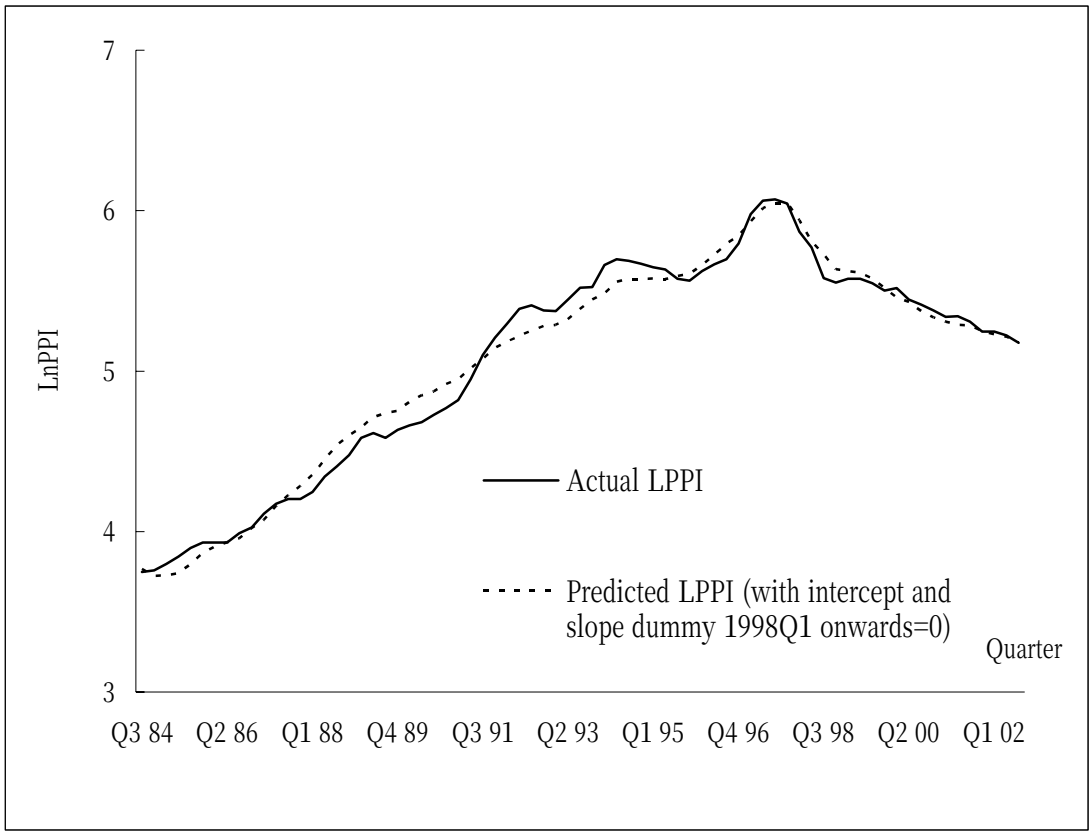
Source: Rating and Valuation Department

Note: From 1998 the percentage price changes are reported for every six months.

Table 9. List of variables and their definitions

Short Form	Explanatory Variables	Definition of Variables
TRAN	Second hand home transaction volume (dependent variable)	Monthly volume figures are no. of registration of transactions in private residential properties in the second hand market and provided by Centaline Ltd.
PPI	Property Price Index	Property price index
FCD	Financial Crisis Dummy	This is a non-binary dummy variable derived from the 12-month forward rate premium of the US dollar on the HK dollar. It is normalized to have a maximum value of unity .
TPS	Tenants Purchase Scheme	1 starting from the announcement of the scheme in December 1997, 0 before that month (Monthly Data)
FQR	First Quarter Effect	1 for months in the first quarter of the year, 0 otherwise
PR	Prime Rate	moving average of the prime rate for 3 quarters ending in the current quarter
EX	Total Exports of Goods and Services	In million HKD (current price), seasonally adjusted
D98Q1	Dummy Variable	1 starting from the 1998 1st quarter, 0 before that quarter (Quarterly Data)
DQ	Timing Test Dummy	1 starting from the quarter tested, 0 prior to that quarter
EMP	Employment	in thousands, seasonally adjusted

Figure 1. Predicted Values for the Housing Price Index Using JH Model Incorporating Dummy Variables Switched to Unity from 1998:quarter 1



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