

HOUSING PRICE MISALIGNMENTS FROM FUNDAMENTALS BEFORE THE 1997-98 FINANCIAL CRISIS: EVIDENCE FROM MALAYSIA

HUI HON-CHUNG

The University of Nottingham, Malaysia

ABSTRACT

This paper attempts to assess the presence and extent of house price misalignments from fundamental values, with particular focus on the pre-Asian financial crisis years in Malaysia. The main findings suggest two episodes where overpricing of houses were historically large, namely 1990-92 and 1995-97. However, the magnitude of housing price misalignments before 1997 was not large enough to be considered as bubbles. As such, 'housing price bubbles' could not have been a contributor to Malaysia's 1997-98 financial crisis.

Keywords: House price misalignments, fundamental price, cointegration

INTRODUCTION

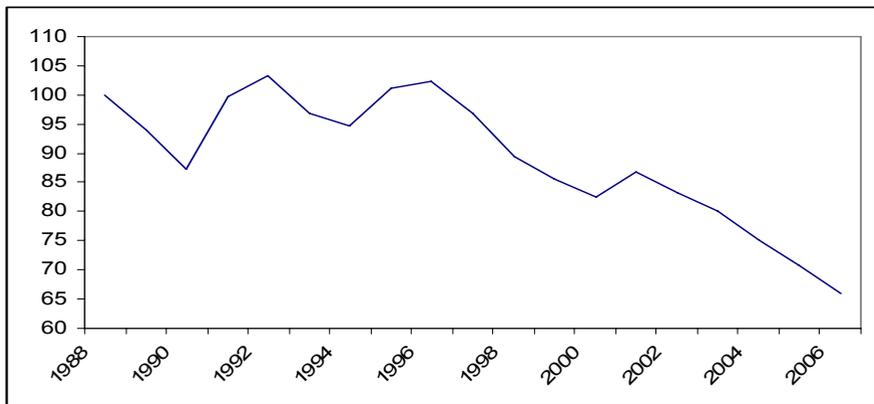
The orthodox Asian financial crisis narrative expressed explicitly by Collyns and Senhadji (2002) and implicitly by Jomo (1998) suggested that financial liberalisation and the subsequent capital inflows unleashed were the main factors behind observed real estate booms in East Asia before 1997. By a similar logic, a reversal of capital flows produced busts. Hence, the financial crisis was partly a result of a boom-bust cycle in real estate markets. What made this narrative particularly appealing was somewhat unproven claims that real estate price escalations in the pre-crisis years resembled speculative bubbles. As a way to test this claim, it would be important to empirically verify whether prices were misaligned from fundamentals. Such investigations on economies that were affected by the financial crisis in East Asia are still rare, perhaps due to lack of data.

We attempt to make a contribution to this gap in the literature. Our purpose in this paper is to assess the existence and extent to which actual real estate prices are misaligned from fundamentals, with special focus on Malaysia. As price data for other segments of real estate do not yet exist, we can only focus on one particular segment of the real estate sector, namely the housing market.

Our motivation to investigate house price behaviour in Malaysia began with some preliminary statistical explorations, which is summarised in Figures 1-2. If the ratio of

real house prices to per capita income is normalised (1990=100)¹, an index of housing affordability similar to those of Stephansen and Koster (2003) can be produced. Rising index values indicates falling housing affordability (i.e. houses becoming more expensive relative to per capita income²) and vice versa. However, this index which is plotted in Figure 1, merely illuminates whether housing affordability is rising or declining over time but does not provide any information on whether houses are overpriced compared to some fair value. As shown in Figure 1, houses were historically expensive during the boom years of 1990-92 and 1995-97. Figure 2 suggests that low housing affordability in 1995-97 was due to house prices that lie above a long-run trend, which may indicate presence of 'bubbles'.³ Whether the low housing affordability in 1990-92 was also caused by overpriced houses is less clear, since actual house price was only above trend by a small magnitude. Nonetheless, the long-run house price trend in Figure 2 is not derived from some robust theory of house price determinants. Hence, the extent of pricing misalignments may not be accurately stated. More rigorous work is merited to investigate house price misalignments, which we attempt to do here.

Figure 1: Housing affordability (1990=100)

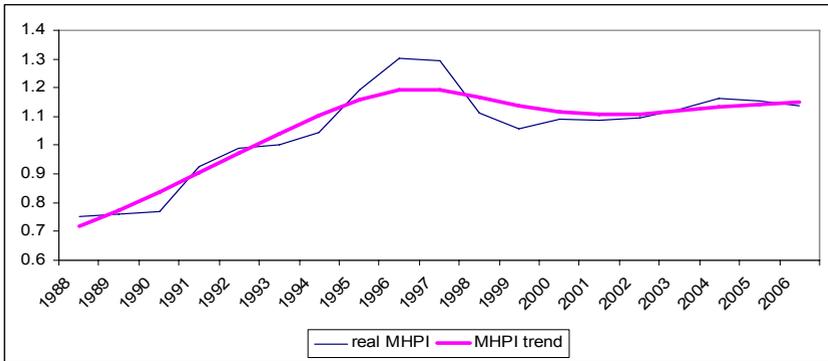


¹ The house price is measured by the Malaysian House Price Index (MHPI), which was first published in 1988 by the Valuations and Services Department under the Ministry of Finance. Details and shortcomings of this index are discussed in Ting (2003). Real house price is obtained by deflating MHPI with consumer price index (CPI, 2005=100). Data in Figures 1-2 are annual

² There is no 'household income' data for Malaysia. Hence, per capita income is used instead

³ Trend is obtained by applying the Hodrick-Prescott filter to real house prices (i.e. nominal house price divided by consumer price index)

Figure 2: Real house price and trend



In this paper, we derive determinants of fundamental house prices from an established model used in Mayo and Sheppard (1996). Next, we estimate this model using the Autoregressive Distributed Lag (ARDL) and bounds test approach to cointegration. The coefficient estimates are then used to generate a fundamental house price series which is compared with actual house prices. In this comparison, we find that house prices were misaligned in 1990-92 and 1995-97 by magnitudes that ranged 3-12%. Albeit the magnitudes of misalignments were historically unprecedented, they were nonetheless small in comparison with the experiences of Hong Kong (1994-97) and Shanghai (2001-03). As such, with the onset of the financial crisis in 1997, the crash in house prices could not have been the main contributing factor to Malaysia's financial crisis.

The remainder of this paper is structured as follows. Section 2 discusses basic concepts in theory. Section 3 develops a simple housing market model. Section 4 presents data sources and definitions. Section 5 describes empirical methodology. Section 6 reports the main findings. Section 7 concludes.

BUILDING CONCEPTS: LITERATURE REVIEW

Defining house price misalignments and bubbles

The notion of asset price misalignments comes from the deviation of actual prices from fundamental prices. Hence, it is crucial to define what constitutes the fundamental price of an asset before misalignments can be measured. According to Ito and Iwaisako (1995) and Mera (2000), fundamental asset price is defined by the Gordon pricing formula:

$$P = \text{Rent} / (r - g)$$

where:

P = Fundamental price

R= Rent

r = interest rate and

g = expected growth rate of rent

$r > g$

The denominator of this valuation formula is also known as rate of capitalization. As interest rate is defined to be larger than the expected rent increase, greater expectations of rent increases will drive fundamental prices higher. As such, evidence of overpricing is obtained if actual price exceeds this definition of fundamental price. Notably, this formula is a variant of the dividend discount model which values an asset based on the net present value of future dividends.

Econometric approaches

The notion of fundamental price can also be captured in econometric models with real estate price as the dependent variable and a variety of macroeconomic, demographic and institutional factors as independent variables (for example, see Kalra et al, 2000; Hui and Yue, 2006; Fernandez-Kranz and Hon, 2006). Although not always obvious, the regressors can be interpreted as determinants of equilibrium real estate prices. Such models are subsequently estimated as regression functions. Given the coefficient estimates of the regression function, the equilibrium real estate values can be calculated and are taken as a measure of fundamental price. Next, this fundamental price is compared with actual price movements to see if any deviations are present. We adopt this convention in our attempt to study Malaysian real estate markets. However, this approach suffers from one major problem. Using different regressors and different model structures would generate dissimilar sets of fundamental real estate price series. Hence, when different measures of fundamental prices are compared with actual prices, the magnitudes of deviations would also not be identical.

Importantly, observing price misalignments is a necessary but insufficient condition for bubbles to exist. From a central banker's perspective (see Hunter et al, 2003), predicting and measuring bubbles is a complicated task, not least because there are no watertight definitions. Case and Shiller (2003) remarked that bubbles are frequently used but infrequently defined in a clear manner. Given these uncertainties, we shall therefore refrain from making judgments regarding what constitutes a bubble at this stage and just focus on whether and to what extent real estate prices are misaligned from fundamental values.

FUNDAMENTAL HOUSE PRICES: A THEORETICAL MODEL

Fundamental house price can be derived formally from a model of housing market behaviour. In this regard, there is a wide range of models attempted in the literature. We draw ours from Mayo and Sheppard (1996). This choice of model building is largely influenced by paucity of data. As a result, it would not be possible to replicate models used by, among others, Kalra et al (2000) and Hui and Yue (2006) because data on new housing supply, construction starts, housing stock and rent are not consistently available for the sample period being considered. It would be important to adopt established models in the literature as what we are currently doing instead of coming up with some ad-hoc specification as what Ng (2006) has done. The basic model has the following structure:

$$Q_d = \alpha_0 + \alpha_1 P_h + \alpha_2 Y + \alpha_3 P_o \quad (1)$$

$$Q_s = \beta_0 + \beta_1 P_h + \beta_2 P_c \quad (2)$$

$$Q_s = Q_d \quad (3)$$

where:

Q_s = quantity of housing supplied

Q_d = quantity of housing demanded

Y = disposable income

P_h = house price

P_o = price of other goods

P_c = cost of construction

Solving the model outlined in (1)-(3), and re-parameterising the model yields the following reduced form equation, which represents fundamental (equilibrium) house price:

$$P_h = \gamma_0 + \gamma_1 Y + \gamma_2 P_o + \gamma_3 P_c \quad (4)$$

However, the basic model may not be realistic because in practice, first time buyers do not usually earn enough to purchase houses from their salaries. Instead, they obtain loans from banks, implying that there is some kind of credit constraint on consumer behaviour. Moreover, the cost of borrowing is also important for those who have taken loans and hence, this cost needs to be taken account in the formulation of the housing model. Hence, in contrast to Mayo and Sheppard (1996) who estimated a simply model corresponding to (4), we have added bank credit and interest rate to the demand-side equation (1), to capture what Collyns and Senhadji (2000) call the 'credit channel'. Thus, equation (1) becomes:

$$Q_d = \alpha_0 + \alpha_1 P_h + \alpha_2 Y + \alpha_3 P_0 + \alpha_4 CR + \alpha_5 IR \quad (1a)$$

where:

CR = quantity of commercial bank loans outstanding

IR = average lending rate of commercial banks

Taking equations (1a), (2) and (3), the housing model is solved again, and then re-parameterised to obtain a specification for equilibrium prices⁴:

$$P_h = \Pi_0 + \Pi_1 Y + \Pi_2 P_0 + \Pi_3 P_0 + \Pi_4 CR + \Pi_5 IR \quad (5)$$

In this case, all variables are expressed in logarithms. Equation (5) can also be written in stochastic form and estimated as regression function.⁵

The main objective of this paper is to obtain some empirical measure of fundamental house prices. This can be done by first estimating models (4) and (5). Model (4) can be used as baseline for comparison with a more complex model (5). Next, coefficient estimates from both models can be used to generate fundamental house price series. Actual house prices can be subsequently compared with these fundamental house prices to see if there is substantial deviation of the former from the latter.

DATA SOURCES AND DESCRIPTION

Definitions of variables are summarised in Table 1. The sample period spans 1991Q1-2006Q2 and is determined by data availability. As this period is less than 20 years, we use quarterly data to expand the sample size⁶. All data are sourced from various issues of Bank Negara Malaysia's Monthly Statistical Bulletin. Variables have been transformed into natural logarithms. We have also summarised the statistical properties of each variable in Table 2⁷.

⁴ Based on the rank and order condition of identification, equations (1a) and (1) are exactly identified while equation (2) is over-identified.

⁵ Specifying all variables in real terms (i.e. deflating the nominal variables before including them into the model) does not provide good regression diagnostics and empirically intuitive results. Hence, the present approach is favoured.

⁶ We acknowledge that there may be seasonal effects arising from the use of quarterly data. Attempts to control for seasonal effects in our regressions by using dummy variables following the approach of Brooks and Persaud (2001) does not avail good regression diagnostics and hence these dummies have been left out.

⁷ We stress again that while rent is mentioned in the Gordon pricing formula, we do not use this variable in our analysis because data is not available

Table 1: Data definitions

Variables	Definition
P_h	Malaysian House Price Index (MHPI). Data before 1999 are annual, so quarterly data is obtained by using Eviews' cubic-spline interpolation function ^{a/}
P_0	Implicit GDP deflator ^{b/}
P_c	Construction sector deflator
Y	Nominal GDP minus corporate and individual income taxes
CR	Total commercial bank loans outstanding
IR	Average lending rate of commercial banks

^{a/} We have also tried linear interpolation, but the qualitative results do not differ substantially. The MHPI is the only property price index available for Malaysia. There were previous attempts to construct a similar index (see Lau, 2001), but it was not possible to extend this index beyond 1998 due to the fact that beginning 1999, certain raw data for the construction of the index was no longer reported. Arguably, interpolating house prices would not cause as much problems as interpolating commercial property price index, stock price index or exchange rates. The reason is because house prices tend to exhibit less short-term volatilities (Zhu, 2003), partly due to its infrequent trading

^{b/} CPI has been used as well, but the regression results do not pass all diagnostic tests

Table 2: Summary statistics

Variables	P_h	P_0	CR	IR	Y	P_c
Minimum	3.9555	0.1397	11.3458	2.4662	10.2953	0.2842
Maximum	4.7749	0.6731	13.2490	8.8281	11.7381	0.7616
Mean	4.5349	0.3988	12.3498	5.4504	11.0688	0.6357
Std deviation	0.2085	0.1538	0.5409	1.4049	0.3954	0.1208
Skewness	-1.0520	-0.0463	-0.3601	-0.0841	-0.2528	-1.5065
Kurtosis	0.0797	-1.0911	-1.0680	-0.0768	-0.8588	1.4483
Coefficient of variation	0.0460	0.3857	0.0438	0.2578	0.0357	0.1900

Information in Table 2 captures several aspects of development in the Malaysian economy during the sample period that deserve further elaboration. In terms of volatility (measured by coefficient of variation), it can be seen that house prices were quite stable throughout the sample period, except for 1990-92 and 1995-97. These two periods of instability were marked by relatively steep increases in house prices (as shown in Figure 2) and coincided with periods where the economy was overheating. The housing boom in 1990 ended with a soft-landing as GDP growth slowed down slightly with monetary policy tightening. Meanwhile, the second housing boom in 1995 ended in a hard-landing, as economic activities abruptly plummeted in the second half of 1997 with the onset of the Asian financial crisis. After 1998, real house prices were quite stable and signs of steep price increases have yet to be detected. Disposable income is relatively stable mainly because taxes are included in calculating this series. Taxation functions as fiscal stabilisers which insulate income from excessive fluctuations.

Figure 3: Construction cost and GDP deflator compared

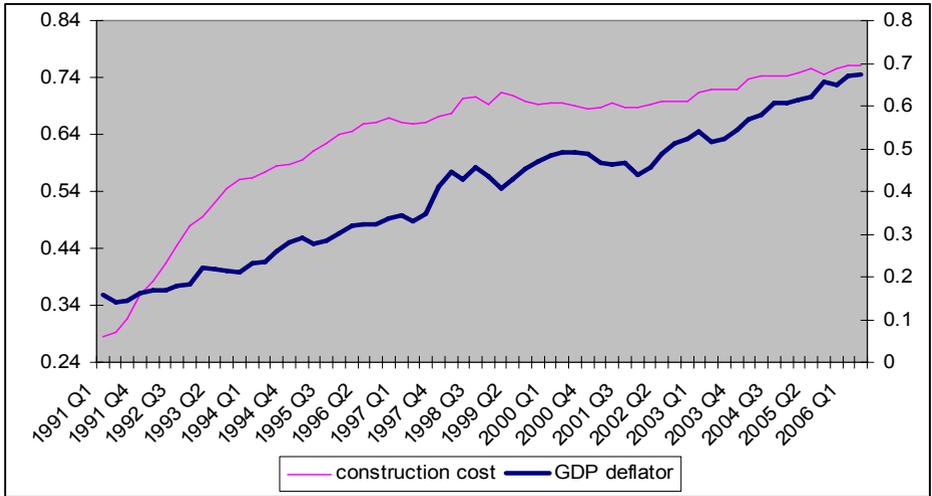
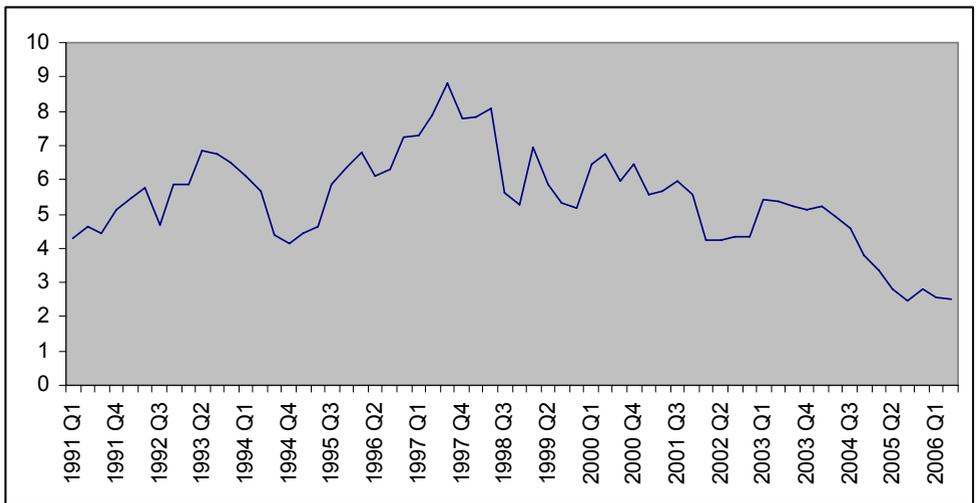


Figure 4: Average lending rate



Construction cost and prices of other goods are relatively volatile throughout the entire sample period (Figure 3). In the pre-crisis years, living expenses increased in response to a booming economy but stabilised during the financial crisis. Of late, recent oil price shocks contributed to more volatile price movements. Interest rates were particularly volatile in the pre-crisis years, as the financial system was adjusting to a shortage of domestic resources to finance a growing economy (Figure 4). Borrowing cost increased sharply in the initial stages of the financial crisis before moving down as the central bank started to loosen monetary policy to stimulate a recovery. Thereafter, rates have been trending down.

ESTIMATION PROCEDURES⁸

Equations (4) and (5) are estimated using the Autoregressive Distributed Lag (ARDL) and bounds test approach to cointegration of Pesaran et al (2001). This approach to cointegration is superior to those of Engle and Granger (1987) and Johansen and Juselius (1990) because it is particularly suitable for research involving small samples. In this respect, our empirical methodology provides the remedies to Ng's (2006) paper where the author essentially used Engle and Granger's approach to cointegration. This approach may not be reliable given the small sample size used (63 observations over 15 years).

The ARDL procedure consists of two stages. First, the presence of cointegration (i.e. existence of equilibrium relationships) has to be ascertained. This can be carried out using the bounds test⁹. The null hypothesis of this test supposes that there is no equilibrium or long-run relationships among the variables in models (4) and (5), respectively. These hypotheses can be tested using the F-test. Nonetheless, the F-statistic for testing these hypotheses does not have a standard distribution. Hence, the critical values are taken from Table CI (iii) in Pesaran et al (2001)¹⁰. Once the presence of long-run equilibrium relationships are confirmed, the second stage involves estimating models (4) and (5) using the ARDL approach.

⁸ All regressions were estimated with Microfit 4.0

⁹ Readers interested in technical details may refer to Pesaran et al (2001). A working paper version with full technical details can be obtained from the author upon request.

¹⁰ For a given level of significance, the critical values consist of a lower and upper bound. The null hypothesis is rejected if the F-statistic exceeds the upper bound critical value. If the F-statistic falls below the lower bound critical value, then the null of no cointegration cannot be rejected. On the other hand, if the F-statistic falls between the upper and lower bound, a conclusion cannot be made on whether cointegration exists. More information is required on the order of integration of variables in the regression

RESULTS AND DISCUSSIONS

Results of bounds test

The results of the bounds test indicate that since the calculated F statistic is 4.2971 for model (4) and 5.2440 for model (5), these values are larger than the upper bound critical value at 10% significance (Table 3). Therefore, it can be confirmed that the long-run equilibrium relationships exist in models (4) and (5) respectively.

Table 3: Results of bounds test^{a/}

Model	F-statistic	Critical bounds at 10% significance ^{b/}
(4)	4.2971*	(2.72, 3.77)
(5)	5.2440*	(2.26, 3.35)

Note: ^{a/} *, ** and *** indicate 10%, 5% and 1% level of significance, respectively

^{b/} Critical bounds taken from Pesaran, Shin and Smith (2001).

Estimation of models (4) and (5) using the Autoregressive Distributed Lag (ARDL) approach

Models (4) and (5) are respectively estimated as ARDL regressions using Ordinary Least Squares (OLS). Both models pass a battery of diagnostic tests: evidence of serial correlation, heteroskedasticity, model misspecification and non-normality of residuals failed to be detected¹¹. Results are reported in Table 4¹².

Notably, the coefficient estimates of model (4) possess several interesting characteristics. All the estimated coefficients have the expected signs and are intuitively appealing. The positive and statistically significant coefficient on construction cost (P_c) suggest that higher costs are eventually factored into the final price of houses, whereas higher cost of living penalises housing demand and subsequently results in lower house prices. Disposable income exerts a positive and significant effect on housing demand and house prices.

After controlling for credit constraints and borrowing cost in model (5), the gist of the results in the above paragraph does not alter substantially. Interestingly, the coefficient on credit constraint turns out to be strongly significant whereas the coefficient on interest rate is not so. It can be reasoned that financial innovation has created conventional housing loans with flexible payment schedules and interest payment

¹¹ Furthermore, we used the CUSUM and CUSUM of squares (CUSUMSQ) test developed by Brown et al (1975) to check for long-run parameter instability. Again, the results of these tests do not indicate unstable long-run parameters. Details of diagnostic tests are available from the author upon request

¹² ARDL models contain a particular lag structure. As quarterly data is used, we set maximum lags to equal 4. The optimal lag structure is selected using Schwarz Bayesian Criterion (SBC), upon the recommendation of Pesaran and Shin (1999)

structures (Ng, 2006). Hence, effects of average lending rates on housing demand may not be adequately captured¹³.

Table 4: Long-run coefficients of models (4) and (5) ^{a/}

Variables	Model (4)	Model (5)
Disposable income	0.6347* (0.3456)	0.3053* (0.1794)
Price of other goods	-1.4256* (0.7914)	-1.3914*** (0.4201)
Construction cost	1.4998** (0.5587)	1.2682*** (0.2861)
Average lending rate	-	-0.0071 (0.0089)
Bank lending	-	0.2938*** (0.0867)
Constant	-2.8694 (3.3173)	4.3533** (1.3948)
Diagnostics tests ^{b/}		
Serial correlation	1.8061 [0.146]	2.5903 [0.050]
Model	0.2730 [0.604]	1.1044 [0.299]
Misspecification	0.8382 [0.658]	5.4656 [0.065]
Normality in residuals	3.5274 [0.066]	0.0675 [0.796]
Heteroskedasticity		

^{a/} *, ** and *** indicate 10%, 5% and 1% level of significance, respectively; all values in parenthesis represent asymptotic standard errors.

^{b/} All values in parenthesis represent p-values. The existence of serial correlation is tested using Breusch-Godfrey LM test. Normality of residuals is tested with Jarque-Bera test of non-normality. Model misspecification can be ascertained using Ramsey RESET test. Presence of heteroskedasticity is tested with a simple test of whether the variance of residuals changes with different values of the explanatory variables (see Pesaran and Pesaran, 1997 for more details).

The fundamental equilibrium house prices can be generated from the long-run coefficients reported in Table 4. The comparisons between fundamental and actual house price can be seen in Figures 5-8.¹⁴ It can be observed that whether one uses the

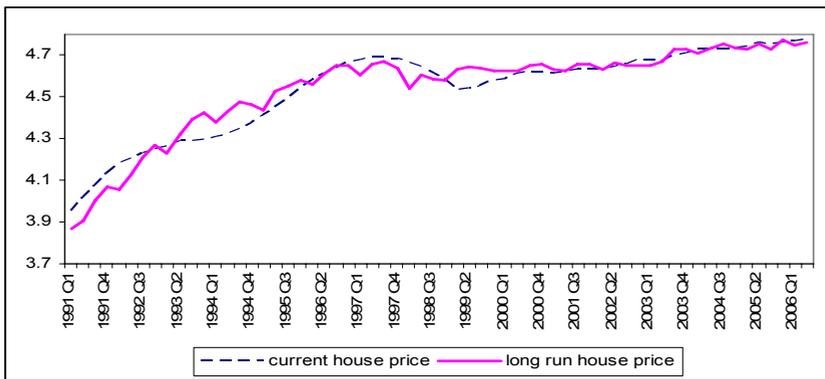
¹³ Since variables are in logarithms, the coefficients are interpreted as elasticities, so that the first difference of a variable measures proportionate change.

¹⁴ To measure overpricing or deviation between actual and fundamental house prices as found in Figures 6 and 8, we follow the approach of Hui and Yue (2006). Particularly, we calculated a 'bubble term', which measures the percentage deviation of actual house price from fundamental house price.

fundamental house price from model (4) or (5), the overpricing in houses in 1995-97 lie within the interval of 3-12%¹⁵.

Drawing a comparison with findings in the extant literature, Hui and Yue (2006) have found evidence of real estate pricing misalignments which were larger than 20% in Hong Kong (in 1996-97) and Shanghai (in 2003). Kalra et al (2000) found real estate prices in Hong Kong to be overvalued by 40-45% in 1997. Although historically unprecedented, the pricing misalignments in the Malaysian experience were comparatively mild. Hence, there should be some skepticism in labeling the overpricing in 1995-97 as bubbles. Without a large housing bubble preceding 1997, the fall in house prices in 1997 could have slowed down economic growth, but would not have been able to single-handedly cause the recession of the Malaysian economy during 1998.

Figure 5: Actual and long-run house prices (based on model (4))



¹⁵ It is important to note that whether one considers the long-run coefficients of model (4) or (5), the fundamental house price series from both models yield qualitatively similar results i.e. historically large overpricing was observed in 1990-92 and 1995-97 but this overpricing was not too large compared to the experiences of other countries. The close correlation between fundamental house price and actual house price after 1998 is curious (as seen in Figures 5 and 7). But this observation should not be surprising. Notably, steep house price increases is a necessary condition for housing bubbles to exist. However, Figure 2 suggests that there was not a single episode of steep price increase between 1998 and 2006 after taking account of the level of cost of living. Hence, it is safe to say that pricing misalignments of the sort observed before 1997 have yet to materialise again.

Figure 6: Deviation of actual and long-run house prices (based on model (4))

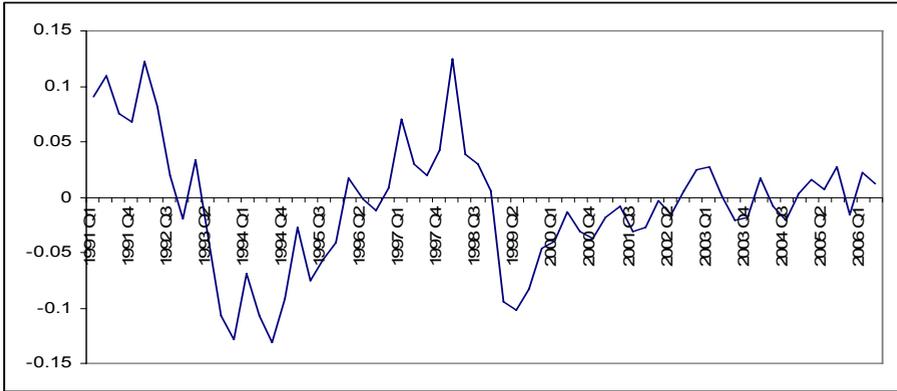
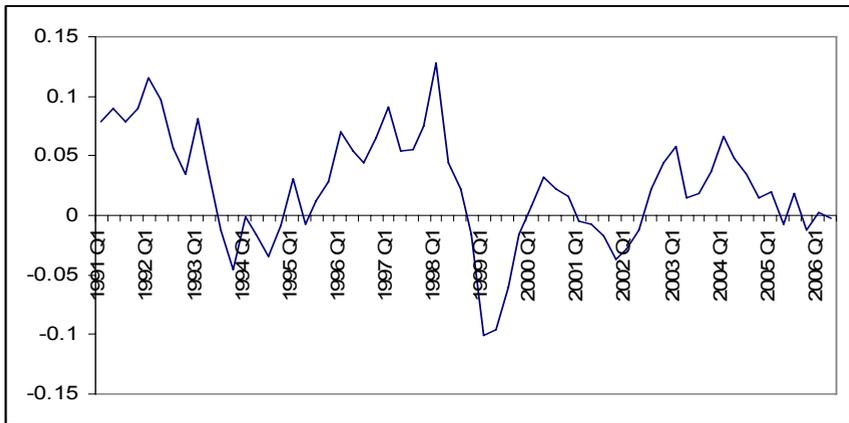


Figure 7: Actual and long-run house prices (based on model (5))



Figure 8: Deviation of actual and long-run house prices (based on model (5))



Some caveats are in order when interpreting the results of the analysis. Notably, there are all kinds of definitions for fundamental house price, depending on what variables are put into the model. As such, the exact magnitude of pricing misalignments may be sensitive to the number of regressors and different model specifications. Additionally, this paper uses aggregated variables, so that geographical influences on house prices are not featured. Although the regression diagnostics do not detect model misspecification, there may be other important variables which have been omitted mainly due to lack of data. Rectifying this problem is a future research task.

CONCLUSION

This paper attempts to assess the existence and extent of house price misalignments from fundamentals during the pre-Asian financial crisis years, with special focus on Malaysia. In contrast to the frequently cited view that booms and busts in real estate prices was one key factor in understanding the severity of the 1997-98 financial crisis, literature which formally tests the existence of real estate imbalances and bubbles remains scarce for the case of Malaysia. The lack of antecedent of a similar research programme motivates our interest in developing this paper.

Our findings from the ARDL and bounds testing approach to cointegration highlight two comparable episodes of overpricing in housing markets, namely 1990-92 and 1995-97. Nonetheless, house prices were misaligned only by 3-12% in the latter period. Without a large housing bubble preceding 1997, the collapse in prices in 1997 could not have been the main contributor to Malaysia's 1997-98 financial crisis.

REFERENCES

- Brown, R.L., Durbin, J. and Evans, J.M. (1975), 'Techniques for testing the constancy of regression relations over time', *Journal of Royal Statistical Society*, 37(Series B), 149-163.
- Bjorklund, K. and Soderberg, B. (1999), 'Property cycles, speculative bubbles and the gross income multiplier', *Journal of Real Estate Research*, 18 (1), 151-74.
- Brooks, C. and Persaud, G. (2001), 'Seasonality in Southeast Asian stock markets: some new evidence on day-of-the-week effects', *Applied Economics Letters*, 8 (3), 155-158.
- Case, C. and Shiller, R. (2003), 'Is there a bubble in the housing market? An analysis', paper presented for the Brookings Paper on Economic Activity, 2, 299-362.
- Collins, C. and Senhadji, A. (2002), 'Lending Booms, Real Estate Bubbles and the Asian Crisis', IMF Working Paper 02/20.
- Engle, R.F. and C.W.J. Granger (1987), 'Cointegration and error correction representation: estimation and testing', *Econometrica*, 55(2): 251-276.
- Hui, ECM and Yue, S (2006), 'Housing price in Hong Kong, Beijing and Shanghai: a comparative study', *Journal of Real Estate Finance and Economics*, 33, 299-327.
- Hunter, W.C., Kaufman, G.G. and Pomerleano, M. (Eds.), *Asset Price Bubbles: The Implications for Monetary, Regulatory and International Policies*, MIT Press.
- Ito, T. and Iwaisako, T. (1995), 'Explaining Asset Bubbles in Japan,' NBER Working Paper 5358.
- Johansen, S. and Juselius, K. (1990), 'Maximum likelihood estimation and inference on cointegration with applications to the demand for money', *Oxford Bulletin of Economics and Statistics*, 52, 169-210.
- Jomo, K.S. (Ed.) (1998), *Tigers in Trouble: Financial Governance, Liberalisation and Crises in East Asia*, Zed Books, London.
- Lau, W.K. (2001), Residential property cycles, business cycles and credit availability, unpublished master's dissertation, University Malaya.
- Kalra, S., Mihajek, D. and Duenwald, C. (2000), 'Property Prices and Speculative Bubbles: Evidence from Hong Kong SAR', IMF Working Paper 00/2.

Mayo S. and Sheppard S. (1996), 'Housing supply under rapid economic growth and varying regulatory stringency: an international comparison', *Journal of Housing Economics*, 5, 274-289.

Mera, K. (2000), 'Land price ascent and government response in Japan,' in Mera, K. and Renaud, B. (eds.), *Asia's Financial Crisis and The Role of Real Estate*, M.E. Sharpe, pp 27-64.

Ng, A. (2006), 'Housing and mortgage markets in Malaysia,' in Kusmiarso, B. (ed.), *Housing and Mortgage Markets in SEACEN Countries*, SEACEN Publication, 123-188.

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

Pesaran, H., Y. Shin and R.J. Smith (2001), 'Bounds testing approaches to the analysis of level relationships', *Journal of Applied Econometrics*, 16(3), 289-326.

Pesaran, H. and Y. Shin (1999), 'An autoregressive distributed lag modelling approach to cointegration analysis', in: S. Strom (ed), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*. Cambridge, UK: Cambridge University Press), 371-413.

Stephansen, K. and Koster, M. (2003), 'Housing Valuations: No Bubble Apparent', paper presented at the IMF-BIS Conference on Real Estate Indicators and Financial Stability, 27-28 October 2003, Washington D.C.

Zhu, H. (2003), 'The Importance of Property Markets for Monetary Policy and Financial Stability', paper presented at the IMF-BIS Conference on Real Estate Indicators and Financial Stability, 27-28 October 2003, Washington D.C.