

# Housing price bubble in Hong Kong : A multi - indicator analysis

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## ABSTRACT

Housing price increase by almost 24 percent recently in Hong Kong and it has been become the leading housing markets in urban China. It is third expensive city in Asia and 8<sup>th</sup> in the world. After becoming part to china in 1997, this city experienced a very high growth in the housing price appreciation. The purpose of this paper is to examine whether there exists housing price bubble in this largest city of China.

**Design/methodology/approach:** The study is based on a set of a comparison of housing market prices with the rational expectation price and mortgage loans. Control chart which is a Statistical tool is introduced to quantify housing bubbles.

**Findings:** The study shows that Hong Kong has been on the way of forming a housing price bubble between in year 2004, 2009 and in 2011. The housing market of Hong Kong is very volatile, every year it moves upward and downward.

**Originality/value:** In an attempt to explain the housing bubble in Hong Kong, this paper uses an integrated strategy involved with such fundamentals as interest rates, rent, GDP.

**KEY WORDS :** Housing price, Bubble

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From the late 1990's real state has become a major industry in the Chinese economy. After the 1997's Asian crisis, there was an increase in demand among the households and they begun to purchase housing and the sector has contributed greatly in expanding the domestic demand. There was a dramatic run up in housing prices in many cities like Hong Kong during the period 2004-2007. However, there may be a rise in many problems and even financial crisis, when the housing price deviates too much from its fundamental values. This article will discuss whether there exists housing bubble in Hong Kong by the examination of macroeconomic indicators with micro measures.

Housing is an immovable estate with long life and is a durable good, with low elasticity of supply. The elasticity of housing supply is very low in Hong Kong compared to other cities, since demand shocks such as income and household

formations are more significant and the land for development is limited in this city. Thus, the expectation of housing prices may become stronger, and the speculative behaviour is more likely to produce a bubble by buying at a certain price with the plan of soon selling it at a higher price in this city.

This article focuses on newly constructed housing rather than the stock as a whole, since transactions in China mainly occur in the new housing in recent years. This means that the data in the study are generally concerned with new housing. All the data on prices, income, rent and GDP are in nominal values in this paper.

## Definition of bubble:

According to the New Palgrave Dictionary (2008), Kindleberger defines a bubble as: a sharp rise in price of an asset or a range of assets in a continuous process, with the initial rise generating expectations of further rises and attracting new buyers – generally speculators interested in profits from trading rather than in its use or earning capacity. The rise is then followed by a reversal of expectations and a

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sharp decline in price, often resulting in severe financial or economic crises. Whereas Stiglitz (1990) quoted the definition of bubble as follows: “the basic intuition is straightforward: if the reason that the price is high today is only because investors believe that the selling price will be high tomorrow – when ‘fundamental’ factors do not seem to justify such a price – then a bubble exists”.

As per Flood and Hodrick (1990) a bubble is a deviation of the current market price of the asset (such as stocks or real estate) from the value implied by market fundamentals. However, Smith and Smith (2006) presented a situation in which the market prices of the assets rise far above the present value of the anticipated cash flow from the asset.

In this study the bubble is defined as an abnormal deviation of housing market prices from the fundamental value; particularly for the control chart as discussed later, this paper classifies the price deviation into three zones based on the normal distribution in probability theory.

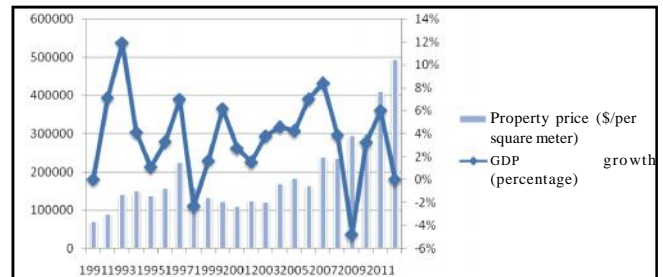
**Housing fundamentals in Hong Kong:**

The Housing market of Hong Kong is very volatile and important as it consists the major part in China. Recently, Hong Kong experienced a tremendous growth in housing because of increase in urbanization and per capita disposable

income (PCDI) of households. At the same time, supply of housing has also increased.

Over the time period between 2003 and 2011, GDP of Hong Kong increased thrice, this implies an increase in the purchasing power of the country. Since, the purchasing power of a household is mainly dependent on the income; hence, in this paper GDP of Hong Kong is taken to find out the prosperity of this country.

As compared to many other countries, fast urbanization and household structure are the driving factor to the housing market in China. But in Hong Kong, since last two decades,



Source: GDP growth data: world bank: <http://data.worldbank.org/country/hong-kong-sar-china>  
 Housing price data: [http://www.rvd.gov.hk/en/property\\_market\\_statistics/index.html](http://www.rvd.gov.hk/en/property_market_statistics/index.html)  
 (Private retail - Average Rents and Prices (from 1989))

**Fig. 1: Housing supply and demand**

**Table 1: Population of Hong Kong**

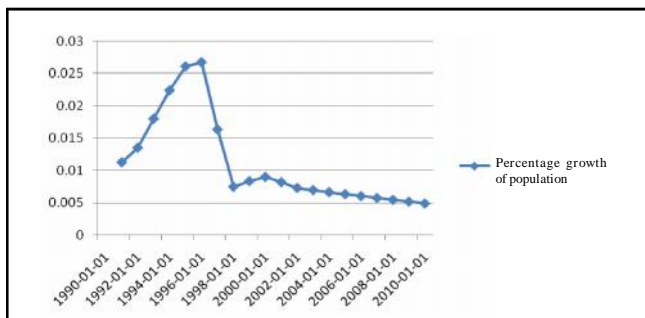
Year	Total population (in 1,000) Hong Kong	Percentage growth
1990-01-01	5687.959	
1991-01-01	5752.000	1.13%
1992-01-01	5829.696	1.35%
1993-01-01	5934.511	1.80%
1994-01-01	6067.288	2.24%
1995-01-01	6225.347	2.61%
1996-01-01	6391.564	2.67%
1997-01-01	6495.918	1.63%
1998-01-01	6544.564	0.75%
1999-01-01	6599.307	0.84%
2000-01-01	6658.720	0.90%
2001-01-01	6713.376	0.82%
2002-01-01	6762.476	0.73%
2003-01-01	6809.738	0.70%
2004-01-01	6855.125	0.67%
2005-01-01	6898.686	0.64%
2006-01-01	6940.432	0.61%
2007-01-01	6980.412	0.58%
2008-01-01	7018.636	0.55%
2009-01-01	7055.071	0.52%
2010-01-01	7089.705	0.49%

the population just increased by an average of 4.6 per cent, The following graph shows the housing supply and demand in Hong Kong (Fig. 1).

Fig. 1 clearly shows the volatility in GDP and property prices in Hong Kong. Although there has been a constant increase in the property prices but the GDP increased and decreased drastically over the period of 2003-2011.

As far as population is concerned, following table gives an insight on the population change in Hong Kong.

Table 1 and Fig. 2 show that although the population has been increased but the increase was very little. A compared to other countries, here in Hong Kong the percentage increase in the population was little over a period of time.



Source: University of Pennsylvania

Fig. 2 : Percentage growth of population of Hong Kong

**Framework of analysis and measurement strategy:**

The theory of rational expectation is already explained by various researchers. One way to assess whether a housing bubble exists is to calculate the deviation between the observed housing prices and the rational expectation price.

The rational expectation model is built on the theory of asset pricing with the present value model. The theory states that housing prices depend upon the return and utility of a property. According to the theory of rational expectation, a bubble must grow fast enough to earn the expected return.

The arbitrage-free situation can be described by the formula:

$$E(R_t) = \frac{E(P_{t+1}) - P_t + E(D_{t+1})}{P_t} \dots\dots(1)$$

where,  $P_t$  is the market price at time  $t$ ,  $D_t$  is the rent paid to the owner of the property at  $t$ , and  $R_t$  is the expected return (or discount rate) composed of the risk-free rate and risk premium.  $E$  denotes the expectations operator.

By rearranging Equation (1), the current price of a housing unit can be expressed as the present value of the expected price and expected rent the next period:

$$P_t = E(D_{t+1}) + E(P_{t+1}) \dots\dots(2)$$

where, “ $\lambda$ ” means the discount factor,  $\lambda = 1/(1+r)$ ,  $E(R_t) = r$  and “ $r$ ” means risk adjusted constant rate ( $0 < r < 1$ ). Substitute the expression for  $P_{t+1}$  into the original Equation (2), then Equation (2) can be replaced with:

$$P_t = E[D_{t+1} + E(D_{t+2} + P_{t+2})] \dots\dots(3)$$

Equation (2) can be solved by recursively substituting the expression for  $P_{t+i}$  into

$$P_t = \sum_{i=1}^{\infty} \lambda^i E(D_{t+1+i}) + \lim_{i \rightarrow \infty} \lambda^i E(P_{t+1+i}) \dots\dots(4)$$

the original equation with an infinite number of times (i):

Then, if we assume that the expected price infinitely far in the future is equal to zero, the actual  $P_t$  will equal to the fundamental price ( $P^*t$ ), which can be defined as:

$$P^*t = \sum_{i=1}^{\infty} \lambda^i E(D_{t+1+i}) \dots\dots(5)$$

If the actual price is not in line with  $P^*t$ , a deviation from the fundamental price will occur. In this case, it is possible to investigate the magnitude of the deviation, *i.e.* a bubble. The

$$B_t = \lim_{i \rightarrow \infty} \lambda^i E(P_{t+1+i}) + \epsilon_t \dots\dots(6)$$

bubble is defined as:

where,  $B_t$ , referred to as a rational bubble in most literature, represents the deviation of the actual price from its fundamental value  $P^*t$ , which can also be regarded as the rational expectation price without a bubble.  $\epsilon_t$  denotes the error term. More generally, the bubble can be defined as:

$$B_t = P_t - P^*t \dots\dots(7)$$

Considering the lack of a long time series data about the return of a property, it appears inappropriate to employ directly Equation (5) to compute the rational expectation prices. However, this study replaces Equation (5) with the following formula to compute the rational expectation price of housing:

$$P^*t = P_{t-1}(1+r) - D_{t-1} \dots\dots(8)$$

where  $P^*t$  means the housing price with perfect foresight, *i.e.* rational housing price, “ $r$ ” is the equilibrium return to capital, *i.e.* discount rate. Now, taking the interest rate at the rate 3 per cent (equilibrium return to capital) on the property price minus the rental income from the house. Then equation (7) can be translated into the following form:

$$B_t = P_t - [P_{t-1}(1+r) - D_{t-1}] \dots\dots(9)$$

Clearly, the deviation of market prices from the rational expectation price states the existence of a bubble. The larger

the deviation, the more likely is the existence of a bubble.

Fixing the data of market prices and interest rate in the above equation, we got the rational expectation prices, and using computer software e-views, we got the deviations of the market price from the rational expectation prices, which came out to be very large, representing a bubble in the housing sector in Hong Kong. Fig. 3 shows the same.

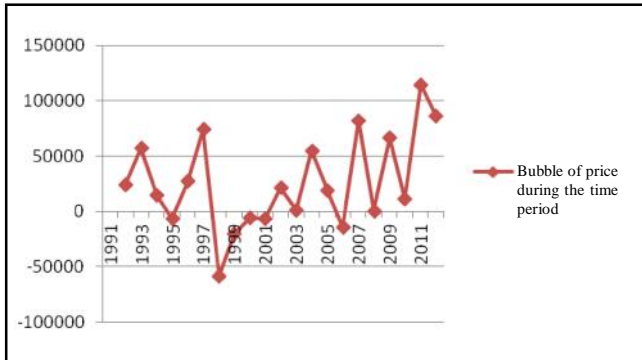


Fig. 3: Bubble of price during the time period

From Fig. 3 it is clear that there was a housing bubble in Hong Kong. After 2001 there was so much variation between the rational price of house and the actual price of house.

#### Control chart:

This study introduces the control chart to recognize the housing price shifts. The control chart is an effective statistical tool used for quality control in the manufacturing sector. It is composed of three lines: midline ( $\mu$ ), upper control line (UCL) and lower control line (LCL). In designing the control chart for housing price changes, this study assumes that the change of housing prices follows a standard normal distribution. If the mean and standard deviation are denoted by  $\mu$  and  $\sigma$ , then the probability that the price growth will stay within the range  $\pm 3\sigma$  is equal to 0.997. The lines at  $\mu \pm 3\sigma$  are set as the UCL and LCL, respectively. If the change of housing prices lies within this area, it is considered to be under control, otherwise, this study will infer that there is a housing bubble (above UCL).

To design the empirical control chart for Hong Kong, it is important to set the three key control lines; midline, upper

Table 2 : Bubble of property price during the time period

Year	Property price Pt(Yaun/M2)	rf	rp 3%	Rent Rent (\$/Sq. meter per Month)	Rational price	Deviation	% of deviation
1991	70 600		3%	597.9			
1992	90 213		3%	741.4	65543.2	-24 670	-38%
1993	141 784		3%	820.2	84022.59	-57 761	-69%
1994	150 924		3%	943.4	136195.1	-14 729	-11%
1995	137 727		3%	1 028.9	144130.9	6 404	4%
1996	156 789		3%	986.1	129512	-27 277	-21%
1997	224 280		3%	1 105.3	149659.5	-74 621	-50%
1998	159 163		3%	907	217744.8	58 582	27%
1999	132 963		3%	774	153053.9	20 091	13%
2000	121 920	2.8 90	3%	798	127663.9	5 744	4%
2001	109 710	2.8 90	3%	858	116001.6	6 292	5%
2002	124 478	2.2 10	3%	791	102705.3	-21 773	-21%
2003	120 041	2.3 20	3%	750	118720.3	-1 321	-1%
2004	169 879	2.7 40	3%	844	114642.2	-55 237	-48%
2005	183 927	3.3 20	3%	939	164847.4	-19 080	-12%
2006	164 077	3.2 70	3%	1 001	178176.8	14 100	8%
2007	239 540	3.3 90	3%	1 060	156987.3	-82 553	-53%
2008	234 851		3%	1 189	234006.2	- 845	0%
2009	294 149		3%	1 079	227628.5	-66 520	-29%
2010	301 514		3%	1 239	290025.5	-11 489	-4%
2011	410 697		3%	1 296	295691.4	-115 006	-39%
2012	493 764		3%	1 458	407465.9	-86 298	-21%

control limit and lower control limit. Using the available data, the average property price growth rate from 1991 to 2012 is set as the midline of the control chart for Hong Kong.

In Fig. 4 the prices are in the range of UCL and LCL, but there was so much fluctuation in the same.

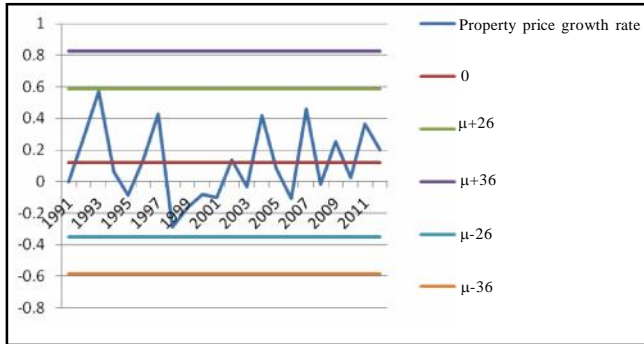


Fig. 4: Control chart

**Mortgage loans:**

Mortgage loan plays an important role in the housing market. Data on the national loan are used to analyze the

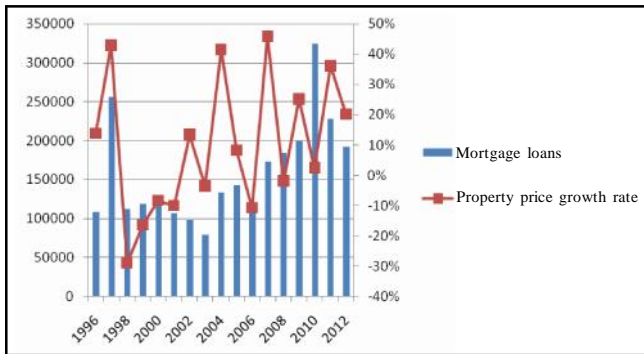


Fig. 5: Graphical presentation between mortgage loans and property price growth rate

housing bubble. We try to find out like how the price of housing will react with respect to the loan amount. Fig. 5 is the graphical representation of the same.

From Fig. 5, it is clear that as the loan amount increases in the housing market, the housing price also increases in Hong Kong.

**Conclusion:**

This paper tried to examine whether there is a housing bubble in the Hong Kong or not. By all the above stated analysis, it was found that there was housing bubble in the Hong Kong, since, population is not growing at a very rapid rate of growth, the GDP is also not growing at the rate as the housing price are increasing in Hong Kong. Furthermore, by using the rational price model, it was found that there was a huge gap between the actual housing price in Hong Kong and the rational housing price of the same, thus an existence of the housing bubble in Hong Kong.

Also by analyzing the control chart, we came on the conclusion that the price are in the control limit over the whole time period, but they fluctuate so much, showing that the housing market is very volatile in the Hong Kong.

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