# THE IMMINENT HOUSING COLLAPSE - WILL HISTORY REPEAT ITSELF?

**Ping-fu (Brian), LAI, DBA***
**Ho Sum CHAN, MSc Fin****

**Abstract**

Human being is not particularly good at learning from history. Either we haven't lived long enough to live through every moment of it, or we just forget what we have lived through. Today, many analysts' cranky critiques are still very bullish, and are trying hard to explain intuitively why Hong Kong property prices can't drop, and how much healthier the market is. However, a remarkably stagnant property market in terms of transaction volume, even though prices are still holding up for the time being, is far more sceptical about markets' inherent rationality. There is very little doubt that home prices are among the most expensive on earth; Demographic trend is working against the market; Economic uncertainties of U.S fiscal cliff increase; Mainland China slowdown curbs Hong Kong growth; Interest rates on the only way up; Government's moves to check speculation and the Illusion of supply shortage etc. This is the prerequisite to call anything a "bubble", and the property market in certainly meets these criteria. The purpose of this paper is to use an econometric model and descriptive statistical analysis to illustrate Hong Kong resident property prices correction is imminent today.

**Keywords:** Housing, Property, Bubble, Resident, Hong Kong

**JEL Classification:** F3

* *Assistant Professor, Division of Business and Management, United International College, Beijing Normal University Hong Kong Baptist University.*
** *Researcher, ABRS International Consultancy.*

## 1. Introduction

General market overview - The volatility of Hong Kong property prices is world famous. Before the Asian financial crisis, the Hong Kong property market rose continuously for nearly a decade. But when the crisis hit and the government mishandled its reaction, property prices sunk precipitously until 2003, losing 50% of their peak 1997 values. Equally astonishing, the subsequent comeback - though interrupted by the US financial crisis in 2008 - was so powerful that residential property prices rose 29% in 2009, rose 21% in 2010, rose 18% in 2011 and rose another 15% in 2012. Overall, residential housing prices rose about 78% from the bottom in late 2008 after the Great Financial Crisis. Consequently, home prices in Hong Kong are now back to the most expensive in the world.

"This is not the end, though it is not even the beginning of the end. It is perhaps the end of the beginning"– Sir Winston Churchill, 1942. Time flies, particularly the happy one. As property prices are getting more and more expensive, we find less and less reasons why we should stay bullish. "Beginning of the end" or "end of beginning", this is not the question. The thing is it is going to the end, and now we are observing some signs of key risks factors that would trigger a huge housing correction. Before conducting the empirical analysis, it is important to understand the theoretical relationships between the economic fact and home price.

Theoretical background - The key to call for the end of bull market in Hong Kong real estate is to identify something that could trigger property bubble to burst. Since the home price in Hong Kong have risen over 10% to surpass 1997 peaks at their record high, and, on the other hands, property gloom spreads on mainland China in the Q2 of 2013, all those have made Hong Kong property market more risky to us than it was, here are some vital reasons why I turn from slightly cautious to downright bearish:

**a) Hong Kong property prices are really expensive**

Home price in Hong Kong are the highest it's ever been, the Centa-City Leading Index (CCL), which tracks resident property market prices - with the level in July 1997 set at 100 - shows flat prices rose to an index level of 114.57 on 9 Dec 2012. This surpassed the previous record high of 102.93 in October 1997. Even though properties look very affordable, according to the 8th Annual Demographical International Housing Affordability Survey 2012, Hong

Kong continued to be the most unaffordable market out of 81 major metropolitan areas.

**b) Illusion of supply shortage**

The most frequently cited reason for high home prices are the supply shortfall, though some pundits has debunked this myth: Hong Kong private residential market has about 210,000 excess flats relative to the true demand, which should well be able to buffer any alleged supply shortfall for 2-3 years. In fact, should the property market correct, the same group of people who are arguing for the shortage of supply probably argue that there are too many flats around.

**c) Demographic trend is working against the market**

Demographics have a weird relationship with asset prices. Real estate markets all over the world will face demographic headwinds, and there is no different for China and Hong Kong. Similar to China, the ratio of working-age population to total population in Hong Kong peaked in 2010, and population ageing will happen at an even faster rate than China. By 2050, the population aged 15 to 59 will account for less than half of total population, down from about 70% in 2010 according to UN Population Division's forecast.

Population growth is very slow. Worse still, like many other parts of the world, the population is ageing, and that is going to be negative for real estate market. Property market volatility aside, Hong Kong will face a strong demographic headwind, which means that the long-term trend is more likely to go downward.

**d) Interest rates on the only way up**

The Federal Reserve Board announced, once again, that it was committed to maintaining its extremely low interest rate policy through 2014. Nearly four years have passed since the Fed adopted the policy. What began as an emergency measure to support the entire financial system in late 2008 has seemingly become permanent policy at the Fed.

Interest rates in Hong Kong do not always move with that of the United States. As long as funds are flowing away from Hong Kong, market interest rates will probably rise even the Federal Reserve was keeping interest rates low. The increasingly clouded economic outlook may trigger some funds flowing away from Hong Kong, which will decrease money supply and put upward pressure on interest rates.

Everyone knows that interest rates cannot remain low forever. Banks in Hong Kong have raised mortgage interest rates marginally, not because of any earlier-than-expected interest rates hikes in the United States, but to increase net interest margin. Although not consequential by itself, this gives a signal that interest rates cannot be at record low forever.

**e) Mainland slowdown spills over into Hong Kong economy**

Our neighbour, Mainland China, is fighting with inflation and tightening policy. More-aggressive-than-expected monetary tightening in China will inevitably slow down the economy, and that will be negative for Hong Kong real estate. The World Bank cut its forecast for China's economic growth this year to 8.2%, down from 8.4% previously, saying external weakness amid Europe's lingering debt crisis and further domestic property market adjustment would weigh on the world's second largest economy.

Hong Kong is no longer a fast-growing economy. It's registered lowest rate of economic growth in more than 2 years in the 1Q, with a slowdown on mainland having a knock-on effect. The GDP grew just 0.4% from a year ago, sharply down on the 3% growth recorded in the 4Q of 2011. These data showed Hong Kong economic activity was slackening. As a reminder, unless "China is fixed" and quite soon, the situation will first get worse before it gets much worse.

**f) Mainlanders stay away**

The Hong Kong Government's moves to check real estate speculation and prevent the housing bubble from bursting are working. Mainlander property buyers have almost disappeared from the Hong Kong property market since the government introduced then Buyer's Stamp Duty (BSD), targeting non-permanent residents and company buyers.

Mainland visitors coming to Hong Kong to buy property have plunged 70% since the measure was introduced, while those who actually invested in property in Hong Kong fell to almost zero. Obviously the proportion of mainlanders among property buyers in Hong Kong has been falling since last year, even before the government's cooling measures.

**g) Eurozone uncertainties increase**

The Organization for Economic Cooperation and Development (OECD) warns of risk of Eurozone falling into 'severe recession'. Back in those days when the US subprime crisis emerged, many people

thought it was just a blip. Now, many people think that the Eurozone debt crisis is merely going to be a blip. However, the market is genuinely worried about the potential disorderly default and exit by Greece and what that means in terms of contagion risks.

## 1. Literature review

Because of the Federal Reserve Board announced, once again, that it was committed to maintaining its extremely low interest rate policy through 2014. Andrew (Nov 2011) of Barclays Capital was the first buy-side analyst and turned bullish on Hong Kong property sector at almost the same time as Lawrence (Oct 2011) of Morgan Stanley, they came out and published their analysis report which stayed that the low interest rate environment would not wreaks havoc, but also stimulates business investment and enables consumers to more easily finance big ticket purchases such as housing. “The low interest environment in Hong Kong is pushing more local residents to buy properties for the preservation of their purchasing power said by Hong Kong Monetary Authority (HKMA) Chief Executive Officer, Norman Chan (April 2012).

We have already aware about something very obvious but Andrew and Lawrence didn't thought so: Federal Reserve does not determine interest rates in Hong Kong, but the Hong Kong banking system does. With the monetary tightening in China as well as increasing macro risks, we have long expected that these factors would tighten monetary condition. Indeed, we have seen gradual tightening of monetary condition in Hong Kong over the past a year, yet we can still see quite a few people not getting it despite the latest monetary statistics from HKMA showing that all money supply measures have dropped year-on-year while loan-to-deposit ratio continued to surge.

Although Federal Reserve Chairman Ben S. Bernanke promises to continue his near-zero interest rate policy, everyone knows that interest rates cannot remain low forever. Banks in Hong Kong have raised mortgage interest rates marginally, not because of any earlier-than-expected interest rates hikes in the United States, but to increase net interest margin. Although not consequential by itself, this gives a signal that interest rates cannot be at record low forever.

A recent study conducted by Yu Jincui and Wang Lei (June 2011) of the university of southern California, which published in the journal Proceedings of the National Academy of Economics,

concluded that the Hong Kong property market has been resilient so far despite the fact of the macro environment is getting increasingly unfavourable. This is not too surprising, as the buyers, analysts and pundits alike are still playing their bullish horns by emphasizing that the property market in Hong Kong is a market for 1.3 billion people, and the supply in Hong Kong is limited, thus there is no way that property prices can correct.

The methodology of this report is too superficial. By looking at the annual supply, combined with the wishful thinking that Chinese buyers will continue to pour in for ever and ever, one is ignoring the fact that Hong Kong economy is extremely sensitive to external shocks, and so does the Hong Kong property market. We should be bearish stance on Hong Kong property right now has been based on the fact that the Chinese government and People's Bank of China are tightening policy, which, as a side-effect, also tighten monetary condition in Hong Kong.

Dennis Lim (June 2012), co-chief executive officer of Templeton asset Management (Asia), sees there is going to be a soft landing, as opposed to a hard landing in China. He defines growth of 7% or more as a soft landing. China came through the 2008-2009 crisis better than any other country in the world, and he thinks China will this time, too. Therefore, this kind of soft landing with at least 7% growth would not trigger the housing correction in Hong Kong.

Much of the slowdown in Hong Kong can be traced to the mainland China, where consumer inflation eased with the CPI rising 3.4% in March 2012, and HSBC manufacturing PMI in May 2012 declined to 48.7 from 49.3 in April. It was a bigger decline than we expected, albeit recent data have indicated increasing downside risk. The official China Manufacturing PMI finally reverted to the reality that HSBC Manufacturing PMI has been arguing for and fell for the first time in six months in May 2012. The drop is the largest since February 2010. While still above 50, the lowest level of expansion in five months, or 50.4 technically, down from 53.4, and missing expectations of 52.0, it seems another engine of global growth just sputtered finally.

Chinese economy leads us to believe that a hard landing in Chinese economy is becoming increasingly likely. A hard landing of the Chinese economy will probably spill over to Hong Kong as Hong Kong is increasingly dependent on the economic growth of mainland China. Thus, in the event of hard landing, expect Chinese buyers to

stop buying properties in Hong Kong, or even start selling properties in Hong Kong to save their own businesses in China.

"The current price hike reflects the property market is dominated by home buyers who bought houses for residential use. I predict the home price, in terms of CCL, will rise further for the near future, reflecting the local property market's buoyancy," Centaline Property Agency Research Director Wong Leung Sing (March 2012) predicted. He believe prices will keep rising this couple of years for reason that the supply shortage in Hong Kong, local and foreign investors seems to be finding Hong Kong property to be an attractive investment, therefore, pushing them to buy properties for the preservation of their purchasing power.

The most frequently cited reason for high home prices are the supply shortfall, though I have debunked this myth: Hong Kong private residential market has about 210,000 excess flats relative to the true demand, which should well be able to buffer any alleged supply shortfall for 2-3 years. In fact, should the property market correct; the same group of people who are arguing for the shortage of supply (e.g. pundits, politicians, and some analysts) will probably argue that there are too many flats around.

A more plausible reason to think the market may be close to its peak is a looming shift in government policy. C.Y. Leung, who takes over in July as Hong Kong's new chief executive, has made it clear that he wants to end the expensive-land policies pursued by the outgoing administration. He wants to speed up the rollout of subsidized housing, which will dampen the private market. More important, he promises to make more land available: for example through zoning changes, the redevelopment of old residential sites and land-reclamation projects.

An IMF working paper develops a structural macro econometric model of the world economy, disaggregated into thirty five national economies. “A variety of monetary policy analysis, fiscal policy analysis, spillover analysis, and forecasting applications of the estimated model are demonstrated, based on a Bayesian framework for conditioning on judgment.”

"Somebody tell that, now the bull market is entering the second period. The so-called first phase of the bull market is increasing price, but the rental return is above the rate of increase in property prices. When it comes to the second period, prices rose above the rental rate." says Patrick Chovanec (April 2012), a business professor at Tsinghua University. "Historically it's also quite

interesting, if encountering a U.S. recession when the Hong Kong property market is bearish, it will turn to be bullish in one or two years. There has been like this in the past 30 years. If encountering a U.S. recession when it's the bull market in Hong Kong property market, it will turn to the second phase from the first phase of the bull market period. Take the 1990s for example, if not encountering the U.S. recession, we wouldn't have encountered the crazily increasing property. Now, if not encountering a recession in the U.S. after Lehman, the Hong Kong property market should not be so crazy. In short, basically, it's time to buy a property now." he added.

Katrina Ell (February 2012), an economist at Moody's analytics in Hong Kong has developed a structural macro-econometric model of Hong Kong real estate market, which stated that Real estate prices in Hong Kong will certainly fall in short term only, the long term atmosphere of Hong Kong real estate market has not been adjusted. "Despite the moderate downtick in recent amount of transaction, this is a stellar jobs report and paints a very unhealthy picture of the property market," said Ell.

Some economists are still not sceptical for the long term scenario. There is already massive overcapacity, but they are still saying everything is going to be fine for the long terms. Hong Kong today looks like Japan in 1990. Low birth rate and population ageing will have negative impact on residential housing demand, which are certainly somewhat similar to what we see in Japan today. Japan started to implement increasingly tough real estate market regulation in the late 1980s with no effect, until they became effective. As there is a big lag between the implementation of policy and the policy taking effect, the impact became somewhat catastrophic for Japan (as we know it) when they finally became long lasting negative effect.

Hong Kong risk is increasing by the day. This is because of the government's repeated introduction of real estate market regulations. This is similar to what happened in Japan. Various regulations were introduced during the late 1980s to rein in the overheating real estate market. Because of the upward momentum in real estate prices, initially there is no effect regardless of how many regulations are introduced. However, this is simply because of the time lag until the effects materialize. Nevertheless, since regulators desire swift results, they rapidly implement a succession of regulations. When the effects of these regulations take times to build up, the real estate market collapses.

A Richmond Fed paper investigates changes in structural correlations between housing price and either the new government regulation (SSD) and bank loan (mortgage) policy in Hong Kong during both the unusual periods. The correlation between price and either of the two other series exhibits a remarkably weak co-movement. The report holds that Real estate prices will certainly fall in short terms with 5% to 10% only, because government regulation is to start directly from the loans, those who lack the financial capital will be affected the most, and with the greatest deterrent effect, for they simply cannot move without the loan. But for group speculators, those are the main factor to drive the price up, the influence may be relatively small.

"While it seems that rents are rising at the expense of home values, the opposite is true. A thriving rental market will stimulate home sales, as investors snap up low-priced inventory to convert to rentals. That, in turn, will lower the number of homes on the market, which will eventually help put a floor under the value of all homes," says Zillow chief economist Stan Humphries (March 2012). However, more supply of rental homes, especially single family, could slow the upward trajectory of rent rates, which in turn would make renting more attractive and buying less so. It just raises a red flag to see home affordability at a record high, investors rushing in, and rents so strongly outpacing home values.

Right now investors are rushing to get in on cheap foreclosures, hoping to turn them around for quick rental income. So what exactly is the tipping point, given that mortgage availability is still tough, consumer confidence in housing is still weak, and employment, while improving, is still not where it needs to be to spur strong buyer demand.

A Universal Investments LP working paper by Mark Yip (October 2011) investigates the effect of fiscal transparency on market assessments of sovereign risk, as measured by credit ratings. "Our results suggest that a one standard deviation improvement in fiscal transparency index is associated with a significant increase in credit ratings: by 0.7 and 1 notches in advanced and developing economies respectively."

Neil Monnery (April 2012), Senior Vice President and Director of Boston Consulting Group, In his recent research "Safe as Houses? A Historical Analysis of Property Prices", he presents data from an array of nations going back several centuries. What he discovers is that real house prices have generally been flat over time, or have

increased by at most 1% a year. Rather like gold, then, house prices have been a good store of value rather than an automatic route to riches.

Many people think that owning a house in Hong Kong is a certain money-maker, but this is not the historical experience among the world. The exception is the period of the past 15 years or so, when real house prices took off in a few countries. In Germany and Switzerland the trend has been flat-to-lower. In Japan there has been a decline which has pretty much wiped out the rise in house prices that occurred between 1970 and 1990. So there are really three types of market to explain: America and Japan, where real prices rose sharply then corrected; those where they rose sharply but have yet to lose all their gains; and those where the markets have been flat in real terms.

The latest Case-Shiller home price data is out and it beat analysts' expectations as home prices rose 0.67% versus the 0.3% rise which was expected. Higher price data in recent months has led some - like Business Insider deputy editor Joe Weisenthal - to call a bottom in the housing market. Major risks to such calls include rising foreclosure starts. Some experts like Gluskin Sheff chief economist David Rosenberg think the housing market has lower to go. Regardless, what is observable is that many major cities around the United States are seeing rapid increases in both the amount of homes being sold and the prices at which they are selling. And other markets could soon follow.

Martin Fieldstein (September 2012) of Swire Properties Asia estimates the fiscal cliff multiplier effect of the pending tax and spending measures is close to zero, while Willem Buiter (November 2012), global chief economist of Citi, estimates they are not robust and without economically significant on the price of Hong Kong property.

The U.S. fiscal cliff is the combination of more than $600 billion in automatic tax increases and spending cuts scheduled to take effect at the beginning of 2013. The combination of spending cuts and tax increases scheduled to take place at the outset of 2013 stands to hinder economic growth due to substantial income effects and liquidity constraints. The results may be worsened by distribution concerns. There is no consensus among economists about the efficacy of fiscal multipliers under most circumstances and the level of precision in predicting behavioural changes among households has eluded the dismal science for years.

The likelihood that policy makers will permit all of the scheduled fiscal changes to occur is low. Based on Robert Barros' academic working paper, the full fiscal shock of $600 billion, estimated a simple fiscal multiplier of 0.75, it would result in real GDP being 3.1% less than what it otherwise would be.

The Hong Kong government imposed a Special Stamp Duty (SSD) and minimum down payments ranging from 10% and 50% imposed on foreign buyers acquiring a property priced not lower than HK$6 million and HK$10 million, respectively. Mainland investors belonging to the elite, millionaire circle are still keen increasing their property investments overseas next year, according to a Citibank consumer survey (October 2012) recently released indicating the investment trends of the Chinese city's affluent class. The survey said that 55% of the wealthy Mainland residents with at least a million in liquid assets cited that their preferred investment is in Hong Kong property market because of the relative strength of the CNY.

Another interview-survey report, which was done, after government introduced the BSD, by the University of Hong Kong Social Sciences Research Centre (December 2012) among 4100 mainlanders aged 20 to 70 between Oct-.Nov. 2012, revealed that over 90% will not place their investments on Hong Kong property assets next one or two years. The remaining 10% of the respondents have cautioned against property market investments.

The report added that, at the moment, impact of BSD, mainlanders wealthy segment is very conservative, thus, only less than 5% bought property by mainlanders in 2013. This perceived investment trend had been influenced by the restrictions set by the Hong Kong government to ease the strain in the property market.

**2. Methodology and data**

Price of property goes up & down is one of the most difficult phenomena for economists to understand. At the theoretical level, many models are available as a framework for applied analysis. However, the models tend to contain a limited number of variables, and these are normally the proximate determinants of property price. They are probably not the underlying determinants. It might be necessary to go behind the proximate determinants if we are to understand why property price has grown so fast. This could be particularly important in the case of a transition economy. In the movement from a centrally planned economy towards a market

economy, many institutional variables are changing rapidly, in a way which would not be true of advanced market economies.

No single methodological approach on its own can explain something as complicated as real estate. Accordingly, we adopt and encompass several approaches: economic theory, international history, econometric and technical analysis. We regard this as a particular strength of our contribution. It corresponds closely to what IMF Research Reports (Dec 2010 and Nov 2011), which analysis sharp house price increase in Hong Kong, have termed 'analytic narrative', that is, a country study which is explicitly informed and framed by growth theory and growth econometrics. However, whereas IMF objective is primarily to improve our understanding of property price climbing using the country analytic narrative as a backdrop and secondarily to understand the growth of the country being studied, our priorities are reversed.

The mathematical toolbox that people use to work with historical data is somewhat grandly called historical time-series analysis. Thick books have been written about it, but we will use only a couple of ideas out of that toolbox. The first of them, our vital analytic model, is linear regression, which used to establish a relationship between two or more time series. Ever since the dawn of modern portfolio theory in the 1950s, academic researchers have used multiple regression model to relate returns on investment to returns on the market as a whole.

- **Factor Analysis**

Before we perform the regression analysis, factor analysis will be executed that is a technique to identify factors the statistically explain the variation and covariation among measures. From this perspective, factor analysis can be viewed as a data-reduction method since it reduces our large number of overlapping measured variables to a much smaller set of factors. More specifically, the factors can correspond to constructs of a theory that helps us understand behaviour of Hong Kong property market.

Our factor analysis requires two stages, factor extraction and factor rotation. The primary objective of the first stage is to make an initial decision about the number of factors underlying a set of measured variables. The goal of the second stage is twofold: (1) to statistically manipulate the results to make the factor more interpretable and (2) to make final decisions about the number of underlying factors.

A single assumption underlies factor analysis extraction in general, while an additional assumption is required for maximum likelihood methods.

*Assumption 1*: the measured variable is linearly related to the factors plus error.

This assumption is likely to be violated if items are factor-analyzed, particularly our data items have very limited response scales, and the item distribution vary in skewness. Violation of this assumption may lead to the identification of spurious factors.

*Assumption 2*: the X test for the maximum likelihood solution assumes that the measured variables are multivariate normally distributed.

This assumption is problematic when the factor analysis is conducted on items.

- **Stepwise Multiple Regression**

Stepwise multiple regression analyses are used to explore the statistical relationships between house price index and meteorological parameters. It is a way of choosing predictors of a particular dependent variable on the basis of statistical criteria. The stepwise technique permits screening of a large number of potentially useful spectral observations (predictors) to isolate those few that contribute most to the explanation of the variance of a particular meteorological parameter. Essentially the statistical procedure decides which independent variable is the best predictor, the second best predictor, etc.

There are a number of multiple regression variants in our research. Stepwise is usually a good choice though one can enter all variables simultaneously as an alternative. It combines the best of forward and backward selection. Thus, one can enter all of the variables simultaneously and gradually eliminate predictors one by one if elimination does little to change the overall prediction. The emphasis is on finding the best predictors at each stage. When predictors are highly correlated with each other and with the dependent variable, often one variable becomes listed as a predictor and the other variable is not listed. This does not mean that the latter variable is not a predictor, merely it adds nothing to the prediction that the first predictor has not already done. Sometimes the best predictor is only marginally better than the second predictor and minor variations in the procedures may affect which of the two is chosen as the predictor.

### 3. Data and model description

Our empirical analysis is based on worldwide aggregate series, including Hong Kong Housing Society, Rating and Valuation Department, Census and Statistics Department, Land Registry, International Monetary Fund, The World Bank, and National Bureau of Statistics. We have collected annual data for the period of 1995 to 2012. And we will also use latest monthly data of Q1 2013 for our technical analysis.

In our multiple regression model we have one dependent variable (ŷ) and several independent variables (β) which are potential predictors of the former. The best model is one that makes sense to us and which explains as much variation of Y with as few as possible βs. The reason we want few variables is that if we are only guided by a desire to increase the R2 and thoughtlessly add or remove variables into the model, then the equation will be impossible to interpret. The statistical equation is:

$$\hat{y}=\beta 0+\beta 1(RENT)+\beta 2\ (COMPL)+\beta 3\ (VACAN)+\beta 4\ (GDPcap)+\beta 5\ (DHno)+\beta 6\ (DHsize)+\beta 7\ (DHinco)+\beta 8\ (SPreg)+\beta 9\ (SPval)+\beta 10\ (AFF)+\beta 11\ (M1)+\beta 12\ (M2)+\beta 13\ (M3)+\beta 14\ (HKD/CNY)+\beta 15\ (UNEM)+\beta 16\ (CPI)+\varepsilon$$

The model provides updated estimates of housing price index using information about changes of the market environment.

- ŷ: Price Indices - The overall price index of private residential units, It uses the 1999 price level as the base point of 100.
- (RENT): Rental Indices - It reflects the movements of rent paid by households in Hong Kong.
- (COMPL): Newly completed residential flats.
- (VACAN): Vacancy - The percentage of all units or space that is unoccupied or not rented.
- (GDPcap): GDP per Capita - A measure of the total output in Hong Kong that takes the GDP and divides it by the number of Hong Kong people.
- (DHno): Number of Domestic Household
- (DHsize): Average Domestic Household Size
- (DHinco): Median Domestic Household Income
- (SPreg): Sales and Purchase Number of Registration
- (SPval): Sales and Purchase Value of Consideration
- (AFF): Home affordability ratio - the household monthly income ratio that is used in the calculations of home mortgage loans repayment.

- (M1): Money Supply - Contains transactional balances and currency.
- (M2): Money Supply - Contains consumer savings accounts and other interest-bearing consumer accounts. M2 includes M1 plus short-term time deposits in banks.
- (M3): Money Supply - Includes M2 plus longer-term time deposits.
- (HKD/CNY): Current exchange rate Hong Kong Dollar to China Yuan Renminbi.
- (UNEM): Unemployment Rate.
- (CPI): Consumer Price Index - y-o-y price movements of commodity/service sections which is useful for analysis the inflation that affects consumers.
- ε: Residual - the difference between the observed value of independent variable (y) and the predicted value ($\hat{y}$).

**The problem of multicollinearity**

In our multiple regression analysis procedure enters and removes variables in turn until the regression equation is satisfactory, but we may face the problem that if two or more of the independent variables are highly correlated, then it becomes difficult to estimate reliably their slopes and the slopes' standard errors. Indeed, it is possible that we might fail to reject the null hypothesis that one of the slopes is equal to 0 when in fact it should be rejected, because the effect of that particular β is masked by the effect of the other one with which the former is highly correlated. There are 3 things we can do to avoid the problem of correlated independent variables.

- Do a correlation matrix analysis of all the variables.
- Produce a measure of multicollinearity called tolerance (TOL).
- Compute a statistic called the variance inflation factor (VIF).

## 4. Empirical results

### 4.1. Factor analysis

We have run techniques designed to classify measured variables with reference to relatively few hypothetical reference variables or factors, which are taken to represent underlying substantive characteristics. In exploratory factor analysis, our aim is to ascertain the minimum number of factors needed to generate reasonably close approximations to the correlations in the original R-matrix. Another important aspect of exploratory analysis is rotation, whereby the factors, viewed as mathematical axes with respect to

which each variable can be plotted as a point in space, are rotated in order to achieve the 'simple structure' needed to interpret the factors.

**Factor Extraction**

The output showing the initial statistics and the scree plot from the principal components analysis is shown in Figure 1 and Figure 2.

In Figure 1, the eigenvalues are listed for component 1 through 18. These are important quantities. The total amount of variance of the variables in an analysis is equal to the number of variable. The extracted factors account for the variance among these variables. An eigenvalue is the amount of variance of the variables accounted for by a factor. An eigenvalue for a factor should be greater than or equal to zero and cannot exceed the total variance (in our studies is 18). The percent of variance of the variables accounted for by the factor, as shown in the output, is equal to the eigenvalue divided by the total amount of variance of the variables times 100.

**Figure 1**

**Total Variance Explained**

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 11.032 | 61.290 | 61.290 | 11.032 | 61.290 | 61.290 |
| 2 | 4.734 | 26.299 | 87.589 | 4.734 | 26.299 | 87.589 |
| 3 | 1.143 | 6.347 | 93.937 | 1.143 | 6.347 | 93.937 |
| 4 | .597 | 3.317 | 97.253 | | | |
| 5 | .183 | 1.019 | 98.272 | | | |
| 6 | .130 | .720 | 98.992 | | | |
| 7 | .082 | .455 | 99.446 | | | |
| 8 | .039 | .216 | 99.662 | | | |
| 9 | .029 | .163 | 99.825 | | | |
| 10 | .012 | .069 | 99.894 | | | |
| 11 | .009 | .049 | 99.942 | | | |
| 12 | .005 | .030 | 99.973 | | | |
| 13 | .003 | .014 | 99.987 | | | |
| 14 | .001 | .006 | 99.992 | | | |
| 15 | .001 | .005 | 99.997 | | | |
| 16 | .000 | .003 | 100.000 | | | |
| 17 | 8.582E-005 | .000 | 100.000 | | | |
| 18 | 1.002E-013 | 1.012E-013 | 100.000 | | | |

Extraction Method: Principal Component Analysis.

Eigenvalues are helpful in deciding how many factors should be used in our analysis. Many criteria have proposed in the literature for deciding how many factors to extract based on the magnitudes of the eigenvalues. One criterion is to retain all factors that have eigenvalues greater than 1. This criterion is the default option in

SPSS. It may not always yield accurate results. Another criterion is to examine the plot of the eigenvalues, also known as the scree test, and to retain all factors with eigenvalues in the sharp descent part of the plot before the eigenvalues start to level off. This criterion yields accurate results more frequently than the eigenvalue-greater-than-1 criterion. Based on the scree plot in Figure 2, we concluded that two factors should be rotated.

**Figure 2**

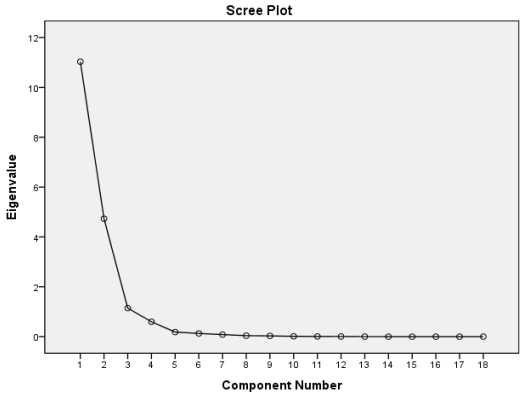



Figure 3 shows the unrotated component matrix containing the loading of the 18 variables on the two factors extracted.

**Figure 3**

**Component Matrix[a]**

| | Component | |
|---|---|---|
| | 1 | 2 |
| RENTAL_INDICES | .564 | .756 |
| COMPLETIONS | -.813 | -.205 |
| VACANCY | -.410 | -.858 |
| GDP | .995 | -.019 |
| Per_capita_GDP | .989 | .082 |
| CPI | .662 | .425 |
| Exchange_rate_HKD_CNY | .970 | -.034 |
| No_of_Domestic_Households | .866 | -.474 |
| Average_Domestic_Household_Size | -.841 | .451 |
| Median_Domestic_Household_Income | .940 | -.117 |
| Population | .865 | -.469 |
| Unemployment_Rate | -.374 | -.842 |
| Sale_and_Purchase_Registrations | .276 | .641 |
| Sale_and_Purchase_Value | .657 | .598 |
| Affordability_Ratio | -.220 | .950 |
| Money_supply_M1 | .958 | -.151 |
| Money_supply_M2 | .943 | -.289 |
| Money_supply_M3 | .972 | -.213 |

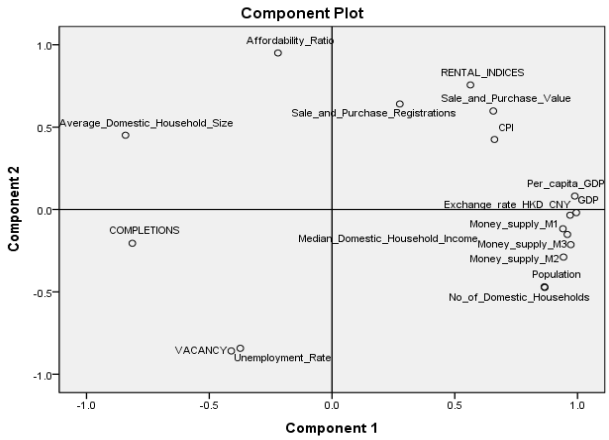
Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Since the components or factors can be thought of as graphical axes, each test can be plotted as a point on the graph with its loadings on the factors as coordinates. It has been done, the graph appears as in Figure 4.

Figure 4 Plot of the unrotated factor matrix, in which each of the 18 variables in the battery appears as a point in space with its loadings on the axes (factors) as coordinates

**Figure 4**




It can be seen that, in agreement with impression given by the correlation matrix, our factor analysis has extracted two factors. On the other hand, it is not easy to interpret the unrotated factor matrix. Both groups of tests show substantial loadings on both factors, which is not in accord with the obvious psychological interpretation of the pattern of correlations in the original R-matrix.

**Factor Rotation**

**Figure 5**

**Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 11.032 | 61.290 | 61.290 | 11.032 | 61.290 | 61.290 | 10.184 | 56.578 | 56.578 |
| 2 | 4.734 | 26.299 | 87.589 | 4.734 | 26.299 | 87.589 | 5.582 | 31.012 | 87.589 |
| 3 | 1.143 | 6.347 | 93.937 | | | | | | |
| 4 | .597 | 3.317 | 97.253 | | | | | | |
| 5 | .183 | 1.019 | 98.272 | | | | | | |
| 6 | .130 | .720 | 98.992 | | | | | | |
| 7 | .082 | .455 | 99.446 | | | | | | |
| 8 | .039 | .216 | 99.662 | | | | | | |
| 9 | .029 | .163 | 99.825 | | | | | | |
| 10 | .012 | .069 | 99.894 | | | | | | |
| 11 | .009 | .049 | 99.942 | | | | | | |
| 12 | .005 | .030 | 99.973 | | | | | | |
| 13 | .003 | .014 | 99.987 | | | | | | |
| 14 | .001 | .006 | 99.992 | | | | | | |
| 15 | .001 | .005 | 99.997 | | | | | | |
| 16 | .000 | .003 | 100.000 | | | | | | |
| 17 | 8.582E-005 | .000 | 100.000 | | | | | | |
| 18 | 1.002E-013 | 1.012E-013 | 100.000 | | | | | | |

Extraction Method: Principal Component Analysis.

The proportion of variance accounted for by each of the rotated factors is frequently reported in articles to indicate the relative importance of each factor. Our SPSS reports these statistics in the right side of the table labelled Total Variance Explained. As reported, the first and second factors accounted for 56.578% and 31.012% of the variance of the 18 variables. In total, the two factors accounted for 87.589% of the variable variance. Note that this percentage must be identical to the percent of variance accounted for by the unrotated factors (labelled Extraction Sums of Squared Loadings).

Figure 6 (see the Appendix) shows the reproduced correlation matrix of coefficients, computed from the extracted factors (components), together with the residuals, which are the differences between the values in R-matrix and the corresponding values in the reproduced matrix. The residuals are small, indicating that the two factors extracted give a good account of the correlations in the R-matrix.

The residuals are the differences between the actual and reproduced correlations. Footnote b gives the number and proportion

of residuals that are greater than 0.05. We found there are only 35 (22%) such residuals.

The diagonal values labelled a in are the communalities listed in Figure 7 below. Each communality is the sum of the squares of the loadings of a test on the two factors extracted. Notice that, except the variables CPI (61.9%) and Sales & Purchase Registrations (48.7%), all other communalities are very large – at least 70%.

Figure 8 shows the rotated factor matrix, which should be compared with the unrotated matrix in Figure 3.

**Figure 7**

**Communalities**

| | Initial | Extraction |
|---|---|---|
| RENTAL_INDICES | 1.000 | .889 |
| COMPLETIONS | 1.000 | .704 |
| VACANCY | 1.000 | .905 |
| GDP | 1.000 | .990 |
| Per_capita_GDP | 1.000 | .984 |
| CPI | 1.000 | .619 |
| Exchange_rate_HKD_CNY | 1.000 | .941 |
| No_of_Domestic_Households | 1.000 | .975 |
| Average_Domestic_Household_Size | 1.000 | .911 |
| Median_Domestic_Household_Income | 1.000 | .898 |
| Population | 1.000 | .968 |
| Unemployment_Rate | 1.000 | .849 |
| Sale_and_Purchase_Registrations | 1.000 | .487 |
| Sale_and_Purchase_Value | 1.000 | .789 |
| Affordability_Ratio | 1.000 | .952 |
| Money_supply_M1 | 1.000 | .942 |
| Money_supply_M2 | 1.000 | .972 |
| Money_supply_M3 | 1.000 | .991 |

Extraction Method: Principal Component Analysis.

**Figure 8**

**Rotated Component Matrix[a]**

| | Component | |
|---|---|---|
| | 1 | 2 |
| RENTAL_INDICES | .247 | .910 |
| COMPLETIONS | -.682 | -.489 |
| VACANCY | -.067 | -.949 |
| GDP | .933 | .347 |
| Per_capita_GDP | .890 | .439 |
| CPI | .459 | .638 |
| Exchange_rate_HKD_CNY | .915 | .324 |
| No_of_Domestic_Households | .980 | -.123 |
| Average_Domestic_Household_Size | -.948 | .111 |
| Median_Domestic_Household_Income | .918 | .236 |
| Population | .977 | -.119 |
| Unemployment_Rate | -.039 | -.921 |
| Sale_and_Purchase_Registrations | .022 | .697 |
| Sale_and_Purchase_Value | .391 | .797 |
| Affordability_Ratio | -.554 | .803 |
| Money_supply_M1 | .947 | .211 |
| Money_supply_M2 | .983 | .077 |
| Money_supply_M3 | .983 | .158 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 3 iterations.

Now we have a pattern that is much easier to interpret: there are two groups of variables, and the variables in each group are loaded upon on factor only. Our purpose of rotation is not to change the number of components extracted, but to try to arrive at a new position for the component that is easier to interpret in substantive terms.

According to the rotated output, we found there are 9 variables now have high loadings on one factor only (Component 1),

which are the GDP [.933], Per capita GDP [.890], Exchange rate HKD/CNY [.915], Number of domestic households [.980], Median domestic household income [.918], Population [.977] and Money supply M1;M2;M3 [.947; .983; .983]; whereas Rental indices [.910], Affordability ratio [.803], Sale & Purchase value [.797] and Sale & Purchase registrations [.697] have high loadings on the other factor (Compoenent 2).

**Figure 9**

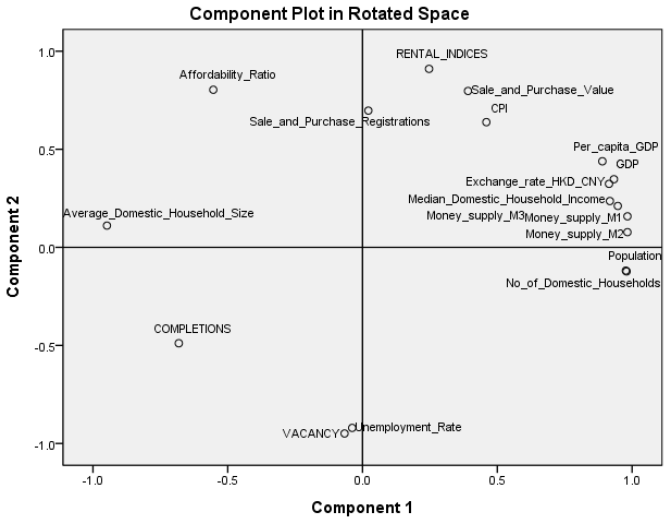



Figure 9 is a graph of rotated F-matrix, in which each of the 18 variables is plotted as a point in space with its new loadings on the rotated axes as coordinates. It can be seen from the graph in Figure 9 that the rotated factor matrix is much easier to interpret than the unrotated matrix in Figure 4. Since the rotation was orthogonal, that is, the axes were kept at right angles, the two factors are uncorrelated. This is quite consistent with that we concluded from our inspection of the original R-matrix, namely, that the correlations among the 18 variables in our battery could be accounted for in terms of two independent economical dimensions of impact.

Vriables with high loadings on one factor only are said to be indicators of the factor concerned. Clearly, as mentioned previously, Figure 9 shows nine variables are indcators of Factor 1; whereas four variables are indicators of Factor 2.

### 4.2 Multiple Regression

Multiple regression is an extension of bivariate correlation. Our result of regression is an equation that represents the best prediction of a dependent variable from 18 independent variables. Moreover, in stepwise regression, the number of independent variables entered and the order of entry are determined by statistical criteria generated by the stepwise procedure.

**Figure 10**

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 25246.106 | 1 | 25246.106 | 93.851 | .000[b] |
| | Residual | 4304.032 | 16 | 269.002 | | |
| | Total | 29550.138 | 17 | | | |
| 2 | Regression | 28223.171 | 2 | 14111.586 | 159.517 | .000[c] |
| | Residual | 1326.967 | 15 | 88.464 | | |
| | Total | 29550.138 | 17 | | | |
| 3 | Regression | 28601.022 | 3 | 9533.674 | 140.627 | .000[d] |
| | Residual | 949.115 | 14 | 67.794 | | |
| | Total | 29550.138 | 17 | | | |
| 4 | Regression | 29018.825 | 4 | 7254.706 | 177.506 | .000[e] |
| | Residual | 531.313 | 13 | 40.870 | | |
| | Total | 29550.138 | 17 | | | |
| 5 | Regression | 29250.083 | 5 | 5850.017 | 233.958 | .000[f] |
| | Residual | 300.055 | 12 | 25.005 | | |
| | Total | 29550.138 | 17 | | | |
| 6 | Regression | 29383.094 | 6 | 4897.182 | 322.485 | .000[g] |
| | Residual | 167.044 | 11 | 15.186 | | |
| | Total | 29550.138 | 17 | | | |

a. Dependent Variable: PRICE_INDICES

b. Predictors: (Constant), RENTAL_INDICES

c. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1

d. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY

e. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY, CPI

f. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY, CPI, Sale_and_Purchase_Value

g. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY, CPI, Sale_and_Purchase_Value, Sale_and_Purchase_Registrations

The output shown in Figure 10 informs us that the final model was built in six steps; each step resulted in a statistically significant model. The df column shows us that one variable was added during each step. We can also deduce that no variables were removed from the model since the count of predictors in the model steadily increases from 1 to 6.

**Figure 11**

**Variables Entered/Removed[a]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | RENTAL_INDICES | . | Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100). |
| 2 | Money_supply_M1 | . | Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100). |
| 3 | Exchange_rate_HKD_CNY | . | Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100). |
| 4 | CPI | . | Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100). |
| 5 | Sale_and_Purchase_Value | . | Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100). |
| 6 | Sale_and_Purchase_Registrations | . | Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100). |

a. Dependent Variable: PRICE_INDICES

This latter deduction is verified by the display shown in Figure 11, which tracks variables that have been entered and removed at each step. As can be seen, (1) RENTAL_INDICES, (2) Money_supply_M1, (3) Exchange_rate_HKD_CNY, (4) CPI, (5) Sale_and_Purchase_Value, & (6) Sale_and_Purchase_Registrations have been entered on steps 1 to 6, respectively, without any variable having been removed on any step.

**Figure 12**

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .924[a] | .854 | .845 | 16.4013 | .854 | 93.851 | 1 | 16 | .000 |
| 2 | .977[b] | .955 | .949 | 9.4056 | .101 | 33.653 | 1 | 15 | .000 |
| 3 | .984[c] | .968 | .961 | 8.2337 | .013 | 5.574 | 1 | 14 | .033 |
| 4 | .991[d] | .982 | .976 | 6.3930 | .014 | 10.223 | 1 | 13 | .007 |
| 5 | .995[e] | .990 | .986 | 5.0005 | .008 | 9.249 | 1 | 12 | .010 |
| 6 | .997[f] | .994 | .991 | 3.8969 | .005 | 8.759 | 1 | 11 | .013 |

a. Predictors: (Constant), RENTAL_INDICES

b. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1

c. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY

d. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY, CPI

e. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY, CPI, Sale_and_Purchase_Value

f. Predictors: (Constant), RENTAL_INDICES, Money_supply_M1, Exchange_rate_HKD_CNY, CPI, Sale_and_Purchase_Value, Sale_and_Purchase_Registrations

Figure 12, the Model Summary, presents the R Square and Adjusted R Square values for each step along with the amount of R Square Change. In the first step, as cn be seen from the footnote beneath the Model Summary table, RENTAL_INDICES was entered into the model. The R Square with that predictor in the model was .854. Not coincidentally, that is the square of correlation between RENTAL_INDICES and PRICE_INDICES (.9242=.854), and is the value of R Square Change.

On our second step, positive affect was added to the model. The R Square with both predictors in the model was .955, thus, we gained .101 in the value of R Square (.955-.854=.101), and this is reflected in the R Square Change for that step. By the time we arrive at the end of the 6th step, our R Square value has reached .991. Note that this value is very close to but identical to the R2 value we obtained under the standard method.

**Figure 13**

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | -81.752 | 20.665 | | -3.956 | .001 | | |
| | RENTAL_INDICES | 1.850 | .191 | .924 | 9.688 | .000 | 1.000 | 1.000 |
| 2 | (Constant) | -69.501 | 12.037 | | -5.774 | .000 | | |
| | RENTAL_INDICES | 1.533 | .122 | .766 | 12.525 | .000 | .801 | 1.249 |
| | Money_supply_M1 | .041 | .007 | .355 | 5.801 | .000 | .801 | 1.249 |
| 3 | (Constant) | 80.113 | 64.243 | | 1.247 | .233 | | |
| | RENTAL_INDICES | 1.696 | .128 | .848 | 13.290 | .000 | .564 | 1.774 |
| | Money_supply_M1 | .092 | .022 | .788 | 4.122 | .001 | .063 | 15.937 |
| | Exchange_rate_HKD_CNY | -191.342 | 81.049 | -.489 | -2.361 | .033 | .053 | 18.692 |
| 4 | (Constant) | -.782 | 55.931 | | -.014 | .989 | | |
| | RENTAL_INDICES | 1.413 | .133 | .706 | 10.631 | .000 | .313 | 3.191 |
| | Money_supply_M1 | .093 | .017 | .794 | 5.349 | .000 | .063 | 15.940 |
| | Exchange_rate_HKD_CNY | -218.826 | 63.514 | -.559 | -3.445 | .004 | .053 | 19.041 |
| | CPI | 1.427 | .446 | .221 | 3.197 | .007 | .290 | 3.448 |
| 5 | (Constant) | -35.011 | 45.173 | | -.775 | .453 | | |
| | RENTAL_INDICES | 1.180 | .129 | .590 | 9.139 | .000 | .203 | 4.923 |
| | Money_supply_M1 | .076 | .015 | .653 | 5.221 | .000 | .054 | 18.486 |
| | Exchange_rate_HKD_CNY | -175.773 | 51.657 | -.449 | -3.403 | .005 | .049 | 20.587 |
| | CPI | 1.545 | .351 | .239 | 4.399 | .001 | .286 | 3.491 |
| | Sale_and_Purchase_Value | .030 | .010 | .143 | 3.041 | .010 | .383 | 2.608 |
| 6 | (Constant) | 18.096 | 39.513 | | .458 | .656 | | |
| | RENTAL_INDICES | .978 | .122 | .489 | 8.038 | .000 | .139 | 7.194 |
| | Money_supply_M1 | .053 | .014 | .450 | 3.778 | .003 | .036 | 27.625 |
| | Exchange_rate_HKD_CNY | -151.545 | 41.081 | -.387 | -3.689 | .004 | .047 | 21.438 |
| | CPI | 1.242 | .292 | .192 | 4.253 | .001 | .251 | 3.978 |
| | Sale_and_Purchase_Value | .137 | .037 | .644 | 3.718 | .003 | .017 | 58.299 |
| | Sale_and_Purchase_Registrations | .000 | .000 | -.373 | -2.960 | .013 | .032 | 30.847 |

a. Dependent Variable: PRICE_INDICES

The Coefficients table in Figure 13 above provides us the details of the result. We note that the values of the regression coefficients are different from those associated with the same variables in the standard regression analysis. That the differences are not large, because of the fact that these six variables did almost the same amount of predictive work in much the same configuration as did the eighteen predictors accomplished using the standard method. If economy of model were relevant, we would probably be appreciated with the trimmed model of six variables replacing the full model containing eighteen variables.

By the time we reach the 6th step, there is no variable of the excluded set that has a statistically significant partial correlation for entry at 7th step, thus, the stepwise produce ends after completing the 6th step. The relative magnitudes of the beta weights in the standardized equation are more helpful than the regression coefficient from the unstandardized equation in indexing the relative importance of the variables in predicting the value of dependent variable within the context of the other independent variables in the equation.

Our regression equation is based on standardized scores, the constant disappears because of the mean of all z-distributions is zero. For the data shown in Figure 13, the standardized regression equation is found to be Equation 1:

$$PRICE\_INDICES = 0.489_{xRENTAL\_INDICES} + 0.45_{xMoney\_supply\_M1} - 0.387_{xExchange\_rate\_HKD\_CNY} + 0.192_{xCPI} + 0.644_{xSale\_and\_Purchase\_Value} - 0.373_{xSale\_and\_Purchase\_Registrations}$$

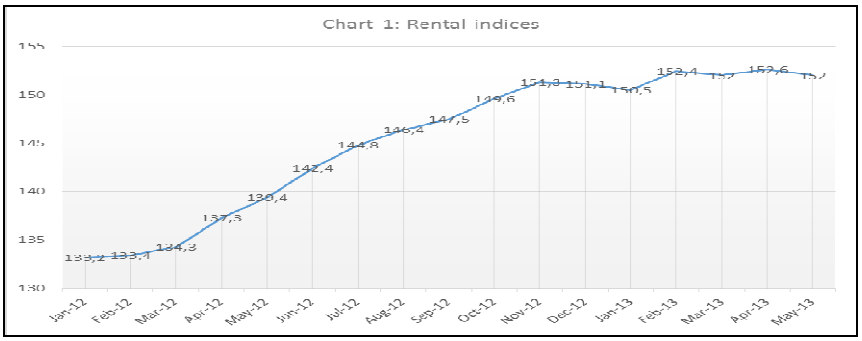
### 4.3 Technical Trends Analysis

Rental price, money supply (M1), exchange rate of HKD/CNY, CPI, sale & purchase value and registrations were used in a stepwise multiple regression analysis to predict house price in Hong Kong. The model was statistically significant, $F(6, 11) = 322.485$, $p < .001$, and accounted for approximately 99% of the variance of house price ($R2 = .994$, Adjusted $R2 = .991$). We are now focusing on current market performance with latest primary data to forecast how price indices to be affected by the six independent variables on equation 1.

**Rental indices**

The cooling measures implemented by the government on the residential sector actually led to an immediate volume contraction in 1st quarter of 2013. Upward price momentum stalled and housing rents fell 3% year-to-year as corporate tenants downgraded themselves to more affordable premises. Looking ahead, the current trend of rental price is going to be sustained except in the residential sector which is predicted to consolidate by 10%.

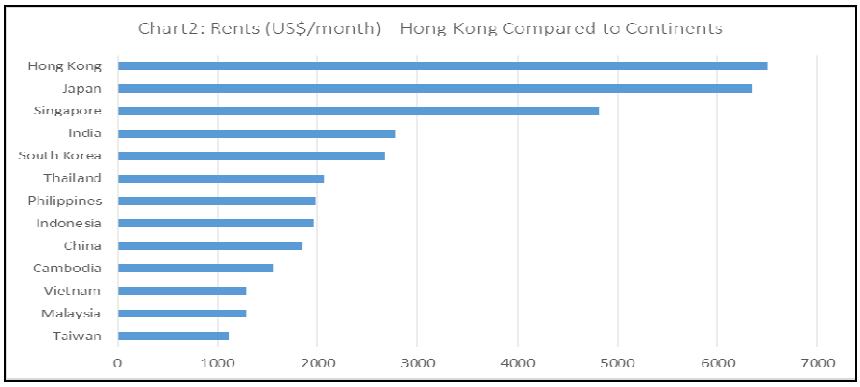
**Chart 1**




*Source: Rating and Valuation Department - Hong Kong Property Review Monthly Supplement July 2013*

Hong Kong expatriate apartment rents world's most expensive. Rents for high-end flats of the type commonly let by expatriates are the most expensive in the world. Property prices are some of the most expensive in the world. Both renting and buying a property is normally the largest expense that an expatriate will encounter. Once the economic slump has hurt the crucial expatriate sector, therefor, demand dropped, rental price will drop further.

**Chart 2**

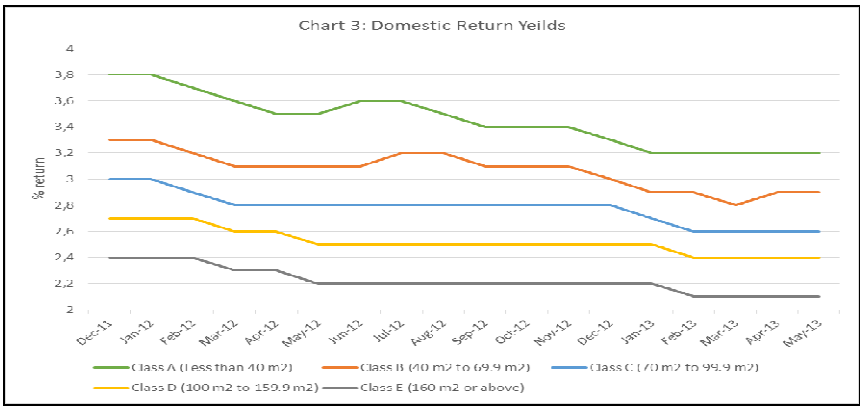



*Source: Global Property Guide Q1 2013*

For investment purpose, Hong Kong's rental yields are low. For the latest figures announced recently from Rating and Valuation Department, gross rental yields for property Class A; B; C ranged from 2.6% to 3.2%, and Property Class D; E are around 2.4% and

2.1% respectively. Such extremely low rental returns reflect the abnormal high house prices.

**Chart 3**



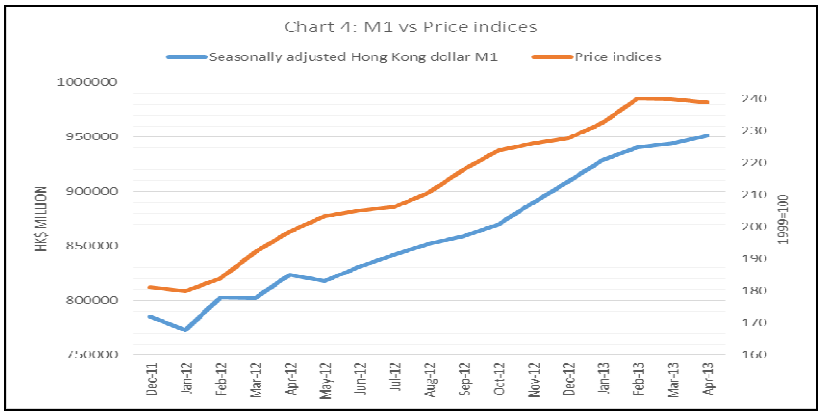

*Source: Rating and Valuation Department - Hong Kong Property Review Monthly Supplement July 2013*

The worsening economic environment could see further decline in the rental market. If landlords continue to be alerted in demand for residential properties has become weaker, they are willing to offer incentives to attract, and maintain, tenants. Occurrence of vicious circle that may also cause the rental price decrease or collapse.

**Money Supply M1**

The two monetary policies from USA and China drove property prices up. First of all, it was the monetary policy of quantitative easing (QE) from USA, in the three rounds of QE since the financial crisis in 2008, the US government has aggressively pimped cash into economy and kept interest rates low as a way of boost investment. Second, it was the monetary policy of China, which was exaggeratedly loose because Chinese government's desire to keep highly growth after the world financial crisis, leading to an overheating Chinese economy and increased number of Mainland investors jump into the Hong Kong property market. The chart 4 shows how money supply M1 has been driving home prices in Hong Kong.

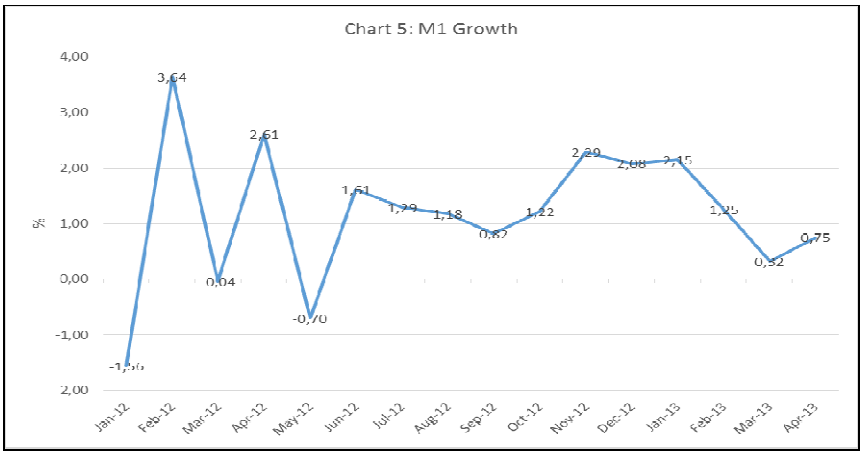
**Chart 4**




*Source: HKMA Quarterly Bulletin. June 2013*

Obviously it's good with the fact that it is pretty clear in the chart 5 shows money supply M1 growth has been slowing. Although monetary policy will still be loose in the USA, after second round of quantitative easing expires without any extension. However, the reality is that both Hong Kong dollar M1 peaked in 2011 to 2012, and it has been gradually dropping.

**Chart 5**




*Source: HKMA Quarterly Bulletin. June 2013*

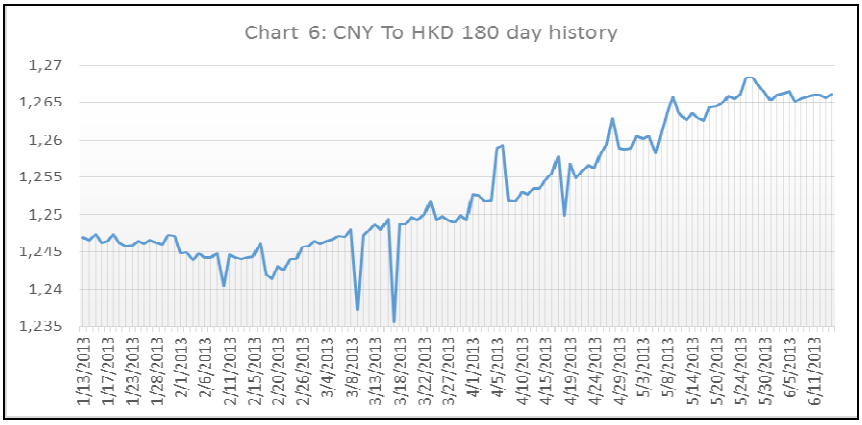
There are two other developing factors are motivating liquidity out. The first development is a dwindling of Hong Kong dollar

deposits. Due to the expectation of appreciation of CNY, depositors seem to favour CNY deposits over HKD deposits. Second, the People's Bank of China (PBC) continue to halt its regular bill auctions and bond repurchase (repo) agreement sales even as a cash crunch in the banking system started to ease. This means it won't drain or inject cash into the banking system, these monetary tightening in China is spilling over to Hong Kong.

**Chinese Yuan Renminbi (CNY) To Hong Kong Dollar (HKD)**

According to the equation we found in stepwise regression, CNY-to-HKD comes with a negative effect to the house price of Hong Kong, therefore, when other factors being constant, CNY rise the house price drop. Chat 4 shows CNY still stay at the record high against the HKD, further appreciation can be predicted.

**Chart 6**




*Source: Rating and Valuation Department*

"A higher Yuan may damp investment in Hong Kong's residential real estate because it would mainly benefit CNY-denominated assets", Cusson Leung and Joyce Kwock (Feb 2013), Credit Suisse research analysts, said in the report.

PBOC deputy governor Yi Gang (Apr 2013) said "it is generally presumed that CNY appreciation will be good for real estate in Hong Kong since home prices will look discounted, but there has also a downside for this argument…CNY appreciation is essentially a tightening policy from the Chinese perspective, If tightening in China

continues, it might be a real risk of a spill over to Hong Kong property market".

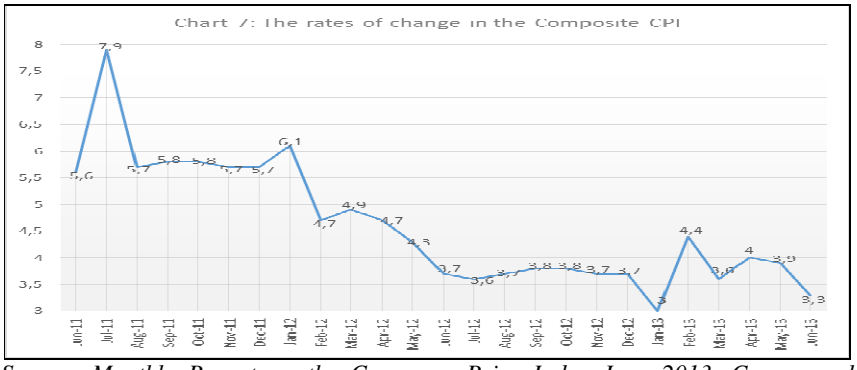
China, no doubt, is a currency manipulator, CNY appreciation this year, against strong USD. China's plan is likely to hit U.S. shoppers in the pocketbook, meanwhile making the stocks of firms with goods targeted at Chinese consumers more attractive as well, it shows that the CNY appreciation will be allowed endlessly.

When the pressure of CNY appreciation is about to happen, mainland investors demand might shift from Hong Kong property to CNY-denominated assets, thus, mainland investment demand for HKD-denominated assets during a period of appreciation is likely to be unhurried.

**Consumer Price Index (CPI)**

The latest available figures for the CPIs and their rates of change as well as the related rates of change upon removing the effects of Government's one-off relief measures are summarized in Chart 7.

**Chart 7**




*Source: Monthly Report on the Consumer Price Index June 2013, Census and Statistics Department*

For analysing the latest trend in consumer prices, it is useful to study the year-on-year changes in the original CPI series and the month-to-month changes in the seasonally adjusted series together. Since July 2011, the month-to-month changes still tend to decline due to recent economic factors. The trend of the CPIs may be more clearly discerned by looking at the Hong Kong Government "First Quarter Economic Report 2013" (released on May 2013) and "IMF 2013 global growth forecast" (released on July 2013).

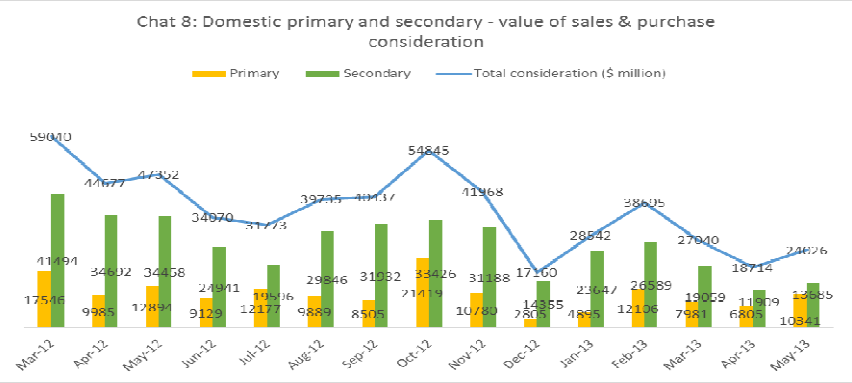
World Economic outlook - Hong Kong First Quarter Economic Report 2013, the Government Economist, Mrs. Helen Chan, described the economic situation in the first quarter of 2013 and provided the latest GDP and CPI forecasts. She warned that the China liquidity tightens and the declining of local housing rentals may pull down inflation for the coming years.

The IMF has cut its global economic growth forecast, citing new downside risks in key emerging market economies and a deeper recession in the euro zone. It warned that the global economy will grow 2.9% this year, down from its earlier estimate of 3.2%. It added that China and Hong Kong now face the possibility of a longer growth slowdown.

**Sale and Purchase Value of Consideration**

The Hong Kong Government's restrictive property measures have had a remarkable impact on number of transaction and the value of consideration. Hence, from Chat 8, the value of consideration in May of 2013 was HKD 24,026 million, drop 49.26% compared with HKD 47,352 in May of 2012.

**Chart 8**

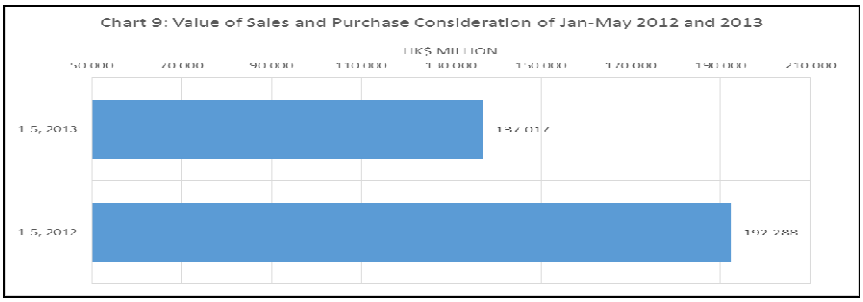



*Source: Rating and Valuation Department - Hong Kong Property Review Monthly Supplement July 2013*

The further tightening policy measures – the new BSD along with the revised SSD to prevent overseas investors from speculating in Hong Kong – aiming at mainland buyers who are more focused on high-end luxury properties, will lead to a price correction.

With Chat 9 point out that the total consideration of $137,017 million for the first five months of 2013, down 28.74% at the same period of 2012.

**Chart 9**



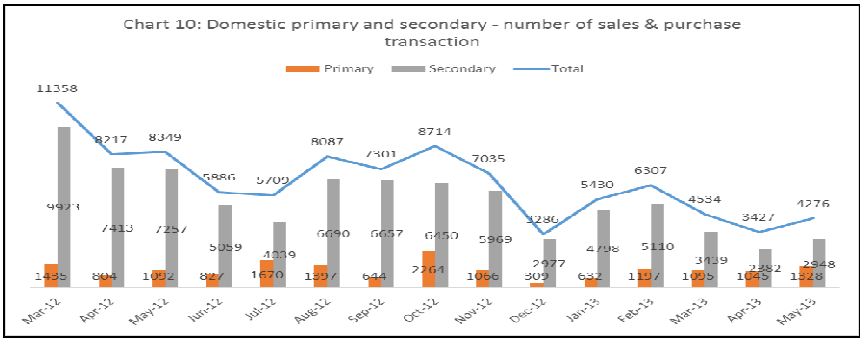

*Source: Rating and Valuation Department - Hong Kong Property Review Monthly Supplement July 2013*

Consideration of sales and purchase in residential property market continued to trend down on critical fundamentals.

**Sale and Purchase Number of Transaction**

Number of transactions fell to the bottom since 1996 after the government doubled stamp duty taxes on property deals in February 2013 to suppress concerns that an asset bubble is establishing.

**Chart 10**




*Source: Rating and Valuation Department - Hong Kong Property Review Monthly Supplement July 2013*

According to the July monthly supplement from the Rating and Valuation Department, Hong Kong's property cooling scheme did able to curb price hikes, even shortage of supply wasn't addressed. But we found that the Government's restrictive property measures have had a notable impact on value of consideration but have had mild

outcome on number of transaction, it's most likely because some homeowners willing to cut prices in a weak market.

### 5. Historical Prospective

#### 5.1. Hong Kong Property Market History

To understand the relationship of government housing policy and Hong Kong property prices, in Chart 11 (see the Appendix) it is plotted 32-year property prices history along with major economic and political events, as well as major government policies. As we can see in the chart, the truth is that, in spite of government has tried to restrain home prices in bullish market and maintenance home prices in bearish market, most of the time the policies unsuccessful, instead, quite the opposite.

#### 5.2. Japanese Plaza Concord

In 1985, the governments of the US, Japan, the UK, Germany and France had signed the famous Plaza Concord to depreciate the US dollar, which by and large caused the Japanese Yen to appreciate. Few years after the signing of the Plaza Concord, the value of yen against the dollar had increased by nearly 300%.

The revaluation of yen had made the Japanese unprecedented wealthy as the yen they held could exchange for a lot more US dollars. Actually it was around that time that the US assets had become much cheaper to the Japanese. What they could not afford in the past were now within their reach.

Giddy with their new wealth, the Japanese began their purchases in the US, starting from commercial products to the entire companies and assets. Some newspapers heading has a saying that Japanese could afford to buy the entire US real estate and made it become the 41st provinces of Japan.

Such a massive shopping spree had triggered the social discontent. Some described it as the second invasion after the attack of the Pearl Harbour while others believed the Japanese would eventually take home their Statue of Liberty.

The US government was urged to stop the Japanese's expansion for the sake of the national interest and to prevent Japanese from pushing up the property price. But the Japanese, at the height of their national pride, were more than happy to go on and on with the shopping spree.

Nevertheless, partly because of their extreme opulence and partly due to poor management and an unfamiliar market, the Japanese suffered from consecutive losses in the real estate they had invested. Following the burst of its bubble economy, Japan had entered its lost decades and finally led to the retreat of Japanese capital from the US.

A recent academic paper reports that under the tightened government policy to regulate the property market, investment environment changes arise in the hot property market of Beijing and Shanghai. Mainland Investors are shifting their focus to overseas property markets with relatively less strict property restrictions.

While China is a huge consumer market, the "purchase restriction order" has accelerated Chinese consumers' decisions to opt for other investment channels. Besides, the persistent high property prices in Beijing have changed the mindset of some high-income groups who have turned their eyes to real estate in foreign countries. They are now purchasing the properties around the world, especially keen on buying in Hong Kong. Are they doing a repeat as what Japanese did in the last century?

### 5.3. Lessons from US market

We examined the US market and its uniquely well-developed real estate finance context to draw lessons from the causes of the credit crisis of 2007-2009 and the consequences for the real estate cycle in that market from 1950 to 2010. We believe we can extrapolate Hong Kong generalization from this history.

Real estate in the US, as in most countries, is cyclical. In general, cycles appear to repeat themselves every 17 years approximately, although the causes of the cyclical pattern have changed over time. In the US, we can identify three distinct upturns that were followed by severe downturns in the modern era of real estate investment since 1970. In each case, an abundance of capital directed to real estate created a situation whereby investors were willing to invest far more in the asset class than previously. This abundance of capital led to an increase in the general level of real estate values, inducing developers to introduce more space to the market than was needed.

Starting in 1970, the following pattern has repeated itself three times.

- ✓ Market values of existing property exceed replacement value (the cost of construction), and developers expand the supply of real estate, sell buildings at completion, and earn a profit.
- ✓ Large amounts of debt and equity capital flow into the real estate industry.
- ✓ Development activity increases, creating jobs in real estate and related sectors (construction and lending)
- ✓ Additions to supply exceed tenant demand for space
- ✓ With a glut of property, rents fall as tenant options expand (usually in conjunction with an economic downturn).
- ✓ Property values fall, ultimately dropping below replacement value.
- ✓ Given the long lead time to develop real estate, supply continues to be introduced to the market as projects that have been started are completed.
- ✓ New development stops, eliminating jobs in real estate and related industries, leading to further economic deterioration.
- ✓ Over time, the economy recovers, sometimes very slowly.
- ✓ As the economy recovers, jobs are created, increasing the demand for office space, and incomes rise, increasing the demand for retail and other space.
- ✓ Rents ultimately increase with expansion of the economy and absorption of space by tenants.
- ✓ Because replacement value exceeds market value, developers cannot profit by adding new supply to the market and a supply shortage forms.
- ✓ As rents increase, market values ultimately rise above replacement values.
- ✓ Development slowly starts again.
- ✓ Capital flows into real estate as investors seek outsized returns based on expectations of continued value appreciation.
- ✓ Market values of existing property exceed replacement values, so developers can expand the supply of real estate, sell buildings at completion, and earn a profit.
- ✓ And the cycle repeats itself.

From the safety of a retrospective position, most observers would agree that by 2007 overpricing had become established in property market in the UK, the US and elsewhere. The causes of this are well documented. The global financial crisis of 2007-2008 had its

roots in property speculation, facilitated by the packaging and repackaging of equity, debt and risk.

The systemic risk that had become endemic to the market did not reduce interest in new products. While this frenzy continued, professional responsibility appeared to take a back seat to the profit motive. Those who had been previously objective became self-interested and boardrooms lacked the detached yet experienced voice hat advances in information and research should have made available. But to argue that this was a failure of those engaged in objective analysis presumes that there were obvious warning signs. Is this true? Was the overpricing in 2007 evident?

Those of greater-than-average age should certainly have had inkling that a correction was imminent. We remember 1997 and 2003, and simple extrapolation forecasts a property crash in 2008. This smack is not mere superstition, and it suggests that a 17-year cycle is inevitable in Hong Kong.

## 4 Conclusions

Time flies. We are half way through 2013, in a past rollercoaster years for the property market, it's time for Hong Kong people or global investors to ask questions: where is Hong Kong property market heading to? Is history about to repeat itself? Was the crash predictable...etc?

A bubble will always follow its own rhythm, fundamentally unchanged in character throughout the centuries. Whether you agree the methodology or not, there is very little doubt that Hong Kong home prices are among the most expensive on earth. This is the prerequisite to call anything a "bubble", and the property market in Hong Kong certainly meets this criteria. Of course, being expensive by itself does not mean that prices are going to drop. The key is that fundamentals are not as strong as people think.

Based on our finding from technical trends analysis which given the likelihood of rental; money supply M1; CPI and value of Sale & Purchase are going down. However, CNY appreciating and number of Sale & Purchase increasing as well. We noted that all the 6 factors on equation 1 are unfavourable to property price.

Since 2009, more than 30 curbs have been imposed by Hong Kong government: from raising minimum down payment on flats to slapping an extra tax, SSD and BSD, on buyers. Nevertheless, US has issued a tentative timetable to end quantitative easing, it means that flood of liquidity into the global and Hong Kong asset markets will

gradually come to an end. However, the government and the Hong Kong Monetary Authority have been issuing warnings for some time that key risks concerning the property market are external, and now the Fed has made the inevitable move. No matter whether it's possible to predict future policy measure, we are entering an era of higher interest rates once the US Federal Reserve's curbs its stimulus.

Whatever cannot go on forever must come to an end. Over the past 24 years, mortgage rate in Hong Kong has averaged 6.2%, with an affordability ratio of 45.7%. If mortgage rates increase from their current 2.3% to 6%, home prices would has been severely hurt with drop 27% in order to maintain an affordability ratio of 45.7%. Moreover with the government stepping up measures to calm down the market, average monthly transactions in the property market could drop to 4,500, a level close to that during SARS in 2003.

Property prices are at a record high, not only increased by some 50% over the last 3 years but also exceeding the territory's property crash in 1997. Is history about to repeat itself—with an imminent fall in prices? Overall, these may mark the beginning of the end of the epic Hong Kong property bull market 2009-2012. Although we don't expect any immediate huge drop in property prices, we believe the property market is now reaching its peak with very limited upside. History tells us in the worst scenario, home prices are going to drop by as much as 60%. What it needs now is something to trigger the burst of it.

**References**

1. Ahuja Ahuja and Nathan Porter (2010) "Are House Prices Rising Too Fast in Hong Kong SAR?" IMF Working Paper WP/10/273.
2. Ahuja, A. et al. (2010) "Are house prices rising too fast in China?" IMF Working Paper WP/10/167.
3. Altunbas, Y, L Gambacorta, and D Marques-Ibanez (2010), "Does Monetary Policy Affect Bank Risk-Taking?" ECB Working Paper 1166.
4. Assenmacher-Wesche, K and S Gerlach (2008), "Financial Structure and the Impact of Monetary Policy on Asset Prices", Swiss National Bank Working Paper 2008-16.
5. Borio, C and P Lowe (2002), "Asset Prices, Financial and Monetary Stability: Exploring the Nexus", BIS Working Paper No 114.

6. Cecchetti, M, H Genberg, J Lipsky, and S Wadhwani (2000), "Asset Prices and Central Bank Policy", Geneva Report on the World Economy 2, London: CEPR and ICMB.
7. Chan, N., W. Peng, and K. Fan (2005) "A Graphical Framework for Monitoring the Property Market in Hong Kong," HKMA Quarterly Bulletin.
8. Ciccarelli, M, A Maddaloni, and J-L Peydró (2010), "Trusting the Bankers: A New Look at the Credit Channel of Monetary Policy", ECB Working Paper No 1228.
9. Colin Jones, and Michael White (2012) "Challenges of the Housing Economy: An International Perspective", RICS Research, UK.
10. Crowe, C., G. Dell'Ariccia, D. Igan, and P. Rabanal (2011) "Policies for Macro financial Stability: Options to Deal with Real-Estate Booms," IMF Staff Discussion Note SDN/11/02.
11. David J. Lynn and Tim Wang (2010) "Emerging Market Real Estate Investment: Investing in China, India and Brazil", John Wiley & Sons, Inc. Canada.
12. Edward C. Y. Yiu and Sherry Y. S. Xu (2012) "The Changing Nature of Household Demand and Housing Market Trends in China", John Wiley & Sons, Ltd. USA.
13. Fostel, A., and J. Geanakoplos, (2008) "Leverage cycles and the anxious economy," American Economic Review 98:4, pp. 1211–44.
14. Gary B. Gorton (2012) "Misunderstanding Financial Crises: why we don't see them coming", Oxford University Press, USA.
15. Geanakoplos, J. (2010) "Solving the present crisis and managing the leverage cycle," Cowles Foundation Discussion Paper No. 1751, Yale University, New Haven.
16. Geanakoplos, J. (2010) "The leverage cycle," Cowles Foundation Discussion Paper No. 1715R, Yale University, New Haven.
17. Goodhart, C and B Hofmann (2007), "House Prices and the Macro economy: Implications for Banking and Price Stability", Oxford: Oxford University Press.
18. Harding, J., S. Rosenthal, and C. Sirmans (2007) "Depreciation of housing capital, maintenance and house price inflation: Estimates from a repeat sales model," Journal of urban Economics, pp. 193–217.
19. Harold L. Vogel (2010) "Financial Market Bubbles and Crashes", Cambridge University Press, USA.

20. Harry W. Richardson and Gordon F. Mulligan (2012) "US Housing Policy in the Era of Boom and Bust", John Wiley & Sons, Ltd. USA.
21. Himmelberg, C., C. Mayer, and T. Sinai (2005) "Assessing high house prices: Fundamentals and misperceptions," Journal of Economic Perspective, pp. 67–92.
22. Hong Kong Property Review – Monthly Supplement July 2013, Rating and Valuation Department, the Government of Hong Kong SAR.
23. Hong Kong Property Review (2012), Rating and Valuation Department, the Government of Hong Kong SAR.
24. Hott, C and T Jokipii (2012), "Housing Bubbles and Interest Rates", SNB, Mimeo.
25. IMF (2003), "When Bubbles Burst," in World Economic Outlook April 2003: Growth and Institutions, World Economic and Financial Surveys.
26. Lai, N., and K. Wang (1999) "Land-Supply Restrictions, Developer Strategies and Housing Policies: The Case in Hong Kong," International Real Estate Review.
27. Lung, F., K. Chow, and G. Han (2008) "Long-Term and Short-Term Determinants of Property Prices in Hong Kong," HKMA Working Paper 15/2008.
28. OECD (2012) "Economic Outlook No 89", OECD, UK.
29. Peng, W. (2002) "What Drives Property Prices in Hong Kong?" HKMA Quarterly Bulletin.
30. Piyush Tiwari (2010) "International Real Estate Economics", Palgrave Macmillan, UK.
31. Poterba, J. (1984) "Tax subsidies to owner-occupied housing: An asset market approach," Quarterly Journal of Economics, pp. 729–52.
32. R. Sean Craig and Changchun Hua (2011), "Determinants of Property Prices in Hong Kong SAR: Implications for Policy" IMF Working Paper WP/11/277.
33. Shin, H. S., 2009, "Discussion of 'The Leverage Cycle'," paper prepared for the 2009 NBER Macroeconomic Annual.
34. Wong, E., T. Fong, K.-F. Li, and H. Choi (2011) "Loan-to-Value Ratio as A Macro-prudential Tool: Hong Kong's Experience and Cross-Country Evidence," HKMA Working Paper 01/2011.

# Appendix

## Figure 6

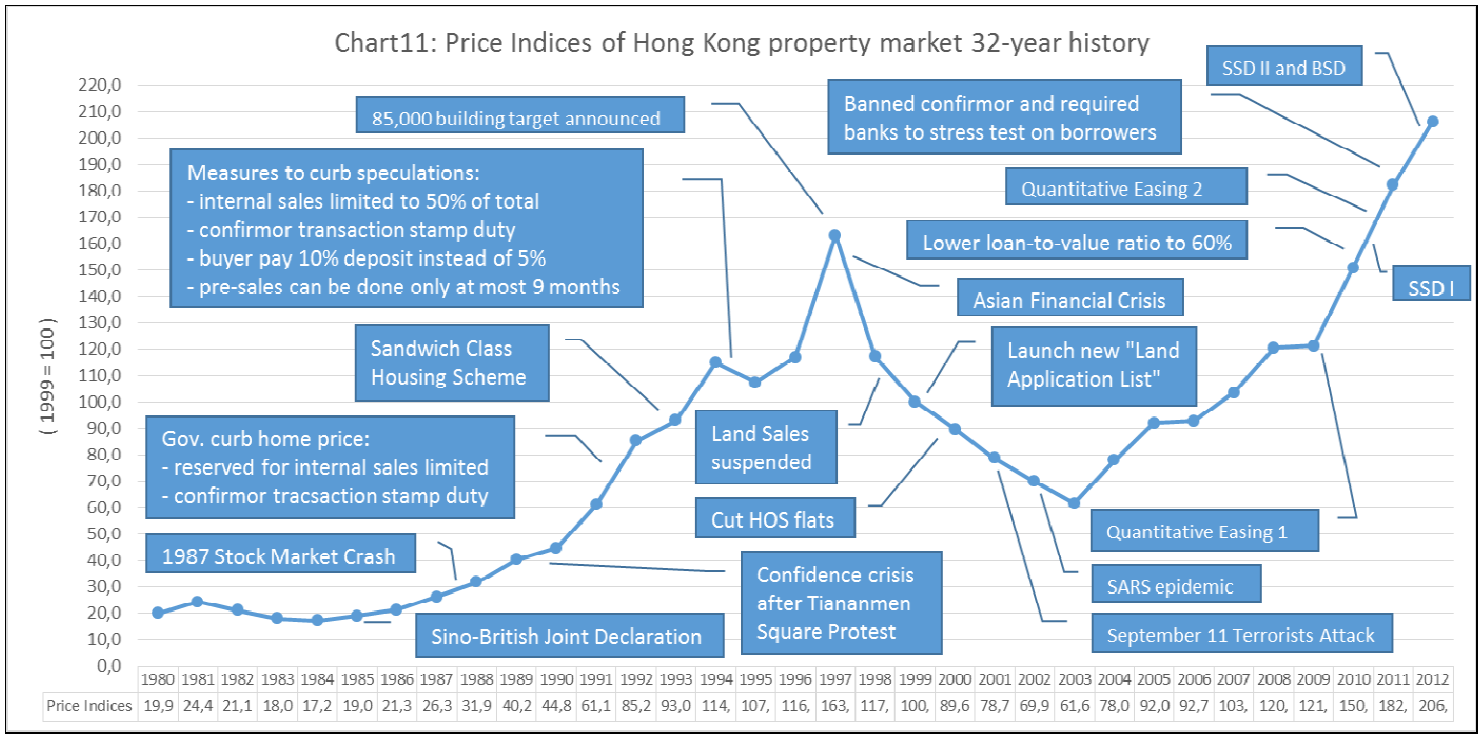
| | | RENTAL_INDICES | COMPLETIONS | VACANCY | GDP | Per_capita_GDP | CPI | Exchange_rate_HKD_CNY | No_of_Domestic_Households | Average_Domestic_Household_Size | Median_Domestic_Household_Income | Population | Unemployment_Rate | Sale_and_Purchase_Registrations | Sale_and_Purchase_Value | Affordability_Ratio | Money_supply_M1 | Money_supply_M2 | Money_supply_M3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reproduced Correlation | RENTAL_INDICES | .889[a] | -.613 | -.880 | .546 | .619 | .694 | .520 | .130 | -.133 | .441 | .133 | -.848 | .640 | .822 | .595 | .426 | .313 | .387 |
| | COMPLETIONS | -.613 | .704[a] | .510 | -.805 | -.821 | -.625 | -.782 | -.608 | .592 | -.741 | -.608 | .477 | -.356 | -.657 | -.016 | -.749 | -.708 | -.747 |
| | VACANCY | -.880 | .510 | .905[a] | -.392 | -.476 | -.637 | -.368 | .051 | -.042 | -.285 | .047 | .876 | -.663 | -.783 | -.725 | -.264 | -.139 | -.216 |
| | GDP | .546 | -.805 | -.392 | .990[a] | .982 | .650 | .965 | .871 | -.846 | .938 | .870 | -.356 | .262 | .642 | -.237 | .957 | .943 | .972 |
| | Per_capita_GDP | .619 | -.821 | -.476 | .982 | .984[a] | .689 | .956 | .818 | -.795 | .920 | .817 | -.438 | .325 | .698 | -.140 | .935 | .909 | .944 |
| | CPI | .694 | -.625 | -.637 | .650 | .689 | .619[a] | .627 | .372 | -.365 | .572 | .373 | -.606 | .455 | .689 | .259 | .570 | .501 | .553 |
| | Exchange_rate_HKD_CNY | .520 | -.782 | -.368 | .965 | .956 | .627 | .941[a] | .856 | -.831 | .916 | .855 | -.333 | .245 | .616 | -.246 | .934 | .924 | .950 |
| | No_of_Domestic_Households | .130 | -.608 | .051 | .871 | .818 | .372 | .856 | .975[a] | -.942 | .870 | .971 | .075 | -.064 | .286 | -.641 | .902 | .953 | .943 |
| | Average_Domestic_Household_Size | -.133 | .592 | -.042 | -.846 | -.795 | -.365 | -.831 | -.942 | .911[a] | -.844 | -.939 | -.065 | .057 | -.283 | .614 | -.875 | -.923 | -.914 |
| | Median_Domestic_Household_Income | .441 | -.741 | -.285 | .938 | .920 | .572 | .916 | .870 | -.844 | .898[a] | .868 | -.253 | .184 | .548 | -.318 | .919 | .920 | .939 |
| | Population | .133 | -.608 | .047 | .870 | .817 | .373 | .855 | .971 | -.939 | .868 | .968[a] | .072 | -.062 | .288 | -.636 | .900 | .951 | .941 |
| | Unemployment_Rate | -.848 | .477 | .876 | -.356 | -.438 | -.606 | -.333 | .075 | -.065 | -.253 | .072 | .849[a] | -.643 | -.749 | -.718 | -.231 | -.109 | -.184 |
| | Sale_and_Purchase_Registrations | .640 | -.356 | -.663 | .262 | .325 | .455 | .245 | -.064 | .057 | .184 | -.062 | -.643 | .487[a] | .564 | .548 | .168 | .075 | .132 |
| | Sale_and_Purchase_Value | .822 | -.657 | -.783 | .642 | .698 | .689 | .616 | .286 | -.283 | .548 | .288 | -.749 | .564 | .789[a] | .424 | .539 | .446 | .511 |
| | Affordability_Ratio | .595 | -.016 | -.725 | -.237 | -.140 | .259 | -.246 | -.641 | .614 | -.318 | -.636 | -.718 | .548 | .424 | .952[a] | -.355 | -.482 | -.417 |
| | Money_supply_M1 | .426 | -.749 | -.264 | .957 | .935 | .570 | .934 | .902 | -.875 | .919 | .900 | -.231 | .168 | .539 | -.355 | .942[a] | .947 | .964 |
| | Money_supply_M2 | .313 | -.708 | -.139 | .943 | .909 | .501 | .924 | .953 | -.923 | .920 | .951 | -.109 | .075 | .446 | -.482 | .947 | .972[a] | .978 |
| | Money_supply_M3 | .387 | -.747 | -.216 | .972 | .944 | .553 | .950 | .943 | -.914 | .939 | .941 | -.184 | .132 | .511 | -.417 | .964 | .978 | .991[a] |
| Residual[b] | RENTAL_INDICES | | .109 | -.001 | .024 | .030 | .113 | .043 | -.041 | .072 | .054 | -.034 | -.016 | -.196 | -.103 | .014 | .021 | .021 | .011 |
| | COMPLETIONS | .109 | | .069 | .037 | .034 | .254 | .019 | -.035 | .101 | .113 | -.001 | .098 | -.092 | -.012 | .036 | .034 | .002 | .005 |
| | VACANCY | -.001 | .069 | | .011 | .013 | .026 | -.039 | .025 | -.017 | .028 | .028 | .025 | .090 | .082 | .020 | -.023 | -.031 | -.010 |
| | GDP | .024 | .037 | .011 | | .011 | .037 | .000 | -.005 | .021 | .023 | -.001 | -.004 | -.040 | -.019 | .006 | -.004 | .002 | .002 |
| | Per_capita_GDP | .030 | .034 | .013 | .011 | | .030 | .003 | -.006 | .022 | .018 | -.003 | -.016 | -.053 | -.026 | .008 | -.006 | .005 | .004 |
| | CPI | .113 | .254 | .026 | .037 | .030 | | .026 | -.040 | .125 | .144 | .004 | .110 | -.212 | -.103 | .061 | -.006 | .001 | -.005 |
| | Exchange_rate_HKD_CNY | .043 | .019 | -.039 | .000 | .003 | .026 | | -.029 | .032 | -.009 | -.032 | .006 | -.091 | -.061 | -.004 | .027 | .019 | .009 |
| | No_of_Domestic_Households | -.041 | -.035 | .025 | -.005 | -.006 | -.040 | -.029 | | -.033 | -.014 | .022 | -.002 | .086 | .050 | .001 | -.022 | -.015 | -.007 |
| | Average_Domestic_Household_Size | .072 | .101 | -.017 | .021 | .022 | .125 | .032 | -.033 | | .063 | -.012 | -.002 | -.147 | -.088 | -.002 | .004 | .019 | .008 |
| | Median_Domestic_Household_Income | .054 | .113 | .028 | .023 | .018 | .144 | -.009 | -.014 | .063 | | .011 | .012 | -.084 | -.035 | .002 | -.021 | -.015 | -.010 |
| | Population | -.034 | -.001 | .028 | -.001 | -.003 | .004 | -.032 | .022 | -.012 | .011 | | .003 | .072 | .043 | -.001 | -.028 | -.017 | -.010 |
| | Unemployment_Rate | -.016 | .098 | .025 | -.004 | -.016 | .110 | .006 | -.002 | -.002 | .012 | .003 | | .092 | .080 | .032 | .036 | -.017 | -.007 |
| | Sale_and_Purchase_Registrations | -.196 | -.092 | .090 | -.040 | -.053 | -.212 | -.091 | .086 | -.147 | -.084 | .072 | .092 | | .309 | -.038 | -.019 | -.066 | -.027 |
| | Sale_and_Purchase_Value | -.103 | -.012 | .082 | -.019 | -.026 | -.103 | -.061 | .050 | -.088 | -.035 | .043 | .080 | .309 | | -.006 | .001 | -.050 | -.018 |
| | Affordability_Ratio | .014 | .036 | .020 | .006 | .008 | .061 | -.004 | .001 | -.002 | .002 | -.001 | .032 | -.038 | -.006 | | .006 | .003 | .004 |
| | Money_supply_M1 | .021 | .034 | -.023 | -.004 | -.006 | -.006 | .027 | -.022 | .004 | -.021 | -.028 | .036 | -.019 | .001 | .006 | | .016 | .010 |
| | Money_supply_M2 | .021 | .002 | -.031 | .002 | .005 | .001 | .019 | -.015 | .019 | -.015 | -.017 | -.017 | -.066 | -.050 | .003 | .016 | | .014 |
| | Money_supply_M3 | .011 | .005 | -.010 | .002 | .004 | -.005 | .009 | -.007 | .008 | -.010 | -.010 | -.007 | -.027 | -.018 | .004 | .010 | .014 | |

Extraction Method: Principal Component Analysis.

a. Reproduced communalities

b. Residuals are computed between observed and reproduced correlations. There are 35 (22.0%) nonredundant residuals with absolute values greater than 0.05.

**Chart 11**




*Source: Rating and Valuation Department - Hong Kong Property Review Monthly Supplement July 2013*