# Real Estate Indices As A Barometer Of Stable Real Estate Returns And Predictor Of Real Estate Risks During Real Estate Boom Or Burst Cycles.

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**Key words**: real estate indices, real estate risks, real estate bubbles, investment management

## SUMMARY

Global financial crisis and debt crisis in recent times has drawn increased attention towards modern banking regulation and surveillance during asset management. One such important asset that needs attention in today's globally economic scenario is real estate. Real estate bubbles decrease growth in the returns in investments and put government policies under severe scrutiny.

Governments around the world are cautious and structuring policies in a way to tackle a crisis that might be caused due to real estate bubbles. Standard measures for controlling real estate bubbles include increase in stamp duty and decrease in mortgage percentage. To understand the timing and causes of these bubbles governments are encouraging comprehensive real estate indices that provide a full picture of the changes in the real estate market and the prices during real estate management.

A real estate index that is comparable cross-regionally and across countries is essential for understanding and or forecast an emerging scenario of global economic crisis triggered by real estate bubbles. It would also allow investors and other stake holders to make cross-national comparisons. Risks associated with real estate market vary from region to region. An index which has uniformity and feasibility to provide cross-regional comparison can aid in identification of the problems caused due to the heterogeneous nature of risk assessment data. Risks of default in mortgage loans, banking risks and exposures could also be predicted through real estate index built using the data about these real estate risks. It is in this context this paper dwells the key aspects of real estate pricing indices and their importance in real estate risk assessment models.

Risk calculation based on operating cash flow, finance structure and credit and rent volatility are should supplement the real estate indices to understand the nature of the real estate bubble and to forecast the impact of these bubbles. In this paper an effort is made to present the interpretation of real estate bubbles in Asian countries like Singapore and Hongkong as a particular reference of China. An extension is also made to interpret emerging real estate bubbles in a few other European countries.

The ability to assess the risk of specific properties and measure the expected contribution of such properties to the enterprise-wide risk of typical institutional portfolios would mean the potential to predict the changing investment scenarios in assets like properties in real estate. This paper tries to bridge the trading gap of investor's reactions although the indices are capturing accurate variations in the property prices.

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# 1. INTRODUCTION TO REAL ESTATE PRICING INDEXES

The house pricing of indexes are used as a general macroeconomic indicator of the real value of money with time, as an input into the measurement of consumer price inflation, an element in the calculation of household (real) wealth and as a direct input into an analysis of mortgage lender's exposure to risk of default(Fenwick, 2006). Further uses could be for forecasting and understanding of real estate price bubbles which have repeatedly been related to financial crises which is important to measure these price bubbles accurately and in a way that is comparable across countries.

During the construction of these real estate price indexes an exact matching of properties over time is not possible due to reasons like the heterogeneous nature of the real estate depreciation of property over time and usually the property may have had renovations, low turnover of properties (especially in european countries)(Diewert, 2007) because of the low incidence of resales, separation into constant quality components that records change in the price of the structure and underlying land. It is well established that pillars of a real estate index are – representatively, diversity, purpose and geographical coverage. There could be new dimensions that might get added to the index in light of significant developments and increase recognition of contribution of real estate markets to global economic indicators.

# 2. METHODS

Despite the existing problems, governments globally are positive towards construction of real estate indices using different methods which could be broadly classified as appraisal methods and/or transaction based methods. A sub classification of the transaction based methods is 1) repeated sales method 2) hedonic methods and the main example of the appraisal based method is use of assessment information. In scope of this paper only the repeated sales method is used as a measure of appropriate real estate index methodology.

## 2.1. Repeated sales method:

The repeated sales method index is built using data of sales on individual properties selling more than once, so that the change in the price between sales indicates the variation in the values of the same property either an increment or a decrement at least in theory. The index is thus based on the price type change that correlates to property investor's investment expectations similar to the price changes that stock market indexes usually experience.

Constructing a property index on sales prices of the same property at different times using regression analysis minimises quality differences of the price index giving great flexibility to reproducibility of results as data collection give the same data on sales of housing units. Standard errors which could be easily inferred from the regression analysis help to eliminate any adverse effects on the valuation of the real estate properties.

Many data collections were able to produce data on more than two sales of a given property for the time period covered by the index. In such cases there is no unique way to reduce these sales to price relatives and if computed will be subject to correlated residuals. In cases of more than two sales, secondary sales are largely correlated to previous sales hence the sales price relatives will be subject to correlated residuals. Each time another period is added to the

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index, the entire regression analysis should be recomputed. But regression analysis does provide the flexibility of easy modification to eliminate the effects on the value of certain changes in a property between periods between sale events.

A typical repeated sales model in simplistic terms can be see below – (Martin et al, 1963 and Bailey et al 1963)

$$R_{itt'} = \frac{B_{t'}}{B_t} e^{-c(t-t')} U_{itt'} \qquad r_{itt'} \equiv \sum_{j=1}^{T+1} b_j x_j + u_{itt'} \qquad (1)$$

$R_{itt'}$ = ratio of final sales price in period $t'$ to initial sales price in period t for the i$^{th}$ pair of transaction with initial and final sale in these two periods.

B's are unknowns and estimated through regression and U's are residuals.

A revised version of the repeated sales model has been in use in the built up of the Hong Kong Residential pricing index, the details of the equation are as follows – ( Chau, 2006)

$$\ln \frac{P_{i,t2}}{P_{i,t1}} \equiv \sum_{t=1}^{T} \ln(1 + cr_{t'}) D_{i,t} + \ln(\epsilon_i), \qquad (2)$$

where, $P_{i,}$'s are prices of repeated transactions of the property asset, $cr_{t'}$ is the cumulative return of the portfolio from time 0 to t with $cr_0$ =0, where $D_{i,t}$ is a time indicator which equals -1 if t is equal to $t_1$, +1 if t2 and 0 otherwise, and $\epsilon_i$ is random error.

The repeat sales indexes are aimed at tracking property prices without removing capital improvement expenditures like major developments, redevelopment or rehabilitation of the properties between two sales dates. Disadvantages exist for repeated sales methodology like – non accountability to depreciation of the dwelling unit, ignoring large renovations, can be used only at a higher scale of classification and all available information on property sales is not used for index calculation, updating every time a new significant transaction happens. To account for the renovations and extensions at the time of sale, hedonic methods are applied.

**2.2. Hedonic methods:**

"This is the most efficient method for making use of the available data during regression analysis. However it is observed that hedonic method suffers from specification bias". (Diewert et al, 2007 and Davor et al, 2008). A typical hedonic method is represented as follows –

$$\ln p_{it} = \alpha + \beta \ln m_i + \sum_{j=2}^{T} \delta_j D_{ij} + \sum_{j=1}^{l} \gamma_j X_{ij} + \epsilon_i \qquad (3)$$

$p_{it}$ = Achieved prices in real estate;

$X_{ij}$ = Locational and qualitative characteristics known for all real estate sold;

$\alpha, \beta$ = Time dummy variables where $D_{ij} = 1$   $\delta, \gamma_j$ are regression coefficients and $\epsilon_i$ is random error. Hedonic methods are data intensive and relatively expensive when it comes to applying them to large real estate markets. Since it is a custom driven regression analysis it might not be replicated during new transactions. However the method can be modified to give a decomposition of property prices into land and structures components which are unique to this methodology.

Using this methodology as the basis, National University of Singapore developed the Singapore Residential pricing Index (SRPI). The basic equations that governed the base periods valuation of SRPI are as follows: (Lum sau kim, 2010).

1) A hedonic price model is specified and estimated using all available transactions in the basket up to and including the base period.

$$\ln\left(\frac{Price_{kjst}}{A_{kj}}\right) = \gamma_j + \tau_s + \alpha_j \ln A_{kj} + \lambda_j L_{kj} + PT_{st} - y_s.TTOP_j + r_t TTOP_j + \epsilon_{kj}$$

(4)



Figure 1: HDB resale price index and URA private residential price index. Lum sau kim (2011)

2) The hedonic residuals for these properties in the above equation for those properties in the basket that were sold prior to the base period are used to extrapolate the hedonic value of unobserved attributes.

3) The base period value is then computed as the sum of the value of the observed attributes and that of the unobserved attributes:

$\ln\left(\frac{Price_{kjst}}{A_{kj}}\right) + \epsilon_{kj}$ where PT is the price trend, TTOP is time to total occupation permit, r is the interest rate, y is the yield, $\alpha$ is the marginal effect of strata area[A], and $\lambda_j$ is the marginal effect of floor level [L], $\tau_s$ the ground level fixed effect and $\epsilon_{kj}$ the hedonic residual.

The hedonic procedure models property prices as a function of various characteristics of the properties, such as size, age, location, and quality. By regressing property transaction prices onto these hedonic characteristics of the properties that sell, and controlling for or keeping track of the time of the sale, it is possible to construct a constant- quality price-change index, or an index that tracks property market price changes controlling for property differences. To improve the quality of the indices the appraisal methods of the type of use of assessment information has been in use.

Use of Assessment Information -

This methodology is unique in its methodology based on the data from the periodic appraisals of all the taxable real estate property. It is also called the SPAR method of constructing an appraisal index.

"The (regular) Dutot, Carli and Jevons Market Value to Appraisal Indexes" is the common methodology used based on the assessment information:

$$P_D(S^t, A^{0t}) \equiv \left[\sum_{i=1}^{N(t)} S_i^t / \sum_{i=1}^{N(t)} A_i^{0t}\right]$$

(5)

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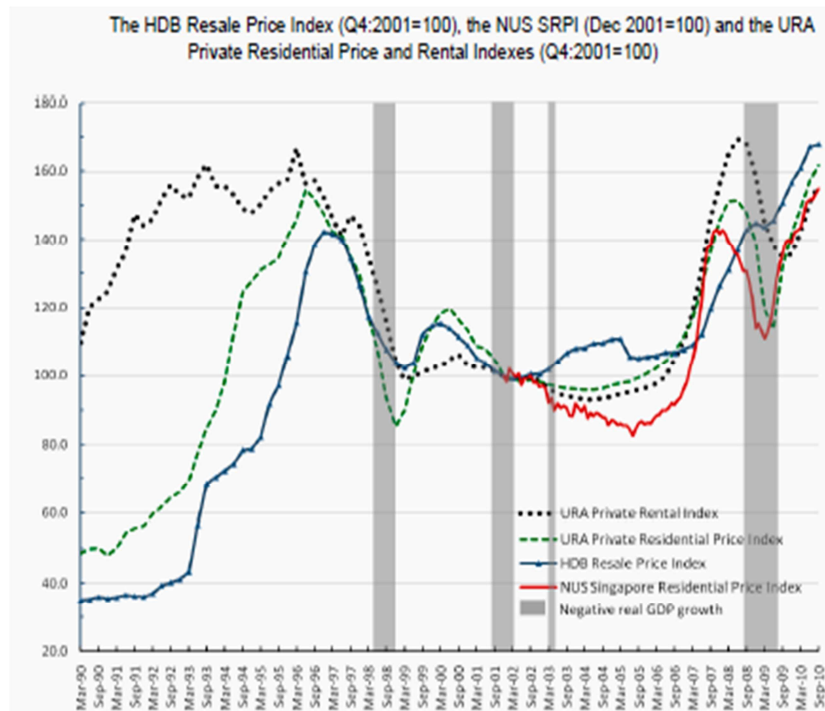Rome, Italy, 6-10 May 2012

$$P_C(S^t, A^{0t}) \equiv \left[\Sigma_{i=1}^{N(t)}(S_i^t/A_i^{0t})N(t)\right] \qquad (6)$$
$$P_J(S^t, A^{0t}) \equiv \left[\Pi_{i=1}^{N(t)}(S_i^t/A_i^{0t})\right]^{1/N(t)} \qquad (7)$$

Where $P_D, P_C, P_J$ are the dutot, carli, Jevous type price indices, sales prices be denoted as $[S_1^t, S_2^t, ..., S_{N(t)}^t] \equiv S^t$ and the corresponding official appraisal prices as $[A_1^{00}, A_2^{00}, ..., A_{N(0)}^{00}] \equiv A^{00}$;

N (t) = number of sales of the same type of property in the current period (Diewert, 2007).

The availability of sales data from administrative records makes the data available extensive avoiding the sparse data problem and including structural and house characteristics that one would encounter using repeated sales method.
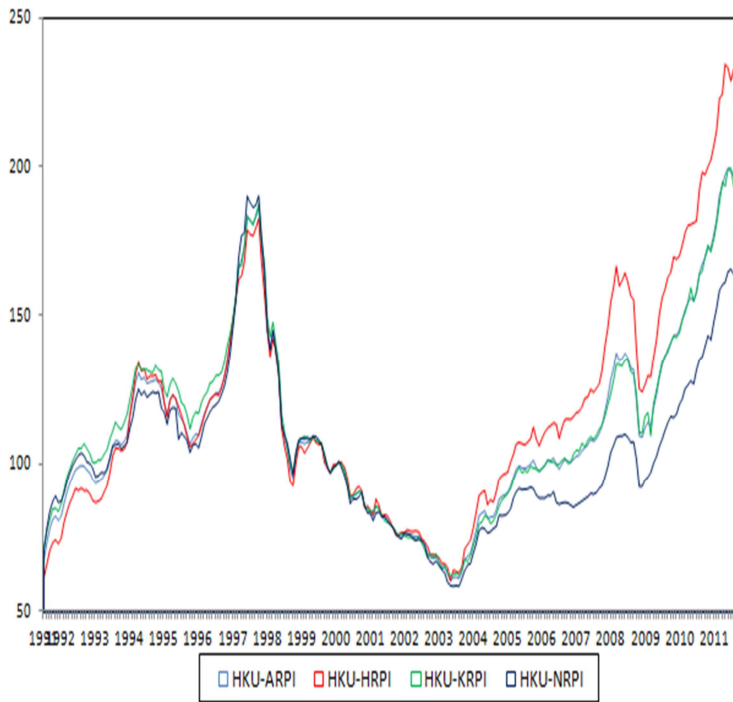


**Figure 2: Residential pricing index, Hong Kong. Source: Chau (2006)**

Similar to repeated sales method, assessment methods donot include depreciation of dwelling units or structures, renovations. The quality of the base period assessment decides the index and further the index constructed from this method could not be decomposed to structure and land components

## 3. EXAMPLES OF THE REAL ESTATE INDICES

Swiss real estate index in Switzerland developed by UBS comprises six indices that is calculated as the average of trend adjusted and standardized indicators weighted using a principal component analysis. "The index value is categorized as where slump (below -1), balance ( between -1 and 0), boom ( between 0 and 1), risk ( between 1 and 2), and bubble ( above 2). The six sub indices that constitute the swiss real estate index are the relationship between purchase and rental prices, the relationship between house prices and household income the relationship between house prices and inflation, the relationship between mortgage debt and income, the relationship between the construction and gross domestic property (GDP), and the proportion of credit applications for residential property not intended for owner occupancy." (UBS WMR, 2011).

Developed by a team of researchers at Institute of Real estate studies (IRES), the Singapore Residential Price Index (SRPI) provides a resource for the development of property derivatives that would help to expand the suite of financial products offered in Singapore, particularly in the context of obtaining exposure to and managing risks associated with the real estate market. It will also complement existing property information on the state of the

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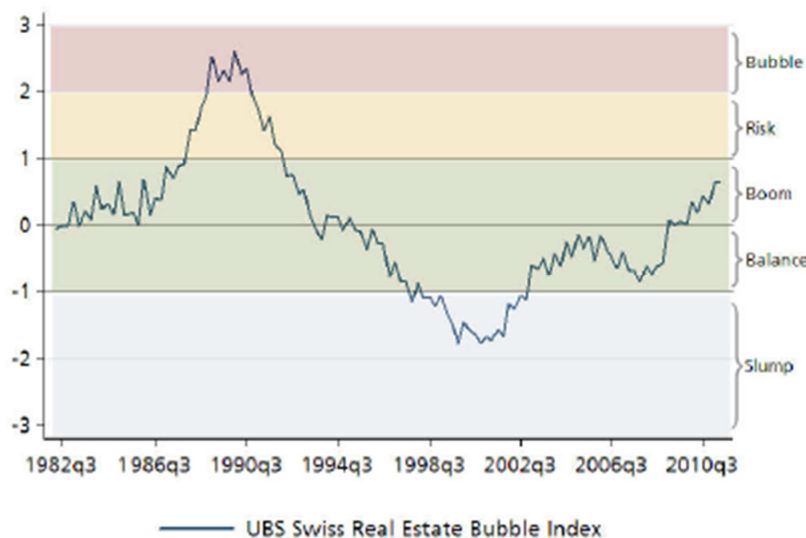
residential market.

Currently, SRPI indexes are published in the form of value-weighted indexes. The SRPI is the index for the overall non-landed residential market in Singapore based on the whole SRPI property basket. Two sub-indexes are also produced for the Central and non-Central regions. The Central region sub-basket comprises properties within the overall SRPI basket located in Postal Districts 1 through 4 and 9 through 11 while properties in the other postal districts are in the non-Central region sub-basket. (IRES. NUS, 2010)

In a similar way, the University of Hong Kong developed index – University of Hong Kong Real estate Index series (HKU-REIS). "The University of Hong Kong".



**Figure 3:  Chinese housing prices**

All residential price index (HKU-ARPI) is a monthly real estate price index that tracks the changed in the general price level of residential properties in Hong Kong over time. The Index is constructed based on the actual transaction of completed private residential properties registered with the Hong Kong SAR government (the Land Registry). The index covers the entire Hong Kong Special Administrative Region and is a weighted average of sub-indices for three sub-regions in Hong Kong" (Chau, 2006):

$$HKU\text{-}ARPI_t = (w_H * (HKU\text{-}ARPI_t)/( HKU\text{-}HRPI_{t0}) + w_K * (HKU\text{-}KRPI_t)/( HKU\text{-}KRPI_{t0}) + w_N * (HKU\text{-}NRPI_t)/( HKU\text{-}NRPI_{t0}))* HKU\text{-}ARPI_{t0} \qquad (9)$$



**Figure 4: UBS Real estate index for Switzerland. Source: UBS WMR (2011)**

Where $t_0$ and t indicates the initial time and time of sale, $w_H$, $w_K$, $w_N$ represent the weightings for Hong Kong Island, Kowloon and the New Territories respectively. HKU-ARPI: The University of Hong Kong All Residential Price Index which is a composite index comprising the following sub-indices, HKU-KRPI: The University of Hong Kong Kowloon Residential Price Index, HKU-NRPI: The University of Hong Kong New Territories Residential

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Price Index, HKU-HRPI: The University of Hong Kong, Hong Kong Island Residential Price Index.

The results of the above stated index correlated to the staff estimates report on Hong Kong real estate residential property prices - confirming the statistical inferences of a bubble and actual price moved above the 2 standard errors. error bank during 2009 – providing evidence of a bubble – but in 2010 the gap closed owing to a more rapid increase in the equilibrium price. This latter convergence reflects the fact that the fundamental variables turned highly supportive of rapidly rising property prices with, owing to negative real interest rates, a limited supply of new apartments, and rapid real GDP and domestic credit growth. Overall, this suggests that policy should focus on restraining the fundamental drivers of property prices rather than seeking to burst the bubble by targeting speculators (Lum Saukim, 2011).

China's real estate price statistics include: Housing sale prices, including both sale prices of newly-built houses and second-hand houses; Rental prices with reference to market, land transaction prices for land use rights, the price of real estate management which refers to the price/fee which the property management enterprise charges the owners for services provided." (Dong, 2010). The price collection is carried out every month, and the quarterly prices are calculated as three month averages. All of them are calculated as a weighted average by using the chained Laspeyres formula:

$P_L \equiv [\frac{\sum P_{c,tn}*q_{c,t0}}{\sum P_{c,t0}*q_{c,t0}}]$ , where P is the relative index of the price levels in two periods $t_0$ is the base period and $t_n$ is the period for which the index is computed.

There has been increased acceptance of the projections and forecast of the real estate growth through the use of these indices. Real estate investors until have seen real estate as an asset class which led to increased focus on real estate markets for asset allocation decisions, and portfolio performance attributions in modern portfolio investment decisions. It is in this context that the growth rates or the real estate index projections are of extreme importance for robust real estate investment management in order to maintain the confidence of the investors.
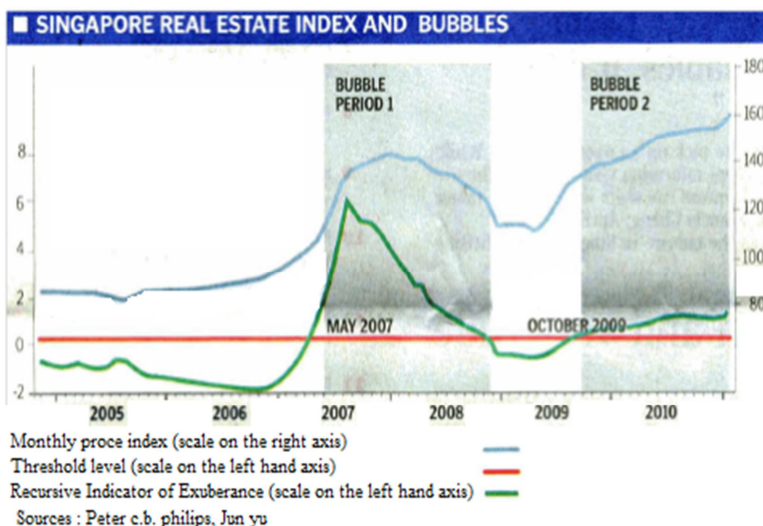
## 4. EMERGING REAL ESTATE BUBBLES



**Figure 5: Real estate bubbles in Singapore**

Basel I Accord of 1988 and Basel III accord in recent times sought to promote a stable framework of world banking. In the light of the recessive trends in global economy, real estate bubbles have been highlighted as these bubbles has tendency to accentuate the trends. The IMF uses the following definition for a bubble – "a bubble refers to a situation when the price for an asset exceeds its fundamental price by a large margin."

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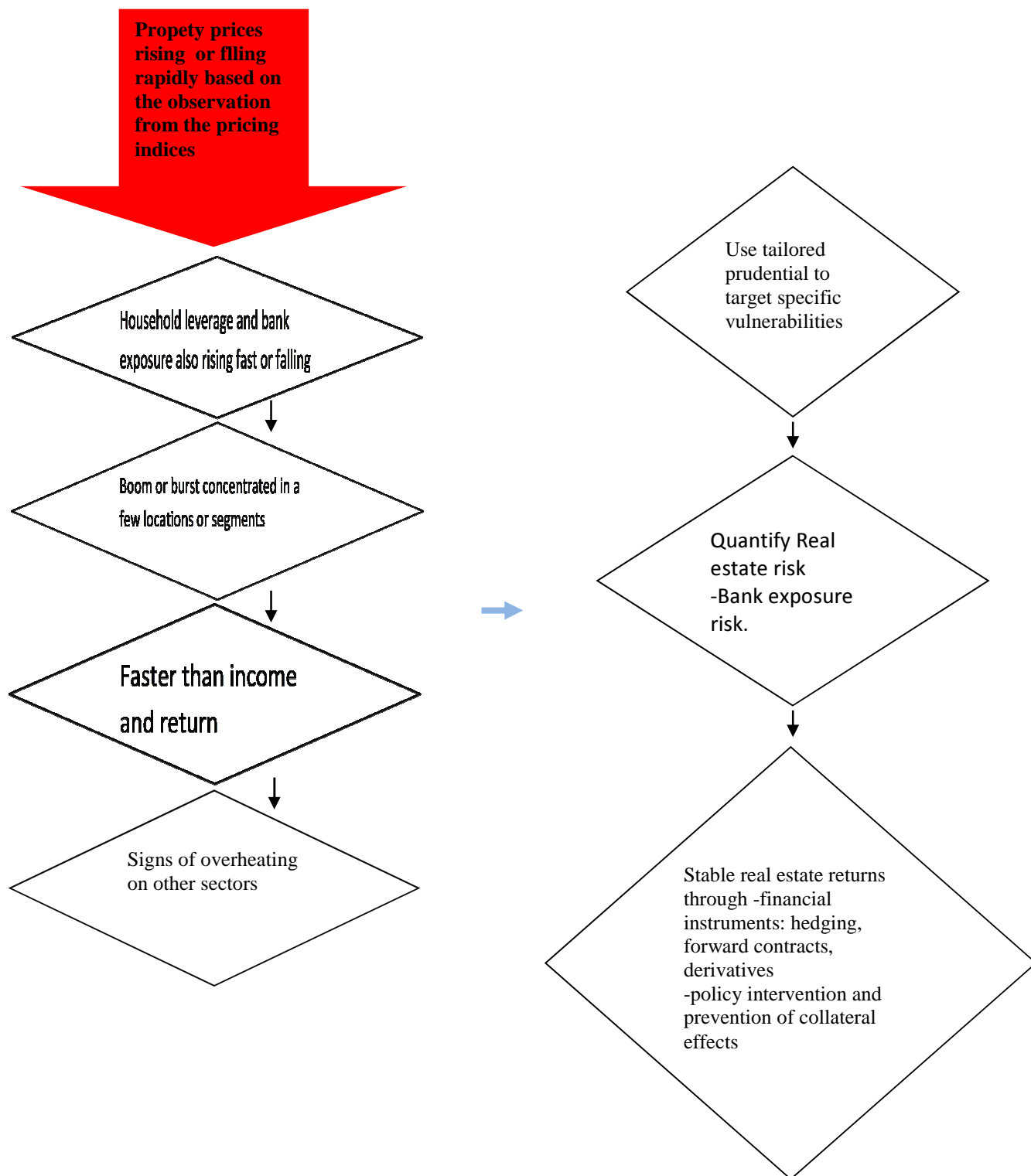
Figure 6 : Framework for stable real estate returns  (modified from Christopher Crowe) (2011)

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A real estate index produced graphs which give a inference about the bubbles. Theories of bubbles can be divided into four categories. These are (i) bubbles based on infinite horizon overlapping generations' models, (ii) asymmetric information bubbles, (iii) agency theories, and (iv) behavioral theories. It is suggested that agency theories provide the best foundation for developing a theory of monetary policy, credit and real estate bubbles.

'The UBS Swiss Real Estate Bubble Index currently stands at a level of 0.65. This represents a minor increase of 0.02 points compared to the prior quarter. The current level of 0.65 is indicative of a booming housing market in Switzerland, without an elevated risk of overheating."(UBS WMR, 2011).

"In Singapore and Hong Kong, governments have introduced several measures to curb real estate bubbles, including stamp duties and lower mortgage percentages due to second bubble that emerged in early 2010" (Peter, 2011). The Chinese real estate bubble according to sources like IMF or many other wealth management reports in financial industry are mainly attributed to the decreasing working age of the population in china, the credit explosion after the financial crisis leading to limited investment options thereby allowing investors to make forced investments only inside mainland china. The main basis for bubble assessment could be possible by scenario analysis and is the notion of mean reverting real home prices per square meter, supported by low rental yields.

During times of real estate bubbles there seems to be an inferior risk adjusted returns as investors take a risk-averse strategy to invest in real estate. During a boom or normal periods of real estate market there is a seemingly superior risk adjusted return for real estate that may be caused by inappropriate measures that ignore the non identical .independently. distributed (i.i.d) nature of the assets return distribution as well as the illiquidity risk. Real estate risk assessment is an important factor in order to estimate the returns associated with the real estate investment made by the investors.
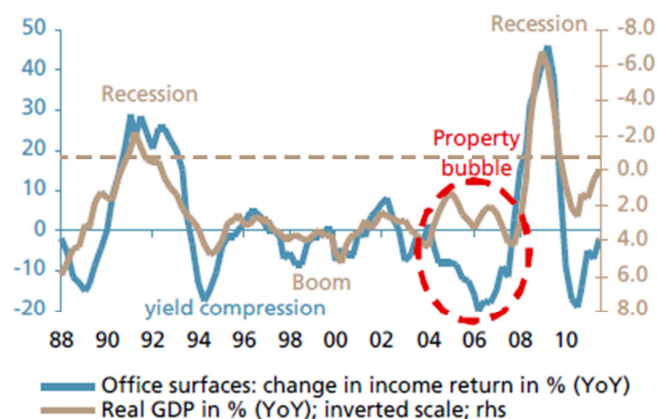


**Figure 7: Real estate bubbles in United kingdom**

## 5. REAL ESTATE RISK ASSESSMENT AND STRATEGY FOR STABLE REAL ESTATE RETURNS

Commercial risk estate property's represent more than 50% of the global stock market capitalization. Therefore securitization still has a high growth potential over long term. "Usually while investing in real estate, the investor is faced with a trade-off between liquidity on the one hand and volatility on the other. This trade off becomes less important as the investment horizon lengthens." (UBS WMR, 2011).

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Risk due to illiquidity is considered to be the leading risk factor in real estate investment and allocation decisions. The conventional risk calculation using standard deviations from historical returns leads to erroneous real estate risk calculation. Superior risk adjustment returns of real estate as some researchers proved are caused by inappropriate risk measurement. Investors apart from the illiquidity risk also face the uncertainty of time of market.

A tentative core principle framework that could act as a tool kit to deal with real estate booms and bursts (bubbles) is necessary for maintaining stable real estate returns A good example is the Italian real estate sector, which plays an important role in the national economy, as a contribution to productive activities, for links with the banking sector and as a form of asset allocation. The entire real estate market has a turnover which represents almost a fifth of gross domestic product. The real estate activities account for more than 60 percent of overall household wealth. Credit to the real estate sector accounts for about one third of total bank credit disbursed (Rinaldi, 2006)

Italy like other countries has reflected the oscillation of the market value of property which has resulted in large losses several times for investors. Between 1992 and 1997 there was a large decline in market prices of real estate, and investors who bought in the late 80's and early 90's found themselves in a state of negative-equity that has led to large capital losses. Similar is the situation of the last decade, when the birth of variable rate mortgages, in conjunction with the oil crisis, has led the Italians to invest in real estate, causing an excessive demand that caused a sudden exponential rise in prices.

Northern and central Italian cities have been the most affected by the great increase in prices and by the phenomena of negative-equity. Thus Italian banks have adopted common guidelines for the disbursement of credit [Italian resolution, 1995], and have now become more restrictive due to the high risk currently associated with the real estate.

The 100% of the value of the properties is allowed only if the borrower has adequate guarantees for loans granted, such as money, securities, properties or other guarantee policies for which it is possible to include mortgage. In other cases the credit granted by banks may not exceed 80% of the value of the property. Otherwise you lose the requirements for the issuance of mortgage loan below:
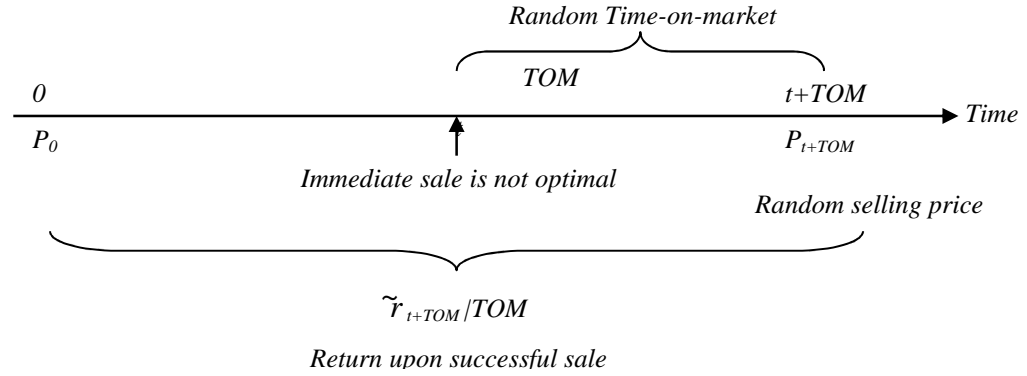
- inclusion of a first-grade mortgage;
- duration of the contract over 18 months;
- grant not exceeding 80% of the value of the property (except in the presence of additional guarantees);

The adoption of insurances related to credit and a general line of protection adopted by Italian banks, are relying more and more on systems that can predict in advance the real estate market fluctuations and relative risks.

A time dependent nature of real estate risk is capable of taking in to account the uncertainty time of market. The methodology for computation is as follows – (Ping cheng, 2008)

There are two risks at the time of the decision to sell:

▪ random selling price

▪ random time-on-marker

Random Time-on-market

*0*      TOM      *t+TOM*

$P_0$          Time

*Immediate sale is not optimal*     $P_{t+TOM}$

*Random selling price*

$\tilde{r}_{t+TOM}/TOM$

*Return upon successful sale*

The exante risk is computed on the total time of $t + t_{TOM}$ (Ping cheng, 2008)

$$\sigma^{ex-ante} = \sqrt{(t + t_{TOM})(\beta^T)^2 \sigma^2 + 2\sigma^2 \beta^T (1-\beta^T) + \frac{(u^2 + (\beta^T)^2 \sigma^2)\sigma_{TOM}^2 + \sigma^2(1-\beta^T)^2}{(t+t_{TOM})}} \quad (10)$$

The Sharpe ratio is used for comparisons of investment performance based on assets risk-adjusted returns. The Sharpe ratio is defined as $S = u - r_f / \sigma$ . For an exante return a modified Sharpe ratio captures the time-dependent nature of real estate risk by incorporating an illiquidity risk in a closed-form formula as follows:

$$S_{RE} = \frac{u - r_f}{\sqrt{(t+t_{TOM})(\beta^T)^2\sigma^2 + 2\sigma^2\beta^T(1-\beta^T) + \frac{\left(u^2 + (\beta^T)^2\sigma^2\right)\sigma_{TOM}^2 + \sigma^2(1-\beta^T)^2}{(t+t_{TOM})}}} \quad (11)$$

The variance is equal to the square of its mean. Therefore, the variance of the time-on-market (TOM) is equal to the square of the expected TOM, i.e., $\sigma_{TOM}^2 = t_{TOM}^2$. Thus, the equation can be rewritten as:

$$S_{RE} = \frac{u - r_f}{\sqrt{(t+t_{TOM})(\beta^T)^2\sigma^2 + 2\sigma^2\beta^T(1-\beta^T) + \frac{\left(u^2 + (\beta^T)^2\sigma^2\right)t_{TOM}^2 + \sigma^2(1-\beta^T)^2}{(t+t_{TOM})}}} \quad (12)$$

Where $u, \sigma$ are return and risk from indices, $\beta^T$ is the risk factor growth rate for each data series.

In addition to computing the real estate risk that captures time–dependency investors should be aware of the positive and statistically significant relationship between bank stock returns and real estate market returns as it demonstrates that the real estate risk is a pricing factor.

When the value of a firm's real estate appreciates by certain amount, its investment increases by fraction of its investment. This investment is financed through additional debt issues. The impact of real estate shocks on investment is stronger when estimated on a group of firms which are more likely to be credit constrained. Real estate represents a significant fraction of the assets held on the balance sheet of corporations.

Studies from researchers hypothesized that bank sensitivities are crucial in the light of the house price run up and severity crisis as illustrated in the figure. Small banks are with high asset balance sheet exposure to real estate risk are tending to be more sensitive to real estate returns. The influence that real estate market developments have on the banks' stock returns is
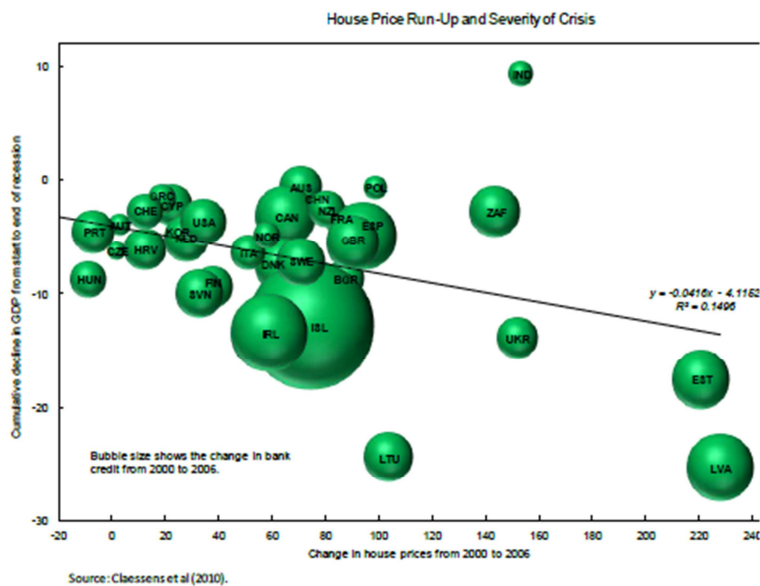
**Figure 8: House Price Run-up and Severity of crisis. Claessens et al (2010)**

related to the banks' exposure to real estate market. Relationship between bank stock returns and the proxies for real estate is more significant when regional market indices are used as a benchmark for real estate market conditions, which is justified given that most of major European banks are global banks. In other words, the stocks of the banks that have more real estate loans are more sensitive to the real estate market developments. (Chaney, 2009).

Using the multi-factor least squares regression with mean monthly returns as a dependent variable, when the returns on the stock market go up, the returns on the banks' stocks go up as well. This multi factor regression analysis can be potentially improved by employing the GARCH model to understand that negative influence of the increasing real estate values is due to market's penalty of the banks' lower diversification and increasing share of the loan portfolio invested into real estate in times of rapid real estate market values growth. It could also be a reflection of the market perception of the fact that banks give out higher loans in the periods of increasing real estate values while maintaining the same loan-to-value ratio.

To quantify bank's exposure to real estate risk one could use the following methodology:

$$R_{B,t} = const + \phi_1 R_{M,t} + \phi_2 i_t + \phi_3 RI_t + \phi_4 D_t RI_t + \mu_t \qquad (13)$$
$$RIS_j = (const + \alpha_1 RIL_j + \alpha_2 RII_j + v_j) \qquad (14)$$
$$RIS_j = (const + \alpha_1 RIL_j + \mu_j) \qquad (15)$$
$$RIS_j = (const + \alpha_1 RII_j + e_j) \qquad (16)$$

where $R_{B,t}$ is the men monthly return of the banks in the sample, $R_{M,t}$ is the monthly market return, $RIS_j$ is the real estate sensitivity of bank j, $RII_j$ and $RIL_j$ denote proxies for the real estate exposure of bank j, and $u_j$, $v_j$, $\mu_j$ together with the $e_j$ are error terms. The proxies for the real estate exposure are calculated in the following way:

RII = Investment into real estate within tangible assets / Total assets

RIL = Retail real estate loans / Total assets

Real estate risks should be supplemented by market risk and interest rate in the cost of the capital and asset pricing models, when assessing the NPV of the bank investments of evaluating bank's true performance (Antonio Miguel martins, 2011). A decreased sensitivity to the real estate risk of the banks could be made possible through better risk management techniques and managerial oversight over the real estate loan portfolio, or better hedging. A better risk management could be possible when risk specific properties are assessed and later used to measure the expected contribution of such properties to the enterprise-wide risk of

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typical institutional portfolios. Four risk components are included – operational cash flow valuation risk, financial structure, credit and rent volatility, and risk components could be calculated using the "Everything Everywhere" (EE) model. EE model is measured mathematically as

$$R_{it} = Int_j + \beta_{1i}SectRet_{st} + \beta_{2i}RegRet_{ct} + \beta_{3i}BR_t + \beta_{4i}Oil_t + \beta_{8i}Size_t + \beta_{6i}ValGrow_t + \beta_{7i}MktDev_t + \beta_{8i}FX_c + \beta_{9i}BF1_t + \beta_{10i}BF2_t + \beta_{11i}BF3_t + \beta_{12i}BF4_t + \beta_{13i}BF5_t + \epsilon_t$$

(17)

Where $R_{it}$= the return of company I in period t, calculated in the base currency; $Int_j$= the intercept, $SectRet_{st}$= the return for the sector s index in period t; $RegRet_{ct}$ =the return for region c index that the company i's country belongs to in period t ; $BR_t$= the return on the Salomon brothers World government bond Index ( a proxy for global interest rates) in period t $Oil_t$ = the % change in oil prices in USD terms in period t ; $Size_t$= company size in period t ( the difference between a return index of the 10% of the companies with the largest capitalization and a return index of the 10% of the companies with the largest capitalization ad a return index of the 10% of the companies with the largest capitalization and a return index of the 10% of the companies with the smallest capitalization.

## 6. REAL ESTATE RISK TACKLING USING DERIVATES AND OTHER HEDGING OPTIONS

Real estate derivatives could be useful for property owners and private investors hedging their risk exposure in both domestic and global real estate. The heterogeneous nature of real estate is making these instruments difficult to improve liquidity during trading although in Singapore they have 30% contribution potential to the real estate market share.

Commercial property price derivatives differ from the major traditional derivatives products, such as commodities and financial or foreign exchange futures; in that because the asset



**Figure 9 : Maximum LTV and House prices**

(the real estate) cannot be traded in a cash, or spot, market. This renders the traditional futures–spot arbitrage impossible to execute, undercutting the classic formula for the fair price of the derivative, and raising the need to consider in depth the nature of the dynamics of the underlying index.

Derivatives that use both appraisal and transaction-based indexes are likely to evolve. They may serve needs of different investors. On the other hand, investors who want to hedge a decline in prices or to use a derivative to capture changes in property market prices without

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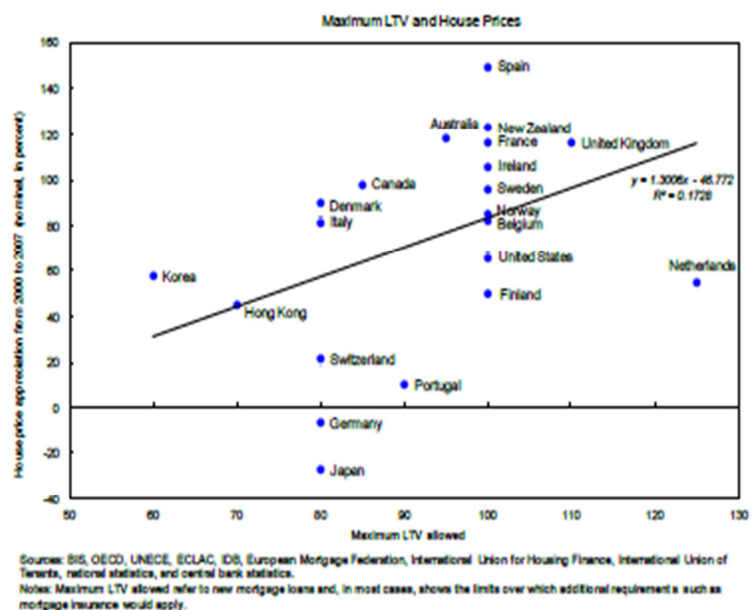Knowing to manage the territory, protect the environment, evaluate the cultural heritage
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any lag should use a derivative supported by a transaction-based index. In either case, investors must understand how each type of derivative should be priced and how well it will perform as a hedge. The pricing formula is as follows:

Pricing the Forward Contract – $F_t = E_0[S_t]((1 + i)/(1 + E_0[r_s])^T)$ (18)

## 7. IMPROVING FINANCIAL STABILITY IN REAL ESTATE INVESTMENT

Assuming a long run linear relationship exists between the equilibrium residential property price and the above variables, the co-integrating equation specification is: (R Sean Craig, 2011)
$$p_t^* = \alpha_0 + \alpha_1 c_t + \alpha_2 h_{t-m} + \alpha_3 y_t + \alpha_4 r_t + \alpha_5 l_t \qquad (19)$$
Where p= residential property price, c= building costs, h = land supply, y= household income, r= lower interest rates, l=domestic credit.

To allow for the long lag it takes for completed flats to come onto the market and be sold, h enters the equation with m-quarter lag, with m determined by empirical tests. The variable p* is the "equilibrium" property price as determined by long run fundamentals.
Assuming statistical tests find a long run co-integrating relationship among $p_t$ , $c_t$ , $h_{t-m}$, $y_t$, $r_t$ and $l_t$ , the associated error correction model of short-term price dynamics that can be used to test for the impact of policies is:

$$\Delta p_t = \beta_0 + \lambda \Pi_{t-1} + \beta_1 \Delta c_t + \beta_2 \Delta h_{t-m} + \beta_3 \Delta y_t + \beta_4 \Delta r_t + \beta_5 \Delta l_t + \varpi_1 LTV_t + \varpi_2 SDT_t \quad (20)$$

where LTV = loan to value ratio, SDT = stamp duty tax, the other terms being – linear trend, real interest rate, real GDP per capita, log(real tender price), private flat supply, real domestic credit. The error-correction term in this model, $\Pi_{t-1} = p_{t-1} - p_{t-1}^*$, is the error term from equation 1 lagged one period. This term is the deviation of the actual residential property price from the long-run equilibrium price estimated in equation 1. The parameter on this term, λ, represents the speed of adjustment of the property price back to its long run equilibrium value. The loan-to-value ratio and stamp duty tax are represented by the variables LTV and SDT.

## 8. CONCLUSIONS

For pricing purposes in real estate market , one needs to specify exogenously the market price of risk. It is critical to be able to model real-estate indices as closely as possible to real world market conditions since many mortgage-related securities are marked to model in the absence of a liquid market. A large bias in forecasting future levels of a real estate index will be reflected, say, in marking the profit and loss position of a real estate position and this could be extremely detrimental to banks' holding positions in these securities. However all the user needs cannot be met by a single real estate price index. So combining hedonic and repeat-sales methods used in the construction of housing price indexes makes them applicable equally well to other durables. Unusually short turnover periods between sales of any house

are associated with typical price movements reflecting distressed sales or uninformed initial offer prices. Virtual real estate markets on the internet may well facilitate the development of high quality property price indexes there by leading to a better prediction measure of volatility and bubbles.

One could expect the impact of real estate shocks on aggregate investment to be non-trivial. However, this is not necessarily the case in a world where responses to balance sheet shocks are heterogeneous. In particular, small firms respond speedily than large firms, which attenuate the aggregate impact of credit constraints.

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## 10. BIOGRAPHICAL NOTES

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Fabio Pinna graduated from technical school of surveyors with specialization in the field of ISO certifications 9001:2008 and 14001:2004 and OHSAS 18001:2007. He is the nominated coordinator for project and activities funded by the public administration. Fabio has been part of the National Council of Surveyors and Graduated Surveyors since 2011, as delegated for Commission 9 of FIG.

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