



Problems and practical solutions for developing tradable repeat sales indices: a Hong Kong case study

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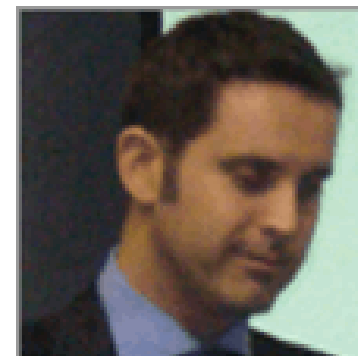
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First property derivative traded in Hong Kong

Source: Asia Risk | 01 Mar 2007

Categories: Structured Products, Regulation



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Sun Hung Kai Financial and ABN Amro execute swap based on residential property

Hong Kong-based financial services firm Sun Hung Kai Financial (SHKF) and Dutch bank ABN Amro have completed Asia's first property derivatives deal, a swap based on Hong Kong residential properties.

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ABN Amro bought exposure to the city's housing market by paying SHKF the Hong Kong interbank offered rate (Hibor) plus an undisclosed spread for changes in the University of Hong Kong's Hong Kong island residential price index (HKU-HRPI). The deal, brokered by new joint venture GFI Colliers, had a one-year tenor and a notional of less than HK\$100 million (\$12.8 million).

Dealers gain licences to trade HK property derivatives

Author: Christopher Jeffery

Source: Risk magazine | 13 Sep 2007

Categories: Regulation, Infrastructure



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Five dealers have secured licences to trade residential property derivatives based on the University of Hong Kong real estate index series (HKU-REIS). The firms – Deutsche Bank, Goldman Sachs, Lehman Brothers, Merrill Lynch and Morgan Stanley - join ABN Amro and Sun Hung Kai Financial, which traded the first property derivatives in Hong Kong in February.

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“Following the success of property derivatives in Europe, the HKU-REIS enables Asia investors a new way to gain liquid exposure to real estate,” said Connie Choi, a Hong Kong-based executive director in the fixed-income, currency and commodities division at Goldman Sachs.

Andrew Chan, vice-president for property derivatives trading at Merrill Lynch in Hong Kong, believes Hong Kong will become

Requirements of the tradable real estate index

- Trading – benchmark indices for settlement of property derivatives
 - Property derivatives – financial derivatives with a portfolio of properties as underlying.
- Tradable indices – more than an economic indicator
- Four additional requirements besides the basic requirements of accurately and reliably measuring changes in price levels



(1) Objectivity

- Cannot be easily manipulated by a "insiders"
- Involves no subjective judgment
- Clear and objective rules of sampling
- Based on actual transactions



(2) Transparency

- Mechanics of computation is clear
openly accessible
- Replicable results
 - Any third party can reproduce the same set of results following the computation procedures using the same set of data.



(3) Wide Coverage

- Reflect changes in price level trend of all the entire market or sub-market
 - Too small a sample / portfolio – biased and prone to manipulation



(4) Timeliness

- Index values are published in final form (not provisional) on a monthly basis with
- Time lag - no more than 3 months.



Modified Repeat Sales Method

- Lack of complete information on property attributes
 - Problem of missing variables in the specification of the hedonic price model
- Centaline-City residential index is hedonic based index
 - Cover estate type development only
 - Model specification not revealed to the public



Problems of repeat sales method

1. Lack of data
2. Exact collinearity between time and age
 - difficult to estimate depreciation rate
3. Quality not constant (e.g. home improvement)
4. Sample selection bias
5. Index revision



1. Lack of Data

- Very liquid and actively traded market
- Close to 880,000 repeat sales pairs over a period of 21 years (1992-2012)
 - On average over 40,000 pairs per year.
- Average holding period: appr. 4 years



2. Exact collinearity between time & age

- Linear age effect => Exact collinearity
- Age effect is not linear even if the rate of the physical depreciation of the structure is constant
- Compare the value of a property at age a_1 and a_2 ($a_2 > a_1$)
- Let T = economic life of the structure
- V_{a_1} = PV of stream of income from now to $(T-a_1)$ + residual value (vacant land value)
- V_{a_2} = PV of stream of income from now to $(T-a_2)$ + residual value (vacant land value)
- Age effect: $V_{a_1} - V_{a_2} =$ PV of stream of income for the period (a_2-a_1) , which is a function of the discount rate (proxied by the real interest rate) – real rent can decline linearly over time. (age effect is small when land price is high)
- Empirical estimation – (1) Non-linear age terms and (2) interact real interest rate with non-linear age terms



Exact collinearity between time & age (cont'd)

Empirical implementation:

Box-Cox transformation of the Age and real interest rate

$$\ln\left(\frac{P_{it_2}}{P_{it_1}}\right) = \sum_{t=1}^K \alpha_t D_{it} + \beta_1 \left(A_{it_2}^{(\lambda_1)} r_{t_2}^{(\theta_r)} - A_{it_1}^{(\lambda_1)} r_{t_1}^{(\theta_r)} \right) + \beta_{23} \left[A_{it_2}^{(\lambda_{23})} - A_{it_1}^{(\lambda_{23})} \right] + \varepsilon_{it_1 t_2}$$

Chau, K. W., Wong, S. K., & Yiu, C. Y. (2005). Adjusting for non-linear age effects in the repeat sales index. *The Journal of Real Estate Finance and Economics*, 31(2), 137-153.



Problem: computational complexity

3. Change in attributes

- High land prices
 - 60% - 80% of the value of a property attributable to land.
 - home improvements / renovation / redecoration (add value to the structure) have relatively little effect housing prices
- significant home improvements are unlikely to be approved
- Units with illegal improvements are difficult to transact
 - less likely to be repeat sales pairs



Change in attributes (cont'd)

Changes in environmental attributed

- lost of a seaview
- Increases accessibility

More likely to occur with long holding period pairs

Case and Shiller's solution:

Weight least squares: Down weight the repeat sales pairs with longer holding periods.

Case, K.E. and Shiller, R.J. (1987). "Prices of single family homes since 1970: new indexes for four cities", *New England Economic Review*, Sept/Oct, 45-56.



4. Sample selection bias

A real issue

- Short holding period pairs (flips) have abnormal behavior
- Long holding period pairs – increase in probability of quality change



5. Index revision

- Not a problem if revision is random or not systematic
- Clapp and Giaccotto found that revisions are systematically downward biased
 - caused by short holding period pairs (flips)
- Flips overestimate the most recent index level
- When flips (holding period ≤ 2 years) are removed, revision is no longer systematic

Clapp, J. and Giaccotto, C. (1999). "Revisions in repeat-sales indexes: here today, gone tomorrow?" *Real Estate Economics*, 27(1), 79-104.

- Same systematic bias found in HK



HKU-REIS (cont'd)

Data cleaning

- Data entry error
- Non-arms length transactions
- Data pairs with large standard error ($> d$) are excluded
- Included data increase d but remains stable after $d > 1$ ($< 1\%$ of the entire sample)
- Mechanical rule - objectivity
- Government (Rating and Valuation Department) spots these outliers manually and based on professional judgment



HKU-REIS (cont'd)

10 year rolling estimate

- Index fixed once published
- Excluding holding periods ≥ 10 years
- Zero weight on long holding period pairs (12%)
- The effect of depreciation minimized (average holder period ≤ 4 years) and fixed (will not grow as the time span increases over time)



HKU-REIS (cont'd)

- Index revision
- Revision is not systematic when pairs with holding period ≤ 4 months are excluded (10% of the sample) – experiment
- The average growth rates of the flips were about 10 times that of the other pairs (non-flips)



Who are the flippers?

Hypothesis:

- Informed traders who can spot under priced properties (high information cost)
- These informed traders are experts in valuation but not trend predictors and therefore will re-sell the property quickly (function like arbitrageur)
- Examples of flippers: estate agents, land assemblers (for redevelopment), foreclosure dealers or their “friends”.

Empirical implications:

- Less flippers in areas with properties that are more homogeneous (e.g. estate type developments)
- Increase in transaction cost (e.g. stamp duties) => less frequent flips but higher average excess return

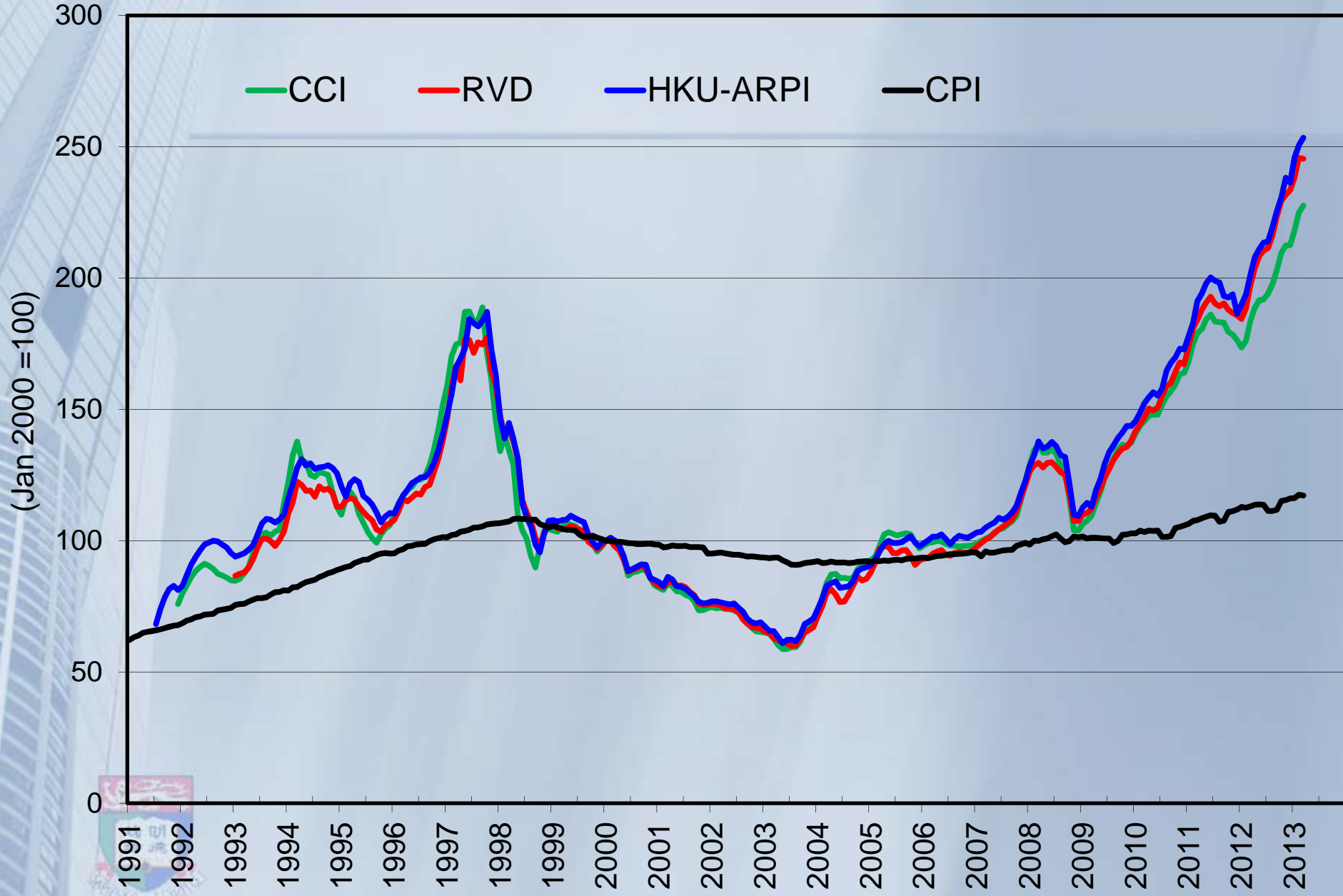


Property price indices in Hong Kong

- Rating and Valuation Department Indices
http://www.rvd.gov.hk/en/property_market_statistics/index.html
- Centa-City Index
http://www.centadata.com/cci/cci_e.htm
- The University of Hong Kong Real Estate Index Series (HKU-REIS)
<http://hkureis.versitech.hku.hk/>
 - Details of index construction method and historical data (since July 1991)
 - Updated every month (6 weeks time lag)
 - Username: **kwchau**
 - Password: **846434**



HK Housing price indices and inflation





Thank You

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