

The Interest Rate Risk of Mortgage Loan Portfolio of Banks

A Case Study of the Hong Kong Market

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Paper presented at the Expert Forum on Advanced Techniques on Stress Testing: Applications for Supervisors
Hosted by the International Monetary Fund
Washington, DC– May 2-3, 2006

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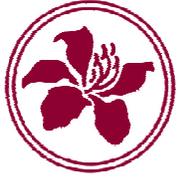
A Case Study of the Hong Kong Market

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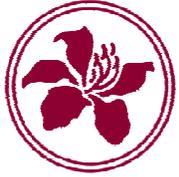
Content

- Market and Interest Rate Structures
- Interest Rate Risk
- Stress-testing Framework and Model
- Scenario Analysis



Mortgage Market in Hong Kong

- Primarily adjustable rate mortgages, with pricing mainly referenced to prime rate (P)
- The cost of fund is determined by a mix of interest rates
- Dominated by major retail banks
 - not only by market shares
 - also by price setting



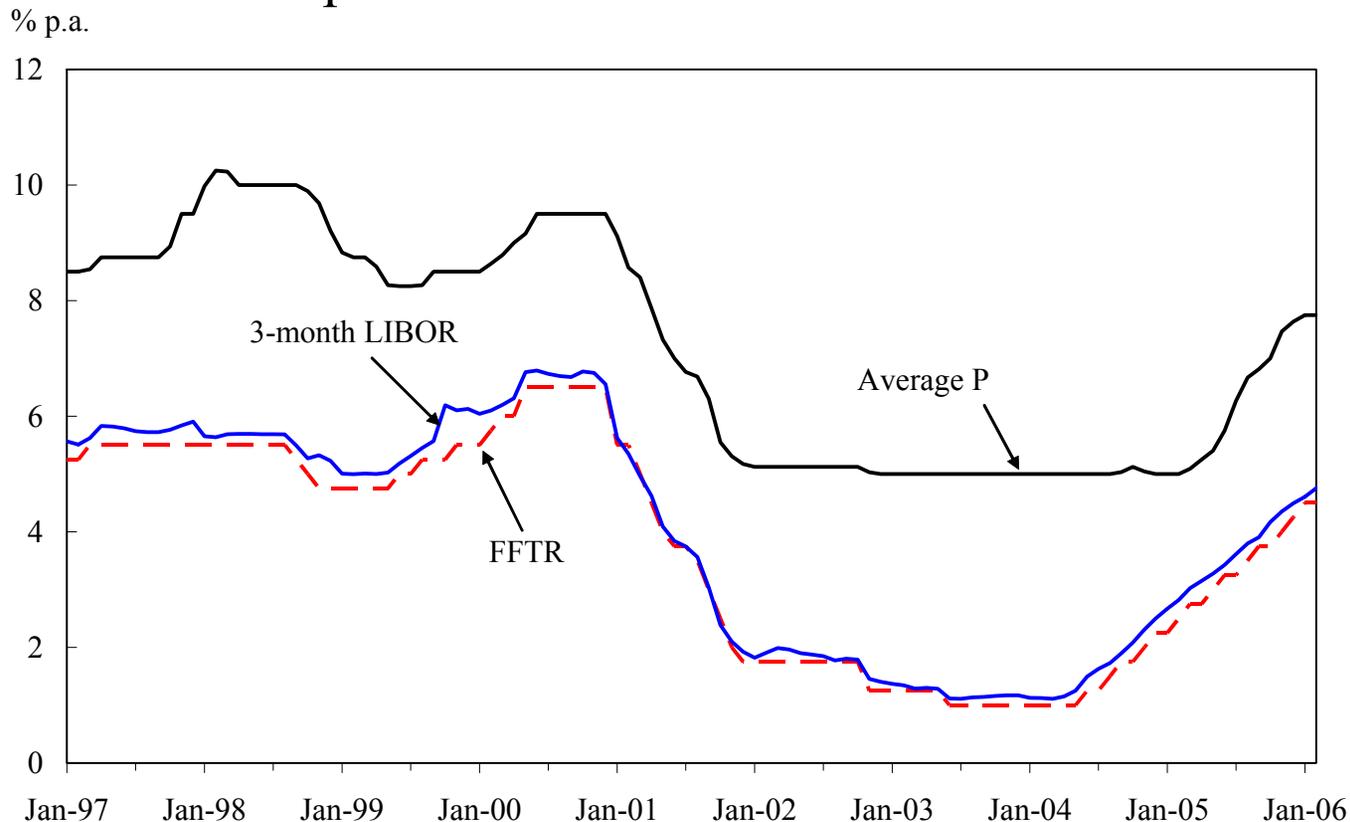
Interest Rate Structure of Hong Kong

- Under the Linked Exchange Rate system, interest rates in Hong Kong tend to track closely their US counterparts
- Major local interest rates are:
 - Prime rate (P, this is also named as the best lending rate)
 - Savings deposit rate (SR)
 - Interbank rates (HIBORs)
 - Time deposit rates (TDRs)
 - Others (such as interest rates on negotiable certificates of deposit and debt instruments)



Prime rate

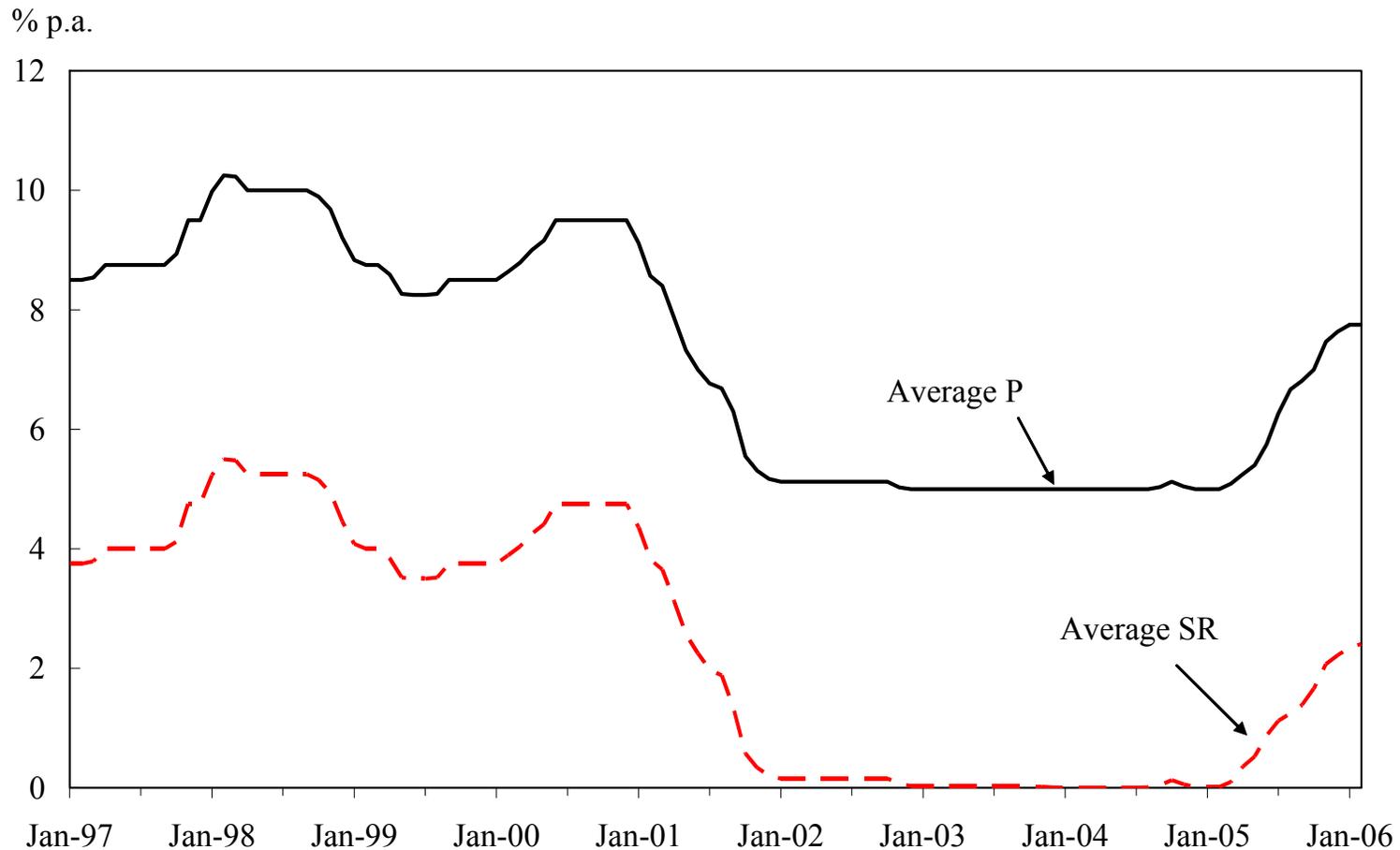
- Set by major retail banks and followed by other banks
- normally adjusts when there is a change in the US Federal funds target rate (FFTR), or when pressures from changes in the cost of funds are built up to a certain level





Savings deposit rate

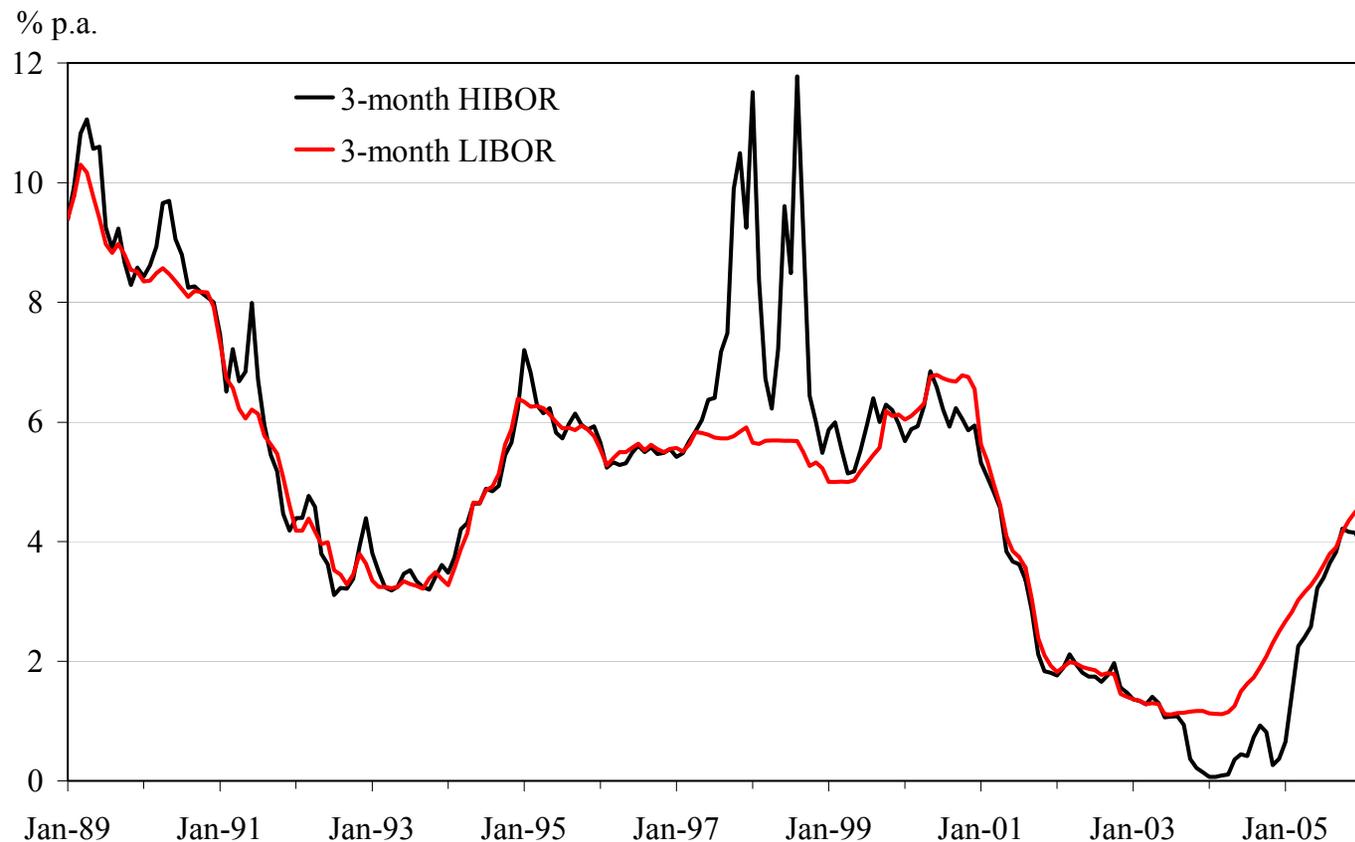
- Normally adjusts in tandem with P
- Traditional practice, not required by regulation





Interbank rates

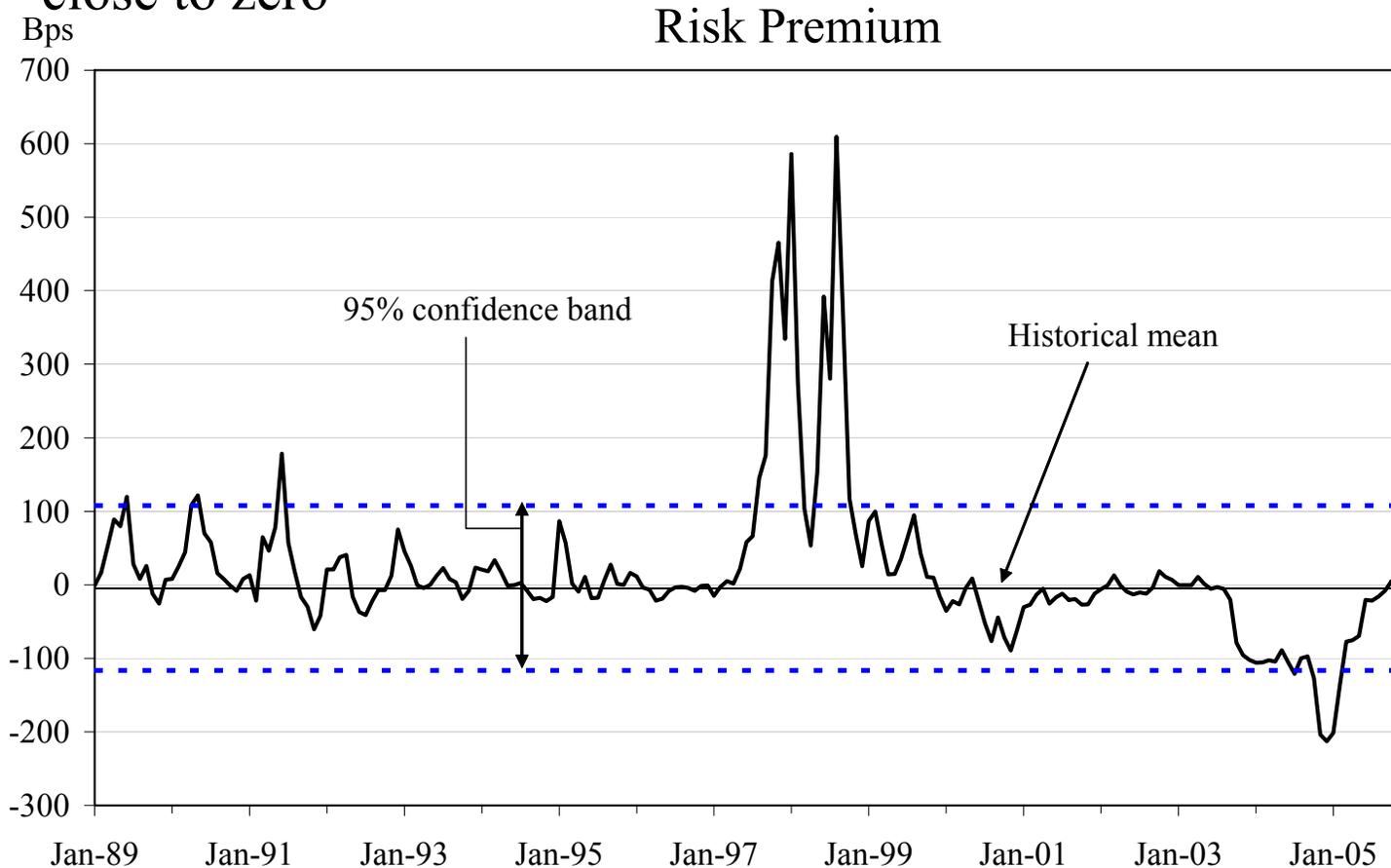
- Normally track closely US interest rates, but may deviate from the US rates with a risk premium due to liquidity conditions and other factors

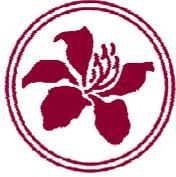




Risk premium

- HIBOR minus LIBOR
- Short-term deviations in interest rates of the Hong Kong dollar over the US dollar. The mean level over the past 17 years is close to zero

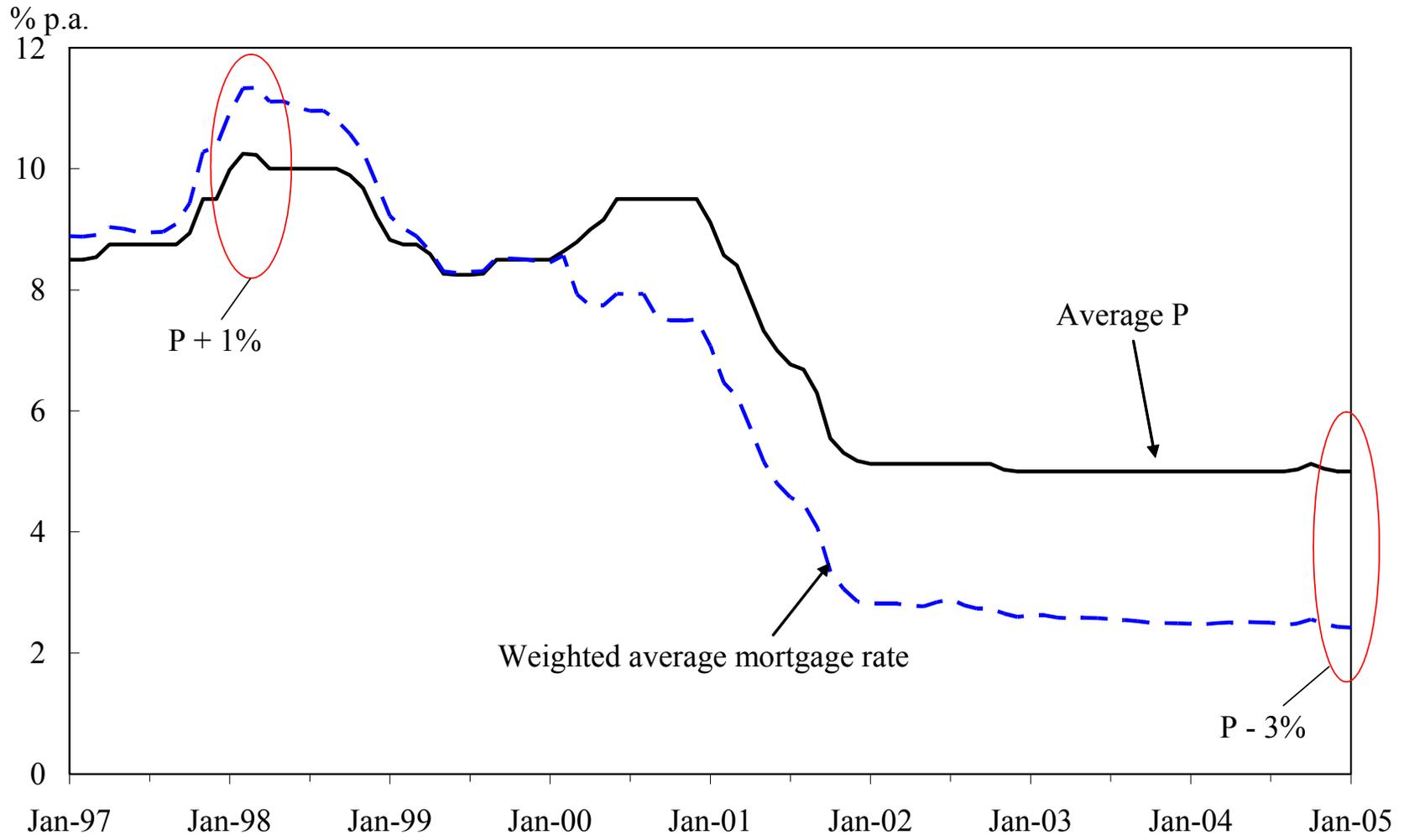
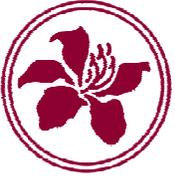




Reasons for the narrowing of spread

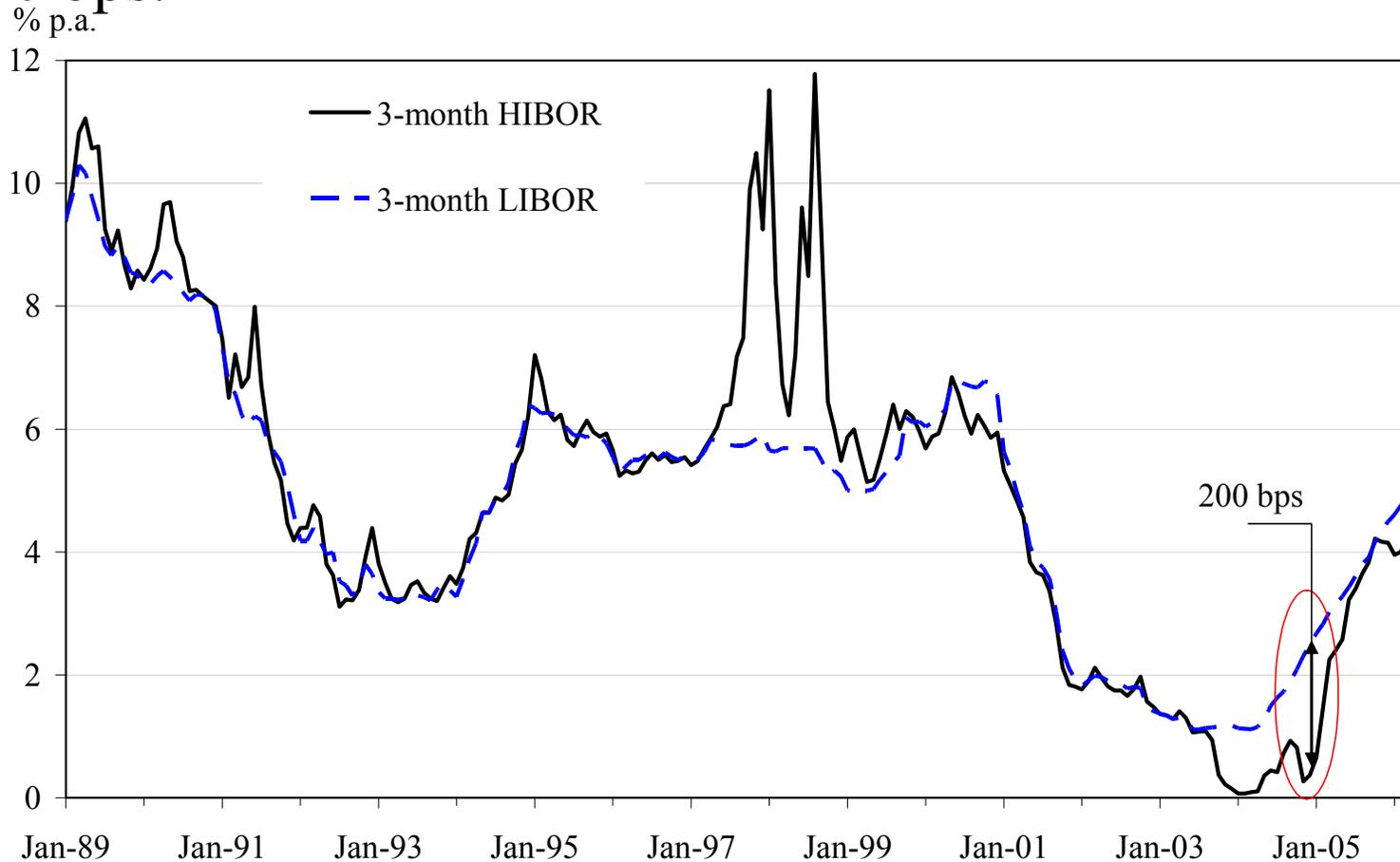
Balance sheet positions of banks

| Assets | Liabilities |
|--|--|
| Fixed-rate assets | Fixed-rate liabilities |
| Variable-rate assets (mostly HIBOR-based lending) | Variable-rate liabilities (mostly HIBOR-based borrowings) |
| P-based assets (largely priced with reference to P) | P-based liabilities (largely savings deposits, the interest rates of which move in tandem with the P) |
| Non-interest bearing assets (such as equipment and buildings) | Non-interest bearing liabilities (mainly demand deposits and capital) |





- This was made possible by the extraordinary low funding cost with the HIBOR being at an usually deep discount to LIBOR of 200 bps.





Stress-testing framework and model

- An error correction model is established to examine how P and other interest rates may move in response to changes in FFTR (and LIBOR) and risk premium.
- With the estimation results, we could stress test and assess the potential impact on interest margin of banks' existing mortgage portfolio under an interest rate shock of a possible sharp reversal of the risk premium.



Stress-testing framework and model

Model specification:

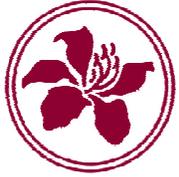
$$\Delta P_t = \alpha_0 + \alpha_1 R_{t-1} + X_t + \alpha_2 DS1_t + e_t \quad (1)$$

where X_t is

$$X_t = \begin{cases} \phi_1 \Delta FFTR_t^+ + \phi_2 \Delta FFTR_t^- + \phi_5 \sum_{l=0}^M \Delta prem_{t-l}^+ + \phi_6 \sum_{l=0}^M \Delta prem_{t-l}^- & \text{Observations with} \\ & \text{P - based} \\ & \text{L/A ratio} \geq 1 \\ \phi_3 \Delta FFTR_t^+ + \phi_4 \Delta FFTR_t^- + \phi_7 \sum_{l=0}^M \Delta prem_{t-l}^+ + \phi_8 \sum_{l=0}^M \Delta prem_{t-l}^- & \text{when} \\ & \text{Observations with} \\ & \text{P - based} \\ & \text{L/A ratio} < 1 \end{cases} \quad (2)$$

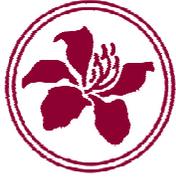
with

$$R_t = P_t - \beta_1 FFTR_t \quad (3)$$



Stress-testing framework and model

- The error correction model studies the situations (total 4 situations) :
 - FFTR/Risk Premium are increasing or decreasing
 - P-based L/A ratio is greater than or less than 1



Stress-testing framework and model

Estimation Results

| Dependent Variable : P | Jan 95-Jan 05 |
|---|--------------------|
| <u>Selected Variable</u> | <u>Coefficient</u> |
| <i>Short run (1)</i> | |
| R_{t-1}^A | -0.09 * |
| <i>L/A ratio ≥ 1</i> | |
| $\sum \Delta prem_t^+$ | 0.12 ** |
| $\sum \Delta prem_t^-$ | 0.54 ** |
| $\Delta FFTR_t^+$ | 0.16 * |
| $\Delta FFTR_t^-$ | 0.74 *** |
| <i>Long run (2)</i> | |
| $FFTR$ | 0.89 *** |
| Adj. R-squared | 0.69 |
| Q(6) | 11.75 |
| Q(12) | 17.83 |
| DW | 1.82 |



Scenario analysis

The scenario that the risk premium increases by 200 bps (back to its historical mean level), while US interest rates remain unchanged, is examined. The effects in three months' time are as below:

Risk Premium Reversal of 200 bps (back to the mean level)

Changes (bps)

| | |
|------------------------------------|-------------|
| P | +24 |
| HIBOR | +200 |
| <i>Interest Margin (P – HIBOR)</i> | <i>-176</i> |



Scenario analysis

The impacts on net interest margin of HIBOR-based mortgage loans priced in January 2005 are simulated.

Risk Premium Reversal of 200 bps (back to the mean level)

| | |
|--|-------------------|
| Mortgage Pricing | 200 |
| Funding Cost | -65 |
| <i>Current Gross Mortgage Margin</i> | <i>135</i> |
| Operating Cost | -30 |
| Credit Cost | -10 |
| <i>Current Net Mortgage Margin</i> | <i>95</i> |
| Estimated Reduction of Mortgage Margin | -176 |
| <i>Simulated Net Mortgage Margin After Impact</i> | <i>-81</i> |
