How does Hong Kong Monetary Authority use statistics in financial market surveillance?

by

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The views expressed in this presentation do not necessarily represent those of the Hong Kong Monetary Authority.
Agenda

• What does the HKMA do?
• Hot topic: What is happening after US tightens its monetary policy?
  – Will Hong Kong banks remain resilient? – Macro stress tests
  – Will Hong Kong dollar remain credible? – Linked exchange rate system
  – How would emerging markets be affected? – A study of financial contagion
• Q&A
Main functions of the HKMA

Which functions are correct?

1. maintaining currency stability within the framework of the Linked Exchange Rate system
2. promoting the stability and integrity of the financial system, including the banking system
3. developing competitive, efficient, fair, orderly and transparent securities and futures markets
4. helping to maintain Hong Kong's status as an international financial centre, including the maintenance and development of Hong Kong's financial infrastructure
5. encouraging the development of the retirement scheme industry in Hong Kong
6. managing the Exchange Fund
Main functions of the HKMA

Which functions are correct?

✓ maintaining currency stability within the framework of the Linked Exchange Rate system
✓ promoting the stability and integrity of the financial system, including the banking system
X developing competitive, efficient, fair, orderly and transparent securities and futures markets
✓ helping to maintain Hong Kong's status as an international financial centre, including the maintenance and development of Hong Kong's financial infrastructure
X encouraging the development of the retirement scheme industry in Hong Kong
✓ managing the Exchange Fund
### Exchange Fund assets

#### Table 3: Currency mix of the Exchange Fund’s assets on 31 December 2014 (including forward transactions)

<table>
<thead>
<tr>
<th>Currency</th>
<th>HK$ billion</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>US dollar</td>
<td>2,367.2</td>
<td>75.2</td>
</tr>
<tr>
<td>Hong Kong dollar</td>
<td>228.9</td>
<td>7.3</td>
</tr>
<tr>
<td>Others¹</td>
<td>552.9</td>
<td>17.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,149.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

¹ Other currencies included mainly Australian dollar, Canadian dollar, euro, renminbi, sterling and yen.
Investment return of the Exchange Fund


<table>
<thead>
<tr>
<th>Year</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>10.8%</td>
</tr>
<tr>
<td>1995</td>
<td>5.1%</td>
</tr>
<tr>
<td>1996</td>
<td>6.1%</td>
</tr>
<tr>
<td>1997</td>
<td>12.1%</td>
</tr>
<tr>
<td>1998</td>
<td>10.8%</td>
</tr>
<tr>
<td>1999</td>
<td>4.8%</td>
</tr>
<tr>
<td>2000</td>
<td>0.7%</td>
</tr>
<tr>
<td>2001</td>
<td>5.1%</td>
</tr>
<tr>
<td>2002</td>
<td>10.2%</td>
</tr>
<tr>
<td>2003</td>
<td>5.7%</td>
</tr>
<tr>
<td>2004</td>
<td>3.1%</td>
</tr>
<tr>
<td>2005</td>
<td>9.5%</td>
</tr>
<tr>
<td>2006</td>
<td>11.8%</td>
</tr>
<tr>
<td>2007</td>
<td>-5.6%</td>
</tr>
<tr>
<td>2008</td>
<td>5.9%</td>
</tr>
<tr>
<td>2009</td>
<td>3.6%</td>
</tr>
<tr>
<td>2010</td>
<td>1.1%</td>
</tr>
<tr>
<td>2011</td>
<td>4.4%</td>
</tr>
<tr>
<td>2012</td>
<td>2.7%</td>
</tr>
<tr>
<td>2013</td>
<td>1.4%</td>
</tr>
<tr>
<td>2014</td>
<td>2.2%</td>
</tr>
</tbody>
</table>
Prudential measures for residential mortgage loans (RML)

The Hong Kong Monetary Authority issued today (Friday) a circular to banks in Hong Kong to provide guidance on loan-to-value (LTV) ratios for residential mortgages on properties valued at $20 million or more.

For residential properties valued at $20 million or more, the LTV ratio will be capped at 60%. For properties valued at below $20 million, the 70% LTV ratio will be maintained, but the maximum loan amount will be capped at $12 million.

The measures will take effect immediately, but there will be a grace period for purchasers who have already signed provisional sale-and-purchase agreements on or before 23 October 2009. Such purchasers will still be able to apply, within one month from 23 October, for mortgage loans up to 70% LTV ratio.

The circular also reminds banks that they should be prudent in conducting valuation of properties and in calculating borrowers' debt servicing ratios (the ratio of their mortgage repayments to borrowers' income). In particular, banks should consider the effect on borrowers' ability to service mortgage payments when interest rates, which are currently at historical low levels, return to more normal levels.

The Chief Executive of the HKMA, Mr Norman Chan, said "These are prudential measures designed in the interest of maintaining banking stability, to enhance banks' risk management on mortgage lending to high-end residential properties. The lower LTV ratio for high-end properties will be helpful to banks in the management of the credit risks in lending against such properties." He also reminded prospective buyers of properties to take fully into account the impact of interest rates returning to more normal levels on their repayment ability and avoid overstretching themselves.

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Hong Kong Monetary Authority
23 October 2009
International financial centre

Basel Committee on Banking Supervision

Second Hong Kong-Australia RMB Trade and Investment Dialogue
22 May 2014

RMB Business in HK
Infrastructure
Financial markets

- Money markets
  - Short term debt financing and investment
- Foreign exchange markets
- Derivatives
  - Futures and options
- Capital markets
  - Stocks and bonds
What will happen in the HK money market when US interest rates rise?
Who will suffer from interest rate rises?
What will happen to banks when interest rates increase?
Our macro stress test framework

Input data

Estimation of macroeconomic credit risk model

Monte Carlo simulation of default rates based on combination of market situations

Loss distribution of credit risks:
1. Mean
2. Value-at-risk

Credit loss distribution
HK banks are always under stress...

<table>
<thead>
<tr>
<th>Credit loss</th>
<th>Baseline</th>
<th>Stressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.24</td>
<td>1.04</td>
</tr>
<tr>
<td>VaR at 90%CL</td>
<td>0.56</td>
<td>1.93</td>
</tr>
<tr>
<td>VaR at 95%CL</td>
<td>0.78</td>
<td>2.40</td>
</tr>
<tr>
<td>VaR at 99%CL</td>
<td>1.53</td>
<td>3.57</td>
</tr>
<tr>
<td>VaR at 99.9%CL</td>
<td>2.72</td>
<td>5.58</td>
</tr>
</tbody>
</table>

Notes:
1. Classified loans are those loans graded as "sub-standard", "doubtful" or "loss".
2. Figures related to retail banks' Hong Kong office(s) and overseas branches.
Source: HKMA.
Is HKD credible?

HKD banknotes issued by the three note-issuing banks are fully backed by USD reserves.

Fixed exchange rate:

HK$7.8 = US$1
Resilience against external shocks

- HKD has shown a high degree of credibility

HK$/$US$
Convertibility zone

- Is the spot exchange rate mean-reverting?
- If credible, the rate will revert to the mean (=?)

HKD per USD
A test for mean reversion

- Variance ratios
  - Check whether the variance of multi-period returns decreases with time

\[
VR(K) = \frac{Var(r^K_t)}{Var(r^1_t)/1} = \begin{cases} 
1 & \text{under random walk} \\
<1 & \text{under mean reversion} \\
>1 & \text{under mean aversion}
\end{cases}
\]

where \( r^K_t \) is the \( K \)-period return
VR tests for the HK dollar

![Graph showing variance ratio and white noise over days]

- **Variance Ratio**
- **White noise**

The graph illustrates the variance ratio and white noise over a series of days.
Empirically HK dollar is mean-reverting!
More than credibility!

Risk reversal of the Hong Kong dollar
(vis-à-vis the US dollar)

Lehman bankruptcy  European debt crisis
Risk reversals of northeast Asian currencies (vis-à-vis the US dollar)
Volatility as yardstick of turbulence

- VIX: "The Investor Fear Gauge" (Whaley, 2000)
What is quantile?

A quantile is: $r_1 \leq r_2 \leq \ldots \leq r_{n/2} \leq \ldots \leq r_n$

e.g. median

Median

Change in spread
How large this response could be?

- Quantile regression is used to assess the tail risk

Notes:
(1) For illustrative purpose, the three quantile regression lines and the distributions are roughly sketched out in this graph.
(2) The graph presents roughly a bird’s eye view of the distributions.
HKD is a safe haven currency!

Estimated coefficient at 5% quantiles

Currency

Indian Rupee
Australian Dollar
New Zealand Dollar
Canadian Dollar
Singapore Dollar
Euro
Danish Krone
Norwegian Krone
Swedish Krona
Chinese Renminbi
Pound Sterling
Swiss Franc
Hong Kong Dollar
Gold
Japanese Yen
FX links with sovereign creditworthiness - cointegration and error corrections
Contagion among economies: Sovereign CDS spreads

Australia, China, Hong Kong, Japan, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand, New Zealand
Sovereign tail risk assessment

A 95\textsuperscript{th} percentile of the historical distribution, is used to identify a sharp increase.

![Diagram showing PDF distribution with 95\% area highlighting a tail risk increase in sovereign credit risk.](image)
Determinants of sovereign credit risk: at the mean vs tail

- Major source of risk factors
  - Global vs domestic factors
  - Are they equally important?

- Market extremity
  - Normally, how do these factors contribute to sovereign credit risk?
  - During market turbulent, does the contribution change?
Determinants of sovereign credit risk: at the mean vs tail

- QE tapering tantrum
What a data analyst always sees...

what people think it looks like

what it really looks like
Summary: What should you ask yourself before making a good estimation

• How much time / money do you have?
• What does the data / theory tell you?
• Is your model parsimonious and adequate?
• Is your model useful in telling the truth?
Any questions?