

5. Banking sector performance

The local banking sector continued to record healthy growth, characterised by steady credit expansion and favourable liquidity conditions. These positive developments took place despite continued deleveraging by euro area banks, as local and other foreign banks moved in to fill the void. Looking ahead, uncertainties regarding fiscal issues in the US and Europe, the continued expansion of the sector's credit exposure to Mainland-related business and risks in the property market will continue to pose challenges to the sector. With strong capital positions by international standards and sound asset quality, banks are well placed to meet the new capital requirements under the Basel III framework.

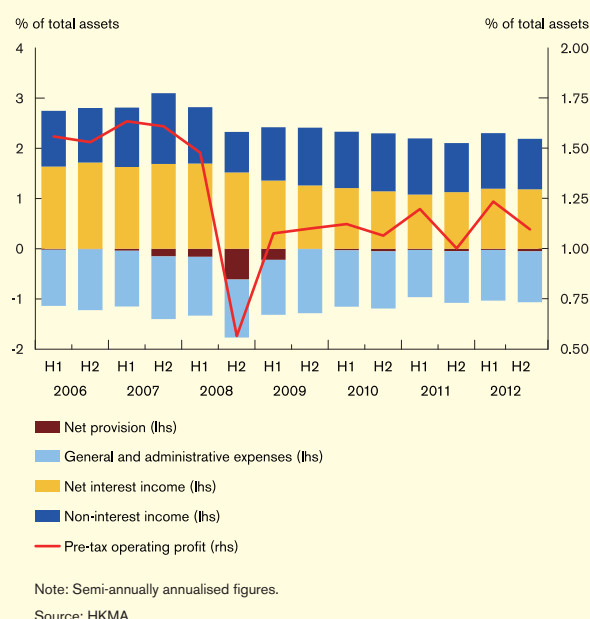
5.1 Profitability and capitalisation

Profitability

The profitability of retail banks⁴⁵ moderated during the second half of 2012 from the very buoyant results of the first half, due to lower non-interest income, a rise in operating cost and higher net charges for provisions, which more than offset the increase in interest income. Nevertheless, the performance remained more favourable than the same period of 2011, with retail banks registering a return on assets⁴⁶ of 1.1%, compared with 1.24% in the first half of the year and just 1% in the second half of 2011 (Chart 5.1).

For 2012 as a whole, the aggregate pre-tax operating profits of retail banks recorded an increase of 12.7%, with the average return on assets rising to 1.16%, from 1.1% in 2011.

Chart 5.1
Profitability of retail banks



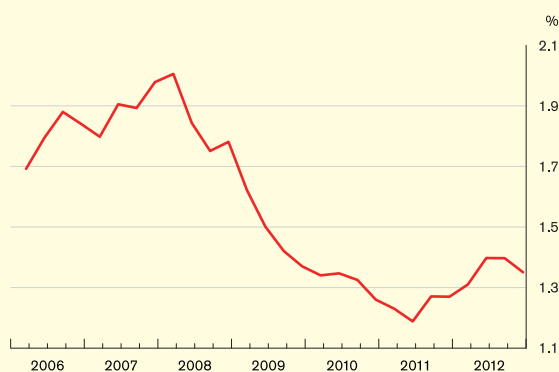
⁴⁵ Throughout this chapter, figures for the banking sector relate to Hong Kong offices only, except where otherwise stated.

⁴⁶ Return on assets is calculated based on aggregate pre-tax operating profits.

Banking sector performance

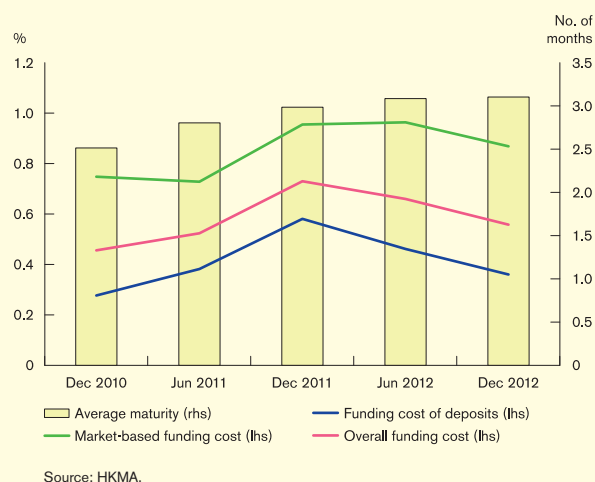
The net interest margin of retail banks improved in the second half of 2012 to an average of 1.37%, from 1.35% in the first half (Chart 5.2), partly due to an easing of banks' funding pressures. For licensed banks as a whole, the interest costs for their Hong Kong dollar and US dollar funding declined across the board in the second half of the year – for both deposits and market-based funding⁴⁷ (Chart 5.3). Meanwhile, the composite interest rate, a measure of the average cost of Hong Kong dollar funds of retail banks, decreased by 10 basis points in the second half of 2012 (Chart 5.4).

Chart 5.2
Net interest margin of retail banks



Note: Quarterly annualised figures.
Source: HKMA.

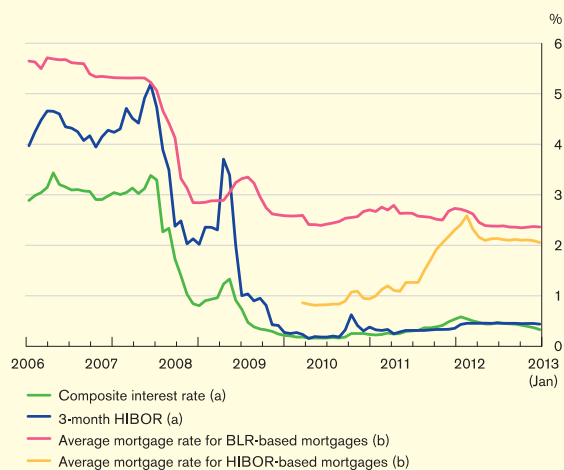
Chart 5.3
Hong Kong and US dollar funding cost and maturity of licensed banks



Source: HKMA.

During the second half of 2012, both best lending rate-based (BLR-based) and HIBOR-based mortgage rates remained broadly stable, with the share of BLR-based mortgages amongst newly approved mortgage loans increasing further to an average of 92.8%, from 92.1% in the first half of the year.

Chart 5.4
Interest rates



Notes:

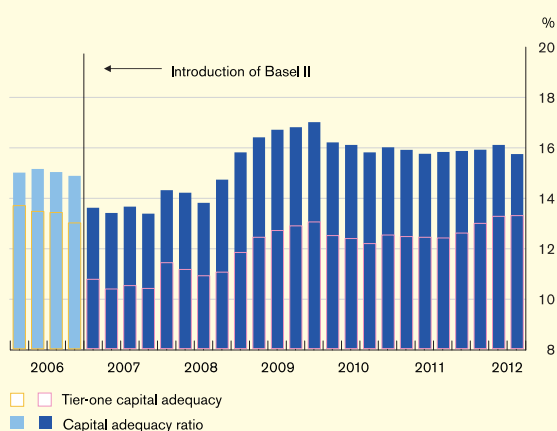
- (a) End of period figures.
 - (b) Period-average figures for approved loans. All mortgage rates are estimates only.
- Sources: HKMA and staff estimates.

⁴⁷ Market-based funding cost is measured by the interest costs of banks' non-deposit interest bearing liabilities.

Capitalisation

Capitalisation of the banking sector remained well above minimum international standards. The consolidated capital adequacy ratio of locally incorporated AIs was stable at 15.7% at the end of 2012, compared with 15.9% six months earlier (Chart 5.5), with the tier-one capital adequacy ratio (the ratio of tier-one capital to total risk-weighted assets) increasing to 13.3%, from 13%.

Chart 5.5
Capitalisation of locally incorporated AIs



Notes:

1. Consolidated positions.
2. With effect from 1 January 2007, a revised capital adequacy framework (Basel II) was introduced for locally incorporated AIs. The capital adequacy ratios from March 2007 onwards are therefore not directly comparable with those up to December 2006.

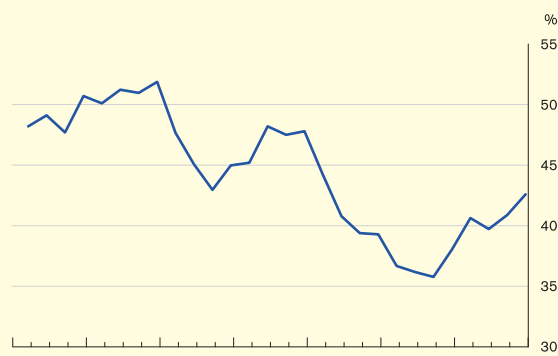
Source: HKMA.

The first phase of the new Basel III framework became effective from 1 January 2013, in accordance with the transitional timeline specified by the Basel Committee. Given their strong capital positions, banks in Hong Kong are well placed to adopt the Basel III standards.

5.2 Liquidity and funding

Liquidity conditions continued to be sound, with the average liquidity ratio of retail banks rising to 42.6% at the end of 2012, from 39.7% six months earlier (Chart 5.6), and remaining well above the regulatory minimum of 25%.

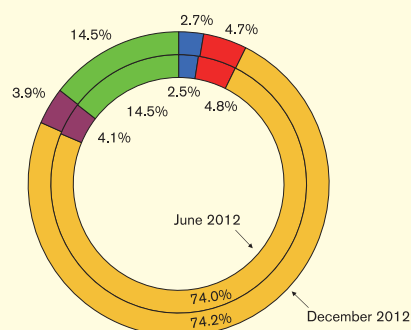
Chart 5.6
Liquidity ratio of retail banks



Note: Quarterly average figures.
Source: HKMA.

Customer deposits, which are typically less volatile than other funding sources, continued to be the primary funding source for retail banks. The share of customer deposits to banks' total liabilities rose marginally to 74.2% at the end of 2012, from 74% six months earlier (Chart 5.7).

Chart 5.7
Liabilities structure of retail banks



- Due to AIs
- Debt securities outstanding
- Due to banks abroad
- Other liabilities and capital and reserves
- Customer deposits

Notes:

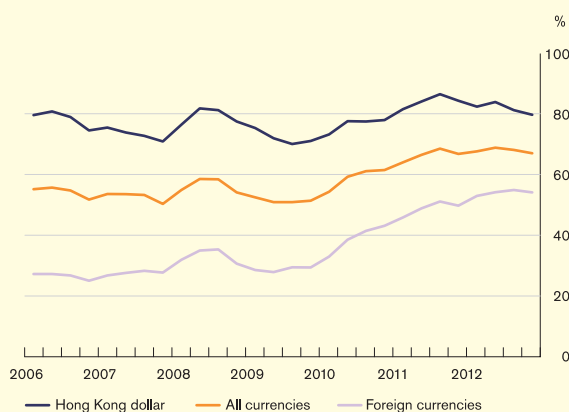
1. Figures refer to the percentage of total liabilities (including capital and reserves).
2. Debt securities comprise negotiable certificates of deposit and all other negotiable debt instruments.

Source: HKMA.

Banking sector performance

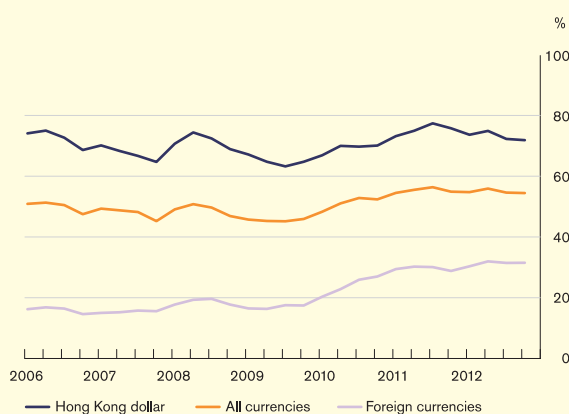
The all currency loan-to-deposit (LTD) ratio of all AIs went down notably to 67.1% at the end of 2012 from 69% six months earlier (Chart 5.8), with the Hong Kong dollar LTD ratio falling to 79.8% and the foreign currency ratio staying unchanged at 54.3%. For retail banks, both the Hong Kong dollar and foreign currency LTD ratios recorded a decline, with the all currency LTD ratio declining to 54.8% from 56.3% (Chart 5.9).

Chart 5.8
Loan-to-deposit ratios of all AIs



Source: HKMA.

Chart 5.9
Loan-to-deposit ratios of retail banks



Source: HKMA.

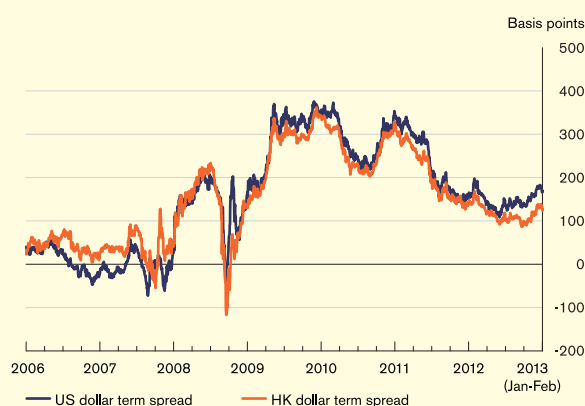
Foreign currency position

The banking sector's capability to repay liabilities denominated in foreign currencies can be assessed by reference to the aggregate net open position of AIs for all foreign currencies. This position amounted to HK\$76 billion at the end of December 2012, which was equivalent to 0.5% of total assets of AIs, indicating that the overall exposure of AIs to foreign exchange risks may not be of significant concern.

5.3 Interest rate risk

The spreads between the long- and short-term interest rates for the US dollar and Hong Kong dollar widened somewhat towards the end of 2012 and continued their upward trends in early 2013 (Chart 5.10), suggesting that the incentive for banks to search for yield by borrowing short-term funds to purchase long-term interest-bearing assets may have increased. This could potentially lead to greater maturity mismatches and increased interest rate risk. Banks should be watchful in monitoring and managing the potential mark-to-market loss for their financial investments, which could arise from changes in the yield spreads.

Chart 5.10
Term spreads of Hong Kong and US dollars



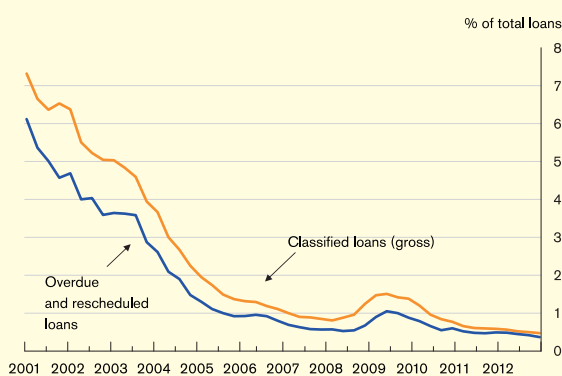
Note: Term spreads are defined as 10-year swap rates minus three-month money market rates of the respective currencies.

Source: HKMA staff estimates based on data from Bloomberg.

5.4 Credit risk

The asset quality of retail banks' loan portfolios improved in general in the second half of 2012, with the classified loan ratio falling further to 0.47% at the end of 2012 from 0.52% six months earlier, and the ratio of overdue and rescheduled loans edging down to 0.37% from 0.45% (Chart 5.11).

Chart 5.11
Asset quality of retail banks



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.

Despite continued deleveraging by euro area banks, credit expansion continued as local and other foreign banks moved in to fill the void, with total loans and advances extended by banks growing at a steady pace of 4.7% in the second half of 2012, the same as in the first half.

Looking ahead, banks have turned slightly more positive on credit demand, reflecting a more sanguine economic outlook. According to the results of the HKMA Opinion Survey on Credit Condition Outlook in December, there were more surveyed AIs anticipating an increase in loan demand in the subsequent three months than those anticipating a decline, though a

majority of them expected loan demand to remain the same (Table 5.A).

Table 5.A
Expectation of loan demand in the next three months

As % of total respondents	Mar 12	Jun 12	Sep 12	Dec 12
Considerably higher	0	0	0	0
Somewhat higher	19	5	10	14
Same	71	76	71	76
Somewhat lower	10	19	19	10
Considerably lower	0	0	0	0
Total	100	100	100	100

Source: HKMA.

Household exposure

Household loans⁴⁸ grew at a relatively solid pace by 6.6% in the second half of 2012, outpacing domestic credit expansion of 4.1%. Partly reflecting a more buoyant residential property market, mortgage lending expanded by 5.0% in the second half, following a 2.5% increase in the first half of 2012. As a result, the share of mortgage lending to total domestic loans edged up to 23.0%. Other types of household lending, such as credit cards and other loans for private purposes, also registered a noticeable pick-up in growth (Table 5.B). With household debt growth outpacing that of household income, the household debt burden has further increased. The potential risk of this trend to the banking sector should be closely monitored.

Table 5.B
Half-yearly growth of loans to households of all AIs

item (%)	2009		2010		2011		2012	
	H1	H2	H1	H2	H1	H2	H1	H2
Mortgages	1.7	5.6	5.1	8.6	5.5	1.2	2.5	5.0
Credit cards	-9.6	5.7	-0.9	17.9	-1.4	15.9	-1.6	16.6
Other loans for private purposes	-8.1	8.9	7.9	6.6	9.4	3.6	5.0	9.3
Total loans to households	-0.8	6.1	5.1	8.9	5.6	2.7	2.6	6.6

Source: HKMA.

⁴⁸ Loans to households constitute lending to professional and private individuals, excluding lending for other business purposes. Mortgage lending accounts for a major proportion of household loans, while the remainder comprises mainly unsecured lending through credit card lending and other personal loans for private purposes. At the end of 2012, the share of household lending in domestic lending was 31%.

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While the delinquency and rescheduled loan ratio of banks' mortgage portfolios and the number of bankruptcy petitions both stayed at relatively low levels (Charts 5.12 and 5.13), the risk of a property-price bubble against the background of an extended period of loose global liquidity continues to overshadow the banking system.

Chart 5.12
Delinquency ratio of banks' mortgage portfolios and household debt-service burden in respect of new mortgages

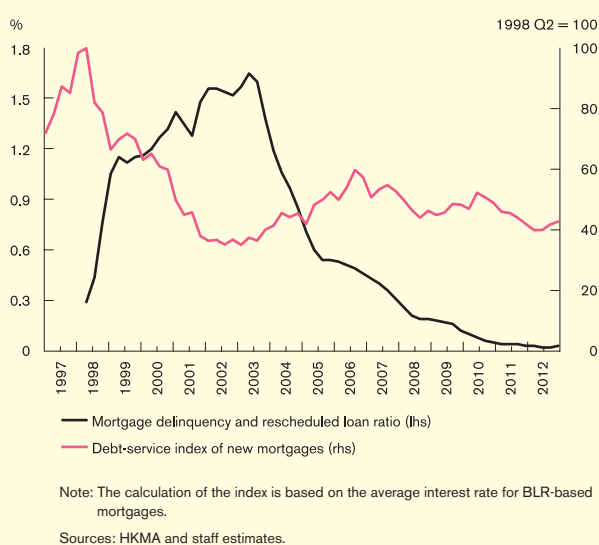
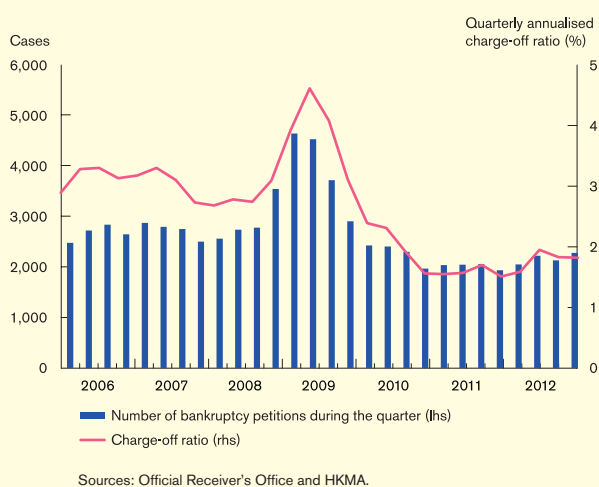


Chart 5.13
Charge-off ratio for credit card lending and bankruptcy petitions



It is worth noting that the debt-service burden for new mortgages deteriorated during the second half of 2012, albeit slightly, due to an increase in loan size whilst household income remained steady. This took place even with interest rates staying at their extraordinary low levels. The HKMA will continue to monitor developments in the mortgage market and introduce appropriate measures with a view to safeguarding banking stability⁴⁹. Box 5 empirically shows that the supply of mortgage loans has been constrained by loan-to-value caps and the lower supply has been translated into lower loan growth effectively. The policy effect has helped prevent excessive household leverage and overextension of credit to marginal borrowers so that the quality of banks' mortgage loan portfolios can be maintained.

Corporate exposure⁵⁰

Domestic loans to corporations⁵¹ grew at a slightly slower pace of 3.0% in the second half of 2012, after a 3.3% increase in the first half. At the end of the year, corporate loans accounted for 68.6% of domestic lending. A number of indicators suggest a steady credit risk environment for banks' corporate lending. The number of compulsory winding-up orders of companies only increased slightly to 158 in

⁴⁹ On 22 February 2013, the HKMA introduced a new round of prudential supervisory measures on property mortgage business to strengthen banks' risk management and resilience. The measures imposed a higher mortgage rate increase assumption in stress-testing mortgage applicants' repayment ability and a lower maximum loan-to-value ratio. For details, see HKMA press release "Prudential Supervisory Measures for Mortgage Lending" issued on the same date.

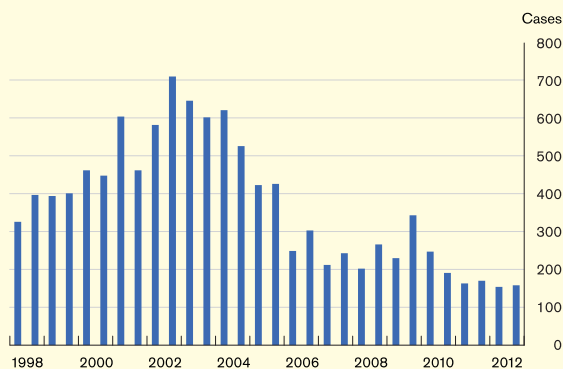
⁵⁰ Excluding interbank exposure.

⁵¹ Loans to corporations comprise domestic lending except lending to professional and private individuals.

Banking sector performance

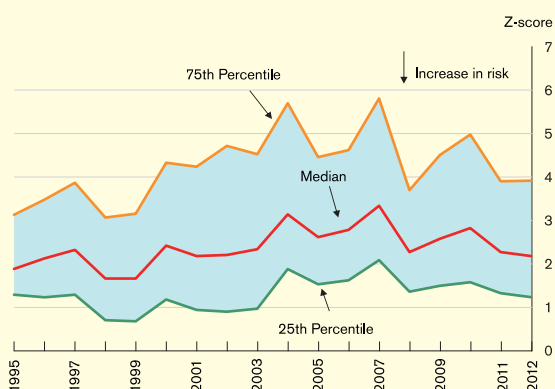
the second half of 2012, from 154 in the first half (Chart 5.14), while the Altman's Z-score⁵² remained stable (Chart 5.15).

Chart 5.14
Number of winding-up orders of companies



Source: Official Receiver's Office.

Chart 5.15
Altman's Z-score: A bankruptcy risk indicator of listed non-financial companies

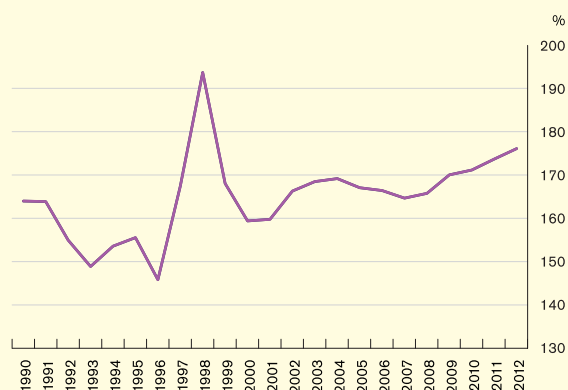


Note: A lower Z-score indicates a higher likelihood of a company default.

Source: HKMA staff estimates based on data from Bloomberg.

However, the leverage ratio of the corporate sector has been on the increase in recent years, reaching 1.76 in 2012, the highest level since the Asian financial crisis (Chart 5.16). The potential risks of this trend on local banks should be closely monitored.

Chart 5.16
Leverage ratio of listed non-financial companies in Hong Kong



Notes:

1. The leverage ratio is defined as the ratio of total assets to shareholders' funds.
2. A higher value indicates a higher leverage.
3. The figure for 2012 is based on data as of June 2012.

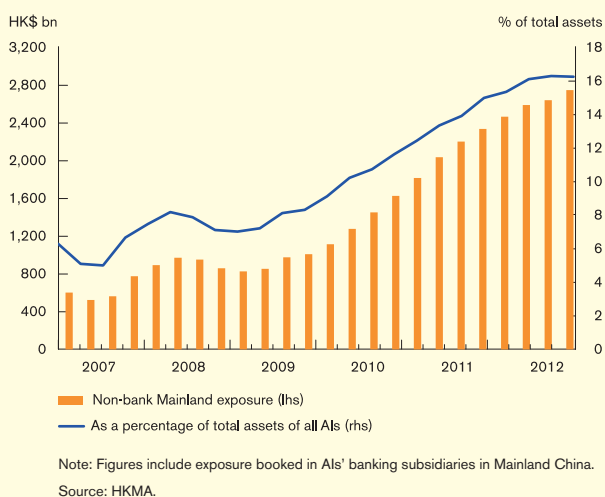
Source: HKMA staff estimates based on data from Bloomberg.

⁵² Altman's Z-score is a credit risk measure based on accounting data. It is a typical credit risk measure to assess the health of the corporate sector based on an array of financial ratios reported in companies' financial statements. The accounting ratios used to derive the Z-score are working capital/total assets, retained earnings/total assets, earnings before interest and taxes/total assets, market value of equity/book value of total liabilities, and sales/total assets.

Mainland exposure

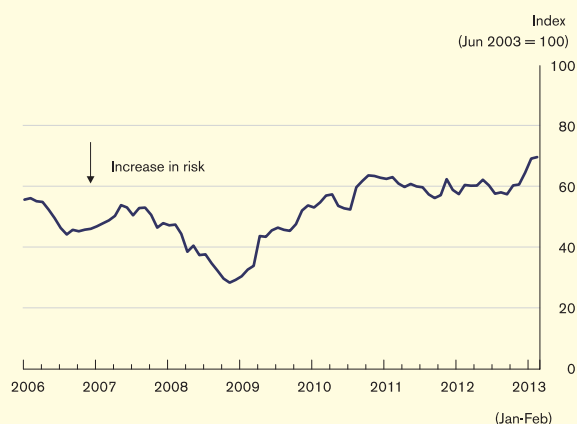
The credit exposure of the domestic banking sector to Mainland-related business continued to expand further. The total non-bank Mainland exposure of all AIs reached HK\$2,738 billion (16.2% of total assets) at the end of 2012, from HK\$2,582 billion (16.1% of total assets) six months earlier (Chart 5.17). Of this, retail banks' non-bank Mainland exposure⁵³ rose to HK\$1,777 billion (16.5% of total assets) from HK\$1,717 billion (16.8% of total assets).

Chart 5.17
Non-bank Mainland exposure of all AIs



Consistent with signs of a bottoming-out in the Mainland economy, the overall credit quality of the Mainland's corporate sector appeared to have improved, as suggested by its aggregate distance-to-default index⁵⁴ which increased tangibly during the second half of 2012 (Chart 5.18).

Chart 5.18
Distance-to-default index for the Mainland corporate sector



Note: Distance-to-default index is defined as the simple average of the distance-to-default values of non-financial constituent companies (i.e. excluding investment companies and those engaged in banking, insurance and finance) of the Shanghai Stock Exchange 180 A-share index.
Source: HKMA staff estimates.

While a substantial share of the non-bank Mainland exposure is backed by guarantees or collateralised, banks should remain vigilant about the credit risk management of their Mainland-related exposure in view of concerns over the relatively high level of credit-to-GDP ratio on the Mainland (Chart 5.19), the recent

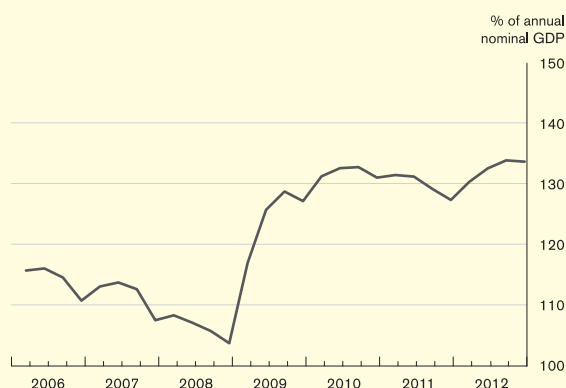
⁵³ Including exposure booked in retail banks' banking subsidiaries in Mainland China.

⁵⁴ The distance-to-default is a market-based default risk indicator based on the framework by R. Merton (1974), "On the pricing of corporate debt: the risk structure of interest rates", *Journal of Finance*, Vol. 29, pages 449 – 470, in which equity prices, equity volatility, and companies' financial liabilities are the determinants of default risk. In essence, it measures the difference between the asset value of a firm and a default threshold in terms of the firm's asset volatility.

Banking sector performance

increase in the amount of non-performing loans in the Mainland's banking system (Chart 5.20) and the potential risks of the shadow banking system on the Mainland.⁵⁵

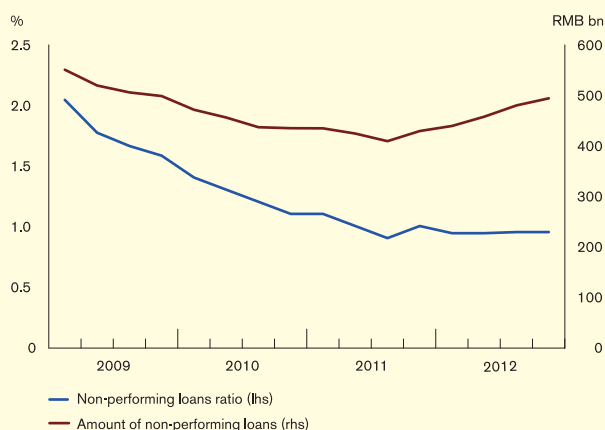
Chart 5.19
Credit-to-GDP ratio in Mainland China



Note: Credit-to-GDP ratio is defined as the ratio of claims on private sector to the sum of quarterly nominal GDP for the latest four quarters.

Sources: IMF International Financial Statistics and CEIC.

Chart 5.20
Non-performing loans in Mainland China

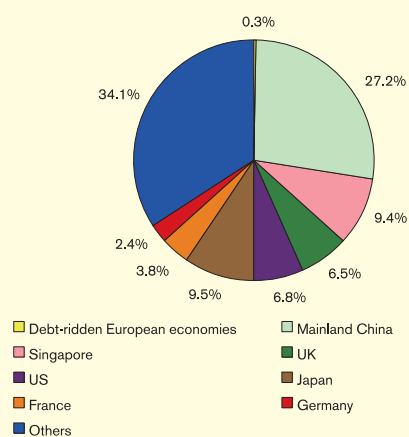


Source: China Banking Regulatory Commission.

Impact of the European sovereign debt crisis

While recent policies have reduced the tail risk of the European sovereign debt crisis, downside risks to economic growth remained.⁵⁶ Thus, the performance of local banks will continue to be affected by the evolution of the debt crisis and fiscal issues. Given that the exposure of the Hong Kong banking sector to banks in the UK, France and Germany is not immaterial (Chart 5.21), and these banks in turn have significant exposure to the more debt-ridden European economies, the possible contagion risk and its implications for banks in Hong Kong merit close attention.

Chart 5.21
External claims of the Hong Kong banking sector on major economies (all sectors) at the end of 2012



Note: Debt-ridden European economies refer to Greece, Ireland, Italy, Portugal and Spain.

Source: HKMA.

⁵⁵ Shadow banking refers to credit intermediation involving entities and activities outside the regular banking system. The potential risks of shadow banking on the Mainland have aroused concerns recently. For example, see Xiao Gang "Regulating shadow banking", *China Daily*, 12 October 2012. For more discussions about the potential risks of shadow banking, please refer to Financial Stability Board's *Global Shadow Banking Monitoring Report 2012*.

⁵⁶ For details, please refer to Section 2.2 of the report.

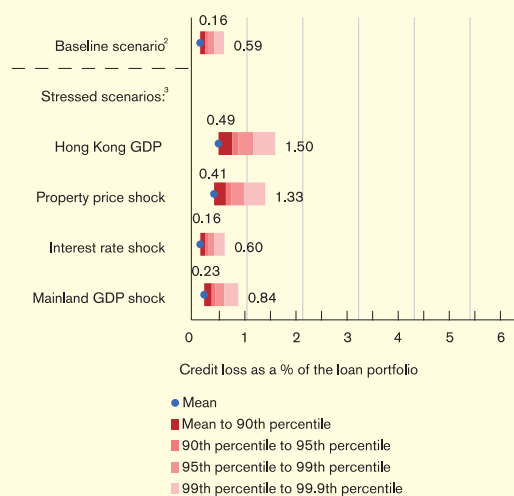
Macro stress testing of credit risk^{57 & 58}

Results of the latest macro stress testing on retail banks' credit exposure suggest that the Hong Kong banking sector remains resilient and should be able to withstand rather severe macroeconomic shocks, similar to those experienced during the Asian financial crisis.

Chart 5.22 presents the simulated future credit loss rate of retail banks in the fourth quarter of 2014 under four specific macroeconomic shocks⁵⁹ using information up to the fourth quarter of 2012. The expected credit losses for retail banks' aggregate loan portfolios two years after the different hypothetical macroeconomic shocks are estimated to be moderate, ranging from 0.16% (interest rate shock) to 0.49% (Hong Kong GDP shock).

Taking account of tail risk, banks' maximum credit losses (at the confidence level of 99.9%) under the stress scenarios range from 0.6% (interest rate shock) to 1.5% (Hong Kong GDP shock), which are significant, but smaller than the loan loss of 4.39% following the Asian financial crisis.

Chart 5.22
The mean and value-at-risk statistics of simulated credit loss distributions¹



Notes:

1. The assessments assume the economic conditions in 2012 Q4 as the current environment. The Monte Carlo simulation method is adopted to generate the credit loss distribution for each scenario.
2. Baseline scenario: no shock throughout the two-year period.
3. Stressed scenarios:

Hong Kong GDP shock: reductions in Hong Kong's real GDP by 2.3%, 2.8%, 1.6%, and 1.5% respectively in each of the four consecutive quarters starting from 2013 Q1 to 2013 Q4.

Property price shock: Reductions in Hong Kong's real property prices by 4.4%, 14.5%, 10.8%, and 16.9% respectively in each of the four consecutive quarters starting from 2013 Q1 to 2013 Q4.

Interest rate shock: A rise in real interest rates (HIBORs) by 300 basis points in the first quarter (i.e. 2013 Q1), followed by no change in the second and third quarters and another rise of 300 basis points in the fourth quarter (i.e. 2013 Q4).

Mainland GDP shock: Slowdown in the year-on-year annual real GDP growth rate to 4% in one year.

Source: HKMA staff estimates.

⁵⁷ Macro stress testing refers to a range of techniques used to assess the vulnerability of a financial system to "exceptional but plausible" macroeconomic shocks. Details of the model adopted in this exercise can be found in J. Wong et al. (2006), "A framework for stress testing banks' credit risk", *Journal of Risk Model Validation*, Vol. 2(1), pages 3 - 23. An updated framework is used for the current estimations.

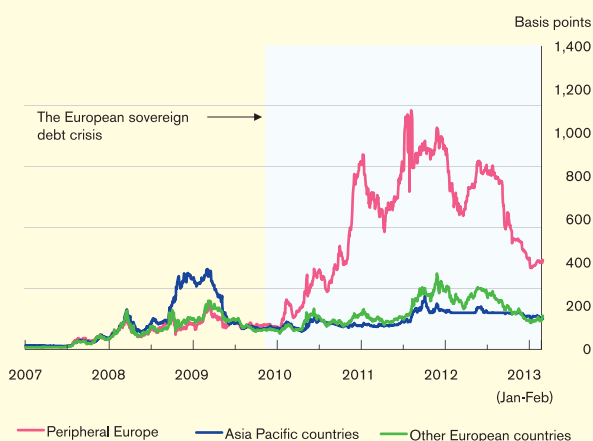
⁵⁸ All estimates of credit loss for the overall loan portfolio of Hong Kong banks presented in this report are based on a revised stress testing framework. They are not strictly comparable to those estimates from the past framework that appeared in previous reports due mainly to different definitions of credit losses in these two frameworks. Specifically, credit losses in two years after any shock under the revised framework are measured by the estimated specific provision ratio at the end of the second year plus 50% of the estimated specific provision ratio at the end of the first year after the shock, while credit loss estimates from the past framework are derived based on an estimated delinquency ratio at the end of the second year multiplied by a loss-given-default estimate, which is determined by the simulated property price change over the two-year horizon.

⁵⁹ These shocks are calibrated to be similar to those that occurred during the Asian financial crisis, except the Mainland China GDP shock.

5.5 Systemic risk to the banking system

While the credit default swap spreads for European banks narrowed notably during the review period, the spreads remained well above the levels prevailing prior to the onset of the European sovereign debt crisis. Meanwhile, the corresponding spreads for Asian banks continued to stay at low levels (Chart 5.23).

Chart 5.23
Credit default swap spreads of banks in Europe and Asia



Notes:

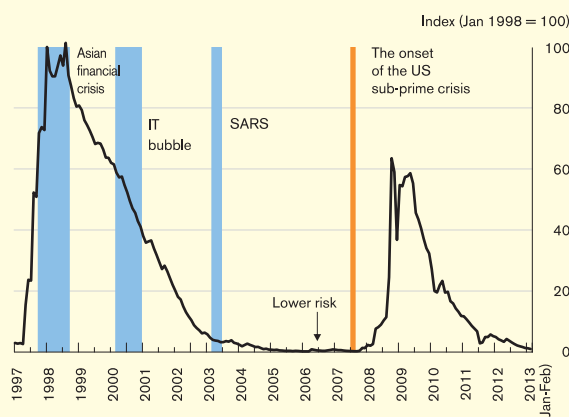
1. Median of five-year credit default swap spreads of the respective groups.
2. Peripheral Europe includes Greece, Ireland, Italy, Portugal and Spain.

Source: Bloomberg.

In Hong Kong, the banking distress index, a market-based systemic risk indicator for the local banking sector, fell further to 1 in February 2013 from 2.6 in August 2012 (Chart 5.24), indicating that the risk of contagion in the banking system remained insignificant and the probability of an occurrence of multiple bank defaults is small. This optimistic market view was broadly

consistent with the latest assessment result of the composite early warning system⁶⁰, which estimated that the banking distress probability remained within the range of the low fragility category, suggesting that the banking sector continued to be stable and resilient.⁶¹

Chart 5.24
The banking distress index



Source: HKMA staff estimates based on data from Bloomberg.

⁶⁰ The composite early warning system is designed to estimate banking distress probability based on 10 leading indicators. These include macroeconomic fundamentals, currency crisis vulnerability, default risk of banks and non-financial companies, asset price misalignments, credit growth, and the occurrence of banking distress in other Asia-Pacific economies. For details, see J. Wong et al. (2010), "Predicting banking distress in the EMEAP economies", *Journal of Financial Stability*, Vol. 6(3), pages 169-179.

⁶¹ The composite early warning system is a four-level risk rating system. A. Demirgüç-Kunt and E. Detragiache (2000), "Monitoring Banking Sector Fragility: A Multivariate Logit Approach", *World Bank Economic Review*, Vol.14(2), pages 287-307, has been followed in the selection of the upper bounds of each of the four fragility classes so that type I error associated with the bounds are 10%, 30%, 50% and 100% respectively.

Banking sector performance

The recent financial crisis has highlighted the important role of global banks in the transmission of shocks across banking sectors in different economies. Box 6 assesses how US and European banks have adjusted the business models of their Hong Kong branches after the 2008-09 global financial crisis. The result shows that these adjustments are likely to produce two different opposing effects on shock transmissions. The favourable impact sees them becoming less prone to drastic withdrawal of funds by their head offices during crises than before, due to the shift of some of these branches from operating traditionally as regional funding centres of global banks to performing as their regional lending units. Counteracting this are the more adverse impacts of any given withdrawal of funds due to the greater reliance of the branches on intra-group funding to fund their lending activities in the region.

Key performance indicators of the banking sector are provided in Table 5.C.

Table 5.C
Key performance indicators of the banking sector ¹ (%)

	Dec 2011	Sep 2012	Dec 2012
Interest rate			
1-month HIBOR fixing ² (quarterly average)	0.24	0.30	0.28
3-month HIBOR fixing (quarterly average)	0.31	0.40	0.40
BLR ³ and 1-month HIBOR fixing spread (quarterly average)	4.76	4.70	4.72
BLR and 3-month HIBOR fixing spread (quarterly average)	4.69	4.60	4.60
Composite interest rate ⁴	0.53	0.38	0.32
Retail banks			
Balance sheet developments ⁵			
Total deposits	2.9	3.2	3.1
Hong Kong dollar	3.0	4.9	3.5
Foreign currency	2.8	1.1	2.8
Total loans	0.3	0.7	2.9
Domestic lending ⁶	-1.5 ^r	0.4	2.9
Loans for use outside Hong Kong ⁷	10.1 ^r	2.2 ^r	3.0
Negotiable instruments			
Negotiable certificates of deposit (NCD) issued	5.4	-7.7	-2.8
Negotiable debt instruments held (excluding NCD)	2.3	3.6	6.9
Asset quality ⁸			
As a percentage of total loans			
Pass loans	98.28	98.19	98.16
Special mention loans	1.13	1.31	1.36
Classified loans ⁹ (gross)	0.59	0.50	0.47
Classified loans (net) ¹⁰	0.34	0.30	0.31
Overdue > 3 months and rescheduled loans	0.49	0.42	0.37
Profitability			
Bad debt charge as percentage of average total assets ¹¹	0.04 ^r	0.02	0.04
Net interest margin ¹¹	1.24	1.37	1.36
Cost-to-income ratio ¹²	46.6 ^r	44.9	45.6
Liquidity ratio (quarterly average)	38.0	40.9	42.6
Surveyed institutions			
Asset quality			
Delinquency ratio of residential mortgage loans	0.01	0.01	0.02
Credit card lending			
Delinquency ratio	0.19	0.21	0.20
Charge-off ratio – quarterly annualised	1.51	1.83 ^r	1.82
– year-to-date annualised	1.49	1.75 ^r	1.70
All locally incorporated AIs			
Capital adequacy ratio (consolidated)	15.8	16.1	15.7

Notes:

- Figures are related to Hong Kong office(s) only except where otherwise stated.
 - The Hong Kong dollar Interest Settlement Rates are released by the Hong Kong Association of Banks.
 - With reference to the rate quoted by The Hongkong and Shanghai Banking Corporation Limited.
 - The composite interest rate is a weighted average interest rate of all Hong Kong dollar interest-bearing liabilities, which include deposits from customers, amounts due to banks, negotiable certificates of deposit and other debt instruments, and Hong Kong dollar non-interest-bearing demand deposits on the books of banks. Further details can be found in the HKMA website.
 - Quarterly change.
 - Loans for use in Hong Kong plus trade finance.
 - Including "others" (i.e. unallocated).
 - Figures are related to retail banks' Hong Kong office(s) and overseas branches.
 - Classified loans are those loans graded as "substandard", "doubtful" or "loss".
 - Net of specific provisions/individual impairment allowances.
 - Year-to-date annualised.
 - Year-to-date figures.
- ^r Revised figure.

Box 5

The demand for and supply of mortgage loans: The role of loan-to-value policy

Introduction

One key question for the operation of loan-to-value (LTV) policy is under what market conditions LTV cap tightening is expected to be more effective in limiting credit growth. Theoretically, answering this question requires an examination of two issues: First, to what extent would the LTV cap tightening reduce the demand for and supply of mortgage loans?⁶² Second, in the current state of the loan market, does the demand or supply play the major role in determining the credit volume? The second issue is particularly relevant in view of findings in banking research that excess demand or excess supply may occur in the credit market⁶³, suggesting that either the demand or supply can be the sole binding factor in determining the credit volume.

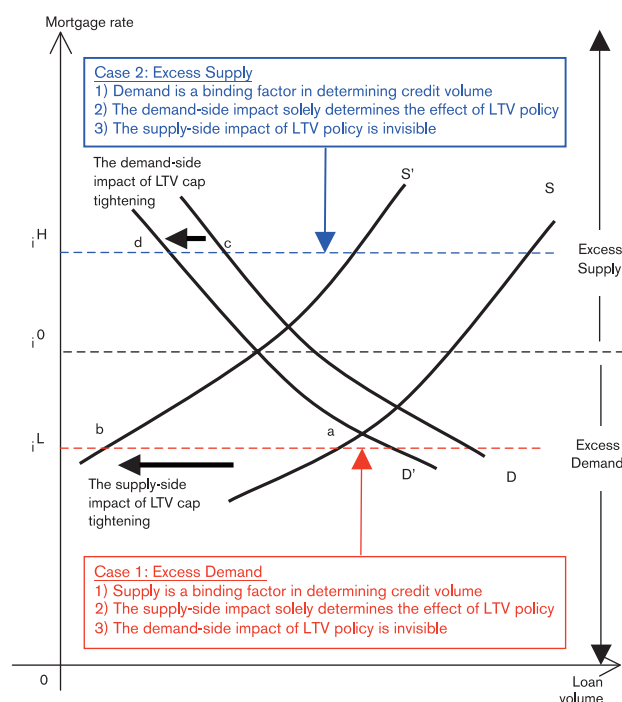
To see the importance of these two issues to the effectiveness of LTV policy, consider a hypothetical mortgage market where LTV cap tightening significantly reduces the credit supply but less so the credit demand. Chart B5.1 illustrates that the tightening shifts the demand from D to D' moderately and supply from S to S' more significantly. Although the magnitude of the shift in supply and that in demand play roles

⁶² Theoretically, LTV cap tightening may reduce demand for mortgages, as home buyers may be forced out of the property market because of higher liquidity hurdles or lower returns on equity for property investment. LTV cap tightening may also reduce credit supply because it may lead banks to lend less than they otherwise would.

⁶³ For example, see Stiglitz and Weiss (1981), "Credit rationing in markets with imperfect information", *American Economic Review*, vol. 71, pp 393-410. Apart from the conventional explanation that excess supply or excess demand may occur due to stickiness of lending interest rates, Stiglitz and Weiss (1981) show theoretically that credit rationing (i.e. excess demand) may exist in the loan market if banks face an adverse selection problem. A profit-maximising bank may charge an interest rate below the market clearing rate, as a higher interest rate could attract more risky borrowers and discourage safer borrowers, which could increase the credit loss of banks' loan portfolios.

in determining the policy effect, the state of the market (i.e. whether the supply or demand is the binding factor) is a pivotal factor. Specifically, in Case 1 where demand exceeds supply (implying credit supply is the binding factor) at the prevailing mortgage interest rate (i^L), the effect of the tightening solely reflects the supply-side impact, while the demand-side impact is invisible. In this case, the loan volume decreases considerably from a to b . In Case 2 where supply exceeds demand at the prevailing mortgage interest rate (i^H), the effect of the tightening solely reflects the demand-side impact, while the supply-side impact is invisible. In this case, the loan volume decreases marginally from c to d . In this example, LTV policy is expected to be more effective when there is excess credit demand but less so when excess credit supply occurs, suggesting a state-dependent feature of the policy effect.

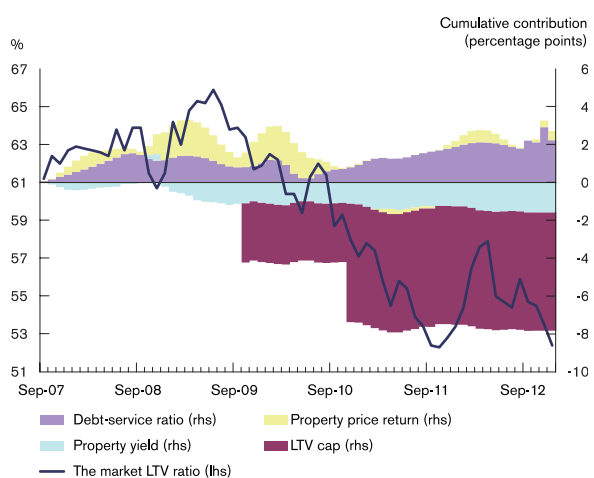
Chart B5.1
A supply-and-demand diagram to illustrate the effect of LTV policy under scenarios of excess supply and excess demand in loan markets



One important implication of the possible state-dependent feature of the policy effect is that an empirical identification of the impact of LTV policy on the demand for and supply of mortgage loans, and the state of the market could help policymakers to assess under what market conditions, LTV policy is more effective in restraining credit growth.

To advance our understanding of the transmission mechanism of LTV policy in such context, this article develops an empirical model of residential mortgage lending in Hong Kong, which allows for, but does not impose, the existence of excess supply or excess demand in the loan market. The average LTV ratio of new mortgages approved (hereafter referred to as “the market LTV ratio”) is considered as one major factor affecting both the demand for and supply of mortgage lending. With this specification, any LTV cap tightening or loosening is assumed to have an initial impact on the market LTV ratio, which in turn affects both the demand for and supply of mortgage loans. This assumption is justified by a regression-based decomposition analysis, which shows that LTV caps are one significant determinant of the market LTV ratio (Chart B5.2).

Chart B5.2
Contributions of main factors to change in the market LTV ratio



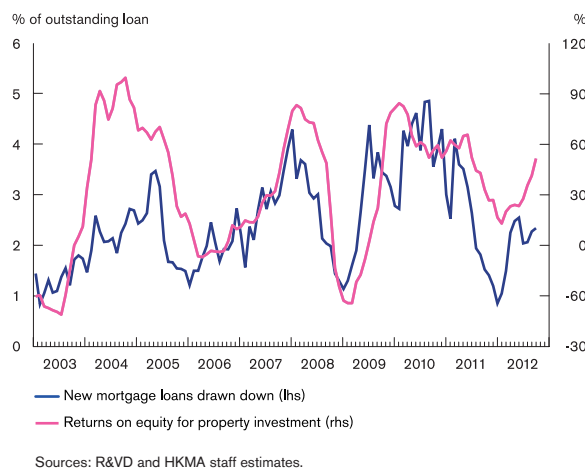
Note: The decomposition is based on the result of a regression model, which suggests that a higher LTV cap, a higher property price return to volatility, a higher rental yield for property investment, and a lower debt-servicing ratio tend to be associated with a higher market LTV ratio.

Sources: R&VD, C&SD and HKMA staff estimates.

The econometric model of mortgage demand and supply

Table B5.1 presents the specification for demand and supply equations for mortgage loans. The demand for mortgage loans is hypothesised to be correlated negatively with unemployment rates (to proxy for macroeconomic conditions) and positively with returns on equity (ROE) for property investment. A lower ROE (due either to a lower market LTV ratio, declines in property price appreciations and rental yields or an increase in mortgage interest rates) is expected to reduce the demand for mortgages. The strong historical co-movement of ROE and new mortgage loans drawn down (Chart B5.3) suggests that the ROE may have significant explanatory power on the demand for mortgages.

Chart B5.3
Returns on equity for property investment and new mortgage loans drawn down



As the Special Stamp Duty (SSD) introduced in November 2010 may reduce the demand for properties and thus the demand for mortgage loans, an interaction term of ROE and a dummy variable for capturing the effect of the SSD⁶⁴ is included in the model. The model also includes a dummy variable to account for lower demand for properties during the month of Chinese New Year.

⁶⁴ Defined as one for monthly observations after November 2010 and zero otherwise.

Table B5.1
Major factors affecting the demand for and supply of mortgages

Variable	Expected impact
Demand equation	
Unemployment rate	-
Returns on equity for property investment: $1/(1-\text{market LTV ratio})^1$ times net property return (defined as 12-month property price return + property rental yield - effective borrowing rate for best lending rate-based mortgages)	+
An interactive term of a dummy variable for capturing the effect of the SSD and returns on equity for property investment	-
A dummy variable for Chinese New Year	-
Supply equation	
Annual growth rate of residential property prices	+
Annual change in the market LTV ratio	+
Risk-adjusted return on mortgage lending: Effective mortgage rate - Loss given default ² times three-month delinquency ratio - The yield of 12-month Exchange Fund Bills	+
Available funds: Annual growth rate of Hong Kong dollar deposits	+

Notes:

1. It can be shown that $1/(1-\text{market LTV ratio})$ equals the ratio of the property value to equity (i.e. the amount of down payments) for property investment.
2. Assuming a loss given default of 50%.

The supply equation postulates that banks tend to supply more mortgages when the collateral value increases. The collateral value in this model is assumed to be dependent on property prices and the market LTV ratio. The consideration of the collateral value as one factor driving the supply of mortgage loans is consistent with the assertion of the financial accelerator theory⁶⁵ that rises in property prices lead to higher collateral value, which in turn increases the supply of mortgage loans.

In addition, the supply of mortgage loans is assumed to be positively correlated with a net risk-adjusted return on mortgage lending (which is proxied by mortgage interest rates minus the expected default loss of mortgage lending minus the yield of 12-month Exchange Fund Bills) and deposit funding.

A preliminary estimation result of the model is found to be broadly consistent with the specification. In particular, the market LTV ratio is found to be a significant factor affecting both the demand for and supply of mortgage loans. The estimation result also suggests that demand does not necessarily equal supply at the prevailing market interest rate.

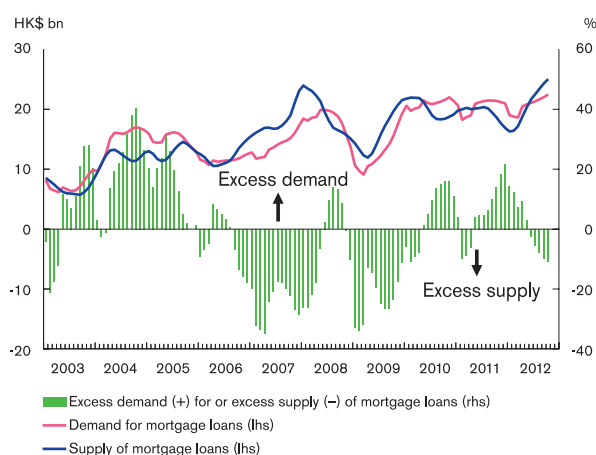
Regarding the extent to which the LTV cap tightening after October 2009 reduced the supply of and demand for mortgage loans, a back-of-the-envelope calculation using the preliminary estimation result suggests that had the HKMA not tightened LTV caps, the supply of mortgage loans might be around 10% more than the current estimate. By contrast, the policy effect on the demand for mortgage loans is estimated to be relatively small.

In order to evaluate whether the significant dampening impact on the supply of mortgage loans was effectively translated into lower

⁶⁵ See Bernanke (2007), "The Financial Accelerator and the Credit Channel," Speech at the Credit Channel of Monetary Policy in the Twenty-first Century Conference, Federal Reserve Bank of Atlanta.

loan growth, we need to assess the state of the market. Chart B5.4, which presents the estimated mortgage demand and supply, reveals that since the beginning of the tightening of macroprudential policy in October 2009, the number of months with estimated excess demand is more than that with estimated excess supply, suggesting that credit supply is a major factor in determining the volume of new mortgage loans. In other words, LTV policy was effectively transmitted to the mortgage loan market through its dampening impact on the supply of mortgage loans.

Chart B5.4
Estimated demand for and supply of mortgage loans



Note: Excess demand or supply is expressed as a percentage of the estimated new mortgage loans drawn down. The estimated demand and supply are expressed as three-month moving averages.

Source: HKMA staff estimates.

Conclusion

On the theoretical front, this analysis shows that the effect of LTV policy on loan growth may be state-dependent because of asymmetric responsiveness of loan demand and supply to LTV ratios. Therefore, analysing the relative forces of credit demand and supply is important when conducting macroprudential policy.

Empirically, this analysis shows that the supply of mortgage loans has been constrained by the LTV ratios and the lower supply has been translated into lower loan growth effectively since late 2009. The policy effect helps to prevent excessive household leverage and over-extension of credit to marginal borrowers so that the quality of banks' mortgage loan portfolios can be maintained. In principle, constraining the supply of mortgage loans may also help dampen the amplitude of property price cycles to a certain extent because if the demand for mortgage loans had been fully satisfied by banks, then upward pressures on property prices may have been even higher. These policy actions have shown that managing the quantity of leverage in the system has contributed to financial stability in Hong Kong.

Box 6

Changing business models of Hong Kong branches of US and European global banks

Most global banks have significant operations in Hong Kong⁶⁶, suggesting that any shock in their home countries could spread internationally in part through their operations in Hong Kong. Global banks' business models, as revealed from the recent research, play a fundamental role in determining how the risk would be transmitted.⁶⁷ Against this background, this article assesses how US and European banks, which were hard hit in the 2008-09 global financial crisis, have adjusted the business models of their Hong Kong branches after the crisis⁶⁸, and implications for the risk transmission mechanism.

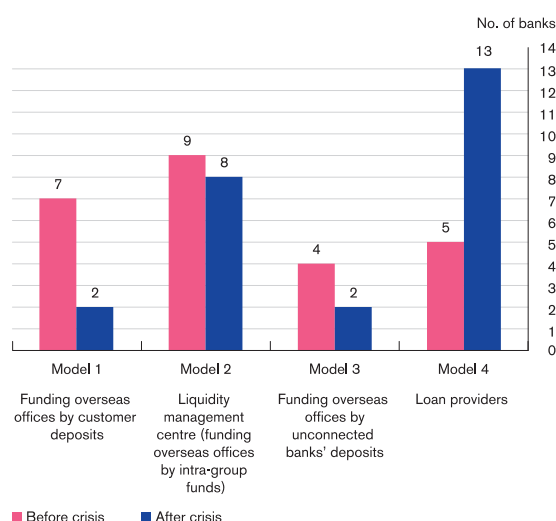
An overview

The assessment is based on financial disclosure of 25 selected overseas incorporated Hong Kong licensed banks in pre- and post-crisis periods.⁶⁹ The sample banks consist of branches of US and European global banks that have significant operations in Hong Kong. Twenty-one of them are branches of global systemically important banks (G-SIBs) identified by the Financial

Stability Board.⁷⁰ As at June 2012, the aggregate assets of these 25 selected banks accounted for 17% of the total assets of the Hong Kong banking sector.

The 25 selected banks are broadly classified into four business models by their major sources and utilisation of funds. Chart B6.1 shows the distribution of these banks by business models before and after the crisis.⁷¹

Chart B6.1
Distribution of Hong Kong branches of US and European global banks by business models



Sources: Classification by HKMA staff based on banks' financial disclosure statements.

Banks under models 1-3 all served to provide funding for their overseas offices but differed in their major funding sources, whereas banks under model 4 served to provide loans to non-bank customers domiciled both in Hong Kong and other jurisdictions of the Asia-Pacific region. Before the crisis, liquidity management was the principal function of the Hong Kong branches of global

⁶⁶ At the end of 2012, 46 out of the world's largest 50 banks (in terms of asset size) are authorized institutions or have local representative offices in Hong Kong. From a stability perspective, 27 out of the 28 global systemically important banks (G-SIBs) identified by the Financial Stability Board have operations in Hong Kong.

⁶⁷ Cetorelli and Goldberg (2012), "Liquidity management of US global banks: Internal capital markets in the great recession", *Journal of International Economics*, pp 299-311.

⁶⁸ Global banks' subsidiaries in Hong Kong are not included in this assessment, as their business models are similar (i.e. to fund local lending by local retail deposits) and remain broadly unchanged after the crisis.

⁶⁹ The financial disclosure statements of the selected banks reflect the operation of their branches in Hong Kong. Banks' pre-crisis and post-crisis positions are taken from interim or final financial disclosure statements 2007 (June 2008 for one exception) and those in June 2012 respectively.

⁷⁰ Among the 28 G-SIBs, 24 are US and European banks. The remaining four banks, which are excluded from this analysis, are in Japan and China. See Financial Stability Board (2012), "Update of group of global systemically important banks".

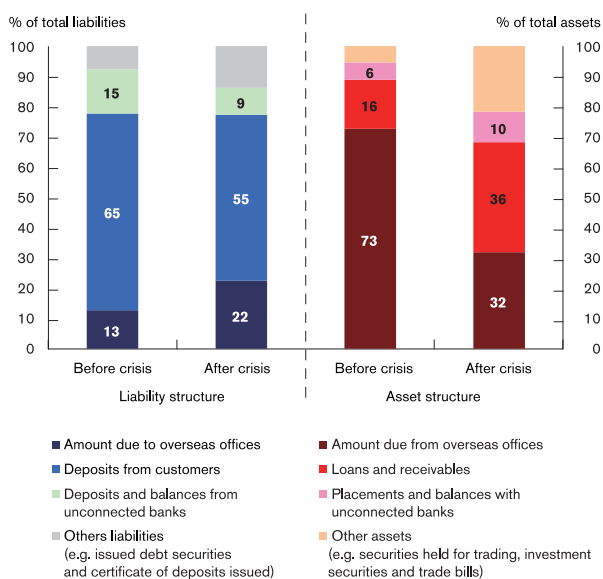
⁷¹ The classification, however, is not perfectly precise because some banks actually operated with multiple functions (e.g. a bank may have sizeable operations of both lending and funding overseas offices).

banks, as 20 out of the 25 selected banks operated with models 1-3. After the crisis, however, lending to non-bank customers has become increasingly important, with 13 sample banks adopting model 4. The shift of the principal functions of the Hong Kong branches of these global banks reflects there were significant changes in the asset-liability structure, as analysed below.

Business model 1: Funding overseas offices by customer deposits

Chart B6.2 shows the asset-liability structure for those sample banks that adopted model 1 before the crisis.⁷² Although customer deposits remained the major source of funds after the crisis, its share has declined. The gap was nearly filled by an increase in intra-group borrowings. The asset side underwent dramatic changes. The share of lending to overseas offices decreased from 73% to 32%, while that of lending to non-bank customers increased from 16% to 36%. As a result, lending to non-bank customers has become the primary activity after the crisis. Indeed, five of the seven banks in this group have transformed into a lending arm of their respective banking groups (i.e. model 4) after the crisis.

Chart B6.2
Asset-liability structure: Business model 1



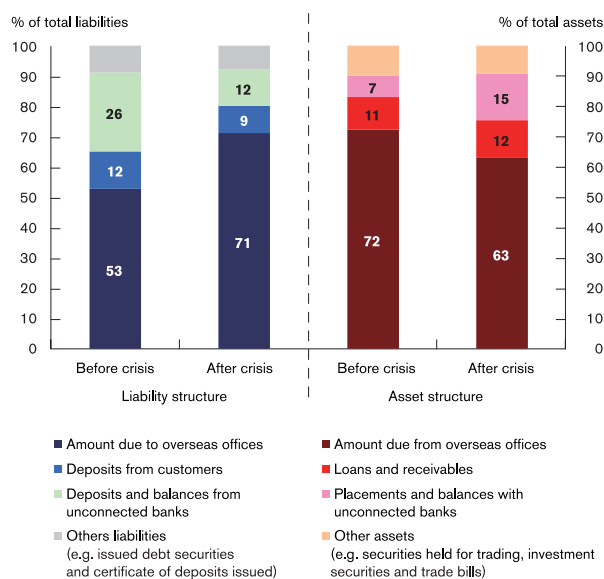
Sources: Banks' financial disclosure statements and HKMA staff estimates.

⁷² The analysis on the changes in the asset-liability structure of different business models and the construction of charts B6.2-B6.5 are based on the aggregate positions of banks adopting the corresponding models before the crisis, which does not preclude that the changes at individual bank level may differ from the aggregate level.

Business model 2: Liquidity management centre

The business model of these banks remained broadly unchanged after the crisis (Chart B6.3), with six out of the nine banks in this group maintaining a similar business model after the crisis. Nevertheless, moderate adjustments in the asset-liability structure were observed. In particular, intra-group funding became even more important after the crisis, with its share in total liabilities increasing further from 53% to 71%. On the asset side, distributing intra-group funding remained the core activity after the crisis, despite growing shares of lending to non-bank customers and unconnected banks.

Chart B6.3
Asset-liability structure: Business model 2

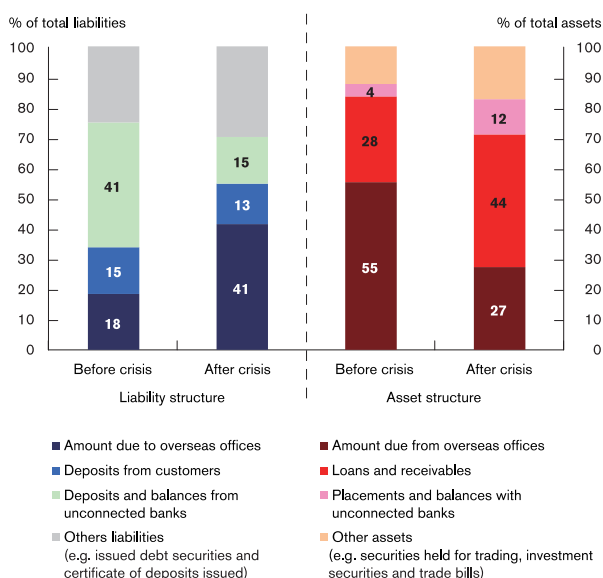


Sources: Banks' financial disclosure statements and HKMA staff estimates.

Business model 3: Funding overseas offices by unconnected banks' deposits

Large changes were observed on both the asset and liability sides for those banks that adopted model 3 before the crisis (Chart B6.4). The principal funding source has shifted from unconnected banks' deposits to intra-group funds after the crisis. On the asset side, lending to non-bank customers has replaced intra-group lending as the core activity after the crisis. It is worth noting that this model was not a mainstream before the crisis with only four sample banks adopting it, and this business model appears to have become even less viable with only two banks adopting it after the crisis.

Chart B6.4
Asset-liability structure: Business model 3

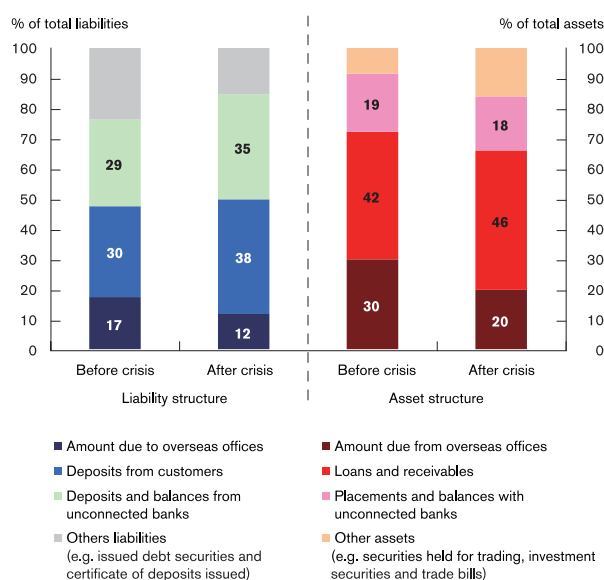


Sources: Banks' financial disclosure statements and HKMA staff estimates.

Business model 4: Loan providers

The asset-liability structure of this model remained largely stable (Chart B6.5). In general, the liability structure of banks adopting model 4 before the crisis was broadly unchanged. On the asset side, the role of lending to non-bank customers has strengthened, with its share climbing to 46% from 42%. As shown in Chart B6.1, around half of the sample banks serve as a lending unit after the crisis.

Chart B6.5
Asset-liability structure: Business model 4



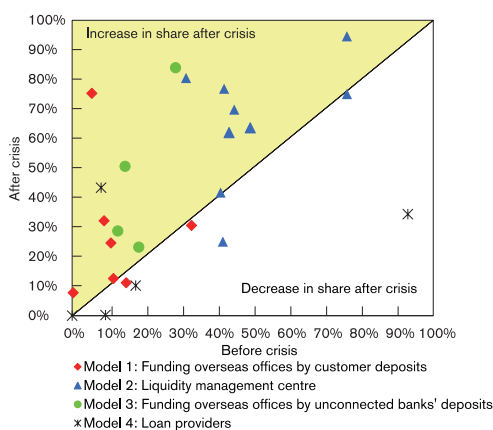
Sources: Banks' financial disclosure statements and HKMA staff estimates.

Common patterns of changes in the asset-liability structure

Notwithstanding the heterogeneous asset-liability structure across the sample banks, some common developments after the crisis are observed. In general, the sample banks become more reliant on intra-group funding as a source

of funds (Chart B6.6)⁷³, which may be attributed to the surplus funds at the headquarters of these global banks after unprecedented liquidity injections by central banks in their home countries.⁷⁴

Chart B6.6
Shares of amount due to overseas offices in total liabilities of sample bank branches



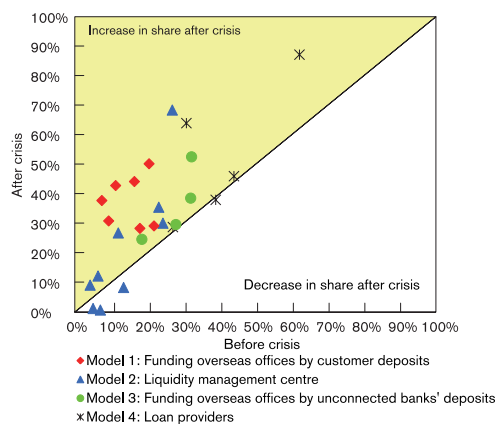
Notes:

1. Each data point represents one sample bank.
2. Data point above the diagonal indicates an increase in the share of amount due to overseas offices after the crisis.

Sources: Banks' financial disclosure statements and HKMA staff estimates.

On the asset side, lending to non-bank customers has gained in importance after the crisis (Chart B6.7)⁷⁵, which may be partly driven by the strong demand for bank credit in the Asia-Pacific region.

Chart B6.7
Share of loans to non-bank customers in total assets of sample bank branches



Notes:

1. Each data point represents one sample bank.
2. Data point above the diagonal indicates an increase in the share of loans to non-bank customers after the crisis.

Sources: Banks' financial disclosure statements and HKMA staff estimates.

Implications for the Hong Kong banking sector

The recent change in business models of Hong Kong branches of US and European global banks is likely to produce two counteracting effects on shock transmission associated with US and European global banks. On the one hand, the shift from traditional funding centres to regional lending units may suggest that their operations in Hong Kong would be less prone to drastic withdrawal of funds than before. Recent research revealed that in times of stress global banks are more likely to commit stable intra-group funding to overseas affiliates that carry out significant lending activities.⁷⁶ On the other hand, the greater reliance on intra-group funding to fund lending activities may suggest that any given withdrawal of funds by head offices of these global banks will tend to produce a larger impact on the credit supply of their Hong Kong branches than previously. Nevertheless, the overall impact on the domestic credit supply would be moderate given that lending by Hong Kong branches of these global banks only accounted for around 12% of total loans in the Hong Kong banking sector.

⁷³ Correspondingly, the shares of deposits from customers and unconnected banks in total liabilities have dropped, possibly due to the perceived higher counterparty risk of US and European banks.

⁷⁴ For example, the two three-year longer term refinancing operations conducted by the European Central Bank have improved the funding conditions of European banks.

⁷⁵ In contrast, the share of amount due from overseas offices in total assets has decreased.

⁷⁶ See footnote 67.