Financial System Report

Bank of Japan
September 2008

This report mainly covers 12 major banks and 109 regional banks.
The 12 major banks comprise Mizuho Bank, The Bank of Tokyo-Mitsubishi UFJ, Sumitomo Mitsui Banking Corporation, Resona Bank, Mizuho Corporate Bank, Saitama Resona Bank, Mitsubishi UFJ Trust and Banking Corporation, Mizuho Trust and Banking Company, The Chuo Mitsui Trust and Banking Company, The Sumitomo Trust and Banking Company, Shinsei Bank, and Aozora Bank. The 109 regional banks comprise the 64 member banks of the Regional Banks Association of Japan and the 45 member banks of the Second Association of Regional Banks, as of March 31, 2008.

In the charts, "I" and "II" represent the first half and second half of the relevant year, respectively.

Unless otherwise stated, this document uses data available as of September 16, 2008.

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Preface

The Bank of Japan publishes the *Financial System Report* biannually with two objectives. The first is to present a comprehensive analysis and assessment of the stability of Japan's financial system. The second is to facilitate communication with concerned parties in order to contribute to the sustained stability of the financial system.

In advancing the Bank's macroprudential research, the stability of the financial system is analyzed in two aspects: the functioning of the system and its robustness. The functioning of the system is assessed in terms of whether it promotes an efficient allocation of economic resources, thereby contributing to the sound development of the economy. The robustness is assessed in terms of whether any potential imbalances that might jeopardize the stability of the financial system are largely contained and whether the financial system is robust against such imbalances. Macroprudential research also provides a valuable insight into the assessment of monetary policy's transmission channels.

The September 2008 issue evaluates the stability of Japan's financial system amid continued turmoil in the global financial system stemming from the U.S. subprime mortgage problem. While Japan's financial system has been stable since it virtually overcame the nonperforming loan problem, given the sluggish economic growth this issue points out the need for caution against the downside risks centering on credit risk.

In addition, this issue examines the necessity of improving profitability, one of the challenges for the financial system that has been repeatedly pointed out. In order to meet customers' diversified needs, financial institutions need to strengthen their efforts from a long-term perspective, such as differentiating their financial services and diversifying the combination of their financial products' prices and qualities. It should be emphasized that banks' profitability, as a source of its capital, needs to be improved, in order to enhance the financial intermediation function while ensuring the sustained stability of the financial system.

The Bank intends to contribute to ensuring the sustained stability of Japan's financial system through research and analyses of the financial system, together with proper pursuit of central banking operations.

An Assessment of the Current State of Japan's Financial System: An Overview

(An assessment of the current state of Japan's financial system)

1. Japan's financial system, on the whole, has remained stable despite continued turmoil of global financial system stemming from the U.S. subprime mortgage problem. However, improvement in banks' core profitability has stalled, and the gaps in their profitability and capital strength have widened.

   The total risk borne by banks has been largely restrained, relative to their capital positions. However, credit risk has started to increase amid the sluggish economic growth, and future developments require vigilance. In addition, market risk associated with stockholdings has further increased its weight in the risk component at the major banks, and interest rate risk has been at a higher level at the regional banks than at the major banks. Meanwhile, both for the major banks and the regional banks, improvements in their capital adequacy ratios witnessed in recent years have slowed due to a decrease (an increase) in unrealized gains (losses) on securities.

2. While Japanese banks' losses stemming from the U.S. subprime mortgage problem increased as the problem became more serious, such losses seem to have been contained within their current profit levels and capital strength, since Japanese banks' related exposures were mainly in the form of investments in structured credit products. Therefore, at present the U.S. subprime mortgage problem is not likely to jeopardize the stability of Japan's financial system. However, negative interaction between the weakened function of financial intermediation and downward pressure on economic activity has become a concern in the United States. Thus, its effects on the global economy and further effects on

Japan's economy warrants caution.

3. In terms of profits, Japanese banks' financial statements clearly showed that their core profitability became sluggish as credit costs returned to past average levels. After recording an all-time high in fiscal 2005, net income of the major banks and the regional banks declined for two consecutive years. In particular, net income of the major banks declined by half compared with that in fiscal 2005. For the regional banks, the number of banks that registered net losses increased despite the limited effects of the U.S. subprime mortgage problem. Banks' high profits in recent years were largely attributable to the fact that credit costs decreased substantially and temporarily as a result of the reversals in loan-loss allowances accumulated in the past. Both the major banks and the regional banks need to establish business models taking into account each bank's comparative advantage such as managerial resources and business bases, thereby enhancing core profitability.

(Risks for the financial system)

4. Credit costs have started to increase amid the sluggish economic growth, which demands meticulous credit risk management by financial institutions, including interest rate setting commensurate with risk. Nevertheless, interest margins on loans remain narrow relative to credit risks, and an increase in those margins factoring in a rise in credit risks is yet to be seen. For the financial institutions to carry out their financial intermediation function in a smooth and sustainable manner, from the perspective of credit management they need to make adjustments as necessary reflecting changes in credit risks. How such behavior of financial institutions influences their profits and firms' funding situations needs to be carefully

examined. In addition, amid a certain degree of stagnation in the flow of funds in real estate finance, financial institutions' lending stance has become cautious against the backdrop of the diminishing tempo of increases in land prices in the metropolitan areas, worsened supply and demand balance for condominiums, and rise in office buildings' vacancy rates. The financial environment surrounding the real estate sector has become increasingly severe.

5. Financial conditions have been accommodative, with interest rates being maintained at low levels relative to economic activity. Nevertheless, potential imbalances that might jeopardize the stability of the financial system, such as the rapid expansion of credit aggregates and excessive risk-taking behavior, have been largely restrained. The private corporate sector remains in financial surplus, reflecting abundant cash flows, and the expansion of credit aggregates through the financial sector has been kept relatively mild. However, profitability of housing loans, which are the key product of bank loans to individuals, has been worsening substantially reflecting prevalence of preferred interest rates, thus resulting in increases in interest rate risk.

(Robustness of the financial system)

6. Based on the results of macro stress-testing that assume substantial fluctuations in interest rates and economic activity, the robustness of the banking system against interest rate risk, credit risk, and market risk associated with stockholdings has remained high on the whole. Nevertheless, in assessing the overall stability of the financial system, it should be noted that the gap in resilience against stresses between individual institutions

has widened. It should also be noted that the number of financial institutions incurring unrealized losses on securities has been increasing due to fall in stock prices, and their capital position has become susceptible to further changes in stock prices.

7. Triggered by the U.S. subprime mortgage problem, a mechanism has come to the fore in which financial institutions' behavior is influenced by economic fluctuations and in turn amplifies the fluctuations, the so-called procyclicality of the financial system. That mechanism needs to be considered in three stages: (1) changes in banks' capital adequacy ratios; (2) changes in banks' credit exposures; and (3) changes in the magnitude of economic fluctuations. In Japan, during the period when banks' capital was considerably eroded due to the nonperforming loan problem, it might have been the case that insufficient capital became a bottleneck constraining their lending behavior, thereby producing downward pressures on economic activity. Whether changes in banks' capital adequacy ratios affect their lending behavior and result in greater fluctuations in economic activity will depend on banks' management of their capital buffers and the prevailing financial and economic conditions.

(Management challenges for Japanese banks)

8. Improvement in the banking sector's profitability has been pointed out repeatedly as an important management challenge for Japanese banks. However, looking at Japan's financial system, many financial institutions have been competing with each other to provide relatively homogeneous services at low prices. Against such a backdrop, it is a difficult task to map out specific

prescriptions to improve profitability. Nevertheless, as previous issues of the *Financial System Report* have emphasized, the roadmap for Japanese banks continues to be to properly assess the risk-return balances and to provide diversified and differentiated financial services by responding to customers' needs. Both the major banks and the regional banks are expected to establish their business models taking into account their comparative advantages such as individual conditions of managerial resources and the business bases.

9. The major banks appear to raise profits from the retail and wholesale banking businesses in a relatively balanced manner, and rely less on the asset management business, compared with the U.S. and European financial institutions. As for geographical operations, their reliance on domestic business is high but profitability is relatively low, while international business is relatively profitable but its contribution to overall profit is limited. In addition to providing high-value-added financial services to raise the profitability of domestic business, banks need to promote concentration in core competence with a comparative advantage from the viewpoint of enhancing efficient use of capital. For international business, banks need to take strategic approaches to establish a profit base from a long-term perspective.

10. For the regional financial institutions, the gaps between institutions with respect to profitability and capital strength have become increasingly obvious. The regional financial institutions need to strengthen their business bases in order to carry out the financial intermediation function in a stable manner to facilitate the development of regional economies. In this regard, small financial institutions have much room to enjoy economies of scale. By eyeing mergers and management integration, which require a high degree of management decision, as one option, regional financial institutions are expected to pursue economies of scale to enhance cost and profit efficiency, thereby raising core profitability and stabilizing their business base.

I. Changes in the Environment Surrounding Japan's Financial System

This chapter provides an overview of domestic and overseas financial and economic developments, and identifies risks and their changes, which could bring instability to Japan's financial system.

A. Turbulence in the Global Financial System

Global financial markets still remain instable, although more than a year have passed since the summer of 2007 when the U.S. subprime mortgage problem worsened (see Box 1 of the March 2008 issue of the *Financial System Report* for an outline of the problem).

1. Turmoil in the U. S. and European financial markets

In the securitization markets that triggered the turmoil, prices plunged for a wide range of structured credit products along with the downgrading of their credit ratings (Chart 1-1; for recent developments in the global financial markets, see the September 2008 issue of the *Financial Markets Report*, Financial Markets Department, Bank of Japan). Therefore, the normal functioning of the overall structured credit markets has continued to be impaired. In particular, a large decline in prices was more notable among multi-layered structured credit products with intensified leverage such as asset backed securities-collateralized debt obligations (ABS-CDOs) (see Box 3 of the March 2008 issue of the *Financial System Report*).

Credit default swap (CDS) premiums for financial institutions widened considerably through the spring of 2008 reflecting concerns that the U.S. and European financial institutions might incur further losses related to the U.S. subprime mortgage problem (Chart 1-2).

Chart 1-1: Market Condition of Securitization on Subprime-Related Products
[1] Prices of RMBS (ABX-HE 2006-2)[1]
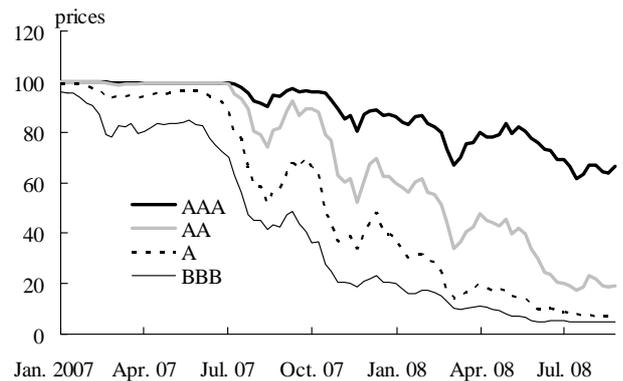
Note: 1. ABX-HE 2006-2 is a credit default swap index linked to subprime residential mortgage-backed securities (RMBS). Its reference pool is 20 subprime RMBS issued within the period between January and June 2006.
Source: JPMorgan.

[2] Spreads of ABS-CDOs[1,2]
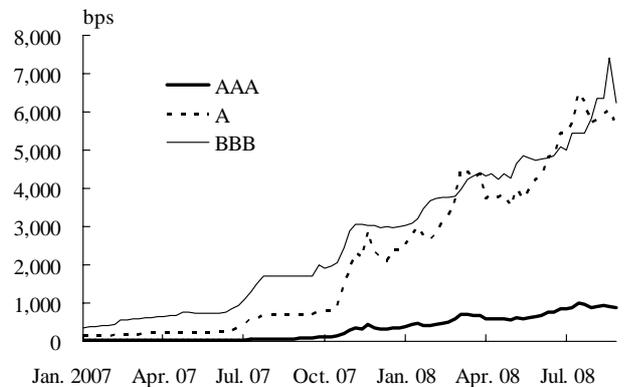

Notes: 1. ABS-CDOs are the multi-layered product whose portfolio assets are comprised of asset-backed securities (ABS).
2. AAA: Senior AAA of high-grade CDOs, A: A of high-grade CDOs, BBB: BBB of mezzanine CDOs.
Source: JPMorgan.

Chart 1-2: CDS Premiums of Major Banks[1]
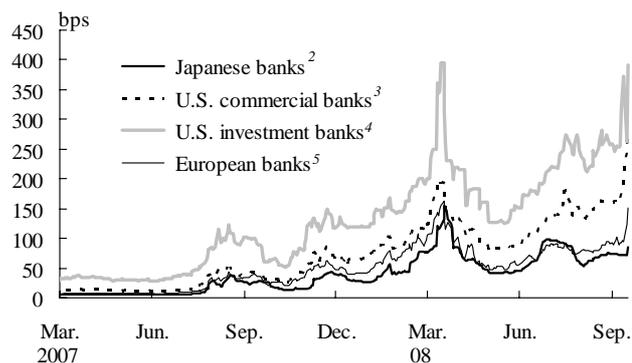
Notes: *1.* The values are calculated as the simple average of the CDS premiums.
 2. The values of Japanese banks include those of The Bank of Tokyo-Mitsubishi UFJ, Sumitomo Mitsui Banking Corporation, and Mizuho Corporate Bank.
 3. The values of U.S. commercial banks include those of Citigroup, Bank of America, JPMorgan Chase, Wachovia, and Wells Fargo.
 4. The values of U.S. investment banks include those of Goldman Sachs, Merrill Lynch, Morgan Stanley, Bear Stearns, and Lehman Brothers.
 5. The values of European banks include those of HSBC, UBS, The Royal Bank of Scotland, Barclays, Santander, BNP Paribas, Unicredito Italiano, Intesa Sanpaolo, and BBVA.
Sources: Tokyo Financial Exchange; Bloomberg.

Chart 1-3: Three-Month Spreads between LIBOR and OIS
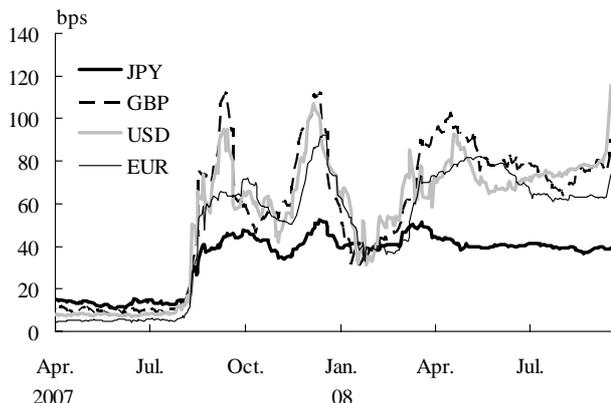
Sources: Bloomberg; Meitan Tradition.

The premiums narrowed for a while, but recently have shown a widening trend again. The CDS premiums for Japanese financial institutions also widened under such developments, albeit at lower levels than those for the U.S. financial institutions.

Meanwhile, the short-term money markets, where financial institutions raise funds, remained jittery. The spread between interbank interest rates on term instruments and the overnight index swap (hereafter LIBOR-OIS spread) – one of the indicators of funding liquidity risks for financial institutions – continued to widen sharply for all major currencies (Chart 1-3). By contrast, the LIBOR-OIS spread of the Japanese yen remained relatively stable compared with other major currencies (funding liquidity risks of Japanese banks are examined in Chapter II).

Against such a background, central banks in the United States and Europe made efforts to stabilize the markets by introducing new measures for money market operations to strengthen their fund supply capacity, in addition to conducting prompt and flexible money market operations within the conventional framework. The main features of these operations include: (1) a longer and more flexible operation period; (2) wider coverage of eligible collateral for money market operations; (3) an increased number of institutions eligible to receive funds; and (4) U.S. dollar lending operations in Europe through currency swap arrangements between the central banks (for details on money market operations and measures by central banks in the United States and Europe, see also "Central bank responses to the money market turmoil stemming from subprime woes," Financial Markets Department, Bank of Japan, July 2008 [currently available only in Japanese; forthcoming in English]).

In the United States, major investment banks and

commercial banks incurred larger losses related to the U.S. subprime mortgage problem, and some of them faced serious financial trouble. First, Bear Stearns, a major U.S. investment bank, encountered difficulty in funding due to simultaneous deterioration of both market and funding liquidity in mid-March 2008, and was acquired by JPMorgan Chase, a major U.S. commercial bank. Then, two government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, which played a central role in the securitization market of U.S. residential mortgages, also faced worsening financial conditions. The U.S. Treasury released a plan for support with the Federal Reserve in mid-July, and in early September the U.S. authorities decided to take further measures, such as conservatorship where two GSEs were put under government control, with public capital injection by means of senior preferred stock. Also in mid-September, the holding company of Lehman Brothers, another major U.S. investment bank, was forced to file for bankruptcy. In addition, the number of defaults due mainly to subprime-related losses increased for regional financial institutions.

2. Repricing of risks and deleveraging

The turbulence in the global financial markets can be regarded as a process of repricing and deleveraging by market participants. A simple summary is given below.

First, to examine the developments in repricing, spreads by each type of CDX. NA. IG tranches relating to CDSs of major U.S. firms are used to calculate the implied correlation and the implied default rate that are factored in by the market (for details of the calculation, see Box 1). The estimation result shows that after mid-2007 when the U.S. subprime mortgage problem became serious, implied default rates for both the senior and equity tranches rose (Chart 1-4). Moreover, in 2008, the rising tempo of the implied default rate of

| **Supplement: Major Developments in the Global Financial System since Early September 2008** |
| :--- |
| Sep. 7: The U.S. Treasury and the Federal Housing Finance Agency announced their decision to take action for two GSEs including government control by conservatorship and injection of public funds by means of senior preferred stocks. |
| Sep. 15: Lehman Brothers Holdings, a major investment bank's holding company in the United States, filed for bankruptcy under Chapter 11 of the U.S. Bankruptcy Code. |
| Sep. 16: The Federal Reserve Board (FRB) announced that it would establish a lending facility to the American International Group (AIG.) |
| Sep. 18: The Federal Reserve and other six central banks including the Bank of Japan (BOJ), announced coordinated measures to address elevated pressures in the U.S. dollar funding markets. The BOJ concluded a dollar swap agreement with the Federal Reserve and decided to introduce dollar funds-supplying operations. |
| Sep. 19: The U.S. Treasury and the Federal Reserve announced the establishment of a temporary guarantee program for money market mutual funds (MMMFs). |
| Sep. 19: U.S. President George W. Bush announced comprehensive actions, including legislation for purchase of mortgage-related assets by the Federal Government. |
| Sep. 21: The FRB approved the application of holding companies of two major investment banks in the United States, Goldman Sachs and Morgan Stanley, to become bank holding companies. |
| Sep. 22: The G-7 Finance Ministers and Central Bank Governors released a statement to reaffirm their strong and shared commitment to protect the integrity of the global financial system and facilitate smooth functioning of markets. |
| Sep. 22: Nomura Holdings, a holding company of a major securities company in Japan, announced that it had agreed to acquire Lehman Brothers' franchise in the Asia Pacific region. |
| Sep. 22: Mitsubishi UFJ Financial Group, a holding company of a major commercial bank in Japan, announced the plan to acquire Morgan Stanley's common stocks. |
| Sep. 23: Nomura Holdings announced that it had agreed to acquire the European and Middle Eastern equities and investment banking operations of Lehman Brothers. |
| Sep. 24: The Federal Reserve and four other central banks announced additional coordinated measures to address elevated pressures in the U.S. dollar funding markets. |
| Sep. 25: The Office of Thrift Supervision closed Washington Mutual Bank, the largest savings and loan association in the United States, and appointed the Federal Deposit Insurance Corporation (FDIC) as a receiver. The FDIC sold it to JPMorgan Chase. |
| Sep. 28: U.S. Congress released a draft for "Emergency Economic Stabilization Act of 2008" that would allow the Federal Government to purchase mortgage-related assets up to 700 billion dollars. |
| All dates shown above are local time. |

Chart 1-4: Implied Default Probabilities and Implied Correlation of CDX. NA. IG[1]
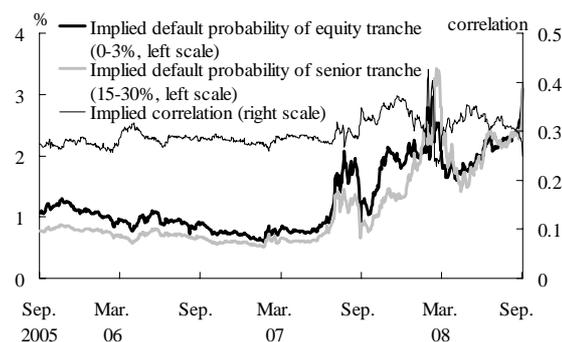
Note: *1*. Bank of Japan estimation. Recovery rate is assumed to be 40 percent in this estimation, drawing upon the model of Markit and others. Figures in parentheses denote attachment (lower limit of tranches) and detachment (upper limit of tranches) of each tranche.
Source: Markit.

Chart 1-5: Repo Transaction Outstanding by Major Financial Institutions in Europe and the United States[1]
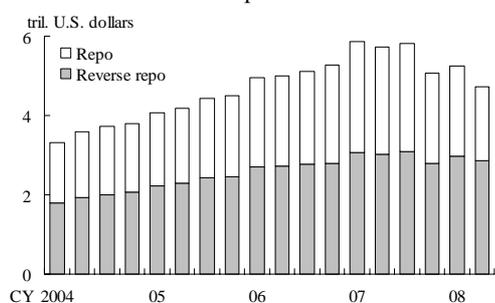
Note: *1*. Figures are the sum of Bear Stearns, Credit Suisse, Citigroup, JPMorgan Chase, Lehman Brothers, Goldman Sachs, Merrill Lynch, Morgan Stanley, and UBS.
Source: Published accounts.

Chart 1-6: Flow of Funds into/from Hedge Funds[1]
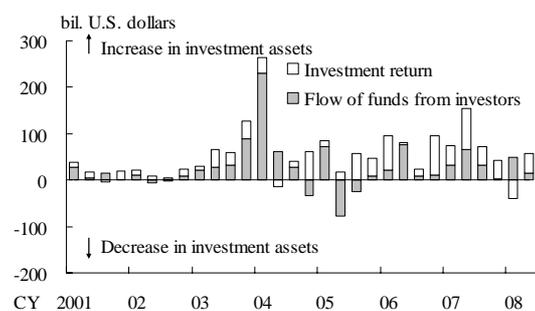
Note: *1*. Bank of Japan estimation.
Source: Eurekahedge.

Chart 1-7: Capital Write-Offs by Global Financial Institutions[1]
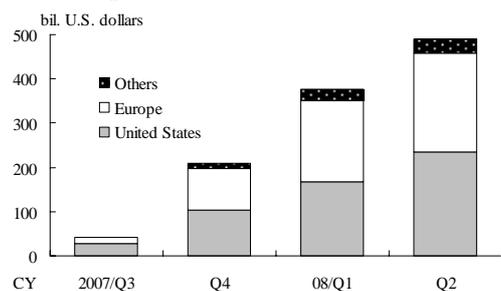
Note: *1*. Figures are calculated using data from July 2007.
Source: Bloomberg.

senior tranches increased, sometimes exceeding the implied default rate of equity tranches. Such developments in the implied default rates suggests that investors for senior tranches came to become more severe, compared with those for equity tranches.

Second, to confirm developments in leveraging, repo transactions that are widely used by financial institutions as a prime broker to extend loans to hedge funds are examined (Chart 1-5; see Box 2 for an outline of monitoring concerning leverage in the financial markets). The outstanding amount of repo transactions rose rapidly from the early 2000s toward the beginning of 2007, after which the growth tempo came to a halt. Recently, the amount has declined compared with the peak.

Estimating capital flows into/from hedge funds, capital inflow increased through the second quarter of 2007, and followed a declining trend from the third quarter (Chart 1-6). Faced with the financial market turmoil since the summer of 2007, capital inflow to hedge funds seems to have decreased.

The developments in such indicators related to leveraging suggest that leveraging has entered into a rapid and substantial rewinding process since the second half of 2007.

**3. Effects on financial institutions' behavior**

In the process of the above repricing of risks and deleveraging, losses for the U.S. and European financial institutions expanded mainly in their securities holdings (Chart 1-7). Recently, in line with the declines in housing prices and real estate prices, provisions for loan losses related to housing loans and commercial mortgage-backed loans have increased.

Moreover, in the process of repricing of risks and deleveraging, reintermediation of assets that were once

removed from the balance sheet induced an unintended expansion of the balance sheet (Chart 1-8). Behind such an expansion of the balance sheet, two factors can be pointed out: first, the difficulty in securitization of real estate-related loans constrained some financial institutions to hold such loans on their balance sheets; and second, financial institutions were forced to extend contingent liquidity to off-balance-sheet investment vehicles such as structured investment vehicles (SIVs) and ABCP conduits and to purchase their securities holdings.

As a result, the U.S. and European financial institutions heightened fund-raising activity in the short-term money markets, and needed to raise additional capital to restore their capital adequacy ratio, which declined because of increases in risk assets and in realized and unrealized losses for structured credit products (Chart 1-9). Capital was initially raised by issuing preferred stocks and hybrid bonds to sovereign wealth funds in the fall of 2007, but from the spring of 2008, capital-raising channels shifted to public offering of common stocks and offering to existing shareholders.

Against such a background, the U.S. and European financial institutions reduced the size of their balance sheets to ease the financing burden of fund liquidity and capital, and also considerably tightened their lending attitude (Chart 1-10). In considering to what extent such negative interaction between financial system and economic activity – deterioration in economic activity provides downward pressure on financial conditions of financial institutions, thereby producing further downward pressures on economic activity – will worsen and how long it persists, the following points are critical: (1) how much losses the U.S. and European financial institutions will further incur in the future; and (2) whether they will be able to

Chart 1-8: Assets of Commercial Banks in the United States

Source: FRB, "Assets and Liabilities of Commercial Banks in the United States."
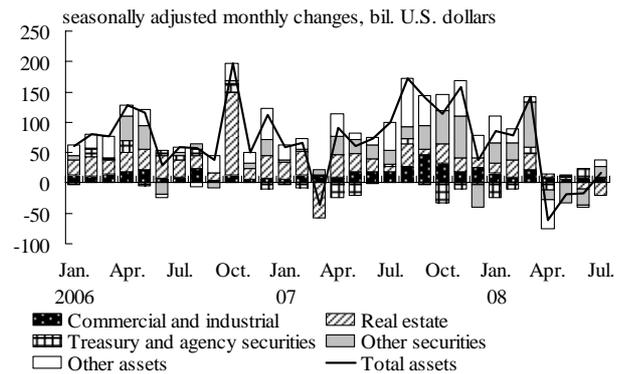
Chart 1-9: Capital Raising by Global Financial Institutions[1]

Note: *1*. Figures are calculated using data from July 2007.
Source: Bloomberg.
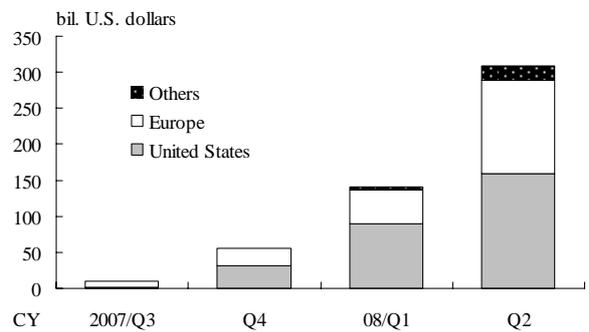
Chart 1-10: Lending Attitude of the U.S. and European Financial Institutions[1]

[1] United States

[2] Euro Area
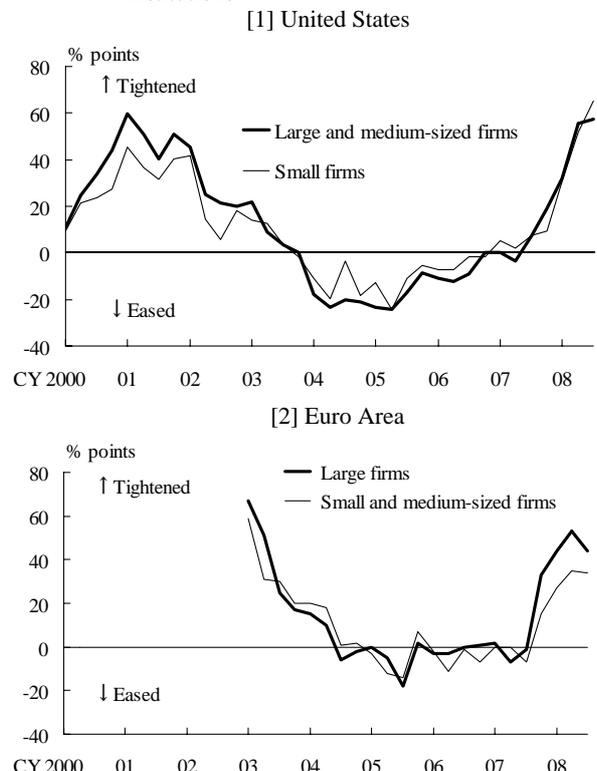
Note: *1*. The values are net percentage of respondents tightening standards for loans.
Sources: FRB, "Senior Loan Officer Opinion Survey on Bank Lending Practices"; ECB, "The Euro Area Bank Lending Survey."

Chart 1-11: Home Price Indices in United States[1]

2000/Q1 = 100

All transactions HPI published by OFHEO
S&P/Case-Shiller Home Price Indices (U.S. National)
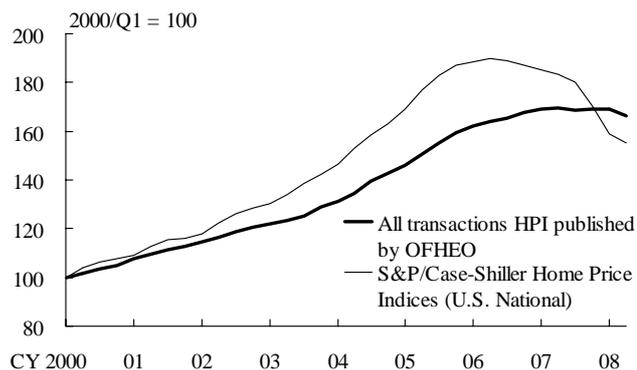
Note: 1. Both the HPI published by OFHEO and S&P Case-Shiller Home Price Indices are indices of the prices for single-family home re-sales. The HPI measures average price changes in repeat sales or refinancings by GSEs (Fannie Mae or Freddie Mac) on the same properties. At the same time, S&P Case-Shiller Indices measures not only GSEs' re-sales or refinancing, but high price residentials and subprime mortgage residentials.

Sources: OFHEO; Standard and Poor's.

Chart 1-12: Profitability of the U.S. Commercial Banks

%   %

ROA (left scale)
ROE (right scale)
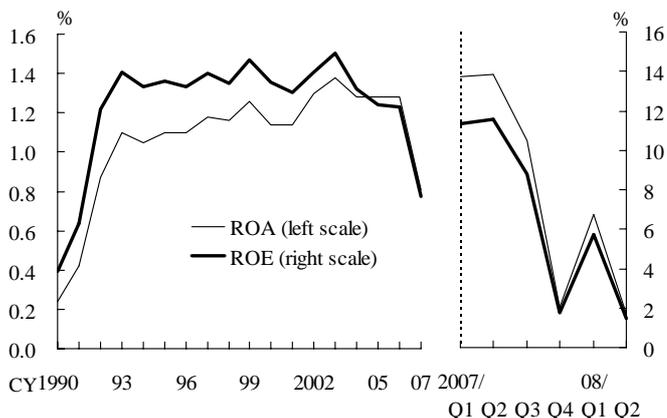
Source: FDIC, "Quarterly Banking Profile."

raise capital on their own.

From this perspective, future developments of housing prices and commercial real estate prices in the United States require attention. According to the Case-Shiller index, housing prices increased rapidly through 2000s, and reached a peak in the second quarter of 2006 (Chart 1-11). Then the index started to decline, rapidly from the second half of 2007, and currently declined by 18 percent from the peak. Should commercial real estate prices further decline, in addition to the decline in housing prices, regional banks in the United States may incur further losses, considering the high proportion of their loans to commercial real estate. In fact, current profits of the U.S. commercial banks have declined substantially (Chart 1-12). Views of market participants about the future profitability of U.S. financial institutions strongly influence the ability to raise capital in the future, so their profitability including that of regional banks deserves continued attention.

4. Discussions on global regulation and supervision

While turbulence in the global financial markets triggered by the worsening of the U.S. subprime mortgage problem continues as examined above, discussions on global regulation and supervision of financial system stability have also been in progress.

In summarizing the lessons and challenges for the financial system at this stage, an important lesson would be that financial institutions in the United States and Europe failed to properly evaluate and manage risks inherent in diversified and complicated financial transactions, while they expanded the originate-and-distribute business (for a tentative summary of the lessons and challenges, see Box 1 of the March 2008 issue of the *Financial System Report*). In light of the progress in financial and economic globalization and

technological innovation in finance, it was reaffirmed that the risks were likely to manifest themselves in an abrupt and wide-ranging manner through unexpected transmission channels. At the same time, the current problem does not necessarily deny the originate-and-distribute business model; rather, it reaffirmed the importance of enhanced risk management when taking advantage of innovation in financial technology under any types of business model.

Based on the above, a framework of financial regulation and supervision should be developed to support financial institutions' voluntary efforts to strengthen risk management and enhance market transparency so that financial and capital markets function in an efficient and stable manner through the full functioning of market discipline. It is, of course, important that financial institutions secure a sufficient capital base.

The report released by the Financial Stability Forum (FSF) in April 2008 also proposed measures such as enhancement of transparency through information disclosure and revision of the uses of credit ratings along with the strengthened prudential oversight of banks. As such, efforts are actively being made by various international forums, financial supervisory authorities, and central banks of relevant countries.

As part of such efforts, the Basel Committee on Banking Supervision has strengthened and further developed the three pillars of the new capital adequacy regulatory framework (Basel II). For example, revising risk weights of multi-layered structured credit products and strengthening disclosure of transactions are under consideration. Also, the committee issued revised guidance on the management of liquidity risks, and is in the process of formulating guidance to enhance the

Chart 1-13: Financial Intermediation Function

[1] Japan

ratio to nominal GDP, %

□ Other financial intermediaries [1]
□ Insurance and pension funds
■ Depository corporations

[2] United States

ratio to nominal GDP, %

□ Other financial intermediaries [2]
□ Insurance and pension funds
■ Depository corporations
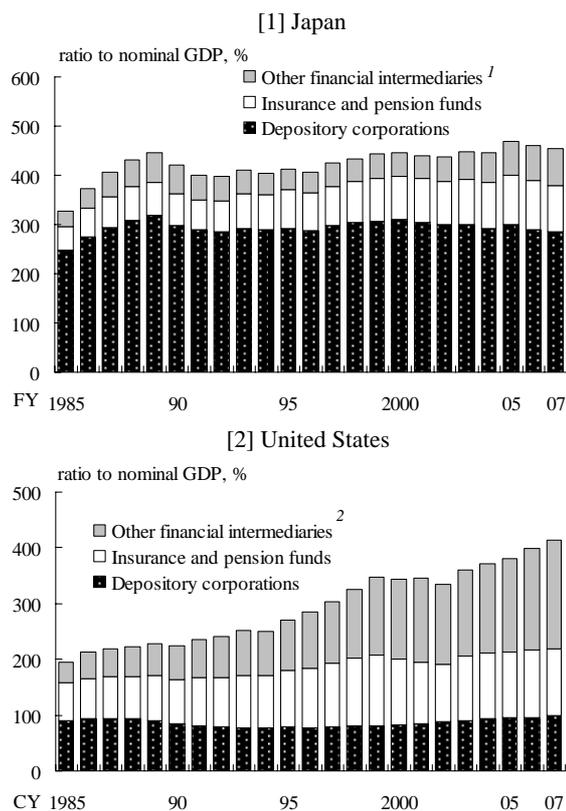
Notes: 1. Other financial intermediaries are comprised of securities investment trusts, nonbanks, and financial dealers and brokers.
2. Other financial intermediaries are the sum of investment trusts, financial dealers and brokers, nonbanks, and funding companies.

Sources: Cabinet Office, "National Accounts"; Bank of Japan, "Flow of Funds Accounts"; "Bureau of Economic Analysis, "National Economic Accounts"; FRB, "Flow of Funds Accounts of the United States."

Chart 1-14 : Exposures of Japanese Deposit-Taking Institutions to Structured Credit Products[1,2,3,4]

end-June 2008, tril. yen

		Deposit-taking institutions		Loss ratio
			Major banks, etc.	
Structured credit products	Book value	23.5	19.4	9.9%
	Unrealized profits/losses	-1.0	-0.9	
	Realized profits/losses	-1.5	-1.3	
Subprime-related products	Book value	1.0	0.9	52.1%
	Unrealized profits/losses	-0.1	-0.1	
	Realized profits/losses	-0.8	-0.7	
Tier I capital (end-March 2008)		50.1	26.0	—
Operating profits before general loan loss provision (FY 2007)		6.1	3.5	—

Notes: 1. "Subprime-related products" are asset-backed securities (ABS) backed by subprime loans or collateralized debt obligations (CDOs) and other financial products referencing these ABS.
2. "Major Banks, etc." includes Norinchukin Bank, Citibank Japan, and others.
3. Loss ratio = (Unrealized profits/losses + realized profits/losses) /book value as of the beginning of the period.
4. Realized profits/losses are calculated using data from April 2007 to June 2008.

Source: Financial Services Agency.

supervisory assessment of banks' valuation process of complex financial products.

B. Effects on Japan's Financial System

Next, effects of the turmoil in the global financial system on Japan's financial system are examined from both the macro and micro perspectives.

1. Effects on profits of the banking sector

In Japan, "depository corporations," mainly commercial banks, play a leading role in the financial intermediation function. This differs greatly from the U.S. financial structure, where "other financial intermediaries" – intermediaries other than traditional financial institutions such as commercial banks, insurance companies and pension funds – are the driving force behind the expansion of the overall financial sector (Chart 1-13). In assessing the effects of the turmoil in the global financial system on Japan's financial system, it is important to examine how the risks manifested themselves, with taking into consideration such difference in the financial intermediation structure.

With regard to the effects on the profits of the banking sector, losses related to the U.S. subprime mortgage problem increased as the overseas market conditions worsened. The U.S. and European financial institutions, having expanded the originate-and-distribute business model, incurred large losses at the stage of origination and distribution of structured credit products. However, since the Japanese financial institutions had exposure to the structured credit products mainly as investors, they have contained losses at a lower level than the U.S. and European financial institutions, which are absorbable within their current profit levels and capital strength (Chart 1-14). Also, Japanese banks have reduced holdings of

structured credit products since the emergence of such
turmoil, and therefore there is little likelihood of
further large losses related to the U.S. subprime
mortgage problem.

2. The financial market's assessment of Japanese financial institutions

With regard to the financial market's assessment of
Japan's banking sector, while there is considerable
variation among indicators, a number of indicators on
the whole have shown signs of deterioration. Banks'
stock prices continued to show weak performance and
the number of downgrades on their credit ratings
marginally exceeded that of upgrades (Chart 1-15).
CDS premiums for Japanese banks remained widened,
although not as wide as those for the U.S. and
European major banks (Chart 1-2).

Looking at a movement of banks' stock prices in more
detail, the comparison of those at the end of June 2008
and at the end of December 2006 (i.e., the
neighbourhood of most recent peak), shows that the
performance of stock prices further varied among the
regional banks (Chart 1-16). This suggests that the
financial market's assessment of regional financial
institutions began to vary as the differential in
profitability among such institutions became distinct.
With regard to the major banks, stock prices plunged
across the board, which may possibly reflect the
lowered expectations of an upturn in banks' business
performance against a backdrop of rising credit costs.
The profitability of banks will be analyzed in detail in
Chapter IV.

3. Capital flow via financial institutions

Next, effects on both domestic and international capital
flows are examined.

First, capital flows in three major economies (i.e.,

Chart 1-15: Credit Rating and Prices of Bank Stocks[1]
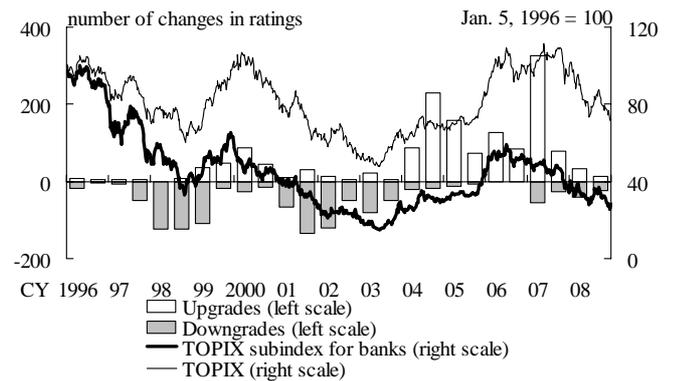
Note: 1. The number of upgrades and downgrades is the sum of the
number of changes in ratings made by the following credit rating
agencies: Moody's Investors Service, Standard and Poor's, Fitch
Ratings, Rating and Investment Information, and Japan Credit
Rating Agency.
Sources: Tokyo Stock Exchange; Bloomberg.

Chart 1-16: Changes in Prices of Bank Stocks[1,2]
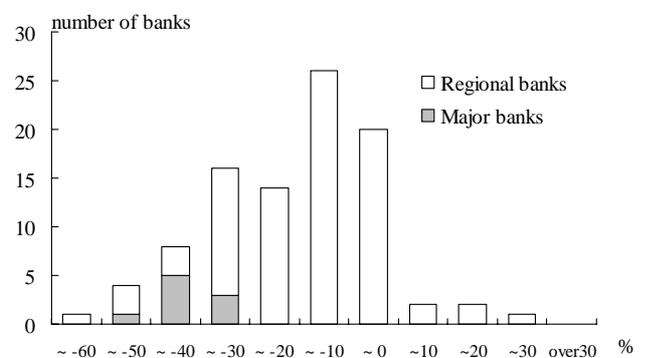
Notes: 1. Changes in prices of bank stocks between the end of December
2006 and the end of June 2008.
2. "~" on the horizontal axis denotes the ranges. For example,
"~ -20" means the range from -30 to -20 percent.
Source: Bloomberg.

Chart 1-17: Capital Flows of Advanced Countries
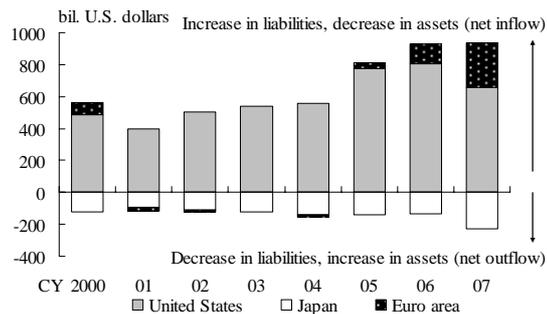

Source: IMF, "International Financial Statistics."

Chart 1-18: Capital Flows of Japan[1]
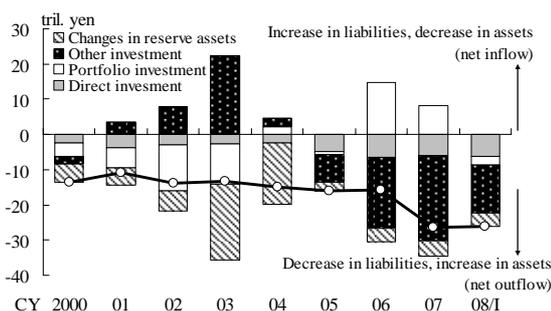
Note: *1*. The figures for the first half of 2008 are those between the second half of 2007 and the first half of 2008.

Source: Bank of Japan, "Balance of Payments."

**Chart 1-19: Consolidated Cross-Border Claims of Japanese Banks**[1]
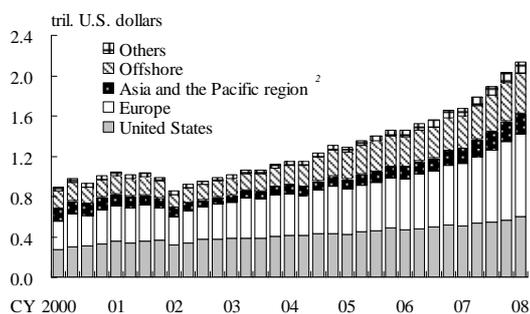
Notes: *1*. Consolidated cross-border claims in all currencies and local claims in non-local currencies of Japanese banks to each country and region.

2. Asia and the Pacific region is comprised of Australia, New Zealand, Hong Kong, Singapore, and 25 countries defined as "Asia/Pacific" in the Statistics.

Source: Bank of Japan, "Consolidated International Banking Statistics in Japan."

Chart 1-20: Yen-Denominated Bond Issues by Non-Japanese Residents[1]
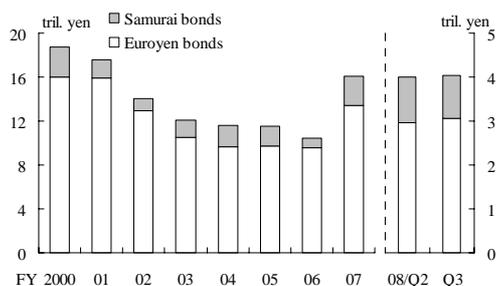
Note: *1*. Figures for the third quarter of 2008 are calculated by multiplying the figures for July by three.

Source: Ministry of Finance, "Securities Investment at Home and Abroad."

Japan, the United States, and Europe) are analyzed (Chart 1-17). With regard to the United States, the capital inflow declined in 2007 despite reversals of outward investment in securities. On the other hand, the amount of capital inflow increased in the euro area supported by inward investments in securities. Meanwhile, capital outflow continued to increase in Japan.

Looking at Japan's capital flow in more detail, capital outflow increased until 2004, mainly reflecting an increase in outward investments in securities and foreign exchange reserves (Chart 1-18). Since 2005, capital outflow increased, led by "other investment," which includes overseas loans by the banking sector and cash and deposits.

Looking at the flow of funds through the banking sector, while the lending attitudes of the U.S. and European financial institutions have become tighter after the U.S. subprime mortgage problem, Japanese banks' cross-border claims in all currencies and local claims in non-local currencies accelerated their pace of increase (Chart 1-19). Geographically, the proportion of Japanese banks' exposure to the United States and Europe is high, but recently the proportion of that to Asia and the Pacific region was also rising.

The issuance of both nonresidential Euroyen bonds (yen-denominated bonds issued in the Euroyen market) and samurai bonds (yen-denominated bonds issued in Japan by nonresidents) increased in fiscal 2007, and their issuance remained at a relatively high level after entering fiscal 2008 (Chart 1-20). Financial institutions and companies abroad seem to have increased incentives for fund-raising in Japanese markets amid continued turmoil in the global financial markets.

When the developments in interoffice accounts of foreign financial institutions in Japan are analyzed as

part of the capital flow from Japan to overseas, the capital outflow marked its all-time high of 7.8 trillion yen in June 2007, gradually diminishing thereafter, and currently has shifted to capital inflow (Chart 1-21). In addition to changes in market environment such as a decline in the U.S. dollar/yen swap cost, conservative funding management on the side of foreign financial institutions, since the outbreak of the U.S. subprime mortgage problem, may have induced such a change in the flow of funds through foreign financial institutions in Japan.

In this regard, payment and settlement data of the Bank of Japan Network System (BOJ-NET) that includes call money transactions of foreign financial institutions shows that until the third quarter of 2007, foreign financial institutions were in net receipt of funds from major commercial banks, but then in the fourth quarter of 2007 they shifted to net provision of funds (Chart 1-22).

As examined above, the domestic and international capital flows via financial institutions changed after the worsening of the U.S. subprime mortgage problem. These changes warrant careful monitoring on a continuing basis.

4. Effects on respective markets

Finally, effects on the domestic flow of funds are examined from a micro perspective focusing on real estate funds and structured credit products.

Looking at the real estate funds market, the price index of J-REITs continued to show weak performance (Chart 1-23). In this respect, looking at the inflow of funds to the real estate market via real estate funds, the expansion of J-REITs decelerated their tempo of increases in investment assets, while private real estate funds increased substantially (Chart 1-24). Such a rise

Chart 1-21: Inter-Office Accounts of Foreign Banks in Japan
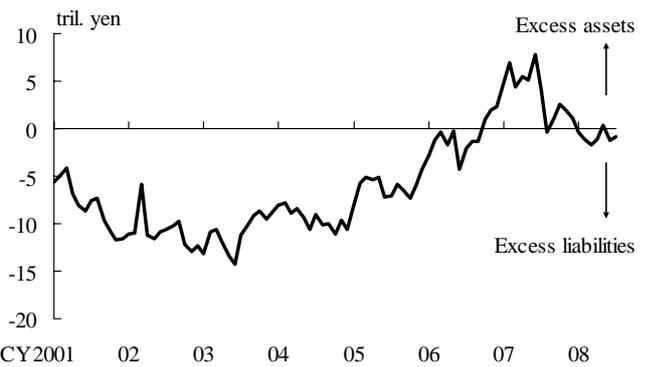
Source: Bank of Japan, "Principal Assets and Liabilities of Foreign Banks in Japan."

Chart 1-22: Interbank Funds Transfer of Foreign Financial Institutions by the BOJ-NET Funds Transfer System[1,2]
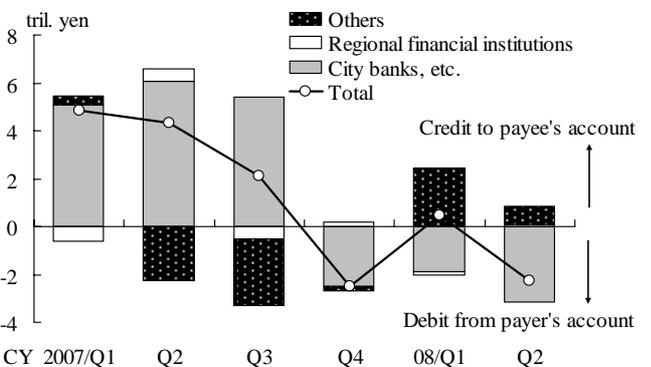
Notes: 1. Figures do not include DVP for securities other than stocks.
2. City banks, etc., comprise Mizuho Bank, The Bank of Tokyo-Mitsubishi UFJ, Sumitomo Mitsui Banking Corporation, Resona Bank, Mizuho Corporate Bank, Saitama Resona Bank, Shinsei Bank, and Aozora Bank. Regional financial institutions comprise regional banks and *shinkin* banks.

Chart 1-23: Price Index of J-REITs[1]
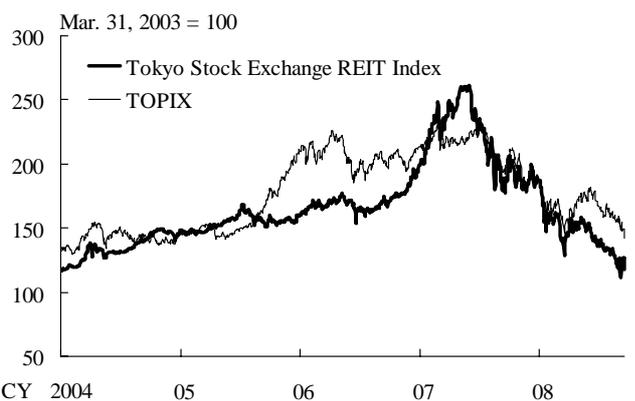
Note: 1. The Tokyo Stock Exchange REIT Index is a capitalization-weighted index based on all REITs listed on the Tokyo Stock Exchange.
Source: Tokyo Stock Exchange.

Chart 1-24: Size of the J-REIT and the Private Real Estate Fund Market[1]
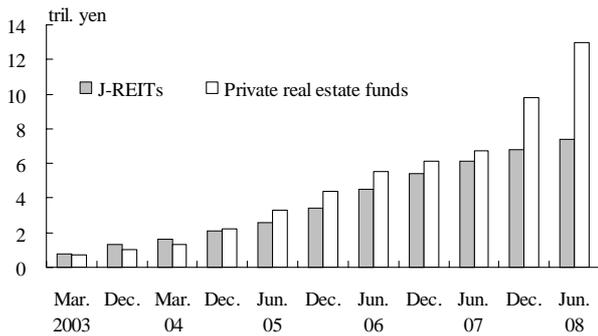
Note: 1. Figures for private real estate funds do not include foreign funds doing business in Japan. According to the STB Research Institute, if foreign funds were included, the figure for June 2008 would reach 15.9 trillion yen.
Source: STB Research Institute.

Chart 1-25: The Outstanding Issue of Structured Credit Products by Type of Underlying Assets[1]
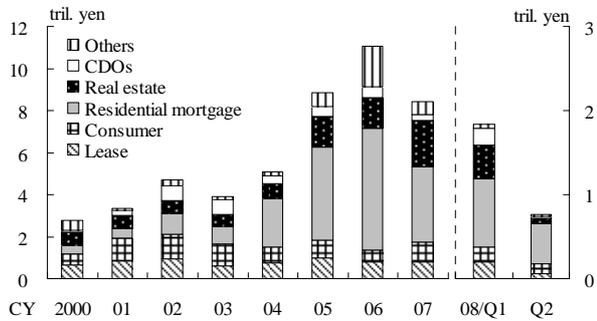
Note: 1. Figures in 2008 are quarterly (right scale).
Source: Deutsche Securities, "Securitization."

Chart 1-26: Number of Downgrades of Structured Credit Products by Type of Underlying Assets[1,2,3]
[1] Number of Deals
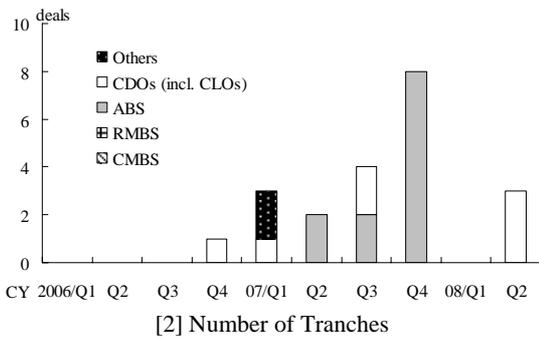
[2] Number of Tranches
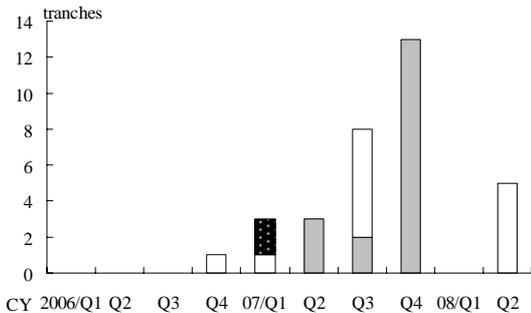
Notes: 1. ABS are all backed by consumer loans.
2. Figures include multiple downgrades in one tranche or one deal.
3. Figures exclude synthetic CDOs referenced to global assets.
Source: Credit Suisse.

in the private real estate funds may in part be attributable to a widening of the survey coverage, but also indicates the possibility of an increase in the number of cases where such properties were accepted by the private real estate funds since an exit strategy to sell properties to J-REITs became difficult.

Turning to the issuance of structured credit products in the domestic market, the amount of issuances decreased mainly for products backed by housing loans and real estate (Chart 1-25). It seems to be affected by tighter conditions in real estate-related finance, which were also seen in the aforementioned changes in the flow of funds via real estate funds.

In the meantime, the credit ratings of domestic structured credit products were downgraded for consumer loan asset-backed securities (ABSs) and small and medium-sized enterprise collateralized debt obligations (CDOs) in 2007, and CDOs continued to be downgraded in 2008 (Chart 1-26). However, such downgrades of structured credit products are attributable to domestic factors, rather than the effect of the U.S. subprime mortgage problem.

C. Japan's Sluggish Economic Activity

Japan's economic growth has been slowing partly due to the fall in housing investment and has recently been sluggish against the backdrop of high energy prices and weaker growth of exports. The effects of sluggish economic growth on the financial system are examined below.

1. Environment surrounding domestic loans

First, the environment surrounding domestic loans is summarized.

The stock market continued to be volatile in line with the developments in U.S. and European stock prices

(Chart 1-27). In the credit market, CDS premiums rose in tandem with the changes in stock prices. Stock prices and CDS premiums became more volatile when the negative outlook on the financial strength of the U.S. and European financial institutions intensified.

Meanwhile, the number of corporate bankruptcies rose particularly in the real estate-related businesses (Chart 1-28). The amount of debts involved in the bankruptcies for the first half of 2008 exceeded that of the previous year due to increased bankruptcies of medium-sized firms. Payment under guarantee by the Credit Guarantee Corporation also showed a moderate increase in both the number of cases and the values for fiscal 2007 (Chart 1-29).

Against such a background, how the quality of banks' credit portfolios changed is examined. The changes in the "migration ratio" from normal loans (loans to normal borrowers or borrowers that need attention) to nonperforming loans (NPLs; loans to borrowers requiring special attention or below) at transition matrices within a year are computed for each bank (Chart 1-30). The result showed that for fiscal 2007, medians were positive under the sluggish economic growth, and the number of banks with a worsening credit portfolio exceeded that of banks with an improving credit portfolio, albeit only slightly. Also, the 75th percentile and 90th percentile of the distribution bottomed out in fiscal 2004, suggesting that a larger number of banks experienced deterioration in the quality of their loan portfolios.

As such, sluggish economic growth has an adverse effect on credit risk from a macro perspective. However, business conditions by type of industry and those by size of firms do not necessarily change in the same manner. Rather, the effect of sluggish economic growth over credit risks may differ depending on the

Chart 1-27: Stock Prices and CDS premiums
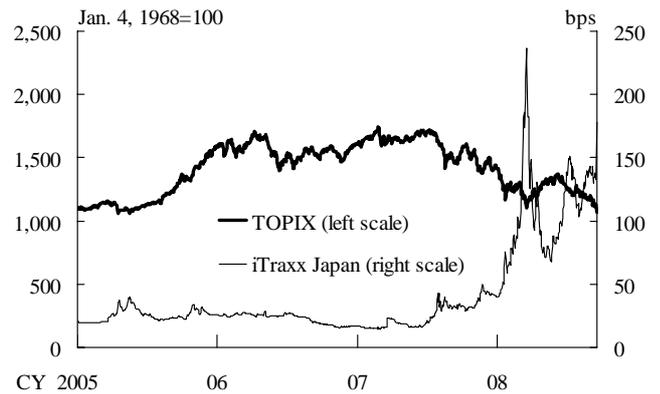
Sources: Tokyo Stock Exchange; Bloomberg.

Chart 1-28: Corporate Bankruptcies[1]
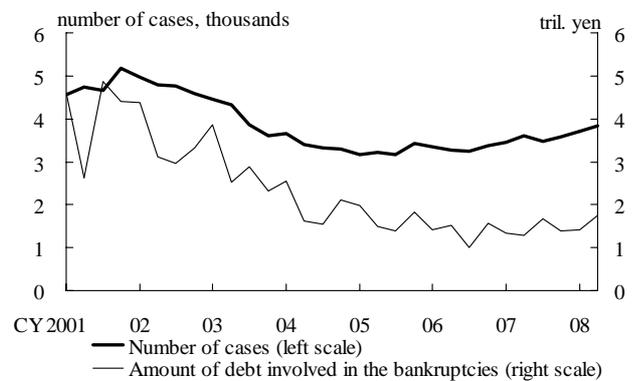
Note: 1. The data are quarterly.
Source: Tokyo Shoko Research, "Tosan Geppo (Monthly Review of Corporate Bankruptcies)."

Chart 1-29: Payment under Guarantee by the Credit Guarantee Corporation[1]
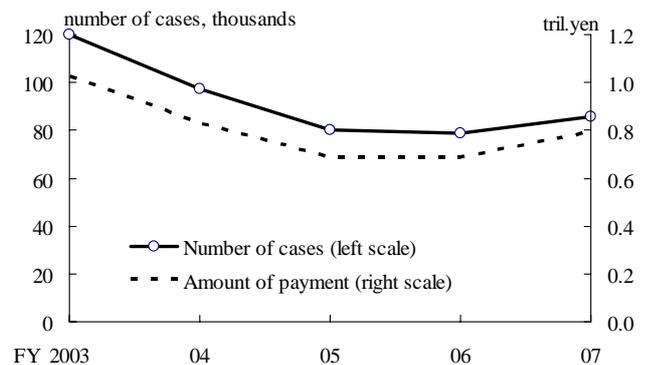
Note: 1. The data are annual.
Source: National Federation of Credit Guarantee Corporations.

Chart 1-30: Changes in the Migration Ratio to NPLs[1,2,3,4]
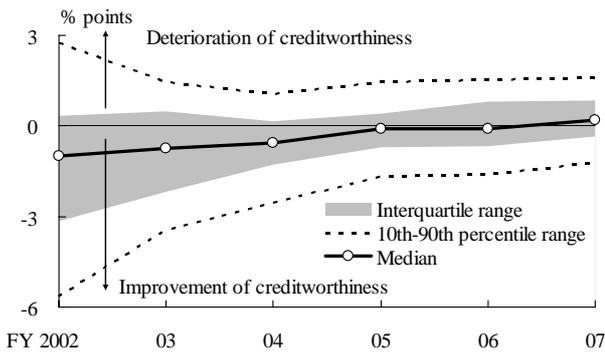
Notes: 1. Bank of Japan estimation.
2. Changes in the migration ratio of downgrade to NPLs for the major banks and the regional banks are sorted out in ascending order. 10th, 25th, 50th, 75th, and 90th percentiles are shown.
3. The migration ratio of downgrade to NPLs = Loans outstanding that are classified in "Normal" and "Need attention" less "Loans requiring special attention" at the beginning of the period and downgraded to "Loans requiring special attention" and lower classifications at the end of the period/Loans outstanding that are classified in "Normal" and "Need attention" less "Loans requiring special attention" at the beginning of the period.
4. Excludes banks that experienced mergers in past periods.

Chart 1-31: Borrowers' Business Sentiment[1]
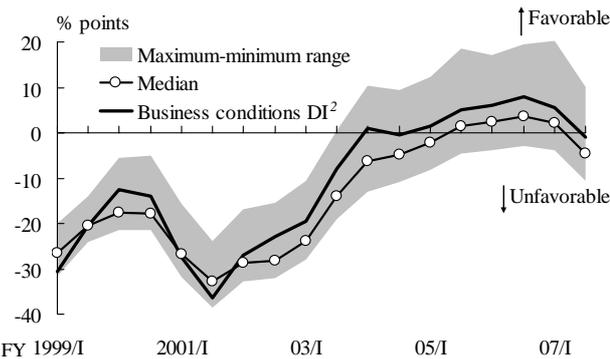

Notes: 1. Bank of Japan estimation.
2. All enterprises and all industries.
Sources: Bank of Japan, "Tankan (Short-Term Economic Survey of Enterprises in Japan) "; "Loans and Discounts Outstanding by Sector."

Chart 1-32: The Effect of Buisness Conditions on NPLs and Credit Costs[1,2]

[1] Migration ratio to NPLs   [2] Credit Cost Ratio
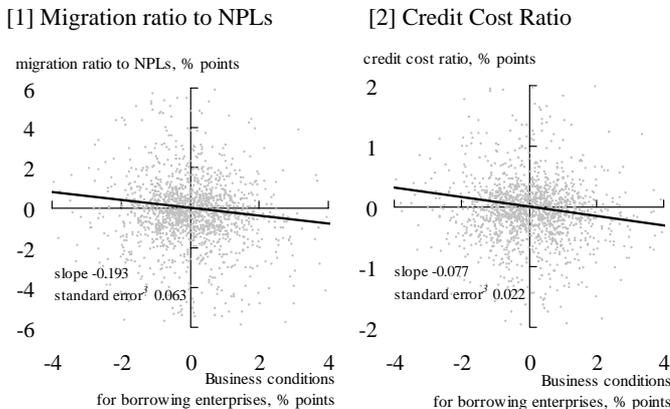
Notes: 1. Bank of Japan estimation.
2. Variables are transformed so that time-invariant and individual-invariant effects are swept out.
3. Heteroskedasticity robust estimates.

component of banks' credit portfolio.

In this connection, a weighted average indicator of business conditions DI by industry group and by firm size based on the Short-Term Economic Survey of Enterprises in Japan (the *Tankan*) was calculated as a variable to summarize the business sentiment of borrower firms for each bank, using share of loans by type of industry and firm size for each bank as a weight (hereafter indicator of borrowers' business sentiment; Chart 1-31). The chart showed that the indicator and the business condition DI for all industries and sizes of firms moved almost in parallel. However, since the ratio of non-manufacturing industry in loans was higher than that in the number of sample enterprises of the *Tankan*, the movement of the indicator deviated from that of the business condition DI in some phases.

The relationship between the differences in the indicator of borrowers' business sentiment among banks and the migration ratio to NPLs as well as credit cost ratios are analyzed using banks' panel data. Specifically, a two-way fixed-effects model that controls influence from both the individual factor of each bank and the common factor at each designated time is estimated, using either the migration ratio or the credit cost ratio as an explained variable, and the lagged indicator of borrowers' business sentiment as an explanatory variable.

The estimation result showed that the differential in the indicator of borrowers' business sentiment was statistically significant in explaining the differential in the migration ratio to NPLs and credit cost ratio among banks (Chart 1-32). This result implies that the differences in the business sentiment of borrowers by type of industry and size of firms could be additional useful information in managing credit risks.

2. Banks' stance on setting loan interest rates

Banks' stance on setting loan interest rates is overviewed below.

First, according to a survey result regarding banks' stance on setting interest margins, the number of banks expecting a rise in interest margins increased slightly (Chart 1-33). However, over the past year the number of banks responding that the margins actually increased remained very small, regardless of the borrowers' credit ratings, suggesting that the increase in interest margins did not progress.

The interest rate distributions of loans after the termination of the quantitative easing policy show that, while loans with extremely low interest rates disappeared, a shift to higher interest rates was not seen (Chart 1-34). Therefore no clear change seemed to take place in the level of loan interest rates.

Next, a multivariate time-series model is employed to decompose the changes in short-term interest rate spreads on loans into: (1) cyclical changes induced by the business cycle; (2) short-term changes due to the fact that loan interest rates do not immediately follow the change in market interest rates; and (3) long-term changes in the lending market environment (Chart 1-35).

The analysis suggests that the cyclical changes and short-term changes, both of which put pressures to narrow spreads in line with economic expansion and a rise in market interest rates, currently have a widening effect on spreads reflecting sluggish economic growth and low and stable market interest rates. However, the contribution of the long-term changes to narrowing spreads exceeded that of the other two changes, and therefore short-term interest rate spreads on loans narrowed again. Although it is not necessarily clear

Chart 1-33: DI for Spreads of Loan Rates[1]
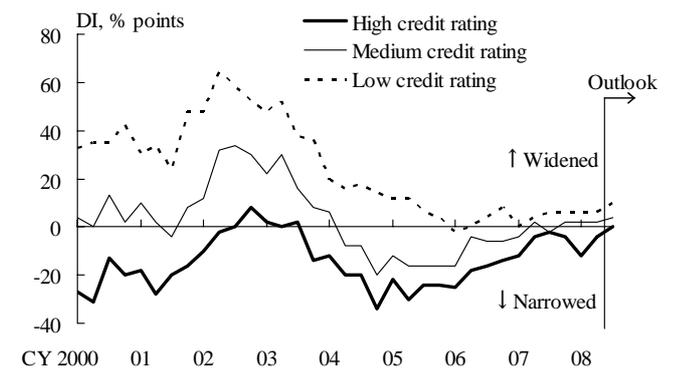
Note: *1.* DI for spread of loan rates = percentage of respondents selecting "widened" - percentage of respondents selecting "narrowed." All responses were given considering lending margins set over the past three months.

Source: Bank of Japan, "Senior Loan Officer Opinion Survey on Bank Lending Practices at Large Japanese Banks."

Chart 1-34: Loans Outstanding on Bills and Deeds by Interest Rate[1]
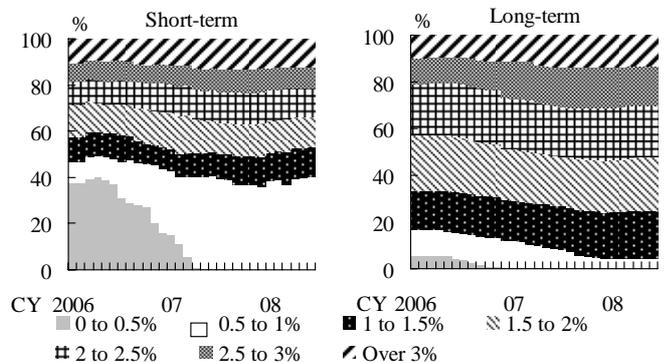
Note: *1.* Bank of Japan estimation.

Source: Bank of Japan, "Loans and Discounts Outstanding by Interest Rate."

Chart 1-35: Composition of Changes in Interest Rate Spreads on Loans[1,2,3,4]
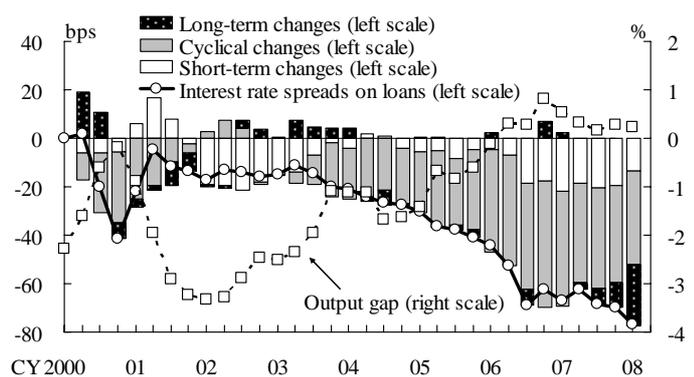

Notes: *1.* Bank of Japan estimation.
2. Interest rate spread on loans = average contracted interest rate on loans and discounts (short-term) - CD interest rate (3-month).
3. Figures are the deviation from those in the first quarter of 2000 except for output gap.
4. For details, see Box 1 of the *Financial System Report* published by the Bank of Japan in March 2007.

Chart 1-36: Housing Investment

[1] Housing Starts[1,2]

s.a., ann., ten thousands   s.a., ann., ten thousands

— Total (left scale)
---- Housing for sale (right scale)
— Owner-occupied houses (right scale)
— Housing for rent (right scale)

[2] Sales of Apartments[1,3]

s.a., ann., ten thousands   s.a., ann., ten thousands

☐ Kinki area (left scale)
▧ Tokyo metropolitan area (left scale)
— Stock (term-end, total of Tokyo and Kinki, right scale)
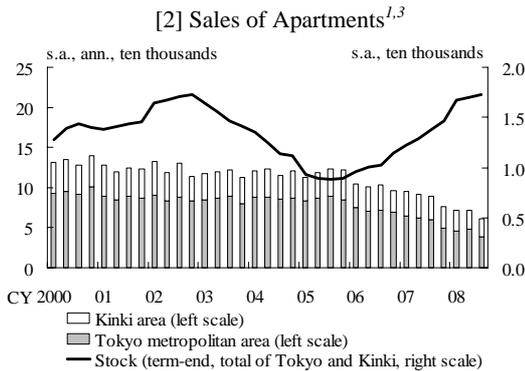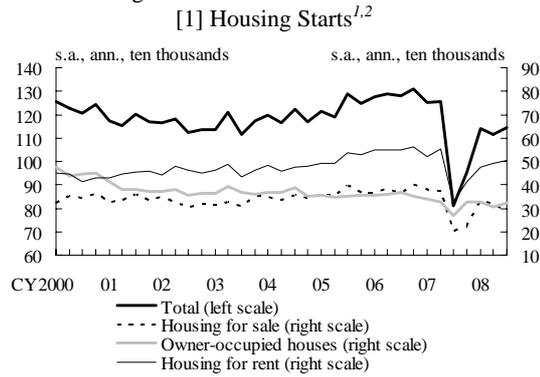
Notes: 1. Seasonally adjusted by X-12-ARIMA.
2. Figures for 2008/Q3 are those of July.
3. Figures of total apartments sales for 2008/Q3 are those of July-August average. Figures of term-end stocks for 2008/Q3 are those of August.
Sources: Ministry of Land, Infrastructure, Transport and Tourism, "Statistics on Building Construction Starts"; Real Estate Economic Institute Co., Ltd., "Fudosan Keizai Chousa Geppou (Monthly Research of Real Estate and the Economy)."

Chart 1-37: Housing Loans Outstanding

tril. yen   ■ Domestic banks   ⊡ Japan Housing Finance Agency
            ☐ Other deposit taking institutions   ▨ Others
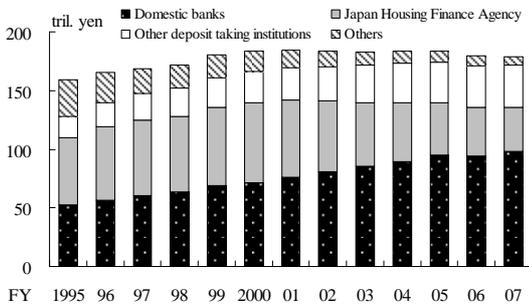
Source: Japan Housing Finance Agency.

Chart 1-38: Cap Rate of Typical Class-A Office Buildings in Tokyo[1]
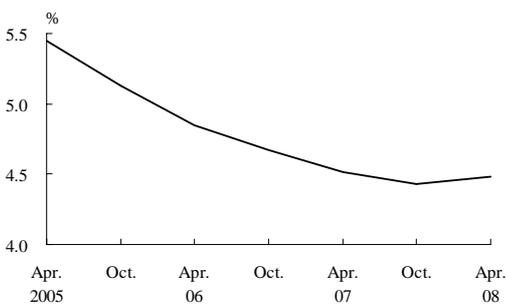
Note: 1. The average of cap rates of average-sized class-A office buildings in the Tokyo business area.
Source: Japan Real Estate Institute, "Japanese Real Estate Investor Survey."

why the long-term changes contributed as narrowing pressure, it is necessary to carefully monitor whether loan interest rates are to be set so as to accurately incorporate changes in credit risks under sluggish economic growth.

3. Environment surrounding loans to real estate-related businesses

Next, environment surrounding loans to domestic real estate-related businesses is summarized.

The number of new housing starts declined until September 2007 due to the revision of the Building Standard Law. It then recovered until January 2008, but the recovery came to a halt in recent months (Chart 1-36 [1]). Looking into the components of new housing starts by types of housing, housing for sale, owner-occupied housing and housing for rent, all of them slightly recovered but remained at a slightly lower level compared with the number before the revision of the law. Also, sales of condominiums have been sluggish since mid-2005 resulting in mounting inventory (Chart 1-36 [2]).

With regard to housing loans, the driving force behind the increase in loans to individuals, the demand for the replacement of loans from the Japan Housing Finance Agency (formerly the Government Housing Loan Corporation of Japan) appears to be coming to a halt (Chart 1-37). As a result, the outstanding amount of housing loans continued to decline after reaching a peak at the end of fiscal 2005.

Looking at the developments of office-type properties, wariness in the outlook of real estate market has recently increased, due to a rise in the vacancy rate at some office buildings. In fact, with regard to the expected cap rates of office-type properties in Tokyo – one of the benchmarks in the real estate business

conditions for offices –, there are signs of change in its declining trend during the past several years backed by the expectations for rent rises (Chart 1-38).

In this regard, developments in rent for office properties in Tokyo are examined from the growth in net operating income (NOI) of individual office-type properties owned by J-REITs. The NOI-weighted median of changes in NOI maintained a growth of 2 percent or more for fiscal 2007 (Chart 1-39). However, the NOI-weighted median underperformed the unweighted median, indicating that the pace of increases in rent from large-scale office properties has become sluggish for the time being.

Also, with respect to land prices, the rate of increase in land price in metropolitan areas became sluggish mainly in commercial areas. And for local areas, the tempo of decline increased again (Chart 1-40).

While the environment surrounding real estate finance has become more difficult on the whole, the inventory turnover period that indicates the balance between sales and inventory of real estate firms has tended to become longer (Chart 1-41). This implies a possibility that inventory of sales properties is currently accumulating at a rapid pace.

At the moment, the loan to value (LTV) of real estate businesses on an aggregated basis that reflects their financial strength remains almost unchanged, and as such, rapid deterioration in the financial strength of real estate businesses cannot be observed through this indicator (Chart 1-42). Nevertheless, depending on the future market conditions of real estates, the value of real estate inventory may decline, and the situation needs to be monitored carefully.

In this regard, as pointed out in the March 2008 issue of the *Financial System Report*, it should be noted that

Chart 1-39: The Rate of Change in Net Operating Incomes (NOIs) of Office-Type Properties Owned by J-REITs in Tokyo[1,2,3,4]
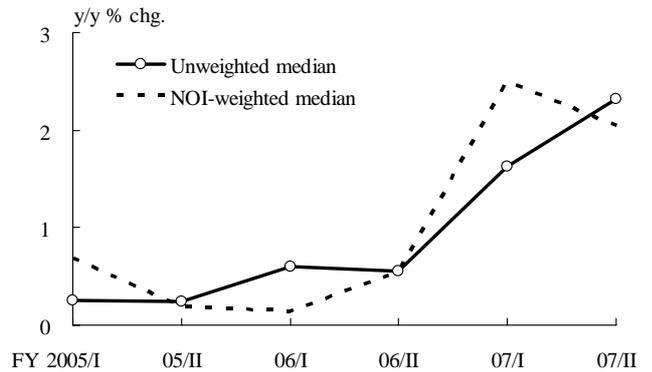

Notes: 1. Bank of Japan estimation.
2. NOIs are adjusted by dividing NOIs per one square meter by the number of business days in a half-year period.
3. Excludes the office-type properties that do not disclose their floor space or those whose operating period is short.
4. NOI-weighted median is derived by weighting the rate of change in NOIs by the level of each NOI.
Source: Association for Real Estate Securitization.

Chart 1-40: Land Prices[1,2]
[1] All City Areas in Japan   [2] Six Major City Areas
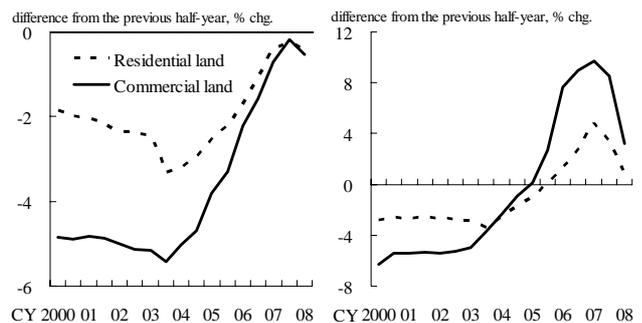
Notes: 1. The Urban Land Price Index is based on surveys conducted at the end of March and September each year.
2. The six major city areas are the 23 wards of Tokyo, Yokohama, Nagoya, Kyoto, Osaka, and Kobe.
Source: Japan Real Estate Institute, "Urban Land Price Index."

Chart 1-41: Inventory Turnover Period of Real Estate Businesses[1,2]
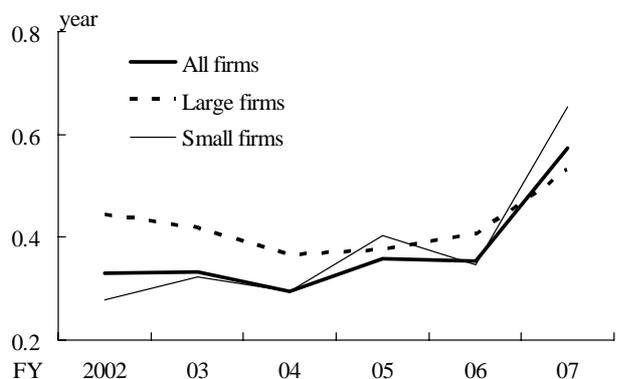
Notes: 1. Large firms: capital of 100 million yen or over. Small firms: 10 million to 100 million yen.
2. Inventory turnover period = inventory assets/sales.
Source: Ministry of Finance, "Financial Statements Statistics of Corporations by Industry."

Chart 1-42: LTV Ratios of Real Estate Businesses[1,2,3]
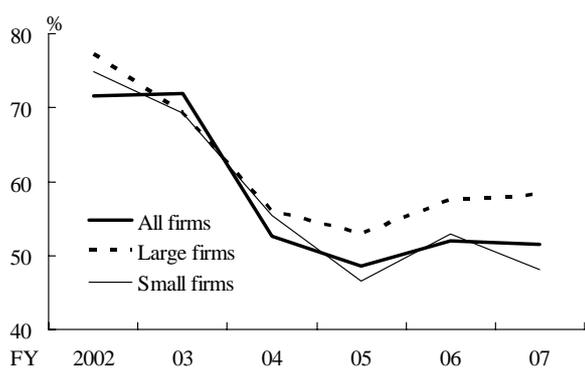
Notes: *1.* Bank of Japan estimation.
   2. LTV = (interest bearing liabilities - cash and deposit) /tangible fixed assets.
   3. Large firms: capital of 100 million yen or over. Small firms: 10 million to 100 million yen.
Source: Ministry of Finance, "Financial Statements Statistics of Corporations by Industry."

Chart 1-43: Lending Attitude of Financial Institutions[1]
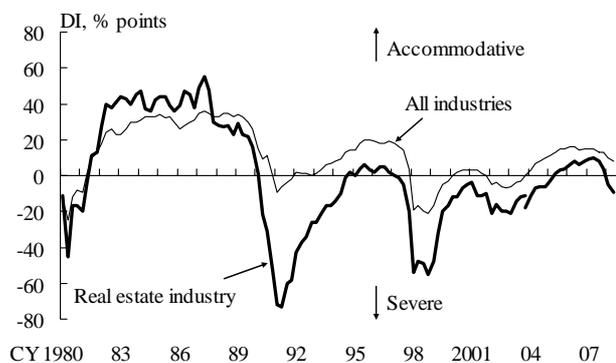
Note: *1.* DI = "accommodative" - "severe."
Source: Bank of Japan, "*Tankan* (Short-Term Economic Survey of Enterprises in Japan)."

the robustness of real estate businesses' balance sheets against an unexpected fall in real estate prices depends greatly on the type of real estate business. That is, real estate businesses are divided into two types: "income gain-oriented real estate businesses," earning profits mainly from income gains such as lease and management of real estate properties; and "capital gain-oriented real estate businesses," earning profits mainly from capital gains such as sales of developed real estate properties and dealings in properties. The second type not only possesses sales properties as inventory on the balance sheet, but in many cases also possesses real estate-related contingent liabilities off the balance sheet, such as a commitment for the purchase of real estate properties under development. Therefore, such capital gain-oriented real estate businesses are likely to be susceptible to the changes in real estate prices.

Also, some construction firms have strengthened dependence on real estate businesses such as construction of condominiums due partly to a decrease in public works. As such, construction firms may also have become susceptible to the business conditions of the real estate market.

The DI of financial institutions' lending attitude shows that the lending attitude toward the real estate industry was "accommodative" for the past few years. However, entering 2008, the index changed to "severe" suggesting that financial institutions' lending attitude toward the real estate industry is recently becoming strict (Chart 1-43).

Based on these points, Chapter III focuses on the real estate-related sector including construction firms within banks' loan portfolio, and examines the sector's robustness against price fluctuation in real estate through stress-testing.

4. M&A financing

Looking at M&A financing in Japan, although the pace of growth slowed for the past few years, it remained stable from the latter half of 2007 to the first half of 2008 (Chart 1-44). Also, with regard to the leverage ratio (debt/earnings before interest, taxes, depreciation, and amortization [EBITDA]) of acquired firms, the median stayed at around a multiple of four, and the 75th percentile and 90th percentile of the sample distribution declined (Chart 1-45). Based on such developments, risks associated with M&A financing in Japan are, in general, considered restrained.

With regard to developments in syndicated loans, both the volume and number of syndicated loans reached their peak in 2006 and declined somewhat in 2007 (Chart 1-46). However, while the lending attitudes of the U.S. and European financial institutions became cautious, loans originated by Japanese banks increased, and this mainly contributed to a pause in the decline of the volume and number of syndicated loans. And in 2008, the size of deals became somewhat larger due to arrangement of energy-related large-scale deals (Chart 1-47).

5. Risk-return balance of loans

In sum, with sluggish economic growth, the environment surrounding domestic loans is becoming increasingly difficult particularly in the real estate sector, and the management of credit risk is also becoming increasingly important for banks (Chart 1-48). In relation to this point, the business conditions DI and financial institutions' lending attitude DI are compared by type of industry and firm size, and a positive correlation is found between the above two indices for small and medium-sized firms, which have a relatively high dependency on bank loans (Chart 1-49). This suggests that corporate borrowers in severe

Chart 1-44: Size of M&A Market in Japan
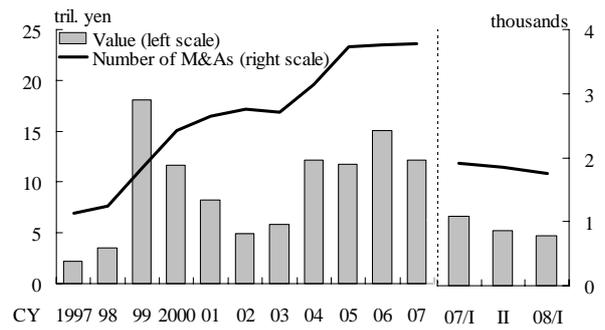
Source: RECOF.

Chart 1-45: Leverage Ratio of M&A Targets in Japan
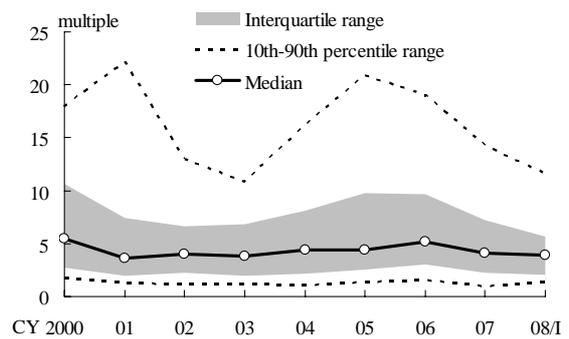
Source: Thomson Financial.

Chart 1-46: Syndicated Loans Arranged in Japan[1,2]
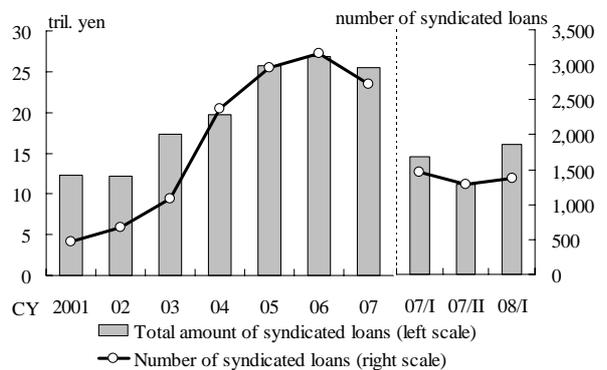
Notes: 1. Figures from fiscal 2001 to 2003 are from Thomson Financial, and those for other years are from the Japanese Bankers Association.
2. Figures cover syndicated loans arranged by the major banks and the regional banks in any currencies.
Sources: Thomson Financial; Japanese Bankers Association, "Loans Syndicated and Loans Transferred."

Chart 1-47: Size of Syndicated Loans[1]
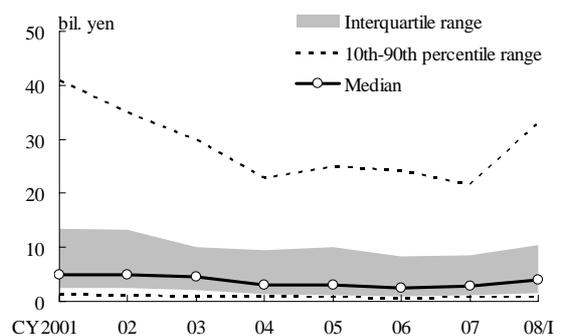
Note: 1. Figures for syndicated loans arranged in Japan.
Source: Thomson Financial.

Chart 1-48: DI for Credit Standards[1]
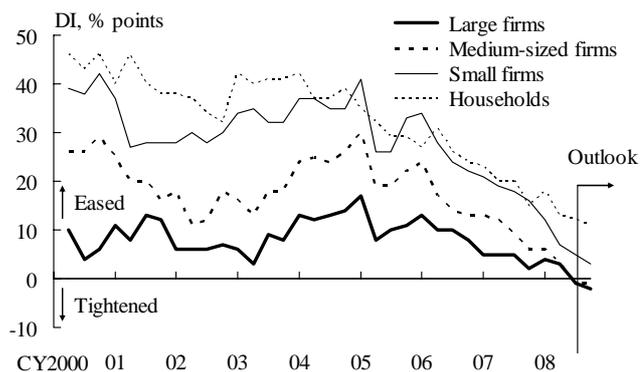
DI, % points

Large firms
Medium-sized firms
Small firms
Households

Outlook

↑ Eased

↓ Tightened

CY2000 01 02 03 04 05 06 07 08

Chart 1-49: Business Conditions and Lending Attitude of Financial Institutions by Industries[1,2,3]
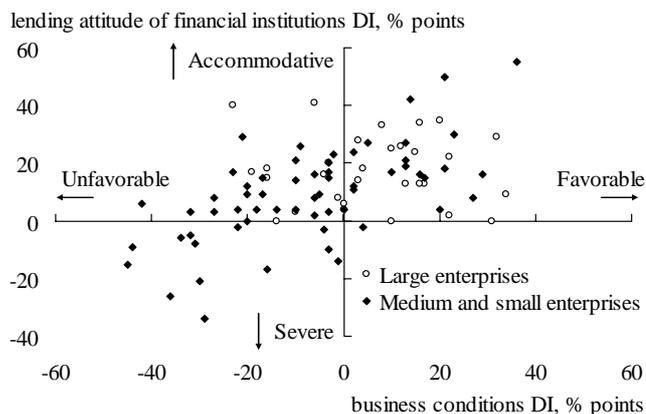
lending attitude of financial institutions DI, % points

↑ Accommodative

Unfavorable

Favorable

○ Large enterprises
◆ Medium and small enterprises

↓ Severe

-60   -40   -20   0   20   40   60

business conditions DI, % points

Chart 1-50: Financial Surplus/Deficit
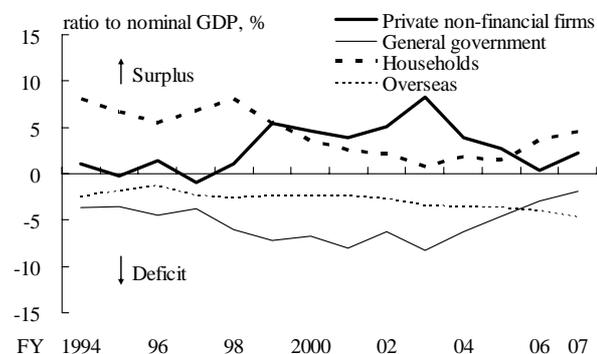
ratio to nominal GDP, %

Private non-financial firms
General government
Households
Overseas

↑ Surplus

↓ Deficit

FY 1994   96   98   2000   02   04   06 07

condition also regard banks' lending attitude as tight.

Even under such circumstances, widening of interest rate spreads on loans in response to increases in credit risk is hardly observed, at least at this moment. For the financial institutions to carry out their financial intermediation function smoothly in a sustainable manner, they need to make adjustment in their credit management as necessary according to changes in credit risk. They need to carefully monitor how such behavior of financial institutions influences their profits and funding of firms.

D. Continuation of the Accommodative Financial Environment

Finally, the balance between the current accommodative financial environment and the level of credit aggregates is examined.

1. Developments in flow of funds

The "Flow of Funds Accounts" shows that the overall picture of the funds surplus/deficit structure by sector remained unchanged from the late 1990s: households and private non-financial firms continued to register a surplus, while the general government continued to register a deficit (Chart 1-50). From fiscal 2005, the surplus of households grew, reflecting an increase in income. By contrast, due to increased demand for business fixed investment, the surplus of private non-financial firms gradually decreased after peaking in fiscal 2003. As a result, households continued to register the largest surplus from fiscal 2006. In the meantime, the surplus of private non-financial firms increased somewhat, recently, due to a steady but slightly weakening appetite for external funds under sluggish economic growth.

From the banks' perspective on the firms' demand for funds, the number of respondents selecting stronger

demand continued to exceed the number of respondents selecting weaker demand from 2005 (Chart 1-51). Recently, however, in light of the sluggish economic growth, the number of respondents selecting weaker demand exceeded the number of respondents selecting stronger demand. The outstanding amounts of total financial liabilities of private non-financial firms remained almost flat relative to the level of economic activity (Chart 1-52).

The outstanding amounts of financial assets held by households continued to follow a moderate uptrend, although recently the outstanding amounts declined slightly. The amounts reached 1,490 trillion yen at the end of March 2008, a little less than the all-time high recorded at the end of September 2007 (1,536 trillion yen) (Chart 1-53). While the proportion of holdings of currency and deposits remained almost unchanged, the proportion of holdings of shares and other equities decreased reflecting a plunge in stock prices. On the whole, currency and deposits still accounted for the largest proportion of the overall financial assets and the shift to risk assets remained limited.

2. Developments in credit aggregates

The credit aggregates in the current accommodative financial environment are examined.

First, regarding the level of short-term interest rates relative to economic activity, the real interest rate gap (i.e., the real interest rate minus the trend growth rate) continued to remain negative from around 2003 (Chart 1-54). Then the negative gap narrowed reflecting the adjustments in policy target rates, and widened again due to a rise in inflation. As a result, the level of real interest rates adjusted for inflation remained low, relative to the level of economic activity, suggesting that the accommodative financial environment was maintained.

Chart 1-51: DI for Demand for Loans: Classified by Borrower Type[1]
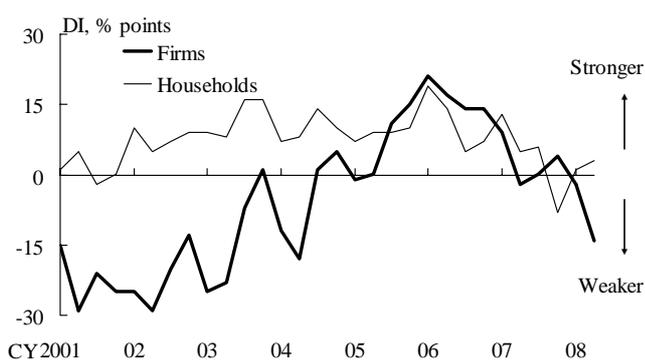
Note: 1. DI for demand for loans = (percentage of respondents selecting "substantially stronger" + percentage of those selecting "moderately stronger" × 0.5) - (percentage of those selecting "substantially weaker" + percentage of those selecting "moderately weaker" × 0.5).
Source: Bank of Japan, "Senior Loan Officer Opinion Survey on Bank Lending Practices at Large Japanese Banks."

Chart 1-52: Financial Liabilities of Private Non-financial Firms[1]
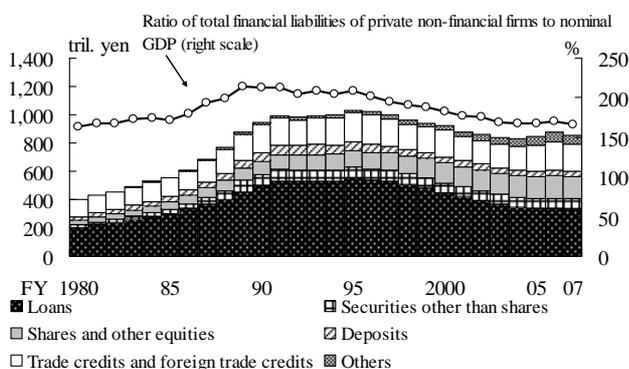
Note: 1. Loans, shares and other equities, and securities other than shares are evaluated at face or book values.
Sources: Cabinet Office, "National Accounts"; Bank of Japan, "Flow of Funds Accounts."

Chart 1-53: Financial Assets Held by Households[1]
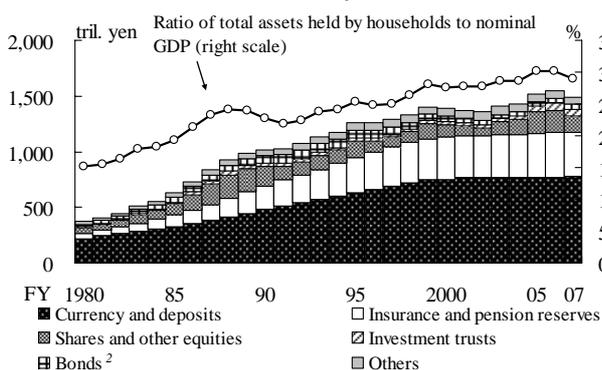
Notes: 1. Shares and other equities, investment trusts, bonds, and some financial products that are included in others are evaluated at market prices.
2. Bonds = "securities other than shares" - ("trust beneficiary rights" + "mortgage securities").
Sources: Cabinet Office, "National Accounts"; Bank of Japan, "Flow of Funds Accounts."

Chart 1-54: Short-Term Real Interest Rate and Real GDP Growth Rate
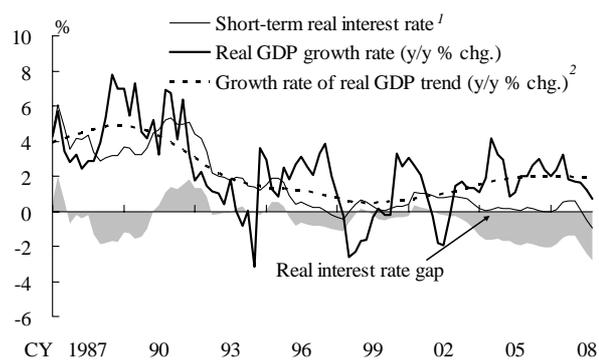
Notes: 1. Short-term real interest rate = call rate (overnight, uncollateralized) - y/y % chg. in CPI (excluding fresh food).
2. Real GDP trend is calculated by applying the HP filter.
Sources: Cabinet Office, "National Accounts"; Ministry of Internal Affairs and Communications, "Consumer Price Index"; Bank of Japan.

Chart 1-55: Financial Liabilities in the Private Non-financial Sector and Loans Outstanding by the Banks
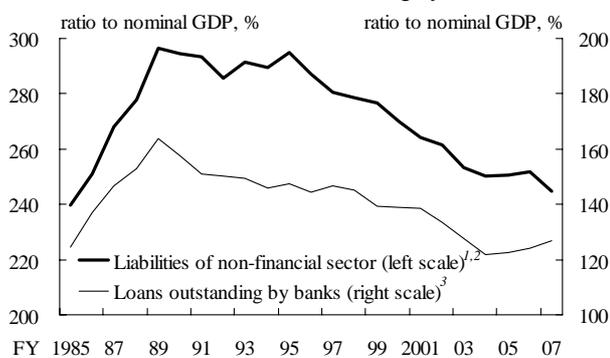
Notes: 1. Figures for the non-financial sector are the sum of private non-financial corporations, households, and private nonprofit institutions serving households.
2. Shares and other equities, and securities other than shares are evaluated at face or book values.
3. Banks are comprised of the domestically licensed banks and foreign-owned banks in Japan.
Sources: Cabinet Office, "National Accounts"; Bank of Japan, "Flow of Funds Accounts."

Chart 1-56: Home Mortgages in Japan and the United States[1,2]
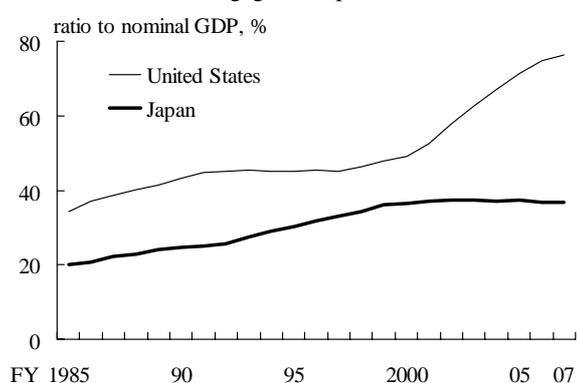
Notes: 1. Japan's figures are housing loans held by households and the U.S. figures are home mortgages held by households and nonprofit organizations.
2. The U.S. figures are calculated on a calendar-year basis.
Sources: Cabinet Office, "National Accounts"; Bank of Japan, "Flow of Funds Accounts"; Bureau of Economic Analysis, "National Economic Accounts"; FRB, "Flow of Funds Accounts of the United States."

Second, regarding the level of credit aggregates relative to the level of economic activity, both the ratio of financial liabilities of the private non-financial sector and the ratio of bank loans outstanding to nominal GDP remained almost unchanged at levels in the mid-1980s even under the continued accommodative financial environment. This suggests that expansion of credit aggregates is moderate (Chart 1-55).

In sum, potential imbalances stemming from extremely rapid expansion in credit aggregates and banks' excessive risk-taking behavior, which might jeopardize the stability of the financial system, are deemed to be restrained on the whole.

Further, comparing the ratio of mortgage loans outstanding to GDP between Japan and the United States, the level of the United States was consistently higher than that of Japan, and it increased rapidly after the beginning of the 2000s (Chart 1-56). That is, in the United States, before the subprime mortgage problem surfaced, mortgage loans increased at an extremely high pace relative to economic activity. In contrast, mortgage loans in Japan increased at a moderate pace, and their ratio to nominal GDP was declining recently.

3. Profitability of housing loans

With regard to housing loans in Japan, however, it should be noted that some banks are taking on larger interest rate risk, with an expectation to make funding in the future at the current extremely low level of short-term interest rates.

From the above viewpoint, profitability of housing loans is examined. Specifically, "housing loans with initially fixed interest rates" (i.e., housing loans that apply fixed rates for a certain period from the loan origination) – a key product for housing loans – is

considered. Here, "interest income (base rates)" is taken as return, and four factors – "funding costs (swap rates for the initial period)," "general and administrative expenses," "group credit life insurance fees," and "preferred discounts" – are taken as costs. Then (1) the profitability at the time of loan origination as return minus costs, and (2) the profitability on an economic value basis as the discounted value of entire cash flow over the life of loan, are estimated (Chart 1-57; see Box 3 for details).

First, the profitability at the time of loan origination deteriorated considerably for the past few years, since preferred discounts widened, while the value obtained by deducting funding costs from the base rates stayed almost unchanged (Chart 1-58 [1]).

Second, the profitability on an economic value basis during the life of loan is considered (Chart 1-58 [2]). Banks seem to make up for their losses incurred during the initial period by making a profit during the post-initial period after the initial period terminates. In this case, should the loan be prepaid at the end of the initial period, the profitability may become negative in the absence of a high prepayment fee. In the meantime, the estimation result indicates that an increasing number of banks continued to apply the preferred interest rates even after the initial period. With the widening of its preferred discount, profitability after the initial period has substantially deteriorated, particularly for the regional banks.

The above estimation implies that, in the housing loan business, banks are taking on larger interest rate risk, since banks expect low funding costs in the future at the current level of deposit interest rates, which is lower than the long-term funding rates (an assessment of the banking sector's robustness against interest rate risk is made in Chapter III).

Chart 1-57: Concepts of Profitability Assessment of Housing Loan
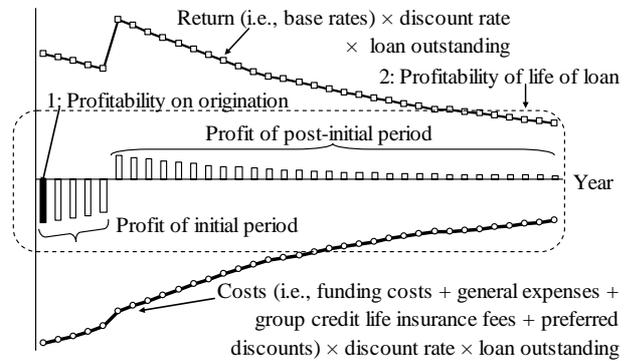
Chart 1-58: Profitability of Housing Loan
[1] Profitability at the Time of Origination

[2] Profitability on Economic Value Basis[1]
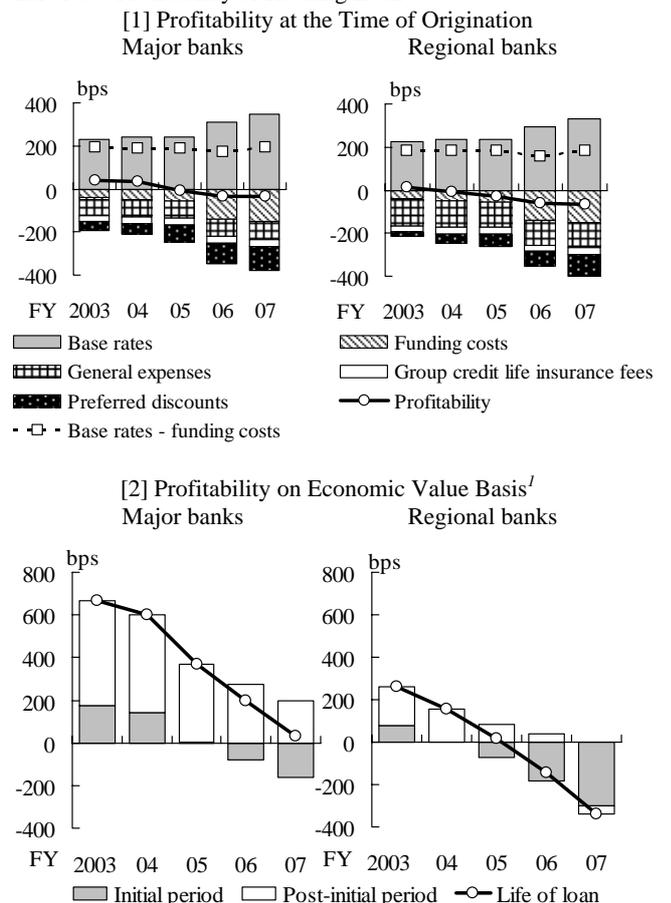
Note: 1. Bank of Japan estimation. See Box 3 for details.
Source: The Japan Financial News Co., Ltd., "Nikkin Report."

Box 1: Implied Correlations

Standardized market indices related to structured credit products enable market participants to compute default correlation of a reference portfolio of assets. Recently, such correlations have become widely used in trading and hedging structured credit products, as well as pricing other unstandardized products. The correlations extracted from market prices are called "implied correlation."

Implied correlations are classified into two types. One is called "compound correlations," which are computed from spreads of each tranche. In theory, compound correlations need to be identical for all the tranches because they have the same reference portfolio of assets. In practice, compound correlations vary from tranche to tranche and typically exhibit a "smile" shape, i.e., correlations become high at both ends of the tranches (equity and senior) and become low at the middle tranches (Chart B1-1). A smile curve is also observed in the implied volatility of various option prices, based on the Black Scholes model. This is partly because the subjective probability density of assets for market participants is more fat-tailed than the density assumed by standard valuation models.

The other type of implied correlation is called "base correlations." The idea behind base correlations is that each tranche can be decomposed into the combination of two hypothetical equity tranches; one with the thickness from zero to the attachment point of the original tranche, and the other with the thickness from zero to the detachment point. Any tranche with various attachment and detachment points can be priced with a continuous curve of base correlations. For these reasons, base correlations are more commonly used in practice.

Chart B1-1: Comparison Between Compound Correlation and Base Correlation
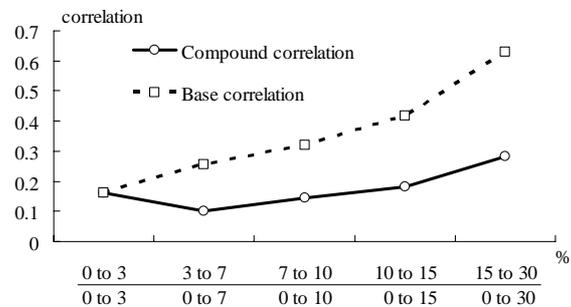
Notes: 1. Bank of Japan estimation. The data of CDX. NA. IG (at the end of 2006) is used for estimation.
2. The label of horizontal axis denotes the level of attachment and detachment, respectively. The upper label is for compound correlations, while the lower label is for base correlations.

Spreads of tranche are not easily interpreted, since observed spreads are attributable to changes in various parameters, including default probabilities in addition to default correlations. This is especially the case where the tranche spreads are fluctuating wildly since the U.S. subprime mortgage problem got worsened, making it difficult to give a consistent interpretation.

For this reason, in Chart 1-4 in the body text, implied default probabilities of the tranches are estimated, with the single compound correlation obtained by minimizing the sum of relative absolute errors between theoretical spreads and actual spreads. This exercise makes it easier to interpret implied default probabilities in a consistent manner, since spreads are an increasing function of default probability, regardless of the level of compound correlations.

Box 2: Monitoring Leveraging by Hedge Funds

Associated with the recent turmoil in the global financial markets, the effects of "deleveraging" over the overall financial system have been pointed out. Specifically, entities (hedge funds, SIV, etc.) that made investments using leverage have been reducing their positions in the market against the background of cancellation by investors, a decline in the inflow of new investments, and the cautious lending stance of financial institutions. There were also cases that fell into a vicious cycle; cancellation of a position to meet the financial institution's requirement for additional collateral (margin call) leading to a further decline in prices and, in turn, inducing further margin calls. Against such a backdrop, the *Financial System Report* examines the situation of leveraging in the global financial markets, on a regular basis, in the process of reviewing domestic and international financial and economic conditions.

The expression "leverage" is used in various contexts, but in the broad sense it can be defined as a "sensitivity of net assets against fluctuation in the risk factor such as market prices." In light of this definition, means to raise leverage can take various forms (Chart B2-1); the traditional way through borrowing as well as investment to a subordinated portion of structured credit products, such as equities, and the use of derivatives transactions.

In recent years, the hedge funds, which faced declining opportunities for excess returns (the so-called α) through arbitrage due to narrowing credit spreads and declining market volatility, seem to have opted for increasing leverage to maintain and enhance their performance. In addition, investors, with a view to increasing the rate of return through intensified leverage, might have shifted their money to hedge funds that have greater latitude on investment strategy.

Due to limited information, it is difficult to directly gauge the trend of leveraging by hedge funds from a macro perspective. In this regard,

Chart B2-1: Various types of Leverage[1,2]

[1] Leverage through Borrowing

[2] Leverage through Investments to Subordinated Portion of Structured Credit Products

Notes: 1. For simplicity, the generic description of [2] assumes a very plain structure without the buffer by overcollateralization for loss, in order to focus on how variations in the value of underlying pooled assets affect the risk/return for investors of CDO equity.
2. The effect of leverage, as described in the case of decreasing value of assets above, equally applies to the case of increasing value of assets.

figures to be monitored and also shown in the text are those for securities-backed loans, such as margin trading and reverse repo transactions, and securities lending, such as repo transactions and bond lending, that were carried out by the major financial institutions of the United States and Europe against their customers including hedge funds. Qualitative information is also added to follow trends in leveraging by hedge funds.

Box 3: Profitability Analysis of Housing Loans of Banks

Amid the pace of increase in banks' housing loans leveling off, intensified competition is said to reduce profitability. In the analysis here, "interest income" is taken as return on housing loans and "general and administrative expenses," "funding costs," "group credit life insurance fees," and "preferred discounts" are taken as four elements comprising cost (Chart B3-1). Then, the initial profitability, i.e., return minus cost at the time of loan origination, and also the present discounted value of entire cash flow over the life of loan are estimated.

Chart B3-1: Settings of Variables

	Initial fixed-rate period	After the initial fixed-rate period
Interest income	Average of base rates of each products by the major banks and the regional banks.	Funding costs of each product plus the average of the "initial base rate minus the initial funding cost" of all the product types originated from fiscal 2003 to 2007.
Funding costs	Swap rate corresponding to the initial fixed-rate period.	Forward rate from after the initial fixed-rate period to maturity (35 years).
General and administrative expenses	Expense ratio by the major banks and the regional banks (constant from origination to maturity).	
Group credit life insurance fees	Constant 30 bps.	
Preferred discounts	Average of preferred discounts of each products by the major banks and the regional banks.	Average of preferred discounts applied to the product in which the average of initial preferred discount is calculated by the major banks and the regional banks.
Probability of default	Constatnt 20 bps (average level of guarantee charge among banks).	
Loss given default	0 bps (Loss is balanced with guarantee charge).	
Prepayment rate	Rises by 10 bps every month from the origination and becomes constant 600 bps after five years.	

Along with the framework mentioned above, profitability of the initial 2, 3, 5, and 10-year preferred fixed interest rate products, which cover more than a 50 percent share of new housing loans, are analyzed separately and the results are aggregated using weighted average of the share of new housing loans (Chart B3-2). The aggregated result is shown in chart 1-58 of the body text.

In the case of the 10-year product, which increased the share during the first half of fiscal 2007, it should be noted that the deterioration in the initial profitability has a large impact on the

Chart B3-2: New Housing Loans by Type of Interest Rate
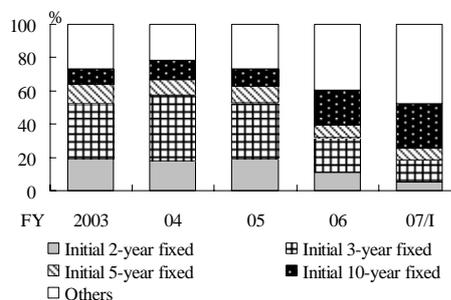
Source: Ministry of Land, Infrastructure, Transport and Tourism, "Heisei 19-Nendo Minkan Jutaku Loan Ni Kansuru Chousa Houkokusho (A Survey on Housing Loans by Private Financial Institutions in Fiscal 2007)."

deterioration in the present value over the life of loan, since the preferred discount is applied for a long time.

The analysis shown above treats the probability of default (PD, hereafter) as constant. However, PD in reality is said to vary over time due to changes in factors such as loan age, business condition, and lending standard. Using the dataset of a housing loan portfolio of the Japan Housing Finance Agency (JHFA), PD at the early stage of loan life (from 6 months to 36 months) is estimated by vintage year. The result suggests that PD for recent vintages is on a steeper trajectory than that for earlier vintages (Chart B3-3).

Regression analyses are conducted to analyze the background of the variations in PD. Using information "Factors and Loan Data" for underlying pooled loans' characteristics of the JHFA's MBS by each issue, average PD for different time horizons is regressed on "share of loans outstanding with LTV over 90 percent to the total loans outstanding of the pool" and "share of loans outstanding with the debt to income (DTI) over 25 percent to

the total loans outstanding of the pool." In addition, "changes in the consumer confidence index" is added as an independent variable to capture the changes in borrowers' expectations of their future ability to make repayment.

Statistical test results indicate that the "share of loans outstanding with LTV over 90 percent" are statistically significant for all specifications and "changes in the consumer confidence index" are statistically significant in some specifications (Chart B3-4). These results imply that controlling LTV under certain threshold at origination of loans may help to restrain the steepening of the PD trajectory and that PD may be affected by changes in macroeconomic condition.

Chart B3-3: Default Rates on Housing Loans by Vintage Year[1,2]
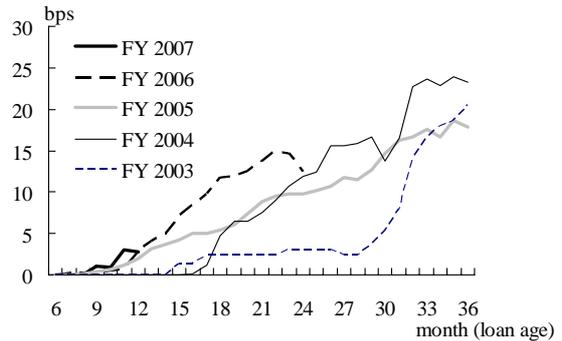
Notes: *1.* Defaulted loans for the Japan Housing Finance Agency (JHFA) are defined as the loans that the JHFA requires borrowers to prepay because they are more than six months overdue, etc.
    2. Twelve-month moving average of each monthly annualized default rate.
Source: Japan Housing Finance Agency.

Chart B3-4: Estimation Results for Average PD Regressions[1,2,3]

	Dependent variable: Average yearly default rate								
	(1) 1-to-12-month average			(2) 1-to-24-month average			(3) 1-to-36-month average		
Independent variables:									
Consumer confidence	-0.005 ***		-0.004 **	-0.008 *		-0.008 *	-0.009		-0.014 *
	(-2.42)		(-2.07)	(-1.50)		(-1.50)	(-1.13)		(-1.69)
LTV 90%+	0.725 ***	0.592 ***	0.798 ***	1.612 ***	1.075 ***	1.582 ***	2.125 **	1.214 ***	2.916 ***
	(3.36)	(2.97)	(3.55)	(4.11)	(3.56)	(3.98)	(2.30)	(2.83)	(3.04)
DTI 25%+	-0.595	-0.436		0.118	-0.225		-1.346	-1.500	
	(-1.30)	(-0.93)		(0.16)	(-0.31)		(-1.38)	(-1.56)	
Constant	0.099	0.105	-0.046	-0.177	0.049	-0.144	-0.013	0.300	-0.535 **
	(0.83)	(0.84)	(-0.74)	(-0.88)	(0.27)	(-1.24)	(-0.03)	(1.04)	(-1.84)
R-sq.	0.224	0.194	0.200	0.310	0.262	0.310	0.454	0.441	0.393
Sample size	56			44			32		

Notes: *1.* *t*-values in parentheses are calculated using heteroskedasticity-robust standard errors. ***,**,* indicate that the parameter estimates are statistically significant at the 1 percent, 5 percent, and 10 percent significance level, respectively.
    2. Average default rate is calculated as 12, 24, and 36-month average of "replacement or partial cancellation rate (long-term deliquency)" multiplied by previous month's "factor (actual)."
    3. Excluding S-series bonds.
Sources: Japan Housing Finance Agency, "Factors and Loan Data," "Lists of MBS Issues," "Shouhinnaiyou Setumeisho (Prospectus)"; Cabinet Office, "Consumer Confidence Survey."

It seems that the potential negative effects of the future rise in PD on the profitability of the housing loan are not thoroughly taken into account, because (1) the repayment on banks' housing loans is in general insured by the guarantee company and (2) historically, recovery rates for foreclosed properties were high. However, it should be noted that the resilience of banks' housing loan business has not been tested by historical events, such as a rapid increase in PD and/or loss given default, since housing loans began to occupy a substantial share in banks' loan portfolio. Progress in accumulation of information regarding borrowers' characteristics will facilitate deeper analyses of the determinants of PD, and, consequently, the analyses are expected to have a positive feedback effect on the product design and risk management of the housing loan business.

Chart 2-1: Net Income/Loss

Major banks

Regional banks
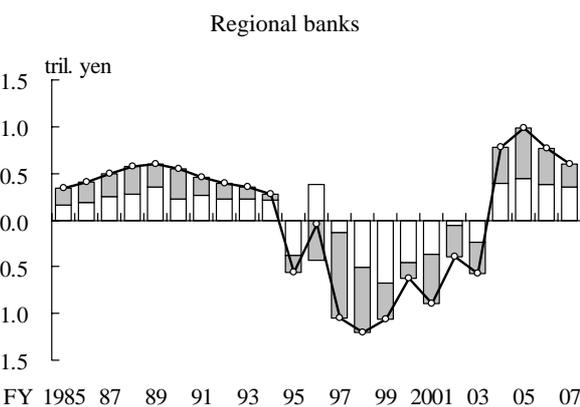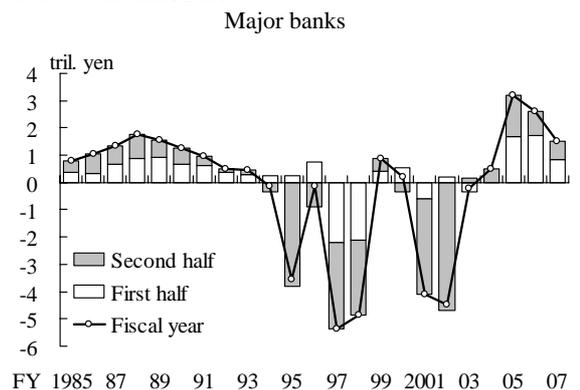
Chart 2-2: Contributions to Changes in Net Income/Loss
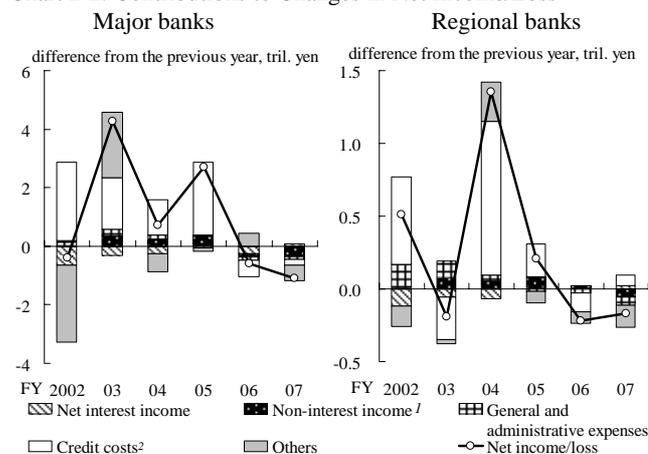
Major banks   Regional banks

Notes: 1. Non-interest income = net fees and commissions + profits on specified transactions + other operating profits - net realized bond-related gains/losses.
2. Credit costs = loan loss provisions + write offs - recoveries of written-off claims.

II. Business Conditions of Japanese Financial Institutions

A. Developments in Banks' Profits

The banks' fiscal 2007 financial statements made it clear that banks' core profitability became stagnant as credit cost ratios were returning to expected average levels while interest income and non-interest income remained sluggish.

Net income in fiscal 2007 declined for two consecutive years for both the major banks and the regional banks (Chart 2-1). For the major banks, net income declined by half from fiscal 2005, when an all-time high was recorded. For the regional banks, 13 banks registered net losses in fiscal 2007, five more than in fiscal 2006.

Looking at factors contributing to net income fluctuations (Chart 2-2), net interest income for both the major banks and the regional banks increased marginally. However, non-interest income decreased more than net interest income increased, and general and administrative expenses also increased. In addition, losses related to the U.S. subprime mortgage problem for the major banks and losses related to securities for the regional banks pushed down their net income.

The degree of improvement in banks' profitability can be seen in the developments in "core return on equity (core ROE)," which is calculated by excluding the impact of volatile components such as credit costs, gains/losses on securities, and corporate income tax from net income (Chart 2-3). Between fiscal 2003 and fiscal 2005, both the major banks and the regional banks experienced improvement in their core ROEs (an upward shift in the downward-sloping relationship between the core ROE and credit cost ratios). However, after fiscal 2006, the line shifted down

again, and the improvement in core profitability was subdued. That indicates that the fluctuations in the banks' profits for the past years mainly reflected the fluctuations in credit cost ratios.

Moreover, the levels of core ROE varied considerably from bank to bank in fiscal 2007, and many banks did not improve their core ROEs, compared with those in fiscal 2003, suggesting the gaps between banks widened (Chart 2-4).

The above analysis suggests that the improvement in core profitability remained sluggish both for the major banks and the regional banks. In particular, sluggish core profitability indicates that the pace of increase in profit itself was leveling off, and capital was not effectively used despite its moderate increase. Banks should improve their core profitability, bearing in mind the balance between risk and return.

B. Developments in the Components of Profits and Costs

Next, the developments in key components of profits and costs – net interest income, overall gains and losses on securities, non-interest income, general and administrative expenses – are examined more closely.

1. Net interest income

Net interest income of both the major banks and the regional banks (Chart 2-5) showed a slight rebound in fiscal 2007. Net interest and dividends on securities underpinned income, and net interest income on loans – the largest component in net interest income – increased. The net interest income on loans, which had been consistently decreasing since the early 2000s, increased for both the major banks and the regional banks but for different reasons: for the major banks, the expansion of total interest margins on loans (i.e., the interest rate on lending minus the interest rate on

Chart 2-3: Credit Cost Ratios and Core ROE of Banks[1]

Major banks

Regional banks
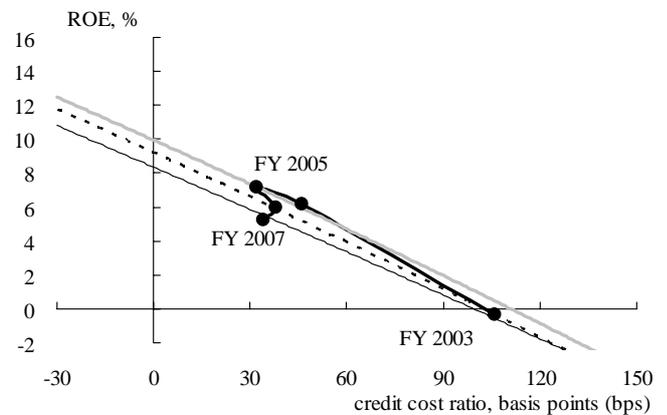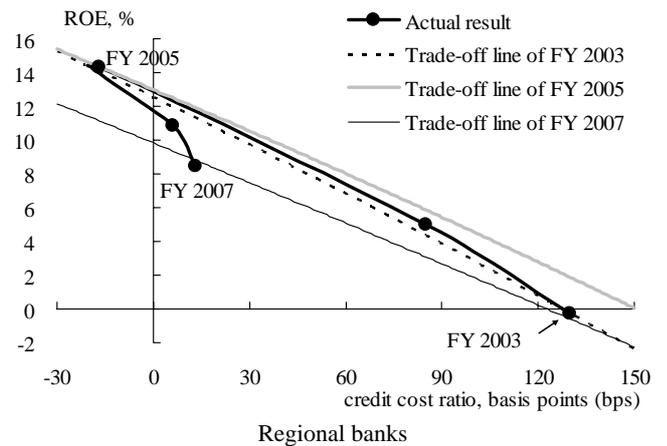
Note: 1. See Hattori, Masazumi, Joji Ide, and Yasuo Miyake, "Bank Profits in Japan from the Perspective of ROE Analysis," Bank of Japan Review 2007-E-3, 2007, for details.

Chart 2-4: Banks' Core ROEs[1,2,3]
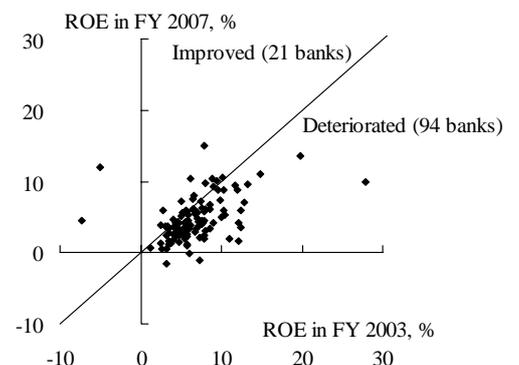
Notes: 1. Credit cost ratio is assumed to be 30 bps.
2. The regional banks that experienced mergers after fiscal 2003 fall outside this chart.
3. The banks that have liabilities exceeding their assets fall outside this chart.

Chart 2-5: Net Interest Income[1]

Major banks | Regional banks
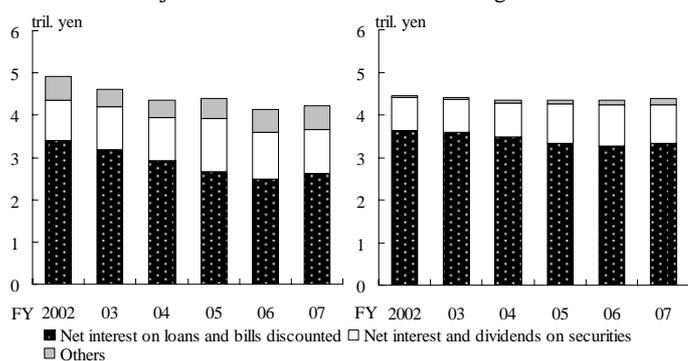
Note: 1. The composition of interest expenses is calculated assuming that the ratio of each component to total expenses is the same as the ratio of interest on loans and bills discounted, interest and dividends on securities, and other interest income to total interest income.
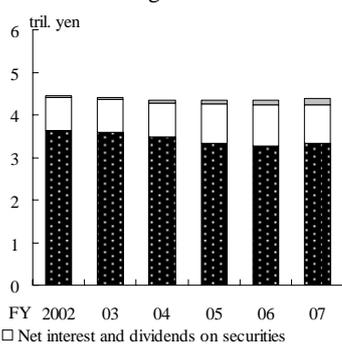
Chart 2-6: Total Interest Margins on Domestic Loans
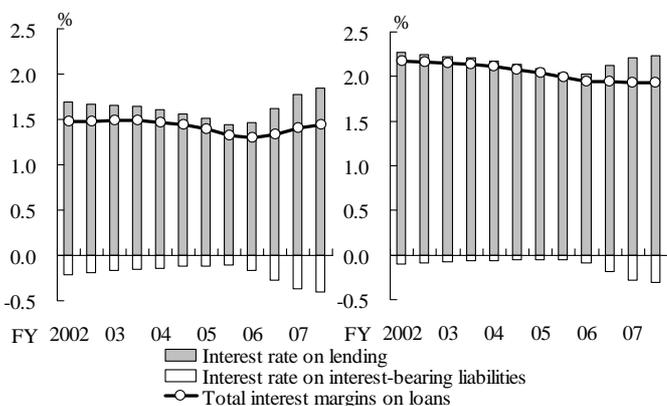
Major banks | Regional banks
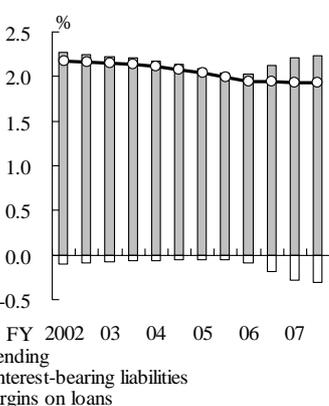
Chart 2-7: Decomposition of Changes in Total Interest Margins on Domestic Loans[1,2,3]

Major banks | Regional banks
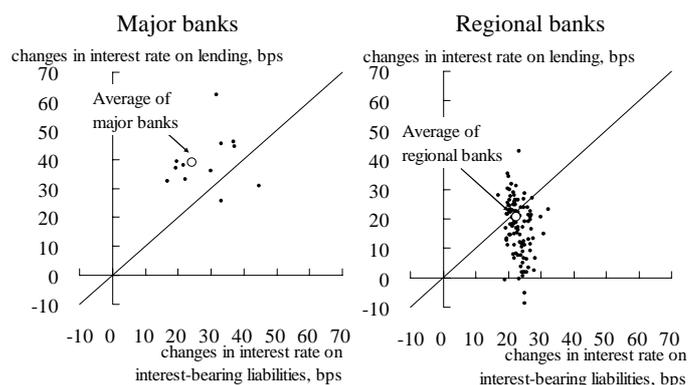
Notes: 1. Changes are between the second half of fiscal 2007 and the first half of fiscal 2006.
2. Observations above the 45-degree line indicate that the interest margin on loans improved in the second half of fiscal 2007 when compared with the first half of fiscal 2006.
3. The observation for one of the banks falls outside this chart (i.e., below -10 basis points of changes in the interest rate on lending).

interest-bearing liabilities) contributed to the improvement in net income, whereas for the regional banks the increase in loans outstanding was the main factor behind the increase in net income. Below, the developments in total interest margins on loans and loans outstanding are further examined.

Total interest margins on loans turned upward in the second half of fiscal 2006 for the major banks and continued to widen through fiscal 2007, while they continued to narrow, albeit by a small amount, for the regional banks (Chart 2-6). Interest rate on interest-bearing liabilities turned upward in the first half of fiscal 2006, when zero interest rates ended, for both the major banks and the regional banks. Interest rate on lending turned upward in the first half of fiscal 2006 for the major banks, while for the regional banks it turned upward in the second half of fiscal 2006, a half year behind the major banks. For the regional banks, the pace of the subsequent increase in interest rate on lending also lagged behind the major banks, suggesting that the delay hampered the expansion of total interest margins on loans.

Next, the changes in total interest margins on loans, between the first half of fiscal 2006 when zero interest rates ended and the second half of fiscal 2007, are divided into two components: changes in interest rates on lending and changes in interest rates on interest-bearing liabilities (Chart 2-7). Changes in interest rates on interest-bearing liabilities were concentrated around 20 bps for both the major banks and the regional banks, and the dispersion between banks was not that large. In contrast, changes in interest rates on loans varied considerably: they ranged between -10 bps and 40 bps for the regional banks, whereas they stayed at around 40 bps for the major banks. That contrast shows that changes in interest rates on loans strongly affected the degree of

improvement in total interest margins on loans. The stark difference between the major banks and the regional banks can be seen in Chart 2-7: many of the major banks showed an improvement in total interest margins on loans (those above the 45-degree line), whereas many of the regional banks lagged in raising interest rates on loans, and experienced worsened total interest margins on loans (those below that 45-degree line).

Meanwhile, interest rate spreads on deposits (i.e., market interest rates minus interest rates on deposits) up to one year continued to widen in the second half of fiscal 2007. By contrast, the interest rate spreads on deposits of longer terms (2 to 5 years) narrowed in the second half of fiscal 2007 relative to the first half, since changes in deposit rates in the second half were limited when market interest rates declined (Chart 2-8).

Outstanding bank loans continued to increase both for the major banks and the regional banks (Chart 2-9), and the pace of increase picked up slightly in the second half of fiscal 2007. For the major banks, overseas lending continued to increase and domestic lending, in a downward trend since the second half of fiscal 2006, remained almost unchanged in the second half of fiscal 2007.

Next, looking at the contribution of various types of loans to the domestic sector (Chart 2-10), the overall rate of change remained almost unchanged for the major banks, with a decline in loans to the non-manufacturing sector (excluding the real estate industry) offset by an increase in loans to the manufacturing sector and individuals. For the regional banks, overall bank loans increased, with loans to the real estate industry, local governments, and individuals being the major driving force.

Chart 2-8: Interest Rate Spreads on Deposits[1,2]
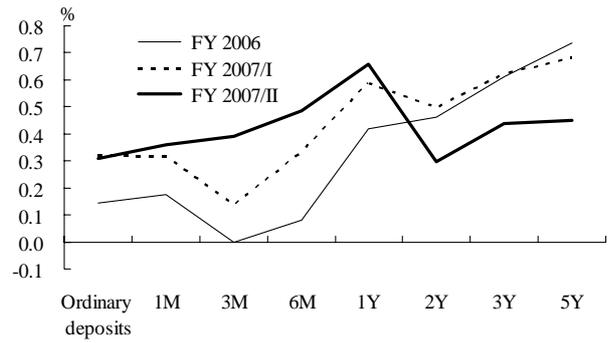
Notes: 1. Interest rate spreads on deposits = market interest rate - deposit rate.
2. LIBOR data are used for the market interest rate for 1-month to 1-year maturity, and the swap rate data for 2-year maturity or more. The overnight call rate is used for the market interest rate for ordinary deposits.

Sources: Bank of Japan, "Average Interest Rates on Time Deposits by Term (New Receipts)"; Bloomberg.

Chart 2-9: Year-on-Year Change of Loans in Domestic and International Sectors
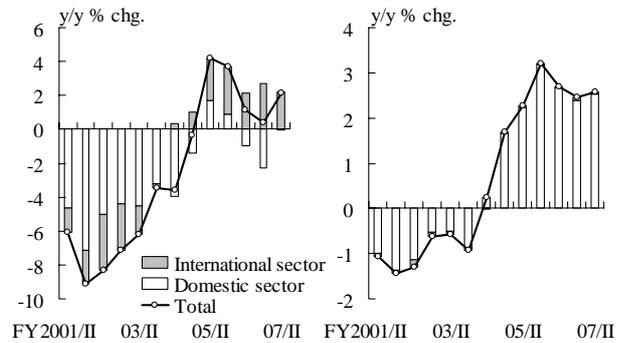
Chart 2-10: Loans Outstanding by Sectors

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Chart 2-11: Overall Gains/Losses on Securities[1]

Note: 1. The overall gains/losses on securities are changes in the sum of net realized securities gains/losses and changes in net unrealized securities gains/losses when compared with previous fiscal year.

Chart 2-12: Unrealized Gains/Losses on Securities

Chart 2-13: Distribution of Unrealized Gains/Losses on Securities at the Regional Banks

2. Overall gains and losses on securities

In fiscal 2007, both the major banks and the regional banks recorded substantial overall losses on securities holdings (Chart 2-11). The fall in stock prices toward the end of fiscal 2007 considerably reduced unrealized gains on stocks, while overall gains/losses on bonds remained almost unchanged.

Concerning the unrealized gains/losses on securities at the end of fiscal 2007 (Chart 2-12), unrealized gains for domestic stocks (excluding those for affiliate companies) declined substantially for both the major banks and the regional banks, reflecting the plunge in stock prices. Since unrealized gains for domestic stocks (excluding those for affiliate companies) account for a large proportion of the unrealized gains/losses, the decline had a substantial impact in bringing down the overall unrealized gains below half of the level in fiscal 2006. In addition, unrealized gains on securities of affiliated companies decreased for the major banks despite their relatively small proportion. Besides, both the major and regional banks recorded unrealized losses on other securities and unrealized losses on foreign securities for the regional banks also worsened. The losses on other securities and foreign securities seemed to reflect unrealized losses on securitized products stemming from the U.S. subprime mortgage problem. Risks of alternative investments including structured credit products are analyzed more thoroughly in the next section.

In addition, looking at the distribution of the unrealized gains/losses on securities for the regional banks (Chart 2-13), almost half of the regional banks recorded unrealized losses. For about 70 percent of the banks that incurred such losses, the magnitude of the losses was limited to -0.5 to 0 percent of the total assets, while some regional banks opted to report the losses in
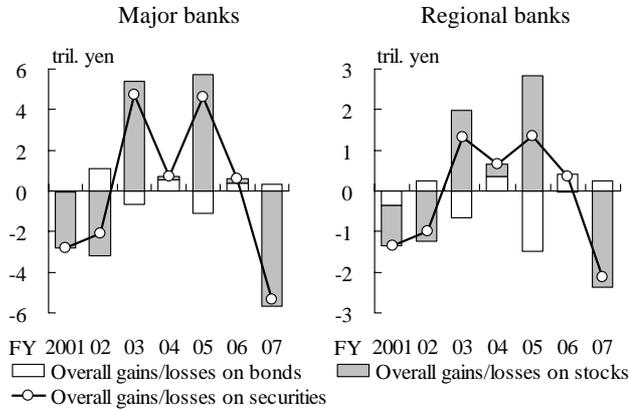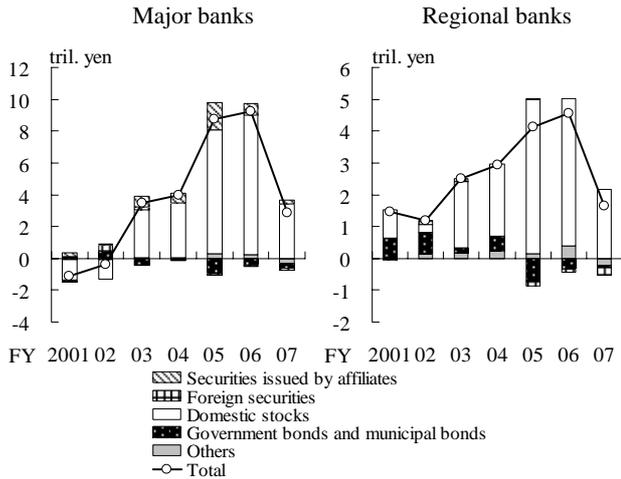
their fiscal 2007 financial statements. The effects of the unrealized losses on banks' capital adequacy ratios are taken up in Section II. D.

3. Non-interest income

Non-interest income had increased in the early 2000s, but had been sluggish in the past few years. In fiscal 2007, it declined for both the major banks and the regional banks (Chart 2-14). For the major banks, overall non-interest income declined for two consecutive years, reflecting a fall in profits on foreign exchange and derivative transactions and a decrease in net income from fees and commissions. The regional banks maintained an increase as a whole until fiscal 2006, but declined in fiscal 2007 due to a fall in income from fees and commissions. As a result, the non-interest income ratio for both the major banks and the regional banks dropped, since non-interest income fell while net interest income slightly increased (Chart 2-15).

Looking at the components of the banks' income from fees and commissions (Chart 2-16), both for the major banks and the regional banks, income from the sales of investment trusts and private pension policies started to decrease. In addition, for the major banks, other income from fees and commissions such as securities brokerage fees also declined. Against a backdrop of sluggish growth in net interest income, banks strived for effective use of managerial resources and diversified their profit base by expanding their fee and commission businesses. However, the expansion of non-interest transactions relying heavily on the sales of investment trusts was to a large extent subject to the conditions of the economy and financial markets, and might not necessarily lead to stabilization in profits.

Chart 2-14: Composition of Non-Interest Income
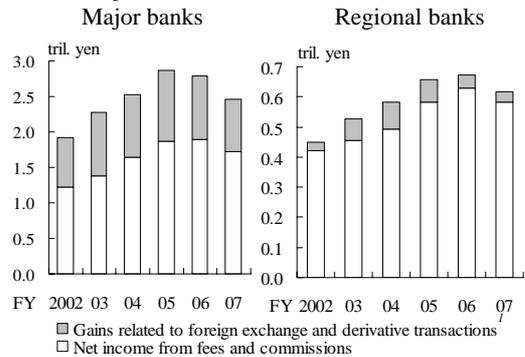
Note: 1. Figures are profits from selected items in trading profits and other operating profits.

Chart 2-15: Ratios of Non-Interest Income to Gross Profits[1,2]
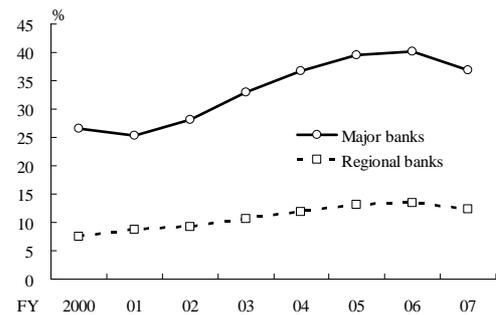
Notes: 1. Non-interest income = net fees and commissions + profits on specified transactions + other operating profits - net realized bond-related gains/losses.
2. Ratio of non-interest income to gross profits from core business = non-interest income/(net interest income + non-interest income).

Chart 2-16: Composition of Gross Income from Fees and Commissions[1]
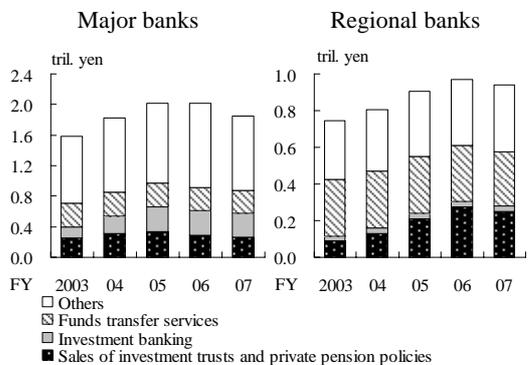
Note: 1. Figures are gross income from fees and commissions of domestic operations.

37

Chart 2-17: Year-on-Year Change of General and Administrative Expenses
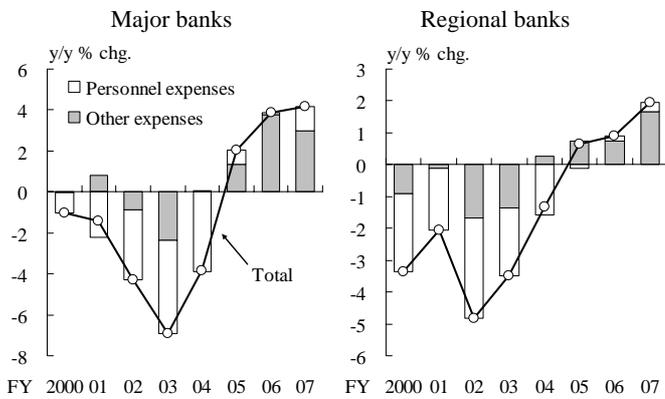
4. General and administrative expenses

Finally, general and administrative expenses for both the major banks and the regional banks continued to increase mainly due to a pickup in other expenses (Chart 2-17). Such an increase in general and administrative expenses seems to reflect financial institutions' steps toward forward-looking resource allocation such as an introduction of a new data processing system, active investments in the new business sector, and reconstruction of the overseas business. As pointed out in the previous *Financial System Report*, whether such forward-looking resource allocation leads steadily to strengthening of banks' profitability will be important in the periods ahead.

C. Risks

In this section, various risks borne by the banking sector are examined.

1. Credit risk

Banks' NPLs were steadily decreasing with the continued expansion of Japan's economy. The ratio of NPLs to total credit exposure at the major banks declined to 1.4 percent at the end of fiscal 2007, down from a peak of 8.7 percent at the end of fiscal 2001. The ratio at the regional banks also declined to 3.8 percent at the end of fiscal 2007, compared with 8.1 percent at the end of fiscal 2001 (Chart 2-18).

However, it seems that the NPL ratio at the regional banks stopped declining at a higher level than the one at the major banks. In addition, the ratio of unrecoverable or valueless loans and doubtful loans to total NPLs was still at a relatively high level at the regional banks, and the pace of the removal of NPLs from banks' balance sheets at the regional banks appears to be slower than that at the major banks.

Chart 2-18: NPL Ratios and the Amount of NPLs[1,2]
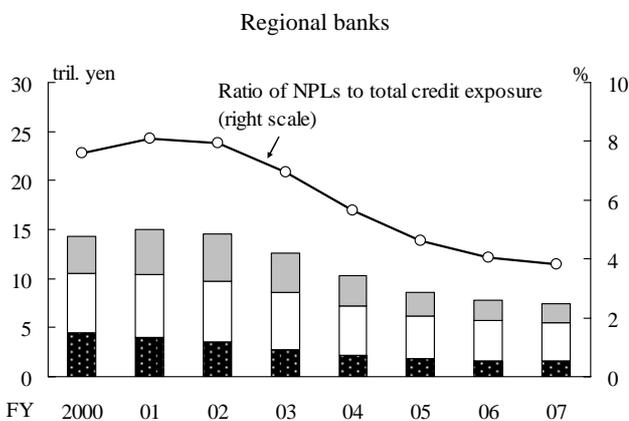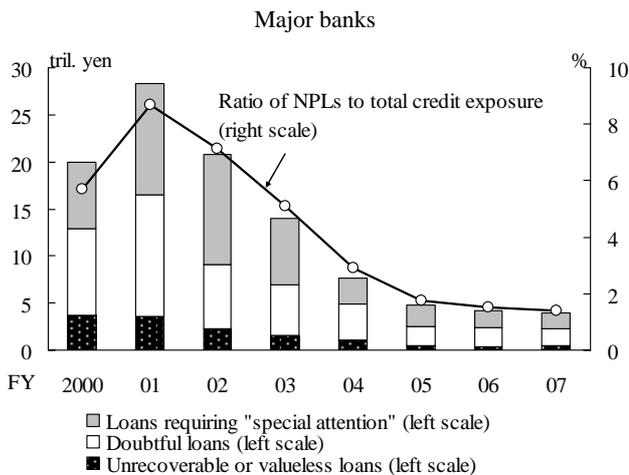
Notes: *1*. NPLs disclosed under the Financial Reconstruction Law.
    2. Figures include NPLs that are transferred to subsidiary companies for corporate revitalization.

Meanwhile, some regional banks still had relatively high NPL ratios (Chart 2-19).

Bearing the above points in mind, banks need to adequately evaluate the risk-return balances of loans, and to step up their efforts to dispose of NPLs.

Next, the credit cost ratio at the major banks rose from fiscal 2006, while it remained nearly unchanged for the regional banks (Chart 2-20; the major banks' credit cost ratio rose from 6 bps in fiscal 2006 to 13 bps in fiscal 2007, and that ratio of the regional banks changed from 38 bps to 34 bps during the same period).

The credit cost ratio at the major banks was 29 bps (annualized basis) in the first half of fiscal 2007, but declined to 13 bps in fiscal 2007 as a whole, since there were the reversals of allowances for loan losses for large borrowers, whose classification was upgraded in the second half of fiscal 2007. If this factor is excluded, the credit costs at the major banks are in the process of returning to a range estimated in the September 2007 issue of the *Financial System Report* (approximately 20 to 40 bps with a GDP growth rate of around 2 percent). Indeed, the level of the credit costs in the first quarter of fiscal 2008 increased substantially, on a year-on-year basis (it should be noted that the amounts of credit costs were those disclosed by individual banks and the definition of credit costs may not strictly coincide with what was referred to the above).

For the regional banks, the credit cost ratio was almost unchanged in fiscal 2007, mainly because of the backlash of some banks becoming more conservative in provisioning in fiscal 2006. Looking at the distribution of the credit cost ratio of the regional banks (Chart 2-21), the 25th percentile, the median and the 75th percentile are on the rise. On the whole, the credit cost ratio shows signs of bottoming out.

Chart 2-19: NPL Ratios at the Regional Banks[1]
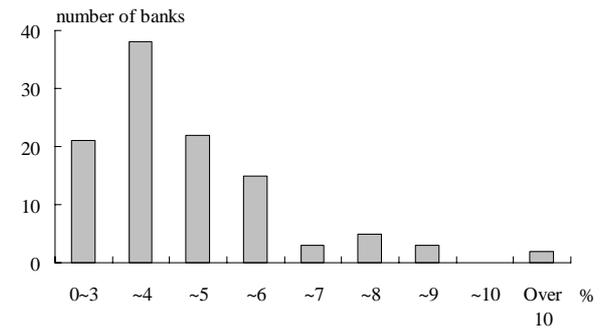
Note: *1*. As of the end of fiscal 2007.

Chart 2-20: Credit Costs and Credit Cost Ratios[1,2]
Major banks
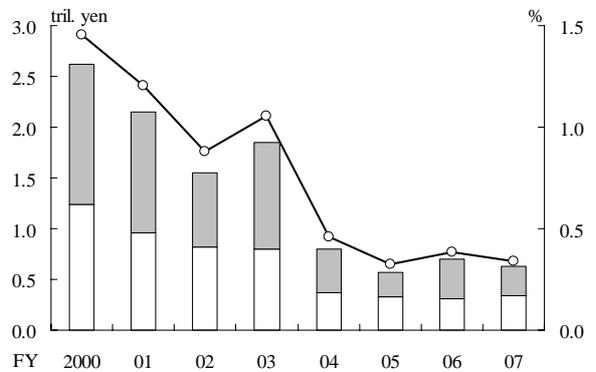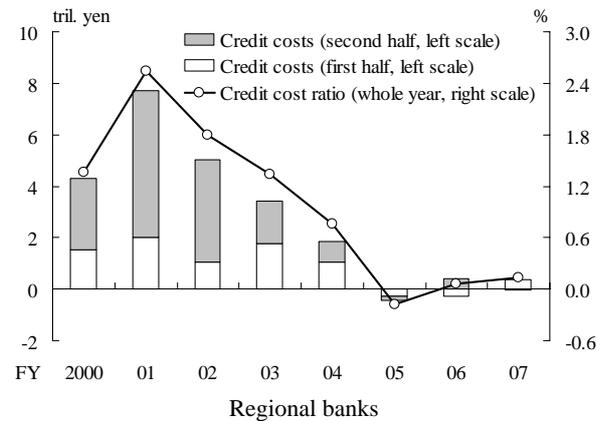
Regional banks

Notes: *1*. Credit cost ratio = credit costs/total loans outstanding.
      2. From fiscal 2000 to 2005, figures include credit costs of subsidiary companies for corporate revitalization.

Chart 2-21: Credit Cost Ratios at the Regional Banks[1]
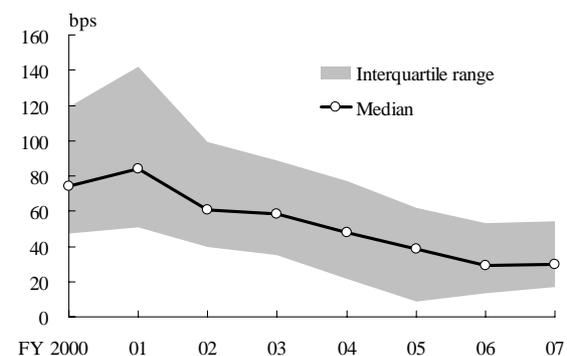
Note: *1*. Credit cost ratios are sorted out in ascending order. 25th, 50th (median), and 75th percentiles are shown.

Chart 2-22: Breakeven Credit Cost Ratios[1,2]
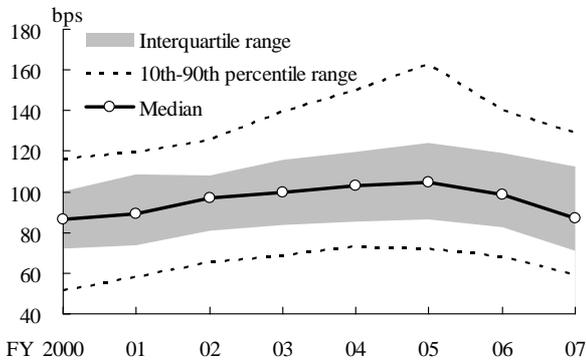
Notes: *1.* Breakeven credit cost ratio = operating profits from core business / loans outstanding.
    2. Breakeven credit cost ratios are sorted out in ascending order. 10th, 25th, 50th (median), 75th, and 90th percentiles are shown.

Chart 2-23: Banks' Stockholdings[1,2]
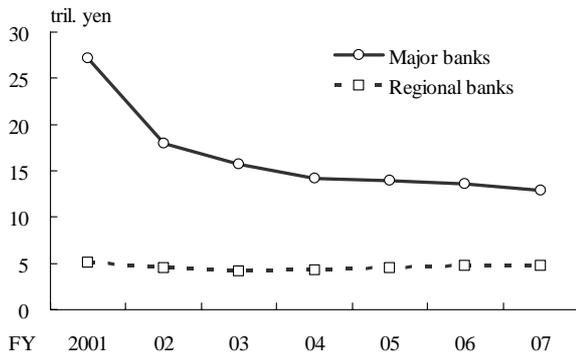
Notes: *1.* Figures are based on acquisition prices.
    2. On a consolidated basis.

Chart 2-24: Ratios of Risks Associated with Banks' Stockholdings to Tier I Capital[1]
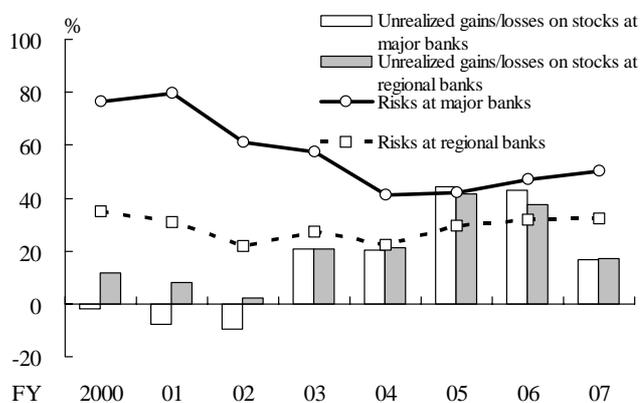
Note: *1.* Bank of Japan estimation. As measured by 1-year, 99 percent VaR (using TOPIX as a risk factor).

As discussed in Chapter I, given the current financial environment and sluggish growth of Japan's economy, downside risks in economic activity are increasingly gaining attention. In terms of the financial system, attention needs to be paid to the possibility that credit costs might increase. Since Japanese banks' total interest margins on loans are relatively low, it may be possible that profit buffers for some banks might not be sufficient to cover the credit costs once they increase substantially.

In this regard, the distribution of the points where operating profits from core businesses equal credit costs (break-even credit cost ratio; Chart 2-22) shows that it increased somewhat after fiscal 2005 due to banks' sluggish core profitability, and fiscal 2007 was almost the same as fiscal 2001 and 2002. The 10th percentile of fiscal 2007 is 59 bps, which suggests that if the credit cost ratio rises to about 60 bps, there is a possibility that about 10 percent of the banks will register net losses in terms of the credit cost factor.

2. Market risk associated with stockholdings

Banks' stockholdings based on acquisition prices slightly decreased for the major banks and remained almost unchanged for the regional banks (Chart 2-23). Since stock prices became highly volatile in the meantime, market risk increased. As a result, the ratio of market risk to banks' core capital (Tier I) became a little more than 50 percent for the major banks and a little more than 30 percent for the regional banks (Chart 2-24). In addition, unrealized gains on stockholdings declined toward the end of fiscal 2007 due to a fall in stock prices, and market risk substantially exceeded the unrealized gains on stockholdings. Therefore, if unrealized gains are excluded, the magnitude of an increase in market risk becomes large.

As pointed out in previous issues of the *Financial System Report*, it remains an important task for banks to adequately analyze and evaluate risk-return balances of their stockholdings.

3. Funding liquidity risk

The importance of "funding liquidity risk" management was reaffirmed during the global financial market turmoil stemming from the U.S. subprime mortgage problem. For Japanese banks, their liabilities mainly consist of deposits, and the share of short-term funding from the money market is small (Chart 2-25).

In this context, how banks' funding needs are met by the central bank's collateralized loans and surplus funds under a stress scenario (where banks cannot raise funds from the market at all in a short period) is estimated (Chart 2-26). The result shows that Japanese banks as a whole had ample funding capacity sufficient to substitute for all the short-term money market financing needs. In addition, the Bank of Japan daily checks the funding liquidity risk of Japanese banks through monitoring and strives for meticulous gauging of the risk.

Given those observations, it is likely that the funding liquidity risk of the Japanese banks as a whole continued to be limited. Against such a backdrop, LIBOR-OIS spread of the yen, an indicator showing financial institutions' funding risk premium, has been stable compared with that of other major currencies, as seen in Chapter I (Chart 1-3).

In the meantime, it appears that foreign currency funding of Japanese banks has so far been made smoothly, mainly through conversion from the yen into the U.S. dollar. However, the balance sheets of Japanese banks show that the pace of increase in foreign currency denominated assets has been

Chart 2-25: Domestic Interest-Bearing Assets and Liabilities[1]

Major banks

Regional banks
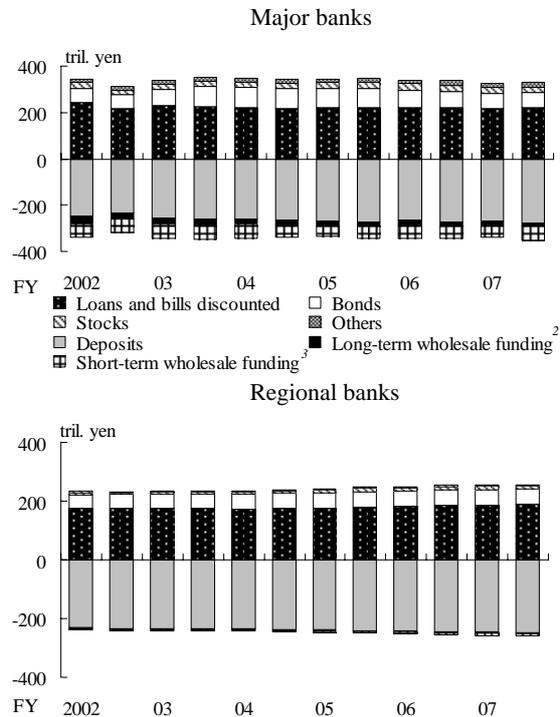
Notes: 1. As of the end of the second half of fiscal 2007.
2. Long-term wholesale funding = bonds and notes + borrowed money (excluding borrowed money from the Bank of Japan).
3. Short-term wholesale funding = CDs + call money + payables under repurchase agreements + payables under securities lending transactions + short-term corporate bonds + borrowed money from the Bank of Japan.

Chart 2-26: Ratios of Banks' Funding Capacity to Their Market Borrowing[1,2,3,4]
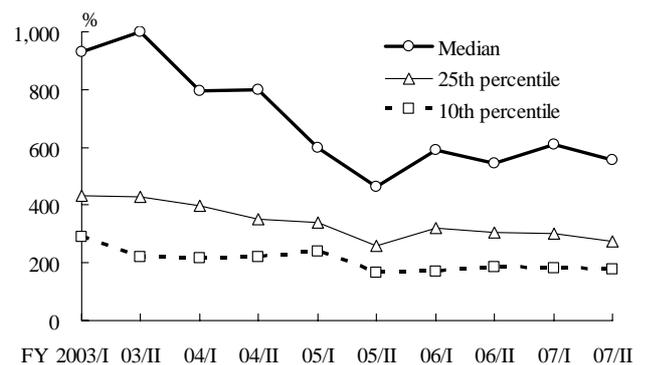
Notes: 1. Ratios of banks' funding capacity to their market borrowing = (market lending up to three months + reserve deposits + government bond holding)/market borrowing up to three months.
2. Ratios of banks' funding capacity to their market borrowing are sorted out in ascending order. The minimum, 25th, and 50th (median) percentiles are shown.
3. Government bond holding is adjusted according to the ratio of the collateral value to the face value of the government bonds accepted by the Bank of Japan at the end of March 2008.
4. Banks consolidated by another bank or one holding company are summed up to one banking group. Data exclude banks with no market borrowing.

Chart 2-27: Average Maturities of Banks' Assets and Liabilities[1]

Note: 1. Bank of Japan estimation.

Chart 2-28: Interest Rate Risks in the Banking Books (100 bpv)[1,2]

[1] Ratios of the Interest Rate Risks to Banks' Tier I Capital

[2] Contributions to Changes in the Ratios of the Interest Rate Risks to Banks' Tier I Capital

Notes: 1. The risks are estimated based on the assumption that market interest rates rise by 100 bps at all maturities.
2. Bank of Japan estimation.

accelerating, especially for the major banks. Given the continued turmoil in the global financial market, it is increasingly important for Japanese banks to properly manage their funding liquidity risk in terms of foreign currency as well as yen.

4. Interest rate risk

Next, interest rate risk in the banking books of the major banks and the regional banks is examined.

First, the average length of time for the renewal of the interest rates (hereafter, average maturity) of major items in the banking books is examined (Chart 2-27). On one hand, the average maturity of bonds was shortening both for the major banks and the regional banks. On the other hand, the average maturity of loans was lengthening especially for the regional banks. Against such a background, the maturity gap between assets and liabilities remained almost unchanged for both the major banks and the regional banks. For the regional banks it was 1.22 years, double that of the major banks (0.59 years).

The ratio of interest rate risk relative to banks' Tier I capital (Chart 2-28 [1]) was at a restrained level of 10 percent for the major banks, while it was higher at 25 percent for the regional banks, reflecting the aforementioned difference in the maturity gap between assets and liabilities.

Decomposing changes in the ratio of interest rate risk relative to banks' Tier I capital from the previous period (Chart 2-28 [2]), the increase in Tier I capital and the decrease in interest rate risk of bonds were both pushing down the overall ratio, whereas by contrast, the increase in interest rate risk of loans was pushing up the overall ratio. The contribution of interest rate risk of loans to increase in the overall interest rate risk was particularly large for the regional
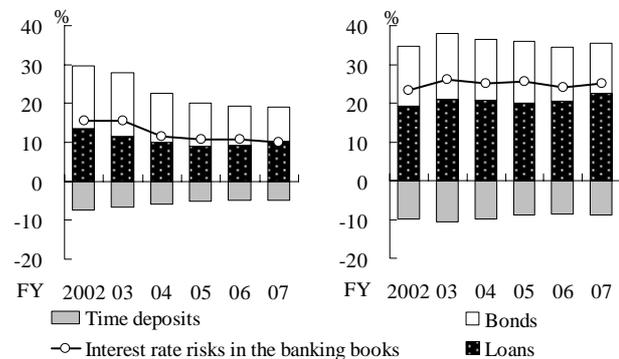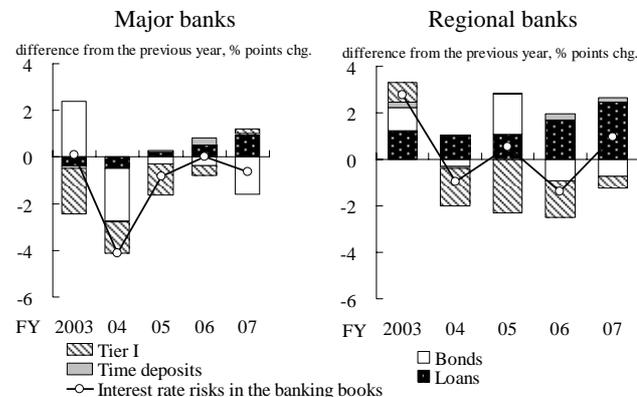
banks.

In this regard, the relationship between the average maturity of loans and the change in interest rates on loans during the second half of fiscal 2007 for the regional banks shows that it was negatively correlated (Chart 2-29). In other words, during the period of market rate rises, banks with longer average maturity of loan portfolios had more difficulty in reflecting market rate rises on their loans; their profits were thus more likely to be squeezed. That is examined thoroughly in Chapter III, where the results of interest rate risk simulations are shown.

5. Risk in alternative investments

Finally, "alternative investments" such as investments in structured products, credit products, and hedge funds – the financial products that have risk-return profiles different from the traditional assets – are reviewed.

When the sum of "other securities" and "monetary claims bought" on banks' balance sheets is used to estimate the trend of the size of alternative investments, its outstanding amount and share in the total securities and monetary claims bought started to decline both for the major banks and the regional banks (Chart 2-30 [1]). It should be noted that some banks had higher shares of alternative investments (Chart 2-30 [2]).

The outstanding amount of investment in credit-related products such as securitized products, hedge funds, and equity investment trusts declined from the first to the second half of fiscal 2007 (Chart 2-31 [1]). Looking at the components of alternative investments, residential mortgage-backed securities (RMBS), mainly originated in Japan, had a large share both for the major banks and the regional banks at the end of fiscal

Chart 2-29: Regional Banks' Average Maturity of Loans and the Changes in Interest Rate on Lending[1,2,3]
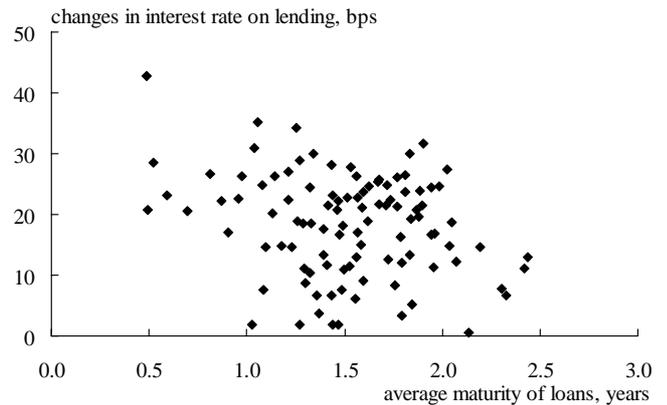
Notes: 1. Bank of Japan estimation.
2. As of the end of the second half of fiscal 2007. The changes in interest rate are between the second half of fiscal 2007 and the first half of fiscal 2006.
3. The observation for 5 of the banks falls outside the chart (i.e., below 0 basis points of changes in interest rates on lending).

Chart 2-30: Alternative Investments
[1] Sum of "Other Securities[1]" and "Monetary Claims Bought[2]"
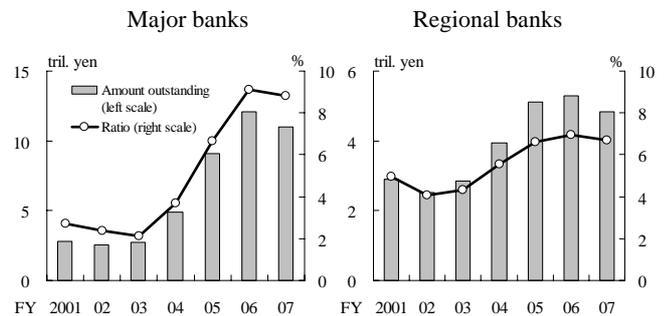
[2] Ratio of the Sum to Total Securities[3]
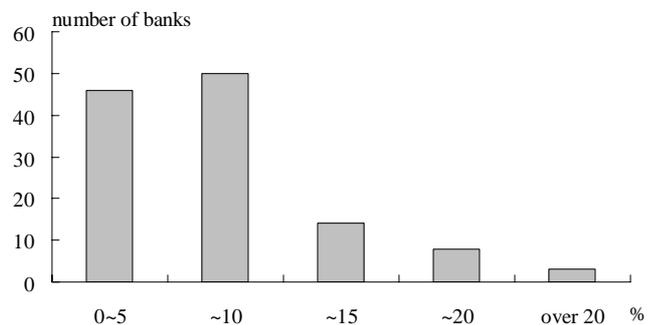
Notes: 1. "Other securities" refer to banks' holdings of securities other than government bonds, corporate bonds, and stocks.
2. "Monetary claims bought" include beneficial interests in trust.
3. Total securities include monetary claims bought.

Chart 2-31: Banks' Alternative Investments by Type[1]

[1] Portfolios

Major banks   Regional banks

- ■ Investment trusts
- ⊞ Hedge funds
- ▦ Multi-layered structured credit products and others
- ▨ ABS collateralized by corporate claims [2]
- ▧ ABS collateralized by retail claims [3]
- ☐ CMBS
- ☐ RMBS
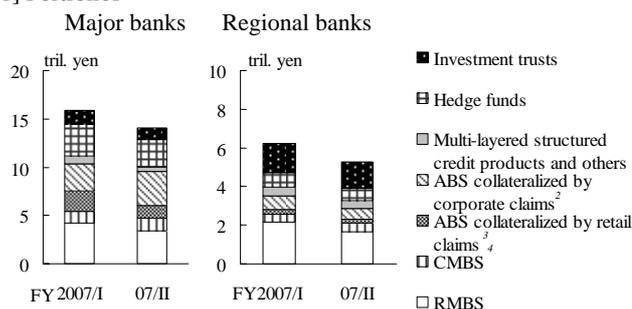
[2] Ratios of Risks to Tier I Capital[5]

Major banks   Regional banks

- ■ Investment trusts
- ⊞ Hedge funds
- ▨ ABS collateralized by corporate claims [2]
- ▧ ABS collateralized by retail claims [3]
- ☐ CMBS [4]
- ☐ RMBS
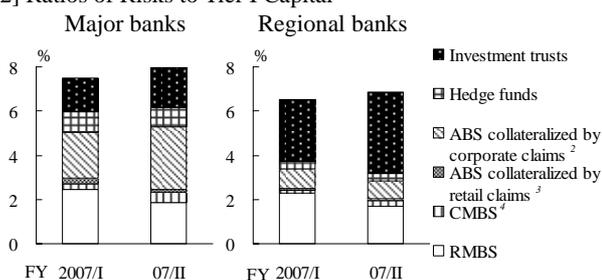
Notes: 1. The definition of alternative investments here is different from that of Chart 2-30. For example, some RMBS are not included in Chart 2-30.
2. Lease claims for example.
3. Credit card claims for example.
4. Commercial mortgage-backed securities.
5. Bank of Japan estimation. As measured by 1-year, 99 percent VaR (using Lehman indices, Dow Jones hedge fund indices, and TOPIX as risk factors). The composition of multi-staged products and others is assumed to be the same as that of the other part of the securitization portfolio.

Chart 2-32: Capital Adequacy Ratios and Tier I Capital Ratios[1]

Major banks   Regional banks

- —○— Capital adequacy ratio
- --□-- Tier I capital ratio

Note: 1. On a consolidated basis.

2007. However, for the major banks, corporate-related structured credit products that include corporate loans, such as leasing receivables, as underlying assets had the largest share, since the major banks sold many RMBS in the second half of fiscal 2007.

The ratio of risk to Tier I capital in credit-related investment portfolios slightly increased in the second half of fiscal 2007, due to an increase in corporate-related products for the major banks and investment trusts for the regional banks. It remained around at 8 percent for the major banks and 7 percent for the regional banks (Chart 2-31 [2]).

Despite the efforts of both the major banks and the regional banks to reduce their investment amount on credit-related products, banks' total risks increased due to heightened volatility. While risks from investment on credit-related products seemed to remain within manageable levels as a whole, many credit-related products have complex risk characteristics, as reaffirmed through the experience of the U.S. subprime mortgage problem. Consequently, it is critical for the banks to properly evaluate and manage products' risk-return profiles and their changes.

D. Banks' Capital

1. Banks' capital adequacy ratios

Banks' capital adequacy ratios that had continued to improve in recent years came to a halt at the end of fiscal 2007 for both the major banks and the regional banks (Chart 2-32). The improvement in the core capital adequacy ratios (Tier I ratios) slowed down and showed only a slight rise from the end of fiscal 2006, since the decrease in net income pushed the dividend ratio upward (for the major banks, 7.6 percent at the end of fiscal 2006 to 7.7 percent at the end of fiscal 2007; for the regional banks, 8.3 percent to 8.5 percent

during the same period). The entire capital adequacy ratio taking supplementary capital (Tier II capital) as the numerator decreased from fiscal 2006 due to a fall in stock prices mainly for the major banks, most of which are allowed to include unrealized gains on securities in Tier II capital by the international standards (for the major banks, 12.6 percent at the end of fiscal 2006 to 11.7 percent at the end of fiscal 2007; for the regional banks, 10.6 percent to 10.5 percent during the same period).

Looking at the components of the capital adequacy ratio (Chart 2-33), both at the major banks and the regional banks, the pace of increase in ordinary stocks and retained earnings decelerated somewhat, and unrealized gains on securities substantially decreased in fiscal 2007. As a whole, at the major banks, the proportions of preferred stocks, preferred securities (included in Tier I capital), and subordinated debt and unrealized gains on securities (included in Tier II capital), remained at high levels. For regional banks, it should be noted that a bank with a lower Tier I ratio tends to have a smaller weight of Tier I capital in the total capital (Chart 2-34). In that respect, increasing the level of Tier I capital and enhancing the quality of the overall capital remain important challenges for the major banks.

Focusing on unrealized gains/losses on securities, an asymmetry should be noted, that unrealized gains are not included in Tier II capital in the case of banks subject to domestic standards, while unrealized losses are deducted from Tier I capital regardless of whether banks are subject to domestic or international standards.

With respect to the banks that experienced a decline in Tier I capital due to unrealized losses on securities, under a fall in stock prices towards the end of fiscal

Chart 2-33: Composition of Capital[1,2,3]

Major banks
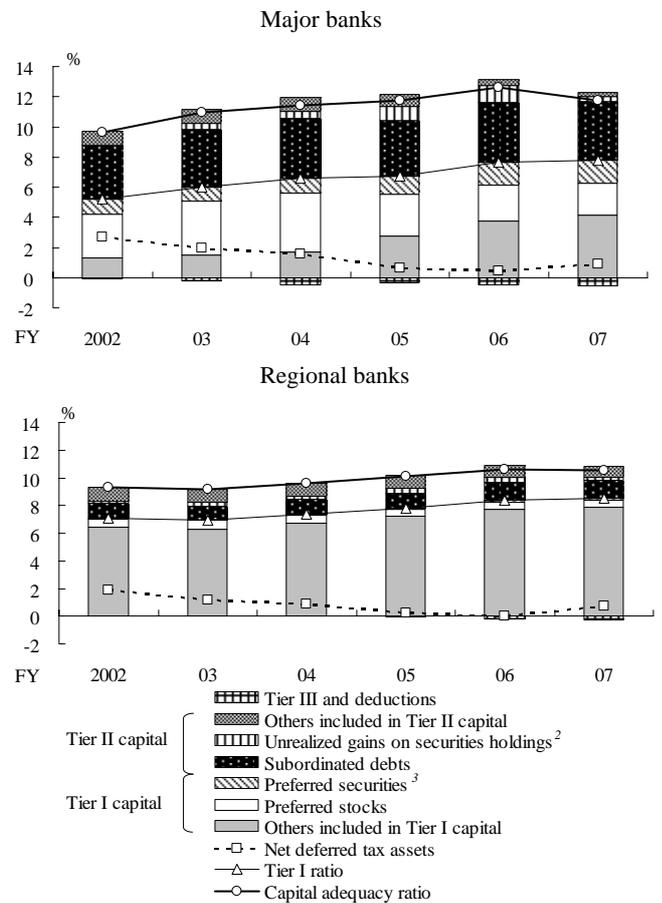
Regional banks

Notes: 1. On a consolidated basis.
2. Only banks subject to the international standard are allowed to include unrealized gains in Tier II capital. The proportion of unrealized gains at the regional banks is smaller than that at the major banks, many of which are subject to the international standard.
3. Issued by consolidated offshore special purpose companies.

Chart 2-34: Tier I Ratio and Proportion of Tier I Capital to Total Capital[1]
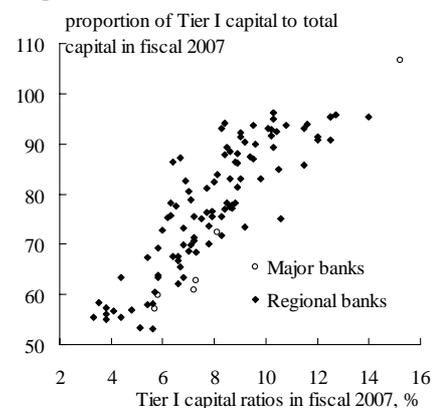
Note: 1. Exclude the banks that are subject to international standards and Ashikaga Bank.

Chart 2-35: Percentage of Banks Registering Net Unrealized Losses on Securities[1]
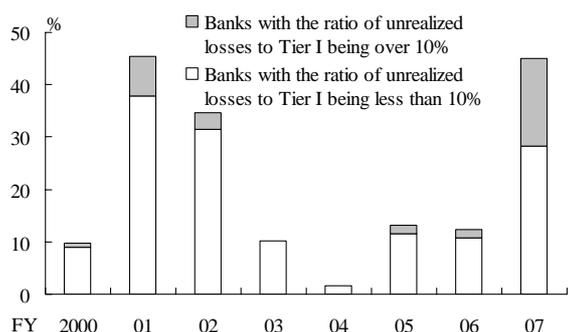
Note: *1*. The percentage of banks registering net unrealized losses on securites.

Chart 2-36: Repayment of Public Funds
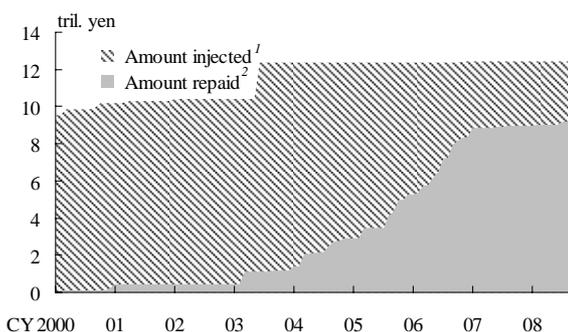
Notes: *1.*The sum of public funds injected pursuant to the Early Strengthening Law, the Financial Function Stabilization Law, the Deposit Insurance Law, the Financial Reorganization Promotion Law, and the Financial Functions Strengthening Law.
    2. At face value.
Source: Deposit Insurance Corporation of Japan.

Chart 2-37: Banks' Risk-Weighted Assets[1]
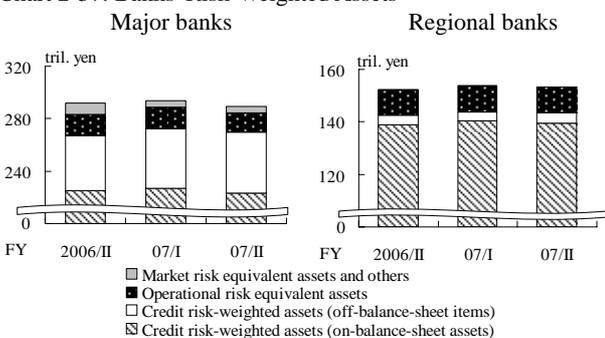
Note: *1*. On a consolidated basis.

Chart 2-38: On-Balance-Sheet Assets (Credit Risk-Weighted Assets)[1]
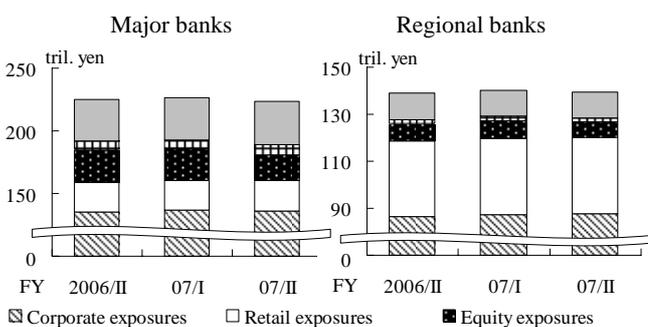
Note: *1*. Refer to Chart 2-37, general note.

2007, almost 50 percent of Japanese bank experienced unrealized losses on securities and deducted them from Tier I capital (Chart 2-35). The number of banks that incurred unrealized losses is close to a level in fiscal 2001 and 2002 when the stock prices marked a recent bottom. Unrealized gains on securities are considered to serve as buffers for banks' financial positions, but for many banks, their buffer role appears to be weakening.

Meanwhile, banks continued to repay public funds. As a result, 9.2 trillion yen of the total public funds injected since 1998 (approximately 12.4 trillion yen) had been repaid by the end of August 2008 (Chart 2-36). While the pace of repayment slowed after the three mega-financial groups fully repaid public funds in fiscal 2006, repayment continues by way of, for example, stock cancellation.

2. Banks' risk-weighted assets

Banks' risk-weighted assets remained almost unchanged for the major banks and the regional banks (Chart 2-37). The share of on-balance-sheet items in the risk-weighted assets was about 80 percent for the major banks and 90 percent for the regional banks. At the major banks, off-balance-sheet items increased steadily.

Developments in components of risk-weighted assets are examined in detail below. The components of on-balance-sheet risk assets (Chart 2-38) remained almost unchanged for both the major banks and the regional banks, although a decline in equity exposures at the major banks was slightly larger, reflecting the fall in stock prices. Risk assets with respect to the corporate sector accounted for about 60 percent of the total assets both for the major banks and the regional banks. For other items, the share of equity exposure was relatively high at the major banks, while the share

of retail exposure was relatively high at the regional banks. With respect to securitization exposures, while the outstanding amount was gradually increasing, their share in total assets remained low at 3 percent.

Average risk weights of on-balance-sheet assets were declining somewhat both for the major banks and the regional banks (Chart 2-39).

Off-balance-sheet items increased centering on derivatives-related item both for the major banks and the regional banks (Chart 2-40). In particular, at the major banks, the proportion of derivatives-related item was steadily rising, which suggests an increase in the use of derivatives for hedging interest rate and foreign exchange rate risks as well as short-term transactions. At the regional banks, while the share of derivatives-related item was also rising, the share of off-balance-sheet items in the risk-weighted assets remained small.

3. Balance between risk and capital

Finally, assessing the amount of risks relative to the level of banks' capital, the sum of credit risk, market risk associated with stockholdings, interest rate risk, and operational risk was restrained on the whole both for the major banks and the regional banks (Chart 2-41).

The amount of credit risk became smaller than in the past both for the major banks and the regional banks. For the major banks, market risk associated with stockholdings continued to account for the largest share in the overall amount of risks, while for the regional banks the amount of interest risk has a relatively larger share than the major banks.

Both the major banks and the regional banks should, by taking account of characteristics of their own portfolios, evaluate objectively the balance between

Chart 2-39: Average Risk Weights[1]
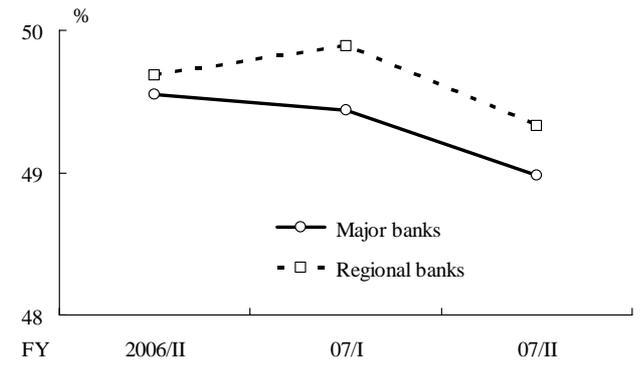
Note: 1. Bank of Japan estimation.

Chart 2-40: Off-Balance-Sheet Items (Credit Risk-Weighted Assets)[1]
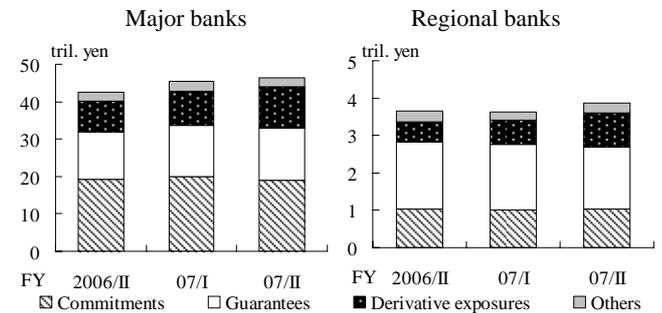
Note: 1. Refer to Chart 2-38, general note.

Chart 2-41: Overall Amount of Risk and Tier I Capital[1]
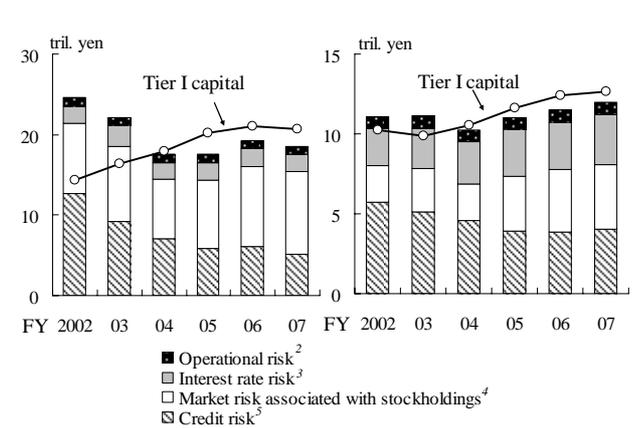
Notes: 1. Bank of Japan estimation.
2. Operational risk is defined to be 15 percent of gross profits based on the Basel II basic indicator approach.
3. Interest rate risk is limited to yen-denominated bond portfolios and calculated by the same method as in Chart 2-28.
4. Market risk associated with stockholdings is calculated by the same method as in Chart 2-24.
5. Credit risk is calculated by subtracting the expected loss (EL) from the maximum loss (EL + UL) based on the Basel II risk weight formulas with a confidence interval of 99 percent. In the estimation, borrowers classified as requiring "special attention" or below (in terms of credit quality) are considered to be in a state of default.

Chart 2-42: Net Income/Loss

Chart 2-43: Contributions to Changes in Net Income/Loss

Chart 2-44: Net Interest Income

the amount of total risks and their capital, thereby improving the efficiency of capital allocation.

E. Developments at *Shinkin* Banks

This section reviews the business conditions of *shinkin* banks that hold current accounts at the Bank of Japan (hereafter, the *shinkin* banks; consisting of 268 *shinkin* banks as of end-March 2008).

Net income of the *shinkin* banks in fiscal 2007 declined to almost 30 percent of that in fiscal 2006. The decline in net income was the first after fiscal 2001 (Chart 2-42). Looking at the factors contributing to the decline in net income (Chart 2-43), while general and administrative expenses rose, net interest income, which had been underpinning the recent increase in net income, turned negative. Increase in write-offs on securities by some *shinkin* banks was also included in "others" as a negative contribution to total changes.

Looking at net interest income components (Chart 2-44), net interest income and dividends on securities, which had underpinned net interest income amid a continued decrease in net interest income on loans, became sluggish. The decrease of net interest income on loans was due to the continued narrowing of total interest margins on loans. If those margins are broken down into changes in interest rates on lending and changes in interest rates on interest-bearing liabilities for individual *shinkin* banks, the extent of increase in interest rates on lending varies considerably, as was the case with the regional banks (Chart 2-45). There were some *shinkin* banks whose interest rates on lending declined despite an increase in interest rates on interest-bearing liabilities, resulting in further delay in the widening of interest rate margins compared with the major banks and the regional banks.

The credit cost ratio is on an increasing trend after
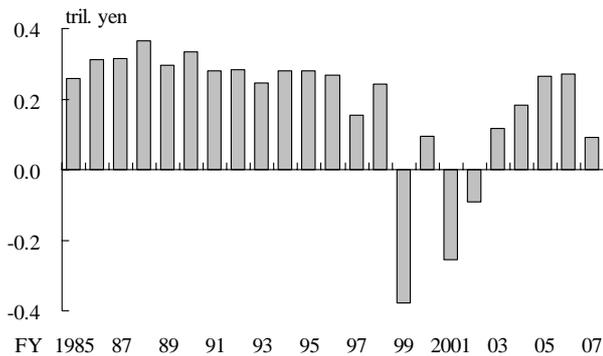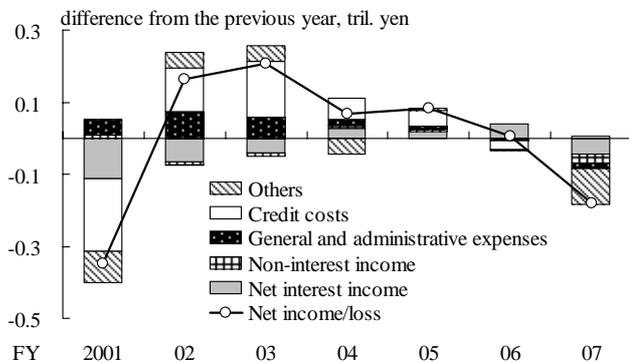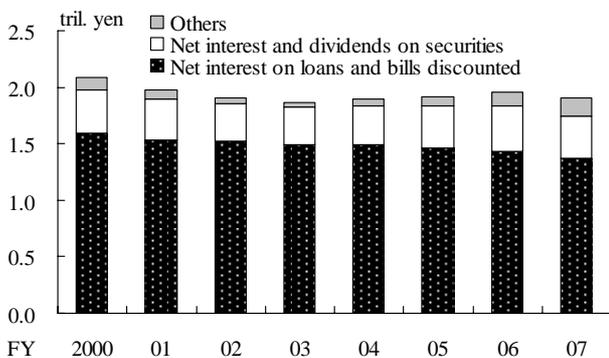
bottoming out in fiscal 2005 (Chart 2-46). Comparing the distribution of credit cost ratios for individual *shinkin* banks between fiscal 2006 and fiscal 2007, the number of the *shinkin* banks receiving reversals in loan-loss allowances as negative credit cost increased, but the number of those with credit cost ratios beyond 200 bps also increased.

A decline in NPL ratios is likely to come to a halt at levels even higher than those of the regional banks (Chart 2-47). Distribution of individual banks shows that there were improvements in the *shinkin* banks whose NPL ratios were below 10 percent, while there was little change in those equal to or more than 10 percent.

With respect to the *shinkin* banks' capital adequacy ratios, while they have been maintained at higher levels relative to minimum required levels, their upward trend came to a halt in fiscal 2007, and both Tier I ratios and capital adequacy ratios declined (Chart 2-48). Looking at individual *shinkin* banks' capital ratios, large dispersion continued, ranging from those over 20 percent to those in single digits.

In sum, for the *shinkin* banks as a whole, their improvement in profitability leveled off at present due to a slowdown in the growth of net interest income. While their financial bases showed little change as a whole, it seems that dispersion between individual *shinkin* banks widened. Taking account of the different business climates individual *shinkin* banks face, they are expected to continue striving for profitability improvement while tackling with challenges, such as enhancing regional financial services and promoting further disposal of NPLs.

F. Developments at Securities Companies

According to the financial statements of Japanese

Chart 2-45: Total Interest Margin on Loans[1,2]
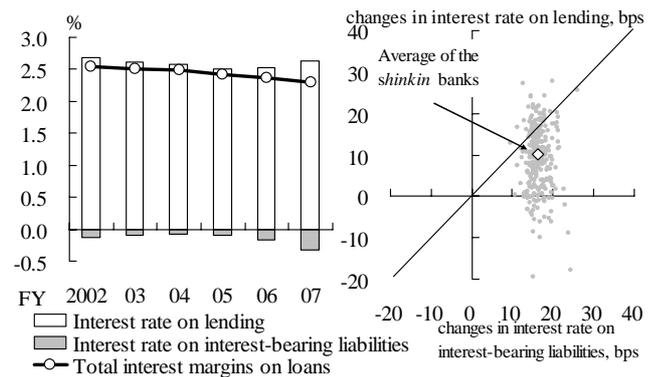
Notes: 1. The observation for one of the *shinkin* banks falls outside this chart.
2. Changes are between fiscal 2007 and fiscal 2006.

Chart 2-46: Credit Cost Ratios
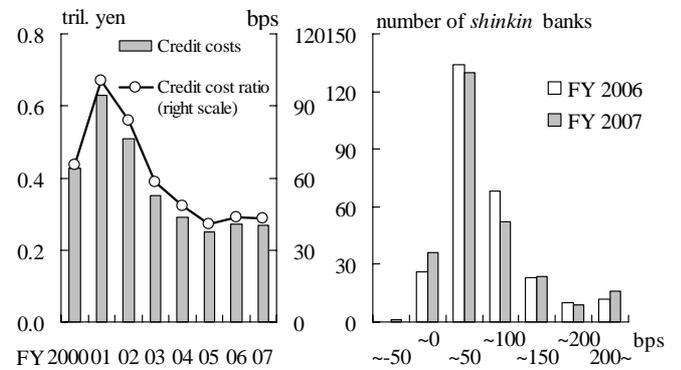
Chart 2-47: NPL Ratios and the Amount of NPLs[1]
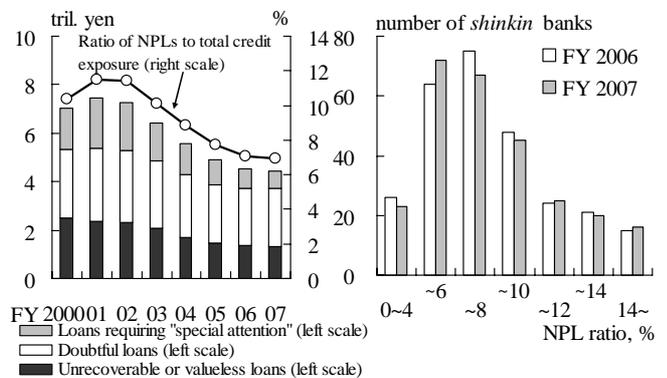
Note: 1. NPLs disclosed under the Financial Reconstruction Law.

Chart 2-48: Capital Adequacy Ratios
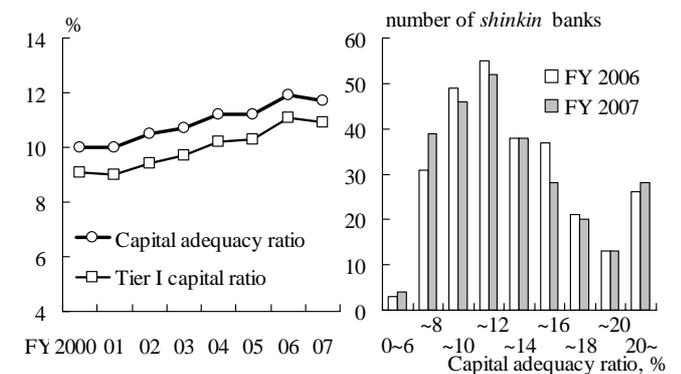
Chart 2-49: Net Incomes/Losses of Securities Companies
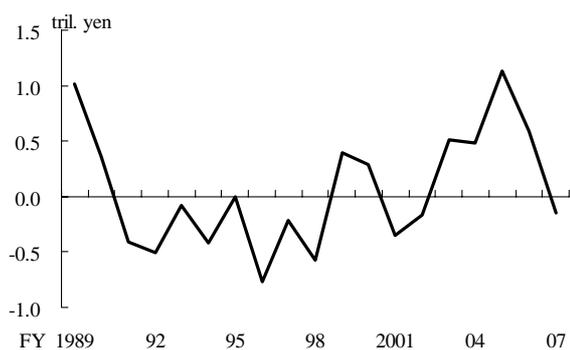
Source: Japan Securities Dealers Association.

Chart 2-50: Shares of Components in Net Operating Revenues

☒ Net trading income and others
☐ Other fees received
⊞ Flotation and distribution fee
▩ Underwriting and distribution commission
▨ Commission to consignees
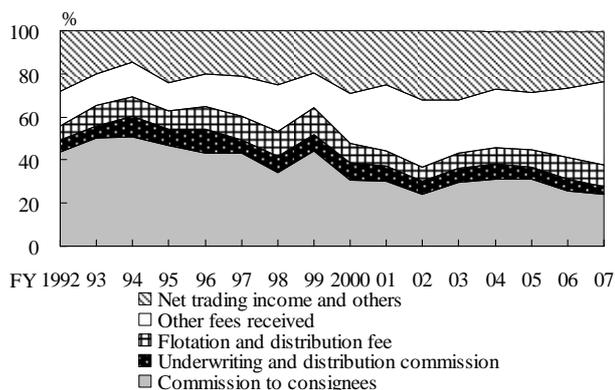
Source: Japan Securities Dealers Association.

Chart 2-51: Commission Rate[1]
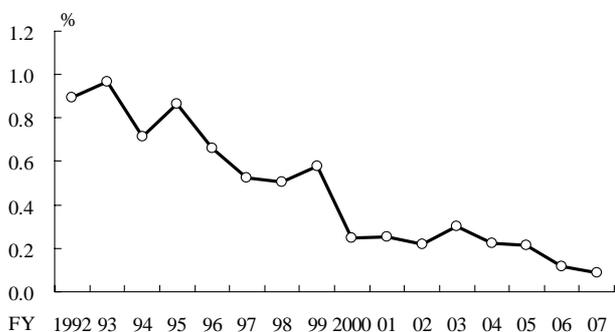
Note: 1. Commission rate = commission to consignees / equity trading volume.
Sources: Japan Securities Dealers Association; Tokyo Stock Exchange.

Chart 2-52: Equity Trading Volume and Commissions to Consignees
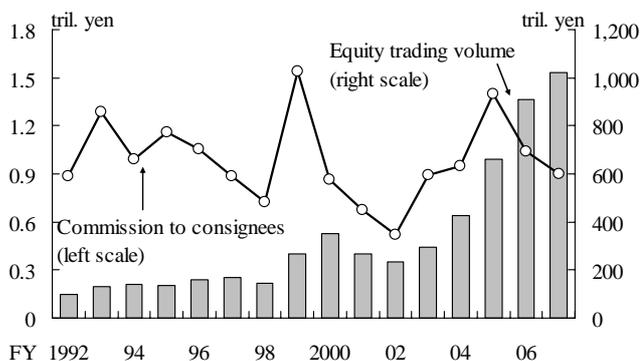
Sources: Japan Securities Dealers Association; Tokyo Stock Exchange.

securities companies for fiscal 2007 (on a non-consolidated basis; 308 companies as of end-March 2008), current net income decreased for two consecutive years and registered a loss for the first time in five years due to a decline in fee income reflecting stagnant stock market (Chart 2-49).

Meanwhile, with regard to the components of net operating profit – the main profit of securities companies –, "commission to consignees," which constituted around 40 to 50 percent of net operating revenues in past years, declined to around 25 percent, whereas "other fees received," such as advisory fees related to M&A and securitization, agent fees for investment trusts, rose to nearly 40 percent from less than 10 percent in past years (Chart 2-50). Developments in commissions to consignees and other fees received are examined in detail below.

1. Commissions to consignees

First, commissions to consignees constituted a major share of securities companies' profit, but since they were prone to fluctuations in the stock market, they were regarded as an unstable source of income. In addition, profitability observed in the commission rate showed a declining trend (Chart 2-51). Against such a background, recent developments in commissions to consignees showed that during fiscal 2006 and 2007, despite an increase in the trading value of stock brokerage, income from commissions to consignees declined (Chart 2-52).

Behind this are three reasons: (1) due to liberalization of commissions and fees in stock brokerage that was implemented in stages from fiscal 1994, commission rate further declined; (2) more recently, institutional investors with relatively low commission rates were becoming the main entity in stock brokerage (Chart 2-53); and (3) individual investors with higher

commission rate than institutional investors were also starting to shift to less expensive on-line transactions (Chart 2-54).

2. Other fees received

Other fees received include diverse items such as advisory fees related to M&A and securitization and agent fees for investment trusts, and it is difficult to analyze respective items due to data constraints. The analysis below focuses on agent fees of investment trusts.

Net assets outstanding of investment trusts (publicly offered investment trusts) sold by securities companies followed an increasing trend after fiscal 2002, exceeding more than 30 trillion yen in fiscal 2007 (Chart 2-55). If the agent fee rate of investment trusts is set at the recent average level of 0.5 to 0.6 percent, agent fees that securities companies received in fiscal 2007 would be around 160 to 200 billion yen. Considering that all agent fees were generated from domestic securities companies, since many of the foreign securities companies did not conduct retail business, the proportion of agent fees for investment trusts in other fees received might reach approximately 30 percent for domestic securities companies.

3. Retail business of securities companies

As such, the source of income for securities companies in the retail sector shifted from commissions to consignees to other fees received. From a different perspective, this could be regarded as a consequence of securities companies' effort in selling investment trusts to compensate for the declining profitability of stock brokerage fees. Nevertheless, whether such a shift in the source of income will become established or not depends on the continuity of the steady increase in net assets outstanding of investment trusts.

Chart 2-53: Share of Equity Trading Volume by Customer Type

Source: Tokyo Stock Exchange.
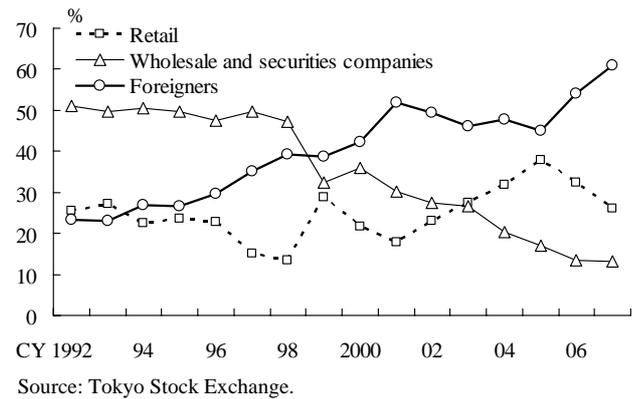
Chart 2-54: Share of Major Online Securities Companies' Volume in Total Retail Trading Volume[1]
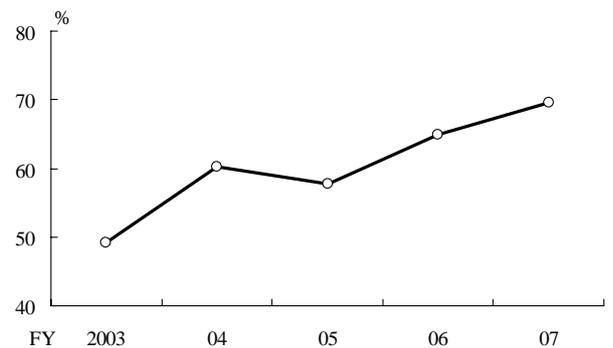
Note: 1. Major online securities companies comprise SBI Securities, Matsui Securities, Monex, kabu.com Securities, and Rakuten Securities.

Sources: Tokyo Stock Exchange; Jasdaq Securities Exchange; Published accounts.

Chart 2-55: Total Net Assets of Publicly Offered Stock Investment Trusts and Estimated Agency Commissions
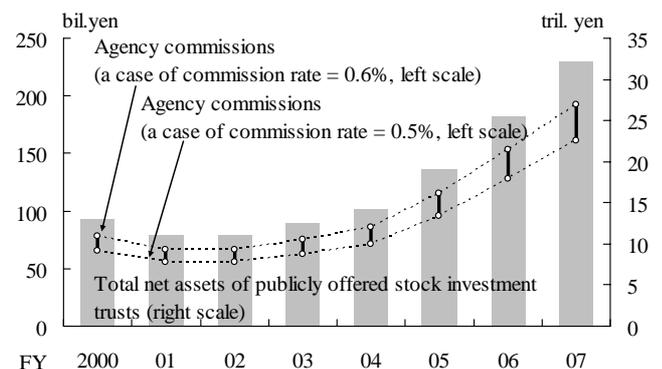
Note: 1. Agency commissions of investment trusts include the commissions paid to securities companies through investment trust management companies in exchange for services to the payment of dividends to investors, the delivery of management reports, and others. Agency commissions are paid in proportion to the net worth of investment trusts sold by securities companies.

Source: The Investment Trusts Association, Japan.

III. Robustness of the Financial System

This chapter first examines the interaction between the financial system and economic activity from the viewpoint of procyclicality of the financial system. Then it examines the robustness of Japan's financial system through macro stress-testing on interest rate risk, credit risk, and market risk associated with stockholdings. In addition, this issue conducts stress testing on real estate-related loan portfolio.

It should be noted that various stress scenarios used in each stress-testing are set to crystallize the risks of the banking sector, and the Bank does not necessarily assume that risks will manifest themselves.

A. Interaction between the Financial System and the Economy

1. Procyclicality of the financial system

Triggered by the U.S. subprime mortgage problem, a mechanism has come to the fore in which financial institutions' behavior is influenced by economic fluctuations and in turn amplifies the fluctuations, the so-called procyclicality of the financial system. In particular, since the new framework for capital adequacy requirements (Basel II) is more risk-sensitive than Basel I, discussion of procyclicality has been drawing increasing attention from the viewpoint of whether regulatory and institutional factors have amplified economic fluctuations by inducing changes in the behavior of financial institutions.

The mechanism of procyclicality of the financial system needs to be considered in three stages: (1) changes in banks' capital adequacy ratios; (2) changes in banks' credit exposures; and (3) changes in the magnitude of economic fluctuations (Chart 3-1).

Chart 3-1: Procyclicality of the Financial System[1]
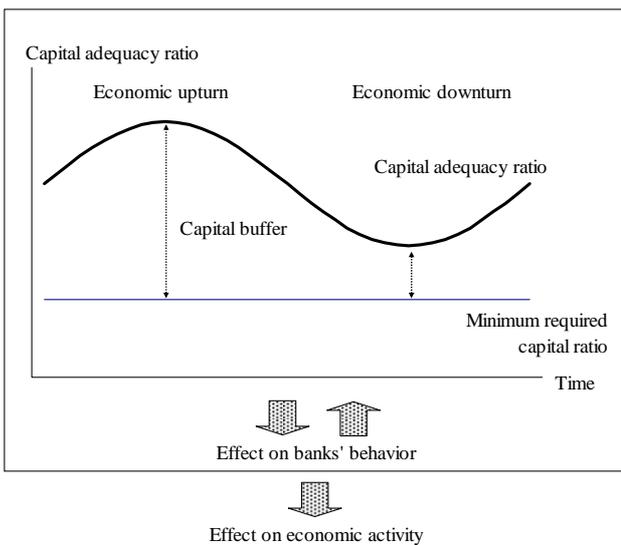
Note: *1.* Banks' capital buffers are depicted as the excess capital adequacy ratio beyond the required level, which is constant over time. At the same time, if banks' capital buffers are considered in relation to their economic capital, which banks determine in consideration of their risk profiles, the required level may vary depending on time or financial and economic circumstances.

The Basel II framework is intended to encourage more proper risk management for financial institutions by increasing risk sensitivity, and thus the aforementioned first stage of inducing changes in banks' capital adequacy ratios in parallel with economic fluctuations might have been increased. For example, during the economic downturn, banks' capital adequacy ratios could decline due to an increase in the risks of credit portfolios.

However, whether changes in banks' capital adequacy ratios and required capitals could lead to the aforementioned second and third stages depends greatly on the levels of banks' capital and conditions of the financial system. If banks hold sufficient capital buffers, the gap between actual capital and minimum required capital, it might help avoid a situation in which banks' behavior would be affected due to capital constraints, even in an economic downturn. In addition, as discussed later, changes in banks' lending caused by external shocks and economic fluctuations amplified by banks' lending could be substantially influenced by an economic or financial environment such as asset price fluctuations and conditions of the balance sheets of firms and households.

Under Basel II that increased risk sensitivity to risk-weighted assets compared with Basel I, the regulatory capital (the minimum required capital) based on the first pillar of the framework may co-move positively with economic fluctuations. However, economic capital, stipulated in the second pillar, might not necessarily co-move positively with economic fluctuations, since it reflects banks' assessment after considering the risk profile. Therefore, in considering whether Basel II increases the procyclicality of the financial system, proper implementation of the second pillar, which is based on banks' own assessment of their economic capital, will be critical. For example, if

financial institutions could build up their capital during an economic upturn in anticipation of a rise in credit costs during a future economic downturn, the procyclicality of the financial system might be attenuated.

2. Co-movement of the capital buffer and business cycle

Next, the extent of co-movement between individual banks' capital buffers – excess capital beyond the minimum required level – and business cycle is analyzed for the major banks and the regional banks (see Box 4 for details).

Here, the capital buffer is defined as a portion of a bank's excess capital to the required level. Estimations are carried out using system GMM (generalized method of moments), with the capital buffer as a dependent variable, and a lagged dependent variable that takes into account the adjustment cost of the capital buffer, a business cycle indicator (output gap), and a bank-specific factor (ROE) as explanatory variables.

Data samples range from fiscal 1989 to fiscal 2005 for the major banks and the regional banks, and estimations are carried out for the full sample, up to fiscal 1997 as the first-half subsample, and from 1998 as the second-half subsample. However, for the regional banks that follow domestic standards, estimations are carried out only with subsamples that are divided in two periods – up to fiscal 1997 and from 1998 – given that those banks adopted gearing ratios, which use the capital account and total assets on the balance sheet as the numerator and denominator, respectively, as capital adequacy ratios until fiscal 1997.

In case capital buffers have positive co-movement with

the business cycle, where capital buffers increase with an economic upturn and decrease with an economic downturn, banks boost their risk assets to a lesser extent, compared with the accumulation of capital and raise their capital buffers during the economic upturn. On the other hand, during an economic downturn, banks maintain their risk assets and absorb risks using their own capital buffers. Consequently, the banking sector smooths out fluctuations in risk assets over time within their capital positions.

In the estimation results shown in Chart 3-2, the estimated parameter of the output gap for the major banks is negative and significant for the full sample and the first-half subsample, but insignificant for the second-half subsample. For the regional banks, it is positive and significant for both the first- and second-half subsamples. The results suggest a possibility that, in the second half of the 1990s when financial system uncertainty mounted, banks' insufficient capital constrained the lending behavior of financial institutions in the major bank sector.

The estimates for the lagged capital buffers are positive and significant for all sample periods for both the major banks and the regional banks. This suggests banks' capital buffers are adjusted only gradually because of significant adjustment costs.

In addition, the estimates for ROE are positive and significant for the second-half subsample of the major banks and first- and second-half subsamples of the regional banks. This illustrates that, especially for the second-half subsample, amid recovering profits, the banks attempted to restore their capital positions that had been eroded by the NPL problem.

Chart 3-2: Estimation Result for the Equation for Capital Buffer[1]

Model : $BUF_{i,t} = \gamma + \alpha BUF_{i,t-1} + \beta_1 GAP_t + \beta_2 ROE_{i,t} + u_{i,t}$

BUF[1] : Capital buffer (actual capital less capital requirements over capital requirements)

GAP : Output GAP (Bank of Japan estimation)

ROE : ROE

Method : System GMM

	Major banks					
	Full sample FY 1989-2005		First-half FY 1989-97		Second-half FY 1998-2005	
	Coef.	P-value	Coef.	P-value	Coef.	P-value
BUF(-1)	0.757	0.00	0.337	0.00	0.859	0.00
ROE	0.198	0.33	-0.251	0.20	4.440	0.02
GAP	-1.770	0.00	-0.876	0.00	-0.745	0.97
Cconstant	4.135	0.22	11.888	0.00	21.323	0.67
2nd & international standard dummy	9.337	0.18	---	---	---	---
2nd & domestic standard dummy	59.480	0.01	---	---	17.044	0.58
Sargan test:	26.450	1.00	18.220	1.00	16.050	1.00
AR(2) test:	-0.335	0.74	-0.519	0.60	-0.001	1.00

	Regional banks			
	First-half FY 1989-97		Second-half FY 1998-2005	
	Coef.	P-value	Coef.	P-value
BUF(-1)	0.771	0.00	0.636	0.00
ROE	0.552	0.07	1.411	0.00
GAP	1.040	0.00	2.508	0.00
Constant	5.904	0.00	59.352	0.00
Sargan test:	78.170	0.47	54.380	0.16
AR(2) test:	-1.040	0.30	-1.100	0.27

Note: 1. In estimation of the regional banks from fiscal 1989 to 1997, the ratio of net assets to total asset is used as the capital adequacy ratio.

B. Simulation Analysis of Interest Rate Risk

In the same way as in the previous issues of the *Financial System Report*, the interest rate risk of the banks is analyzed by using a simulation model that incorporates the actual balance-sheet structure of the major banks and the regional banks at the base point in time (end of March 2008) as well as their interest-rate-setting behavior in the past.

The analysis is conducted in the following way. First, assets and liabilities according to products and maturities at the end of March 2008 are estimated for both the major banks and the regional banks. It is assumed that funds from every product maturing at each point in time are reinvested in the same product with the same maturity.

Second, with respect to the future path of market interest rates, four scenarios are considered; in addition to (1) a baseline scenario (future short-term interest rates follow the path implied by the forward rate curve at the end of March 2008), (2) a parallel shift scenario, (3) a steepening scenario, and (4) a flattening scenario are prepared (see Chart 3-3 for the assumptions of each scenario).

Third, banks' interest-rate-setting behavior for various products is estimated, using the past values of deposit/lending rates and market rates, and scenario being applied. In the estimation, it is assumed that (1) the spread between time deposit/lending rates and the corresponding market rate with a similar maturity converges on its historical average in the long term; and (2) based on the past rates, the ratio of the ordinary deposit rate to 1-month LIBOR is about 25 percent.

Finally, using the scenarios and the estimation results mentioned above, future capital gains/losses from bond holdings, various interest receipts/payments, and

Chart 3-3: Spot Rate Curves[1]

[1] Baseline Scenario[2]

[2] Parallel Shift Scenario[3]

[3] Steepening Scenario[4]

[4] Flattening Scenario[5]
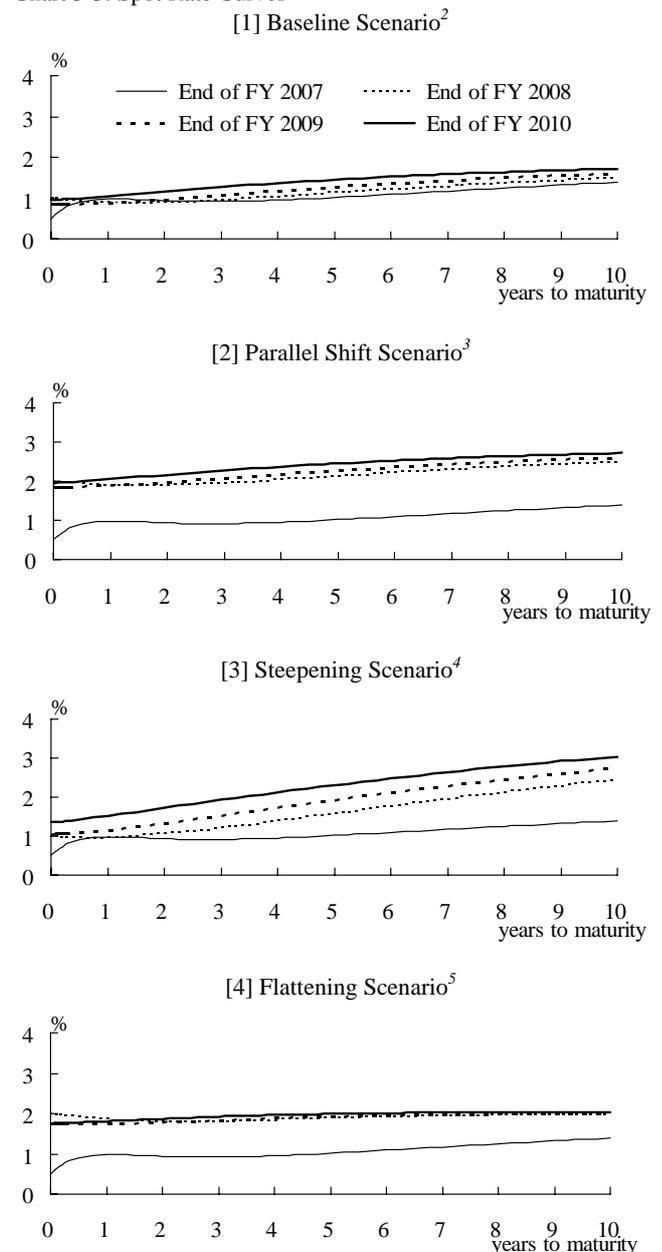
Notes: 1. Bank of Japan estimation.
2. The baseline scenario is that future short-term interest rates follow the path implied by the forward rate curve at the end of March 2008.
3. The parallel shift scenario is that interest rates at all maturities shift upward compared with the baseline scenario by 1 percentage point over the year.
4. The steepening scenario is that the 10-year spot rate shifts upward compared with the baseline scenario by 1 percentage point, and the upward shift becomes smaller as time-to-maturity shortens.
5. The flattening scenario is that the overnight rate shifts upward compared with the baseline scenario by 1 percentage point, and the upward shift becomes smaller as time-to maturity lengthens, thereby flattening at the level of the long-term forward rate.

Chart 3-4: Impact of Rises in Market Interest Rates on Banks' Profit[1,2]

[1] Baseline Scenario

Major banks

Regional banks

- ▢ Net interest income
- ▢ Capital gains/losses on bond holdings
- ○ Total

[2] Parallel Shift Scenario

Major banks

Regional banks

[3] Steepening Scenario

Major banks

Regional banks

[4] Flattening Scenario

Major banks

Regional banks
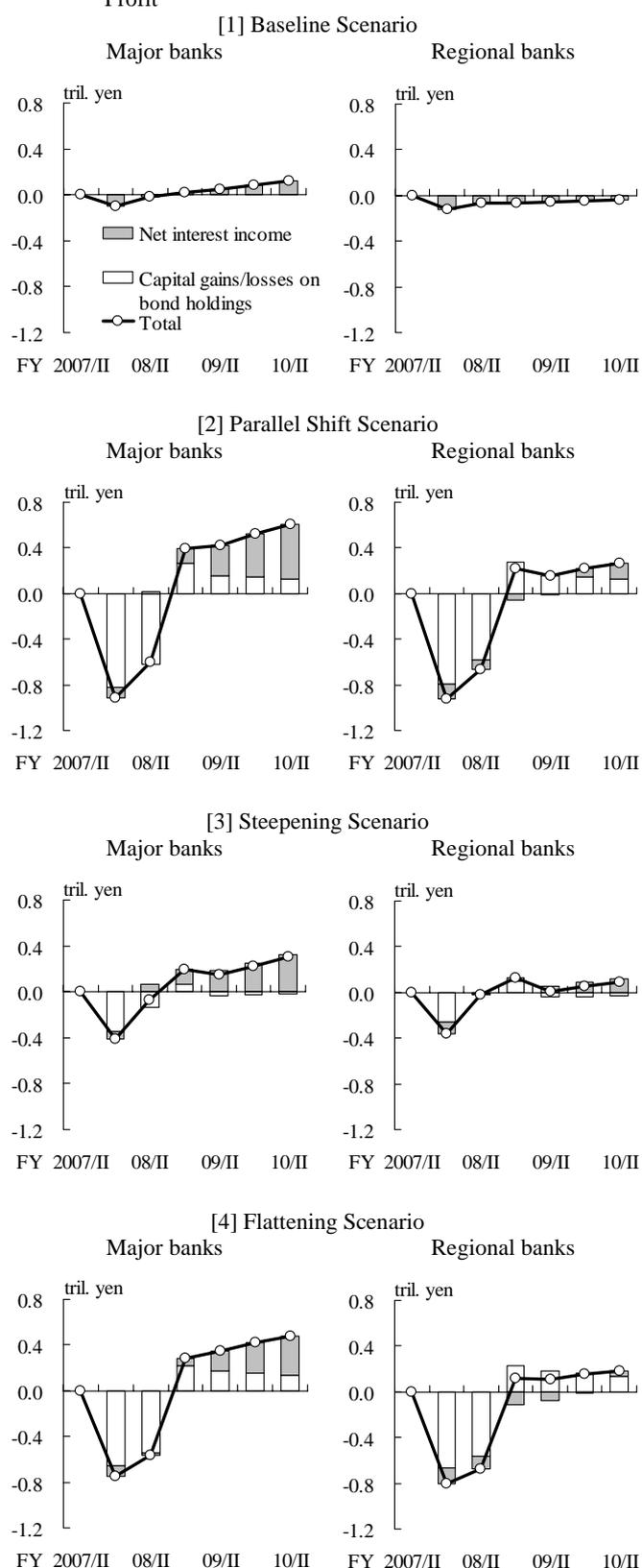
Notes: 1. Bank of Japan estimation. Figures for net interest income are changes from actual results in the second half of fiscal 2007.
2. Net interest income from domestic operations in the second half of fiscal 2007 was 1.9 trillion yen for the major banks and 2.1 trillion yen for the regional banks.

changes in net interest income are calculated. In three scenarios of upward shifts in yield curves, unexpected yield curve shifts lead to unexpected changes in the present value of bond holdings, which are treated as capital gains/losses from bond holdings as before.

The overall picture of the simulation results can be summarized as follows (Chart 3-4). When the yield curve shifts upward gradually, the increase in interest payments on short-term debt such as deposits and market-based financing tends to exceed the increase in interest income from lending and bond holdings in the short term. Therefore, in all the scenarios, net interest income for both the major banks and the regional banks declines compared with the second half of fiscal 2007. In the medium term, net interest income for the major banks exceeds the initial level at a relatively early stage, while for the regional banks it does not reach the initial level for a while. This reflects the difference in average maturity of both lending and bonds between the major banks and the regional banks. Recovery of net interest income becomes more obvious in the scenarios of upward shifts in yield curves, and the difference in the pace of such recovery also becomes more significant between the major banks and the regional banks.

Looking at the capital gains/losses from bond holdings in three scenarios of upward shifts in yield curves, the capital losses occur in the short term, while they diminish in the medium term. The magnitude of the losses tends to be larger in the cases of parallel shift or flattening scenario compared with the steepening scenario. This is because, under the steepening scenario, hedging effects of floating-rate government bonds become large.

In the meantime, when assumptions of market interest rates are compared with the time of the March 2008

issue of the *Financial System Report*, market interest rates at maturities of one year or longer declined 0.3 percentage point at the maximum, and the yield curve shifted downward compared with that in the last issue (Chart 3-5). Consequently, the result indicates that a future recovery of net interest income will be generally delayed compared with the previous simulation.

In sum, in the baseline scenario, the impact on the changes in net interest income and net capital gains from bond holdings is marginal for both the major banks and the regional banks. In the remaining three scenarios of upward shifts in yield curves, capital losses from bond holdings arise in the short term, while the amount of capital losses remains below the net interest income of the second half of fiscal 2007. In the medium term, net interest income for the major banks recovers, while the recovery is delayed and small at the regional banks due to the long average maturity of their loans and bonds. For banks whose average maturity of loans is lengthening, proper management of interest risk of the entire portfolio is needed through, for example, interest rate swaps or off-balancing the loans, based on the banks' own expectation of the future course of interest rates.

C. Macro Stress-Testing of Credit Risk and Risk Associated with Stockholdings

This section assesses the robustness of Japan's financial system against a severe and prolonged economic downturn from the viewpoints of credit risk and risk associated with stockholdings.

1. Credit risk

As was done in the previous issues of the *Financial System Report*, the robustness against credit risk is assessed by using a framework incorporating a mechanism in which an economic downturn increases

Chart 3-5: Spot Rate Curves[1]
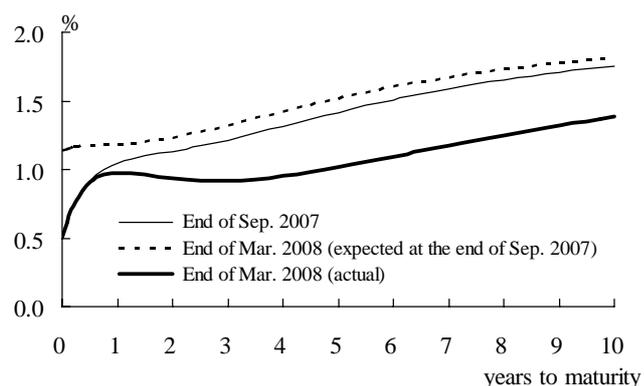
Note: *1*. Bank of Japan estimation.

Chart 3-6: Steps of Macro Stress-Testing

Chart 3-7: Description of Excess Credit Risk and Excess Credit Cost

Probability density

Effects of the stress on credit cost = Excess credit cost

Effects of the stress on credit risk = Excess credit risk

EL for baseline → EL for stress

Max. loss for baseline (99th percentile) → Max. loss for stress (99th percentile)

Loss

——— Loss distribution under the stress scenario

· · · · Loss distribution under the baseline scenario

credit risk by downgrading firms' creditworthiness (see Chart 3-6 and Box 8 of the September 2007 issue of the *Financial System Report*).

The March 2008 issue of the *Financial System Report* introduced "excess credit risk (99th percentile)," which is defined as the difference of the ratio of maximum loss to Tier I capital, between the stress and baseline scenarios. By using the calculated excess credit risk, the robustness was assessed from the viewpoint of to the extent to which incremental credit risk under the stress scenario would impose an additional burden on Tier I capital. In this issue, in addition to the excess credit risk, the difference between the expected loss (EL) under the stress and baseline scenarios (hereafter, "excess credit cost") is used for the assessment (Chart 3-7). The calculated EL can be considered as the upper bound of average credit cost during a certain period. Since credit cost is, in general, covered by making additional provisions out of periodical income, excess credit cost can be interpreted as the indicator to assess the extent to which an increase in credit cost will impose a direct burden on periodical income. Of course, a portion not covered by periodical income needs to be covered by Tier I capital.

As for the path of the real GDP growth rate, in line with the March 2008 issue of the *Financial System Report*, a vector autoregression (VAR) model is constructed using five variables: the real GDP, the CPI (excluding fresh food), the amount outstanding of bank lending, the nominal effective exchange rate, and the overnight call rate. This issue's macro stress-testing uses end-March 2008 as the base point in time, and the baseline scenario assumes no external shock after the second quarter of 2008 to compute a path of the real GDP growth rate. The stress scenario assumes an adverse shock to GDP in the second quarter of 2008 of a size that is likely to occur with a probability of 1

percent on an annualized basis, while subsiding by half in three quarters. The real GDP growth rate in the stress scenario is lower than that in the baseline scenario by about 3.5 percentage points in fiscal 2008, and subsequently recovers to the baseline level in about three years (Chart 3-8).

Chart 3-9 shows the amount of excess credit risk for the major banks and the regional banks in the stress scenario using data on loan portfolios at the end of March 2008. According to the estimate, the increase in the amount of excess credit risk induced by the decline in the real GDP growth rate peaks in fiscal 2009, reaching 25 to 35 percent of Tier I, and subsequently subsides as the GDP growth rate recovers and approaches the baseline level. For the major banks and the regional banks, credit costs to Tier I capital are currently contained at the level of above 20 percent to about 30 percent, as pointed out in Chapter II. Excess credit risk under the stress scenario is estimated to put the same additional impact on banks' capital.

Chart 3-10 shows the excess credit costs calculated based on the same assumptions used in Chart 3-9. The estimate shows that excess credit costs peak in fiscal 2009, the same as with excess credit risk. Excess credit costs relative to loans outstanding are about 1.8 to 1.9 percent. The ratio of excess credit costs to Tier I becomes about 20 to 30 percent, illustrating that most of the excess credit risk is brought about by the excess credit costs. In this regard, break-even credit cost ratios are about 90 bps on average, as seen in Chapter II (Chart 2-22), which suggests that almost half of the excess credit risk could be covered by operating profits.

Consequently, judging from the capital buffers of the major banks and the regional banks as a whole, it appears that the levels of excess credit risk and excess

Chart 3-8: GDP Growth Rate under Stress Scenario: Deviation from Baseline Scenario[1,2]
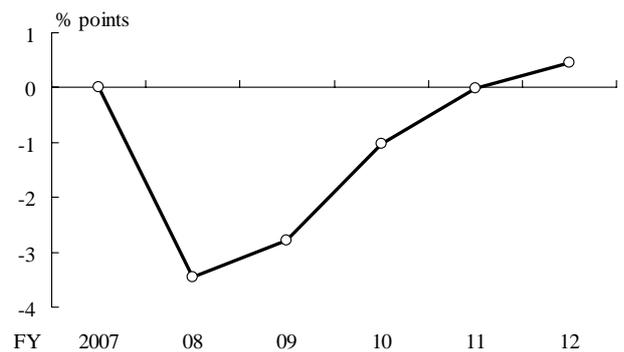
Notes: 1. The stress scenario is the real GDP growth rate under the assumption of an adverse shock to GDP in the second quarter of 2008.
2. Bank of Japan estimation.

Chart 3-9: Excess Credit Risk[1,2]
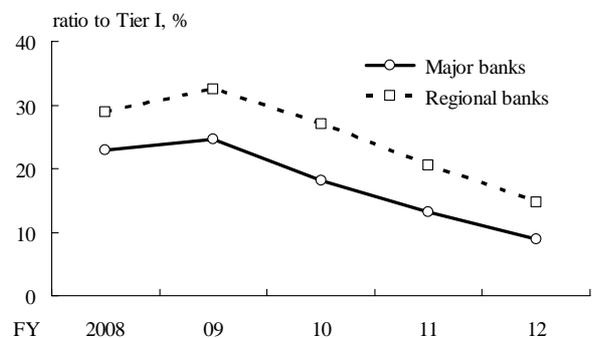
Notes: 1. Bank of Japan Estimation.
2. Tier I is assumed to be fixed at the end of fiscal 2007.

Chart 3-10: Excess Credit Costs[1,2]
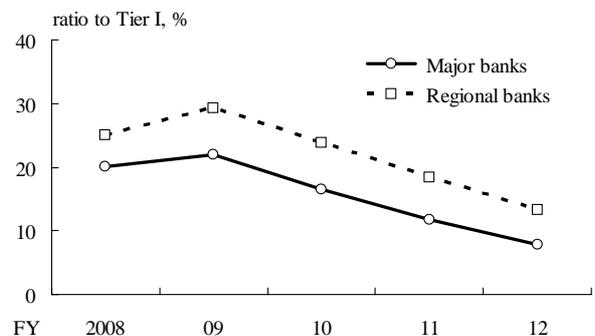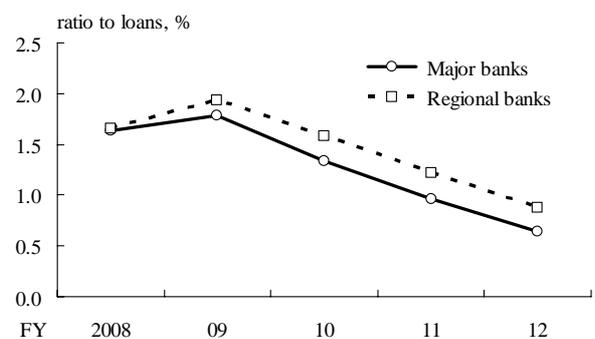
Notes: 1. Bank of Japan estimation.
2. Loan outstandings and Tier I are assumed to be fixed at the end of fiscal 2007.

Chart 3-11: Excess Credit Risks for Each Bank[1]
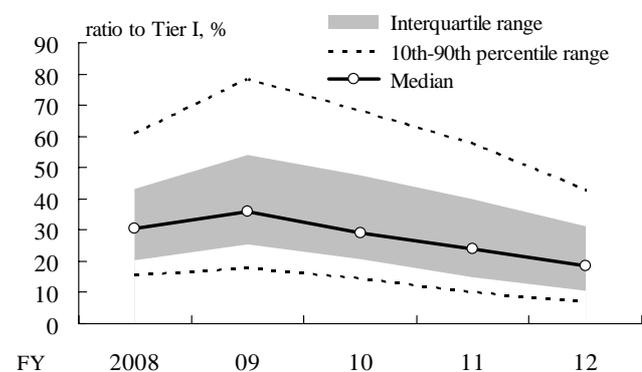
Note: *1*.   Bank of Japan estimation.

credit costs remain under control. However, the extent of robustness against unexpected rise in credit costs is likely to vary substantially from bank to bank, as pointed out in Chapter II.

In order to examine the above point, excess credit risk is calculated for each bank under the same stress scenario (Chart 3-11). The results show that the median of the ratio of excess credit risk to Tier I hovers at the level somewhat above the aforementioned overall credit risk for the regional banks. Looking at the shape of distribution, the distance between the median and 75th or 90th percentiles is longer than that between the distance between the median and 25th or 10th percentiles, respectively, and the shape shows a long tail toward the higher percentile. The Tier I ratio of the 90 percentile exceeds 70 percent at the peak in fiscal 2009, suggesting that an extremely heavy burden is imposed on Tier I capital. In contrast, the Tier I ratio of 10 percentile remains at about 18 percent, suggesting a high degree of robustness.

In sum, while the banking sector as a whole remains fairly robust against the stress of a severe and prolonged economic downturn, some individual banks seem to be vulnerable to an increase in credit costs. As emphasized in Chapter I, under sluggish economic growth, a high degree of vigilance needs to be maintained with respect to a future increase in credit costs. Bearing that point in mind, banks should continue to properly control credit risk while monitoring changes in the risk-return balance of the loan portfolio as a whole.

2. Market risk associated with stockholdings

Next, the robustness against market risk associated with stockholdings is assessed using the same

framework as the March 2008 issue of the *Financial System Report*. More precisely, market risk associated with stockholdings under a stress condition manifests itself as fluctuations in market risk and unrealized gains/losses. When a severe shock hits the economy, two channels need to be considered. One is that when the shock induces a decline in prospects for corporate profits and an increase in probability of default, this leads to a downgrade of firms' credit ratings and a decline in stock prices. The other channel is that the shock to the economy heightens uncertainty in the stock market and increases volatility of stock prices (for an outline of the analytical framework, see Chart 3-12 and Box 10 of the March 2008 issue of the *Financial System Report*).

The same baseline and stress scenarios used for macro stress-testing of credit risk are adopted to estimate the level of stock prices (TOPIX) and future path of their volatility. Then the ratios of unrealized gains/losses and market risk (VaR) to Tier I capital are estimated as deviations from those in the baseline scenario. Then, the additional impact of stress is assessed by deducting unrealized gains/losses from market risk.

Based on stockholdings of the major banks and the regional banks at end-March 2008, Chart 3-13 shows the divergence of market risk and unrealized gains/losses under the stress scenario from those under the baseline scenario. The ratio of market risk to Tier I only increases a few percent in fiscal 2008 for both the major banks and the regional banks, since the decline in outstanding balance of stockholdings because of the plunge in stock prices offsets the rise in volatility. In contrast, a decrease in unrealized gains or an increase in unrealized losses on stockholdings due to the plunge in stock prices pushes up the market risk associated with stockholdings, and the ratio to Tier I reaches about 20 percent for the major banks and about 15

Chart 3-12: Basic Structure of Macro Stress-Testing of Risk Associated with Stockholdings

Chart 3-13: Risk Associated with Stockholdings under the Stress Scenario[1,2]
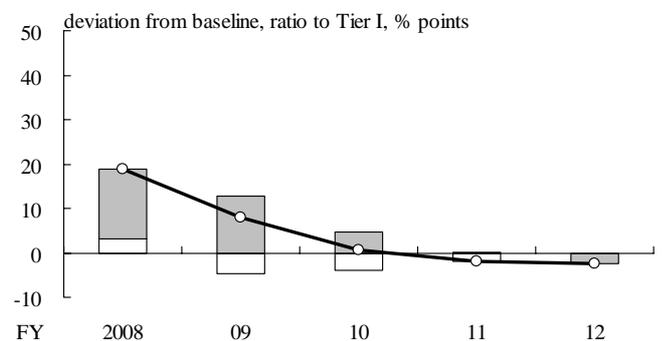
Notes: *1*. Bank of Japan estimation.
    2. Risk associated with stockholdings is the sum of market risk and unrealized gains/losses.

percent for the regional banks. As a result, the sum of market risk and changes in unrealized gains/losses produces an impact, in relation to Tier I, of a little less than 30 percent for the major banks and a little less than 20 percent for the regional banks.

Based on these results, it should be noted that it is highly possible that, in the stress scenario of a severe and prolonged economic downturn, risk associated with stockholdings manifests itself in the form of a decline in unrealized gains of stockholdings stemming from the substantial fall in stock prices.

D. Stress-Testing of the Real Estate-Related Loan Portfolio

By expanding the analytical framework used in the March 2008 issue of the *Financial System Report*, which focused on the financial risk of real estate businesses, this section constructs a new framework for macro stress-testing on future credit costs for the real estate-related sector (including the construction industry), taking into account the effects of real estate market developments on the transition in borrower classifications in the sector (see Box 5 for details). Specifically, in this framework, a random variable is additionally introduced to trace factors other than real estate prices, as major factors that change borrower classification, thereby estimating the distribution of credit cost ratios for loans to real estate-related sectors, under various stress scenarios about the real estate prices.

In this analytical framework, the estimated credit cost ratios depend crucially on the assumptions on two points. First, to what extent do borrower classifications change in response to the fluctuations in real estate market conditions? And second, to what extent are banks' exposures covered by collateral and guarantees when borrowers are downgraded to "in danger of

Chart 3-14: Relationship between Credit Migration and Provisions for Credit Costs[1]

Borrower classification	Items of an account relating to credit cost	Major parameters relating to credit cost	
		Exposure	Loss rate
Normal Downgrading	General provision for loan losses	Both covered and uncovered exposure	*Normal* : about 0.1 to 0.2%
Need Attention			*Need Attention* : about 2 to 5%
Special Attention			*Special Attention* : about 15 to 25%
In Danger of Bankruptcy	Specific provision for loan losses	Covered exposure / Uncovered exposure	About 60 to 80%
Bankrupt/De Facto Bankrupt	Write-off of loans, etc.		100%

Note: *1.* For simplicity, the generic description above makes no distinction in the methods of calculation between general provisions, specific provisions and provisions for large-sized borrowers. In reality, the latter two provisions are built upon the assessment of losses on a loan-by-loan basis, in contrast to general provisions.

bankruptcy" or below from "special attention" or above? (see Chart 3-14).

For the second point on collateral and guarantees, two scenarios are assumed regarding the coverage ratios of collateral and guarantees to banks' exposures when downgrading from "special attention" or above: scenario A assumes conservative coverage ratios such as those for a borrower "in danger of bankruptcy," while scenario B assumes more lax coverage ratios such as those for a borrower requiring "special attention." It should be noted that the coverage ratios for all industries are applied to the real estate-related sector, even though the coverage ratios vary from industry to industry, due to the limitation in the availability of data.

For the real estate prices, two scenarios are also assumed on the future path of the rate of changes in real estate prices: scenario A for real estate prices assumes that the rate of change in real estate prices declines from about 9 percent in 2007 to zero percent in 2008; and scenario B for real estate prices assumes that the rate declines further to minus 10 percent in 2008 (Chart 3-15). As a result, the stress-testing exercise assumes four scenarios with respect to the combinations of the future path of real estate prices and the coverage ratios of collateral and guarantees, as shown in Chart 3-16.

The results of a Monte Carlo simulation (100,000 times) (Chart 3-17) shows that the mean for the distribution of credit cost ratios becomes higher and the tails become longer in the order of stress scenarios from smallest to largest: scenario AA, AB/BA, and BB. Looking at the mean of Scenario AA and 2 standard deviation of scenario BB, the credit cost ratios range approximately from 50 bps to 160 bps for the major banks and the regional banks. Then, computing

Chart 3-15: Rate of Changes in Asset Price on Real Estate Investment[1]
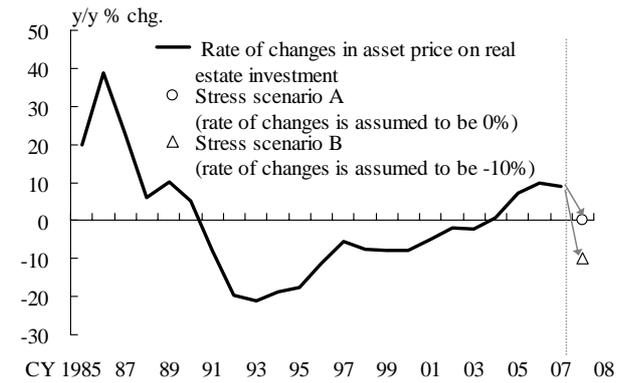
Note: 1. Bank of Japan estimation. The figure from 2002 through 2007 uses the data of capital return on real estate owned by J-REITs. The figure before 2001 is based on data for "single-year capital appreciation return" of MTB-IKOMA.
Sources: The Association for Real Estate Securitization; Mitsubishi UFJ Trust and Banking Company; K. K. Ikoma Data Service System.

Chart 3-16: Scheme of Stress Scenarios

Chart 3-17: Conditional Distribution of Credit Cost Ratio for Loans to Real Estate-Related Businesses[1]
Major banks
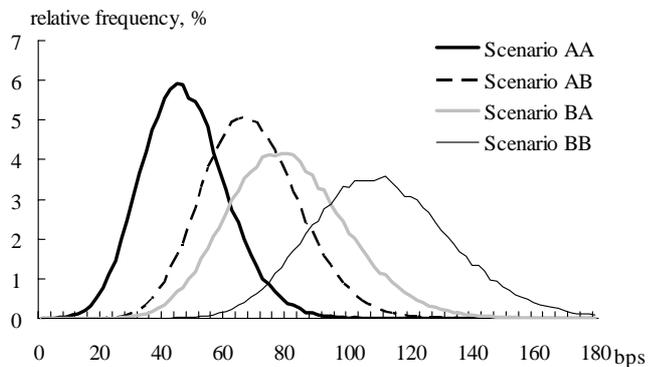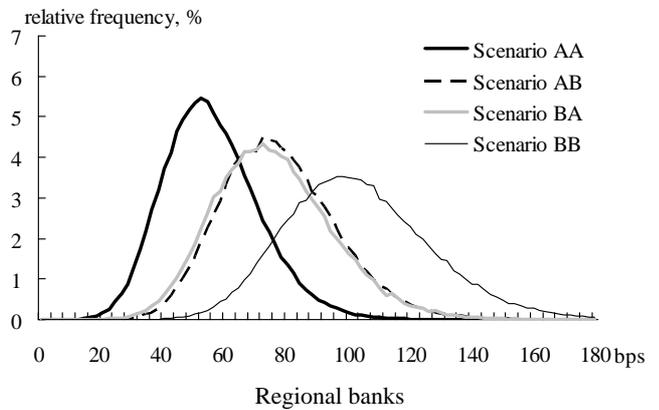
Regional banks

Note: 1. Bank of Japan estimation.

the impact on the observed credit cost ratios in fiscal 2007 (13 bps for the major banks and 34 bps for the regional banks), the contributions to raise the credit cost ratios amount to 10-25 bps for the major banks, and 5-20 bps for the regional banks. This suggests that the impacts are fairly large for ones coming from just a single sector.

The simulation results suggest that changes in credit costs stemming from asset price fluctuations depend crucially on the coverage ratios of collateral and guarantees to banks' exposures. For example, in scenario AB (a combination of "scenario A" for the coverage ratio and "scenario B" for the real estate price), credit cost ratios are constrained under strong stress on real estate prices if the coverage ratios of collateral and guarantees are high. Therefore, in examining the impacts on credit costs in response to real estate price fluctuations, it is important to carefully monitor the conditions for collateral and guarantees.

E. Implications for the Financial and Economic Outlook

Finally, this section wraps up the results of macro stress-testing exercises on four risk categories, i.e., interest rate risk, credit risk, market risk associated with stockholdings, and credit risk for the real estate-related sector. Then, implications for current financial and economic conditions are discussed.

As shown in the statement after the Bank of Japan's Monetary Policy Meeting (the most recent statement on monetary policy released on September 17, 2008), while economic growth will likely remain sluggish for the time being, it is expected to return gradually onto a moderate growth path as commodity prices level out and overseas economies move out of their deceleration phase. However, with regard to risk factors, global financial markets remain unstable, and downside risks

to Japan's economy stemming both from domestic and overseas factors deserve attention. Meanwhile, if the downside risks to the economy turn out to decrease, there will be an increased risk that prolonging the period of accommodative financial conditions will lead to swings in economic activity and prices.

To begin with, in case downside risks of the economy manifest themselves, on the financial system front, both credit risk and market risk associated with stockholdings manifest themselves at the same time, leading to an increase in credit costs and a decline (an increase) in unrealized gains (losses) on securities. In addition, as economic activity slows, it is highly likely that the yield curve will also shift downward, producing adverse impacts on interest income. Moreover, if real estate prices decline, it is also possible that concentration risk to the real estate-related sector, whose weight in banks' loan portfolio is high, will manifest itself.

Note that it is deemed inappropriate to just add up the results of the macro stress-testing exercises and make a quantitative assessment on the impact of the aforementioned compound risks. However, as a qualitative assessment, it appears that Japan's banking sector has increased its robustness to a fair degree against such compound risks, given that banks have been striving to contain risk amounts and strengthen their capital positions since virtually overcoming the NPL problem and have been maintaining stability on the whole. Consequently, even if downside risks to the economy manifest themselves, the financial system will be able to smooth out shocks stemming from such compound risks over time and support a smooth transition to the next economic recovery. However, in assessing the stability of the financial system as a whole, it should be noted that resilience against stress varies considerably from financial institution to

institution, given their divergences in core profitability and capital positions.

Next, the possibility to be examined is the materialization of a risk that prolonged accommodative financial conditions amplify fluctuations in economic activity and prices once downside risks to the economy subside. It is unlikely that credit risk and market risk associated with stockholdings will manifest themselves, while it is more likely that interest rate risk will manifest itself as a sudden rise in interest rates. Nevertheless, it appears that unrealized losses on bond holdings resulting from a rise in interest rates would be temporary and remain within the range of net interest income. In the medium term, a rise in interest rates would increase net interest income, and this, together with an economic recovery, would produce positive effects on financial system stability. However, as seen in Chapter I, it is deemed necessary to become vigilant against banks' risk-taking behavior in mortgage loan rate setting, based on the expectation that funding rates will remain at the current extremely low level.

Box 4: Banks' Capital Buffer and the Business Cycle

The relationship between capital buffers and business cycles are one of the important topics in considering the capital adequacy requirement and risk-taking behavior of banks. The capital buffer represents a surplus of capital relative to regulatory required capital. Some studies have examined the relationship between the capital buffer and the business cycle, namely, whether the capital buffers exhibit positive or negative co-movement with the business cycles.[1] As in the literature on firms' investment behavior, this is reduced to the problem of how banks adjust risk assets relative to capital in response to economic fluctuations.

If the capital buffers exhibit positive co-movement with the business cycle, banks increase their capital buffers by limiting increases in their risk assets within their capital accumulation during economic upturn, and banks use their capital buffers to keep their risk assets from declining during economic downturns. In this case, banks attempt to absorb external shock within their capital buffers, thereby smoothing out fluctuations in risk assets.

By contrast, if capital buffers exhibit negative co-movement with the business cycle, banks increase their risk assets aggressively beyond their capital accumulation and reduce their capital buffers during economic upturn, and banks squeeze risk assets relative to capital and expand their capital buffers during economic downturns. In this case, banks amplify fluctuations in risk assets.

(An empirical framework)

An empirical framework to examine the relationship between capital buffer and business cycle is explained.[2] The capital buffer is defined as follows:

$$BUF_{i,t} \equiv \frac{CAP_{i,t}}{\rho RISK_{i,t}} - 1, \tag{1}$$

where *CAP* is capital, *RISK* is the risk asset (e.g., loans and securities), and ρ is the minimum required capital ratio. ρ *RISK* is the amount of required capital. Banks are assumed to adjust their capital buffers as follows:

$$\Delta BUF_{i,t} = \gamma(BUF_{i,t}^* - BUF_{i,t-1}) + u_{i,t}, \tag{2}$$

where $BUF_{i,t}^*$ is the optimal capital buffer of bank *i* at time *t*, γ is the speed of adjustment, namely, if $0 < \gamma < 1$, then it takes time for banks to adjust the actual capital buffer to an optimal level. The optimal capital buffer is not readily observable, but it depends on the business cycle and bank-specific factors. Hence, the optimal capital buffer is assumed to be determined as follows:

$$BUF_{i,t}^* = \alpha + \beta_1 CYCLE_t + \mathbf{x}_{i,t}' \boldsymbol{\beta}, \tag{3}$$

where $CYCLE_t$ is a measure of the business cycle at *t*, and $\mathbf{x}_{i,t}$ is a vector of controlling bank-specific factors (e.g., ROE and asset size) for bank *i* at time *t*. By substituting equation (3) into equation (4), the estimation equation below can be obtained:

$$BUF_{i,t} = \alpha\gamma + (1 - \gamma)BUF_{i,t-1} + \gamma\beta_1 CYCLE_t + \gamma\mathbf{x}_{i,t}' \boldsymbol{\beta} + u_{i,t}.$$

If $\beta_1 > 0$, then capital buffers have positive co-movement with the business cycle: banks increase the capital buffers during economic upturn, while banks decrease capital buffers during economic downturn. By contrast, if $\beta_1 < 0$, the capital buffers have negative co-movement with the business cycle.

(Estimation results)

Banks are assumed to adjust their capital buffer toward the optimal level of capital buffer, which depends on macroeconomic and bank-specific situations. Therefore, to make use of initial condition information, the system GMM estimator suggested by Blundell and Bond (1998) is used in estimation. As stated in Chapter III, the sample period of the dataset ranges from fiscal 1989 to 2005. The banks examined here are all major banks and regional banks with domestic capital standard.

Chart 3-2 in Chapter III presents estimation results for the major banks and the regional banks. Sample periods of estimation for major banks are full sample (fiscal 1989-2005), first-half (fiscal 1989-1997) and second-half (fiscal 1998-2005) subsample. Those for regional banks are the first and second half sample only.

To check the robustness of the results, alternative measures of business cycle and some additional bank specific control variables are used for estimations. In addition to the output gap by Bank of Japan used in Chapter III, as two alternative measures of business cycle, output gap obtained by HP filtering (*HPGAP*) and TANKAN DI (*DI*), are used. The first to third columns in the Chart B4-1 show that coefficients of the measures of the business cycle are negative and significant except for *HPGAP*. In addition to *ROE* even when more bank specific control variables for bank-specific factors, i.e., asset size (*ASSET*) and ratio of loans to deposits (*LTD*), are added, the coefficients of *GAP* are still negative and significant, and the sizes of the coefficient remain almost unchanged.

Chart B4-1:Robustness Check for Alternative Measures of Business Cycle and Bank Specific Control Variables[1,2,3]

Fiscal 1989-2005: Major banks	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value
BUF(-1)	0.757	0.00	0.740	0.00	0.777	0.00	0.737	0.00	0.734	0.00	0.699	0.00
ROE	0.198	0.33	0.073	0.73	0.302	0.14	0.244	0.30	0.110	0.61	0.161	0.48
GAP	-1.770	0.00	---	---	---	---	-1.827	0.01	-2.690	0.01	-3.400	0.00
HPGAP	---	---	-1.271	0.24	---	---	---	---	---	---	---	---
DI	---	---	---	---	-0.257	0.00	---	---	---	---	---	---
ASSET	---	---	---	---	---	---	-9.022	0.21	---	---	-11.637	0.07
LTD	---	---	---	---	---	---	---	---	-0.168	0.19	-0.251	0.08
CONSTANT	4.135	0.22	3.788	0.27	3.908	0.20	157.859	0.20	24.425	0.10	232.809	0.04
2nd half, international standard	9.337	0.18	13.247	0.05	8.540	0.21	11.205	0.13	6.824	0.40	9.557	0.27
2nd half, domestic standard	59.480	0.01	66.389	0.00	55.917	0.02	56.730	0.02	62.384	0.01	56.681	0.01
Sargan test:	26.450	1.00	26.630	1.00	26.180	1.00	25.970	1.00	26.760	1.00	25.500	1.00
AR(2) test:	-0.335	0.74	-0.403	0.69	-0.305	0.76	-0.227	0.82	-0.388	0.70	-0.199	0.84

Notes: *1. GAP* is Bank of Japan estimation. *HPGAP* is the deviation from the trend estimated by the Hodrick-Prescott filter.
　　　2. In estimating the system GMM of Blundell and Bond (1998), DPD for Ox, version 1.24, Doornik, Arellano, and Bond (2006) is used.
　　　3. Instruments for difference equations are the entire set of the lagged value of *BUF* and *ROE*. Instruments for level equations are the lagged value of *BUF* and *ROE*.

According to the results in Chart 3-2 and Chart B4-1, as for major banks from fiscal 1989 to 2005, estimation results that the capital buffers of major banks have negative co-movement with the business cycle are robust. The other results of the robustness check, which are not able to be shown here due to space limitations, confirm that all results presented in Chapter III are robust. However, it should be noted that the relationship between capital buffer and business cycle varies, depending on the economic and financial environment, banks examined and the level of the capital adequacy ratio.

[1] Most of results in previous studies report that capital buffers have negative co-movement with business cycle. See Ayuso, Perez, and Saurina (2004) for Spain, Stolz and Wedow (2006) for Germany, and Jokippii and Milne (2008) for EU countries.
[2] This formulation follows Stolz and Wedow (2006) and Jokippii and Milne (2008).

References:
Ayuso, Juan, Daniel Perez, and Jesus Saurina, "Are Capital Buffers Pro-Cyclical? Evidence from Spanish Panel Data," *Journal of Financial Intermediation*, 13, 2004, pp. 249-264.
Blundell, Richard, and Stephan Bond, "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models," *Journal of Econometrics*, 87, 1998, pp. 115-143.
Doornik, Jurgen A., Manuel Arellano, and Stephen Bond, "Panel Data Estimation Using DPD for Ox," 2006, available from http://www.doornik.com/download/dpd.pdf.
Jokippii, Terhi, and Alistair Milne, "The Cyclical Behaviour of European Bank Capital Buffers," *Journal of Banking and Finance*, 32, 2008, pp. 1440-1451.
Stolz, Stéphanie, and Michael Wedow, "Banks' Regulatory Capital Buffer and the Business Cycle: Evidence for Germany," mimeograph, Deutsche Bundesbank, 2006.

Box 5: Framework of Stress-Testing for the Real Estate-Related Loan Portfolio

This stress-testing expands the model presented in Box 9 of the previous issue of the *Financial System Report* (March 2008) to cover migrating probabilities of real estate-related businesses, following the generalized linear mixed model of McNeil and Wendin (2006). The model in this stress test is characterized by introducing two systematic variables: the rate of change in real estate price as an observable systematic variable and the unobserved random variable to capture the credit quality of real estate-related business that is not necessarily explained by the conditions of the real estate market. Accordingly, as shown in Chapter III, the model is able to compute the conditional distributions of the credit cost ratio, under various scenarios of the real estate market condition (see Chart B5-1 for the entire process and procedure of this stress testing).

Chart B5-2 shows the estimated parameters of the model for the major banks and the regional banks, respectively. As for real estate business, the estimated coefficients regarding the rate of changes in the real estate price are statistically significant over every borrower classification for both the major banks and the regional banks. Notably, low-rated borrower classifications have larger estimated values, which suggests that the credit quality of the real estate business is likely to be more affected by the conditions of the real estate market as it belongs to a lower borrower classification. As for construction business, some of the estimated coefficients for the rate of changes in real estate are insignificant for certain borrower classifications. In contrast, the estimated volatility of the unobserved random variable for the construction business is larger than that of the real estate business. The result suggests that the credit quality of the construction business is less related to the conditions of the real estate market.

Chart B5-1: Basic Structure of Stress-Testing
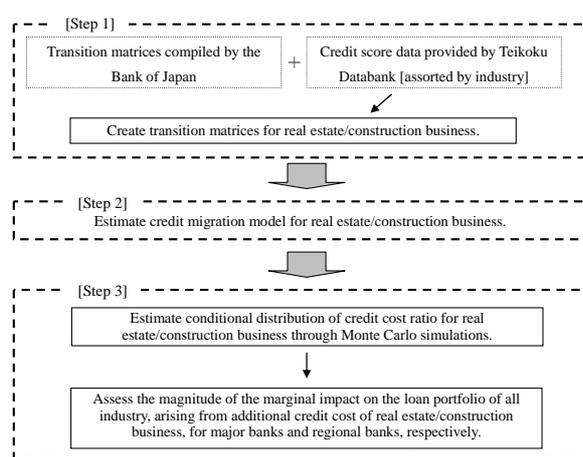
Chart B5-2: Estimated Parameters[1]

Real estate

Borrower classification	Major banks		Regional banks	
	Real estate price	Other effects	Real estate price	Other effects
Normal	0.977 (0.1708)		0.979 (0.1652)	
Need attention	1.494 (0.1731)		1.488 (0.1688)	
Special attention	1.533 (0.1975)	0.0872 (0.0104)	1.323 (0.1891)	0.0869 (0.0116)
In danger of bankruptcy	1.619 (0.1818)		1.603 (0.1744)	
Bankrupt/de facto bankrupt	1.943 (0.1894)		1.936 (0.1816)	

Construction

Borrower classification	Major banks		Regional banks	
	Real estate price	Other effects	Real estate price	Other effects
Normal	0.549 (0.1735)		0.559 (0.2054)	
Need attention	0.550 (0.1755)		0.532 (0.2047)	
Special attention	0.445 (0.2091)	0.1160 (0.0128)	0.633 (0.2204)	0.1074 (0.0107)
In danger of bankruptcy	0.334 (0.1976)		0.414 (0.2138)	
Bankrupt/de facto bankrupt	0.363 (0.2055)		0.372 (0.2350)	

Note: *1*. Standard errors in parentheses. Bank of Japan estimation.

With regard to the scenarios of the coverage ratio for real estate-related business at the time of downgrading, the test referred to the coverage ratio of all industries (Chart B5-3). Chart B5-3 exhibits the characteristics of the coverage ratio of all industries, which shows that the ratio remains low at "special attention" and becomes high

from "in danger of bankruptcy." This difference is considered to partly reflect the tendency for banks to secure more collateral or guarantees in response to the deterioration of business conditions of the borrowers. Given this observation, this stress test prepares for two different assumptions of the coverage ratio; "scenario A," which postulates that all the borrowers above "special attention" have the average of the past three-year coverage ratios of "in danger of bankruptcy," and "scenario B," which requires a more strict condition that all the borrowers above "special attention" have the average of the past three-year coverage ratios of "special attention."

Note that other simplifying assumptions are employed in this stress test in order to facilitate the handling of various technical elements involving the calculation of the credit cost ratio. First of all, the test makes no distinction in the methods of calculation between general provisions, specific provisions, and provisions for large borrowers, although the latter two provisions are, in reality, built upon the assessment of losses on a loan-by-loan basis. Therefore, the calculation of credit cost ratios in the stress test is simplified with the average loss rate and coverage ratio of each borrower classification, similar to the calculation of general provisions. Also, the possibility of fluctuation in the loss rate is not considered in the stress test. Second, as for the loss rate (for specific provisions) and the coverage ratio, the values based on all industries were applied in the stress test, although they are likely to differ by industry. Third, the single value of the coverage ratio, i.e., the average coverage ratio, is applied to individual loan exposures in each borrower classification. If the coverage ratio is not evenly distributed and certain borrowers remain uncovered, the conditional distribution of the credit cost ratio is likely to be more fat-tailed than Chart 3-17 indicates, due to the downgrading of such borrowers.

The transition of the ratio of sales value to valuation of real estate collateral (Chart B5-4) shows that the ratio has continued to be above 1.5 on average. Thus, losses on sale of collateral, which entails additional credit cost, have not occurred so far, at least from an industry-wide perspective. It needs to be kept in mind, however, that this observation is conditioned on the future surroundings in relation to the real estate-related sector.

Chart B5-3: Coverage Ratio for Major Banks and Regional Banks

Major banks			
	Special attention	In danger of bankruptcy	Bankrupt/ de facto bankrupt
FY 2005	34.3%	54.7%	92.5%
2006	38.4%	42.2%	91.0%
2007	28.4%	52.9%	91.1%

Regional banks			
	Special attention	In danger of bankruptcy	Bankrupt/ de facto bankrupt
FY 2005	37.9%	56.1%	63.2%
2006	36.4%	58.2%	63.5%
2007	34.5%	60.3%	65.3%

Source: Financial Services Agency.

Chart B5-4: Ratio of Sales Value to Valuation of Real Estate Collateral (Value Available for Sale)

Source: Financial Services Agency.

Reference:
McNeil, Alexander J., and Jonathan P. Wendin, "Dependent Credit Migrations," *Journal of Credit Risk*, 2(3), 2006, pp. 87-114.
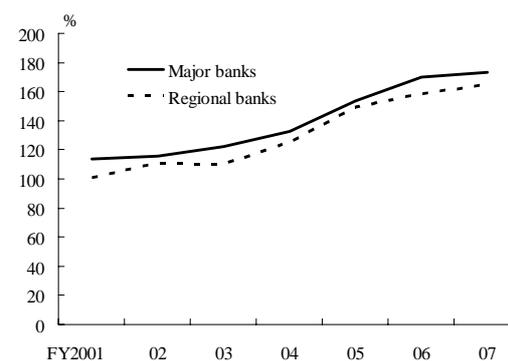
IV. Challenges for the Financial System

Having overcome the NPL problem, Japan's financial system has maintained stability on the whole. Nevertheless, banks' core profitability remains sluggish and improvement of profitability continues to be an important challenge. Strengthening of banks' long-term profit bases is important in order to enhance the stability of the financial system.

This issue of the *Financial System Report* analyzed the profitability of Japan's banking sector in comparison with other countries. That issue pointed out that banks need to properly assess risk-return balances and thereby explore new avenues to make efficient use of their capital through the reorganization of existing business lines.

To further the discussions, this chapter compares the profitability of major financial institutions in Japan with that in the Americas and Europe, and identifies the characteristics of their business models. The chapter then employs empirical analysis for the regional financial institutions with respect to their cost and profit structure. Based on these analytical results, challenges for strengthening and stabilizing the financial intermediation function are summarized at the end of the chapter.

A. Financial Intermediary Businesses of Major Financial Institutions

1. Profitability of major financial institutions in Japan, the Americas, and European countries

First, based on the financial statements between 2005 and 2007, profitability of 106 major financial institutions (including bank holding companies) with asset size of over 100 billion dollars in Japan, the Americas, and European countries is compared.

The return on equity (ROE) of Japanese financial institutions was lower than that of the Americas and European counterparts (Chart 4-1). In addition, the diversity of ROEs among Japanese financial institutions was notably smaller than those in the Americas and Europe. Meanwhile, due to the effects of the U.S. subprime mortgage problem, the ROE of the financial institutions in the Americas declined to 17.9 percent in 2007, underperforming their European counterparts (19.9 percent), and the diversity among the Americas financial institutions widened sharply.

Moreover, the asset growth of Japanese financial institutions remained low, while that of the Americas and European financial institutions registered nearly 10 percent (Chart 4-2). The difference in the asset growth may well reflect the fact that the financial institutions in the Americas and Europe are currently undergoing unexpected expansion in their balance sheets due to the U.S. subprime mortgage problem. On the whole, however, it appears that M&A activities are helping the financial institutions in the Americas and Europe expand their assets.

In sum, the profitability of Japanese financial institutions looks relatively low, compared with their Americas and European counterparts. It should be noted that while Japanese financial institutions recorded high profits during fiscal 2005-06 due to a substantial and temporary decline in credit costs, their Americas and European counterparts also marked high profits amid expanding originate-and-distribute businesses.

Among the various factors, such as the competitive environment in domestic markets, the benefit from economies of scale and scope, and the existence of inefficiencies, which may generate differentials in profitability, the following section focuses on the

Chart 4-1: ROEs by Major Banks in Japan, the Americas, and Europe[1]
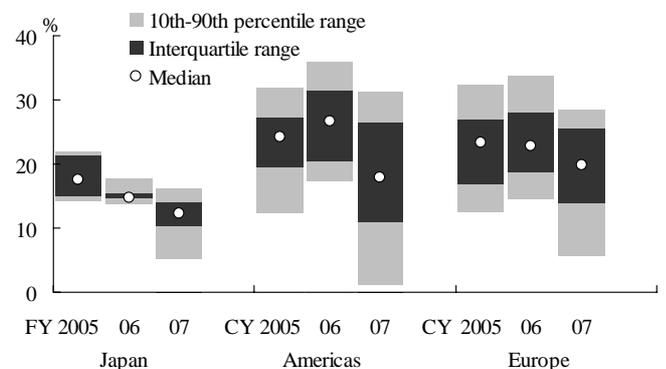
Note: 1. ROE = income before income taxes and others / total stockholders' equity. ROEs are sorted out in ascending order. 10th, 25th, 50th, 75th, and 90th percentiles are shown.
Source: Bureau van Dijk, "Bankscope."

Chart 4-2: Total Assets by Major Banks in Japan, the Americas, and Europe[1]
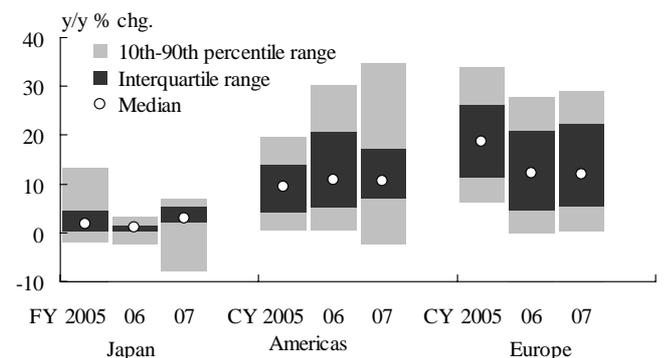
Note: 1. Changes in total assets are sorted out in ascending order. 10th, 25th, 50th, 75th, and 90th percentiles are shown.
Source: Bureau van Dijk, "Bankscope."

business model of financial institutions.

2. Profit structure of major financial institutions in Japan, the United States, and European countries

Over the years, major financial institutions in the United States and Europe appear to have established a business model aiming to generate higher profits by providing a variety of financial services. In this section, the profit structure of financial institutions in Japan, the United States, and Europe with asset size of over 1 trillion dollars is compared, from the perspective of their business segments and geographical operations.

Broadly speaking, major financial institutions generate profits from three business segments: (1) "retail banking business" conducting traditional commercial banking business for individuals and small to medium-sized firms; (2) "wholesale banking business" providing investment banking operations mainly for large firms; and (3) "asset management business" providing other operations – such as asset management and wealth management – that are not included in either retail banking or wholesale banking (Chart 4-3).

While financial institutions have their own definitions of business segments, making comparisons difficult across different institutions on an equal footing, on the whole, they can be divided into two types. The first type corresponds to financial institutions relying on specific business segments in which they have a competitive edge. In Chart 4-3, those institutions with a high share in the wholesale banking business (upper left side of the chart), those with a high share in retail banking business (lower right side of the chart) and those actively involved in the asset management business (lower left side of the chart) fall into this type. By contrast, the second type corresponds to those raising profits from all business segments in a

Chart 4-3: Profits by Business Segment[1,2,3,4]
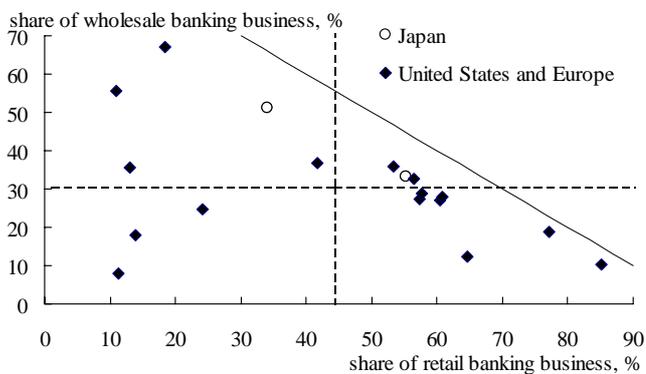
Notes: 1. Plots are the averages of the share of wholesale banking business and retail banking business from 2005 to 2007. This analysis covers major banks whose assets are over 1 trillion dollars. Plots represent 18 banks that release profits by business segment.
2. Japanese financial groups are those listed on the New York Stock Exchange.
3. The vertical line is the mean of shares of retail banking business. The horizontal line is the mean of shares of wholesale banking business. The diagonal line is the combination of wholesale and retail banking business excluding asset management banking business.
4. Financial institutions plotted on the upper-left make relatively large profits from wholesale banking business. Financial institutions plotted on the lower-right make relatively large profits from retail banking business. Financial institutions plotted on the lower-left make relatively large profits from asset management banking business.

Sources: Published accounts.

relatively balanced manner, which lie around the point of intersection of the vertical and horizontal dotted lines.

Japanese financial institutions appear to raise profits from the retail and wholesale banking businesses in a relatively balanced manner, and rely less on the asset management business.

Looking at the retail banking business and the asset management business, financial institutions with higher-than-average profit shares in these businesses register higher-than-average rates of return in these businesses. In contrast, profitability is low for the wholesale banking business and no significant difference can be observed in the rate of return between financial institutions with high shares of profit in the business and those without.

Turning to geographical operations (Chart 4-4), Japanese financial institutions' profitability in the domestic business sector is low despite their high share of domestic assets. Their profitability in the overseas business sector is relatively high, but the contribution to overall profit is limited, due to its small scale.

Concerning overseas credit exposure of Japanese banks, the share of Japanese banks' overseas claims to Japanese and non-Japanese banks' overseas claims was on a downward trend since they strived for the reduction of overseas credit exposure in the early 2000s (Chart 4-5). At present, that share has been somewhat on a rise because of Japanese banks' active engagement in overseas projects. Indeed, Japanese major financial institutions' overseas businesses seem to be generally directed toward extending overseas loans as well as strengthening Asian businesses inclusive of equity participation and business alliances with local financial institutions.

Chart 4-4: Domestic and Overseas Businesses[1,2,3,4]
[1] Domestic Business

[2] Overseas Business
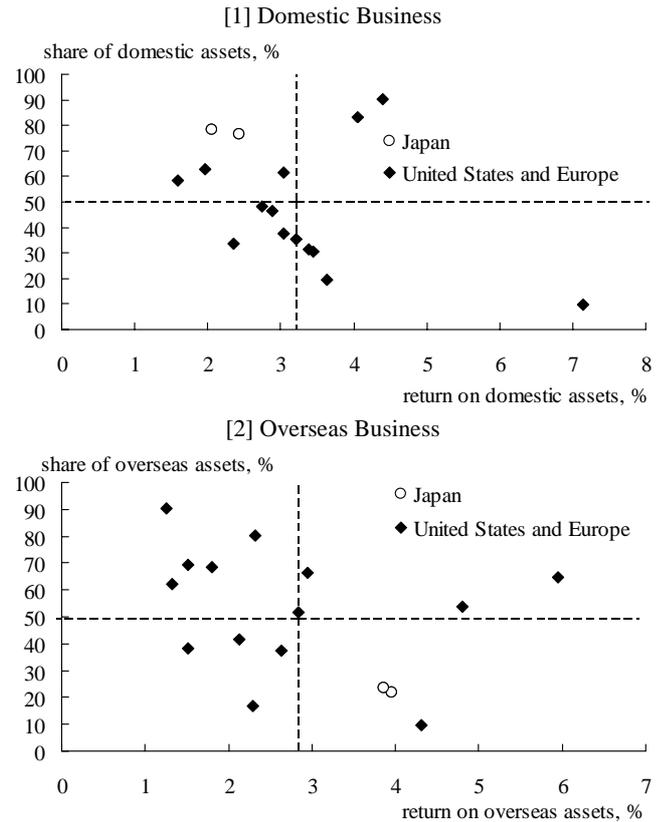
Notes: 1. ROA = gross operating profits/total assets.
2. Plots are the means from 2005 to 2007. Domestic business covers the region where each head office is located. This analysis covers major banks whose assets are over 1 trillion dollars. Plots represent 16 banks that release profits by geographical segment.
3. Japanese financial groups are those listed on the New York Stock Exchange.
4. Vertical lines are the means of returns on domestic/overseas assets. Horizontal lines are the means of shares of assets.
Sources: Published accounts.

Chart 4-5: Share of Japanese Banks' Overseas Claims to Japanese and Non-Japanese Banks' Overseas Claims[1]
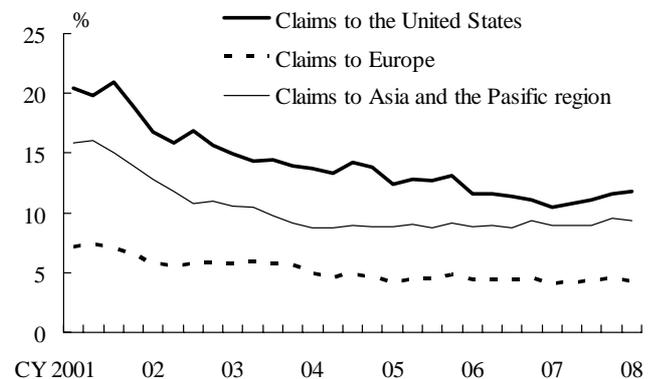
Note: 1. Asia and the Pacific region comprises Australia, New Zealand, Hong Kong, Singapore and 25 countries defined as "Asia/Pacific" in the Consolidated Banking Statistics.
Source: BIS, "Consolidated Banking Statistics."

It is not necessarily the case that those financial institutions in the United States and Europe engaging in overseas business operations continually record high profitability, as their business models vary to a considerable extent in terms of regional coverage. However, among the institutions analyzed, some achieve high profitability by implementing "concentration in core competence" in their business models; consequently, some have focused on domestic business operation while others have engaged in the overseas businesses.

Japanese financial institutions need to reinforce their strategic approaches including "concentration in core competence," toward highly profitable business areas, both domestic and overseas. In the aftermath of the U.S. subprime mortgage problem, the U.S. and European financial institutions are currently reassessing the role of the originate-and-distribute-type business model. Under this context, the proper risk assessment and management has become more important in entering new business areas with the benefit of financial innovation.

Japanese financial institutions, while keeping in mind the vulnerability of such businesses, are required to establish business models that could benefit from the technological innovation in finance and globalization, and increase their profitability. In relation to this point, large-scale investments and acquisitions by the Japanese financial institutions are being observed in the consolidation of the U.S. and European financial institutions, and future developments should be mentioned.

B. Profit and Cost Structure of the Regional Financial Institutions

This section empirically analyzes factors determining the cost and profit structure of the regional financial

institutions (i.e., the regional banks and the *shinkin* banks).

1. Analytical framework

A financial institution can be considered as an economic entity using labor, funds, and capital as inputs and producing financial services such as loans, securities investments, and commission and fee businesses (Chart 4-6; see Box 6 for details). In producing financial services, it aims to minimize costs and maximize profits. In this framework of bank activity, the determining factor of costs and profits can be summarized as follows.

The first factor is the economies of scale (i.e., production scale of financial services). This captures whether or not the estimated costs and profits will increase more than proportional increases in costs and profits as the production of financial services increases. To be more specific, if profit increases by the same proportion to increases in all inputs, there are constant returns to scale. Compared with constant returns to scale as a benchmark, there are two cases: (1) increasing returns to scale, where profit increases more than the benchmark; and (2) decreasing returns to scale, where profit increases less than the benchmark.

In addition to those average effects of economies of scale, the following analysis identifies the marginal effects of economies of scale. The latter intends to capture whether or not there is additional benefit in increasing the production scale given the current production level (see Chart 4-7 for the average and marginal effects of economies of scale).

The second factor is the composition of financial services provided by financial institutions (i.e., production composition of financial services). This

Chart 4-6: Banks' Production Activities

Chart 4-7: Effect of Scale and Composition on Costs and Profits[1]

Note: *1*. Similar discussion about economies of scale also applies for costs.

Chart 4-8: Effects of Scale on Cost and Profit[1]

[1] Average Cost[2]

deviation from benchmark, % points

total assets (in log)

[2] ROA[3]

deviation from benchmark, % points
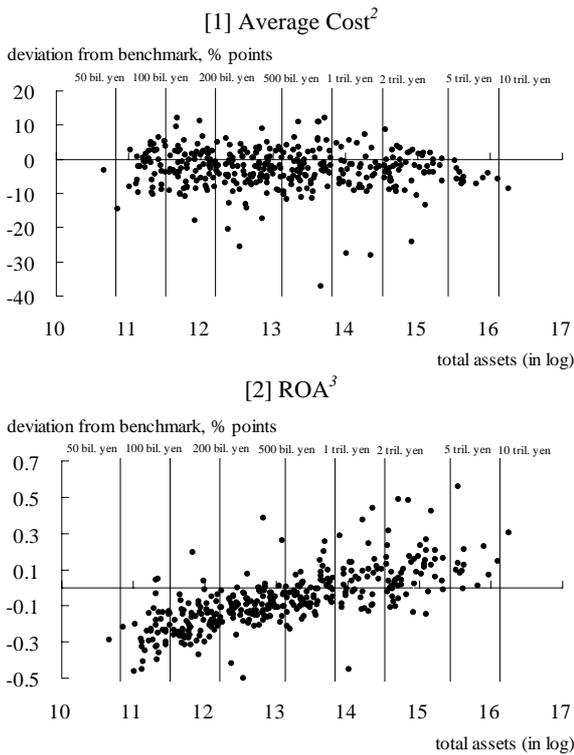
total assets (in log)

Notes: 1. As of the end of fiscal 2007.
2. Average cost = operating cost / total revenue
3. ROA = net operating profit / total assets

Chart 4-9: Scale Elasticity of Cost and Profit[1,2]

[1] Cost

scale elasticity

Increasing return to scale

total assets (in log)

[2] Profit

scale elasticity

Increasing return to scale

total assets (in log)
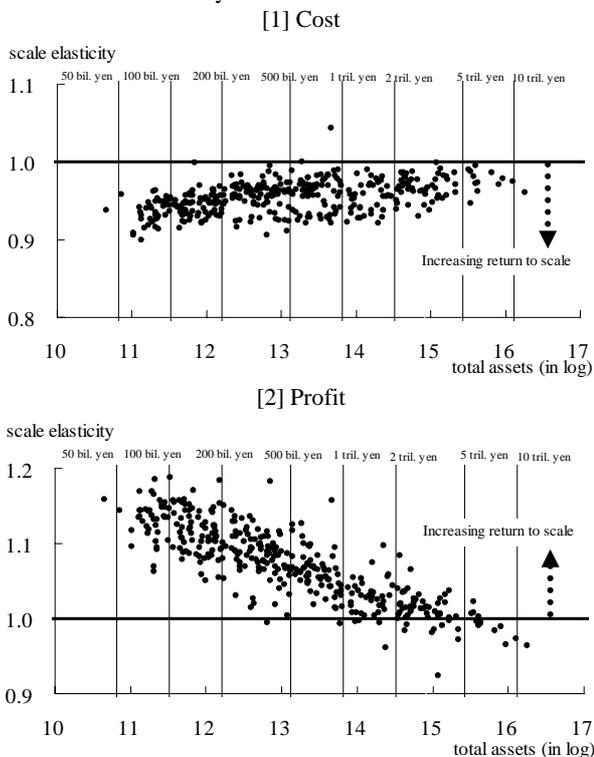
Notes: 1. As of fiscal 2007.
2. Scale elasticity is the ratio of the percent change in cost (or profit) to the percent change in production scale.

shows whether or not there is room to enhance economies of scale by engaging in not only lending businesses but also securities investment and fee and commission businesses.

The third factor corresponds to local market conditions that each financial institution faces, such as the market size and concentration of the deposit and loan market. For the regional financial institutions whose business areas are limited, those characteristics have particularly important implications.

Finally, the fourth factor is inefficiency (X-efficiency) that cannot be gauged by the above three factors. For example, managers' ability and distortion of resource allocation stemming from organizational malfunctioning could be gauged by neither the economies of scale and scope nor characteristics of business areas. The inefficiency is measured by estimating to what extent actual costs and profits deviate from minimum costs and maximum profits obtained by using inputs most efficiently.

In the following section, these four factors are analyzed in turn.

2. Production scale

The average effects of whether estimated costs and profits increase more than proportional increases in costs and profits are first estimated (Chart 4-8). The results show that financial institutions with large asset size benefit from higher average effects of scale economies than those with small asset size, both in terms of costs and profits. In other words, financial institutions with large assets, taking advantage of their scale merit, have lower average costs and higher ROAs than the benchmark, whereas those with small assets have higher average costs and lower ROAs than the benchmark. More specifically, the ROA of financial

institutions whose asset size is equal to or less than 100 billion yen is approximately 0.3 percentage point lower than the ROA of those whose asset size is more than one trillion yen.

In terms of the marginal effects of economies of scale, there are significant effects on financial institutions with small asset size, whereas there are little effects on financial institutions with large asset size (Chart 4-9).

These results suggest that, for financial institutions whose asset size is already large, the merit of economies of scale by increasing the asset size is relatively limited. By contrast, financial institutions with small asset size are yet to benefit from economies of scale sufficiently; thus, there is room for taking advantage of scale merit by increasing their asset size.

3. Production composition

When financial institutions specialize in businesses such as loans and securities investments, the merit of economies of scale is seen in terms of costs but not in terms of profits (Charts 4-10 and 4-11). By contrast, when they expand their businesses by engaging in fee and commission businesses, the merit of economies of scale in terms of profits outweighs cost increases; thereby raising the ROAs.

In sum, financial institutions could in principle improve their ROAs by increasing the weight of fee and commission businesses, even if the production scale is unchanged. For financial institutions with large asset size, while the marginal effects of economies of scale appear to have been exhausted, they can still enhance their scale merit by engaging in more fee and commission businesses.

4. Local market conditions

Regional financial institutions are exposed to limited

Chart 4-10: Effect of Output Composition on Average Cost[1,2]

deviation of average cost, % points
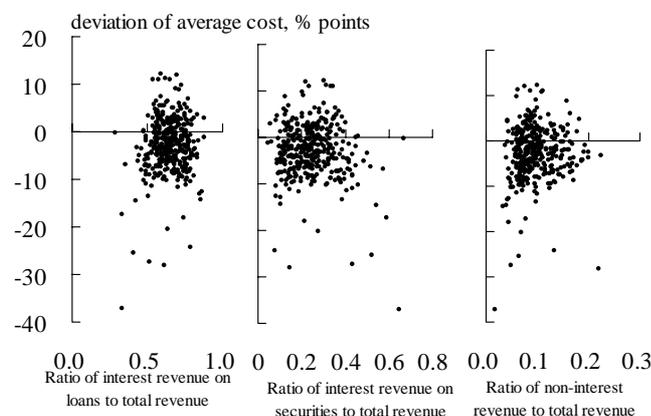
Dependent variable: deviation of average cost

	Coefficients	Standard error[3]	P-value
Production scale index	-0.817	0.221	0.00
Share of interest revenue on loans	-7.541	1.645	0.00
Share of interest revenue on securities	-13.282	3.329	0.00
Share of non-interest revenue	59.277	13.043	0.00

Notes: 1. Definition of average cost is the same as in Chart 4-8.
2. Data for fiscal 2007 are used for scatter plot and estimation.
3. Heteroskedasticity robust estimates.

Chart 4-11: Effect of Output Composition on ROA[1,2]

deviation of ROA, % points
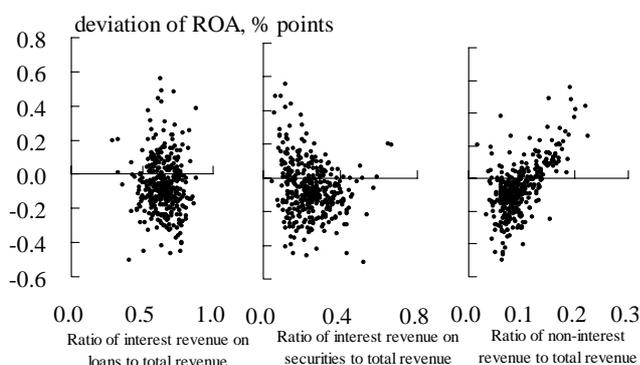
Dependent variable: deviation of ROA

|	Coefficients	Standard error[3]	P-value
Production scale index	0.031	0.006	0.00
Share of interest revenue on loans	-0.320	0.039	0.00
Share of interest revenue on securities	-0.280	0.081	0.00
Share of non-interest revenue	1.849	0.285	0.00

Notes: 1. Definition of ROA is the same as in Chart 4-8.
2. Data for fiscal 2007 are used for scatter plot and estimation.
3. Heteroskedasticity robust estimates.

Chart 4-12: Market Size and Market Concentration
[1] Japan[1]
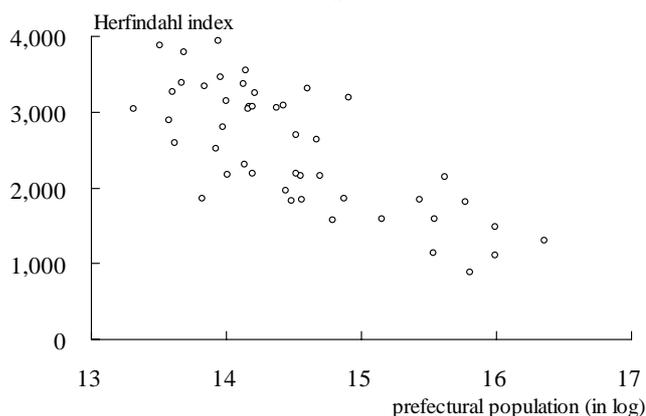
[2] United States[2]
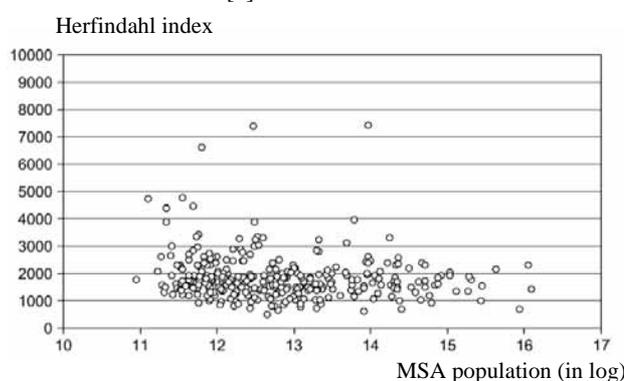
Notes: *1.* Herfindahl index is calculated using loan share at the end of fiscal 2006.
    2. Figure 2 in Dick (2007). As of 2002.
Source: Astrid A. Dick, "Market Size, Service Quality, and Competition in Banking," *Journal of Money, Credit and Banking*, 39 (1), 2007, pp. 49-81.

Chart 4-13: Market Concentration and Total Interest Rate Margin

Dependent variable: total interest rate margin (percentage points)

Regional and *shinkin* banks	Coefficients	Standard error[1]	P-value
Log of Herfindahl index	0.247	0.049	0.000
Log of asset size	-0.191	0.047	0.000
Log of corporate loans per borrower	-0.391	0.099	0.000
NPL ratio	0.014	0.273	0.959
Regional banks			
Log of Herfindahl index	0.223	0.106	0.036
Log of asset size	-0.337	0.152	0.027
Log of corporate loans per borrower	-0.646	0.238	0.007
NPL ratio	1.870	0.743	0.012
Shinkin banks			
Log of Herfindahl index	0.252	0.054	0.000
Log of asset size	-0.175	0.047	0.000
Log of corporate loans per borrower	-0.230	0.044	0.000
NPL ratio	-0.492	0.231	0.034

Sample period: fiscal 2002-2007

Estimation method: two-way fixed effects error components model

Note: *1.* Heteroskedasticity robust estimates.

business areas compared with major banks; thus, the market concentration in those areas should be an important determinant for their cost and profit structure. In this regard, the relationship between market size and competitive environment in Japan and the United States is analyzed, using population by prefecture and Herfindahl index as a proxy measuring the degree of concentration. Herfindahl index takes a small value when market concentration is low, suggesting that market competition is severe. A negative correlation between market size and market concentration is observed in Japan, while no significant correlation is observed in the United States (Chart 4-12).

It is pointed out that in the United States as market size becomes larger, higher entry barriers, including reputation building, are being erected by incumbents who incur higher fixed costs, thereby effectively deterring entry. In Japan, on the contrary, such entry barriers are low, allowing a greater number of financial institutions to enter and thereby increasing competition. In other words, a larger market in Japan, while providing more profit-earning opportunities, encourages greater entry, making it more difficult to make profits in the long run.

In order to see if the degree of competition is a factor explaining total interest margins, the estimation, based on panel data, was carried out. The result shows that the coefficients of Herfindahl index are positive and statistically significant (Chart 4-13). This illustrates the relationship in which total interest margins on loans narrow as the Herfindahl index declines (the degree of market concentration decreases).

5. Efficiency

Finally, a component that has not been explained by the above factors is regarded as an inefficiency, and the

following section examines to what extent such an inefficiency is generated in terms of costs and profits.

On the cost side, financial institutions' efforts to cut costs in past years had paid off, and cost efficiency improved from fiscal 2002. After fiscal 2005, however, the level of efficiency worsened and the differentials among financial institutions were widening again (Chart 4-14 [1]).

In terms of profits, efficiency continued to improve up until fiscal 2006, but recently it started to worsen and differentials among financial institutions were widening again (Chart 4-14 [2]).

Comparing cost efficiency and profit efficiency, they appear to be two sides of the same coin (Chart 4-15 [1]). The probability points of bivariate distribution, derived from the distributions of cost efficiency and profit efficiency, indicate that both efficiency measures improved markedly from fiscal 2002 to fiscal 2005, but then they worsened again (Chart 4-15 [2]).

In addition, when fiscal 2002 and fiscal 2007 are compared, some probability points indicate that profit efficiency worsened despite improvement in cost efficiency. This suggests that while there were cost reduction effects, differentiation of financial services and improvement in product quality lagged, and improvement in cost efficiency did not necessarily lead to improvement in profit efficiency.

6. Profit differential among regional financial institutions

Based on the four factors examined in the analysis, this section sums up the background of cost and profit differentials among regional financial institutions.

First, in terms of costs (Chart 4-16 [1]), both the production scale and the amount of loans per customer

Chart 4-14: Cost and Profit Efficiency

[1] Cost Efficiency [2] Profit Efficiency

5th-95th percentile range   10th-90th percentile rage
Interquartile range   ○ Median
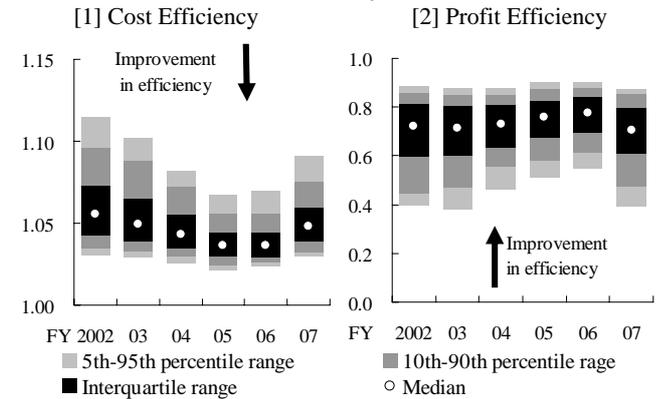
Chart 4-15: Relationship between Cost and Profit Efficiency
[1] Joint Distribution of Cost and Profit Efficiency in fiscal 2007

[2] Changes in Distribution[1]
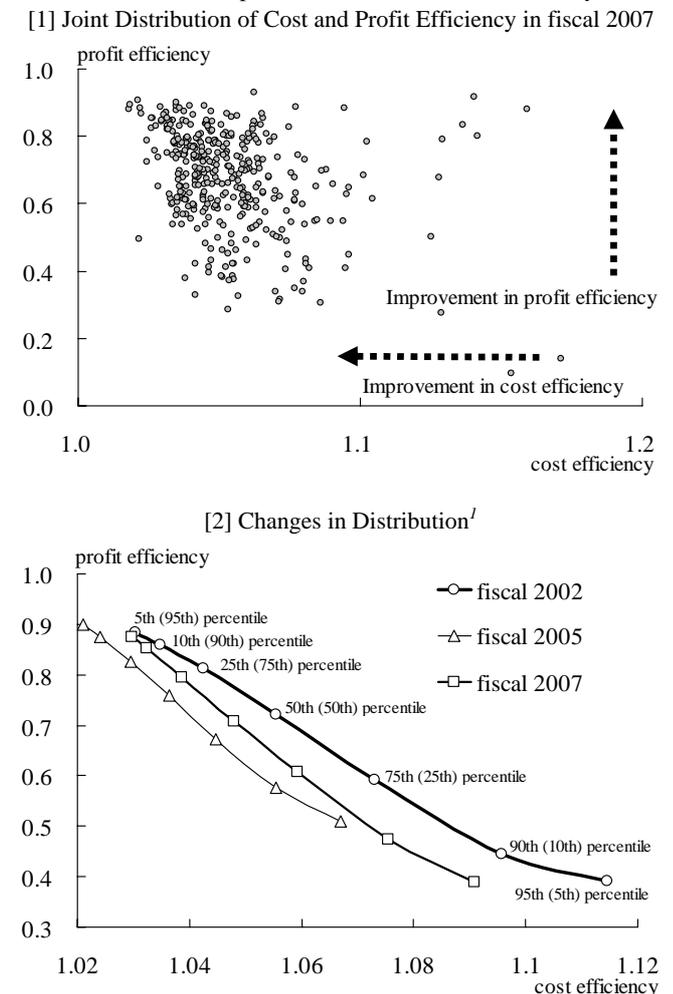
Note: 1. Percentiles of profit efficiency are in parentheses.

Chart 4-16: Decomposition of Cost and Profit Differential[1,2]
[1] Average Cost

[2] ROA
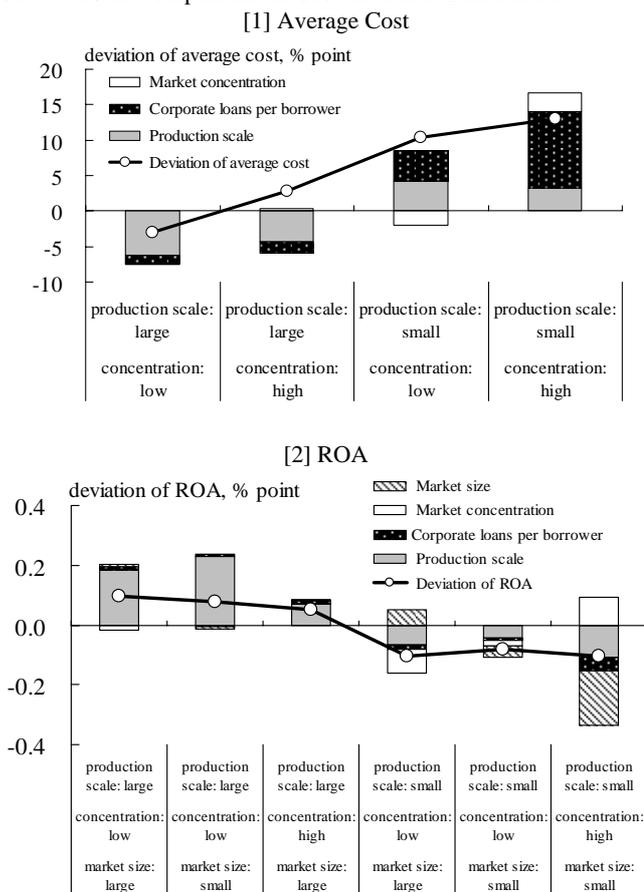
Note: 1. Bank of Japan estimation from data for fiscal 2007.
2. Each type is classified on the basis of mean values of the variables.

Chart 4-17: Viewpoints of Robustness, Efficiency, and Profitability

restrain average costs for large institutions. In contrast, these factors raise average costs for small institutions, and the degree of concentration has a significant effect on average costs.

In terms of profits, the scale of production raises the rate of return for large institutions. However, at small institutions, the degree of market concentration and market size, in addition to the production scale, also contribute to the rate of return (Chart 4-16 [2]).

From the above analysis, it has become clear that, for the regional financial institutions, the size of business areas and competitive environment are important factors in explaining profit differentials. In particular, small institutions tend to be influenced significantly by effects of external factors such as the degree of market size and market concentration. The analysis further shows that there is ample room for small institutions to enjoy economies of scale merit both in terms of costs and profits.

C. Toward Strengthening and Stabilizing the Financial Intermediation Function

Based on the above analysis, many financial institutions in Japan appear to provide homogenous financial services at low prices. In addition, they enter metropolitan areas where plenty of profit-earning opportunities exist, thus competing aggressively with each other.

Against such a backdrop, it is a difficult task for Japanese banks to map out specific prescriptions to improve profitability. Nevertheless, as previous issues of the *Financial System Report* emphasized, the roadmap for Japanese banks continues to be to properly assess the risk-return balances and to provide diversified and differentiated financial services by responding to customers' needs. In this regard, both the
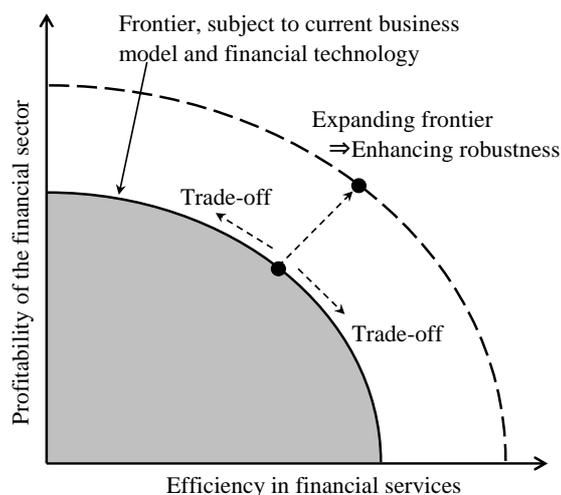
major banks and the regional banks need to build business models that take account of their comparative advantages, including managerial resources.

Reviewing the major banks' business models from this perspective, their important challenge is to enhance strategic approaches such as "concentration in core competence" toward highly profitable areas, while ascertaining the risk-return balances of domestic and overseas business operations.

For the regional financial institutions, they assume an important role in carrying out the financial intermediation function in a stable manner in their home regions. In order to carry out this function, it is critical to establish a stable management base underpinned by sufficient profitability. Financial institutions with a small business base have ample room to benefit from economies of scale both in terms of costs and profits. By pursuing economies of scale with considering mergers and management integrations that entail highly-advanced management decisions as one of the options, those institutions are able to enhance their efficiency both in terms of costs and profits. Through such moves, those institutions are expected to raise their core profitability and stabilize their business base while maintaining efficient provision of financial services.

Finally, additional remarks can be made on the relationship between the aforementioned strengthening of profitability and the stability of financial system. Looking at the global financial system in recent years, the weight of market-based financial intermediation has been increasing amid development of technological innovation in finance and globalization. In contrast, the weight of traditional bank-based financial intermediation remains high in Japan's financial system. Therefore, by utilizing market-based financial

intermediation in addition to bank-based financial intermediation, Japanese financial institutions could enrich their provision of differentiated and diversified financial services.

Based on the above line of thinking, it might be the case that the previously understood trade-off relationship between the efficiency in financial services and the profitability of the financial sector is gradually changing amid development of technological innovation in finance (Chart 4-17). The profitability of the financial sector and the efficiency in financial services could be enhanced simultaneously through the provision of differentiated and diversified financial services. In addition, together with the enriched capital of the financial system as a whole, this could enhance the sustained stability of the financial system. Financial institutions' efforts to improve the trade-off between the efficiency in financial services and the profitability of the financial sector are, from a longer-term perspective, expected to contribute to sustained growth of Japan's economy through more efficient allocation of resources.

Box 6: Stochastic Frontier Cost and Profit Model

The analysis of the regional banks and the *shinkin* banks in Chapter IV employs stochastic frontier (SF) cost and profit models to estimate the effect of input prices, scale of production, composition of production, market conditions, and efficiency on costs and profits. This method decomposes the error term into a measurement error and an efficiency term. Therefore, it insulates the fluctuation of efficiency from that caused by the measurement error. While most previous studies focus solely on the efficiency terms and examine factors that drive those terms to fluctuate, the analysis in Chapter IV examines how the five factors listed above affect cost and profit.[1]

In estimating the stochastic frontier cost and profit models, following functional forms are employed:

$$\ln C_i = \ln \overline{C} + \underbrace{\sum_{j=1}^{n} \alpha_j^c \ln w_j}_{\text{Input prices}} + \underbrace{\sum_{j=1}^{m} \beta_j^c \ln y_{j,i} + \frac{1}{2}\sum_{j=1}^{m}\sum_{k=1}^{m} \gamma_{ij}^c \ln y_{j,i} \ln y_{k,i}}_{\text{Production scale and composition}} + \underbrace{\sum_{j=1}^{l} \eta_j^c \ln z_{j,i}}_{\text{Market conditions}} + \underbrace{u_i^c}_{\text{Efficiency}} + v_i^c$$

$$\ln \pi_i = \ln \overline{\pi} + \sum_{j=1}^{n} \alpha_j^p \ln w_j + \sum_{j=1}^{m} \beta_j^p \ln y_{j,i} + \frac{1}{2}\sum_{j=1}^{m}\sum_{k=1}^{m} \gamma_{ij}^p \ln y_{j,i} \ln y_{k,i} + \sum_{j=1}^{l} \eta_j^p \ln z_{j,i} - u_i^p + v_i^p$$

where i is index of banks, u_i^c, u_i^p are cost and profit efficiency terms, respectively, v_i^c, v_i^p are measurement errors in the cost and profit function, and $\overline{C}, \overline{\pi}, \alpha, \beta, \gamma, \eta$ are parameters to be estimated. The variables used in estimation are

C_i: total cost,

π_i: core operational profit,

w_j: funding rate and personnel expenses per employee (mean of the regional banks and the *shinkin* banks),

y_{ij}:   loans, securities and non-interest revenue, and

z_{ij}:   Herfindahl index, market size (population), ratio of consumer loans to total loans, and corporate loans per borrower.

v_i and u_i are assumed to be independently distributed. v_i is assumed to be normally distributed and u_i is assumed to take some forms of a one-sided error term.[2] Under these assumptions, the cost and profit functions are separately estimated by maximum likelihood estimation.

Cost (profit) efficiency is the distance between actual cost (profit) and the minimum cost (maximum profit) on the frontier function given input prices, outputs, and other conditions. As shown in left-hand panel of Chart B6-1, Bank A is more cost-efficient than Bank B, because Bank A is closer to the cost frontier than Bank B. The right-hand panel of Chart B6-1 shows that Bank B is more profit-efficient than Bank A, because Bank B is closer to the profit frontier than Bank A.

Chart B6-1:Concepts of Cost and Profit Frontier
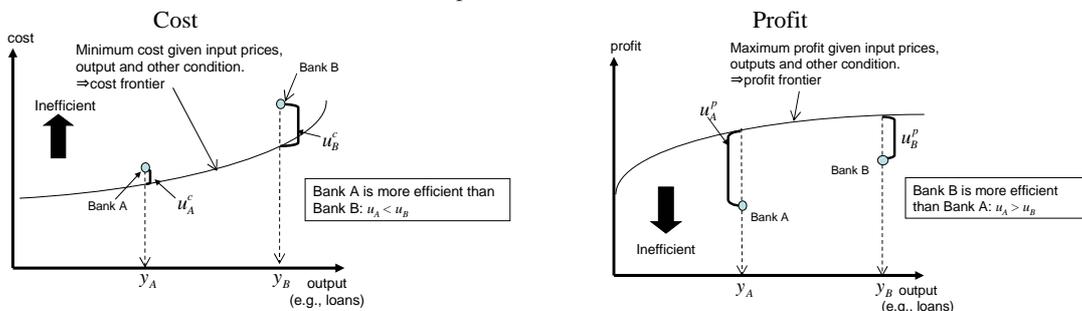
Notes: *1*. Berger and Mester (2003), analyzing banks in the United States., employed a similar approach.
    2. As a distribution of u_i, half normal, exponential, or truncated normal distributions are often used.
Reference:
Berger, Allen N., and Loretta J. Mester, "Explaining the Dramatic Changes in Performance of US Banks: Technological Change, Deregulation, and Dynamic Changes in Competition," *Journal of Financial Intermediation* 12, 2003, pp. 57-95.