



BOJ
Reports & Research Papers

Financial System FSR report



BANK OF JAPAN

APRIL 2019

The total of major banks, regional banks, and *shinkin* banks covered in this *Report* is as follows (as at end-March 2019).

Major banks comprise the following 10 banks: Mizuho Bank; MUFG Bank; Sumitomo Mitsui Banking Corporation; Resona Bank; Saitama Resona Bank; Mitsubishi UFJ Trust and Banking Corporation; Mizuho Trust and Banking Company; Sumitomo Mitsui Trust Bank; Shinsei Bank; and Aozora Bank. Regional banks comprise the 64 member banks of the Regional Banks Association of Japan (Regional banks I) and the 40 member banks of the Second Association of Regional Banks (Regional banks II). *Shinkin* banks are the 251 *shinkin* banks that hold current accounts at the Bank of Japan.

This *Report* basically uses data available as at end-March 2019.

Please contact the Financial System and Bank Examination Department at the e-mail address below to request permission in advance when reproducing or copying the contents of this *Report* for commercial purposes.

Please credit the source when quoting, reproducing, or copying the contents of this *Report* for non-commercial purposes.

Financial System Research Division,
Financial System and Bank Examination Department, Bank of Japan
post.bsd1@boj.or.jp

Objective of the *Financial System Report*

The Bank of Japan publishes the *Financial System Report* semiannually with the objective of assessing the stability of the financial system and facilitating communication with concerned parties on relevant tasks and challenges in order to ensure such stability. The *Report* provides a regular assessment of the financial cycle and the resilience of financial institutions against stress, and analyzes the potential vulnerabilities of the financial system from a macroprudential perspective. Within a macroprudential framework, institutional designs and policy measures are devised based on analyses and assessments of risks in the financial system as a whole, taking into account the interconnectedness of the real economy, financial markets, and financial institutions' behavior, in order to ensure the stability of the overall financial system.

The Bank uses the results of the analysis set out in the *Report* in planning policies to ensure the stability of the financial system and for providing guidance and advice to financial institutions through on-site examinations and off-site monitoring. Moreover, the Bank makes use of the results in international discussions on regulation, supervision, and vulnerability assessment. In relation to the conduct of monetary policy, the macro assessment of financial system stability is also regarded as an important input for the Bank in assessing risks in economic and price developments from a medium- to long-term perspective.

Features of and motivations behind the April 2019 issue of the *Report*

This April 2019 issue of the *Report* provides analyses with a particular focus on the following four areas.

First, this issue provides an analysis and assessment of financial stability risks related to the real estate market from a wide range of perspectives, with the bubble period in mind as a base of comparison. The motivation is that the *real estate loans to GDP ratio* in the heat map has turned "red," which means a large deviation from the trend in the direction of overheating.

Second, to understand the reasons behind the decline in profitability of Japan's regional financial institutions, this issue provides a comparative analysis of the profit structures of Japan's and European financial institutions, both of which are experiencing a low-interest rate environment. Moreover, the potential vulnerabilities of Japan's financial institutions are quantitatively assessed by using stock market information, which reflects the collective view of market participants on these institutions' future profitability.

Third, in addition to regular stress testing that assumes immediate realization of a risk, this issue includes stress testing that extends the simulation period and assumes that a stress event occurs in 5 years' time. The aim of this scenario is to quantitatively examine what would happen to financial stability if the already prolonged declines in regional financial institutions' profitability and capital adequacy ratios were to continue at the same pace into the future.

And fourth, the boxes of this issue provide analyses of the systemic importance and digitalization of major financial institutions, which could have significant impacts on financial stability. The former analysis takes up the issue of global financial connectedness and resonance, which is a reflection of financial institutions' systemic importance. The latter analysis outlines the current status of financial institutions' digitalization efforts and the recent rapid progress of a wide range of cashless payment initiatives.

Contents

Chapter I. Executive summary	1
Chapter II. Risks observed in financial markets	3
A. Global financial markets	
B. Japanese financial markets	
Chapter III. Examination of financial intermediation	15
A. Financial intermediation by financial institutions	
B. Financial intermediation by institutional investors	
C. Investment in financial assets and funding activities by the private non-financial sector	
D. Examination of the financial cycle and financial vulnerabilities	
Chapter IV. Financial institutions' financial bases and risk profiles	39
A. Credit risk	
B. Market risk	
C. Real estate related risk	
D. Funding liquidity risk	
E. Financial institutions' capital adequacy	

Chapter V. Financial institutions' declining profitability and potential vulnerabilities 63

- A. Japan's financial institutions' profitability
- B. Banks' profit structure under low interest rate policies: International comparison
- C. Stock market participants' view on financial institutions' profitability

Chapter VI. Macro stress testing 73

- A. Regular macro stress testing
- B. Stress testing based on medium- to long-term profit simulation

Chapter VII. Toward ensuring financial stability in the future 87

Box 1: Discontinuation of LIBOR and reform of interest rate benchmarks

Box 2: Developments in the real estate market

Box 3: Global financial connectedness of Japanese banks

Box 4: U.S. interest-rate increases and Japanese banks' U.S. dollar funding

Box 5: Stock market based evaluation of regional banks' profitability and financial soundness: P/B ratios and SRISK

Box 6: Financial institutions' use of IT and data: its directions and challenges

Box 7: The digitalization of retail payments and its impact on the banking industry

Glossary 112

I. Executive summary

Developments in financial intermediation

Financial intermediation, particularly bank lending, has continued to be active on the back of monetary easing by the Bank of Japan. In the domestic loan market, loan interest rates have been hovering near historically low levels and loans outstanding have continued to grow at a year-on-year rate of around 2.5 percent. Lending to large firms related to merger and acquisition (M&A) deals has increased, and business fixed investment-related lending to small firms has also increased across a wide range of industries. In the CP and corporate bond market, fund-raising by large firms has been increasing on the whole as issuance rates have hovered at extremely low levels. In global financial markets, stock prices and credit market spreads had previously shown temporary instability reflecting heightened uncertainty over the global economy, but they have recently started to calm. Against this background, Japanese financial institutions have maintained upward momentum in their overseas exposure, particularly through lending and investment in overseas credit products such as highly rated collateralized loan obligations (CLOs) and investment-grade corporate bonds.

Financial cycle and potential vulnerabilities

Under these financial intermediation activities, the funding conditions for firms and households have been highly accommodative. Against this background, the expansion in the financial cycle has continued as the *total credit to GDP ratio* has deviated upward from its trend. However, financial and economic activities as a whole have shown no signs of overheating as observed during the bubble period in the late 1980s. That said, rapid growth of the outstanding amount of real estate loans has continued and a deviation of the *real estate loans to GDP ratio* from its trend has marked a record high for the post-bubble period. Based on information from a wide range of sources, including information about changes in land prices, Japan's real estate market cannot be judged as experiencing overheating. However, the following possible vulnerabilities of the real estate market warrant close attention: (1) the increase in loans has been mainly driven by those to small firms and rental housing businesses run by individuals; (2) the financial institutions that have been active in extending such loans tend to have relatively low capital adequacy ratios; and (3) in addition to lending, financial institutions have increased equity-type investment in real estate investment trusts (REITs) and real estate investment funds. Moreover, regional financial institutions, which are important for their support of firms and the general economy in their region, have been actively extending loans to middle-risk firms with relatively low creditworthiness. For such loans, however, regional financial institutions have continued to face difficulty in securing profit margins commensurate with the risks involved. It is thus necessary to pay attention to the vulnerability of financial institutions to a future rise in credit costs. The expansion in the financial cycle has supported the current overall economic expansion. However, from a somewhat longer-term perspective, if the growth potential of Japan's economy does not increase, then the recent financial developments could build up pressure on balance sheet adjustments and thereby amplify downward pressure on the economy in the event of a future negative shock.

With respect to international finance, Japanese financial institutions have generally maintained a high quality of overseas loans' portfolios, but have shown some increase in lending to relatively high-risk firms amid the intensified competition with overseas financial institutions and higher foreign currency funding costs. Moreover, Japanese financial institutions have become more active in risk taking in securities investment by increasing their holdings of overseas credit products and investment trusts. Consequently, they have become exposed to more diverse and

complex market risks. Therefore, it should be noted that these financial institutions have become more susceptible to the impact of a widespread repricing of risky assets stemming from a possible downturn in the global economy.

Stability of the financial system

Japan's financial system has been maintaining stability on the whole. Financial institutions, despite the above-mentioned vulnerabilities, generally have strong resilience in terms of both capital and liquidity during tail events like the failure of Lehman Brothers (the Lehman shock).

However, the profitability of domestic deposit-taking and lending activities, which are the core financial intermediation functions, has continued to decline. This seems to be mostly caused by structural factors such as the decrease in growth expectations and the secular decline in loan demand associated with the shrinking population, as well as the prolonged low interest rate environment. In response to the decline in domestic business profitability, major financial institutions have aggressively expanded their global activities and pursued group-wide strategies to provide comprehensive financial services, resulting in an increase in their systemic importance and global financial connectedness. Regional financial institutions have become more active in domestic lending to middle-risk firms and the real estate industry, as well as in securities investment. However, as they have generally not been able to secure profits commensurate with the increase in risk-weighted assets, their capital adequacy ratios and stress resilience have declined moderately. Should this situation persist, downward pressure on the real economy from the financial system could intensify in the event of stress, as the capital of financial institutions would decrease substantially due to increased credit costs and securities-related losses.

Challenges from a macroprudential perspective

In order for the financial system to maintain stability into the future, financial institutions need to address the following four business challenges. First, financial institutions should strengthen efforts to raise their profitability. Specifically, they need to (1) set their loan interest rates commensurate with the risks involved, (2) increase profits derived from fees and commissions by providing consulting and advisory services to firms and services supporting households' wealth management, and (3) drastically increase their business efficiency. To strongly promote these efforts, mergers and alliances can be effective options. Second, financial institutions should enhance their risk management in areas where they have increased their risk taking. Regional financial institutions need to strengthen their risk management in response to the increases in their lending to middle-risk firms and the real estate industry and in their investment through the purchases of investment trust products. Major financial institutions need to ensure a solid financial base in accordance with their systemic importance and conduct business management on a global and group-wide basis. Third, financial institutions should adapt to digitalization. In Japan, a wide range of cashless payment initiatives have been making progress and an increasing number of financial institutions have been making use of open application programming interfaces (APIs), artificial intelligence (AI), and cloud computing. Financial institutions need to make clear policies regarding the use of digital technology and establish frameworks for cyber security and data protection accordingly. Finally, financial institutions should implement appropriate capital policies, including those pertaining to sufficient capital levels, dividend payout plans, and the effective use of unrealized gains on securities. The Bank of Japan will support financial institutions' efforts through on-site examinations and off-site monitoring, and will also continue to closely monitor the impact on the financial system of financial institutions' various forms of risk taking from a macroprudential perspective.

II. Risks observed in financial markets

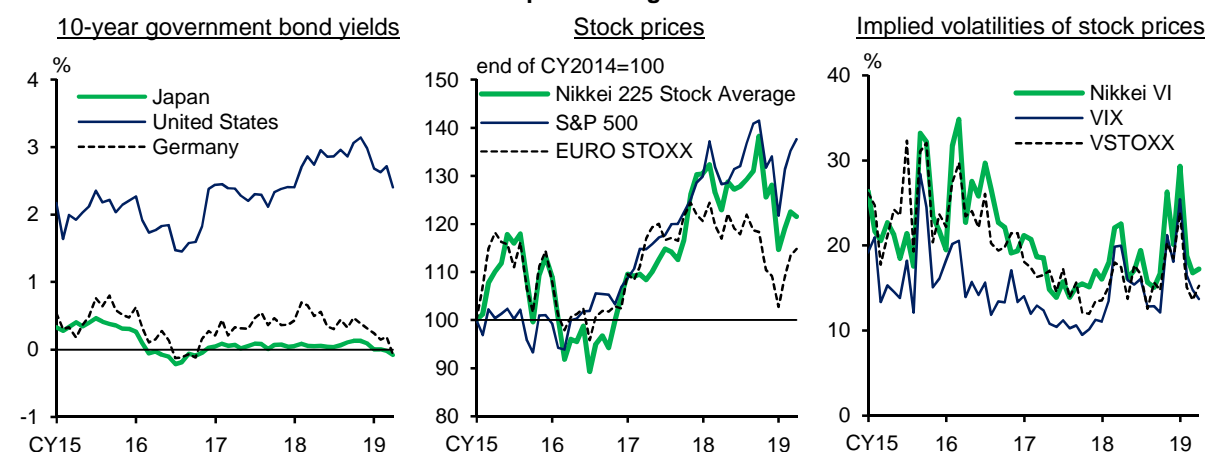
This chapter summarizes the developments in financial markets within Japan and abroad, mainly during the second half of fiscal 2018, and examines the risks observed.¹

A. Global financial markets

In global financial markets, from autumn 2018 to the year-end, investors' risk appetite deteriorated as political uncertainties, such as those related to U.S.-China trade tensions and the situation in Europe, cast a shadow over global financial and economic activities. As a result, U.S. and European long-term interest rates declined and stock prices fell significantly. Prices of credit assets such as corporate bonds fell as well, at least temporarily. Turning to emerging markets, volatile movements in part of these markets have settled, partly reflecting a lower expectation for U.S. policy rate hikes.

More recently, investors' risk appetite has improved, starting to restore calm to global financial markets overall. However, market participants have remained cautious in their expectations about financial and economic conditions. Particular attention should be paid to the possibility that, depending on how events related to the abovementioned political uncertainties evolve, global financial markets would once again become volatile due to concerns over financial and economic activities (Chart II-1-1).

Chart II-1-1: Developments in global financial markets



Note: Latest data as at end-March 2019.
Source: Bloomberg.

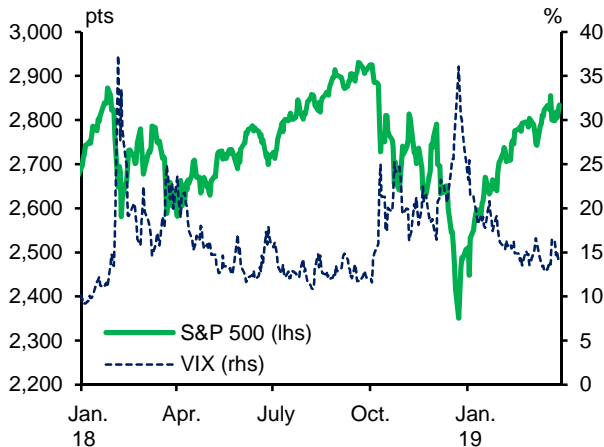
U.S. and European stock prices

In the United States and Europe, corrections in some high-tech stocks triggered a fall in stock prices in autumn 2018. Stock prices declined significantly through the year-end as investors' risk appetite deteriorated sharply amid heightened uncertainty triggered by U.S.-China trade tensions and China's weaker-than-expected economic indicators (Chart II-1-2). However, U.S. stock prices have recently been picking up, reflecting investors' improved risk appetite, as market participants' expectations for policy rate hikes in the United States have declined. U.S. and European price earnings (P/E) ratios, which are stock price valuation indicators, temporarily decreased, returning

¹ In Japan, the fiscal year starts in April and ends in March of the following year.

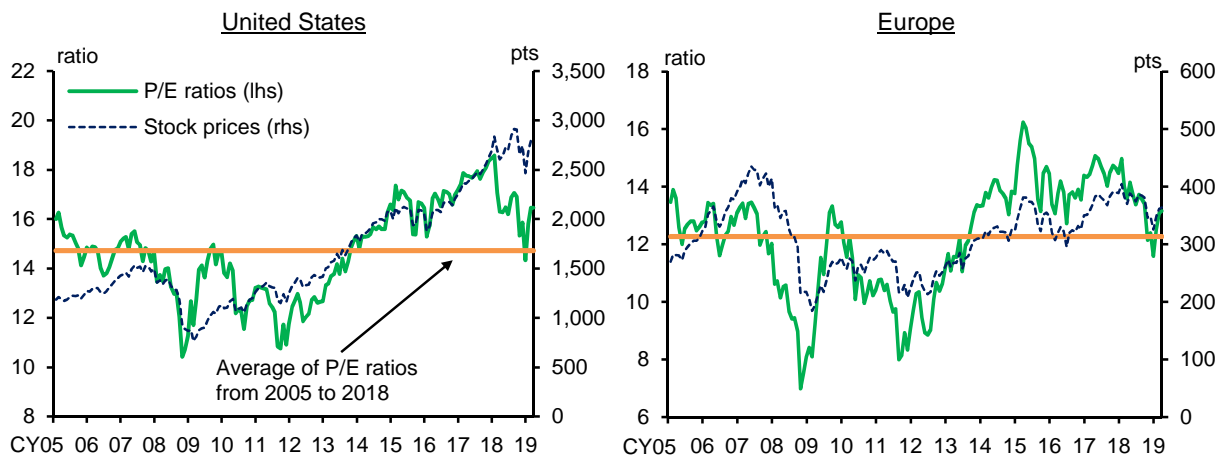
to their long-term average, due to the decline in stock prices (Chart II-1-3).

Chart II-1-2: U.S. stock prices and volatility



Note: Latest data as at end-March 2019.
Source: Bloomberg.

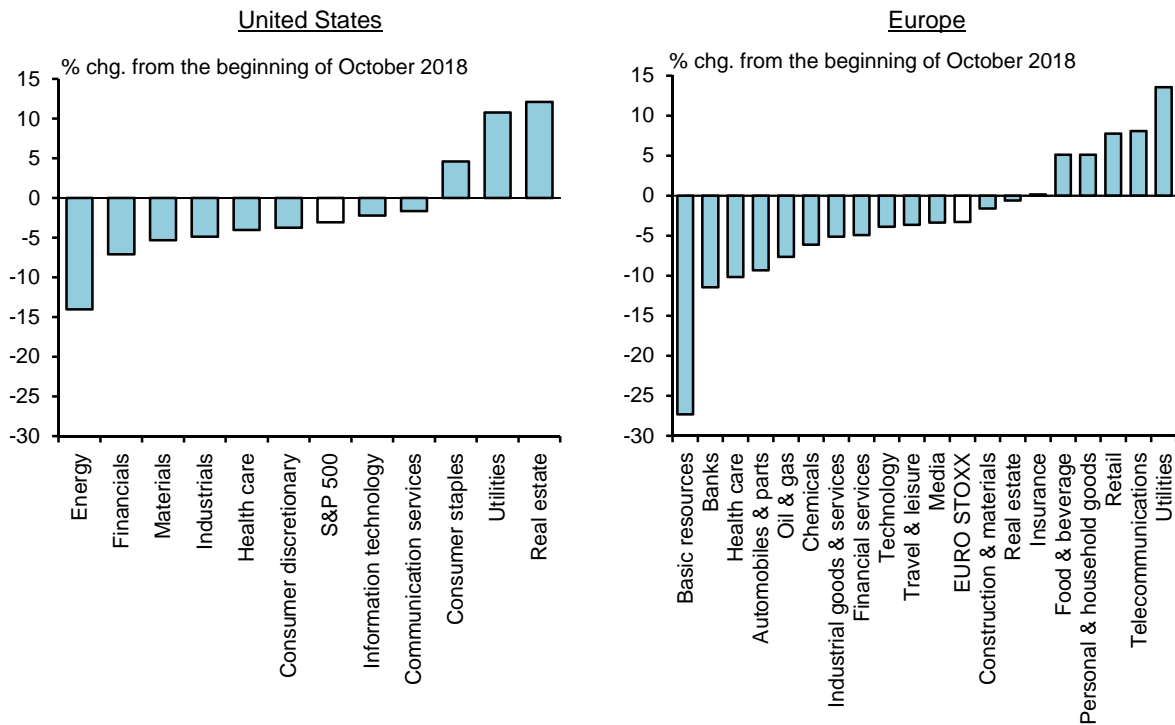
Chart II-1-3: Stock prices and valuation



Note: 1. "Stock prices" indicates the S&P 500 for the United States and the EURO STOXX for Europe. "P/E ratios" is calculated using expected EPS for the next 12 months.
2. Latest data as at March 2019.
Source: Datastream from Refinitiv.

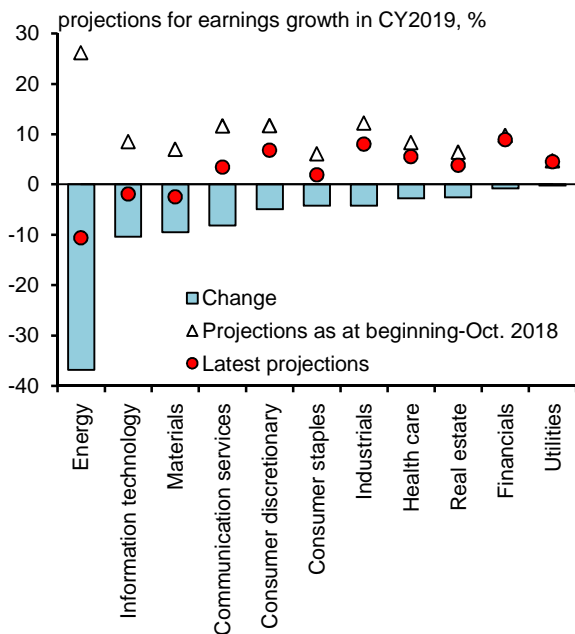
Breaking down stock prices by sector, although the so-called defensive sectors, such as the utilities sector, have remained relatively firm, notable declines are observable in the energy and material sectors because of a decline in commodity prices and higher business-cycle sensitivity, respectively (Chart II-1-4). In addition, expected earnings per share (EPS) has declined for both U.S. and European firms, due to projected earnings being revised downward, particularly for the energy sector and growth sectors such as information technology. Thus, investors have become somewhat more cautious regarding their expectations about future corporate earnings compared to the past (Charts II-1-5 and II-1-6).

Chart II-1-4: U.S. and European stock price performance by sector



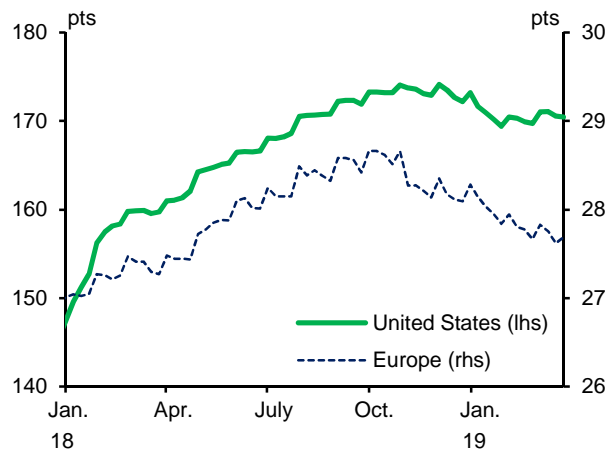
Note: In the left-hand chart, the figures indicate changes by sector in the S&P 500. In the right-hand chart, the figures indicate changes by sector in the EURO STOXX. Latest data as at end-March 2019.
Source: Bloomberg.

Chart II-1-5: Earnings projections for U.S. firms by sector



Note: The year-on-year projections for earnings growth in 2019 are aggregated by sector. Latest data as at end-March 2019.
Source: Eikon from Refinitiv.

Chart II-1-6: Expected EPS for U.S. and European firms

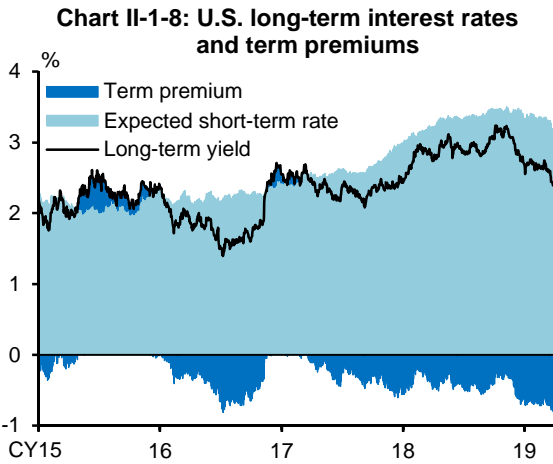
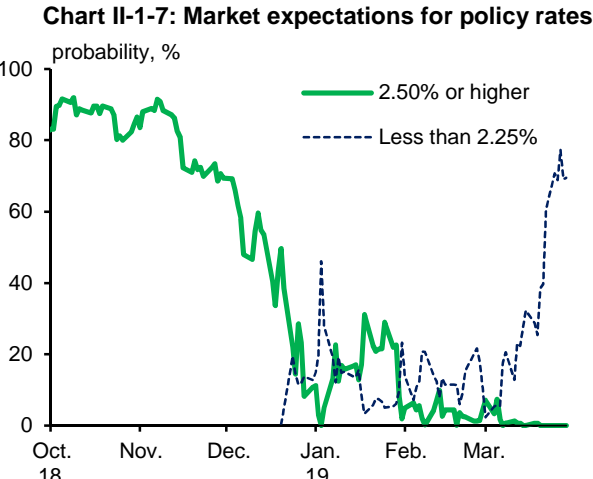


Note: 1. "United States" and "Europe" indicate expected EPS for the next 12 months of the S&P 500 and the EURO STOXX, respectively.
2. Latest data as at March 28, 2019.
Source: Datastream from Refinitiv.

U.S. and European long-term interest rates

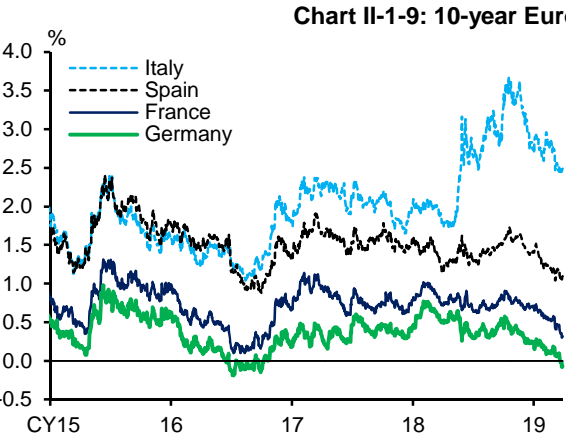
The Federal Reserve (FRB) raised its policy rate for the fourth time during the year in December

2018. The market inferred that there was significantly less probability of rate hikes during 2019, expecting the FRB to be cautious about making further rate hikes. In fact, since the Federal Open Market Committee (FOMC) meeting held in March, a growing number of market participants expect a rate cut later in the year (Chart II-1-7). Under such circumstances, U.S. long-term interest rates have edged lower, reflecting lower term premiums (Chart II-1-8). Meanwhile, European long-term interest rates have fallen in tandem with U.S. interest rates amid somewhat weak economic indicators in Europe (Chart II-1-9). Yet, Italian government bond yields have remained at higher levels compared to other major European countries.



Note: 1. The probability that the lower bound of the federal funds (FF) target range (2.25% as at end-March 2019) would be in either territory specified in the chart at the time of the FOMC meeting in December 2019 is calculated using FF futures rates. For "less than 2.25%," only the data from December 20, 2018 (the day after the FOMC meeting) onward are shown.
 2. Latest data as at end-March 2019.
 Source: Bloomberg.

Note: The data are estimated by the Federal Reserve Bank of New York. Latest data as at end-March 2019.
 Source: Bloomberg.



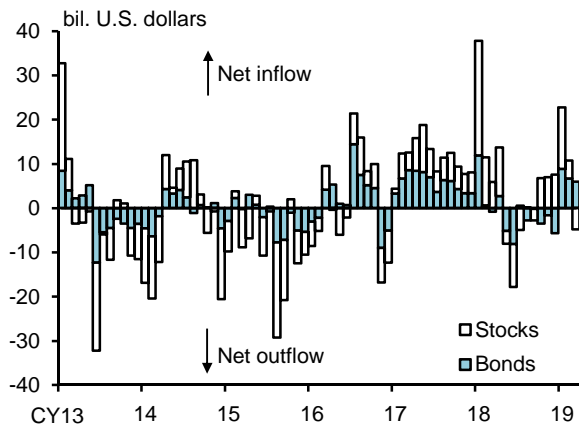
Note: Latest data as at end-March 2019.
 Source: Bloomberg.

Emerging markets

In emerging markets, global capital flows reversed to net inflows and stock prices and currencies have risen for many countries, mainly due to their policy responses, including interest rate hikes, and the reduced expectations for U.S. policy rate hikes (Charts II-1-10 and II-1-11). Although many market participants expect emerging markets to remain relatively resilient, capital flows to emerging markets tend to be strongly affected by changes in U.S. long-term interest rates. Furthermore, structural vulnerabilities remain in some emerging market economies. Therefore, attention should be paid to the possibility that capital outflow pressure would once again elevate

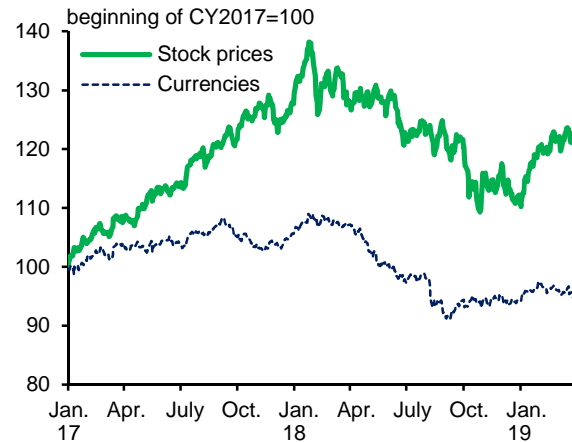
for emerging market economies if U.S. long-term interest rates were to rise sharply.

Chart II-1-10: Net flows in emerging market funds



Note: Latest data as at March 2019 (up to March 27, 2019).
Source: EPFR Global; Haver Analytics.

Chart II-1-11: Stock prices and currencies in emerging markets

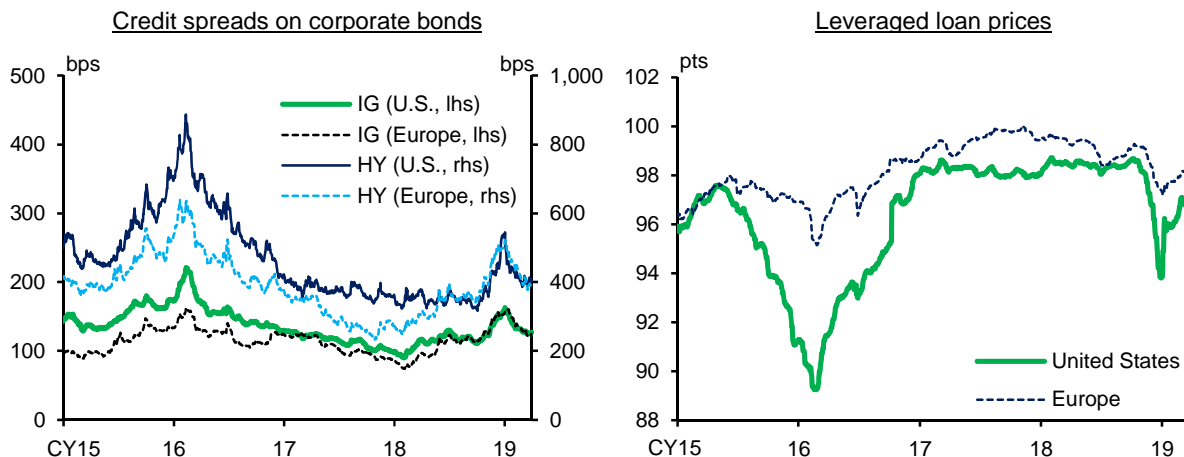


Note: "Stock prices" indicates the MSCI EM Local Index.
"Currencies" indicates the J.P. Morgan EMCI Index.
Latest data as at end-March 2019.
Source: Bloomberg.

Risks related to U.S. and European credit markets

In U.S. and European credit markets, credit spreads temporarily widened significantly after October 2018 as investors' risk appetite deteriorated notably (Chart II-1-12). In the market for leveraged loans -- that is, loans extended to speculative-grade firms -- spreads temporarily widened significantly and secondary market prices fell greatly.² In the high-yield bond market, a decline in crude oil prices also put upward pressure on credit spreads for speculative-grade corporate bonds because energy sector bonds constitute a large share of this market. In Europe, political uncertainty over the United Kingdom's exit from the European Union (EU) and somewhat weak economic indicators also contributed to the widening spreads.

Chart II-1-12: Developments in U.S. and European credit markets



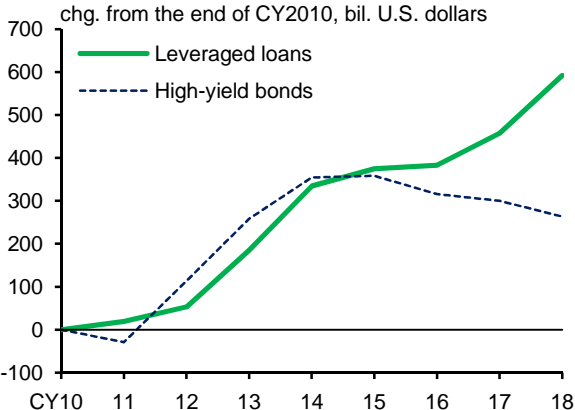
Note: 1. In the left-hand chart, the figures are calculated by ICE Data Indices. "IG" and "HY" indicate investment-grade corporate bonds and high-yield bonds, respectively.
2. In the right-hand chart, the figures indicate the index of leveraged loan prices in the secondary markets (the S&P/LSTA Leveraged Loan Index for the United States or the S&P European Leveraged Loan Index for Europe).
3. Latest data as at end-March 2019.

Source: Bloomberg.

² Although there are no precise criteria agreed upon for defining a leveraged loan, the term generally refers to a loan extended to speculative-grade firms rated BB or below.

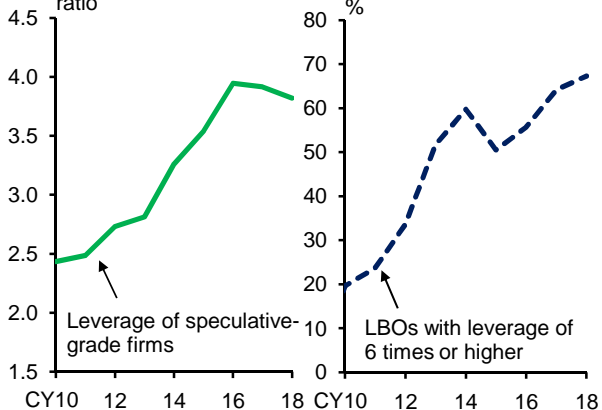
Now that credit markets have begun to settle, many participants are viewing the widening spreads as a temporary adjustment -- a reversal of the past tightening. However, attention should be paid to the possibility that credit quality in overseas credit markets has deteriorated as debt outstanding especially of low-rated firms has increased, given that robust demand by investors has continued to make the funding conditions highly favorable.³ In particular, the outstanding amount of leveraged loans in the United States has increased rapidly, at a faster pace than that of high-yield bonds (Chart II-1-13). In this buildup process, speculative-grade firms rated BB or below -- which correspond to the borrowers in leveraged loans -- have raised their leverage higher. Moreover, an increasing number of corporate buyout deals have been financed by leveraged loans with high leverage (Chart II-1-14). It should also be noted that among leveraged loans, so-called covenant-lite loans and loans that are subordinate to other debt in case of default have been increasing,⁴ thus, loan recovery rates for these leveraged loans in the event of default could be lower than in the past.

Chart II-1-13: Outstanding amount of U.S. leveraged loans



Note: 1. "Leveraged loans" and "high-yield bonds" indicate outstanding amounts of the constituents of the S&P/LSTA Leveraged Loan Index and the U.S. high-yield bond index calculated by ICE Data Indices, respectively.
 2. The data are as at the end of year.
 Source: Bloomberg; Loan Connector from Refinitiv.

Chart II-1-14: Leverage of U.S. firms eligible for leveraged loans



Note: 1. The left-hand chart covers firms for which financial indicators are available since 2008 among those listed in the high-yield bond index calculated by ICE Data Indices, and shows the median of the leverage (net debt / EBITDA) of covered firms.
 2. The right-hand chart shows the proportion of leveraged buyouts (LBOs) which had leverage of 6 times or higher at the time of the buyouts.
 3. Latest data as at 2018.
 Source: Bloomberg; Loan Connector from Refinitiv.

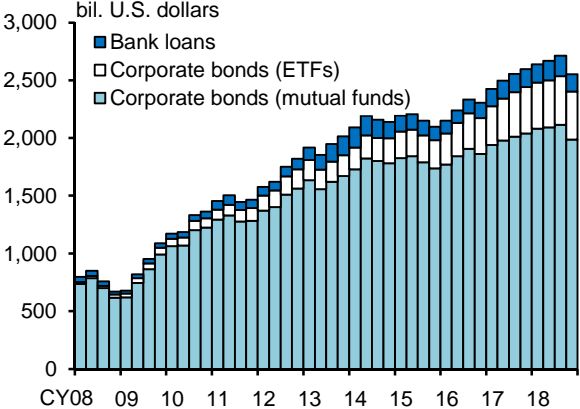
Attention should also be paid to the possibility that the growing presence of credit funds such as mutual funds in the U.S. credit markets could amplify price movements in leveraged loans and other credit assets (Chart II-1-15). Some of these funds guarantee investors liquidation within a short term, despite holding relatively illiquid corporate bonds and loans. Therefore, if investors' sales of credit funds were to increase temporarily due to some negative shock, there is a risk that these funds could put selling pressure on their holdings of corporate bonds and loans, which in turn would lead to price declines and further sales by investors. In fact, in December 2018, bank-loan funds, which held leveraged loans, saw a large amount of capital outflow, due to a deterioration of investors' risk appetite, and this outflow seems to have exacerbated the decline in

³ For details, see Sotaro Kankawa, Yoshiya Ogawa, and Takuya Sukegawa, "Recent Developments in U.S. Credit Markets," *Bank of Japan Review Series*, No. 19-J-3, March 2019 (available only in Japanese).

⁴ A covenant-lite loan is a loan agreement that imposes few or no financial covenants -- e.g., covenants that limit leverage or prohibit the sales and transfer of specific assets -- on borrowers.

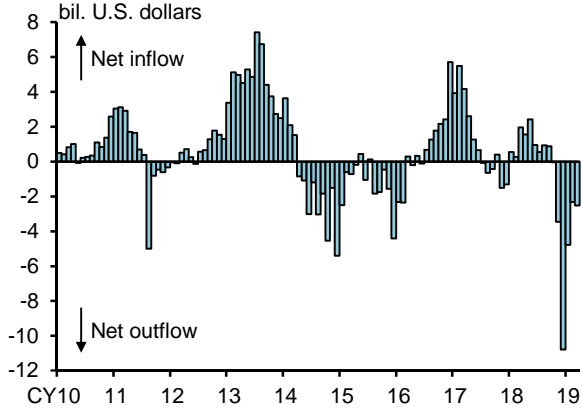
leveraged loan prices in the United States (Chart II-1-16). Under these circumstances, there is a risk that significant price movements could occur in the credit markets if changes in economic and financial conditions were to lead to an increase in firms' defaults.

Chart II-1-15: Outstanding amount of credit funds' assets in the United States



Note: "Corporate bonds (ETFs)" and "corporate bonds (mutual funds)" partly include investments in foreign bonds. "Bank loans" indicates the sum of ETFs and mutual funds. Latest data as at end-December 2018.
 Source: FRB, "Financial accounts of the United States"; Loan Connector from Refinitiv.

Chart II-1-16: Net flows in bank-loan funds

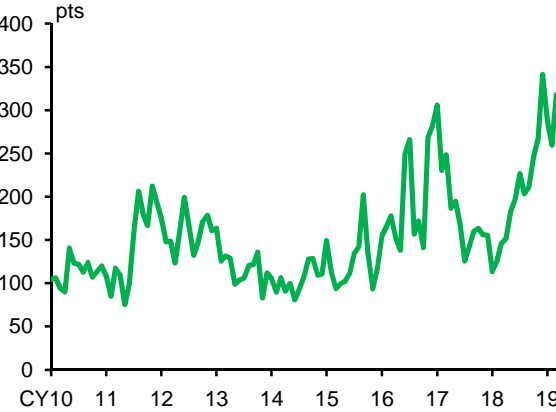


Note: Latest data as at March 2019 (up to March 27, 2019).
 Source: EPFR Global; Haver Analytics.

Heightened global political uncertainties

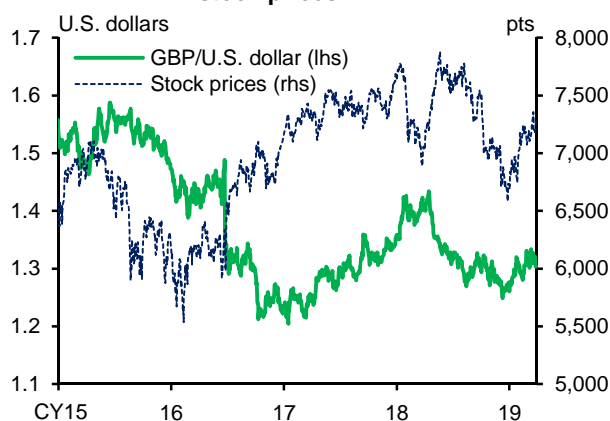
Global political uncertainties have remained high over developments in U.S.-China trade tensions and negotiations on the United Kingdom's exit from the EU (Chart II-1-17). As the trade talks between the United States and China have continued, market participants have become increasingly conscious of their consequences. In the United Kingdom, political uncertainties have remained elevated over the U.K. parliamentary debate on the country's exit from the EU and consequences of the negotiations with the EU. Under these circumstances, U.K. stock prices and the British pound have fluctuated in response to news on EU exit negotiations (Chart II-1-18). British pound risk reversals have reflected somewhat greater vigilance against the pound's depreciation. Attention should be paid to a future risk that a further heightening of global political uncertainties including those mentioned above would lead to volatility in global financial markets (Chart II-1-19).

Chart II-1-17: Global economic policy uncertainty index



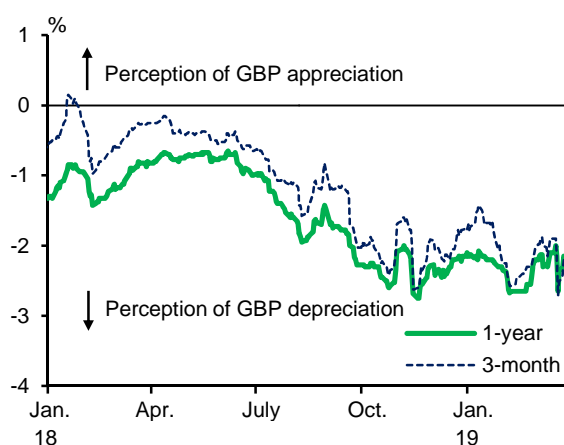
Note: Latest data as at March 2019.
 Source: Economic Policy Uncertainty.

Chart II-1-18: GBP/U.S. dollar rates and U.K. stock prices



Note: "Stock prices" indicates the FTSE 100. Latest data as at end-March 2019.
Source: Bloomberg.

Chart II-1-19: GBP/U.S. dollar risk reversals



Note: Latest data as at end-March 2019.
Source: Bloomberg.

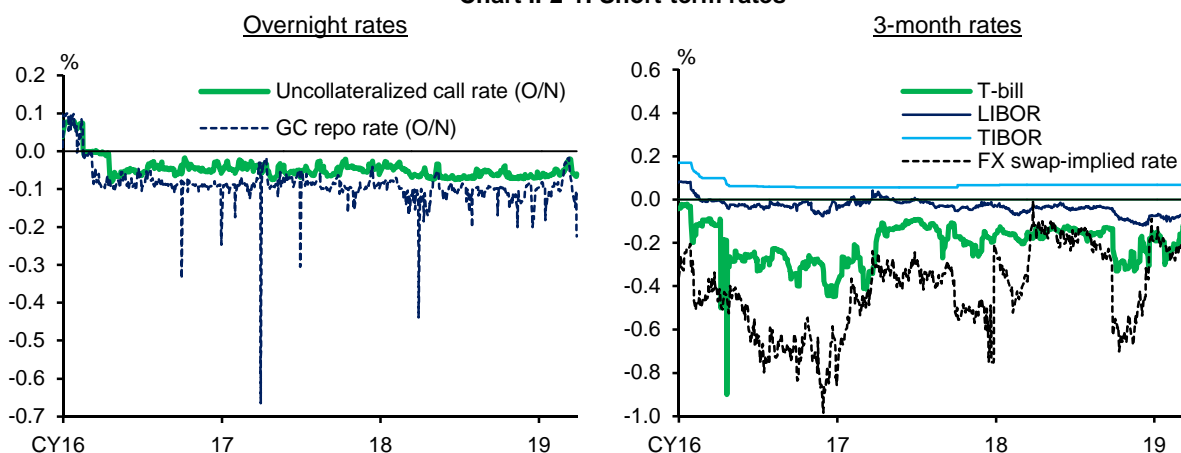
B. Japanese financial markets

In Japanese financial markets, both short- and long-term interest rates have generally been stable since the Bank of Japan strengthened the framework for continuous powerful monetary easing at the end of July 2018. Moreover, despite firms' relatively robust earnings, stock prices have remained more or less unchanged, mainly due to heightened concerns over U.S.-China trade tensions and some appreciation of the yen against the U.S. dollar.

Short- and long-term interest rates

Short-term interest rates, on both overnight and term instruments, have been in negative territory on the whole (Chart II-2-1). The uncollateralized call rate (O/N) has stayed in the neighborhood between minus 0.07 and minus 0.02 percent. The GC repo rate has remained between approximately minus 0.20 and minus 0.02 percent. Rates on term instruments have remained at around 0 percent or in negative territory. Yields on Treasury bills (T-bills) have mostly remained

Chart II-2-1: Short-term rates



Note: 1. In the left-hand chart, the horizontal axis indicates the starting date of transaction settlement. "GC repo rate (O/N)" up to April 27, 2018 indicates the T/N rate.

2. In both charts, the latest data are as at end-March 2019.

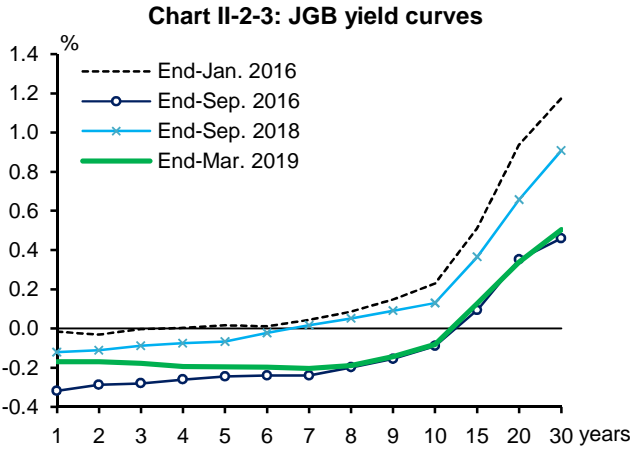
Source: Bloomberg; Japan Bond Trading; JSDA; BOJ.

between approximately minus 0.30 and minus 0.10 percent, with some temporary deviations. FX swap-implied yen rates maturing beyond the year-end fell deeper into negative territory well before the year-end, reflecting that Japanese investors front-loaded their dollar funding over the year-end. However, the rates have remained more or less at the same level as the previous year and have recently calmed. Meanwhile, given the possibility that LIBOR will be permanently discontinued after the end of 2021, measures to address the discontinuation have been discussed, and market participants have paid increasing attention to the discussions (Box 1).

After the Bank strengthened the framework for continuous powerful monetary easing at the end of July 2018, the 10-year JGB yields rose in positive territory through the autumn of the same year but thereafter declined, in line with movements in overseas interest rates (Chart II-2-2). Under Quantitative and Qualitative Monetary Easing (QQE) with Yield Curve Control, the shape of the yield curve for JGBs has been in line with the current guideline for market operations, in which the short-term policy interest rate is set at minus 0.1 percent and the target level of 10-year JGB yields is around 0 percent (Chart II-2-3).



Note: Latest data as at end-March 2019.
Source: Bloomberg.



Source: Bloomberg.

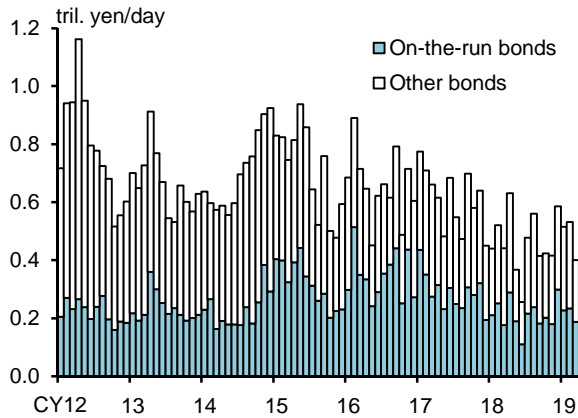
Liquidity and functioning of JGB markets

Liquidity and functioning of JGB markets have improved somewhat. Since the end of July 2018, when the Bank strengthened the framework for continuous powerful monetary easing, inter-dealer transaction volume for cash JGBs has remained somewhat larger amid slightly higher volatility (Chart II-2-4). Under these circumstances, the latest *Bond Market Survey* (February 2019) shows that the diffusion index for the degree of bond market functioning from the surveyed institutions' viewpoint has recently increased somewhat while remaining deep in negative territory (Chart II-2-5).

However, when volatility increased in global financial markets through the end of 2018, liquidity indicators of market depth and resiliency temporarily deteriorated as JGB futures prices showed large fluctuations (Chart II-2-6). In addition, GC-SC repo rate spreads, which indicate scarcity in specific issues, temporarily rose somewhat significantly, reflecting the small amount of off-the-run bonds floating in the markets, but have recently calmed (Chart II-2-7).⁵

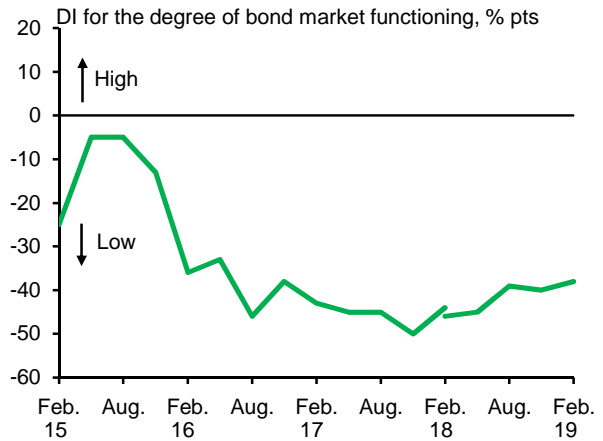
⁵ For other liquidity indicators, see the Bank of Japan's website (<http://www.boj.or.jp/en/paym/bond/index.htm/#p02>). The Financial Markets Department of the Bank generally updates and releases liquidity indicators of the JGB markets on a quarterly basis.

Chart II-2-4: Transaction volume in JGB markets



Note: Inter-dealer transaction volume for cash JGBs (2-, 5-, 10-, 20-, 30-, and 40-year JGBs) via Japan Bond Trading. Latest data as at March 2019.
Source: QUICK.

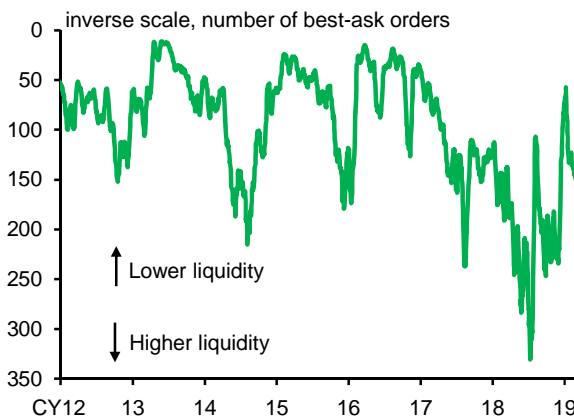
Chart II-2-5: Bond market survey



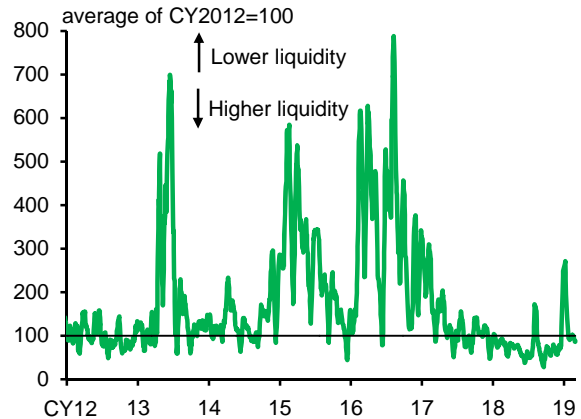
Note: 1. Based on the proportion of responding institutions selecting a given choice, the DI is calculated as follows: DI for the degree of current bond market functioning = "high" - "low."
2. The data from February 2018 onward cover major institutional investors. Latest data are based on the February 2019 survey.
Source: BOJ, "Bond market survey."

Chart II-2-6: Market depth and resiliency in JGB futures markets

Market depth

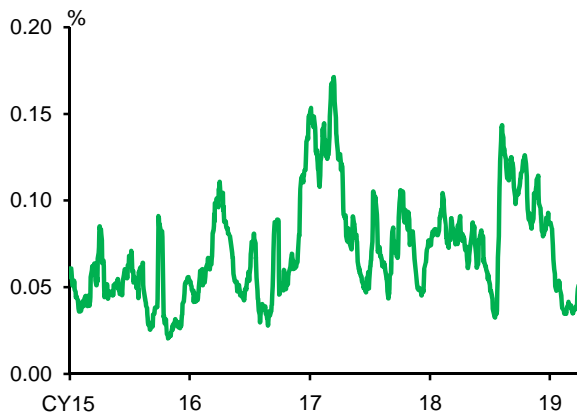


Resiliency (price impact)



Note: 1. In the left-hand chart, the figures are the number of orders at the best-ask price with 1-minute frequency (median for each business day). In the right-hand chart, the figures indicate the price change per unit volume of transactions for each business day.
2. 10-day backward moving averages. Latest data as at end-February 2019.
Source: Nikkei, "NEEDS."

Chart II-2-7: GC-SC repo rate spreads

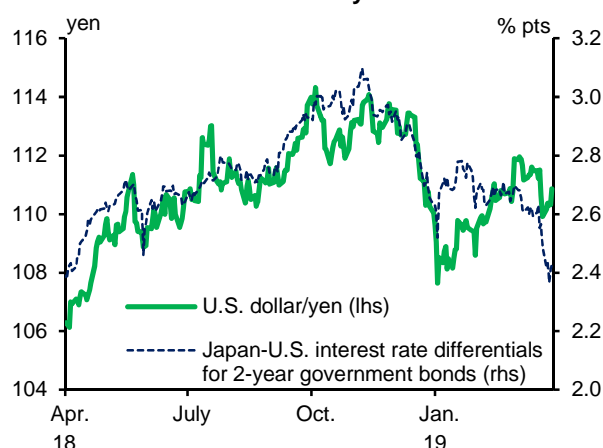


Note: 1. The data are calculated using GC repo rates and SC repo rates (average rates weighted by the trading volume of SC repos by issue) in transactions with the same settlement dates. 10-day backward moving averages.
2. Latest data as at end-March 2019.
Source: JBond Totan Securities; JSDA.

FX markets and stock markets

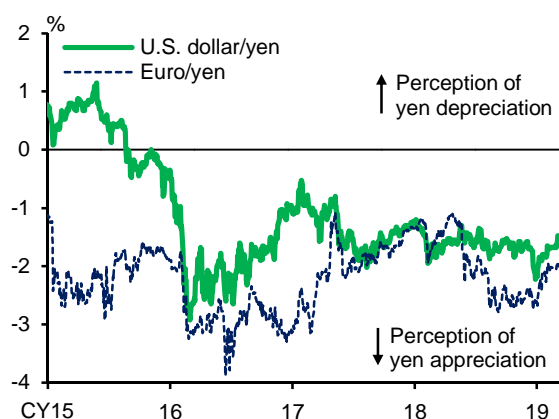
In FX markets, the yen has appreciated against the U.S. dollar, reflecting the narrowing of interest rate differentials between Japan and the United States due to a decline in expectations for policy rate hikes in the United States (Chart II-2-8). Risk reversals suggest market participants' continued vigilance against the yen's appreciation (Chart II-2-9). Meanwhile, the yen showed extreme volatility at the beginning of 2019, surging by up to 4 yen against the U.S. dollar in a very short period (Chart II-2-10). It has been pointed out that, amid exceptionally low liquidity in the morning during the New Year holidays, loss-cutting by Japanese margin traders contributed to temporarily amplifying market movements.

Chart II-2-8: Japan-U.S. interest rate differentials and U.S. dollar/yen rates



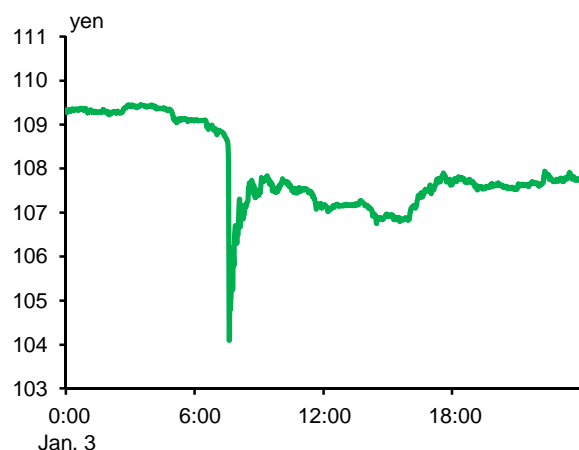
Note: Latest data as at end-March 2019.
Source: Bloomberg.

Chart II-2-9: Risk reversals



Note: Deviation between implied volatilities (1-year) of yen put and call options. Latest data as at end-March 2019.
Source: Bloomberg.

Chart II-2-10: U.S. dollar/yen rates (January 3)

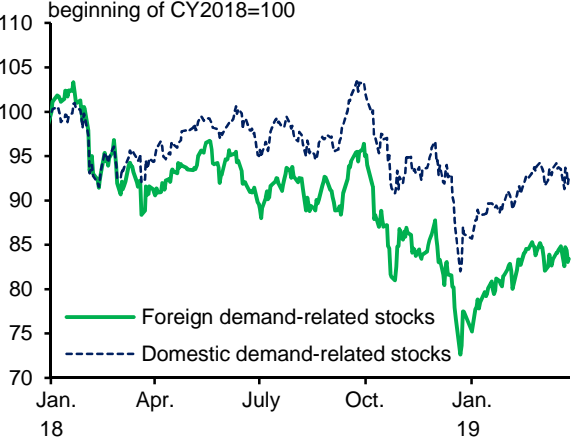


Note: Intraday data with 1-minute frequency on January 3, 2019.
Source: EBS; Eikon from Refinitiv.

Japanese stock prices (Nikkei 225 Stock Average) marked a record high for the period after the bubble burst in the early 1990s at the beginning of October 2018 on the back of expectations for strong corporate earnings. However, they have thereafter declined, dragged down by U.S. stocks, as well as by heightened uncertainty over U.S.-China trade tensions. Furthermore, growing concern over an economic slowdown in China and the yen's appreciation against the U.S. dollar have also pushed stock prices down (Chart II-1-1). The heightened uncertainty over overseas economies has contributed to the underperformance of foreign demand-related stocks (Chart II-2-11). An examination by investor type of the trading volume of stocks under these circumstances suggests the following: (1) the decline in stock prices through the year-end was

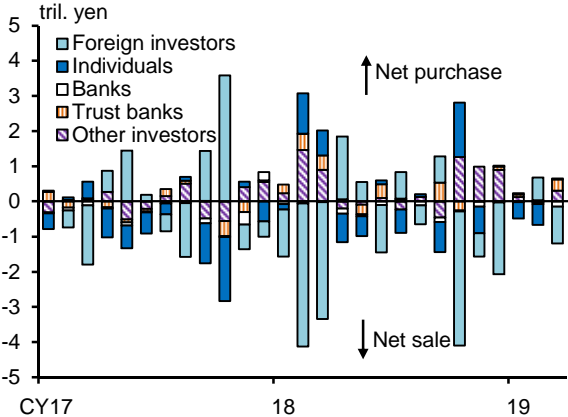
mainly driven by foreign investors' sales as their risk appetites deteriorated; and (2) in the new year, all types of investors have limited their purchases amid prolonged uncertainty over the global economy (Chart II-2-12). Meanwhile, the index for real estate investment trusts (REITs) has been resilient, as (1) capital inflows from overseas investors have continued on the back of favorable views of Japan's real estate fundamentals and the attractiveness of REITs in terms of yield spreads, and (2) purchases by some regional banks have also continued (Chart II-2-13).

Chart II-2-11: Foreign demand-related and domestic demand-related stocks



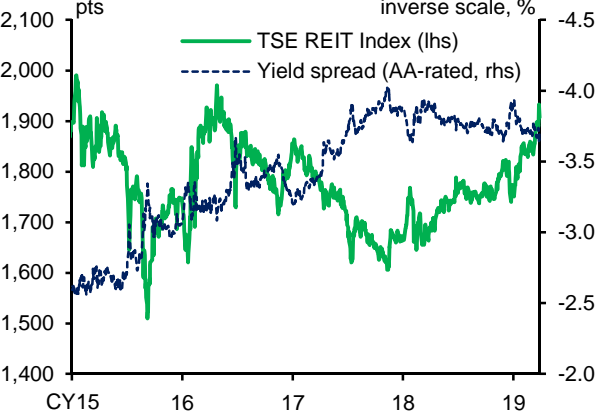
Note: 1. Calculated using sector indices of the TOPIX. "Foreign demand-related stocks" covers electric appliances & precision instruments, automobiles & transportation equipment, machinery, commercial & wholesale trade, steel & nonferrous metals, and raw materials & chemicals. "Domestic demand-related stocks" covers transportation & logistics, electric power & gas, pharmaceutical, construction & materials, retail trade, foods, real estate, and IT & services, others.
 2. Latest data as at end-March 2019.
 Source: Bloomberg.

Chart II-2-12: Japanese stock investments by investor type



Note: The sum of net investments in cash and futures stock markets. Latest data as at March 2019.
 Source: Osaka Exchange; Tokyo Stock Exchange.

Chart II-2-13: TSE REIT Index and yield spreads



Note: 1. "Yield spread" = long-term interest rates (10-year) – dividend yields. Smaller yield spreads (higher points in the chart) represent a higher relative attractiveness of REITs. The spreads cover REITs listed on the Tokyo Stock Exchange whose ratings are available.
 2. Latest data as at end-March 2019.
 Source: Bloomberg; Japan Bond Trading; QUICK.

III. Examination of financial intermediation

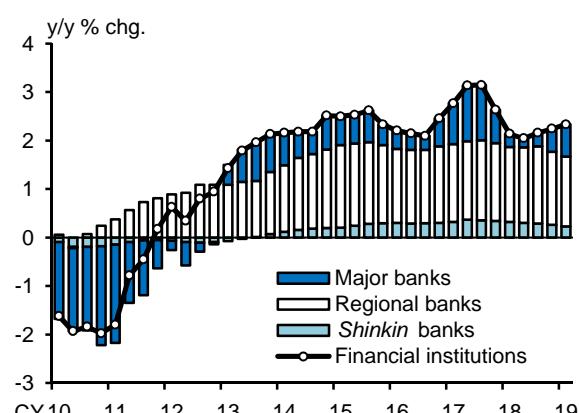
This chapter examines developments in financial intermediation, mainly based on information that was available in the second half of fiscal 2018. Specifically, it first provides a detailed assessment of financial intermediation by financial institutions (banks and *shinkin* banks). Next, it outlines financial intermediation by institutional investors, particularly life insurance companies and pension funds, but also including securities investment trusts. Finally, it describes developments in investment in financial assets and funding activities by the private non-financial sector (i.e., firms and households).

A. Financial intermediation by financial institutions

1. Domestic loans

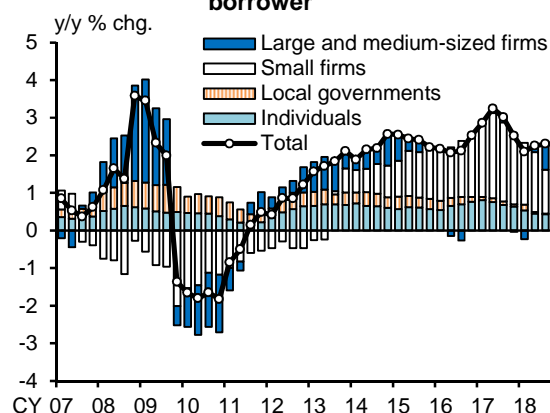
With Japan's economy expanding moderately, financial institutions' domestic loans outstanding have shown somewhat higher growth, at a year-on-year rate of around 2.5 percent (Charts III-1-1 and III-1-2). Although regional banks have continued to drive this growth, major banks have also increased the growth rate of their loans outstanding somewhat, particularly due to those related to merger and acquisition (M&A) deals. The lending stance of financial institutions has remained active, and demand for funds, especially by small firms, has kept increasing (Charts III-1-3 and III-1-4).

Chart III-1-1: Domestic loans outstanding among financial institutions



Note: Latest data as at the January-March quarter of 2019.
Source: BOJ, "Principal figures of financial institutions."

Chart III-1-2: Loans outstanding among financial institutions by type of borrower



Note: Loans to banks and insurance companies are excluded. Latest data as at end-December 2018.
Source: BOJ.

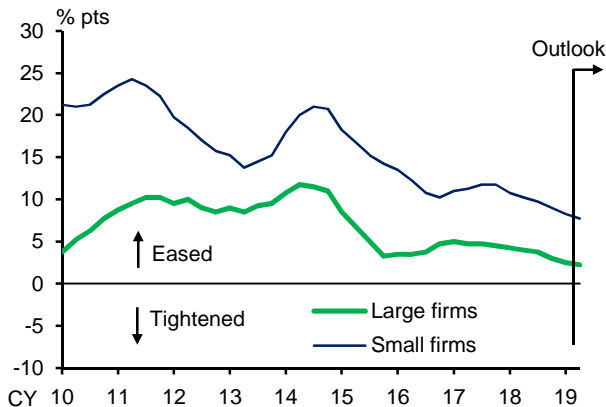
Developments in loans by type of borrower

Loans to firms have driven the growth of total loans (Chart III-1-2). Loans to individuals have also continued to increase, but their growth rate has been gradually declining. Loans to local governments have been more or less flat, reflecting no notable change in demand (Chart III-1-4).

In the case of loans to firms, loans have increased for a wide range of industries, including real estate (Chart III-1-5). Breaking down loans excluding those to real estate firms by firm size, loans to small firms, especially those for business fixed investment, have continued to increase amid the prolonged economic expansion (Chart III-1-6). Although loans to large firms for business fixed

investment have not changed notably, reflecting these firms' ample internal funds, loans for working capital have increased, reflecting those related to large-scale M&A deals in fiscal 2018.⁶

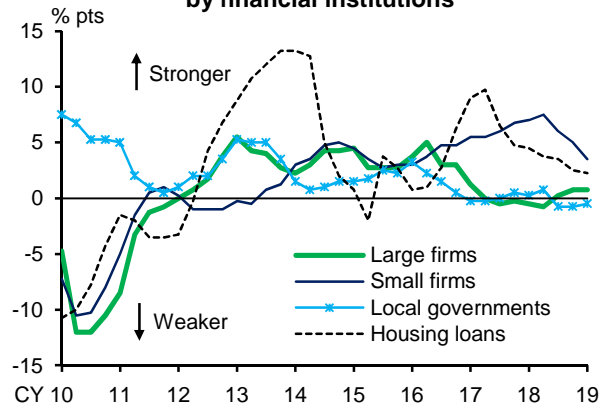
Chart III-1-3: DI of credit standards



Note: 1. Based on the proportion of responding financial institutions selecting each given choice, the DI is calculated as follows:
 $DI = \text{"considerably eased"} + 0.5 * \text{"somewhat eased"} - 0.5 * \text{"somewhat tightened"} - \text{"considerably tightened"}$
 2. 4-quarter backward moving averages. Latest data as at January 2019.

Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

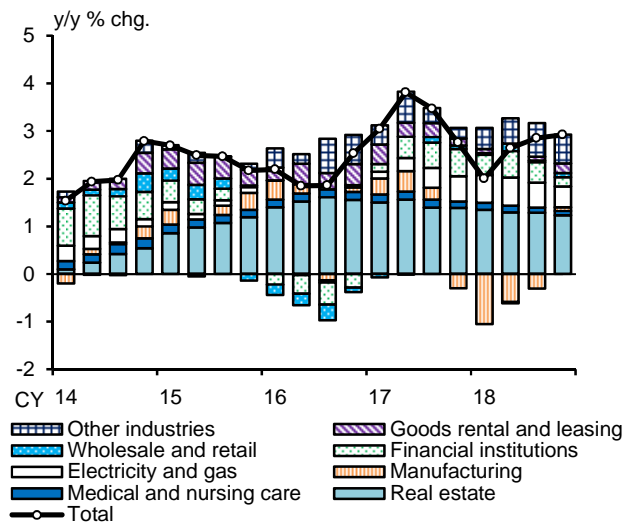
Chart III-1-4: DI of demand for loans as perceived by financial institutions



Note: 1. Based on the proportion of responding financial institutions selecting each given choice, the DI is calculated as follows:
 $DI = \text{"substantially stronger"} + 0.5 * \text{"moderately stronger"} - 0.5 * \text{"moderately weaker"} - \text{"substantially weaker"}$
 2. 4-quarter backward moving averages. Latest data as at January 2019.

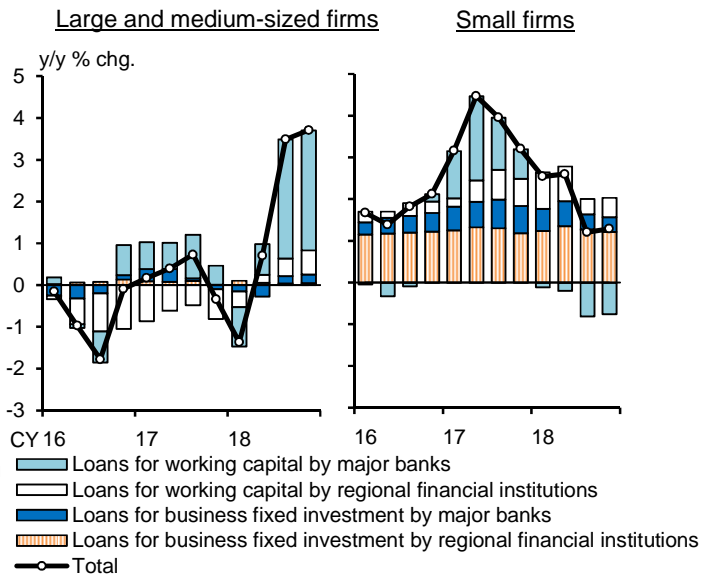
Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

Chart III-1-5: Banks' corporate loans outstanding by industry



Note: Loans to banks and insurance companies, overseas yen loans, and domestic loans transferred overseas are excluded. Latest data as at end-December 2018.
 Source: BOJ.

Chart III-1-6: Corporate loans outstanding by type of bank and loan

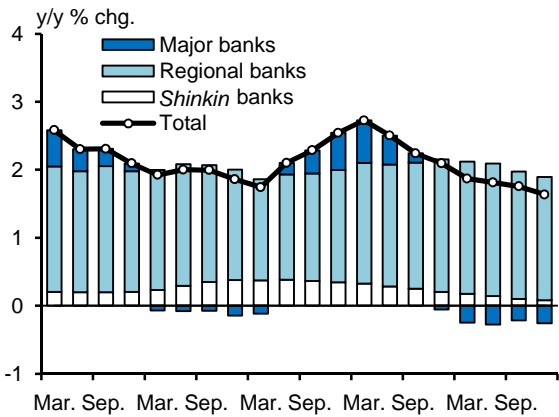


Note: Loans to the real estate industry, banks, and insurance companies are excluded. Latest data as at end-December 2018.
 Source: BOJ.

⁶ M&A-related loans are classified as loans for working capital. In the statistics, loans to holding companies of large firms, including M&A-related loans, are sometimes included in loans to small firms because, for example, these companies have only a small number of regular employees. This seems to be one reason that the fluctuation of major banks' loans to small firms for working capital has been large in fiscal 2017 and 2018.

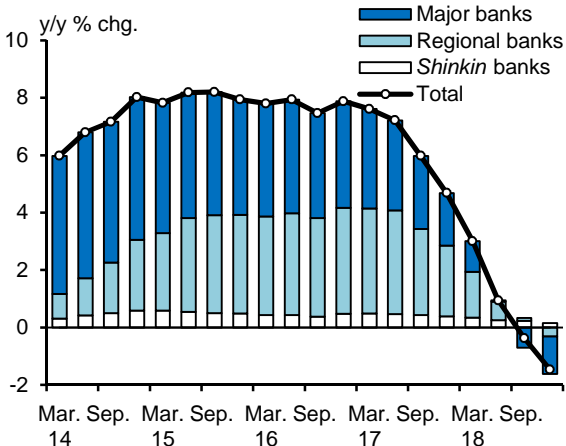
As to loans to individuals, housing loans have continued to grow at around 2 percent annually (Chart III-1-7). Regional banks have driven this growth, whereas major banks have decreased such loans outstanding on a year-on-year basis, which in part reflects their focus on profitability. The annual growth rate of card loans has become negative, reflecting financial institutions' review of advertising strategies and their tightening of screening procedures (Chart III-1-8).⁷

Chart III-1-7: Outstanding amount of housing loans among financial institutions



Note: Latest data as at end-December 2018.
Source: BOJ.

Chart III-1-8: Outstanding amount of card loans among financial institutions

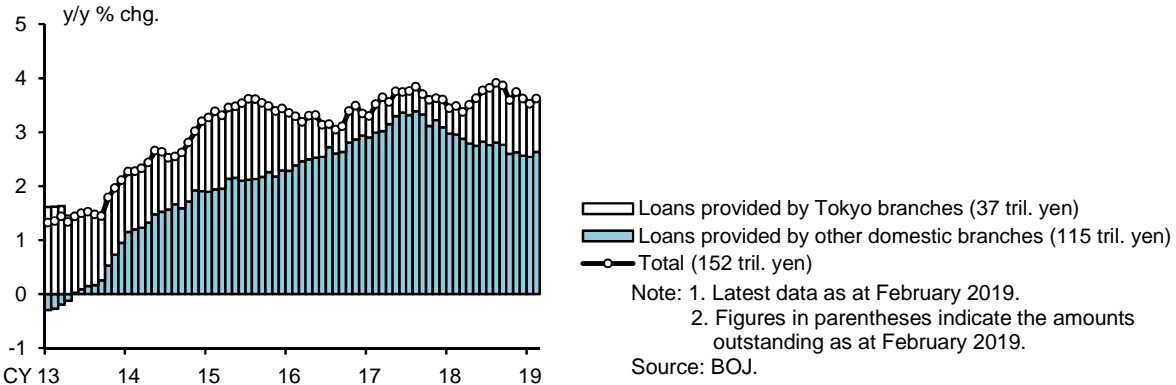


Note: Latest data as at end-December 2018.
Source: BOJ.

Developments in loans extended by regional financial institutions

Regional banks' loans, which have driven the growth of overall domestic loans, have continued to increase, with these loans mainly being made by non-Tokyo branches (Chart III-1-9). Loans by the Tokyo branches have also recently somewhat increased their growth again.

Chart III-1-9: Corporate loans provided by regional banks



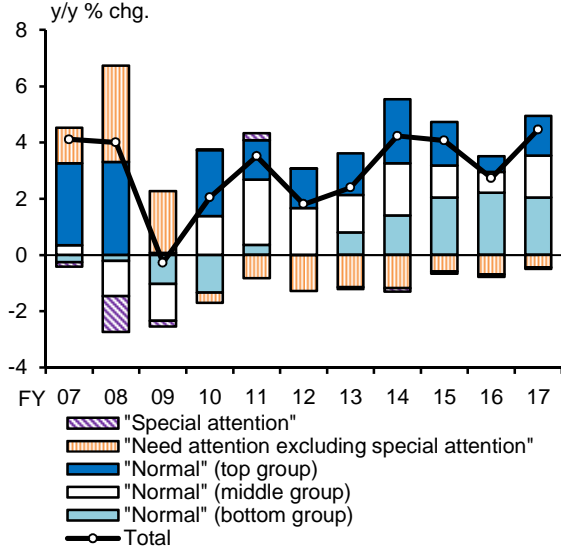
Note: 1. Latest data as at February 2019.
2. Figures in parentheses indicate the amounts outstanding as at February 2019.
Source: BOJ.

Examining regional banks' loans by borrower classification, the growth rate of loans to the bottom group of "normal" borrowers has risen notably in recent years (Chart III-1-10). This mainly reflects an increase in loans to middle-risk firms, which have relatively low creditworthiness among small firms. Moreover, regional banks' loans to small firms have increased across a wide range of industries (Chart III-1-11). Real estate loans have continued to lead this increase, but increases

⁷ As at end-December 2018, of the outstanding amounts of loans to individuals, housing loans account for about 91 percent, card loans for about 3 percent, and other types of loans for about 6 percent.

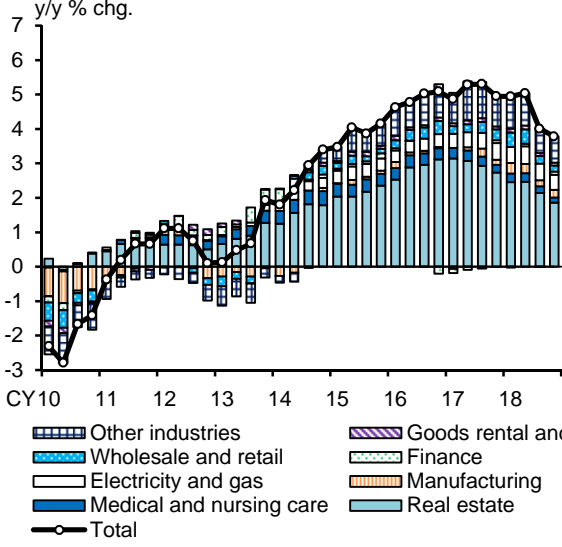
have also been observed for loans to many other industries, such as electricity and gas, transport and postal services, manufacturing, and medical and nursing care. The growth in regional banks' total loans to small firms has slowed somewhat, reflecting the fact that these banks have recently turned cautious about lending to rental housing businesses. This is because regional banks have become vigilant against the risks of an adjustment in the rental housing market and credit concentration in the real estate industry. In the case of loans to large firms, regional banks had been generally reluctant to extend loans to such firms for a while because of concerns about profitability, but some banks have attempted to resume extending such loans as part of their efforts to invest their surplus funds. This is one of the reasons why, as mentioned above, growth in loans by Tokyo branches has somewhat increased again. Meanwhile, the amount of regional banks' syndicated loans outstanding has also increased (Chart III-1-12). A notable feature of these loans in recent years is an increase in those arranged by the regional banks themselves, which could offer them fees and commission income.

Chart III-1-10: Regional banks' loans outstanding by borrower classification



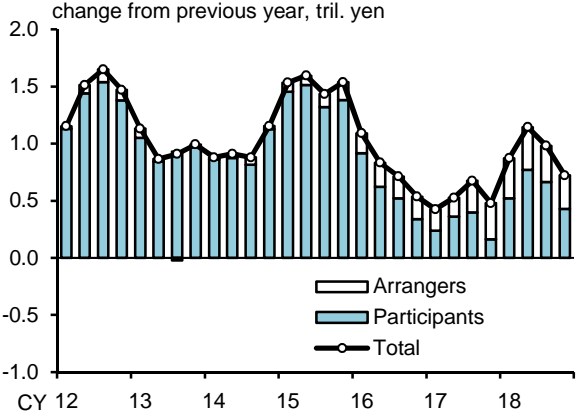
Note: Loans to "normal" borrowers are classified by dividing them into three equal groups ranked by each bank's internal rating.
Source: BOJ.

Chart III-1-11: Regional banks' loans outstanding to small firms by industry



Note: Loans to banks and insurance companies are excluded. Latest data as at end-December 2018.
Source: BOJ.

Chart III-1-12: Regional banks' syndicated loans outstanding



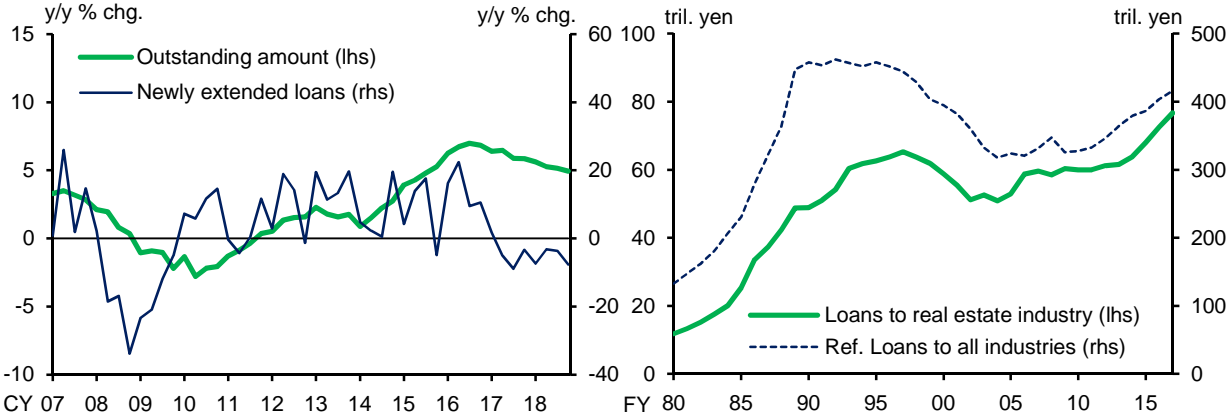
Note: Latest data as at end- December 2018.
Source: BOJ.

Developments in real estate loans

The amount of newly extended loans, i.e., the flow of loans, to the real estate industry has fallen

year on year since the start of fiscal 2017. At the same time, the outstanding amount of loans, i.e., the stock of loans, to this industry has grown at a rate of around 5 percent annually, continuing to exceed the growth rate of loans to all industries, which is around 2.5 percent (Chart III-1-13). Financial institutions have taken note of this concentration of credit in the real estate industry. However, this has not stopped the outstanding amount of real estate loans extended by domestic banks from continuing to be above the level seen during the bubble period in the late 1980s, reaching a record high of approximately 78 trillion yen as at end-December 2018.

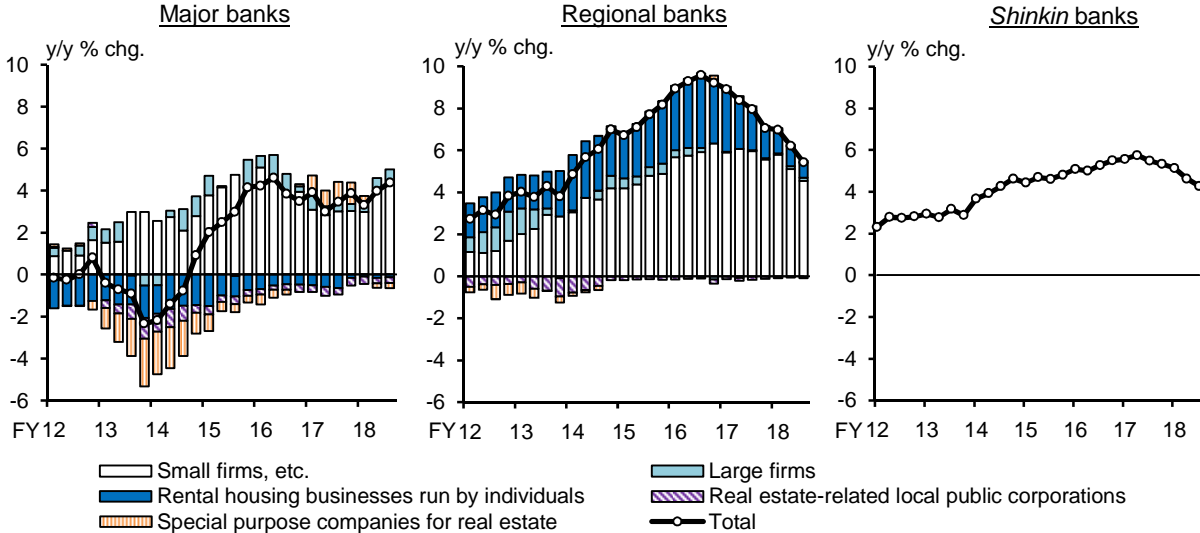
Chart III-1-13: Real estate loans among financial institutions



Note: 1. The right-hand chart covers domestic banks only to extend the time scale.
 2. In the left-hand chart, the latest data for "Outstanding amount" are as at end-December 2018 and the latest data for "Newly extended loans" are as at the October-December quarter of 2018. In the right-hand chart, the latest data are as at end-March 2018.

Source: BOJ.

Chart III-1-14: Breakdown of real estate loans



Note: Latest data as at end-December 2018.
 Source: BOJ.

Breaking down loans to the real estate industry by type of bank, major banks' loans outstanding have grown at around 4 percent annually, led by lending to small and medium-sized firms in which REITs are included (Chart III-1-14). Although the growth rate of regional banks' loans outstanding has been higher than that of major banks, it has continued to decline since its peak at end-2016, mainly due to a slowdown in loans to rental housing businesses run by individuals. From the supply side, the reason for this slowdown is that a growing number of financial institutions have become more prudent in their lending to the real estate industry. From the demand side, reasons

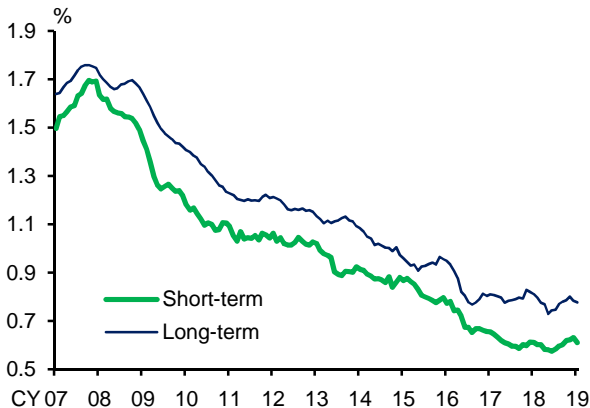
include the slackening of the rental housing market, as indicated by increases in vacancy rates in some areas, and the decline in the number of investment properties in favorable locations that look profitable. In the case of *shinkin* banks, the growth rate of real estate loans outstanding has also slowed down, but the pace of this deceleration is more moderate than that for regional banks.

Developments in loan interest rates

Financial institutions' average contract interest rates, both short-term and long-term, on new loans and discounts have been hovering around historically low levels (Chart III-1-15). Efforts by financial institutions to extend loans with higher profit margins, such as loans related to M&A deals and those to middle-risk firms, have put upward pressure on loan interest rates. However, downward pressure has also come from a decline in base rates such as long-term interest rates, an improvement in firms' financial condition, and an intensified competition among financial institutions.

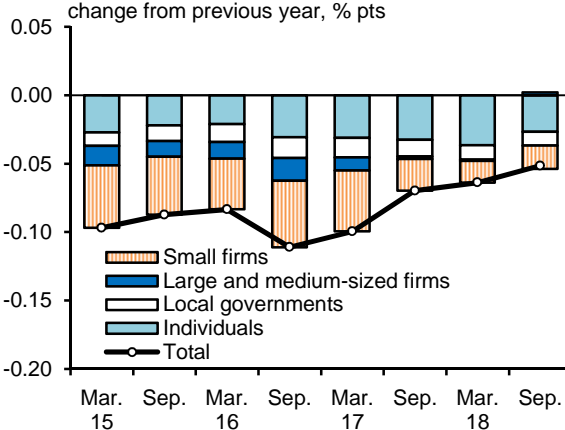
A decomposition of year-on-year changes in regional banks' loan interest rates (calculated based on the outstanding amount of loans) reveals that the pace of decline in interest rates on loans to firms has slowed. This reflects that changes in interest rates on loans to large and medium-sized firms have turned slightly positive and the decrease in interest rates on loans to small firms has slowed (Chart III-1-16). However, interest rates on loans to individuals, such as housing loans, and those on loans to local governments have continued to put downward pressure on loan interest rates overall.

Chart III-1-15: Average contract interest rates on new loans and discounts among domestically licensed banks



Note: 6-month backward moving averages.
 Latest data as at January 2019.
 Source: BOJ, "Average contract interest rates on loans and discounts."

Chart III-1-16: Decomposition of changes in loan interest rates among regional banks by type of borrower



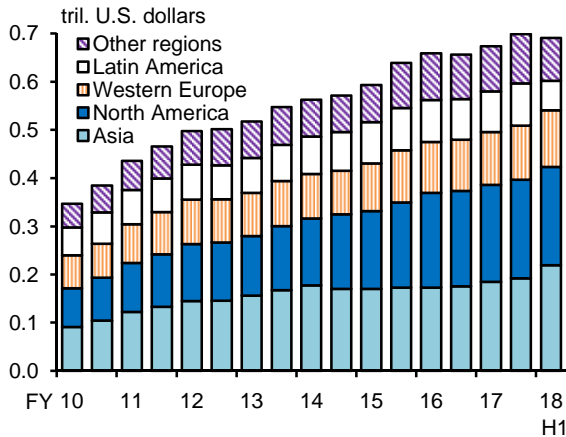
Note: Based on the outstanding amount of loans at month-end; loans to banks and insurance companies are excluded. Latest data as at end-September 2018.
 Source: BOJ.

2. Overseas loans

The trend on overseas loans, especially by major banks, shows a moderate increase, reflecting an increase in loans to Asia amid the region's economic growth (Charts III-1-17 and III-1-18). Banks have strived to expand their lending to overseas firms in order to support the global activities of Japanese firms, meet financial needs in foreign countries, and establish a more solid international business base. Against this background, Japanese banks' share of overall foreign claims increased, filling the gap left by U.S. and European banks, which had deleveraged after the global financial crisis. However, in recent years, Japan's share has generally been flat amid a

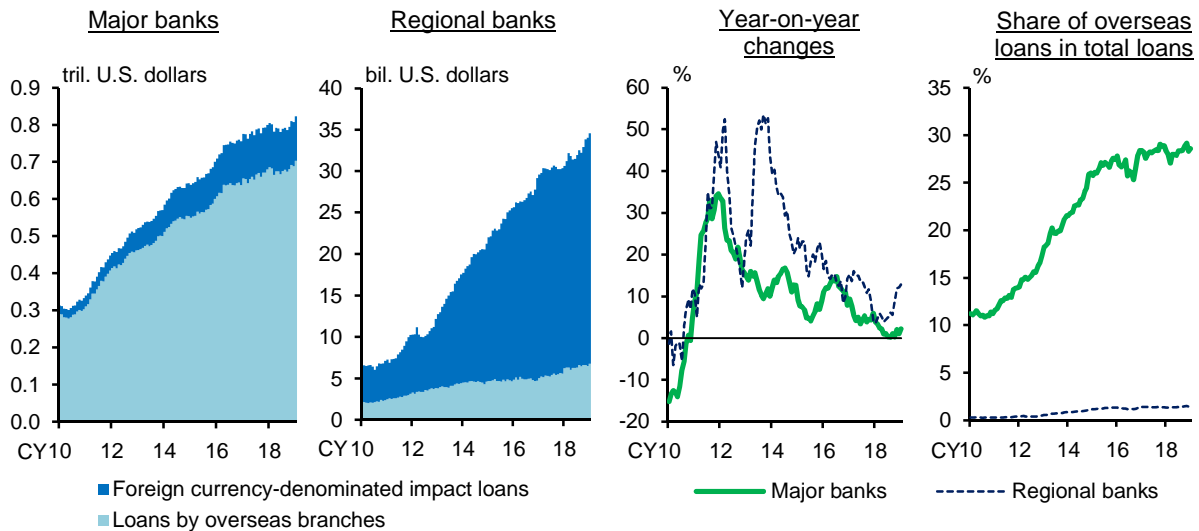
re-intensified competition with overseas financial institutions (Chart III-1-19). Lending margins of Japanese banks have been more or less flat on the whole (Chart III-1-20). However, Japanese banks are currently increasing their focus on profitability, even more so than in the past; for example, they are trying to sell loan claims of low-return borrowers and change their loan portfolios by increasing the profit margins of loans instead of increasing the total amount of loans.

Chart III-1-17: Overseas loans outstanding of the three major banks by region



Source: Published accounts of each bank.

Chart III-1-18: Overseas loans outstanding among banks

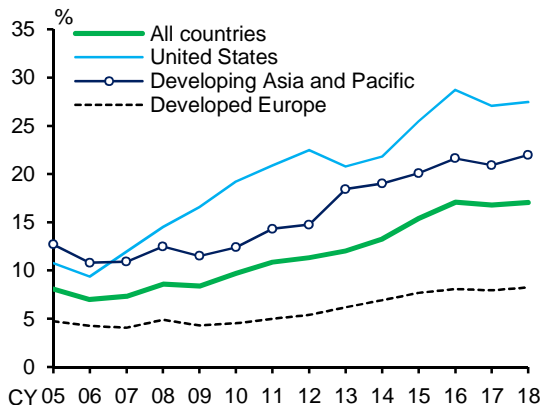


Note: 1. "Loans by overseas branches" includes parts of foreign currency-denominated impact loans in accounts held by overseas branches. "Foreign currency-denominated impact loans" indicates banks' foreign currency-denominated loans to residents.

2. On a non-consolidated basis. Latest data as at end-January 2019.

Source: BOJ.

Chart III-1-19: Japanese banks' share of foreign claims by region

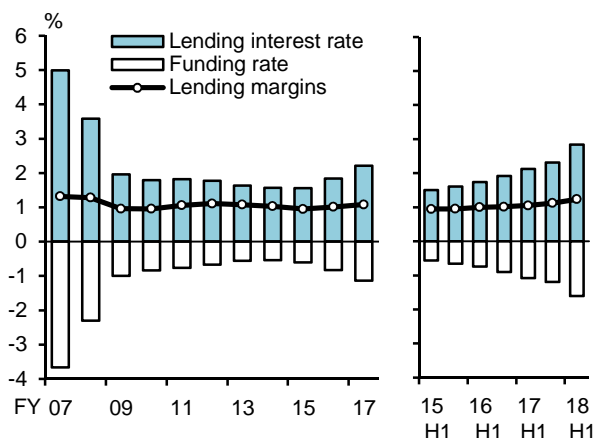


Note: 1. Covers foreign claims on non-bank private sectors (on an ultimate risk basis).

2. The data are as at the end of year. The data for 2018 are as at end-September 2018.

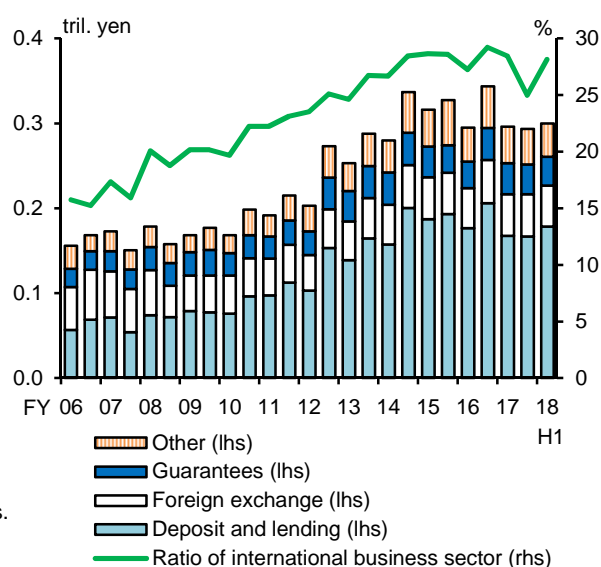
Source: BIS, "Consolidated banking statistics"; BOJ, "The results of BIS international consolidated banking statistics in Japan."

Chart III-1-20: Lending margin on loans in the international business sector among major banks



Note: 1. In calculating "Lending margins," interest expenses on interest rate swaps are deducted.
2. Semiannual data on the right indicate annualized rates.
Source: BOJ.

Chart III-1-21: Fee and commission income in the international business sector among major banks



Note: "Ratio of international business sector" is the ratio of fee and commission income of the international business sector to that of all sectors.
Source: BOJ.

Chart III-1-22: Recent examples of major overseas acquisitions and investments by major financial groups

	Time of announcement	Country	Outline
Mizuho Bank	Feb. 2015	United States	Acquisition of North American asset portfolios from RBS
	Sep. 2015	United States	Share purchase of an asset management company, Matthews Asia
MUFG Bank	Jan. 2015	Thailand	Integration of Bangkok branch with Bank of Ayudhya
	Jan. 2016	Philippines	Share purchase of Security Bank
	Jan. 2016	Cambodia	Acquisition of Hattha Kaksekar Limited by Bank of Ayudhya
	Dec. 2017	Indonesia	Share purchase of Bank Danamon. An increase in its shareholding ratio in Aug. 2018.
	Jan. 2019	Indonesia	Merger of Bank Danamon and Bank BNP, whose shareholders include MUFG's consolidate subsidiary ACOM
Sumitomo Mitsui Banking Corporation	Mar. 2019	Germany	Acquisition of the aviation finance division from DVB Bank
	Mar. 2015	Hong Kong	Additional share purchase of the Bank of East Asia
	Apr. 2015	Colombia	Share purchase of Financiera de Desarrollo Nacional S.A. An increase in its shareholding ratio in Jan. 2018.
	June 2015	Europe	Acquisition of European asset portfolios from General Electric Group
	Aug. 2015	Cambodia	Additional share purchase of ACLEDA Bank
	Oct. 2015	Indonesia	Share purchase of automotive finance companies of Sumitomo Corporation Group
Mitsubishi UFJ Trust and Banking Corporation	Dec. 2016	United States	Acquisition of American Railcar Leasing LLC
	Aug. 2018	Indonesia	Merger of PT Bank Tabungan Pensiunan Nasional Tbk (BTPN) and PT Bank Sumitomo Mitsui Indonesia
	Jan. 2019	Indonesia	Additional share purchase of BTPN, making it a consolidate subsidiary of SMBC Group
Sumitomo Mitsui Trust Bank	Feb. 2016	United States	Acquisition of an overseas fund management company, Capital Analytics II LLC
	Jul. 2016	United States	Acquisition of an overseas fund management company, Rydex Fund Services, LLC
	Oct. 2018	Australia	Acquisition of asset management companies, subsidiaries of Colonial First State Group
Sumitomo Mitsui Trust Bank	Dec. 2015	United States	Share purchase of a freight railcar operating leasing company in North America, a subsidiary of Marubeni
	Feb. 2017	Vietnam	Share purchase of BIDV Financial Leasing Company
	Nov. 2017	United States	Share purchase of an investment bank, GreensLedge Holdings LLC

Source: Published accounts of each bank.

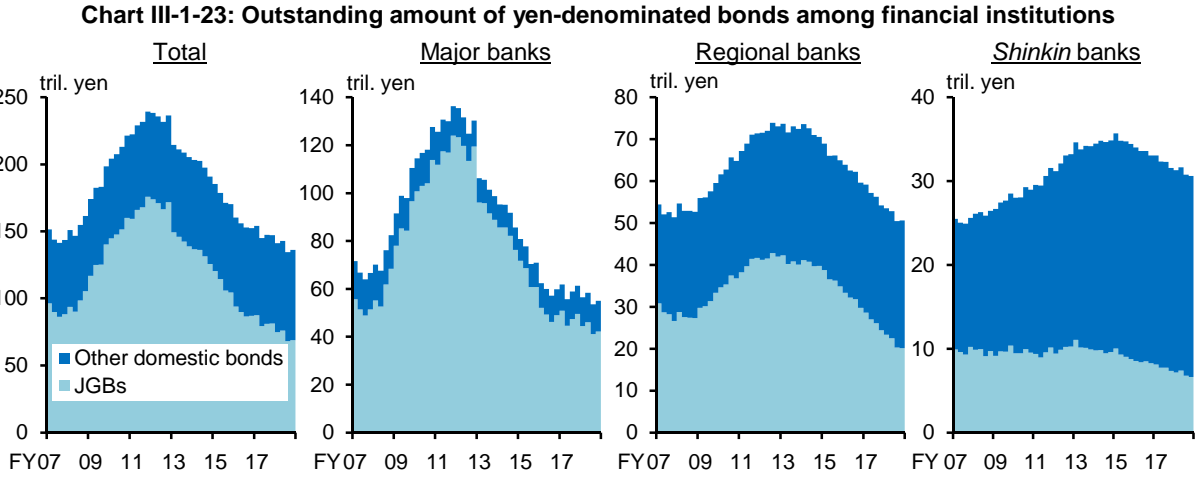
In this context, some banks have aimed at increasing the amount of loans with slightly higher risks but with relatively high profit margins, such as loans to firms in the top group of non-investment-grade companies (which corresponds to the middle group of the "normal" loan classification) while strengthening their risk management. Furthermore, major banks have also aimed at increasing non-interest income in order to improve their overall profitability. For example, faced with a moderation of the growth in loans outstanding, major banks have strived to increase their fee and commission income related to lending, such as income accruing from arranging

syndicated loans, especially in North America and Europe (Chart III-1-21). Additionally, in response to the declining trend in the profitability of domestic deposit-taking and lending activities, major banks have aggressively expanded their global activities, both by extending loans through their overseas branches and also by acquiring and investing in overseas local financial institutions and leasing companies (Chart III-1-22).⁸ Against this background, connectedness between Japanese banks and major overseas banks has increased (see Section A of Chapter IV). Close monitoring is warranted on this increase in Japanese banks' group-wide overseas assets and their risk profiles, keeping in mind a macroprudential perspective.

3. Securities investment

The outstanding amount of financial institutions' yen-denominated bond investment has continued to follow a moderate declining trend, reflecting the Bank of Japan's large-scale JGB purchases. The outstanding amount of foreign bond investment, which had followed a declining trend, has currently increased somewhat amid easing concerns over future interest rate hikes. Meanwhile, the outstanding amounts of investment trust products and overseas credit products have continued to follow an upward trend. Financial institutions as a whole have maintained their active stance of risk taking in securities investment, although some financial institutions have increased their purchases of inverse mutual funds and exchange-traded funds (ETFs).

Holdings of yen-denominated bonds, including JGBs, municipal bonds, and corporate bonds, have continued to decrease moderately for regional banks, and have also decreased somewhat for major banks (Chart III-1-23). While financial institutions need a certain amount of yen-denominated bonds in order to secure net interest income, keep their current account deposit balances at the Bank of Japan from increasing, and meet demand for collateral, some institutions have sold yen-denominated bonds in order to realize profits in response to a decline in yields.



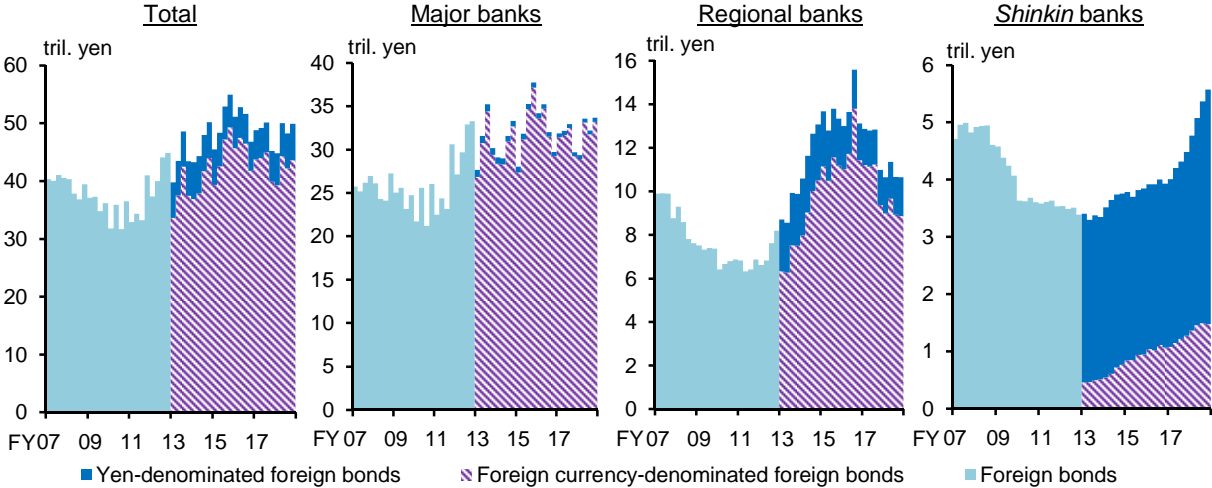
Note: The data are the sum of figures for domestic and overseas branches, based on the outstanding amount at month-end. Latest data as at end-February 2019. Source: BOJ.

The holdings of foreign bonds (in yen terms) have recently increased for major banks, whereas they have decreased for regional banks (Chart III-1-24). As U.S. interest rates have fluctuated

⁸ In Europe, preparing for the United Kingdom's exit from the EU, Japanese financial institutions have established new local subsidiaries in EU countries outside the United Kingdom in order to continue to provide financial services within the EU.

considerably, mainly due to speculation over the future path of monetary policy, there has been a mixture of bond sales aimed at cutting unrealized losses and bond purchases motivated by easing concerns over future interest rate hikes. *Shinkin* banks have steadily increased their holdings of foreign bonds, in particular those denominated in yen, in order to secure profits, although the amount involved is small.

Chart III-1-24: Outstanding amount of foreign bonds among financial institutions

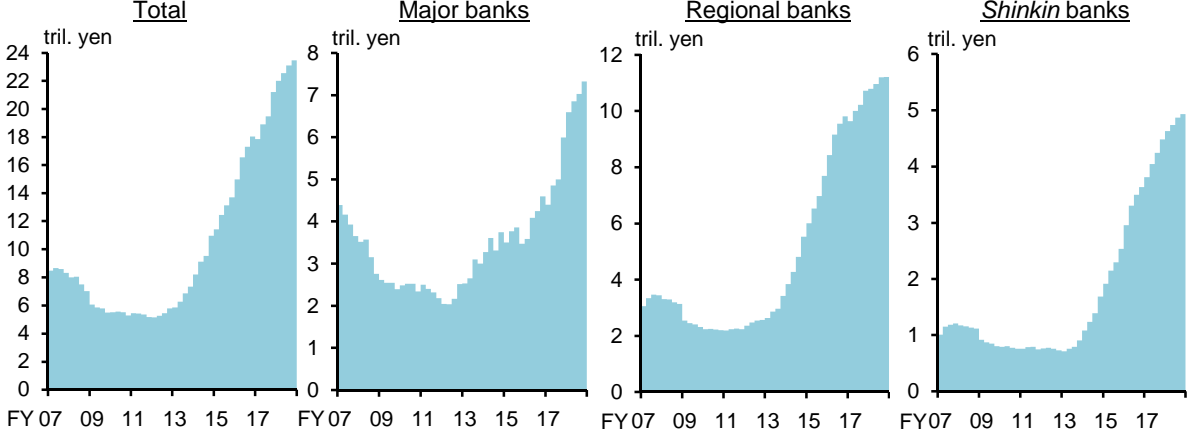


Note: 1. "Foreign bonds" is the sum of figures for "Foreign currency-denominated foreign bonds" and "Yen-denominated foreign bonds." The data up to March 2010 are figures for foreign securities.
 2. The data are the sum of figures for domestic and overseas branches, based on the outstanding amount at month-end. Latest data as at end-February 2019.

Source: BOJ.

Financial institutions' holdings of investment trusts have continued to increase (Chart III-1-25). In the case of major banks, they have continued to hold a large outstanding amount of stock investment trusts. However, the current increase in major banks' holdings of investment trusts seems to have been driven mainly by an increase in inverse mutual funds and ETFs, as some major banks have accumulated such assets to manage unrealized gains/losses on their bondholdings and strategic stockholdings, stockholdings aimed at maintaining business ties with firms. Regional financial institutions have continued to increase their outstanding amount of investment trusts, such as those backed by a variety of risky assets -- including domestic and foreign interest-bearing bonds, corporate bonds, REITs, and foreign stocks -- and multi-asset types of investment trusts that include these risky assets in their portfolios.

Chart III-1-25: Outstanding amount of investment trusts among financial institutions

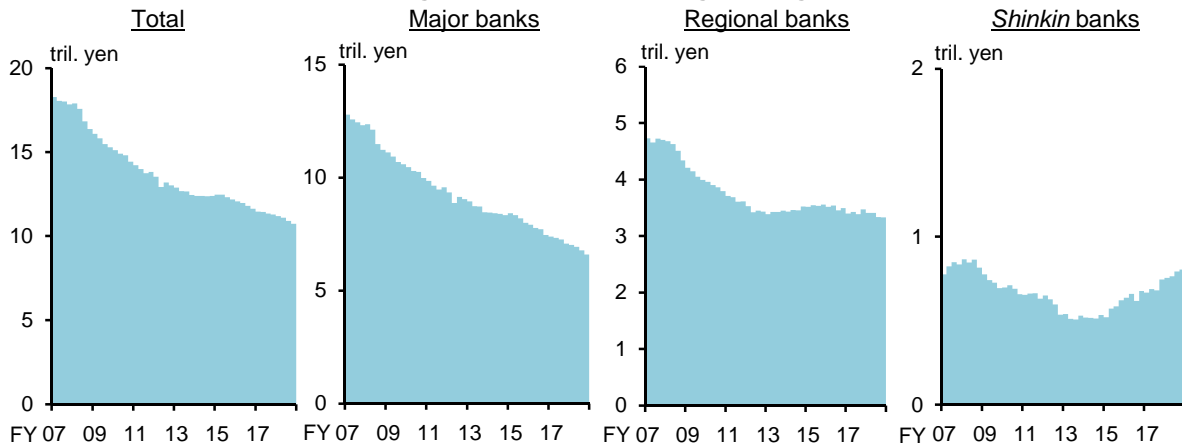


Note: 1. The data include some securities other than investment trusts.
 2. The data are the sum of figures for domestic and overseas branches. The data for domestic branches are based on the average outstanding amount. The data for overseas branches are based on the outstanding amount at month-end. Latest data as at end-February 2019.

Source: BOJ.

The outstanding amount of stockholdings has been following a gradual downward trend for major banks and regional banks, as these banks have continued to reduce their strategic stockholdings (Chart III-1-26). On the other hand, the stockholdings of *shinkin* banks have continued to follow a moderate increasing trend, as they have become active in pure investment.

Chart III-1-26: Outstanding amount of stockholdings among financial institutions

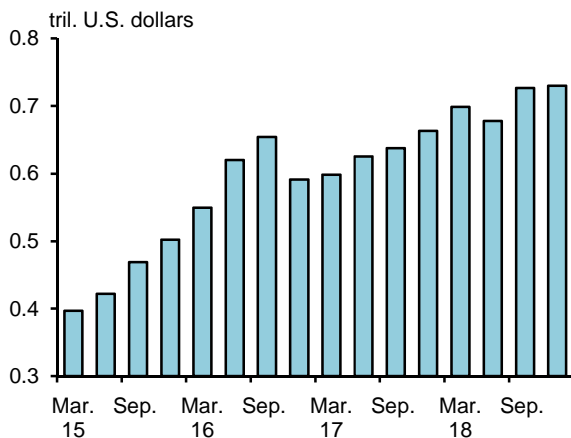


Note: 1. Based on the outstanding amount on a book value basis at month-end. The data exclude foreign stockholdings.
 2. The data for major banks are figures for domestic branches and the data for other banks are the sum of figures for domestic and overseas branches. Latest data as at end-February 2019.

Source: BOJ.

Depository institutions with large shares of securities investment in their assets, such as Japan Post Bank and central organizations of financial cooperatives, have generally continued to shift their investments from yen-denominated bonds to risky assets. Financial institutions as a whole, including these depository institutions, have maintained the increasing trend for investment in overseas credit products -- particularly highly rated collateralized loan obligations (CLOs), bank loan funds, and investment-grade corporate bonds.⁹ However, the pace of the increase decelerated during the October-December quarter of 2018 as overseas credit market conditions underwent some temporary adjustments through the year-end (Chart III-1-27).

Chart III-1-27: Outstanding amount of overseas credit product investment among financial institutions



Note: Covers respondents among major banks, regional banks, *shinkin* banks, Japan Post Bank, and central organization of financial cooperatives.

Source: BOJ.

⁹ The CLOs are securitized products backed by leveraged loans.

4. Financial institutions' balance sheet changes

Financial institutions have continued to expand the size of their balance sheets, reflecting the increase in deposits. At the same time, they have continued to rebalance their asset portfolios by increasing the amount of risky assets.

The total assets and liabilities of financial institutions increased by 282 trillion yen in the period from December 2012, prior to the introduction of QQE, through January 2019 (Chart III-1-28). On the asset side, portfolio rebalancing has continued from JGBs, which entail yen interest rate risk, to other risky assets such as domestic and overseas loans, equities, and assets entailing overseas interest rate risks. Meanwhile, cash and deposits, mainly current account deposits at the Bank of Japan, have increased significantly. On the liability side, not only domestic deposits and NCDs but also other liabilities -- such as overseas deposits and NCDs, and borrowings from the Bank of Japan -- have increased.

Loan-to-deposit ratios have continued to follow a downward trend for major banks, mainly because corporate deposits of large firms with strong earnings have increased at these banks (Chart III-1-29). Meanwhile, for regional financial institutions, which have more transactions with small firms, loan-to-deposit ratios have increased moderately because their lending, particularly to real estate and middle-risk firms, has increased steadily and corporate deposits at these banks have grown at a slower rate than those at major banks.

Chart III-1-28: Changes in assets and liabilities among financial institutions

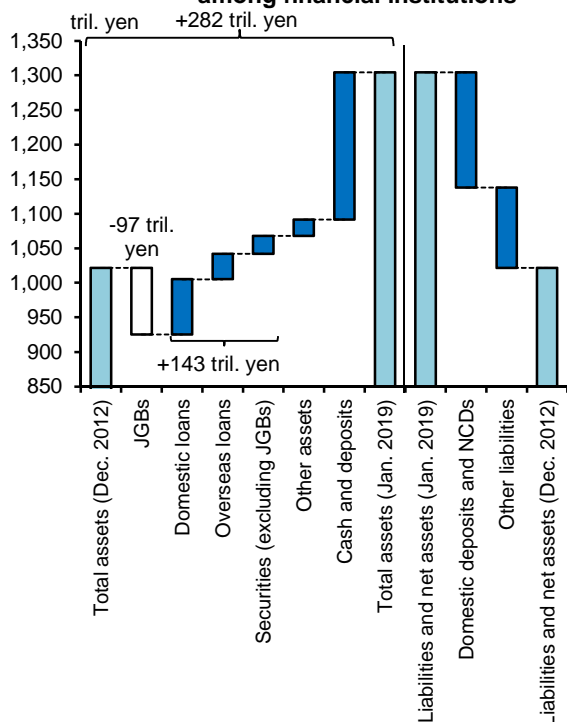
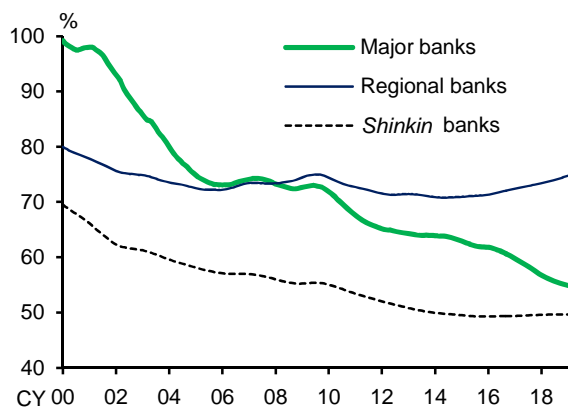


Chart III-1-29: Domestic loan-to-deposit ratios among financial institutions



Note: 1. Loan-to-deposit ratio = loans / (deposits and NCDs).
2. The data are for domestic branches and are based on the average outstanding amount. 12-month backward moving averages. Latest data as at January 2019.

Source: BOJ.

Note: The data are the sum of figures for domestic and overseas branches. The data for domestic branches are based on the average outstanding amount. The data for overseas branches are based on the outstanding amount at month-end.

Source: BOJ.

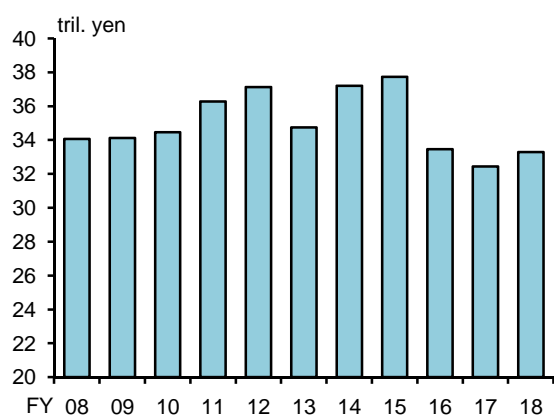
B. Financial intermediation by institutional investors

1. Insurance companies and pension funds

Under the prolonged low interest rate environment, life insurance companies and pension funds have continued to gradually increase their share of investment in foreign-currency denominated assets, which offer relatively high yields.

Life insurance companies' premium income, which is the source of funds for their investments, was generally declining, due to weak sales of savings-type insurance products, but has recently picked up somewhat because of an increase in the sales of protection-type insurance products -- products that both life insurance companies and non-life insurance companies can handle, such as medical insurance -- that meet new customer needs (Chart III-2-1). In response to these circumstances, life insurance companies have moderately increased their holdings of investment assets (Chart III-2-2). Also, under the prolonged low interest rate environment, insurance companies have shown restraint in purchasing domestic bonds, which offer low yields, whereas they have continued to increase their investments in foreign bonds and investment funds, which offer relatively high yields. About 70 percent of insurance companies' foreign bond portfolios comprise currency-hedged foreign bonds. In response to the rise in U.S. dollar hedging costs, life insurance companies have continued to shift their investment in currency-hedged foreign bonds from U.S. Treasuries to bonds that offer relatively high yields -- such as U.S. corporate bonds and agency mortgage-backed securities (MBSs), both of which mostly have high credit ratings, as well as European sovereign bonds. Some life insurance companies have increased their purchases of CLOs, which entail relatively high credit risk, but such moves have been limited. Also, some life insurance companies have purchased currency-unhedged foreign bonds and removed the currency hedge on foreign bonds depending on exchange rate levels. However, smoothing through variations, currency hedge ratios of these companies' foreign bond investments have been flat (Chart III-2-3).

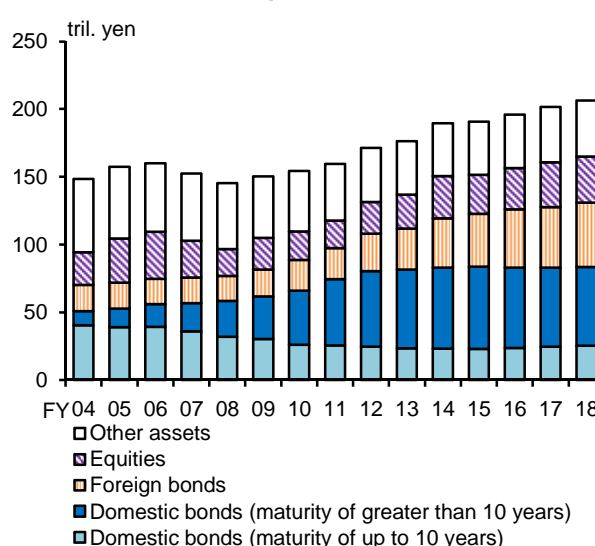
Chart III-2-1: Premium income among life insurance companies



Note: The data for fiscal 2018 are annualized values for the first half of fiscal 2018.

Source: The Life Insurance Association of Japan.

Chart III-2-2: Investment assets outstanding among life insurance companies

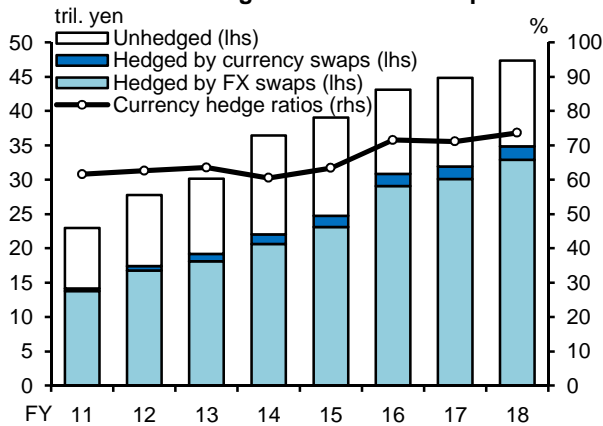


Note: 1. "Other assets" includes cash and deposits, loans, investment trusts, and real estate.

2. Covers nine major life insurance companies. Based on general account. The data for fiscal 2018 are as at end-September 2018.

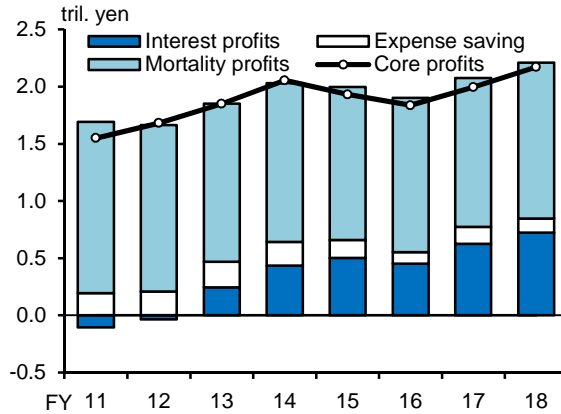
Source: Published accounts of each company.

Chart III-2-3: Currency hedge ratios for foreign bond investments among life insurance companies



Note: Covers nine major life insurance companies.
 Estimated based on general account. The data for fiscal 2018 are as at end-September 2018.
 Source: Published accounts of each company.

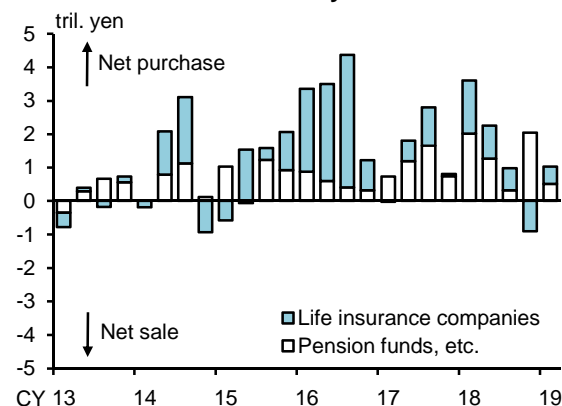
Chart III-2-4: Core profits among life insurance companies



Note: Covers four major life insurance companies.
 The data for fiscal 2018 are annualized values for the first half of fiscal 2018.
 Source: Published accounts of each company.

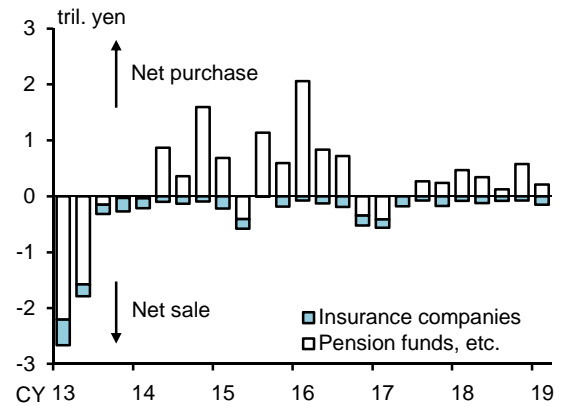
As described above, life insurance companies have not resorted to excessive risk taking despite the prolonged low interest rate environment. One of the reasons for this is the fact that their profits have been relatively stable (Chart III-2-4). A decomposition of their core profits, which represent their underlying profitability, shows that mortality profits -- the difference between expected insurance payouts based on assumed mortality rates and actual payouts -- have remained at a relatively high level because of an increase in life expectancy. In addition, with assumed interest rates (interest rates guaranteed to policyholders) on a long-term decline, interest profits (the difference between actual and expected investment returns based on assumed interest rates) have recently increased moderately, reflecting a growth in stock dividends and an increase in investment in foreign securities.

Chart III-2-5: Medium- and long-term foreign bond investments by institutional investors



Note: 1. "Pension funds, etc." indicates trust accounts of banks and trust banks.
 2. Latest data as at January-February 2019.
 Source: Ministry of Finance.

Chart III-2-6: Stock investments by institutional investors



Note: 1. "Pension funds, etc." indicates banking and trust accounts of trust banks.
 2. Latest data as at January-February 2019.
 Source: Tokyo Stock Exchange.

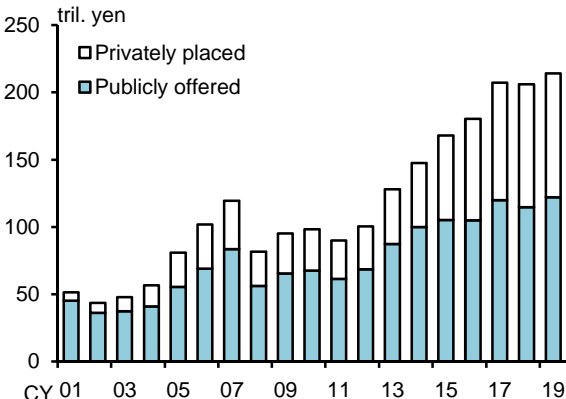
Pension funds have continued to invest in foreign securities and domestic stocks (Charts III-2-5 and III-2-6). Specifically, the Government Pension Investment Fund (GPIF) -- which is in charge of managing the assets of public pension funds, such as employees' pension funds and the national pension fund -- has continued its rebalancing in response to market conditions. In doing so, the

GPIF has followed the basic portfolio allocation, which determines the portfolio share of each asset class from the perspective of safe and efficient asset management over a long-term investment horizon.¹⁰ In September 2018, the GPIF changed the annual plan for fiscal 2018 partly because the portfolio share of domestic bonds in the policy asset mix declined to close to the lower limit. The change allows the GPIF to carry out flexible investment as long as the total share of domestic bonds and short-term assets is kept within the allowable range of deviation for a domestic bond portfolio. The amount of the GPIF's alternative investments, such as investments in infrastructure, private equity, and real estate, has increased gradually, but stayed within its upper limit of 5 percent of the GPIF's overall assets. Meanwhile, corporate pension funds have basically maintained their cautious investment stance, as in the past.

2. Securities investment trusts

The market value of the outstanding amount of investment trusts has been more or less flat, reflecting a decline in stock prices, but privately placed investment trusts have continued to see fund inflows (Chart III-2-7). By type of holder, banks' holdings of investment trusts have increased markedly (Chart III-2-8). In recent years, financial institutions, in search of higher yields, have increased their exposure to investment trusts, which are subject to a variety of risk factors. This will be analyzed in detail in Chapters IV and V.

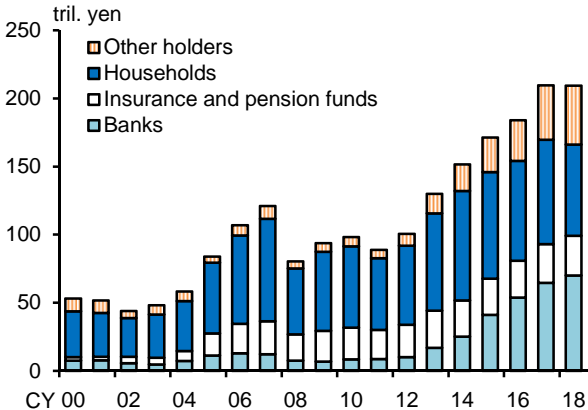
Chart III-2-7: Assets among investment trusts



Note: 1. Includes publicly offered REITs (from 2007) and privately placed REITs (from 2013).
 2. The latest data for REITs are as at end-January 2019 and the latest data for other assets are as at end-February 2019.

Source: The Investment Trusts Association, Japan.

Chart III-2-8: Outstanding amount of investment trusts by type of holder



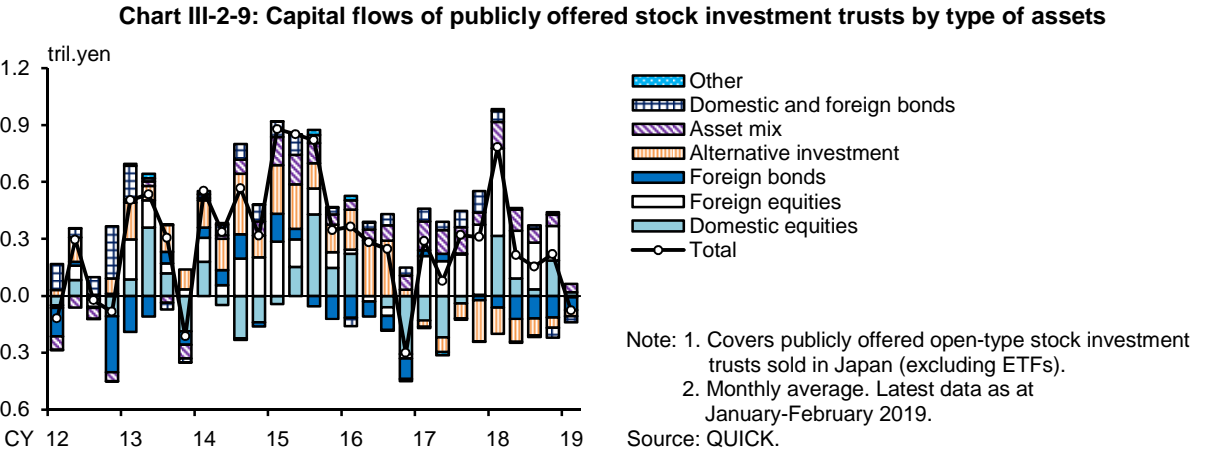
Note: Latest data as at end-December 2018.
 Source: BOJ, "Flow of funds accounts."

The asset size of privately placed investment trusts has been approaching that of publicly offered investment trusts. One aspect of privately placed investment trusts is that products can be flexibly designed to suit investor needs and their costs, such as sales costs, are lower than those of publicly offered investment trusts because buyers of privately placed investment trusts are largely limited to banks and institutional investors, such as life insurance companies. Market shares of privately placed investment trusts are dispersed across a wide range of asset management firms, including foreign-affiliated firms. Their investment assets consist mainly of foreign sovereign bond

¹⁰ The GPIF is one of the largest institutional investors in the world, with total assets of 151 trillion yen as of end-December 2018. Assets are managed both externally and internally.

ladder funds and investment-grade corporate bonds.¹¹ Recently, some privately placed investment trusts have shifted their funds from U.S. Treasuries to European bonds in response to the rise in U.S. dollar hedging costs. In addition, albeit small in the portfolio, investment assets held by these investment trusts include covered bonds, which have high ratings but somewhat complex risk profiles, as they are related to changes in overseas interest rates, as well as non-investment-grade corporate bonds and hedge fund-type assets, both of which entail relatively high risks.¹²

In the case of publicly offered stock investment trusts, fund inflow trends have been seen for both domestic and foreign equities, and fund outflows have continued for foreign bonds (Chart III-2-9).



C. Investment in financial assets and funding activities by the private non-financial sector

This section outlines developments in investment in financial assets and funding activities by the private non-financial sector, i.e., firms and households, in the context of financial intermediation services provided by financial institutions and institutional investors.

1. Corporate sector

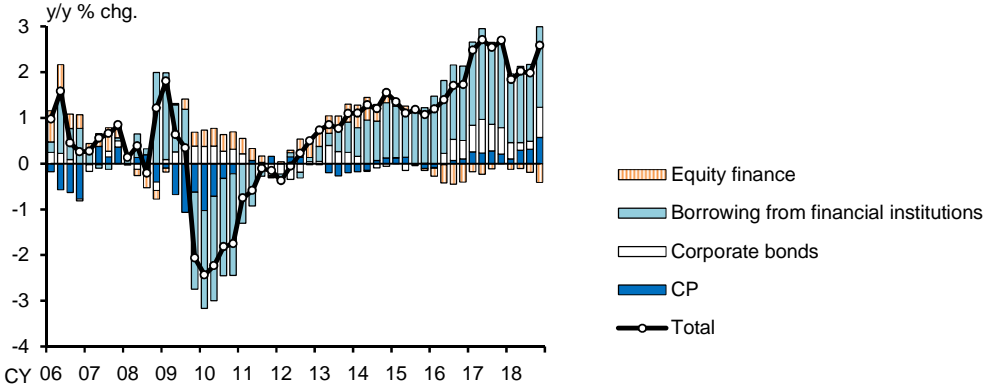
The total volume of firms' funding has grown year on year at around 2.5 percent (Chart III-3-1). This growth has been mainly led by an increase in borrowing from financial institutions, reflecting the growing demand for funds to be used for business fixed investment and M&A deals. Firms have also increased the issuance of corporate bonds in order to raise funds for refinancing, business fixed investment, and M&A deals, in light of issuance rates hovering at extremely low levels. Firms have also increased the issuance of CP, reflecting the growing demand for working capital under the current economic expansion.

In contrast, equity financing through the stock market has remained lackluster, except for the recent sharp increase, which was driven by a single large-scale initial public offering (IPO) (Chart III-3-2). This lack of activity is due to issuers preferring low-interest debt financing, such as bank loans, CP, and corporate bonds. It is also because both investors and firms have prioritized capital

¹¹ Ladder funds are funds that allocate equal proportions to bonds with different maturities in their portfolios.
¹² Covered bonds are corporate bonds issued by financial institutions using loan claims as collateral. Covered bonds are mainly issued in Europe.

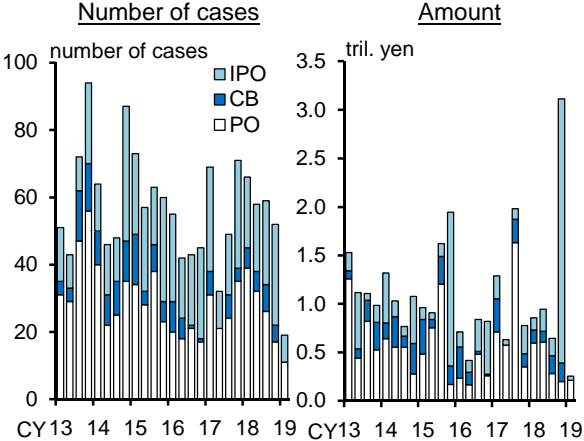
efficiency and shareholder returns under the corporate governance code that took effect in June 2015. Under these circumstances, announced and executed stock buybacks by firms have remained at a high level (Chart III-3-3).

Chart III-3-1: Outstanding amount of firms' funding



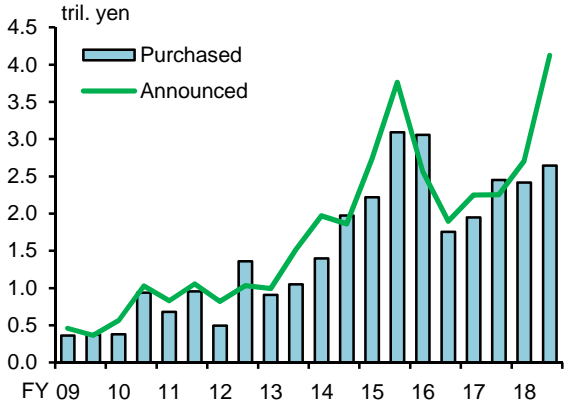
Note: 1. "Equity finance" indicates net changes in the book values of shares and other equities of private nonfinancial corporations.
 2. "Borrowing from financial institutions" excludes borrowing by banks and insurance companies. "CP" and "Corporate bonds" cover those issued by ordinary industrial corporations.
 3. Latest data as at end-December 2018.
 Source: I-N Information Systems; JASDEC; BOJ.

Chart III-3-2: Equity financing



Note: Latest data as at January-February 2019.
 Source: I-N Information Systems.

Chart III-3-3: Amount of stock buybacks



Note: The data include stocks listed on the domestic stock exchanges. Based on the announcement date. Latest data from October 2018 to February 2019.
 Source: I-N Information Systems.

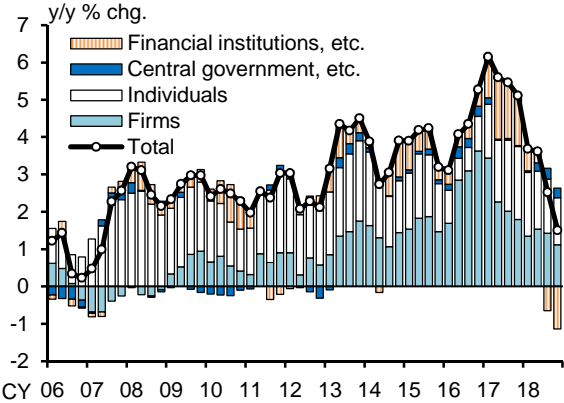
At the same time, deposits in the corporate sector have continued to increase, mainly reflecting an accumulation of retained earnings backed by high profits (Chart III-3-4).

2. Household sector

Households have maintained a cautious investment stance overall. Reflecting such a stance, the outstanding amount of deposits in household assets has increased despite the extremely low interest rates on these deposits (Charts III-3-4, III-3-5, and III-3-6). There are, however, some signs of active risk taking, at least to a limited extent. For example, the net equity holdings in client assets held at securities companies increased substantially in December 2018, reflecting the aforementioned large-scale IPO, when the effect of changes in the market values are excluded;

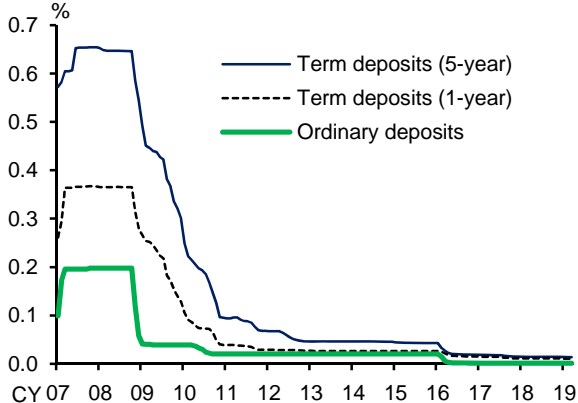
furthermore, even if the impact of this IPO is excluded, the net holdings of relatively high-risk assets such as structured bonds increased (Chart III-3-7). In addition, the inflow of funds to the Nippon Individual Savings Account (NISA) and the individual-type defined contribution pension plan (iDeCo) has increased steadily, contributing to an expansion of households' investment in risky assets.

Chart III-3-4: Deposits outstanding by type of depositor



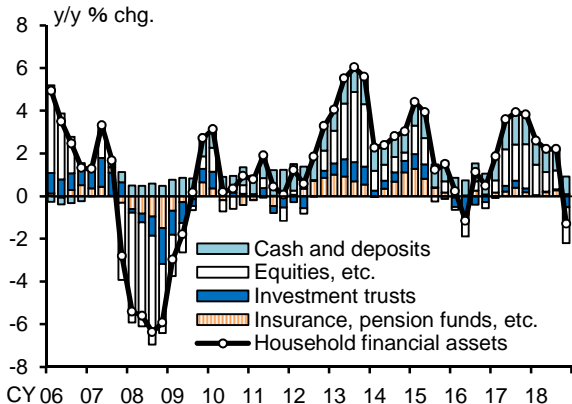
Note: 1. Covers domestically licensed banks. "Financial institutions, etc." includes NCDs.
 2. Latest data as at the October-December quarter of 2018.
 Source: BOJ.

Chart III-3-5: Interest rates on deposits



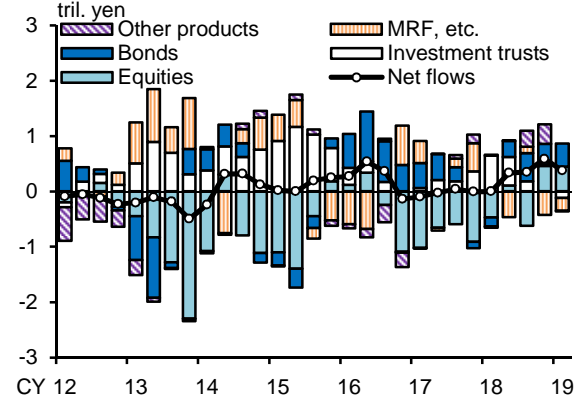
Note: 1. Interest rates on term deposits are simple averages of those posted by financial institutions.
 2. Latest data as at March 25, 2019.
 Source: BOJ.

Chart III-3-6: Amount of household assets



Note: Latest data as at end-December 2018.
 Source: BOJ, "Flow of funds accounts."

Chart III-3-7: Capital flows by product among major securities companies



Note: 1. "Investment trusts" indicates the sum of stock investment trusts and wrap products. "MRF, etc." includes bond investment trusts.
 2. Covers retail customers' assets held at 17 major securities companies that hold current accounts at the BOJ. 2-quarter backward averages. Latest data as at January-February 2019 (converted into quarterly amounts).
 Source: BOJ.

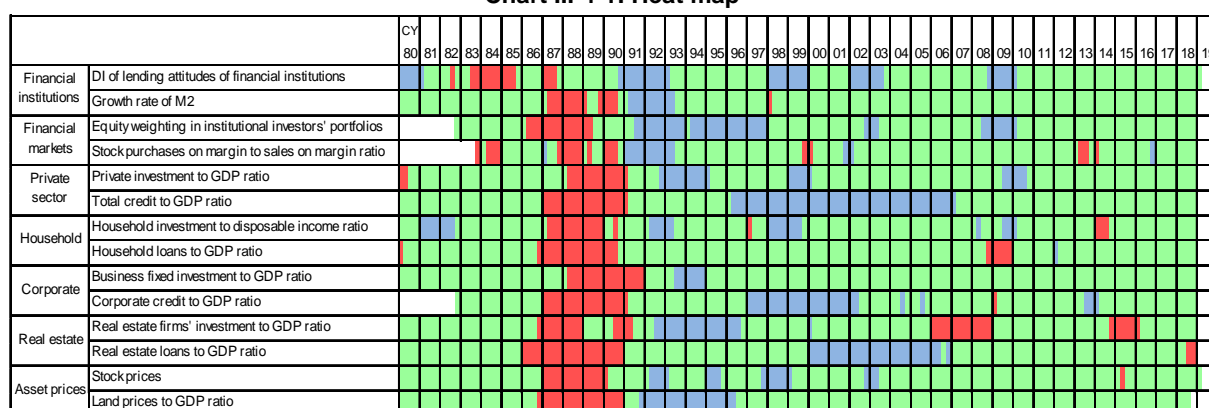
D. Examination of the financial cycle and financial vulnerabilities

This section examines whether there has been a build-up of financial imbalances that could cause major adjustments in the real economy in the future against the background of the financial intermediation activities laid out in the previous three sections.

1. Financial Activity Indexes (heat map)

First, using a heat map, it is assessed whether there are any signs of overheating or contraction in the current phase of the financial cycle. In particular, a heat map is used to show, using colors, the degree of the deviation of various Financial Activity Indexes (FAIXs) from their trends and examines whether there are any signs of overheating, such as were observed during the bubble period in the late 1980s, or contraction, as seen after the bubble burst (Chart III-4-1).¹³ In the created heat map, 13 out of the 14 FAIXs, all except the *real estate loans to GDP ratio*, appear as "green," which signals neither an overheating nor a contraction. It can therefore be judged that financial and economic activities as a whole have not shown excessive movements similar to those seen during the bubble period.

Chart III-4-1: Heat map



Note: The latest data for the DI of lending attitudes of financial institutions and stock prices are as at the January-March quarter of 2019. The latest data for the land prices to GDP ratio are as at the July-September quarter of 2018. The latest data for the other indicators are as at the October-December quarter of 2018.

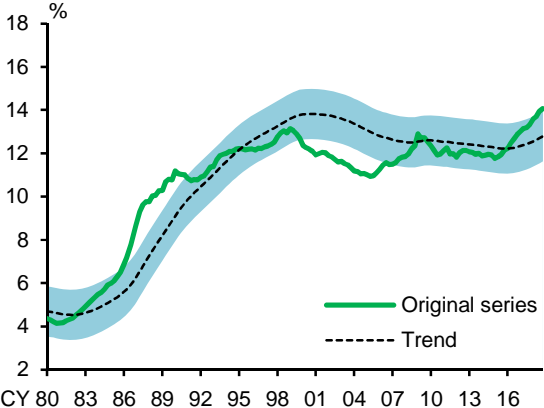
Source: Bloomberg; Cabinet Office, "National accounts"; Japan Real Estate Institute, "Urban land price index"; Ministry of Finance, "Financial statements statistics of corporations by industry"; Tokyo Stock Exchange, "Outstanding margin trading, etc."; BOJ, "Flow of funds accounts," "Loans and bills discounted by sector," "Money stock," "Tankan."

That said, as the highly accommodative financial conditions have continued, some changes in individual FAIXs require attention. First, the *real estate loans to GDP ratio* was "green" in the previous issue of the *Report* but has now turned "red," which signals an overheating, for the first time since the end of 1990. Some financial institutions, concerned over credit concentration risk, have decreased new loans extended to the real estate industry over the past 1 to 2 years. However, as shown in Section A of this chapter, the outstanding amount of real estate loans has continued to grow at a faster rate than total bank loans and the *real estate loans to GDP ratio* has also been rising, reflecting long durations for most real estate loans, with the duration for loans to rental housing businesses typically being 10 or 20 years (Chart III-4-2). In contrast, the *real estate firms' investment to GDP ratio* and the *land prices to GDP ratio* are still in the "green" zone, i.e., no large upward deviation from the trend, so that not so many FAIXs are signaling an overheating in the real estate market (Charts III-4-3 and III-4-4). Based on a wide range of other relevant information, Japan's real estate market cannot, as a whole, be judged as experiencing overheating driven by overly optimistic growth expectations as in the bubble period (Chart III-4-5 and see Box 2).

¹³ The shaded areas in Chart III-4-1 represent the following: (1) areas shaded in red show that an indicator has risen above the upper threshold, that is, overheating; (2) areas shaded in blue show that an indicator has declined below the lower threshold, that is, contracting excessively; (3) areas shaded in green show a limited tendency toward either extreme; and (4) areas shaded in white represent periods without data. For details on the FAIXs, see Yuichiro Ito, Tomiyuki Kitamura, Koji Nakamura, and Takashi Nakazawa, "New Financial Activity Indexes: Early Warning System for Financial Imbalances in Japan," *Bank of Japan Working Paper*, No. 14-E-7, April 2014.

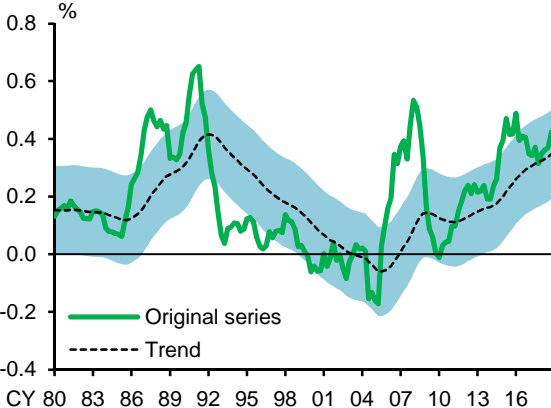
Nevertheless, the recent increase in total real estate loans is distinctive in that, unlike in the bubble period, these loans comprise mainly those for medium- to long-term investments to earn rental income such as those for REITs, real estate investment funds, and rental housing businesses run by individuals. Declines in the population, the number of firms, and the economy's growth potential seem to have been influencing the real estate fundamentals in an opposite direction to that in the bubble period. In this environment, close monitoring from a wider perspective is warranted of developments in the outstanding amount of real estate loans, which has substantially exceeded the level seen in the bubble period; in particular, we need to keep in mind the possibility of a build-up of imbalances that cannot necessarily be captured by FAIXs that were constructed for the purpose of detecting signs of bubble-like overheating (see Chapter IV).

Chart III-4-2: Real estate loans to GDP ratio



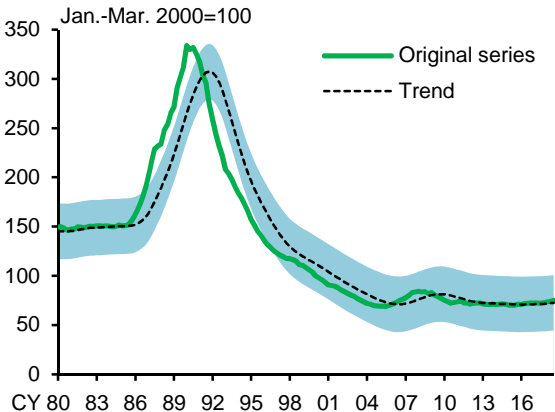
Note: 1. "Trend" is calculated using the one-sided HP filter. The shaded area indicates the root mean square of the deviation from the trend.
 2. 4-quarter backward moving averages. Latest data as at the October-December quarter of 2018.
 Source: Cabinet Office, "National accounts"; BOJ, "Loans and bills discounted by sector."

Chart III-4-3: Real estate firms' investment to GDP ratio



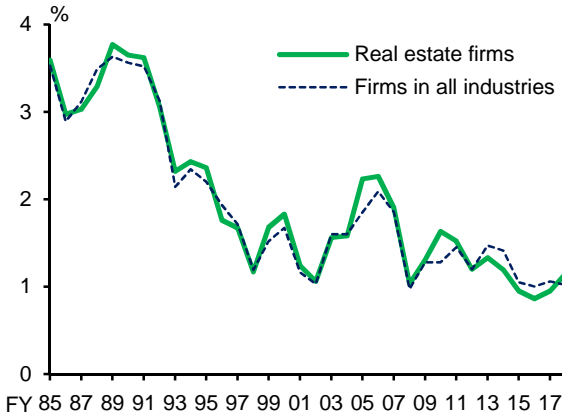
Note: 1. Covers large firms in the real estate industry.
 2. Original series = (business fixed investment [including land investment] + inventory investment) / nominal GDP. "Trend" is calculated using the one-sided HP filter. The shaded area indicates the root mean square of the deviation from the trend.
 3. 4-quarter backward moving averages. Latest data as at the October-December quarter of 2018.
 Source: Cabinet Office, "National accounts"; Ministry of Finance, "Financial statements statistics of corporations by industry."

Chart III-4-4: Land prices to GDP ratio



Note: 1. Land prices indicate urban land price index of six large city areas (average of all categories of land use).
 2. "Trend" is calculated using 3-year backward moving averages. The shaded area indicates the root mean square of the deviation from the trend.
 3. Latest data as at the July-September quarter of 2018.
 Source: Cabinet Office, "National accounts"; Japan Real Estate Institute, "Urban land price index."

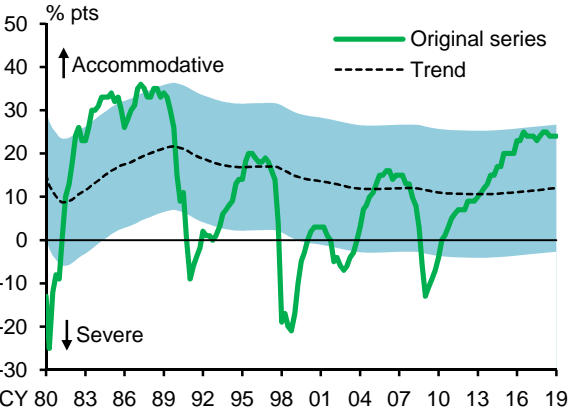
Chart III-4-5: Expected growth rate by real estate firms



Note: 1. The chart indicates the forecasts of Japan's real economic growth rate for next 5 years.
 2. Latest data as at fiscal 2018.
 Source: Cabinet Office, "Annual survey of corporate behavior."

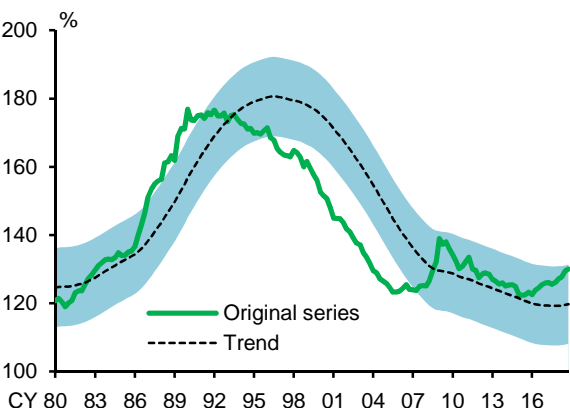
Among the FAIXs that are currently in the "green" zone, there are some that are getting closer to "red." For example, the *DI of lending attitudes of financial institutions* has remained at the highest level since the bubble period amid the prolonged low interest rate environment and the intensified competition among financial institutions (Chart III-4-6). In addition, against the background of such highly accommodative funding conditions, the *total credit to GDP ratio* has steadily increased, deviating upward from its trend (Chart III-4-7). The *corporate credit to GDP ratio* and the *business fixed investment to GDP ratio* are also getting closer to their upper thresholds (Charts III-4-8 and III-4-9), which seems to reflect a rise in bank loans for fixed investment, particularly to middle-risk firms. These developments, just like real estate loans, warrant close monitoring from a wider perspective, taking into account differences in fundamentals of individual indicators between the bubble period and the present (see Chapter IV).

Chart III-4-6: DI of lending attitudes of financial institutions



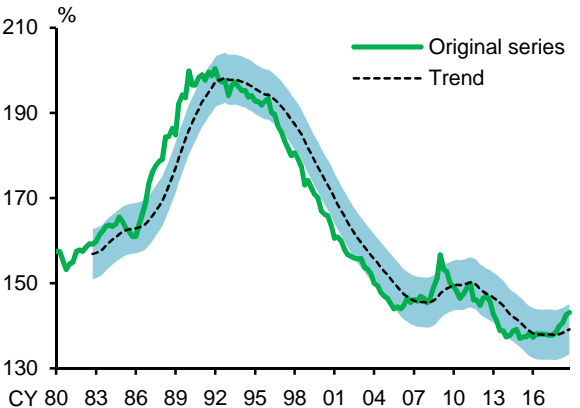
Note: 1. "Original series" is based on all firm sizes and all industries. "Trend" is calculated from the historical average. The shaded area indicates the root mean square of the deviation from the trend.
 2. Latest data as at the January-March quarter of 2019.
 Source: BOJ, "Tankan."

Chart III-4-7: Total credit to GDP ratio



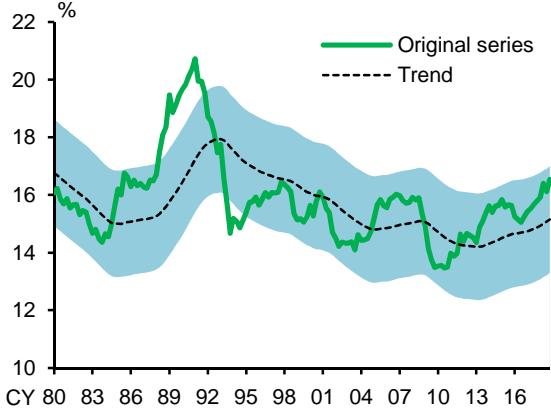
Note: 1. "Trend" is calculated using the one-sided HP filter. The shaded area indicates the root mean square of the deviation from the trend.
 2. 4-quarter backward moving averages. Latest data as at the October-December quarter of 2018.
 Source: Cabinet Office, "National accounts"; BOJ, "Flow of funds accounts."

Chart III-4-8: Corporate credit to GDP ratio



Note: 1. "Trend" is calculated using 3-year backward moving averages. The shaded area indicates the root mean square of the deviation from the trend.
 2. 4-quarter backward moving averages. Latest data as at the October-December quarter of 2018.
 Source: Cabinet Office, "National accounts"; BOJ, "Flow of funds accounts."

Chart III-4-9: Business fixed investment to GDP ratio



Note: 1. "Trend" is calculated using the one-sided HP filter. The shaded area indicates the root mean square of the deviation from the trend.
 2. Latest data as at the October-December quarter of 2018.
 Source: Cabinet Office, "National accounts."

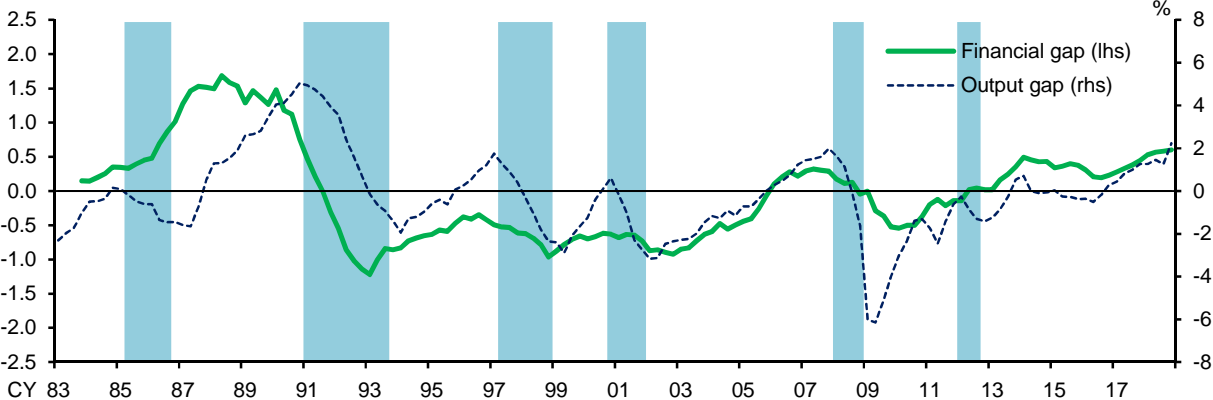
Thus, the FAIXs in the created heat map that signal overheating or levels close to overheating are seen in areas where financial institutions have increased lending and risk taking. These financial

intermediation activities performed actively by financial institutions have underpinned the moderate economic expansion. However, from a somewhat longer-term perspective, if these activities do not lead to a rise in the growth and profitability of Japan's corporate sector, then downward pressure on the economy in the event of a future negative shock could intensify more than expected through a feedback loop between the real economy and the financial sector. Going forward, it is necessary to carefully examine whether some shift of FAIXs in the direction of overheating occurs, as well as whether the total number of FAIXs signaling overheating increases.

2. Financial gap and risks to economic growth (GDP-at-risk)

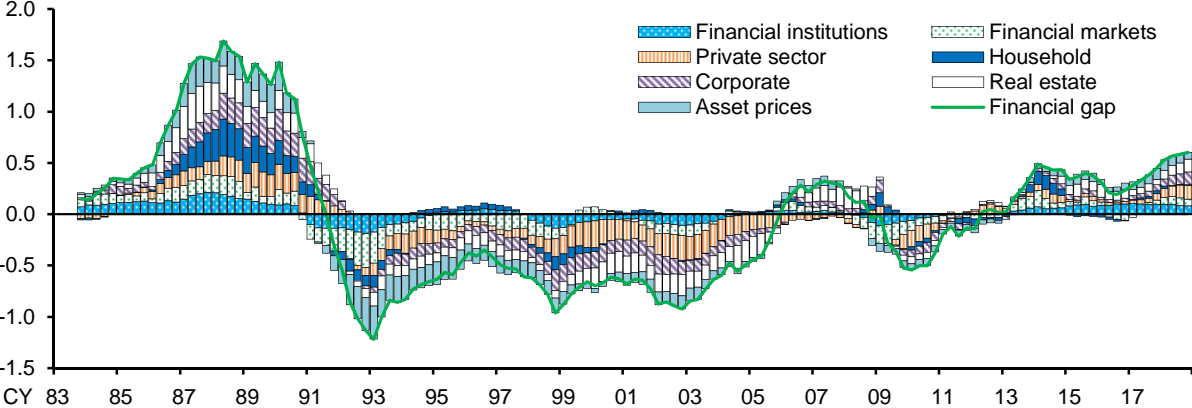
It is difficult to quantitatively assess the extent to which financial imbalances have built up overall using a heat map, which only shows the deviation of individual FAIXs from their trends by means of "discontinuous" colors. Therefore, to assess the phases of the financial cycle, the "financial gap," which is a composite indicator of the 14 FAIXs included in the heat map, is constructed by calculating the weighted average of the deviation rates of individual FAIXs from their trends.¹⁴

Chart III-4-10: Financial gap and output gap



Note: Latest data as at the October-December quarter of 2018. The shaded areas indicate recession phases.
Source: BOJ.

Chart III-4-11: Decomposition of financial gap



Note: 1. The decomposition is based on the seven categories in the heat map (Chart III-4-1).
2. Latest data as at the October-December quarter of 2018.
Source: BOJ.

¹⁴ In calculating the weighted average of the 14 FAIXs, greater weights are given to indexes with higher correlations with other indexes. These weights are time-varying with changes in correlations among the indexes. For details of the calculation method, see Yves S. Schuler, Paul P. Hiebert, and Tuomas A. Peltonen, "Characterising the Financial Cycle: A Multivariate and Time-varying Approach," *European Central Bank Working Paper Series*, No. 1846, September 2015.

The financial gap has continued to increase gradually but steadily in positive territory (Chart III-4-10). As pointed out in the previous issue of the *Report*, the current phase of the positive financial gap has the following features: (1) the level of the financial gap has been below that seen during the bubble period but has experienced a record high during the post-bubble period; (2) the current phase has marked the longest period of a positive financial gap since the burst of the bubble economy; and (3) a wide range of FAIXs have been in positive territory (Chart III-4-11).

Next, to examine the extent to which developments in the financial gap may pose a risk to the real economy from a somewhat longer-term perspective, we use a "GDP-at-risk" (GaR) approach, which was introduced in the previous issue of the *Report*. GaR is an approach for visualizing the risk to economic growth by using a probability distribution to show the probability X that the growth rate falls below Y percent over the next Z years given the current financial gap. In general, the more the financial gap indicates deviation toward overheating, the more likely an asymmetric impact with mainly negative consequences is exerted on future economic activity, due to a possible unwinding of financial activity, typically credit expansion, which is excessive compared to the economy's growth potential. GaR captures this concept quantitatively based on relationships between the financial gap and the output gap actually observed in the past. Thus, GaR can indicate how current financial vulnerabilities affect the future real economy by using a simple measure of the GDP growth distribution. This is why GaR has been widely used internationally in recent years as a tool for monitoring financial vulnerabilities.¹⁵

In what follows, a risk to economic growth is represented by a change in the output gap, which is calculated as the difference between the GDP growth rate and the potential growth rate. To measure the impact of the financial cycle, two channels are considered: the fluctuations in the financial gap in Japan described above, and the fluctuations in overseas financial conditions, which affect Japan's domestic economy, as observed during the time of the failure of Lehman Brothers (the Lehman shock).¹⁶ It should be noted that the GaR shown below is the estimate of a risk to economic growth arising solely from a build-up of financial imbalances and does not take other risk factors into account. Needless to say, it does not represent the Bank of Japan's outlook for future GDP growth.

The estimated probability distribution of GDP growth over the next 3 years has exhibited a fatter tail on the downside in recent years, although this tail is not as fat as during the bubble period, as indicated in the previous issue of the *Report* (Chart III-4-12). This change in the shape of the distribution is mainly attributable to the increase in the positive financial gap in Japan. This is also evident from the fact that the probability distribution of GDP growth shows a fatter tail on the downside when financial vulnerabilities are taken into account than that when they are not (Chart III-4-13). These results indicate that the recent expansion in the financial cycle has contributed to an increase in the downside tail risk to economic growth from a somewhat longer-term perspective by building up pressure on balance sheet adjustments on the back of the cumulative effect of low interest rates.

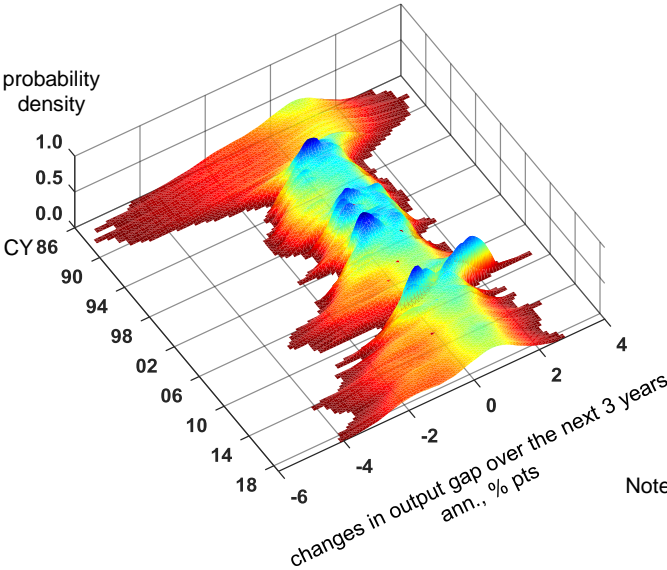
The financial gap and GaR are useful tools for quantifying financial vulnerabilities and the associated risks in a simple manner. However, their use and interpretation warrant the following caveats. First, the financial gap contains non-negligible measurement error. For example, it does

¹⁵ For details on GaR, including the underlying concept and specific estimation method, see Chapter IV and Box 1 in the October 2018 issue of the *Report*.

¹⁶ Specifically, the indicator used for overseas financial conditions is the National Financial Conditions Index published by the Federal Reserve Bank of Chicago.

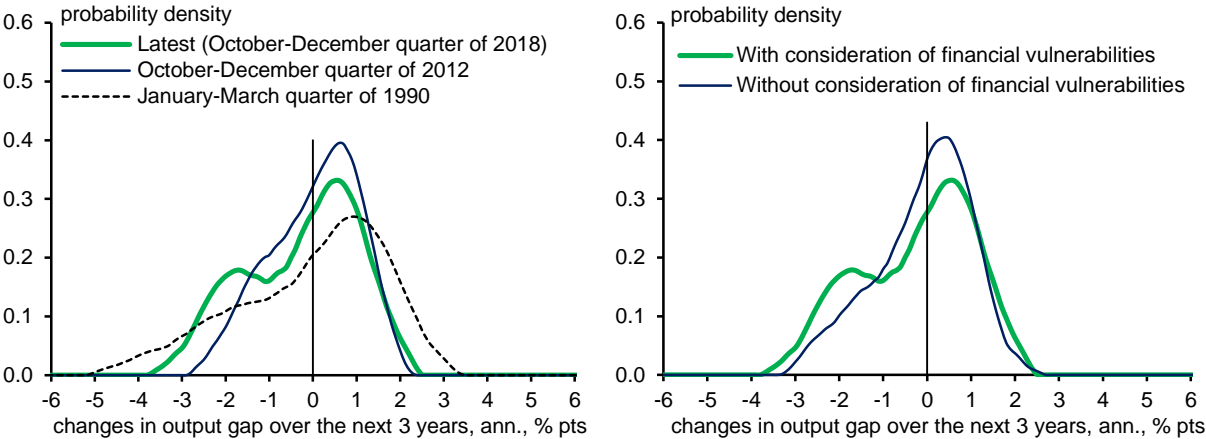
not measure changes in the quality of financial institutions' loans, such as an increase in lending to middle-risk firms. It also may not fully capture long-term changes in Japan's financial and economic structure since the bubble burst. Such measurement error will of course lead to measurement error in GaR, which is estimated using the financial gap. Second, GaR relies on limited time-series data, which contain only a small number of tail events in the estimation sample. Third, GaR only shows estimation results based on past data; it does not explicitly model a mechanism through which an escalation of overheating in financial activity leads to balance-sheet adjustment pressure. Therefore, the financial gap and GaR should each be regarded as subject to a considerable margin of error.

Chart III-4-12: Financial vulnerabilities and risks to economic growth over the next 3 years (GaR)



Note: The chart presents the time series of probability distributions of annualized changes in output gap over the next 3 years at each point in time.

Chart III-4-13: Comparison of risks to economic growth by period



Note: The distributions in the right-hand chart are as of the October-December quarter of 2018.

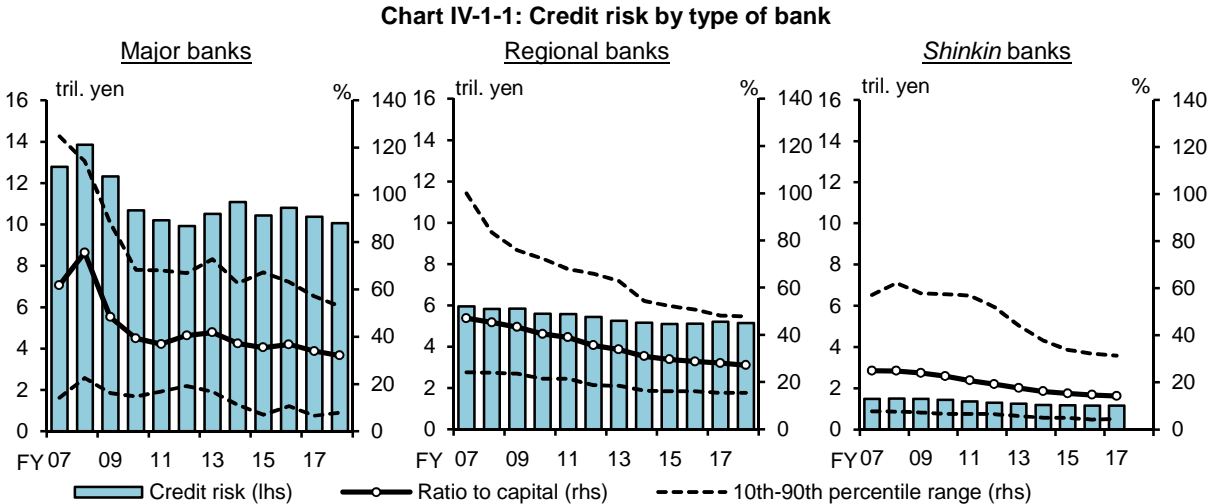
Nevertheless, in assessing the stability of Japan's financial system from a medium- to long-term perspective, it is important to keep in mind the qualitative implication of our GaR analysis: downside risks to the economy from a somewhat longer-term perspective tend to increase during the expansionary phase of a financial cycle. Given this implication, it is necessary to examine using stress testing in a forward-looking manner whether the financial system will remain stable and whether smooth functioning of financial intermediation will be ensured in the future even in the case of a major stress event in which the real economy deteriorates significantly. Chapter VI will examine these issues in detail.

IV. Financial institutions' financial bases and risk profiles

This chapter first examines risk profiles of financial institutions in terms of credit risk, market risk, real estate related risk, and funding liquidity risk and then examines their capital adequacy relative to these risks as of the present.¹⁷

A. Credit risk

Looking at the big picture of credit risk, the amount belonging to financial institutions has remained low on the whole, with the ratio of the amount of credit risk to the amount of capital hovering around historically low levels for every type of bank. Moreover, heterogeneity of this ratio has declined among financial institutions, especially among regional financial institutions (Chart IV-1-1).¹⁸



Note: 1. "Credit risk" is unexpected losses with a 99 percent confidence level.
 2. Covers credit that is subject to self-assessment. The data for fiscal 2018 in the left-hand and middle charts are annualized values for the first half of fiscal 2018.
 Source: BOJ.

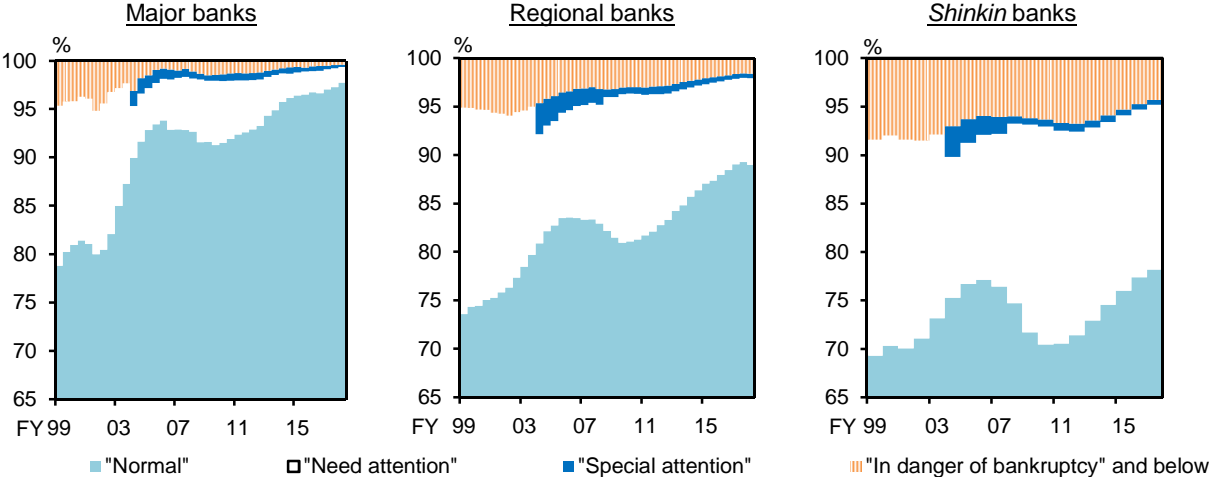
This low level of credit risk has persisted despite the increase in financial institutions' domestic and overseas loans, due to continuing improvement in the composition of loans by borrower classification, which reflects a healthier financial condition among firms amid the prolonged economic expansions at home and abroad and the continued low interest rate environment. Decomposing loans by borrower classification shows that the ratio of normal loans to total loans has continued to follow an upward trend, and, in the case of major banks and regional banks, the ratio has clearly exceeded the peak before the Lehman shock. Moreover, the number of corporate bankruptcies has been at the same low levels as during the bubble period in the 1980s (Charts IV-1-2 and IV-1-3).

¹⁷ Unless otherwise noted, the figures for financial institutions' capital shown in the charts in this chapter represent common equity Tier 1 (CET1) capital for internationally active banks from fiscal 2012 onward, core capital for domestic banks from fiscal 2013 onward, and Tier 1 capital for internationally active banks and domestic banks before fiscal 2012 and fiscal 2013, respectively (excluding the transitional arrangements related to the Basel III framework).

¹⁸ Credit risk defined here refers to unexpected losses. Unexpected losses are estimated by deducting the average amount of losses arising in 1 year (expected losses) from the upper 99th percentile of possible 1-year losses. The amount of credit risk in Chart IV-1-1 and the amount of integrated risk in Charts IV-5-5 and IV-5-6 are calculated by referring to the default rates from fiscal 2005 to the time in question.

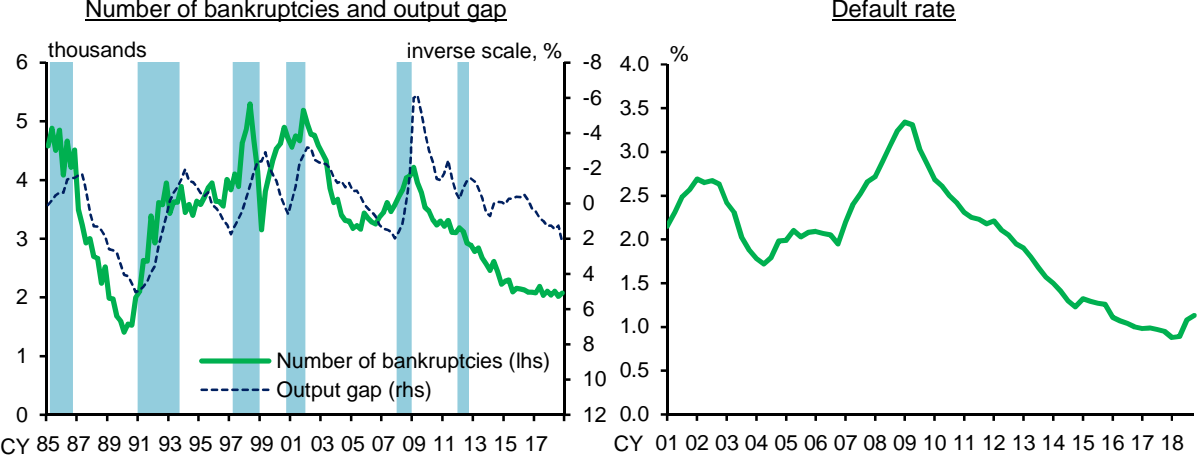
However, there are signs of change in the declining trend in credit risk. The decline in the number of corporate bankruptcies has recently ceased. Moreover, the default rate in terms of loans overdue by more than 3 months or loans where the borrower was downgraded to being "in danger of bankruptcy" or below has risen slightly, albeit remaining at historically low levels (Chart IV-1-3).¹⁹ Meanwhile, although credit cost ratios are still extremely low for every type of bank, those of regional banks rose somewhat in the first half of fiscal 2018 (Chart IV-1-4). The low credit costs in recent years (in fact, they are even below the levels seen during the bubble period in

Chart IV-1-2: Composition of loans by borrower classification



Note: 1. "Need attention" indicates "Need attention excluding special attention" from fiscal 2004.
 2. The latest data in the left-hand and middle charts are as at end-September 2018, and the latest data in the right-hand chart are as at end-March 2018.
 Source: BOJ.

Chart IV-1-3: Number of bankruptcies and default rate

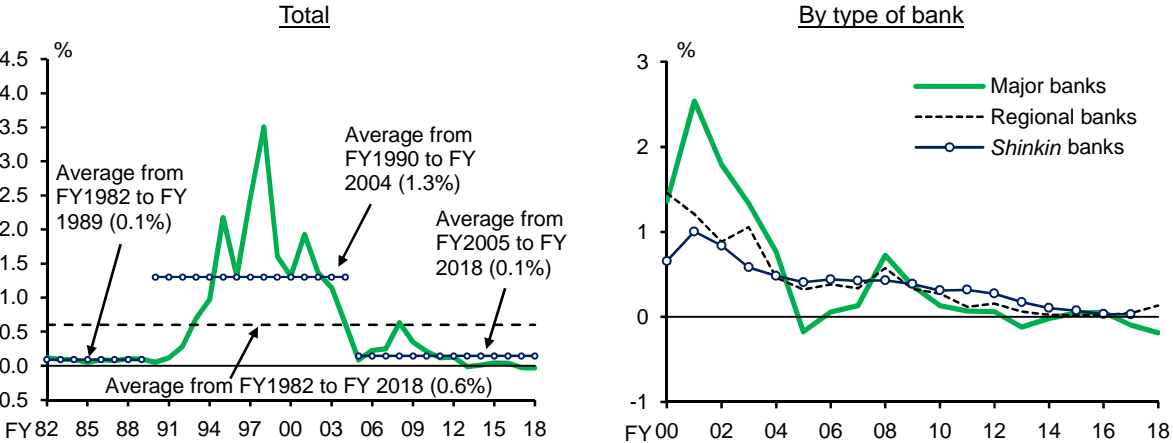


Note: 1. In the left-hand chart, the latest data are as at the October-December quarter of 2018. The shaded areas indicate recession phases.
 2. In the right-hand chart, the figure indicates the end-quarter value. Latest data as at December 2018.
 Source: The Risk Data Bank of Japan; Tokyo Shoko Research; BOJ.

¹⁹ In Chart IV-1-3, the default rate is calculated by dividing the number of defaulted borrowers by the number of non-defaulted borrowers over the preceding 12 months. Defaulted borrowers are defined as borrowers whose loans are overdue by more than 3 months or whose borrower classification was downgraded to being "in danger of bankruptcy" or below for the first time in the preceding 12 months. Non-defaulted borrowers are borrowers that have never been classified as defaulted borrowers in the past and that were classified as "normal" or "need attention" at the end of March in the preceding year (in the year before the preceding year for observations in January and February).

the late 1980s) reflect, to some extent, the fact that financial institutions have supported low-performing firms by offering low interest rates, as will be revisited later in this chapter. However, entering fiscal 2018, some bankruptcies and downgrades of local firms were observed. Moreover, there were some cases where rental housing business loans went into default or became delinquent due to the fact that financial institutions' initial screening of borrowers and/or their management of rental housing agents was insufficient. Given the increase in downside risks to overseas economies, careful monitoring is warranted on whether the credit costs that have declined thus far will start to increase.

Chart IV-1-4: Credit cost ratios among financial institutions



Note: 1. In the left-hand chart, the latest data for "Major banks" and "Regional banks" are annualized values for the first half of fiscal 2018 and latest data for "Shinkin banks" are assumed to be unchanged from fiscal 2017.
 2. In the right-hand chart, the latest data for "Major banks" and "Regional banks" are annualized values for the first half of fiscal 2018 and latest data for "Shinkin banks" are as at fiscal 2017.

Source: BOJ.

In assessing credit risk, due attention should be paid not only to aggregate results but also to the changes in borrowers' credit quality and the composition of individual borrowers. The following focuses on loans to middle-risk firms and the overseas sector, as the share of loans to these sectors has increased in recent years. Loans to the real estate industry will be discussed in the subsequent section.

Lending to middle-risk firms

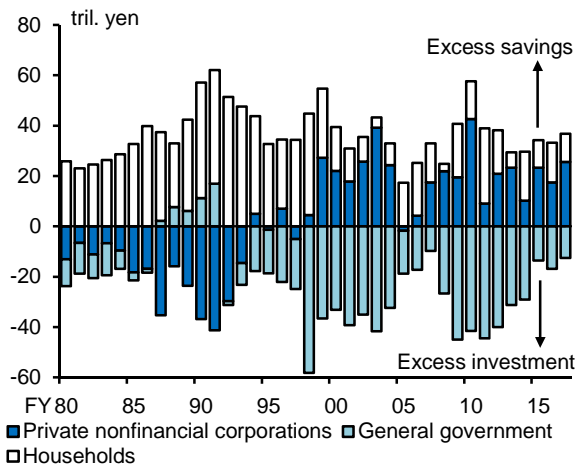
In Japan, the corporate sector changed from being a "net investor" to a "net saver" in the latter half of the 1990s. Under these circumstances, the share of "debt-free firms," i.e., firms that have no borrowings from banks, has increased. Nevertheless, in the past few years, bank lending to firms has continued to grow at an annual pace of 2-4 percent, which exceeds the potential growth rate of the economy. This suggests that bank-dependent firms have raised their leverage. In fact, in recent years, financial institutions have increased lending to firms with relatively high credit risks (so-called middle-risk firms) at low interest rates (Charts IV-1-5 and IV-1-6).

With regard to this, recent issues of the *Report* have identified firms with relatively weak financial condition whose borrowing interest rates are low relative to their credit risk through the business cycle and referred to these firms as "low-return borrowers."²⁰ An analysis based on firm-level microdata of financial institutions leads to the following observations: (1) the share of financial institutions' loans to low-return borrowers among all loans to small firms (hereinafter simply the loan share of low-return borrowers) has been still on the upward trend overall; (2) there is

²⁰ For a detailed definition of loans to low-return borrowers and the reasons behind the increase in the loan share of low-return borrowers, see Chapter VI in the April 2018 issue of the *Report*.

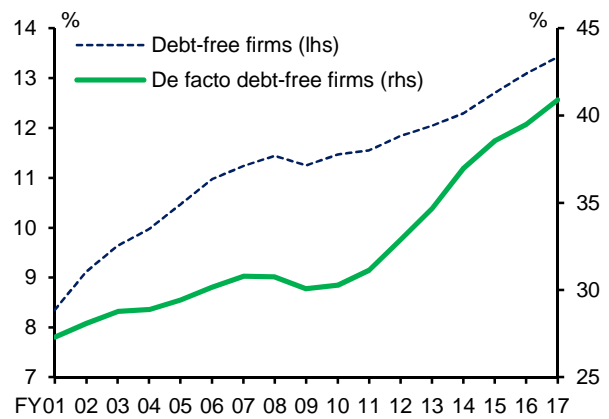
considerable heterogeneity in the loan share of low-return borrowers among financial institutions and that of some institutions has recently reached as high as 30-40 percent; and (3) over the past few years, real estate loans have made a growing contribution to the increase in the loan share of low-return borrowers (Charts IV-1-7, IV-1-8, and IV-1-9).

Chart IV-1-5: Savings-investment balance by sector



Note: Latest data as at fiscal 2017.
Source: BOJ, "Flow of funds accounts."

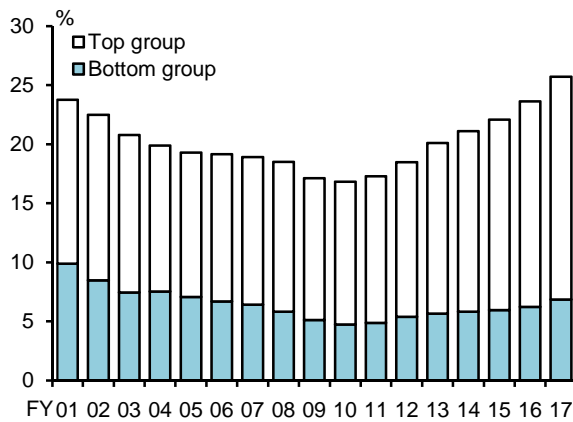
Chart IV-1-6: Share of debt-free firms



Note: 1. "Debt-free firms" is defined as firms without borrowings. "De facto debt-free firms" is defined as firms whose cash and deposits exceed their total amount of borrowings.
2. Covers small firms.

Source: Teikoku Databank.

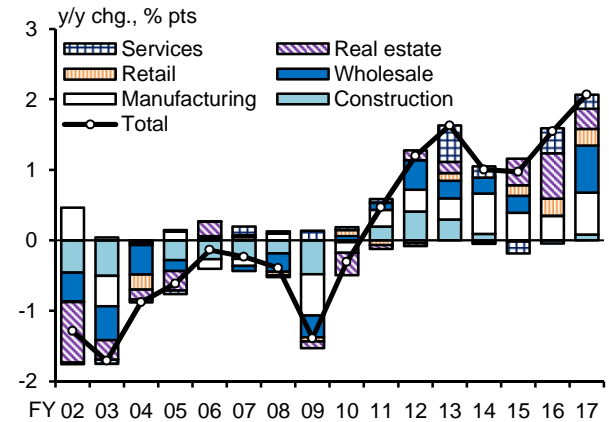
Chart IV-1-7: Loan share of low-return borrowers



Note: 1. The chart indicates the loan share of low-return borrowers in the total amount of loans to small firms.
2. Low-return borrowers are classified into "Bottom group," consisting of those whose ROA was at the bottom 25 percent of firms for the past 2 years or whose leverage ratio was at the top 25 percent for the past 2 years, and "Top group," consisting of all other low-return borrowers.

Source: Teikoku Databank.

Chart IV-1-8: Loan share of low-return borrowers by industry



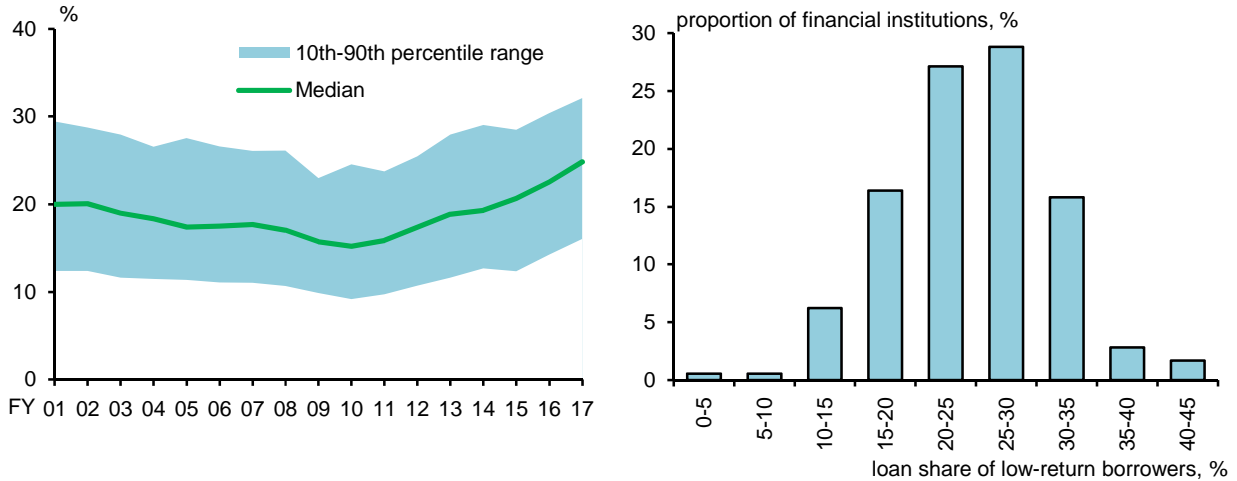
Note: 1. The chart indicates contribution by industry to the changes from the previous year in the loan share of low-return borrowers.

2. "Services" includes transportation, telecommunication, electricity, gas and water.

Source: Teikoku Databank.

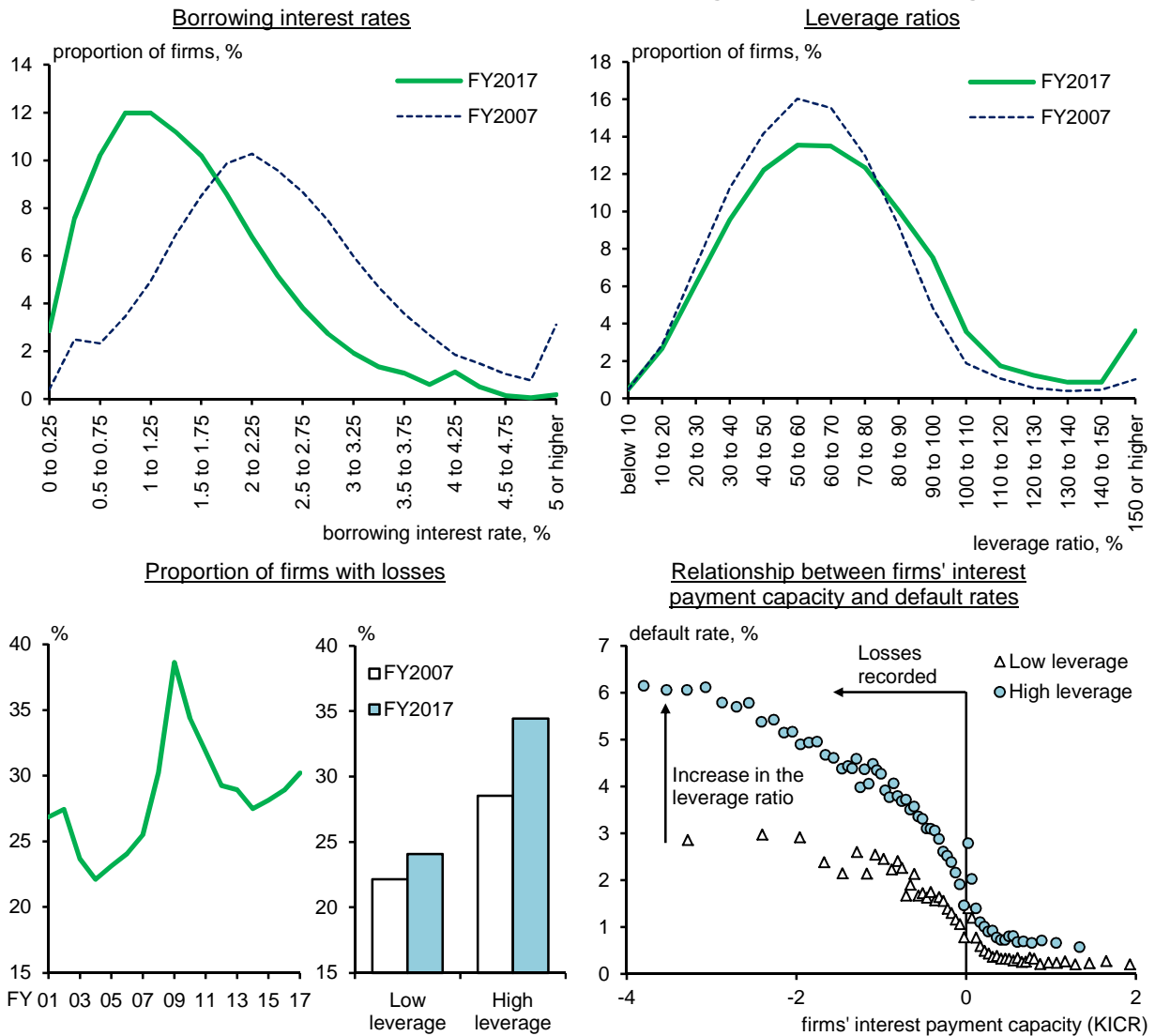
Active lending by financial institutions to such firms at low interest rates has likely underpinned the current economic expansion. Financial institutions have also, to some degree, supported low-performing firms financially by providing business consulting and advisory services. However, financial data on firms with high reliance on borrowing show that there has been no notable improvement in their interest payment capacity as a whole, despite the favorable macroeconomic

Chart IV-1-9: Loan share of low-return borrowers among financial institutions



Note: Covers major banks and regional financial institutions. The data in the right-hand chart are as at fiscal 2017.
Source: Teikoku Databank.

Chart IV-1-10: Financial condition of firms with a high reliance on borrowing

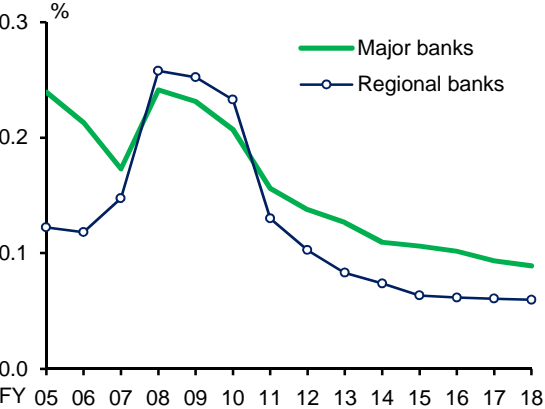


Note: 1. Covers small and medium-sized firms whose total amount of borrowings exceeds cash and deposits (defined as a high reliance on borrowing). In the lower right chart, the data cover from fiscal 2001 to the fiscal 2017. In the other charts, the data from fiscal 2001 to fiscal 2016 cover firms with borrowings as at fiscal 2017.
 2. The proportion of firms with losses indicates the share of firms with negative operating profits (including interest and dividends received) among firms with a high reliance on borrowing.
 3. In the lower middle and right charts, firms are classified into "Low leverage," whose leverage ratios (total amount of borrowing / total assets) are below the median across all fiscal years, and "High leverage," whose leverage ratios are above the median.
 Source: CRD.

environment of an economic expansion and low interest rates. In fact, the proportion of firms with net losses has been increasing and their leverage ratios have also increased significantly (Chart IV-1-10). If low-performing firms do not show more improvement in their business performance, credit costs will eventually increase. The probability of default forecasting model estimated by the Financial System and Bank Examination Department of the Bank based on granular firm-level financial data shows the following: (1) firms' probability of default tends to increase nonlinearly as their interest payment capacity decreases; and (2) such an increase in the probability of default is much larger for more leveraged firms.²¹ Because the middle-risk borrowers to which financial institutions have increased their lending include a substantial number of firms with low interest payment capacity, credit costs could increase sharply in a stress event such as an economic downturn or a rise in interest rates.

A large proportion of middle-risk firms seem to be included in the bottom group of the "normal" borrowers, but the ratio of loan-loss provisions for overall normal loans has remained low by historical standards (Chart IV-1-11).²² It would not be appropriate for financial institutions to allow their calculations of loan-loss provisions to be excessively affected by the current favorable macroeconomic environment. Financial institutions should therefore carefully examine their loan-loss provisions based on accounting rules, by fully taking into account possible future economic deterioration from a medium- to long-term perspective.²³ They also need to pay due attention to the effects on their credit costs of changes in the credit quality and composition of borrowers.

Chart IV-1-11: Ratios of loan-loss provisions to normal loans



Note: 1. The ratio of general loan-loss provisions to the total amount of normal loans.
 2. Latest data as at end-September 2018.
 Source: BOJ.

Overseas credit risk

Overseas exposure of financial institutions has continued to increase, but the associated credit risk has thus far remained subdued. The portfolio quality of large-scale overseas loans has remained high on the whole, as indicated by the fact that investment-grade loans (BBB or better) account for more than 70 percent of these portfolios (Chart IV-1-12). There has been a moderate uptrend in overseas credit investment, but excessive risk taking has not yet been observed (Chart

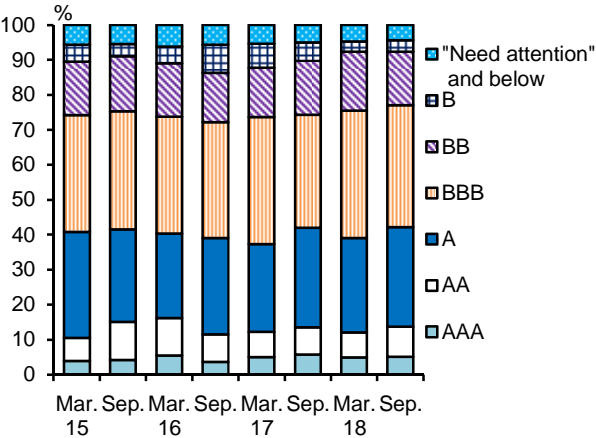
²¹ For details, see "A Forecast Model for the Probability of Default Based on Granular Firm-Level Data and Its Application to Stress Testing," *Financial System Report Annex Series* (forthcoming; the Japanese version was released in March 2019).

²² Some middle-risk firms have also likely been classified as "need attention" (but not as "special attention").

²³ The Study Group on Supervisory Approaches to Lending Practices established by the Financial Services Agency (FSA) of Japan in June 2018 has discussed and explored supervisory approaches to the lending practices of financial institutions in view of the recall of its financial inspection manual. The study group deliberates on loan-loss provisions so that financial institutions can calculate their loan-loss provisions by considering not only actual loan losses and quantitative and qualitative information on individual borrowing firms but also their loan policies, loan portfolio characteristics, and economic forecasts. The Bank participates in this study group.

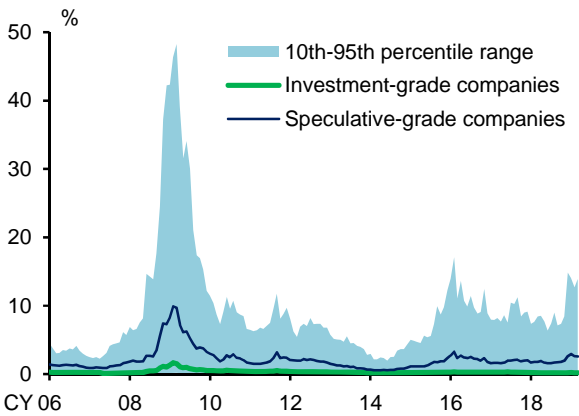
III-1-27). However, some financial institutions have increased lending to relatively high-risk firms or increased their holdings of high-yield bonds and/or illiquid securitized products (such as CLOs) to secure interest margins, against the backdrop of intensified competition with overseas financial institutions and higher foreign currency funding costs.

Chart IV-1-12: Composition of overseas large-scale loans by credit rating



Note: Covers the major banks for which data are available. The latest data cover four banks.
Source: BOJ.

Chart IV-1-13: EDF for U.S. firms



Note: 1. The number of investment-grade companies is 371 and that of speculative-grade companies is 320. The solid lines indicate the average EDF (1-year EDF) for U.S. firms by grade.
2. The shaded area indicates the 10th-95th percentile range for speculative-grade companies.
3. Ratings as at end-March 2019.
4. Latest data for EDF as at end-March 2019.
Source: Moody's.

As described in Chapter II, in global credit markets, spreads on high-yield bonds and some securitized products temporarily widened, reflecting increased uncertainty regarding global economic and financial conditions and a deterioration in investors' risk appetite (Chart II-1-12). Financial institutions need to monitor their overseas investment and lending more carefully than ever so as to understand how an economic downturn or a hike in interest rates would affect the financial condition and default rate of borrowing firms. In this environment, although the expected default frequency (EDF) for U.S. firms has remained stably low for investment-grade companies, it has become somewhat higher than before for speculative-grade companies, reflecting the effects of slower improvements in corporate earnings, past increases in interest rates, and an increase in stock market volatility (Chart IV-1-13).²⁴ Japanese major financial institutions have increased their overseas lending and credit investment in their banking operations (on a non-consolidated basis) and also increased the financial operations of their overseas subsidiaries. As a result of these developments, Japanese major financial institutions have likely become more susceptible to direct and indirect effects from foreign country shocks than before the global financial crisis (see Box 3). Therefore, financial institutions need to improve the effectiveness of their credit risk management for their overseas exposure.

B. Market risk

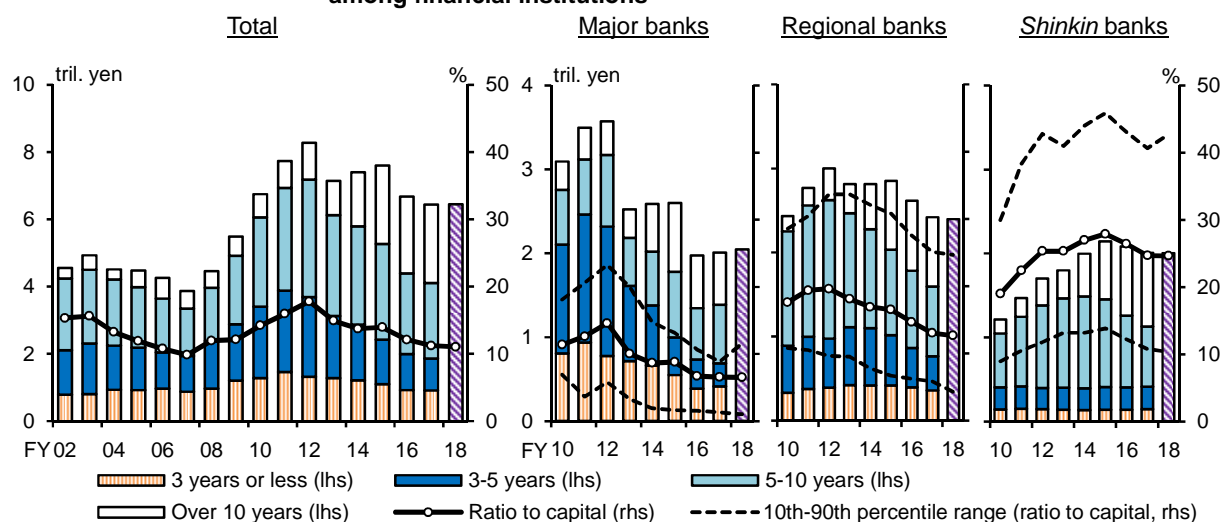
This section assesses four aspects of market risk, namely, the yen interest rate risk, the foreign currency interest rate risk, the market risk associated with stockholdings, and other market risk including that associated with investment trust holdings.

²⁴ Using the firm's stock price and related information, Moody's EDF measures the probability of a firm defaulting over a specific period of time in the future, based on the market value of the firm's assets and liabilities payable.

Yen interest rate risk

The amount of interest rate risk associated with the yen-denominated bond investments of financial institutions had been following a downward trend since peaking in 2012, reflecting a decline in their holdings of such bonds, but the yen interest rate risk has been more or less flat recently (Chart IV-2-1).²⁵ While the reduction in yen-denominated bondholdings continues to put downward pressure on the amount of interest rate risk, it is also subject to upward pressure due to an increase in the duration of bond portfolios (Chart IV-2-2).

Chart IV-2-1: Interest rate risk associated with yen-denominated bondholdings among financial institutions



Note: Interest rate risk is a 100 basis point value in the banking book. Convexity and higher order terms are taken into account. The data for fiscal 2018 are estimated as at end-February 2019. Source: BOJ.

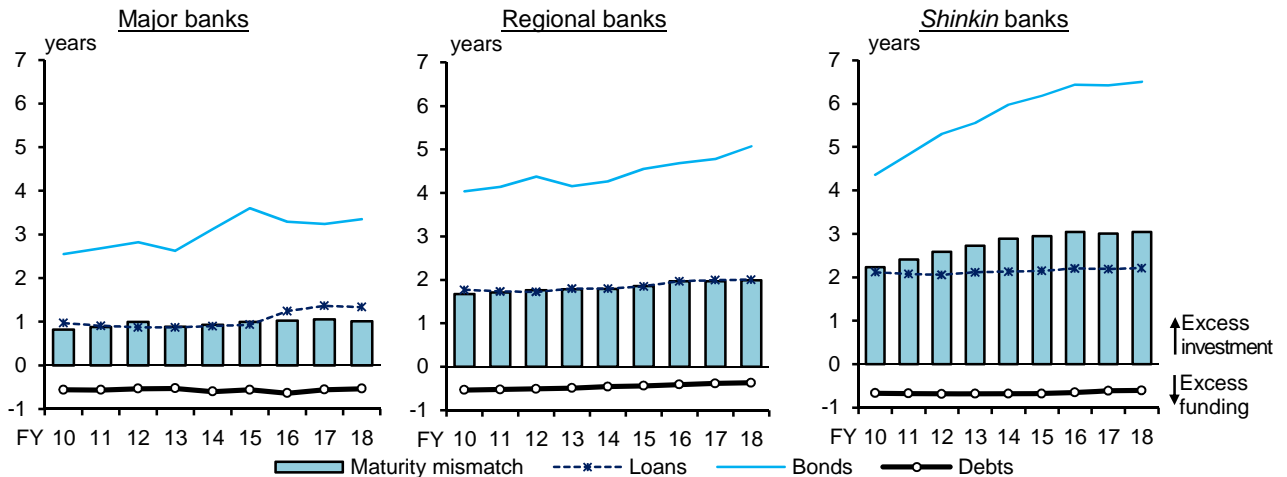
By type of bank, the ratio of the amount of interest rate risk associated with yen-denominated bond investments to the amount of capital has been low at around 5 percent for major banks, whereas it has been relatively high at around 15 and 25 percent for regional banks and *shinkin* banks, respectively. Moreover, heterogeneity in this ratio among regional financial institutions has been quite high (Chart IV-2-1). A similar pattern of relatively high ratios for regional banks and *shinkin* banks is found for the amount of yen interest rate risk overall on the balance sheets of financial institutions, i.e., yen interest rate risk including components such as loans and deposits in addition to bond investments (Chart IV-2-3).^{26,27}

²⁵ In Chart IV-2-1, changes in the economic value of bondholdings are calculated assuming a parallel shift in the yield curve in which the interest rates for all maturities rise by 1 percentage point. One of the interest rate risk scenarios assumed in the FSA's public notice about interest rate risk in the banking book (IRRBB) employs an upward parallel shift of 1 percentage point.

²⁶ In Chart IV-2-3, changes in the economic value of all assets and liabilities are calculated assuming a parallel shift in the yield curve in which the interest rates for all maturities increase by 1 percentage point. When the average duration of assets is longer than that of liabilities, a widening maturity mismatch (the difference between the average durations of assets and liabilities) will amplify the interest rate risk. The estimation of changes in value here includes only the interest rate risk associated with yen-denominated assets (loans and bonds) and liabilities, and yen interest rate swaps (those of *shinkin* banks are not taken into account). In particular, it does not reflect the risk associated with foreign currency-denominated assets and liabilities or that with off-balance-sheet transactions other than yen interest rate swaps. In the estimation of changes in liabilities, it is assumed that the duration of demand deposits is 3 months or less, meaning that so-called "core deposits" are not taken into account.

²⁷ Regarding IRRBB, the FSA's public notices and supervisory guidelines set the following interest rate risk levels as early warning lines: (1) for internationally active banks, 15 percent of Tier 1 capital (since March 2018); and (2) for domestic banks, 20 percent of core capital (since March 2019). Based on materiality tests and the like, the FSA shall hold in-depth dialogues with financial institutions as necessary.

Chart IV-2-2: Average remaining maturity of yen-denominated assets and liabilities by type of bank

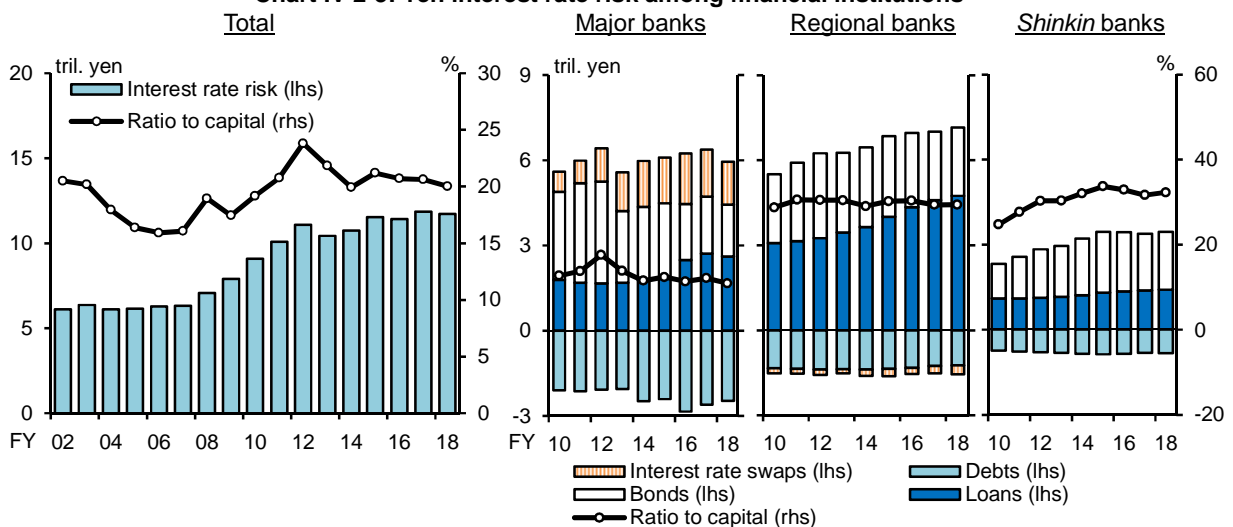


Note: 1. "Maturity mismatch" is the difference between the average remaining maturity of assets and that of liabilities. The average remaining maturity of assets is the weighted average of loans, bonds, and interest rate swaps with interest receipts. The average remaining maturity of liabilities is the weighted average of debts and interest rate swaps with interest payments.

2. The data for fiscal 2018 are as at end-December 2018.

Source: BOJ.

Chart IV-2-3: Yen interest rate risk among financial institutions



Note: Interest rate risk is a 100 basis point value in the banking book. Convexity and higher order terms are taken into account. For major banks and regional banks, off-balance-sheet transactions (interest rate swaps) are included. The data for fiscal 2018 are as at end-December 2018.

Source: BOJ.

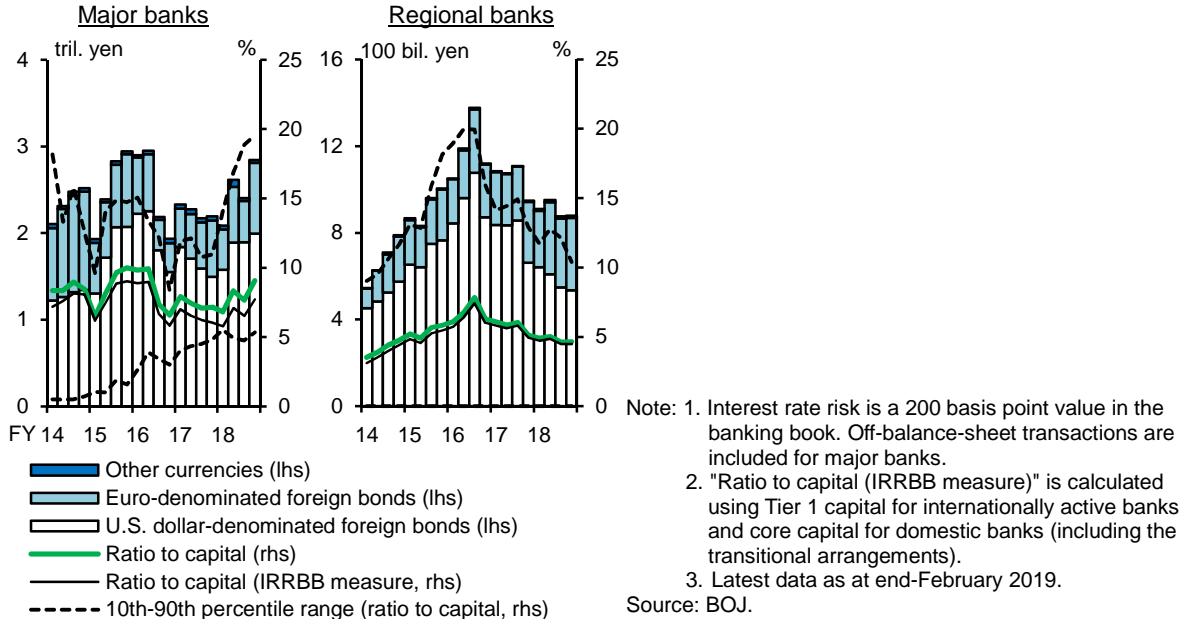
Foreign currency interest rate risk

The amount of interest rate risk associated with foreign currency-denominated bond investments by financial institutions has generally been following a decreasing trend, but with some fluctuations, since the reduction by financial institutions of their foreign bondholdings in response to the rise in overseas interest rates in the second half of 2016 (Chart IV-2-4).²⁸ The ratio of the amount of

²⁸ The FSA's public notice with regard to IRRBB sets an upward parallel shift as one of the scenarios for calculating interest rate risk, assuming the changes in the interest rates of the U.S. dollar and the euro to be 2 percentage points. Similarly, the interest rate risk of foreign currency-denominated foreign bonds in Chart IV-2-4 is calculated as the change in the economic value of bondholdings assuming a parallel shift in the yield curve in which interest rates for all maturities increase by 2 percentage points.

interest rate risk associated with foreign currency-denominated bonds to the amount of capital has been limited to about 10 percent for major banks and about 5 percent for regional banks. Among major banks, heterogeneity in this ratio has increased somewhat as some of them have increased U.S. Treasury holdings in line with reduced expectations of higher interest rates. As for regional financial institutions, there have been no major changes in the average of or heterogeneity in this ratio. It should be noted, however, that quite a few of those that do not hold foreign currency-denominated bonds have purchased investment trusts that invest in these bonds. Investment trusts for which the overseas interest rate risk is the main risk factor account for about 40 percent of all investment trusts held by regional financial institutions. Thus, it is important to manage the foreign currency interest rate risk including that associated with investment trusts.

Chart IV-2-4: Interest rate risk of foreign currency-denominated foreign bonds



Market risk associated with stockholdings

The amount of market risk associated with stockholdings (including stock investment trusts) has declined (Chart IV-2-5).²⁹ This is due to a decrease in financial institutions' exposure as a result of both a reduction in strategic stockholdings and a decline in stock prices. By type of bank, the ratio of the amount of market risk associated with stockholdings to the amount of capital has been around 30 percent both for major banks and regional banks, and around 20 percent for *shinkin* banks.

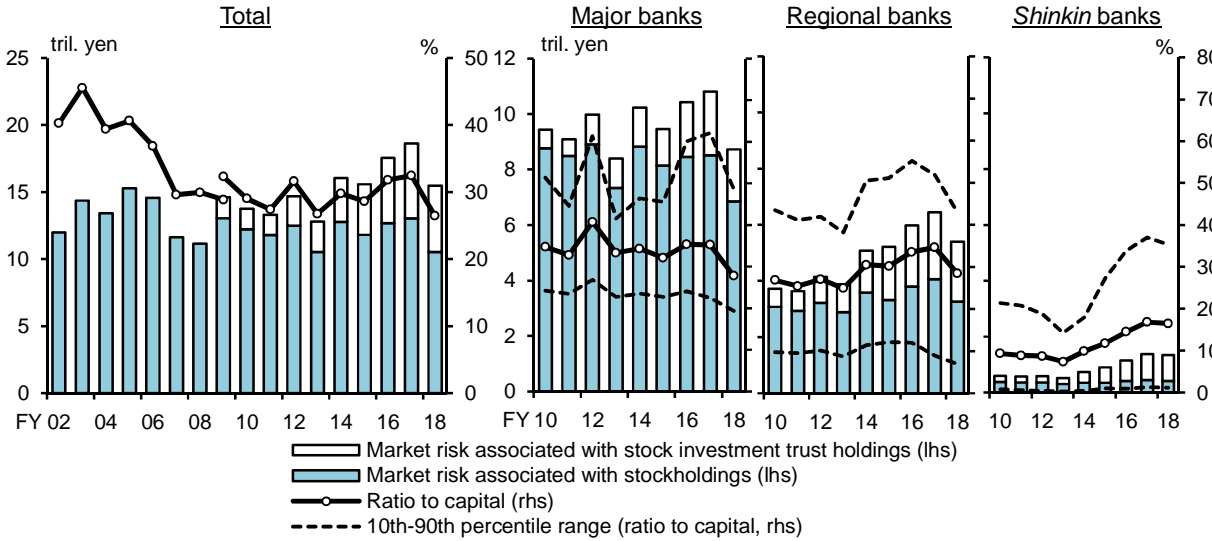
Meanwhile, the volatility of stock prices rose through the end of 2018, reflecting U.S.-China trade tensions, political uncertainty in Europe, including that over the United Kingdom's exit from the EU, and concern over the economic slowdown in China (Chart II-1-1). As long as these market fluctuation factors remain in place, attention should be paid to the possibility that market volatility may increase further, pushing up the market risk associated with stockholdings.

Financial institutions' strategic stockholdings have been exhibiting a gradual downward trend but the associated market risk has remained large enough to potentially have a substantial impact on their financial soundness and profits. Financial institutions need to make an objective assessment

²⁹ In Chart IV-2-5, the market risk associated with stockholdings (including stock investment trusts) is calculated using VaR with a 99 percent confidence level and a 1-year holding period. (The same applies to the integrated risk in Charts IV-5-5 and IV-5-6.) Volatility is calculated based on the past 5 years.

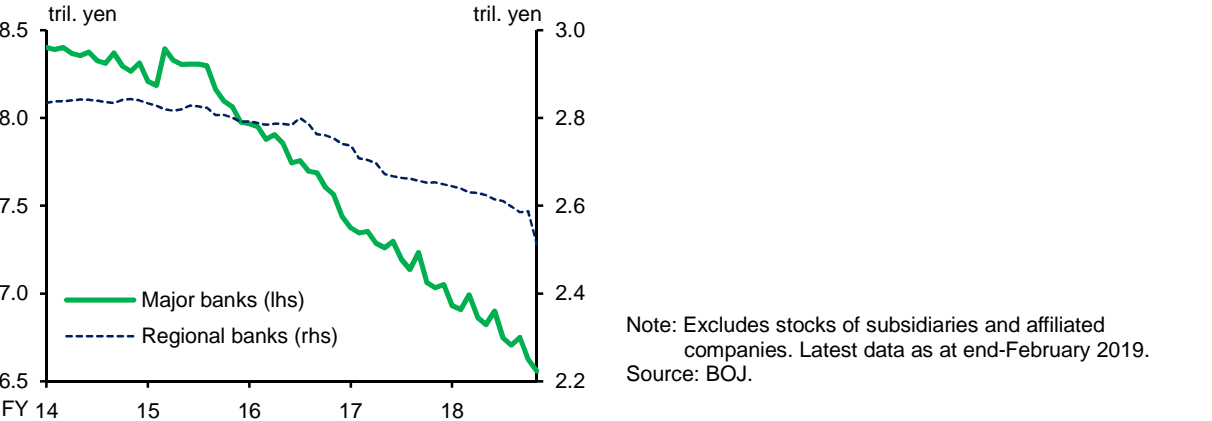
of the purpose and costs of strategic stockholdings and control their exposure to the market risk associated with stockholdings, including strategic stockholdings, within an appropriate range in terms of their financial soundness (Chart IV-2-6).

Chart IV-2-5: Market risk associated with stockholdings among financial institutions



Note: 1. "Market risk associated with stockholdings" and "Market risk associated with stock investment trust holdings" are value-at-risk with a 99 percent confidence level and with 1-year holding period, and exclude risk associated with foreign currency-denominated stockholdings and stock investment trust holdings. Pre-fiscal 2009 data do not include stock investment trusts.
 2. The data for fiscal 2018 are estimated using the outstanding amount of stockholdings and stock investment trust holdings as at end-February 2019 and stock prices up to end-February 2019.
 Source: BOJ.

Chart IV-2-6: Strategic stockholdings among financial institutions



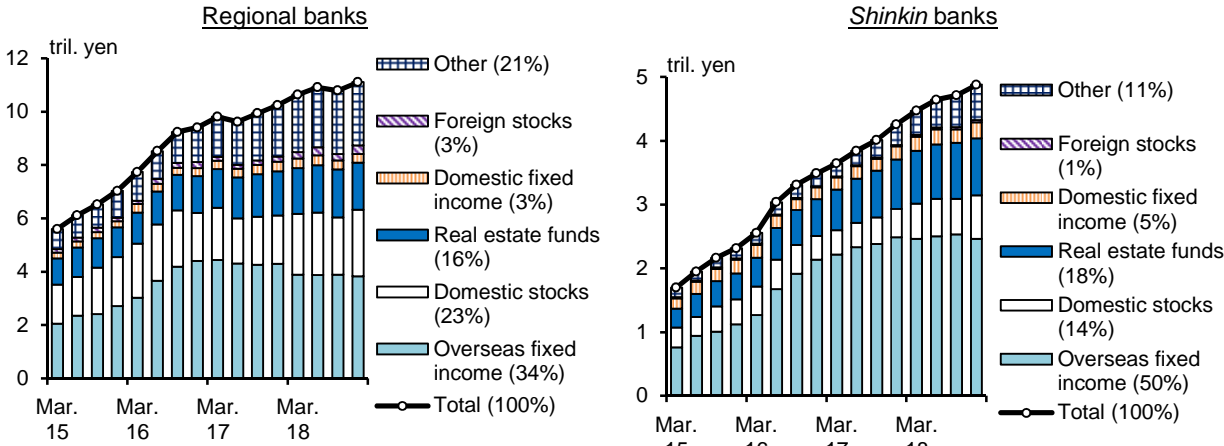
Note: Excludes stocks of subsidiaries and affiliated companies. Latest data as at end-February 2019.
 Source: BOJ.

Other market risk including that associated with investment trust holdings

As seen in Chapter III, regional financial institutions have become more active in risk taking by increasing their holdings of investment trusts. As a result, they have been exposed to a wide range of market risks, such as credit risk, real estate-related risk, and foreign exchange risk, as well as overseas interest rate risk and stockholdings-related risk (Chart IV-2-7). For example, although the assets purchased by overseas fixed income investment trusts consist mainly of sovereign bonds, investment trusts also include products with relatively high credit risk in their portfolios (such as high-yield bonds and CLOs). In addition, recently, some financial institutions have invested in multi-asset investment trusts that invest in a wide variety of assets such as domestic and foreign bonds and stocks, including those for emerging economies, although the amount invested remains limited. Such investment trusts include products called "risk control funds" whose asset allocation ratios are adjusted in response to market fluctuations in order to limit price fall risk.

These investment funds are aimed at controlling risk, unlike macro strategy hedge funds, but the entailed risk may not be sufficiently captured by conventional risk management methods that identify risk factors based on the past investment performance of a certain asset allocation and manage assets on the basis of early warning signs. Due attention should also be paid to the possibility that, when correlations among risk factors and market volatilities change significantly, risk diversification effects will not work sufficiently, which could in turn cause unexpected losses to be incurred.

Chart IV-2-7: Breakdown of outstanding amount of investment trusts

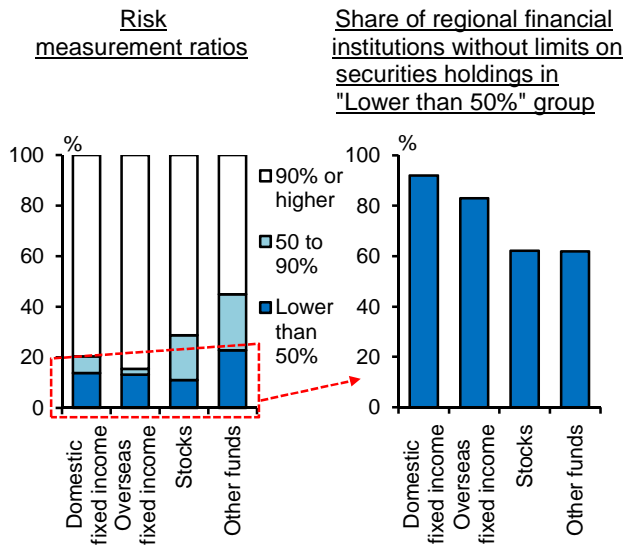


Note: 1. Based on book values. Figures in parentheses in the chart indicate the share of product type in last period.
 2. Latest data as at end-December 2018.
 Source: BOJ.

The results of a survey on financial institutions' ability to measure the amount of risk associated with investment trusts (risk measurement ratio) showed that some institutions do not sufficiently monitor their risk factors, although the majority of institutions grasp the risk of more than 90 percent of the total value of their investment trust holdings. In addition, some financial institutions have not put in place a basic risk management framework such as setting a limit for investment trust holdings even though they have not sufficiently measured the amount of risk (Chart IV-2-8). In recent years, with the U.S. yield curve both flattening and shifting upwards, many financial institutions have recorded losses on investment trusts investing in overseas interest rate products. Under this market environment, financial institutions that have not set risk management limits on the amounts of holdings and/or losses will tend to suffer larger losses, as indicated by the relationship between the quality of the risk management associated with investment trust (public and corporate bond investment trust) holdings and the investment performance (Chart IV-2-9).

In addition to investment trusts, some regional financial institutions have invested in assets with complex risk profiles such as structured bonds (Chart IV-2-10). In particular, among *shinkin* banks, the share of structured bonds in total assets has recently started increasing after falling following the Lehman shock. When financial institutions invest in investment trusts or investment schemes with complex risk profiles, it is important that they (1) identify the risk factors, capture the sensitivity of such investments to these risk factors, and make use of such information in their risk management; (2) assume sufficiently severe scenarios such as a substantial increase in volatility in global financial markets and analyze impacts under such scenarios, including that on financial institutions' profits, from a wide range of perspectives. Furthermore, based on the previous steps, (3) they should organizationally examine an implementable framework in stress situations, and (4) develop and secure the necessary human resources for implementing such a framework.

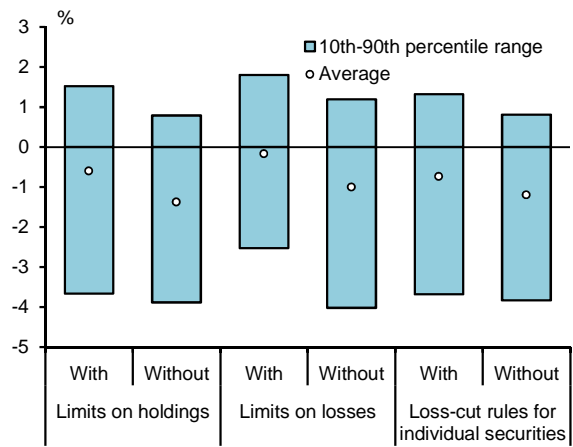
Chart IV-2-8: Risk management of investment trusts



Note: 1. Risk measurement ratios are defined as the amount of investment trusts whose risk is measured divided by the total amount of investment trust holdings.
 2. The data in the charts cover regional financial institutions that hold the indicated type of products. The data in the right-hand chart cover only regional financial institutions whose risk measurement ratio is lower than 50 percent.
 3. Risk measurement ratio is as at end-December 2018.
 4. Setting risk limits on securities is regarded as setting limits on securities holdings. The results are based on the survey conducted in fiscal 2018 on the risk management of securities.

Source: BOJ.

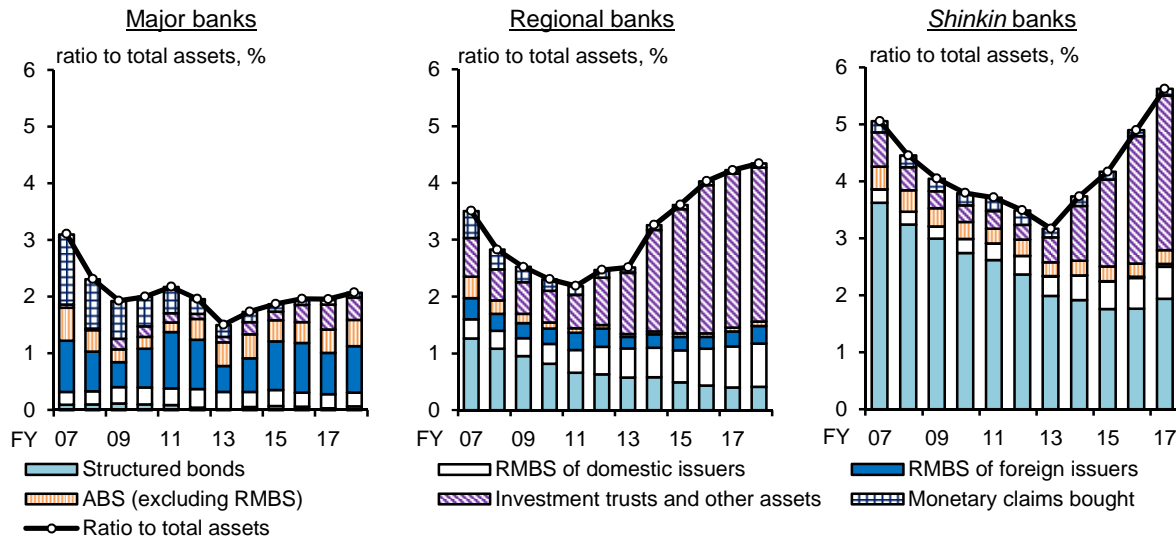
Chart IV-2-9: Limits on investment trust holdings and investment performance



Note: 1. Investment performance is evaluated by the ratio of overall gains/losses (including income gains) on bond investment trusts to gross operating profits (excluding realized gains/losses on bondholdings). The data cover regional financial institutions.
 2. Setting risk limits on securities is regarded as setting limits on securities holdings. The results are based on the survey conducted in fiscal 2018 on the risk management of securities.
 3. The reference period to calculate overall gains/losses on bond investment trusts is from fiscal 2017 to the first half of fiscal 2018 for regional banks and fiscal 2017 for *shinkin* banks.

Source: BOJ.

Chart IV-2-10: Investment trusts and alternative investments



Note: 1. "Investment trusts and other assets" is calculated by subtracting "ABS (excluding RMBS)" from other securities (excluding foreign securities) in the product category of securities.
 2. "RMBS of domestic issuers," "RMBS of foreign issuers," and "ABS (excluding RMBS)" partially include both securities and trust beneficiary rights of monetary claims bought.
 3. The latest data in the left-hand and middle charts are as at end-September 2018 and those in the right-hand chart are as at end-March 2018.

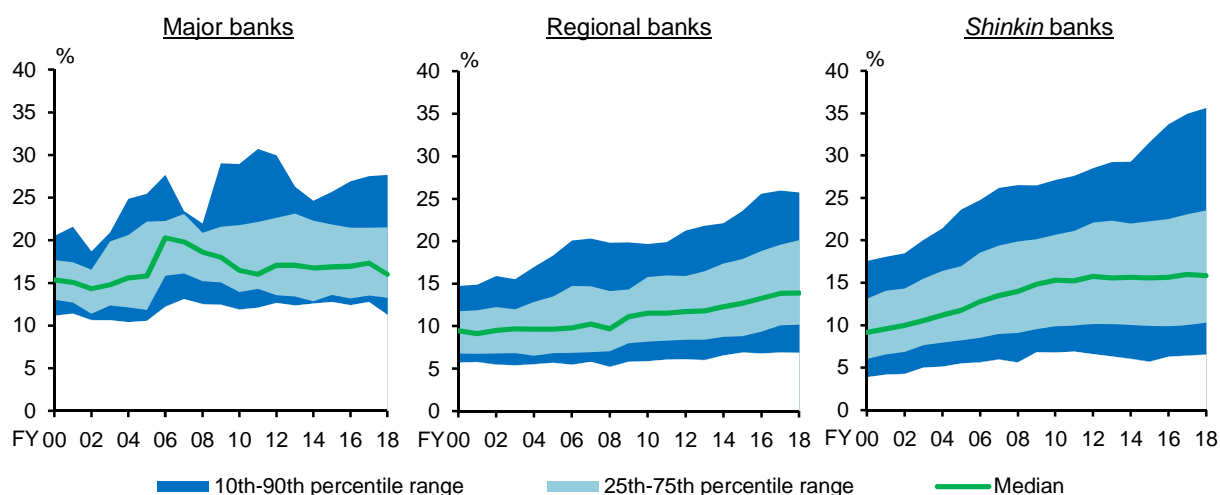
Source: BOJ.

C. Real estate related risk

This section outlines the real estate related risk, which could affect both credit risk and market risk.

The amount of real estate related loans extended by banks, as seen in Chapter III, has continued to increase beyond its peak during the bubble period, despite there having been no substantial nationwide increase in land prices. In addition, a heat map shows that the *real estate loans to GDP ratio* has increased above the trend and turned "red," signaling overheating (Charts III-4-1 and III-4-2). For regional financial institutions, the share of real estate loans among the total amount of loans has continued to rise. Furthermore, heterogeneity in this share has increased as it has exceeded 30 percent at some regional financial institutions (Chart IV-3-1). At the same time, a higher real estate loan share of a financial institution is associated with a lower capital adequacy ratio (Chart IV-3-3). It should also be noted that both real estate loans and investments in real estate investment funds such as J-REITs and privately placed REITs have increased substantially in recent years, especially among regional financial institutions (Chart IV-3-2). In view of the issue of concentration risk, that is, risk concentrated in a particular sector, attention should be paid to the increase in both financial institutions' real estate investment exposure and their large share of real estate loans among total loans. This section therefore outlines differences in real estate loans between the current situation and the bubble period, and points out the challenges of managing the related risks.

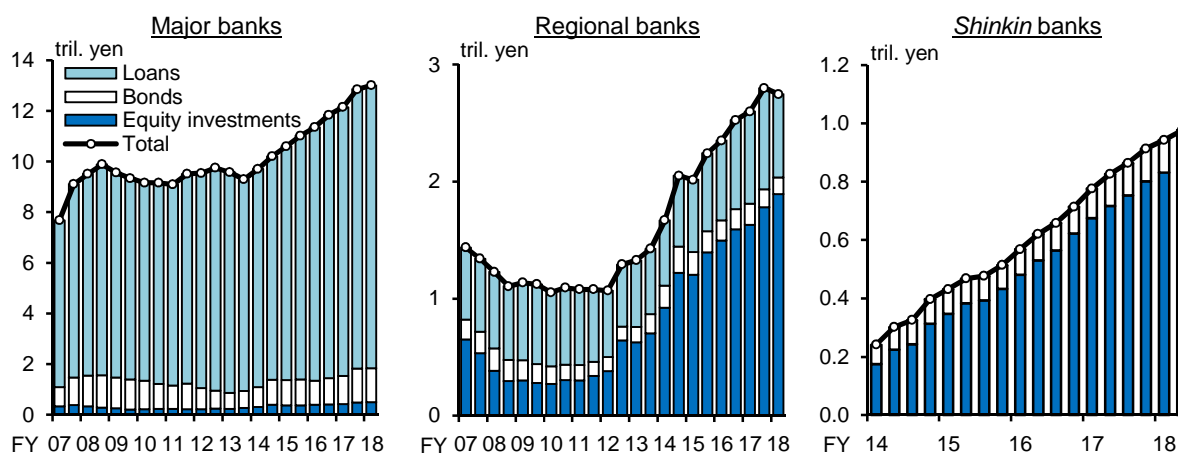
Chart IV-3-1: Ratio of real estate loans to total loans



Note: Latest data as at end-September 2018.

Source: BOJ.

Chart IV-3-2: Outstanding amount of lending and investment in real estate investment funds

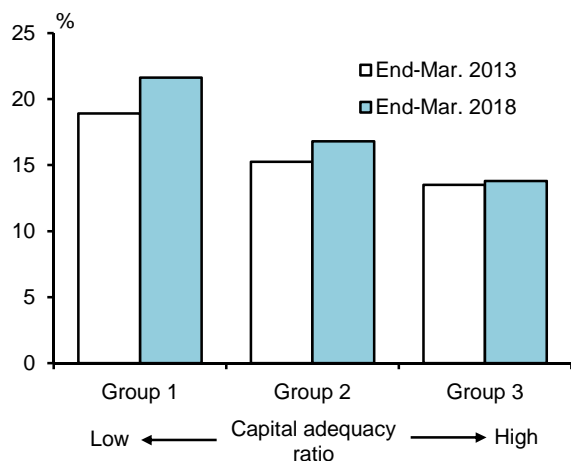


Note: 1. "Loans" indicates non-recourse loans.

2. The latest data are as at end-September 2018.

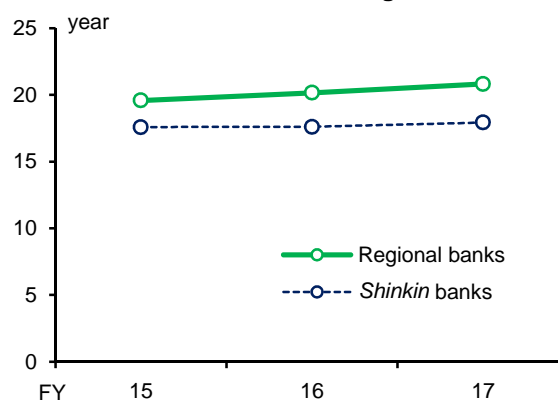
Source: BOJ.

Chart IV-3-3: Capital adequacy ratios and ratios of real estate loans to total loans



Note: 1. Covers regional financial institutions.
 2. Financial institutions are divided into three groups based on their average capital adequacy ratios from fiscal 2012 to 2017, and the average ratio of real estate loans to total loans is shown by group.
 Source: BOJ.

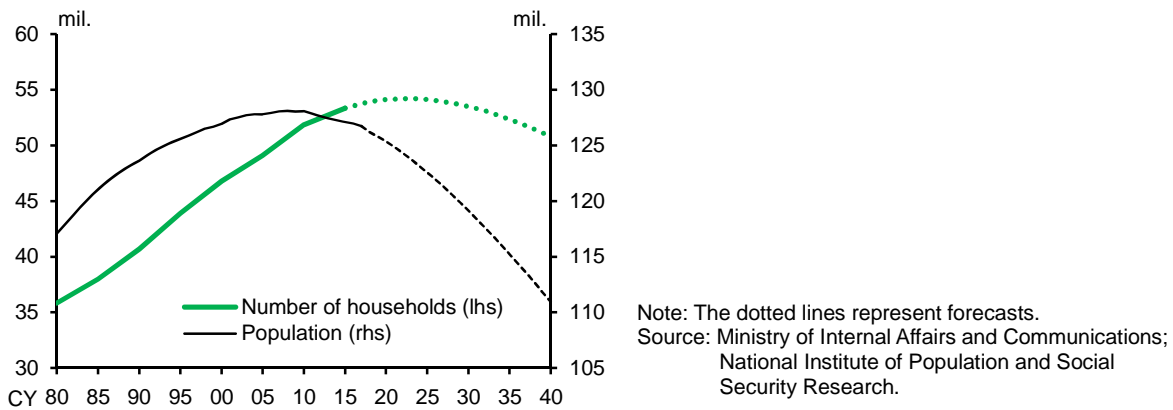
Chart IV-3-4: Average duration of new loans to rental housing businesses



Note: Simple average. Covers regional financial institutions for which data are available for all three periods.
 Source: BOJ.

The main difference in the real estate loans of recent years from those during the bubble period is that more of these loans are to rental housing businesses rather than for large-scale real estate transactions. Loans to rental housing businesses include those to REITs and real estate investment funds for acquiring office buildings, commercial properties, accommodations, logistics facilities, and large-scale condominium complexes, as well as those to individuals for obtaining rental houses. They are mainly long-term loans for which the borrowers intend to repay the principal and interest by using the cash flow of their rental income after deducting the necessary expenses. Currently, the duration of such loans newly extended by regional financial institutions is around 20 years on average (Chart IV-3-4). This long duration is the fundamental reason for the outstanding amount of real estate loans having grown at a relatively high rate despite a decline in the amount of new loans extended. In contrast, in the bubble period, most of the demand for real estate loans was for financing real estate transactions, which were aimed at obtaining resale profits accruing from land price increases amid overly optimistic growth expectations (Chart III-4-5). In recent years, (1) financial institutions have diversified their borrowers of real estate loans including individuals who run rental housing businesses; this contrasts with the bubble period, when the main borrowers were large firms in the related sectors, such as real estate, construction, and other non-bank enterprises. Another difference from the bubble period is that (2) even if real estate loans were to become non-performing, the timing of such events would be somewhat diverse, given the loans' long durations and the diversity of investment properties. These two recent features have contributed to increasing the stress resilience of financial institutions' real estate loan portfolios. However, (1) it is still the case that real estate loans are generally exposed to the common risks of a rise in vacancy rates and a fall in rental income in the medium to long term. Close attention should be paid to whether real estate investment has fallen into overinvestment relative to future rental demand, given the fact that the fundamentals differ from the bubble period, namely that the economy faces declines in the population, the number of firms, and growth expectations (Chart IV-3-5). Due attention should also be paid to the fact that (2) a decline in borrowers' real estate income could directly lead to a decrease in their debt servicing capacity, because many of the loans to REITs and real estate investment funds are nonrecourse loans and borrowers whose loss-absorbing capacity is not necessarily high, such as small firms and individuals, account for the lion's share of loans to rental housing businesses.

Chart IV-3-5: Population and number of households

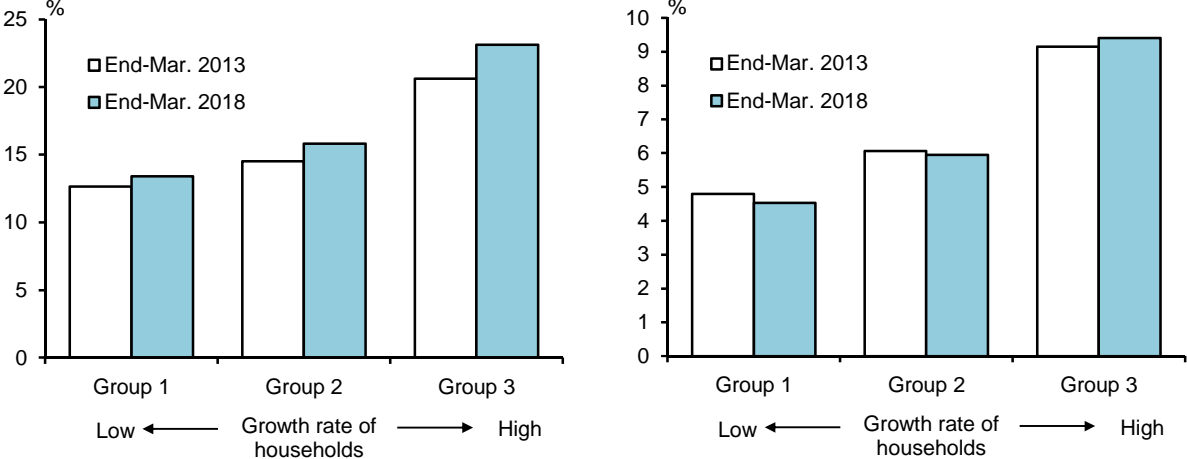


It is difficult to judge, based on the current situation, whether real estate investment has slipped into overinvestment relative to future rental demand. For example, developments in rental housing businesses more or less reflect the actual current demand. In fact, the recent increase in rental housing has mainly been driven by areas with a large growth in the number of households, which arises from both an increase in moves from suburban areas to urban areas and an increase in single-person households. From the lending side as well, in such areas where the growth rate of households is higher, financial institutions tend to have a higher ratio of loans to the real estate industry and rental housing businesses run by individuals among total loans (Chart IV-3-6). The increase in rental housing also partially reflects supply-side factors, in that landowners and wealthy individuals have expanded their real estate investment for purposes of both wealth management and tax saving amid the low interest rate environment. Thus, real estate purchases for investment purposes by individuals have increased not only in metropolitan areas but also in regions where growth expectations are low, and the number of firms is decreasing while the number of debt-free firms is rising. Meanwhile, such demand for funds in rental housing businesses has offered attractive loan opportunities for financial institutions to charge relatively high loan interest rates. In the past few years, financial institutions with a higher ROA based on pre-provision net revenue (PPNR) excluding trading income have increased their share of real estate loans among total loans (Chart IV-3-7). The low default rate and the low ratio of non-performing loans in the real estate industry in recent years have also led to financial institutions being more active in lending to the industry (Charts B2-11 and IV-3-8). Under these circumstances, financial institutions' loan coverage has widened from (1) funds for landowners to construct housing for themselves to include (2) funds for land purchases and construction, as well as (3) funds to finance investment intended to acquire existing rental housing properties. At the same time, the amount of each real estate loan has become larger and there has been growing heterogeneity across borrowers' creditworthiness as measured by their annual income and asset holdings.

Based on the above analyses, due attention needs to be given to the possibility that risks with different features from those in the bubble period may have been accumulating in terms of loan types and durations, although Japan's real estate market as a whole is not overheating like in the bubble period (see Chapter III). How a realization of downside risks, such as an economic downturn, affects the financial system could differ from that in the bubble period. Meanwhile, some real estate market participants are expressing concern over the possibility that the real estate market has peaked (see Box 2). Financial institutions should manage the related risks while taking these points into account. As part of extending loans to REITs, real estate investment funds, and rental housing businesses, including those run by individuals, financial institutions need to conduct appropriate physical inspections and validity assessments of borrowers' cash flow plans. These

institutions also need to continue managing post-disbursement loans, by monitoring vacancy rates and rental income and making appropriate provisions for loan losses, throughout the loan period. The value of investment in real estate investment funds could be more severely affected than loans, because of the former being investment in equity, by a deterioration of real estate market conditions. The prices of REITs are affected not only by real estate market conditions but also by changes in risk appetite in the overall financial market. It should be kept in mind that the prices of privately placed funds and privately placed REITs could fall substantially in times of stress due to a decline in liquidity in the real estate market despite the fact that the volatilities of such prices are not large during normal times.

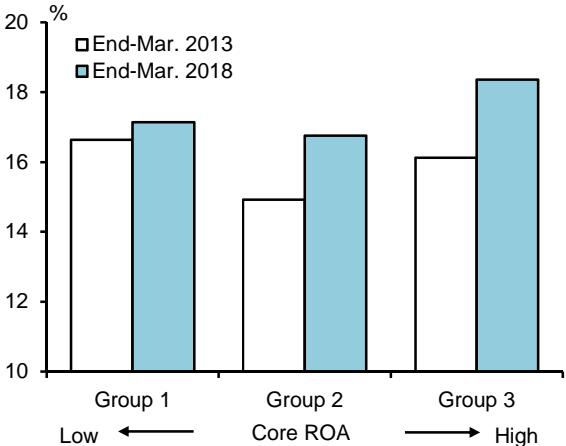
Chart IV-3-6: Growth rate of households and ratio of real estate loans to total loans
Loans to the real estate industry Loans to rental housing businesses run by individuals



Note: 1. Covers regional financial institutions.
 2. Financial institutions are divided into three groups based on the average growth rate of households in the location of their head offices from fiscal 2012 to 2017. The left-hand chart indicates the average ratio of real estate loans to total loans for each group. The right-hand chart indicates the average ratio of loans to rental housing businesses run by individuals to total loans by group.

Source: Ministry of Internal Affairs and Communications; BOJ.

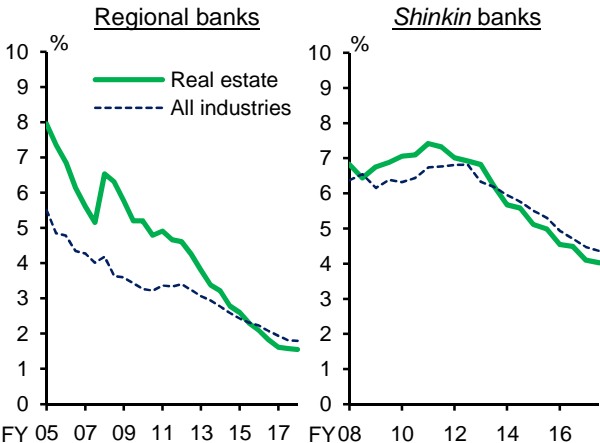
Chart IV-3-7: Core ROA and ratios of real estate loans to total loans



Note: 1. Covers regional financial institutions.
 2. Financial institutions are divided into three groups based on their average core ROA based on PPNR (excluding trading income) from fiscal 2012 to 2017, and the average ratio of real estate loans to total loans is calculated by group.

Source: BOJ.

Chart IV-3-8: Nonperforming loan ratios of the real estate industry



Note: 1. Median for each type of bank.
 2. Latest data as at end-September 2018.
 Source: BOJ.

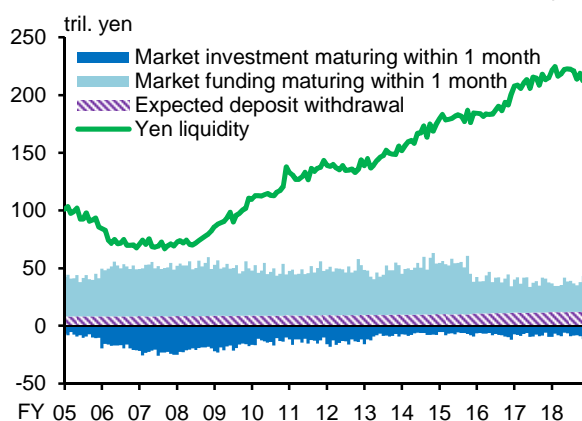
D. Funding liquidity risk

This section assesses the funding liquidity risk, first in yen and then in foreign currencies.

Yen funding liquidity risk

Financial institutions continue to have sufficient yen funding liquidity. This sufficient stability of the investment and funding structure in yen is mainly due to the following facts: (1) the majority of the funding is sourced from stable retail deposits; (2) the outstanding amount of deposits is far larger than the total outstanding loans; and (3) a large part of the excess of deposits over loans is invested in highly liquid securities such as JGBs or current account deposits at the Bank of Japan. Financial institutions can therefore be judged to have a sufficiently high degree of resilience to short-term stress, as they also hold liquid assets worth far more than the expected fund outflows even in a stress situation (Chart IV-4-1).³⁰

Chart IV-4-1: Resilience to yen liquidity stress among major banks



Note: 1. It is assumed that 3 percent of deposits are withdrawn.
2. "Yen liquidity" = cash + deposits + JGBs.
3. Latest data as at end-February 2019.

Source: BOJ.

Foreign currency funding liquidity risk

Financial institutions' share of foreign currency funding through financial markets has been large compared to their yen funding. However, financial institutions have steadily increased their proportion of stable funding, and they also have a sufficient liquidity buffer to cover possible funding shortages even if market funding becomes difficult for a certain period.

In the foreign currency-denominated balance sheets of major banks, loans with relatively long maturities constitute a large proportion of foreign currency investments, whereas client-related deposits are the largest share of foreign currency funding, namely, about a third, followed by interbank funding (Chart IV-4-2). A useful indicator for assessing the stability of this investment and funding structure is the "stability gap," which is the gap between the amount of illiquid loans and stable funding through client-related deposits, medium- to long-term FX and currency swaps, and corporate bonds including TLAC bonds. The stability gap of major banks is on a downward trend from a somewhat longer-term perspective, but has recently been flat, mainly due to the slowdown in major banks' U.S. dollar-denominated deposit taking, as the U.S. dollar accounts for the largest share of their foreign currency funding (Charts IV-4-3 and IV-4-4). This recent flatness

³⁰ Based on the concept of the liquidity coverage ratio (LCR), an outflow of market funds with a maturity of 1 month or less and an outflow amounting to 3 percent of total deposits are assumed.

is related to the high dependence of Japanese banks on large-lot deposits, making them susceptible to a rise in yields on T-bills and MMFs and a resulting shift of funds away from deposits to such alternative assets. In fact, the pass-through rate of market rates to deposit rates and the interest rate sensitivity of deposit balances have tended to be greater at Japanese banks than at their U.S. counterparts (see Box 4). This tendency of Japanese banks is more or less common to non-U.S. banks whose U.S. dollar retail deposit bases are not as solid as their U.S. counterparts. However, Japanese banks in recent years have substantially increased foreign currency funding needs, reflecting the expansion of their overseas business. Therefore, Japanese financial institutions should strive to enhance their foreign currency funding bases both quantitatively and qualitatively through diversifying their funding sources and improving retention.

Chart IV-4-2: Foreign currency-denominated balance sheets by type of bank

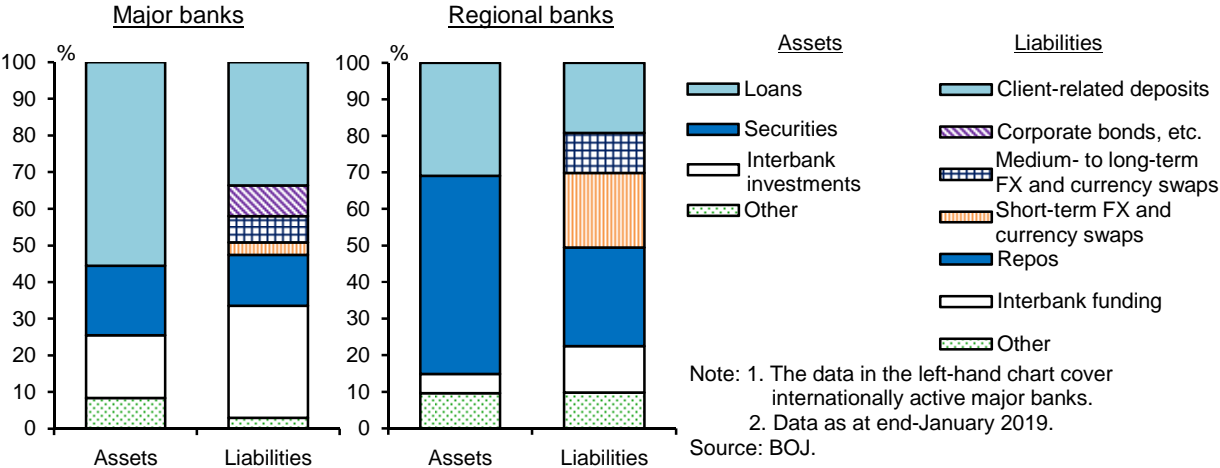
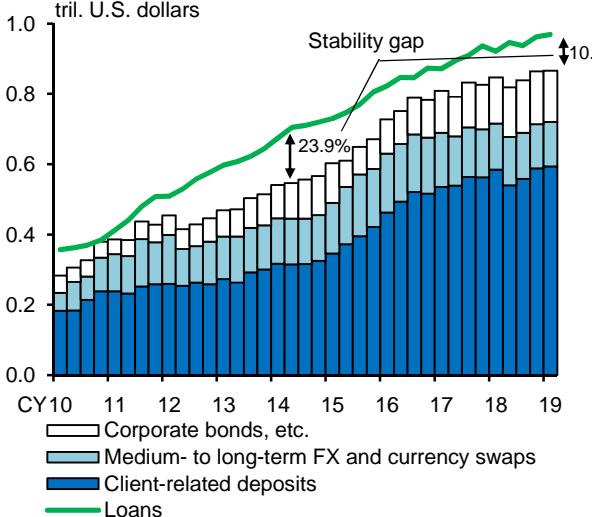
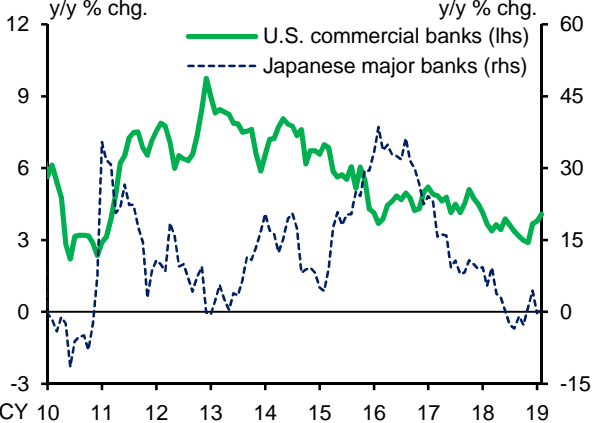


Chart IV-4-3: Stability gap among major banks



Note: 1. Until end-March 2012, "Corporate bonds, etc." and "Medium- to long-term FX and currency swaps" indicate funding maturing in over 3 months and thereafter, funding maturing in over 1 year.
2. The figures in the chart indicate the ratios of the gaps to the loans (as at end-April 2014 and end-February 2019).
3. Covers internationally active banks.
Latest data as at end-February 2019.
Source: BOJ.

Chart IV-4-4: Deposits at U.S. commercial banks and foreign currency deposits at Japanese banks

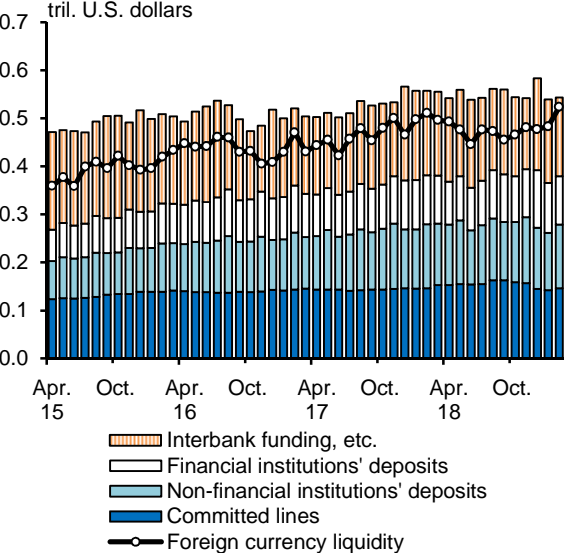


Note: 1. "U.S. commercial banks" includes U.S. branches of non-U.S. banks. "Japanese major banks" covers internationally active major banks.
2. Latest data as at end-February 2019.
Source: FRB; BOJ.

As to resilience to short-term stress, major banks generally hold sufficient liquid assets to cover

the expected outflow of funds under a stress situation. It should be noted, however, that such fund outflow includes factors that are incidental for financial institutions, such as withdrawals from unused committed lines and/or outflows from client-related deposits (Chart IV-4-5).³¹ Major banks have taken measures to reflect the analytical results of efforts to characterize committed lines and deposits in their risk management, but they additionally need to make efforts to manage the risk of outflows more carefully and improve their stress testing, taking into account the characteristics of transaction partners and products.

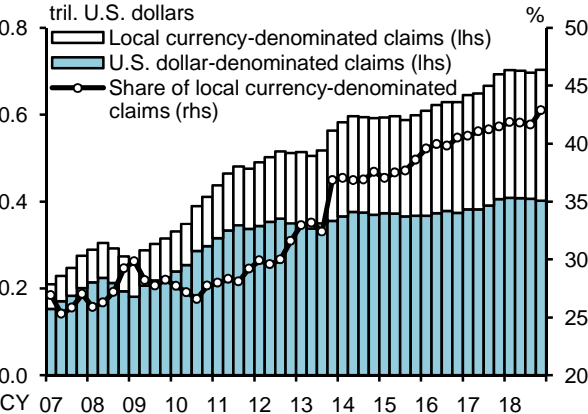
Chart IV-4-5: Resilience to foreign currency liquidity stress among major banks



Note: 1. "Foreign currency liquidity" = interbank investments + 50 percent of loans + FX and currency swaps + unencumbered securities. Data excluding unencumbered securities indicate assets maturing within 1 month or with no specific maturity. "Financial institutions' deposits" up to end-February 2017 are estimated based on the proportion of financial institutions' deposits to non-financial institutions' deposits from end-March 2017.
 2. The bar graph shows the breakdown of cash outflows.
 3. Covers internationally active banks.
 Latest data as at end-February 2019.

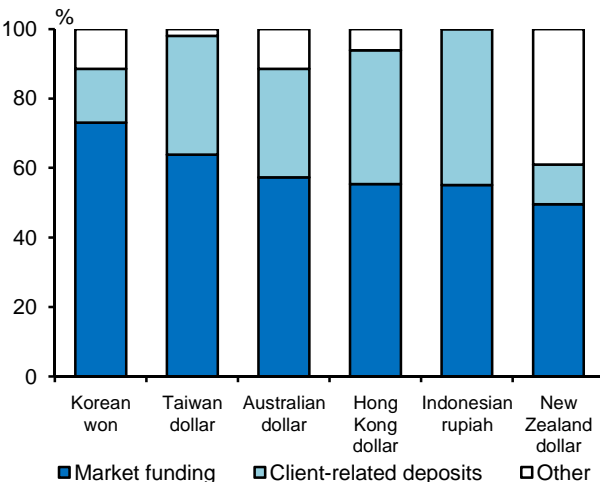
Source: BOJ.

Chart IV-4-6: Japanese banks' claims in Asia by currency



Note: 1. Claims include loans, bonds, equity, etc.
 2. "U.S. dollar-denominated claims" includes local currency-denominated cross-border claims and claims denominated in foreign currencies other than U.S. dollars.
 3. Latest data as at end-December 2018.
 Source: BIS, "Consolidated banking statistics."

Chart IV-4-7: Major banks' funding structure by currency



Note: Covers five major banks' main funding sources. The top six currencies by market funding ratio are selected according to the latest data.
 Data as at end-December 2018.
 Source: BOJ.

³¹ In Chart IV-4-5, the following assumptions are made with regard to assets and liabilities with remaining maturities of up to 1 month (including those with no specific maturity): (1) the total amount of deposits by financial institutions and interbank funding (excluding central bank funding) is withdrawn; (2) 40 percent of deposits by non-financial institutions and central bank funding in interbank funding are withdrawn; (3) 30 percent of unused committed lines are withdrawn; and (4) 50 percent of loans are regarded as foreign currency liquidity on the premise that they will be repaid within a short time period. Repo funding is included neither in fund outflows nor in foreign liquid assets.

Regarding the foreign currency-denominated balance sheets of regional banks, the following can be observed. On the funding side, the reliance of regional banks on short-term market funding such as repos, as well as FX and currency swaps, is higher than that of major banks. In contrast, on the investment side, loans, which are less liquid than securities, make up a smaller share than at major banks, whereas securities, such as U.S. Treasuries, make up a larger share (Chart IV-4-2). Therefore, regional banks generally hold sufficient liquid assets to cover the expected outflow of funds in the event of stress.

The proportion of loans denominated in local currencies other than the U.S. dollar among total overseas loans by Japanese banks, particularly major banks, has continued to trend up, especially in loans to Asia (Chart IV-4-6). In Asian countries, banks' dependence on market funding such as FX and currency swaps and interbank funding has remained high for several currencies (Chart IV-4-7). Because liquidity in local currency funding markets is relatively low, financial institutions need to continue to make efforts to bolster stable funding bases through, for example, attracting local currency deposits, as well as arranging committed lines with local banks and utilizing medium- and long-term funding means (swaps, capital, etc.).

E. Financial institutions' capital adequacy

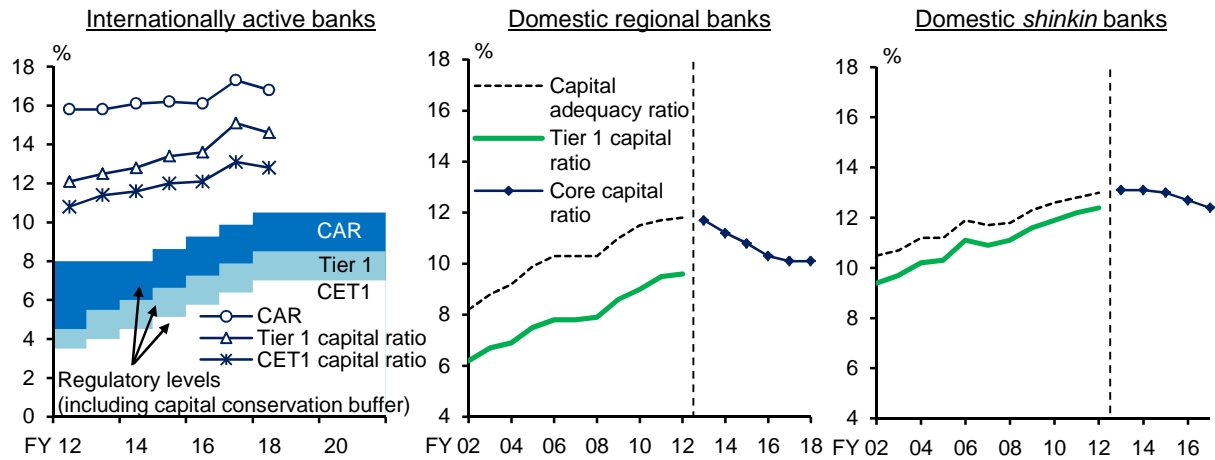
The capital adequacy ratios of financial institutions have been sufficiently above the regulatory requirements. For internationally active banks, total capital adequacy ratios, Tier 1 capital ratios, and common equity Tier 1 capital ratios (CET1 capital ratios) have all significantly exceeded the regulatory requirements (Chart IV-5-1).³² The core capital ratios of domestic banks have also substantially exceeded the regulatory requirement of 4 percent. However, the core capital ratios of domestic banks have gradually declined in recent years, reflecting the fact that the amount of hybrid debt capital instruments (subordinated bonds and loans) has continued to decrease, albeit most recently at a slower pace than before, due to the redemption of such instruments and the reduction in the upper limit of capital inclusion in transitional arrangements related to the Basel III framework. In addition to this temporary institutional factor, the decline in these ratios is also due to the sustained factor such that the positive contribution of earned surplus reserves has become somewhat smaller than the negative contribution of risk-weighted assets (Chart IV-5-2). This sustained factor reflects that financial institutions have been struggling to make profits commensurate with the expansion in risk-weighted assets partly due to the increase in loans to low-return borrowers.

Furthermore, the decline in the capital adequacy ratios of regional financial institutions has been also caused by their distribution of the profits, i.e., by the resulting drain of the profits through dividend payouts and share buybacks (Chart IV-5-3). In recent years, reflecting the growing awareness of the importance of shareholder returns, some financial institutions -- in particular listed regional banks -- have raised their dividend payout ratio to prioritize stable dividend payouts despite a decline in their profitability (Chart IV-5-4). In general, if a firm cannot use its equity capital efficiently to earn adequate profits, returning capital to shareholders can be justified; returning

³² As for internationally active banks, under the Basel III requirements, (1) the capital conservation buffer (2.5 percent), (2) the countercyclical capital buffer (currently 0 percent in Japan and the Basel III upper limit is 2.5 percent), and (3) the surcharge on global systemically important banks (G-SIBs) and domestic systemically important banks (D-SIBs) (that of Japan is set in accordance with the Basel III agreement: currently 1-2.5 percent for G-SIBs depending on their size and other characteristics and levels for D-SIBs determined by national authorities) started to be implemented at the end of March 2016 and became fully effective at the end of March 2019. Under the current transitional arrangements, domestic banks can regard all or a portion of certain instruments (such as non-convertible preferred stocks and subordinated bonds) as part of new core capital, and they are allowed to include certain assets in core capital. These arrangements will be phased out gradually.

capital to shareholders is not itself necessarily a problem from the perspective of capital efficiency.

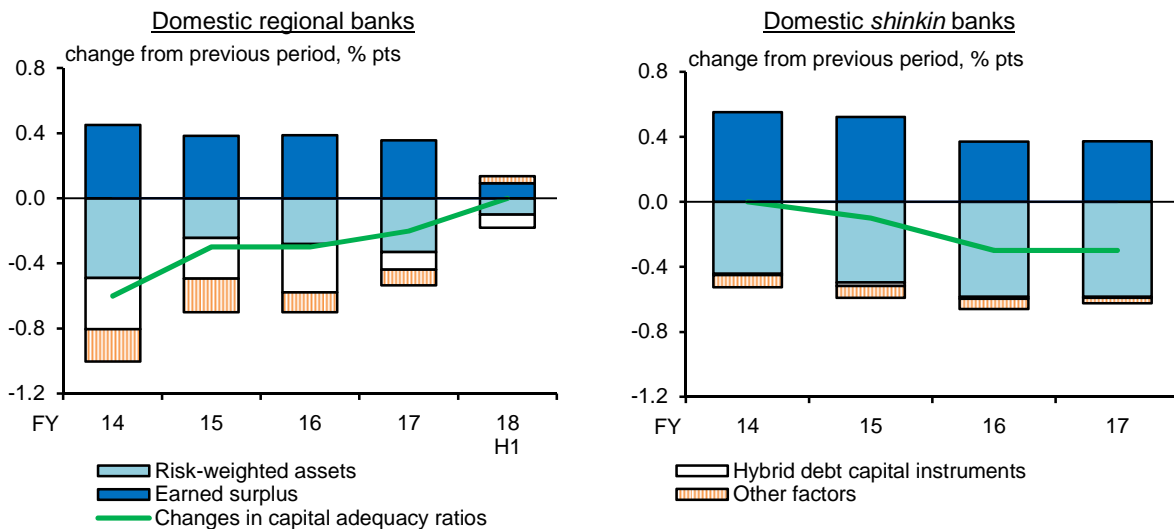
Chart IV-5-1: Financial institutions' capital adequacy ratios



Note: "CAR" indicates total capital adequacy ratio. Classifications of internationally active banks and domestic banks are as at each time point for Basel III's regulatory ratios, and are as at end-fiscal 2013 for regulatory ratios before Basel III. The data in the left-hand and middle charts are calculated on a consolidated basis. The latest data in the left-hand and middle charts are as at end-September 2018 and the latest data in the right-hand chart are as at end-March 2018. The transitional arrangements are taken into consideration.

Source: BOJ.

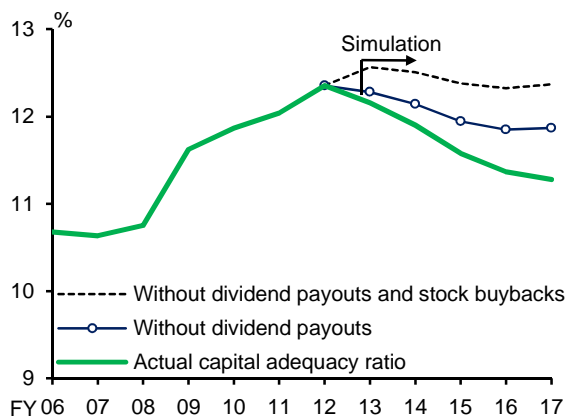
Chart IV-5-2: Factors of changes in capital adequacy ratios



Note: The transitional arrangements are taken into consideration.

Source: BOJ.

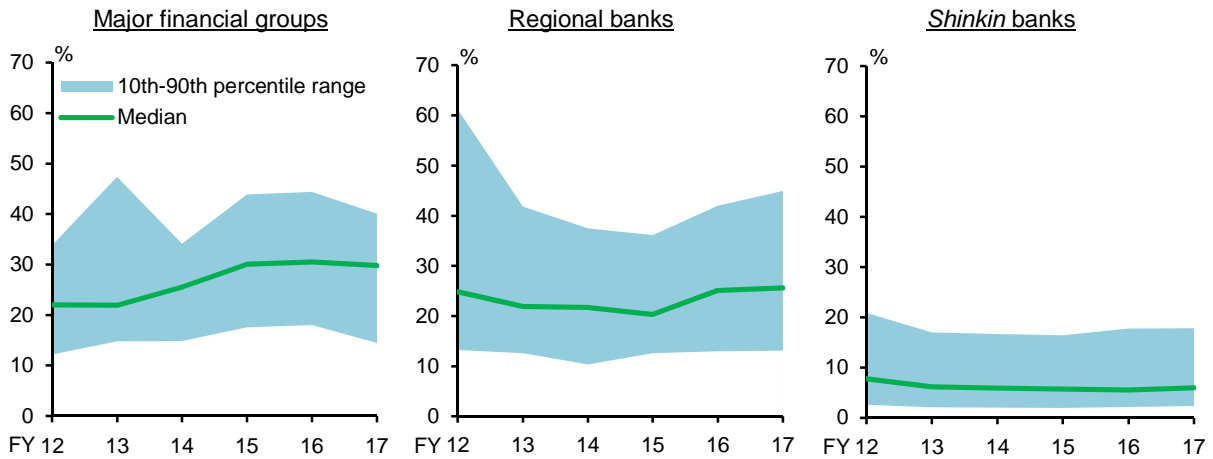
Chart IV-5-3: Dividend payouts, stock buybacks, and capital adequacy ratio



Note: 1. Covers holding companies of regional banks and regional banks that do not belong to a holding company.
2. The capital adequacy ratio indicates the total capital adequacy ratio for internationally active banks from 2012 onward, the core capital ratio for domestic banks from fiscal 2013 onward, and the capital adequacy ratio based on the Basel II requirements for internationally active banks and domestic banks before fiscal 2012 and 2013, respectively. The transitional arrangements are taken into consideration.

Source: Bloomberg; Nikkei Inc., "NEEDS-Financial QUEST"; BOJ.

Chart IV-5-4: Dividend payout ratios by type of bank



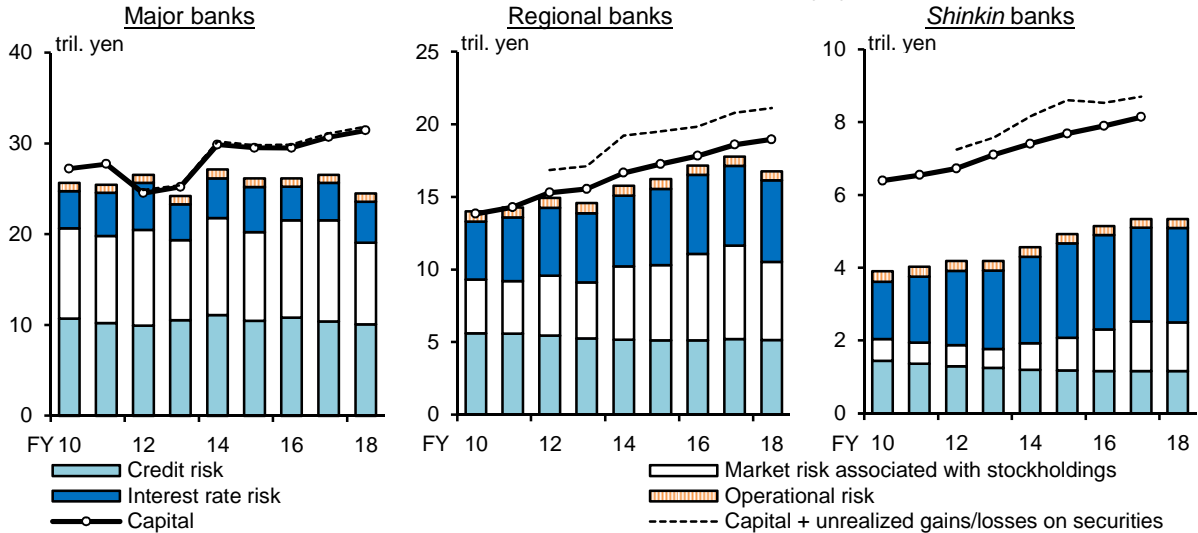
Note: 1. "Major financial groups" covers Mizuho Financial Group, Mitsubishi UFJ Financial Group, Sumitomo Mitsui Financial Group, Resona Holdings, Sumitomo Mitsui Trust Holdings, Shinsei Bank, and Aozora Bank.

2. Dividends of *shinkin* banks cover dividends on common shares.

Source: BOJ.

However, it should be noted that financial institutions perform financial intermediation functions by using deposits, which are regarded as safe assets, as a main funding source and support a wide range of economic activities, including providing fund settlement services. Therefore, in formulating their capital policies, financial institutions need to be attentive to the adequacy of their capital levels, together with their capital efficiency.

Chart IV-5-5: Risks borne and amount of capital by type of bank

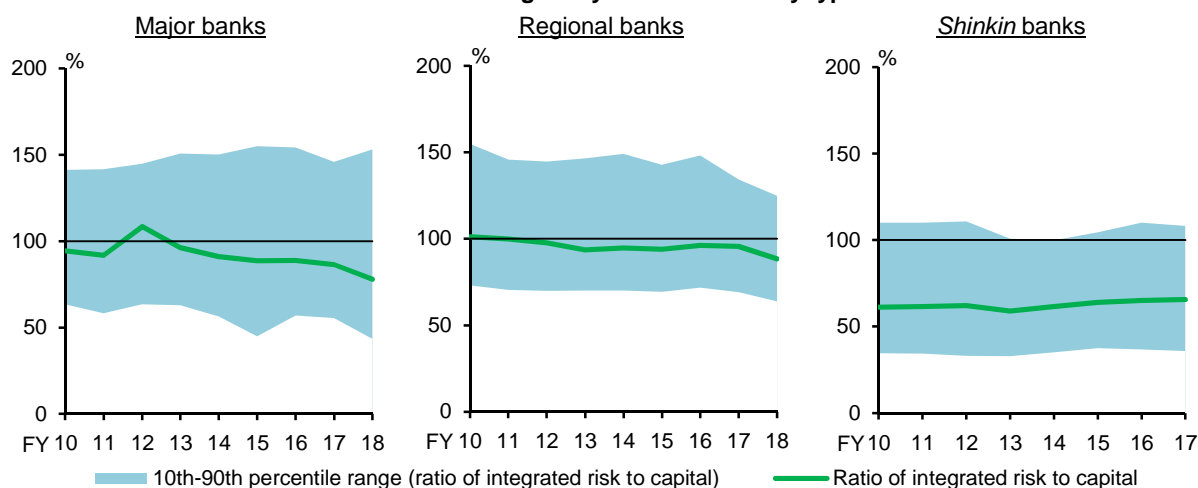


Note: 1. "Credit risk" includes risks of foreign currency-denominated assets. "Market risk associated with stockholdings" includes risks of stock investment trusts. "Market risk associated with stockholdings" and "Interest rate risk" (parts of off-balance-sheet transactions are included) in the left-hand chart include foreign currency-denominated risk. "Capital + unrealized gains/losses on securities" is the sum of capital and unrealized gains/losses on securities (tax effects taken into account) for domestic banks.

2. As for the fiscal 2018 data, (1) credit risk, foreign currency interest rate risk (excluding the risk associated with foreign currency-denominated bondholdings), operational risk, capital and unrealized gains/losses on securities in the left-hand and middle charts are as at end-September 2018 and those in the right-hand chart are as at end-March 2018, and the following data are estimated: (2) market risk associated with stockholdings and interest rate risk associated with yen- and foreign currency-denominated bondholdings as at end-February 2019, and (3) yen interest rate risk (excluding the risk associated with yen-denominated bondholdings) as at end-December 2018.

Source: BOJ.

Chart IV-5-6: Heterogeneity in risks borne by type of bank



Note: "Integrated risk" is the sum of the four risks shown in Chart IV-5-5.
Source: BOJ.

In terms of the overall financial system, the capital levels of financial institutions are adequate relative to the various types of risk they undertake, and financial institutions have sufficient loss absorbing capacity (Chart IV-5-5).³³ However, there is significant heterogeneity among financial institutions and some institutions have capital levels below their held amounts of integrated risk (Chart IV-5-6).

³³ The same method and parameters (such as confidence level and holding period) are used for all financial institutions in calculating the amount of risk they bear. Thus, the amount of risk presented here does not necessarily match the amount of risk calculated internally by financial institutions themselves as part of their risk management process. For the calculation method used for each type of risk, see Footnotes 18, 26, 28, and 29. The amount of operational risk is assumed to correspond to 15 percent of gross operating profits. Moreover, the integrated risk amount is calculated simply by summing the different types of risk; that is, the correlation among the different types of risk is not taken into account.

V. Financial institutions' declining profitability and potential vulnerabilities

The previous chapter confirmed that financial institutions' capital levels as a whole are adequate relative to the various types of risk they undertake. However, even though their current capital is adequate, if their core profitability continued to remain sluggish for a prolonged period, they would not be able to build up internal reserves and thus the adequacy of their capital would not necessarily be guaranteed in the future. Keeping such a possibility in mind, this chapter first examines the current situation of financial institutions' profitability, which provides the basis for building up capital. Next, it highlights key features of the profit structure of Japan's regional financial institutions through a comparison with European financial institutions, which have faced a low interest rate environment similar to Japan's. Finally, the potential vulnerabilities of Japan's financial system are quantitatively examined by using stock market information, which reflects the market participants' collective view on future profits.

A. Japan's financial institutions' profitability

From a long-term perspective, financial institutions' net income has remained high (Chart V-1-1). However, pre-provision net revenue (PPNR) excluding trading income, which indicates their core profitability, has continued to follow a decreasing trend, especially for regional financial institutions, reflecting persistent downward trends in deposit-lending margins and domestic net interest income. The reason why the decrease in PPNR (excluding trading income) is moderate for major financial groups relative to regional financial institutions is that major financial groups' net interest income from overseas has increased along with the expansion of their overseas business. The downward trends in deposit-lending margins and domestic net interest income of financial institutions seem to be mostly caused by structural factors such as the secular decline in loan demand and the slackening of loan markets due to declines in the population, the number of firms, and firms' growth expectations, as well as the prolonged low interest rate environment.³⁴ On the other hand, their net income has been underpinned by the decrease in credit costs on the back of firms' strong performance and realized gains from the sale of securities, in particular stocks. However, some signs of changes in these underpinnings can be detected from a careful examination of current developments.

First, credit costs as a whole appear to have begun increasing, albeit they are still at low levels (Chart IV-1-4). For major financial groups, reversals of loan loss provisions for large borrowers have contributed to pushing up profits, but there remains little room for further falls in credit costs going forward, reflecting the downward trend in outstanding provisions. For regional banks in the first half of 2018, credit costs resulted in a net increase in loan loss provisions for the first time among first half-year figures since fiscal 2013. This is partly due to an increase in the downgrading of borrowers -- that is, the downward transition of borrower classification -- including bankruptcies. Regional financial institutions are projected to continue to suffer from downward pressure on their core profitability. Therefore, in the event of a further increase in the credit costs arising from, e.g., an economic downturn, an increasing number of regional financial institutions are more likely to suffer net income losses, because their PPNR (excluding trading income) would not be able to cover their increased credit costs (Chart V-1-2).

Second, some signs of changes can be detected in investment in securities, which has underpinned

³⁴ As seen in Section A of Chapter IV, Japan's investment-saving balances show that the corporate sector has consistently been a "net saver" since the latter half of the 1990s. Accordingly, the share of "debt-free firms" has increased. Reflecting this, financial institutions have seen a continued increase in the outstanding amount of deposits in excess of that of loans, i.e., "excess deposits," on their balance sheets since the latter half of the 1990s.

Chart V-1-1: Developments in and decomposition of net income
Major financial groups Regional banks

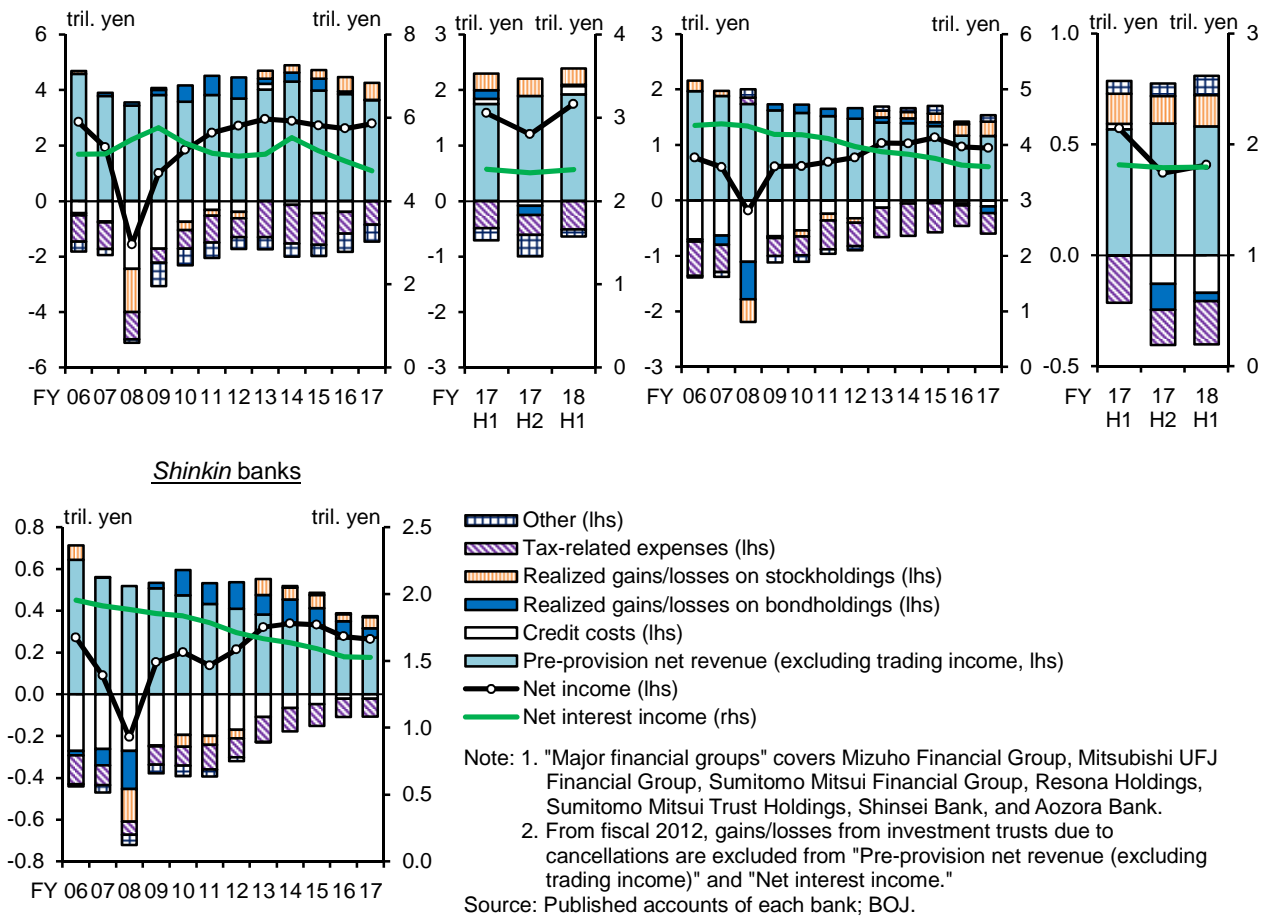
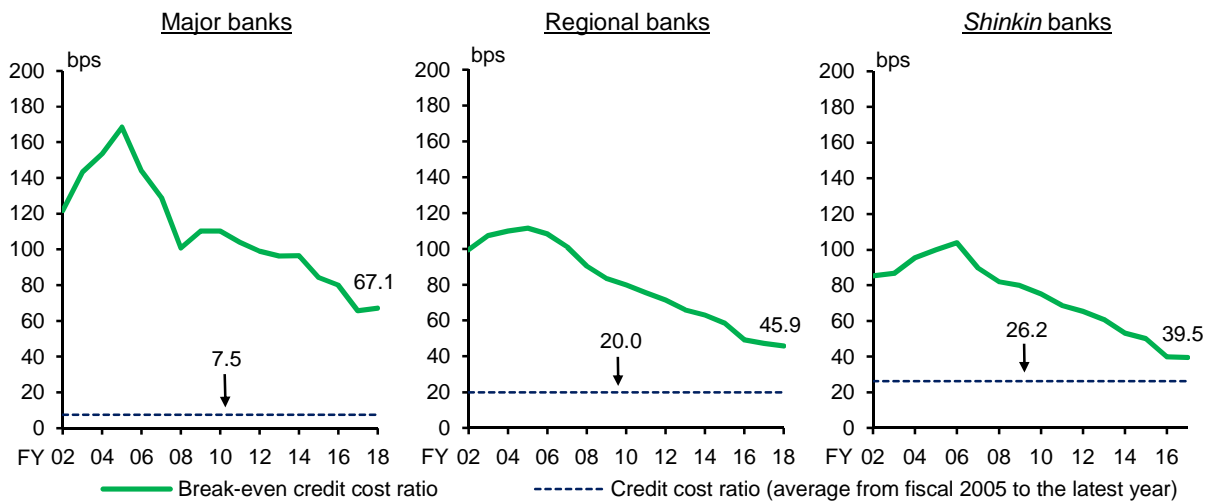


Chart V-1-2: Break-even credit cost ratios among financial institutions



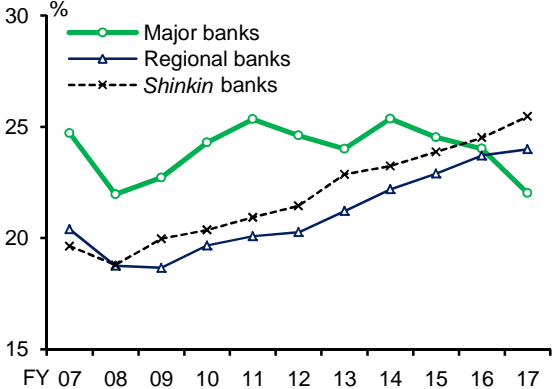
Note: 1. Break-even credit cost ratios are the ratios at which credit cost equals pre-provision net revenue (excluding trading income). The chart indicates the averages by bank type.
2. Pre-provision net revenue (excluding trading income) excludes gains/losses from investment trusts due to cancellations from fiscal 2012.
3. The latest data for "Major banks" and "Regional banks" are annualized values for the first half of fiscal 2018 and those for "Shinkin banks" are as at fiscal 2017.

Source: BOJ.

profits. Amid the low interest rate environment, financial institutions have actively taken risks in market investment. As a result, the shares of interest and dividend income on securities, as well as

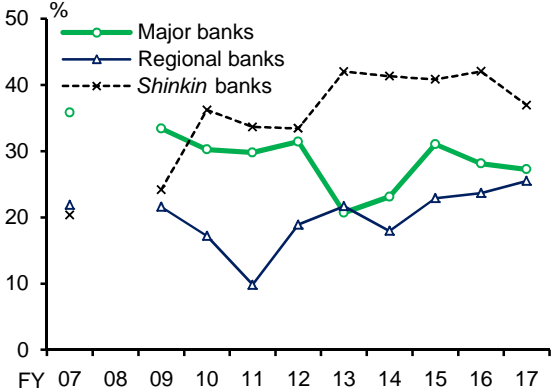
gains on sales of securities in overall profits, have increased in recent years (Charts V-1-3 and V-1-4). However, an increasing number of financial institutions have seen shrinking profit margins on investment and funding, and have recorded losses on past investments in foreign bonds and in foreign-rates-focused investment trusts, with the rising of U.S. interest rates (Chart V-1-5). In the case of yen-denominated bondholdings, large-scale redemptions of JGBs with higher coupon rates than those of recently issued JGBs are scheduled going forward. Consequently, financial institutions are projected to suffer from further downward pressure on investment yields, although this depends on the assets in which the proceeds are reinvested (Chart V-1-6). Furthermore, quite a few financial institutions, many of which are regional financial institutions, have maintained profit levels by realizing gains on securities. However, these institutions have less room recently for doing this, due to the repeated realization of gains and the increase in book values, and they have

Chart V-1-3: Ratios of interest and dividends on securities to interest income



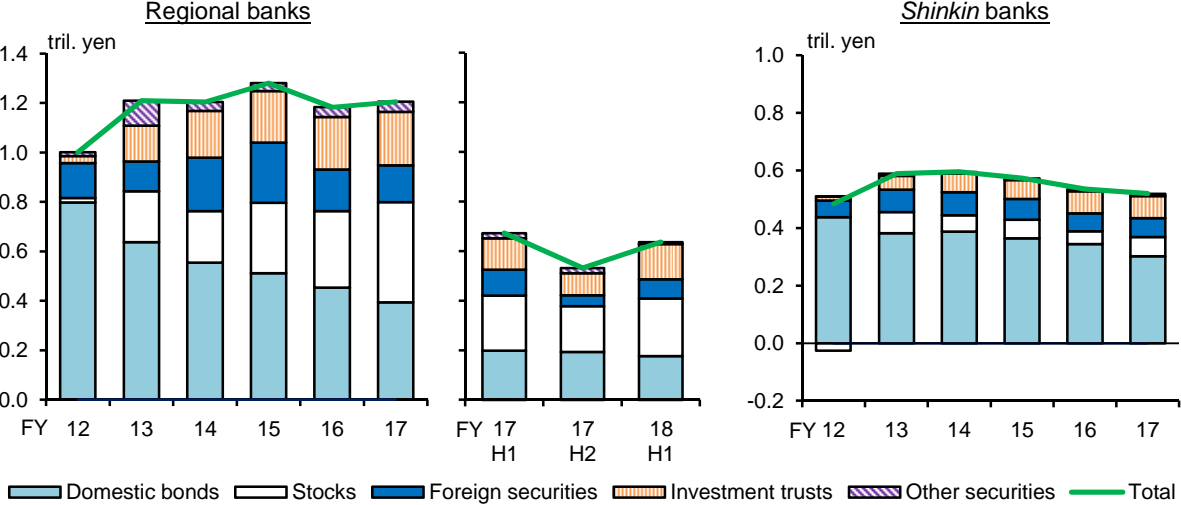
Note: 1. The data for "Major banks" in fiscal 2016 exclude banks' special factors (dividends from subsidiaries).
 2. From fiscal 2012, gains/losses from investment trusts due to cancellations are excluded from interest income, and interest and dividends on securities.
 Source: BOJ.

Chart V-1-4: Ratios of realized gains/losses on sales of securities to net income



Note: 1. "Realized gains/losses on sales of securities" indicates realized gains/losses on sales of bonds/stocks, which include gains/losses from investment trusts due to cancellations from fiscal 2012.
 2. Net income indicates that before taxes (data for fiscal 2008 are excluded due to net loss).
 Source: BOJ.

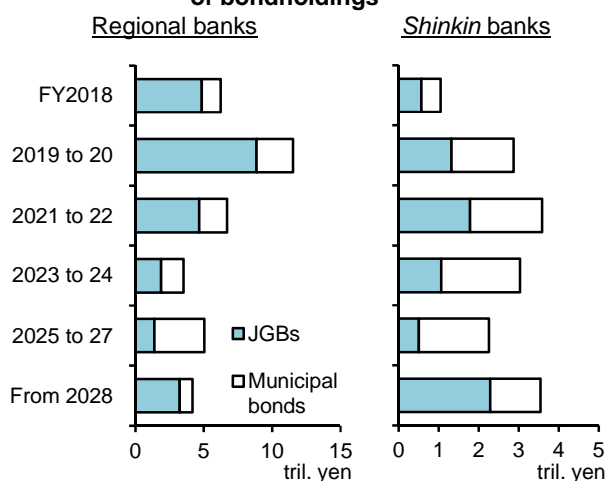
Chart V-1-5: Realized gains/losses by type of securities



Note: 1. "Realized gains/losses on securities" is the sum of interest and dividends, gains/losses on sales, gains/losses on redemption, and losses on devaluation.
 2. The latest data for "Regional banks" are as at the first half of fiscal 2018 and the latest data for "Shinkin banks" are as at fiscal 2017.
 Source: BOJ.

greater heterogeneity in such room (Chart V-1-7).³⁵

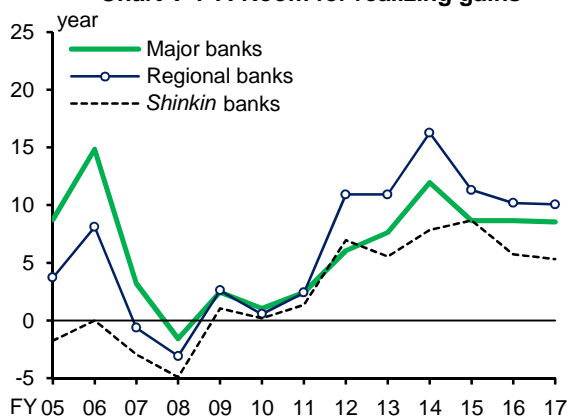
Chart V-1-6: Scheduled amount of redemption of bondholdings



Note: Scheduled amount of redemption is calculated based on outstanding amount of bondholdings at the end of fiscal 2017.

Source: Published accounts of each bank.

Chart V-1-7: Room for realizing gains



Note: 1. "Room for realizing gains" = unrealized gains/losses on available-for-sale securities holdings / realized gains/losses on sales of securities (3-year backward moving average).

2. Realized gains/losses on sales of securities include gains/losses from investment trusts due to cancellations after fiscal 2012.

3. Median by bank type. Latest data as at fiscal 2017.

Source: BOJ.

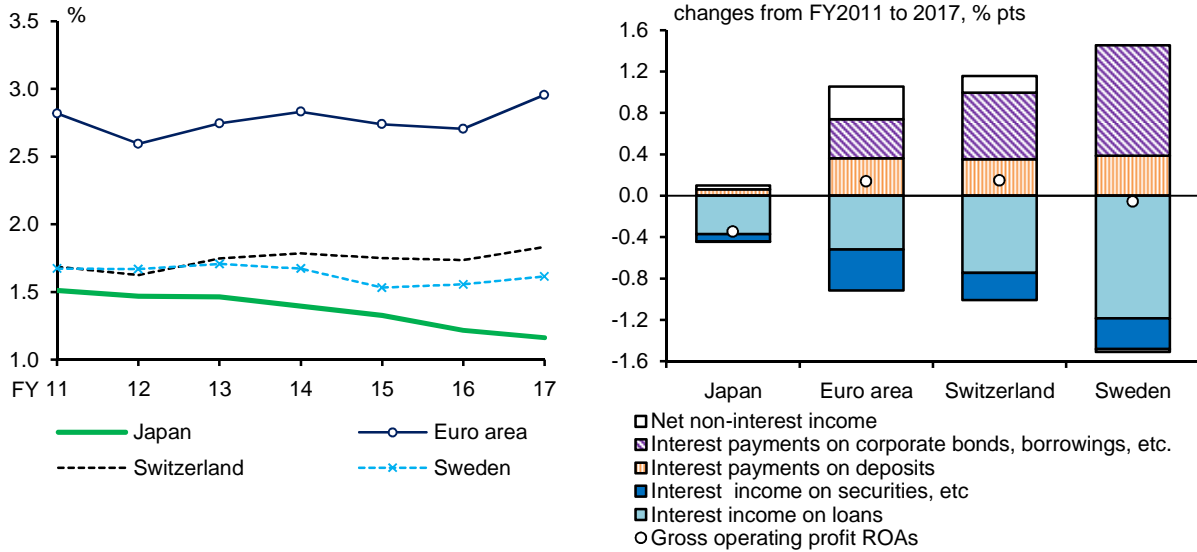
B. Banks' profit structure under low interest rate policies: International comparison

Next, we analyze and assess the impact of the prolonged low interest rate environment on the profit and financial structure of Japanese financial institutions by comparing them with financial institutions in European countries that have introduced a negative interest rate policy like Japan. Specifically, the comparison focuses on regional financial institutions in Japan and financial institutions excluding G-SIBs in four eurozone countries (Germany, France, Italy, and Spain), as well as Switzerland and Sweden. Japanese financial institutions have recently exhibited three features in comparison to their European counterparts.

The first feature is a marked decline in Japanese regional financial institutions' profitability. On a gross operating profit basis, the profitability of European financial institutions has generally been flat in recent years, whereas that of Japanese financial institutions has exhibited a clear decreasing trend (Chart V-2-1). The most important reason for this difference in profitability is developments in funding costs; in other words, there exists a difference in the degree of the decline in funding rates. More specifically, European financial institutions' investment yields have declined by approximately the same degree as their funding rates. In contrast, the funding rates in Japan have been stuck around zero, whereas the investment yields have declined further, partly reflecting the effect of monetary easing (Charts V-2-2, V-2-3, and V-2-4). There are two reasons for such stickiness in Japan's funding rates. First, relative to European countries, deposit interest rates in Japan have been so low that there has been little room for a further decline, reflecting the historically long duration of the low and zero interest rate environment, which is due to the structural factors mentioned above. Second, the share of deposits among liabilities has been extremely high in Japan, so that Japanese financial institutions have benefited little from a decline in the costs of market financing such as funding through corporate bonds (Chart V-2-5).

³⁵ Chart V-1-7 includes strategic stockholdings. It is uncertain whether financial institutions could sell strategic stockholdings even if there is still room to realize gains, because such stockholdings have had a role in maintaining business relationships. For simplicity, however, it is assumed here that they can sell such stockholdings.

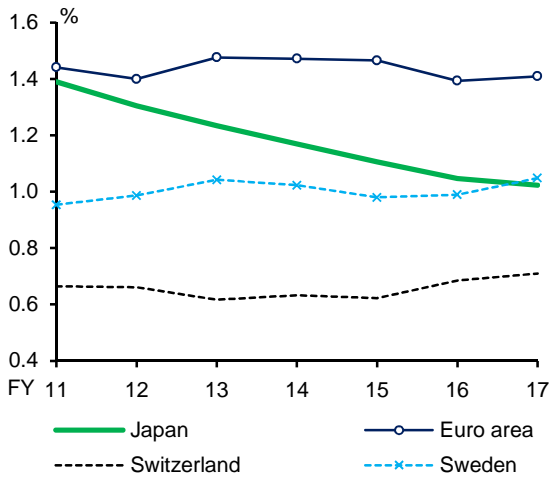
Chart V-2-1: Gross operating profit ROAs of banks in countries with negative policy rates and factors in their changes



Note: 1. Gross operating profits of Japanese banks include realized gains/losses on stockholdings to make them comparable with those of other banks.
 2. "Net non-interest income" = gross operating profits - net interest income.
 "Interest income on securities, etc." = interest income - interest income on loans.
 "Interest payments on corporate bonds, borrowings, etc." = interest expense - interest payments on deposits.
 3. Gains/losses from investment trusts due to cancellations are excluded from interest income and included in net non-interest income. The same definition applies to the charts from V-2-1 to V-2-8.

Source: S&P Global Market Intelligence; BOJ.

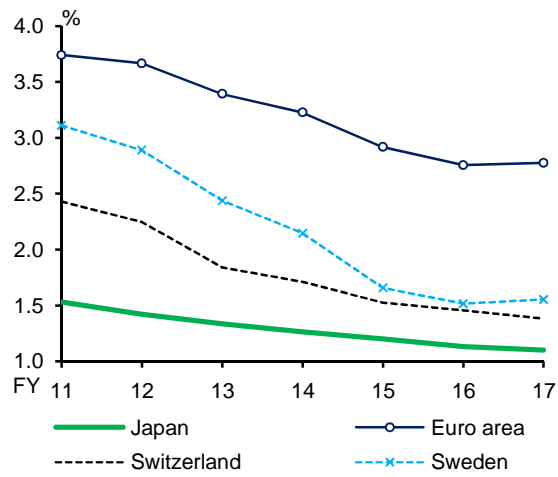
Chart V-2-2: Net interest margins



Note: Net interest margin = yield on financial assets - yield on financial liabilities.
 Yield on financial assets = interest income / financial assets.
 Yield on financial liabilities = interest expense / financial liabilities.

Source: S&P Global Market Intelligence; BOJ.

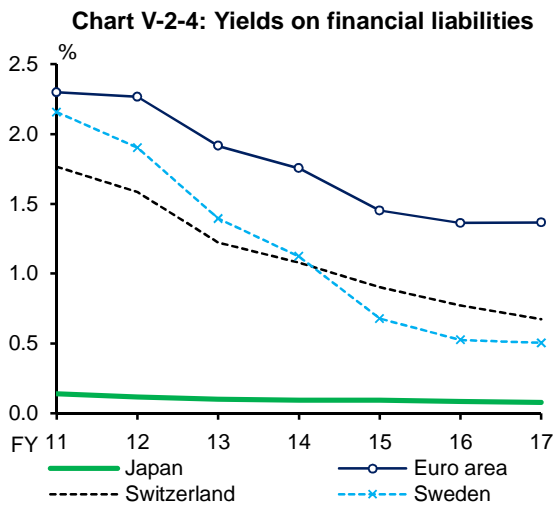
Chart V-2-3: Yields on financial assets



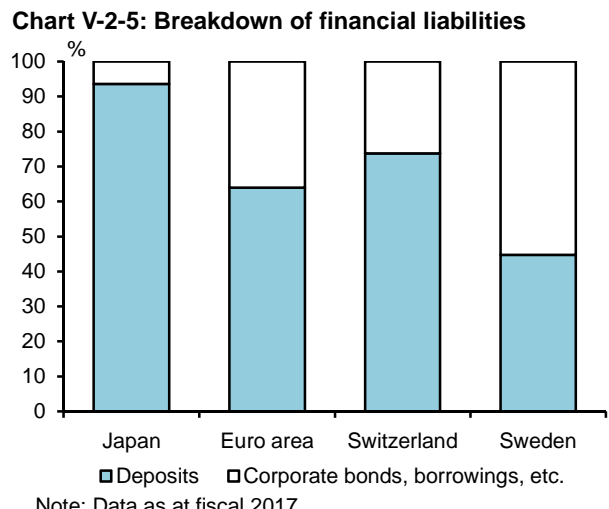
Source: S&P Global Market Intelligence; BOJ.

In addition, the sluggishness of net non-interest income in Japan has had a non-negligible contribution to the low profitability of Japanese financial institutions compared to their European counterparts. Banks in the euro area and Switzerland have varied business domains and models, and have diversified their income sources from fees and commissions. Thus, they have been able to steadily increase net non-interest income that is relatively unaffected by fluctuations in interest rates. In contrast, the net non-interest income of regional financial institutions in Japan has remained low, both as a share of their gross operating profits and in terms of their return on assets

(Chart V-2-6).³⁶

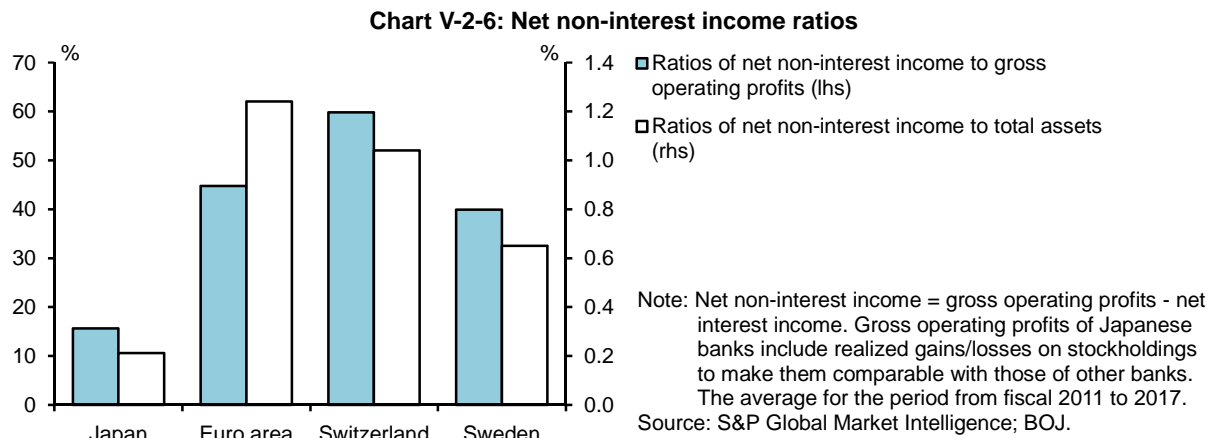


Source: S&P Global Market Intelligence; BOJ.



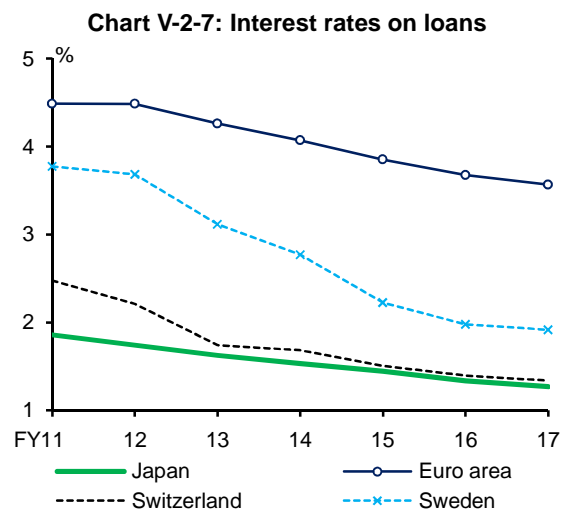
Note: Data as at fiscal 2017.

Source: S&P Global Market Intelligence; BOJ.



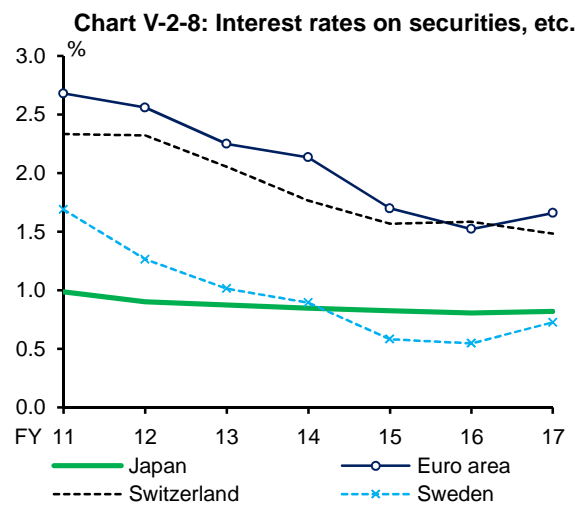
Note: Net non-interest income = gross operating profits - net interest income. Gross operating profits of Japanese banks include realized gains/losses on stockholdings to make them comparable with those of other banks. The average for the period from fiscal 2011 to 2017.

Source: S&P Global Market Intelligence; BOJ.



Note: Interest rate on loans = interest income on loans / total amount of loans.

Source: S&P Global Market Intelligence; BOJ.



Note: Interest rate on securities, etc. = (interest income - interest income on loans) / (financial assets - loans).

Source: S&P Global Market Intelligence; BOJ.

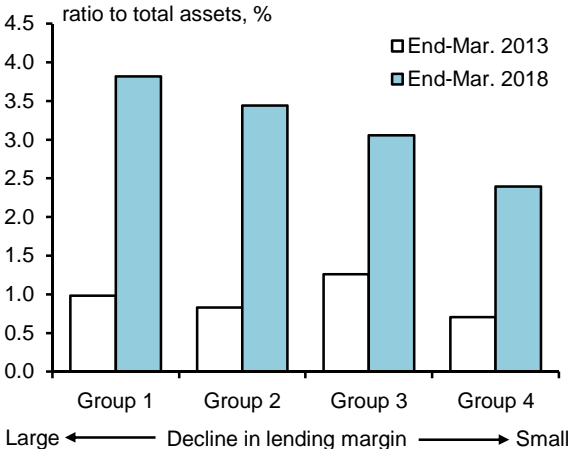
³⁶ For an international comparison of financial institutions' net non-interest income, see Chapter VI of the October 2017 issue of the *Report*. For regional financial institutions' recent efforts to raise fees and commissions, see Box 1 in the April 2018 issue, and for U.S. and European financial institutions' approach for securing retail-related fees and commissions, see Box 5 in the October 2018 issue.

The second feature is Japanese financial institutions' active risk taking in securities investment. Comparing yields by type of asset reveals the following facts. Loan interest rates have been falling more or less in both Europe and Japan. In contrast, whereas yields on securities have been falling in Europe (reflecting developments in government bond yields), they have remained essentially unchanged in Japan, despite falling interest rates (Charts V-2-7 and V-2-8).

Broadly speaking, there are two factors underlying these developments in yields on securities in Japan. The first is the increase in dividend income from stockholdings. Japanese financial institutions have a relatively large amount of strategic shareholdings and have enjoyed growing dividend income, benefiting from robust corporate earnings under the prolonged economic expansion. However, since dividend income is susceptible to economic fluctuations, this factor could conversely put downward pressure on financial institutions' profits, should economic conditions start to deteriorate.

The other factor is the changes in the composition of securities portfolios reflecting active risk taking by Japanese financial institutions. As seen in Chapter III, Japanese financial institutions in recent years have reduced their JGB holdings and have instead actively invested in risky assets, including foreign bonds and investment trusts, which entail various risk factors. Japanese financial institutions have actively taken risk in their securities investment, to a large extent, in order to maintain their profitability amid the unremitting downward trend in profits from deposit-taking and lending activities under the prolonged low interest rate environment. Thus, as the regional banks' lending margins have declined, a greater increase in their investment trust holdings has occurred (Chart V-2-9). Such active risk taking in investment trusts by Japanese financial institutions has helped to support their profits through the increase in interest and dividend income, in contrast to European countries. However, as pointed out in Chapter IV, this also means that the profits and financial soundness of Japanese financial institutions are more affected by domestic and foreign financial markets. Thus, it is a distinctive recent feature of Japan's financial system that financial institutions have been increasing their exposure to investment trusts and foreign bonds that entail various market risks; this clearly differs from the United States and Europe, where non-banks play a major role in the financial intermediation activities in securities markets (Charts V-2-9 and V-2-10). This feature of Japan's financial system basically reflects a greater role of indirect financing, especially by financial institutions in Japan, which in turn emerges from the stronger preference for deposits and risk-free assets in households' asset portfolio choice. In any case, the size of the market risk entailed in securities investment warrants careful attention.

Chart V-2-9: Lending margins and investment trust holdings



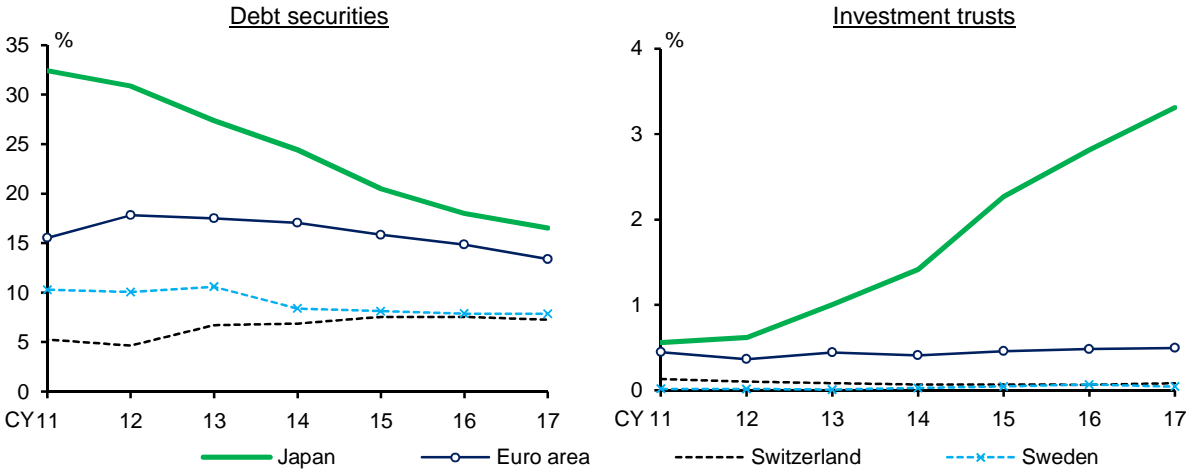
Note: 1. Covers regional banks.
 2. Regional banks are divided into four groups based on their sizes of decline in lending margins from fiscal 2012 to 2017, and the average ratio of investment trust holdings to total assets is calculated for each group.

Source: BOJ.

The third feature is a decline in Japanese regional financial institutions' capital adequacy ratios. As pointed out in Chapter IV, their capital adequacy ratios have been following a moderate declining

trend, reflecting the cumulative effect of the increase in their capital through the accumulation of profits having been smaller than the expansion of their risk-weighted assets. In contrast, for financial institutions in the euro area and Sweden, the increases in their capital have clearly exceeded the increases in their risk-weighted assets, and thus their capital adequacy ratios have been on a moderate increasing trend even under the low interest rate environment (Charts V-2-11 and V-2-12).^{37,38}

Chart V-2-10: Share of securities in financial institutions' financial assets



Note: Covers deposit taking banks (Financial institutions in "Euro area" include MFIs).
Source: Haver Analytics; BOJ "Flow of funds."

Chart V-2-11: Capital adequacy ratios

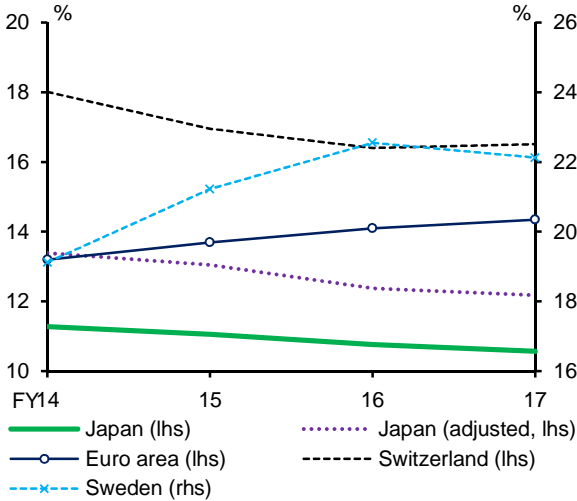
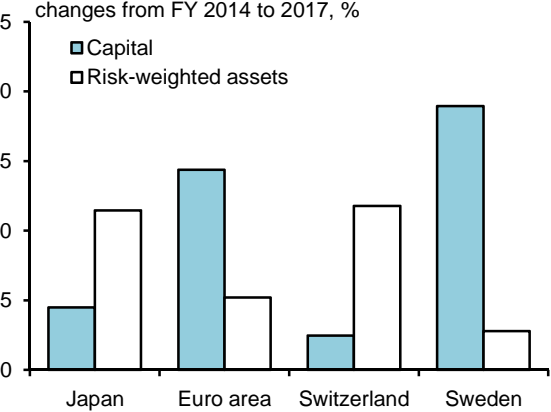


Chart V-2-12: Changes in capital and risk-weighted assets



Source: S&P Global Market Intelligence; BOJ.

Note: "Japan" indicates core capital ratios for domestic banks.
"Japan (adjusted)" is estimated by adding valuation difference on available-for-sale securities to capital. The data for European countries indicate CET1 capital ratios.
Source: S&P Global Market Intelligence; BOJ.

³⁷ Although the capital adequacy ratios of Swiss financial institutions, like those of Japanese financial institutions, have been declining gradually, reflecting smaller increases in capital than in risk-weighted assets, they have nevertheless remained at a high level of around 15 percent.

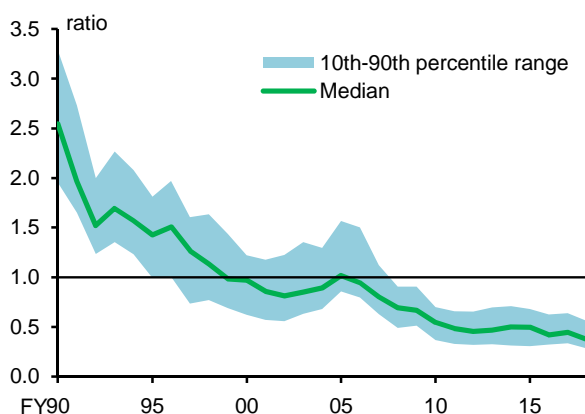
³⁸ The differences in developments in capital adequacy ratios between Japan and Europe could be partly due to capital adequacy regulations for domestic banks in Japan, which are the focus of this comparison. In Europe, all banks are in principle required to conform to the capital adequacy requirements of the Basel III agreement (a CET1 capital ratio of at least 7 percent consisting of the sum of a minimum capital level and a capital conservation buffer, and a total capital ratio of at least 10.5 percent). In contrast, the required capital ratio for domestic banks in Japan is set to be lower (a core capital ratio of at least 4 percent) than its European counterparts.

C. Stock market participants' view on financial institutions' profitability

This section explores market participants' view on financial institutions' profitability and their financial soundness, using stock price information about listed regional banks and their holding companies. Stock prices could provide important information because they basically reflect the market's view on the outlook for financial institutions' profits. Moreover, if stock prices drop sharply, the decline itself could potentially intensify concerns among market participants about financial institutions' business and creditworthiness.

First, the price-to-book ratios (P/B ratios) are considered. The P/B ratios of regional banks in Japan decreased sharply in the 1990s and then declined again gradually, with some fluctuations, from the latter half of the 2000s. In recent years, they have remained at a low level of around 0.5, which is well below 1 (Chart V-3-1). According to standard stock valuation models, a firm's P/B ratio is determined by stock market participants' view on the firm's future return on equity (ROE) relative to the cost of capital. Thus, the fact that P/B ratios are well below 1 means that stock market participants see it as unlikely that Japanese regional banks will achieve an ROE that exceeds the cost of capital in the future. As shown in detail in Box 5, regional banks' P/B ratios have continued to decline in recent years despite the fact that they have maintained relatively high ROE by historical standards; most of the decline in their P/B ratios can be accounted for by the prolonged downward trend in net interest income, the steady decline in the number of borrowing firms, and the prolonged low interest rates (Chart V-3-2). This implies that, in assessing financial institutions' future profitability, stock market participants focus on the underlying downward trend in core profitability, not on net income levels, which have been underpinned by the decline in credit costs and the realization of gains from the sales of securities. It should also be noted that P/B ratios of individual regional banks have not shown a very large dispersion and it has actually tended to shrink in recent years. This implies that market participants view the decline in regional banks' profitability as a sector-wide phenomenon rather than an issue for individual managements.

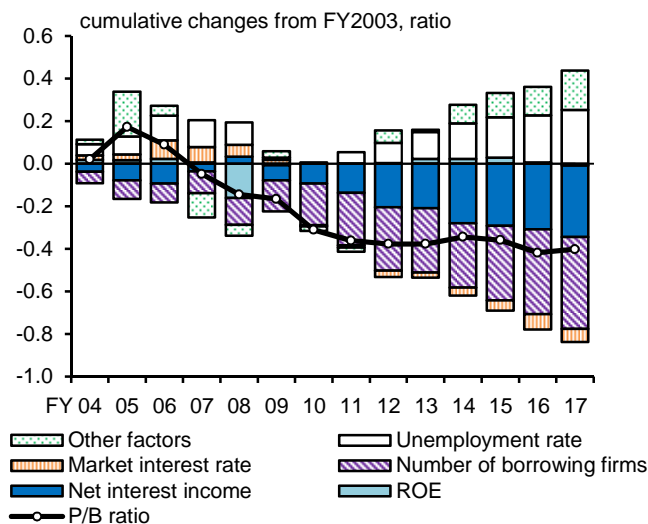
Chart V-3-1: P/B ratios of regional banks



Note: 1. Covers regional banks and regional financial groups whose P/B ratios are available in a given period. Average for each fiscal year.
2. Figures for fiscal 2018 are estimated based on the data by end-February 2019.

Source: Nikkei Inc., "NEEDS-Financial QUEST."

Chart V-3-2: Decomposition of P/B ratios of regional banks

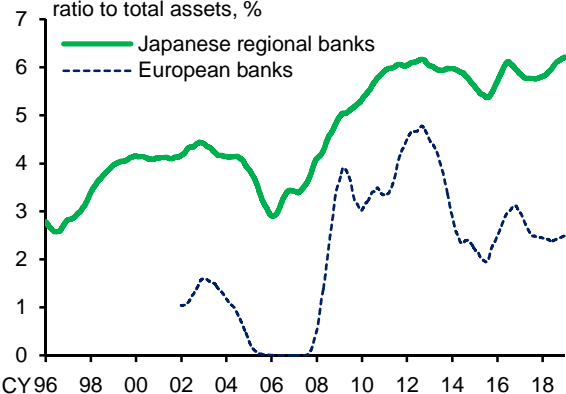


Note: For details on the decomposition, see Box 5.
Source: Nikkei Inc., "NEEDS-Financial QUEST."

Next, SRISK is considered. Using the correlation between an aggregate stock price and an individual financial institution's stock price, (1) SRISK measures a decrease in the stock market value of the financial institution that could occur in the event of an overall stock market collapse.

Then (2) SRISK estimates the financial institution's capital shortfall by regarding the decrease in the stock market value as a decrease in capital. Provided that the decline in overall stock prices represents a macroeconomic shock such as a recession, SRISK can be interpreted as reflecting stock market participants' implicit view on how much loan and investment losses could decrease the financial institution's profits and capital should such an event occur. Estimated SRISK (relative to total assets) for Japanese regional banks gradually rose from the mid-2000s onward and has remained at a high level in recent years (Chart V-3-3). This is in sharp contrast to the SRISK of European banks, which has declined in recent years from the high levels in the wake of the Lehman shock and during the European sovereign debt crisis. The Japanese experience implies that the stock market has priced in the possibility that, going forward, Japanese regional banks will not be able to accumulate sufficient capital to absorb the possible losses that could arise from future economic shocks. In fact, the leverage ratios (which notionally correspond roughly to the inverses of the capital ratios) of Japanese regional banks have remained high compared to their European counterparts, when the stock market value rather than the book value of capital is used as the denominator of the leverage ratio (Chart V-3-4; also, see Box 5 for a detailed analysis).

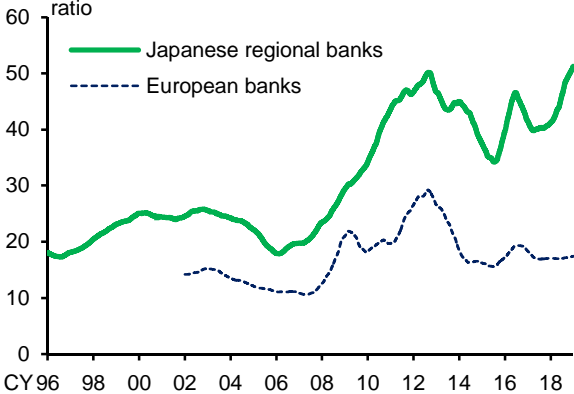
Chart V-3-3: SRISK of Japanese regional banks and European banks



Note: 1. Covers 57 Japanese regional banks and 44 European banks (excluding G-SIBs). "European banks" consists of banks in Germany, France, Italy, Spain, Sweden, and Switzerland.
 2. Median value of Japanese regional banks and European banks are smoothed using 200-day centered moving average. The same method is used for Chart V-3-4.
 3. Latest data as at end of 2018.

Source: Bloomberg; BOJ

Chart V-3-4: Leverage of Japanese regional banks and European banks



Note: Latest data as at end of 2018.
 Source: Bloomberg; BOJ

It should be noted that the interpretation of P/B ratios and the estimation of SRISK presented in this section are based on many assumptions and simplified theoretical models. Keeping this caveat in mind, these analyses show the stock market's pessimistic view on financial institutions' future profitability. It is desirable that regional banks should recognize the cost of capital appropriately and thus, through communications with a wide range of stakeholders including shareholders, examine targets for profits and ROE, the appropriate level of capital, and (as mentioned in Chapter IV) capital policies, including dividend payout policies.

VI. Macro stress testing

Using macro stress testing, this chapter examines how realization of a tail risk, such as a severe economic downturn, would affect the financial intermediation function and stability of the financial system.³⁹ The examined tail event scenario, as in previous issues of the *Report*, assumes a deterioration in financial and economic conditions at home and abroad to levels comparable to those following the Lehman shock.

As seen in Chapter V, it is highly likely that Japanese financial institutions' core profitability will continue to be under downward pressure, and as a result, their capital adequacy ratios may continue to decline. Bearing this outlook in mind, for this issue of the *Report*, macro stress testing is conducted for two tail event scenarios that differ in the timing of the event, namely, tail events that occur (1) immediately or (2) in the future. Thus, in addition to the *Report's* regular stress testing that assumes immediate realization of a risk (as conducted for each previous issue), this issue includes stress testing that extends the simulation period and assumes that a stress event occurs in 5 years' time.

A. Regular macro stress testing

This section examines financial institutions' capacity to absorb losses under an assumed tail event scenario in which the risk event occurs immediately.⁴⁰ It should be noted that the tail event scenario presented is purely hypothetical and adopted for only the purpose of stress testing; it in no way represents the Bank of Japan's outlook for the economy and asset prices, nor does it indicate the likelihood of the outcomes. The severity of the assumed stress remains basically the same as that assumed in previous semiannual reports.⁴¹

In the stress testing in this *Report*, we take into account heterogeneity in borrowing firms' ability to pay interest in estimating credit costs, given that financial institutions have actively increased lending to middle-risk firms. Specifically, financial institutions' loans to small firms are divided into two groups: loans to firms in a vulnerable financial position (low-return borrowers) and those to relatively healthy firms (other borrowers). The model incorporates heterogeneity between the two groups in the sensitivity of their interest coverage ratio (ICR), which is an indicator of their capacity to pay interest, to changes in macroeconomic fluctuations.⁴² Since the ICR of low-return borrowers is generally lower than that of other borrowers and falls more substantially in the event

³⁹ The stress testing targets 114 banks and 251 *shinkin* banks (accounting for approximately 80 to 90 percent of total loans outstanding). The simulation utilizes the Financial Macro-econometric Model (FMM) developed by the Financial System and Bank Examination Department of the Bank. The FMM has the following features: (1) it is an econometric model consisting of two sectors -- a financial sector and a real sector -- that incorporates feedback loop effects between the two sectors; and (2) it can analyze not only aggregate variables for the overall financial sector but also individual variables such as changes in the balance sheets and profits and losses for each financial institution. For the basic structure of the model, see Tomiyuki Kitamura, Satoko Kojima, Koji Nakamura, Kojiro Takahashi, and Ikuo Takei, "Macro Stress Testing at the Bank of Japan," BOJ Reports & Research Papers, October 2014. However, the detailed specifications of the model have been revised since the publication of that paper to reflect, among other things, recent changes in financial institutions' behavior and profit structure.

⁴⁰ The duration of the stress event is assumed to be the 3 years from April-June 2019 through January-March 2022.

⁴¹ Although a similar stress is assumed in each *Report*, the impact of the stress on the financial system may differ, depending on changes in financial institutions' risk profiles and financial bases at the time. For example, even the same macroeconomic shocks would result in larger credit costs and security losses if financial institutions had increased risk taking to compensate for a decline in core profitability.

⁴² "Low-return borrowers" are defined as firms in a relatively weak financial position whose borrowing interest rate is low relative to their credit risk. "Other borrowers" are all firms that do not meet this criterion. For details, see Section A of Chapter IV.

of an economic downturn, low-return borrowers are more likely to default in times of stress. Thus, for the financial institution, a higher loan share of low-return borrowers results in a greater increase in credit costs in times of stress.⁴³

Baseline scenario

The baseline simulation, which is based on the forecasts of several research institutions and average forecasts by markets, assumes that "with overseas economies continuing to grow moderately on the whole, Japan's economy will continue on a moderate expanding trend."⁴⁴ In addition, it is assumed that government bond yields evolve in line with the forward rates implied by the yield curve as of late January 2019. Stock prices (TOPIX) and foreign exchange rates are assumed to remain unchanged from the levels registered in January 2019.

The baseline simulation results are as follows. Since both domestic and overseas economies are gradually growing, loans outstanding continue growing at an annual rate of about 2 percent (Chart VI-1-1). However, due to the persistent effect of a slack domestic loan market, lending margins continue their moderate downward trend (Chart VI-1-2). This causes net interest income, especially for domestic banks, to continue following a moderate downward trend (Chart VI-1-3). Meanwhile, credit cost ratios remain low, reflecting firms' favorable financial condition (Chart VI-1-4). Realized gains on securities holdings slightly decrease as an increasing number of financial institutions have exhausted unrealized gains (Chart VI-1-5).⁴⁵ Net income therefore follows a moderate downward trend reflecting the decreases in net interest income and realized gains on securities holdings (Chart VI-1-6). For all types of banks, capital adequacy ratios remain well above the regulatory requirements throughout the simulation period (Chart VI-1-7). However, the capital adequacy ratio of domestic regional banks continues to follow a moderate downward trend. The latter result is partly due to the effects of the transitional arrangements related to the Basel III framework, such as the reduction in the proportion of instruments that can be included in capital. This is mainly because, under the assumption that dividend payout ratios remain at the 3-year average, retained earnings are accumulated at a slower pace than the expansion of risk-weighted assets due to lending growth.

Tail event scenario

The tail event scenario envisages a situation in which financial markets experience a decline in stock prices (TOPIX), an appreciation of the yen against the U.S. dollar, and a decline in domestic and foreign interest rates, all occurring to the same extent as following the Lehman shock.⁴⁶

⁴³ For the October 2018 issue of the *Report*, we conducted a simulation that incorporated heterogeneity in individual banks' share of loans to low-return borrowers, albeit only for regional banks. For the simulation in this issue, we assume the existence of low-return borrowers for all types of financial institutions, but as the share of loans to those low-return borrowers, we use the average values within the type of financial institution -- major bank, regional bank, or *shinkin* bank -- instead of estimating such shares for all financial institutions individually, due to data limitations. Despite this simplification, however, we can confirm that the stress testing results remain basically unchanged for regional banks.

⁴⁴ The major economic variables for the baseline scenario and the tail event scenario can be downloaded from the Bank's website at <http://www.boj.or.jp/en/research/brp/fsr/fsr190417.htm/>.

⁴⁵ As in the previous *Report*, it is assumed that financial institutions continue to realize gains on securities holdings at basically the same pace as seen in the past 3 years. Realizing such gains is subject to an upper limit, which is set to the amount of unrealized gains. For this reason, gains from the sale of securities are zero for financial institutions that have exhausted all unrealized gains.

⁴⁶ However, since the lower limit for government bond yields is set to a historically low level, the decline in yields both at home and abroad is smaller than in the period following the Lehman shock.

Chart VI-1-1: Loans outstanding

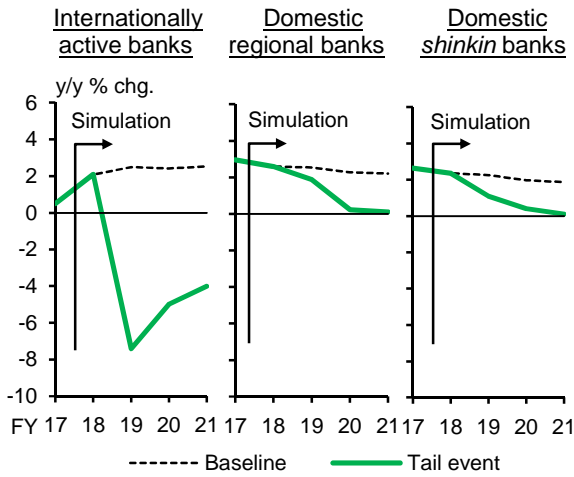


Chart VI-1-2: Lending margin

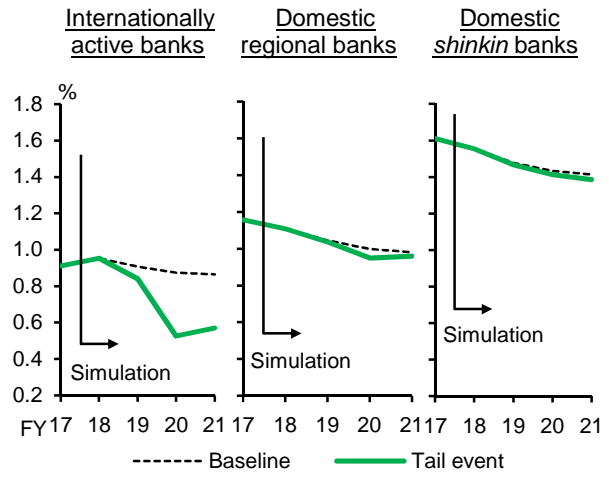


Chart VI-1-3: Net interest income

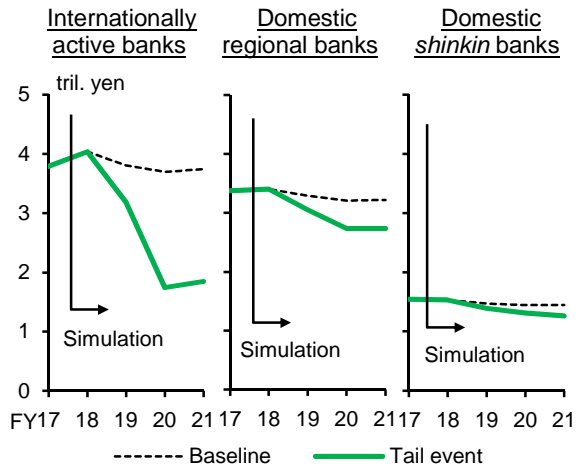
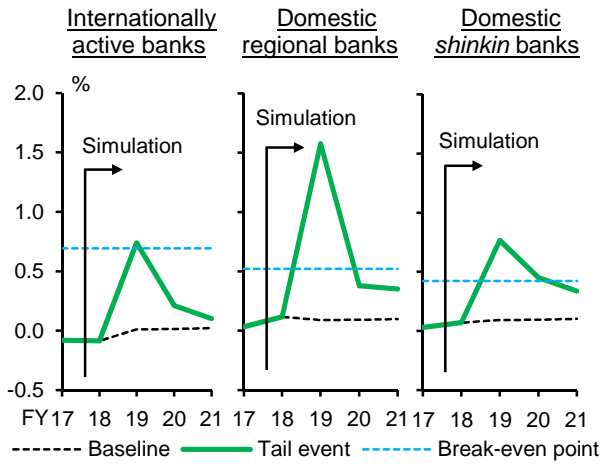


Chart VI-1-4: Credit cost ratios



Note: "Break-even point" is as at the first half of fiscal 2018 (for *shinkin* banks as at fiscal 2017).

Chart VI-1-5: Realized gains/losses on securities holdings

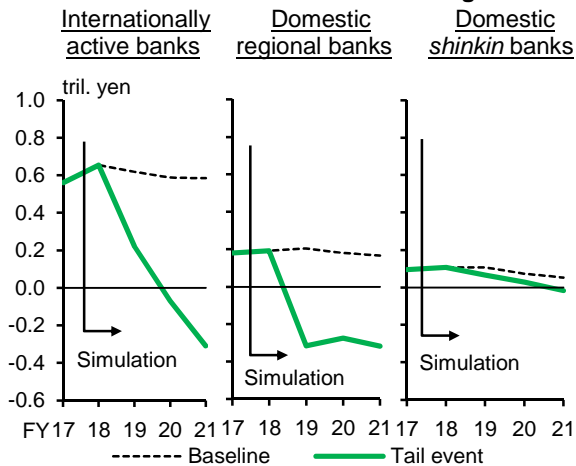
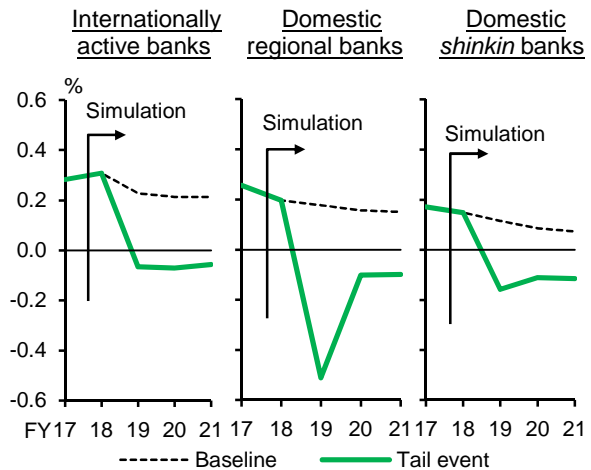


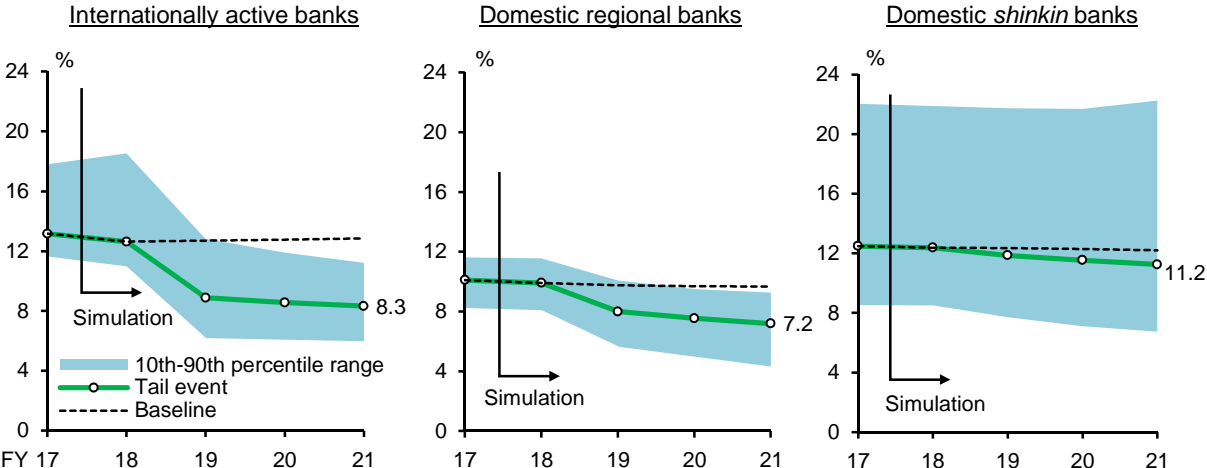
Chart VI-1-6: Net income



Note: The charts indicate the ratio of net income to total assets.

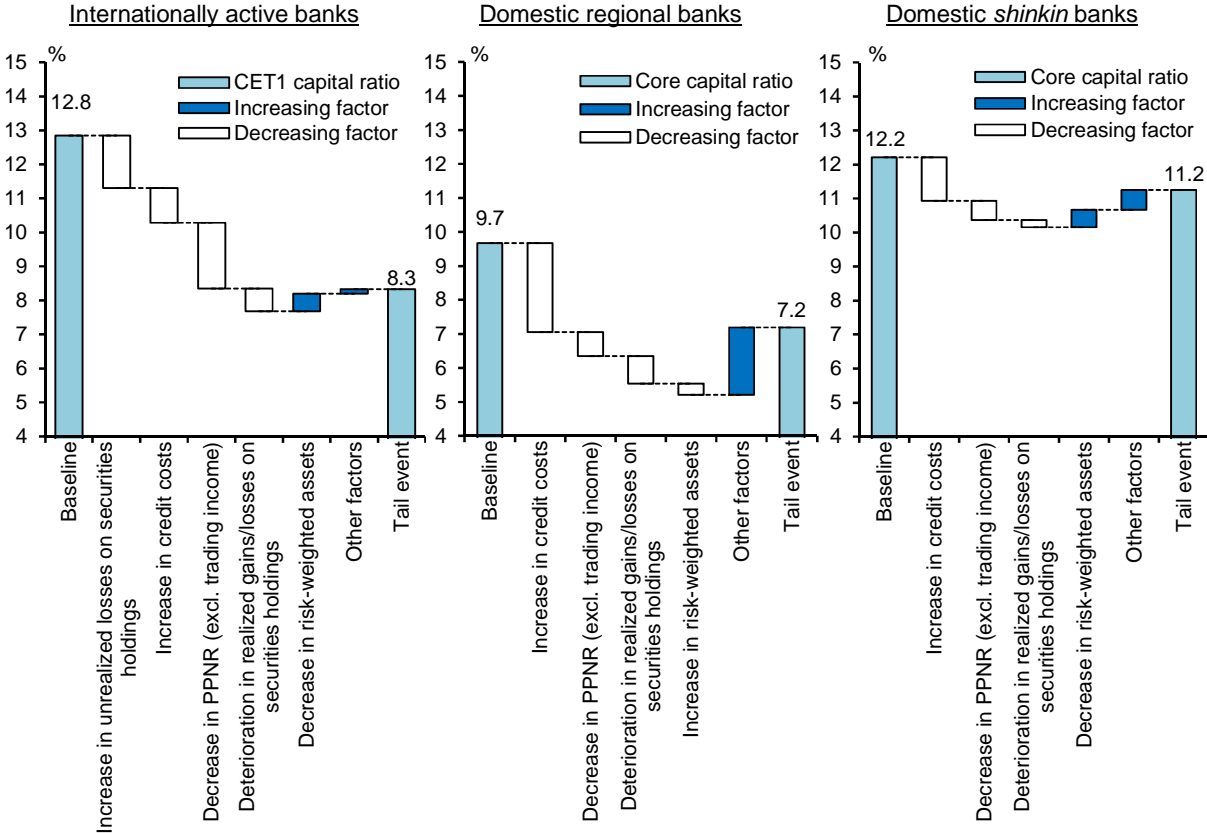
A significant economic slowdown abroad, also similar to that seen following the Lehman shock, is assumed to occur simultaneously, resulting in Japan's output gap also deteriorating to a level comparable to that seen at that time. The simulation results based on this scenario are presented and discussed below.

Chart VI-1-7: CET1 capital ratios and core capital ratios



Note: The left-hand chart shows the CET1 capital ratios of internationally active banks. The middle and right-hand charts show the core capital ratios of domestic banks. The transitional arrangements are taken into consideration.

Chart VI-1-8: Decomposition of the CET1 capital ratio and the core capital ratio (fiscal 2021)



- Note: 1. The charts indicate the contribution of each factor to the difference between the capital adequacy ratios at the end of the simulation period (as at end-March 2022) under the baseline and tail event scenarios. "Increase in unrealized losses on securities holdings" takes tax effects into account.
- 2. The left-hand chart shows the CET1 capital ratio of internationally active banks. The other charts show the core capital ratio. The transitional arrangements are taken into consideration.
- 3. "Other factors" includes taxes, dividends, and CET1 regulatory adjustments.

First, net interest income declines significantly as the deterioration in domestic and overseas economies leads to sluggish loan demand and a narrowing of lending margins (Charts VI-1-1, VI-1-2, and VI-1-3).⁴⁷ Credit cost ratios are projected to rise to levels above their break-even points, due to deterioration in firms' ICRs (Chart VI-1-4). In particular, the credit cost ratio of domestic regional banks, which have a high share of loans to low-return borrowers, rises to around 1.5 percent. This is below the peak during the financial crisis in the late 1990s, but is still quite high by historical standards.⁴⁸ Securities-related realized losses are substantial, due mainly to the large decline in stock prices (of more than 50 percent compared to the baseline) (Chart VI-1-5).⁴⁹ As a result, net income decreases sharply (Chart VI-1-6). Capital adequacy ratios decrease correspondingly but exceed regulatory requirements on average for all types of banks (Charts VI-1-7 and VI-1-8). The decline in capital adequacy ratios is projected to be largest for internationally active banks, for which unrealized losses on securities are reflected in their capital adequacy ratios. Although the capital adequacy ratios of domestic banks also decline, this decline is projected to be larger for regional banks than for *shinkin* banks, mainly reflecting a difference in credit costs.⁵⁰

The above results show that Japan's financial institutions are resilient on the whole, even under the assumption of an immediate tail event comparable to the Lehman shock. However, it should be noted that there would be substantial variation in financial institutions' capital adequacy ratios in times of stress (Chart VI-1-7). In particular, the decline in capital adequacy ratios would be large for financial institutions that have substantially more lending to low-return borrowers and holdings of stock investment trust, and those that have become more dependent on realized gains on securities holdings.

B. Stress testing based on medium- to long-term profit simulation

This section examines financial institutions' stress resilience in the medium to long term by assuming that a stress event occurs, not immediately, but in 5 years' time, where in the intervening 5-year interval it is assumed that the decline in net income and the subsequent downward pressure on capital will continue at their current levels. The stress test results will be more severe than those reported in Section A, reflecting (1) the lower capital adequacy ratios in 5 years' time, i.e., at the outset of the stress scenario, and (2) that even assuming an economic shock similar in magnitude, financial institutions' losses are likely to be larger as a result of a greater accumulation

⁴⁷ Net interest income falls much more for internationally active banks than for domestic banks. This is a result of internationally active banks being projected to suffer a larger decline in the outstanding amount of loans, partly reflecting a fall in the yen-denominated value of overseas loans due to yen appreciation. Moreover, internationally active banks are also projected to undergo a larger fall in lending margins, since their foreign currency funding costs rise substantially, due to instability in global financial markets.

⁴⁸ The loan share of low-return borrowers is higher for regional banks than for *shinkin* banks (Chart VI-2-4). This is because *shinkin* banks maintain wider lending margins than do regional banks while having a higher share of loans to small firms with high credit risk.

⁴⁹ Financial institutions that have unrealized gains on bonds could partly offset stock-related losses by realizing such gains, since bond prices rise (interest rates fall) in times of stress.

⁵⁰ During the tail event, the credit cost ratio of domestic regional banks is projected to become significantly higher than that of *shinkin* banks (Chart VI-1-4). This is because, as mentioned above, regional banks' share of loans to low-return borrowers is higher than that of *shinkin* banks. This is also largely attributable to differences in credit costs observed in the period after the Lehman shock. Specifically, credit costs for regional banks increased substantially during that period, especially for loans to large-scale borrowers that were susceptible to overseas demand conditions, whereas the rise in *shinkin* banks' credit costs was generally limited, reflecting the fact that many of their borrowers were small businesses (Chart IV-1-4). Since this difference is reflected in the parameters of the credit cost models estimated separately by bank type (using data from fiscal 2005 onward), regional banks' credit costs are more sensitive to the business cycle fluctuations than those of *shinkin* banks.

of lending to low-return borrowers. Thus, an important point in this section is not qualitative but quantitative assessment: the extent to which the stress testing results presented in this section differ from those in the previous section.

In this section, the baseline simulation period is extended from the 3 years (until fiscal 2021) assumed in Section A to 10 years (until fiscal 2028) and financial institutions' capacity to absorb losses is examined under the assumption that financial and economic conditions in 5 years' time deteriorate to the same extent as following the Lehman shock.

Simulation of medium- to long-term profits and baseline scenario

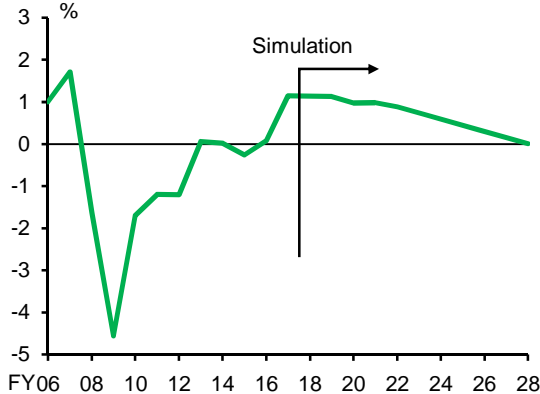
The extension of the baseline scenario to 10 years is carried out as follows. The first 3 years of this scenario are the same as those assumed in the baseline scenario in Section A. For the following 7 years, the baseline scenario is based on the assumption that "Japanese financial institutions' core profitability will continue to be under structural downward pressure with the domestic and overseas economies gradually returning to their long-run equilibrium states." This scenario is purely hypothetical, is based on a number of simplifying assumptions, and is intended only for examining how resilient financial institutions will be to stress if the current profit environment is prolonged. Hence, it in no way represents the Bank of Japan's outlook for medium- to long-term financial and economic conditions or financial institutions' profits.

Specific assumptions are as follows. First, it is assumed that the output gap, which represents the level of economic activity, follows the same path in the first 3 years as in the baseline scenario presented in the previous section. In the following 7 years, it gradually converges to its long-run equilibrium level, i.e., zero, at which the economy is neither overheating nor contracting (Chart VI-2-1). Japan's population, which affects the trend in loans to individuals, is assumed to continue to decline moderately in line with the population projections in the medium-fertility and medium-mortality case released by the National Institute of Population and Social Security Research. Regarding the potential growth rate, which determines the trend in loans to firms, the current level in the range of 0.5-1.0 percent is assumed to continue throughout the simulation period for simplicity. For the financial variables, government bond yields are assumed to evolve in line with the forward rates implied by the current yield curve (Chart VI-2-2). Specifically, it is assumed that short-term interest rates continue to be slightly negative until the mid-2020s and then rise into slightly positive territory through the late 2020s. Long-term interest rates are assumed to initially remain close to zero but follow a moderate upward trend from the early 2020s, reaching around 1 percent toward the end of the simulation period. Meanwhile, stock prices (TOPIX) and foreign exchange rates are assumed to remain unchanged throughout the entire simulation period.

Under these financial and economic conditions, it is assumed that the behavior of financial institutions remains essentially unchanged and that their general and administrative expenses remain constant during the simulation period. It is also assumed that factors that crucially affect their profits, such as loan amounts, loan interest rates, and credit costs, are determined based on the same mechanisms as in Section A. However, regarding the underlying supply-demand conditions of the loan market, which have constituted a structural factor causing the secular decline in loan interest rates observed so far, two alternative cases are considered: (1) a decreasing loan demand case in which firms' loan demand continues to decrease at the same pace as seen so far; and (2) a constant loan demand case in which, going forward, firms' loan demand immediately stops declining and thereafter remains unchanged. For tractability of the simulation model, the "loan demand index," calculated as the number of borrowing firms per bank branch, is introduced as a proxy variable for the underlying supply-demand conditions of the loan

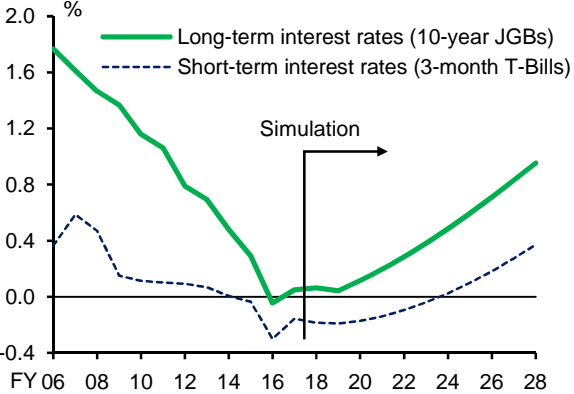
market. Thus, in the model, this index crucially affects loan interest rates (Chart VI-2-3). The basic mechanism is as follows: the fewer firms with demand for loans there are in a financial institutions' business area, the more slack is the loan market and the greater is the underlying downward pressure on loan interest rates. In the decreasing loan demand case, it is assumed that the loan demand index continues to decline during the simulation period, following the trend that has held since 2010, and that, in tandem with this, the share of loans to low-return borrowers, for which the loan interest rate does not match the credit risk involved, will continue to rise (Chart VI-2-4). In contrast, the constant loan demand case features both the loan demand index and the share of loans to low-return borrowers remaining unchanged at their current levels into the future.⁵¹

Chart VI-2-1: Output gap (medium- to long-term baseline scenario)



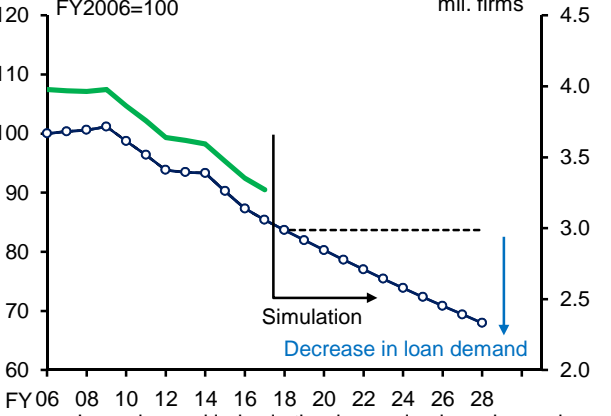
Source: BOJ.

Chart VI-2-2: Nominal interest rates (medium- to long-term baseline scenario)



Source: Bloomberg; Ministry of Finance.

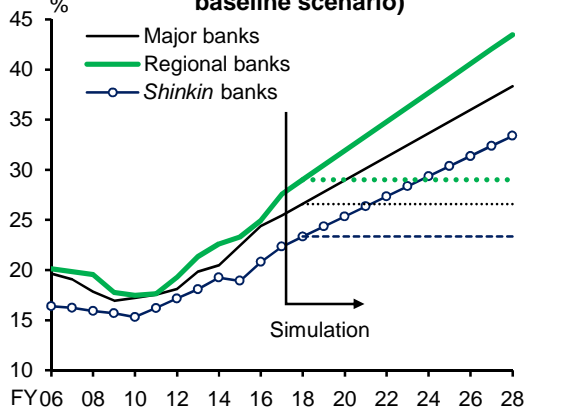
Chart VI-2-3: Loan demand index (medium- to long-term baseline scenario)



Legend:
 —○— Loan demand index in the decreasing loan demand case
 - - - - - Loan demand index in the constant loan demand case
 — Number of firms with positive amount of borrowings (rhs)

Note: "Loan demand index" is calculated by dividing the number of borrowing firms by the number of banks' branches (constructed for each prefecture).
 Source: Ministry of Internal Affairs and Communications; Teikoku Databank; The Japan Financial News.

Chart VI-2-4: Share of loans to low-return borrowers (medium- to long-term baseline scenario)



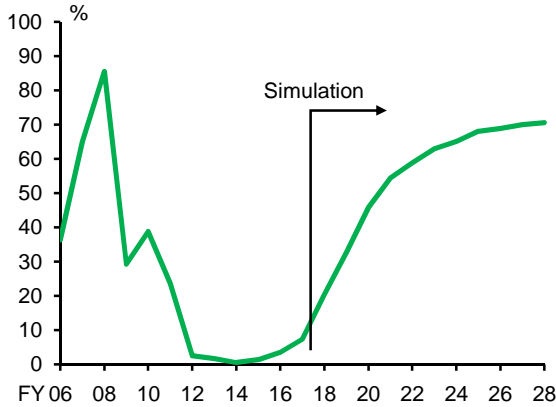
Note: The chart indicates the share of loans to low-return borrowers in the total amount of loans to small firms. The solid lines indicate the decreasing loan demand case and the dotted lines indicate the constant loan demand case.
 Source: Teikoku Databank.

For securities-related gains, as in the previous section, it is assumed that financial institutions

⁵¹ This case illustrates the possibility that the decrease in the number of borrowing firms comes to a halt due to an increase in firms' investment appetite and a decline in the propensity to save, and/or that an increase in consolidations and tie-ups among financial institutions puts an end to the decrease in the number of client firms per branch and leads to an easing of competitive pressure in financial intermediation services.

continue to realize gains on securities holdings at the same pace as seen in the past 3 years up until they have exhausted all unrealized gains, including those on strategic stockholdings. Under the aforementioned assumptions on asset prices, the number of financial institutions that have exhausted unrealized gains will gradually increase in the future, reaching about the same level as in the period immediately after the Lehman shock, when stock prices were less than half their current level, by the end of the simulation period (Chart VI-2-5).

Chart VI-2-5: Share of banks that have exhausted unrealized gains (medium- to long-term baseline scenario)



Note: Share of banks whose "valuation difference on available-for-sale securities" is equal to or below zero in a given year.

Chart VI-2-6: Loans outstanding in the decreasing loan demand case (baseline scenario)

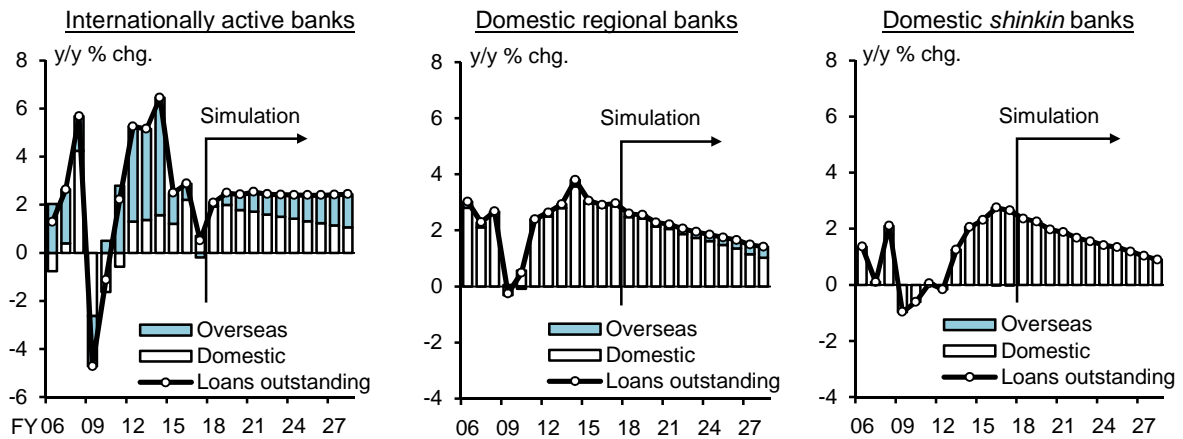
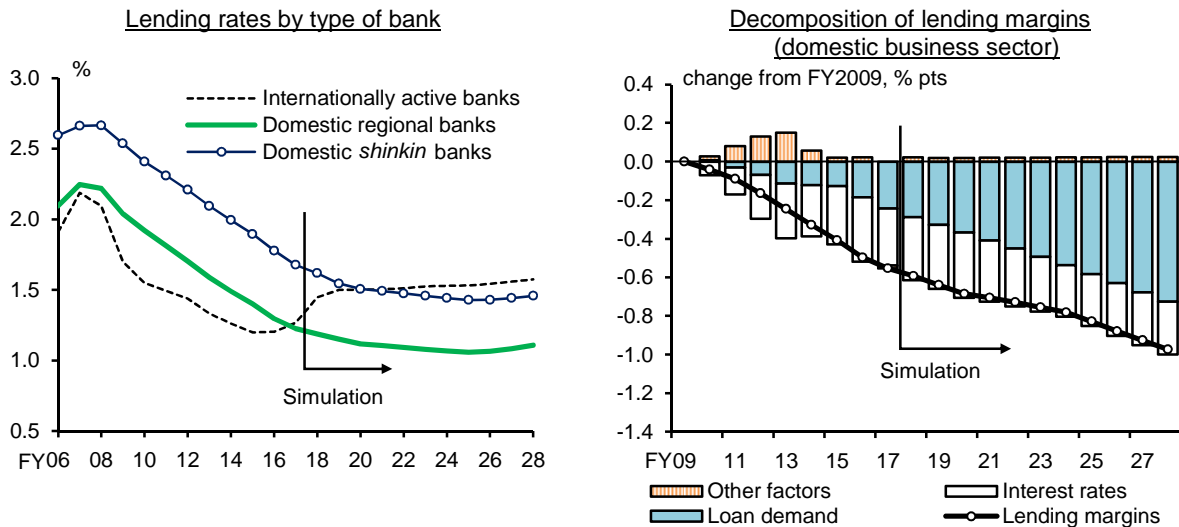


Chart VI-2-7: Lending rates and margins in the decreasing loan demand case (baseline scenario)



Note: "Other factors" in the right-hand chart includes a nonperforming loan factor and estimation errors.

Based on the above assumptions, a medium- to long-term baseline simulation is conducted. Its results are as follows. First, loans outstanding of internationally active banks continue to grow more or less at the current pace, driven by their international business, while the growth in those of domestic banks gradually slows down, reflecting the decline in Japan's population and the shrinking of the positive output gap (Chart VI-2-6). Although loan interest rates start to rise, albeit only slightly, toward the end of the simulation period because of the rise in market interest rates, lending margins, particularly in banks' domestic business, continue to be under structural downward pressure in the decreasing loan demand case (Chart VI-2-7). As a result, in the decreasing loan demand case, net income follows a downward trend throughout the simulation period for all types of banks (Chart VI-2-8). It should be noted that domestic banks' profits are projected to fall to a greater extent than those of internationally active banks, whose profits are underpinned by their international business; in fact, domestic banks' profits as a whole shrink close to zero toward the end of the simulation period and accordingly the number of domestic banks with net losses increases (Charts VI-2-9 and VI-2-10). Analyzing the decline in domestic banks' net income in the decreasing loan demand case leads to the following three observations. First, PPNR (excluding trading income), which represents banks' core profitability, continues to decline due to sluggish loan growth and shrinking lending margins. Second, credit costs grow in response to default rates due to the shrinking of the positive output gap. Third, realized gains on securities holdings overall follow a moderate downward trend as the number of financial institutions that have exhausted unrealized gains gradually increases.

Chart VI-2-8: Net income ROA (baseline scenario)

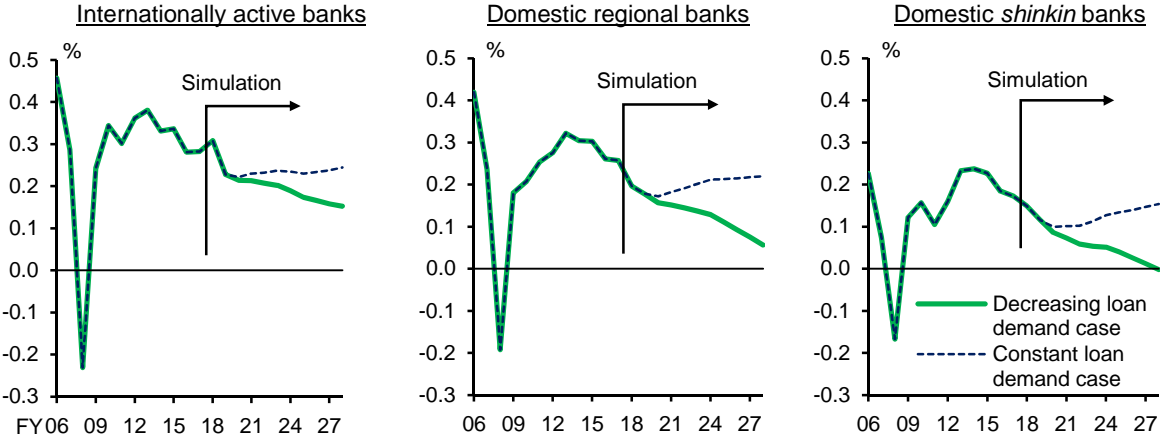


Chart VI-2-9: Share of banks with net losses (baseline scenario)

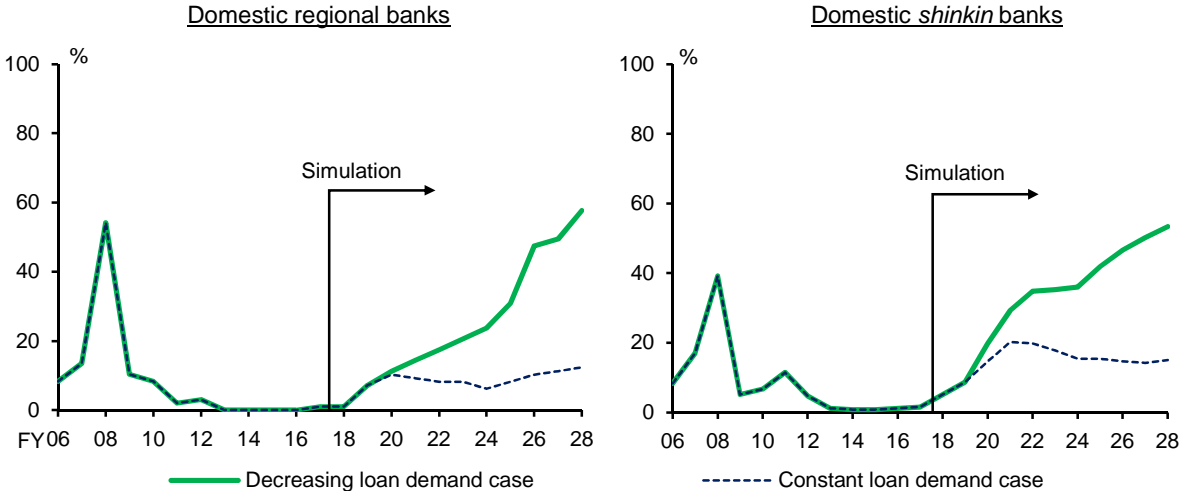
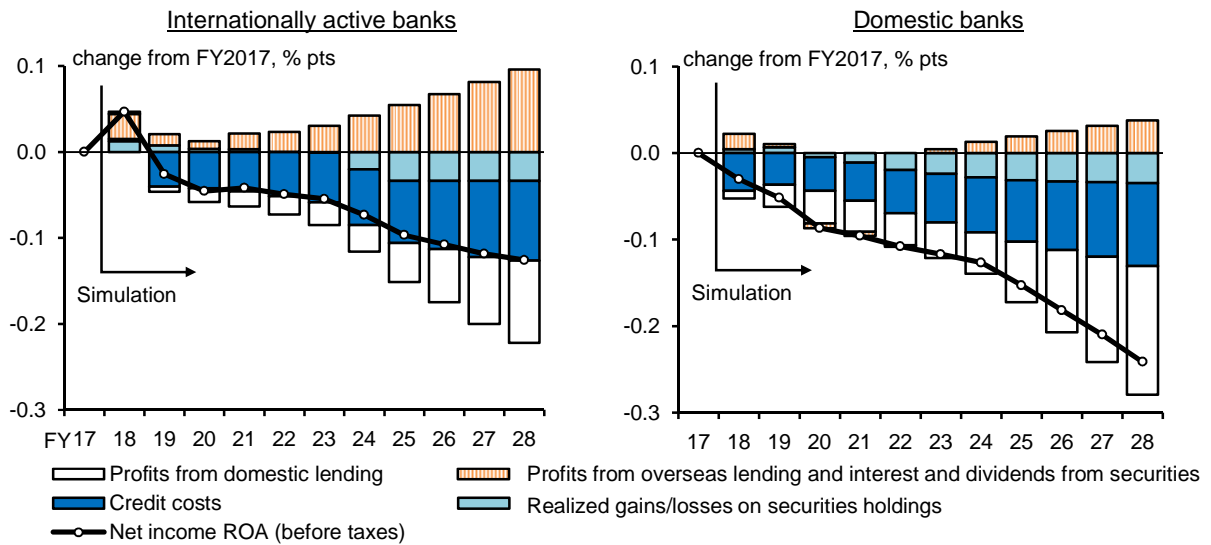


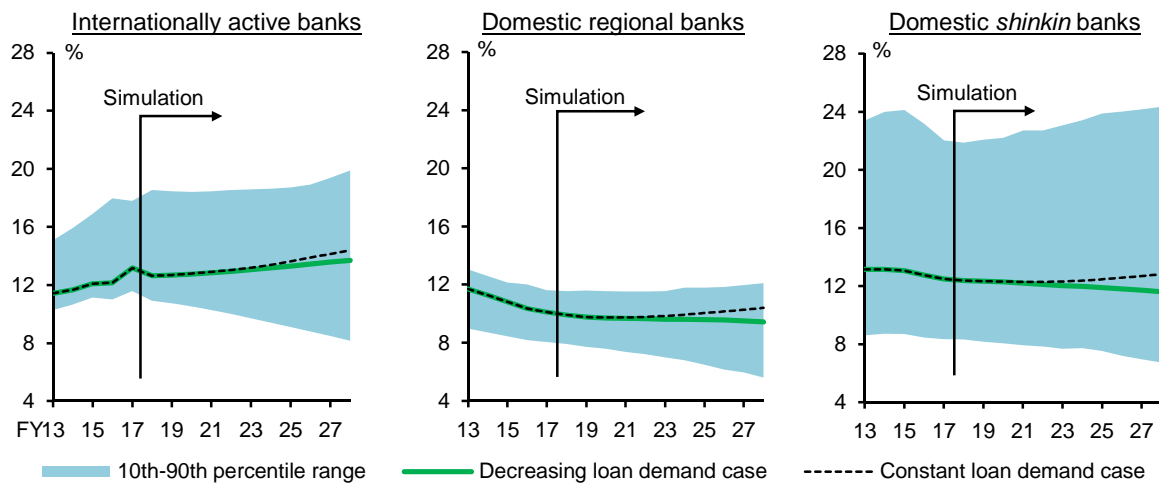
Chart VI-2-10: Decomposition of net income ROA in the decreasing loan demand case (baseline scenario)



Note: "Profits from domestic lending" denotes the net interest income from domestic lending (domestic loans outstanding x lending margins in the domestic business sector).
 "Profits from overseas lending and interest and dividends from securities" is defined as the PPNR (excluding trading income) minus the net interest income from domestic lending.

In contrast, in the constant loan demand case, net profits remain at an adequate level until the end of the simulation period for all types of banks, which is mainly because of a halt of the shrinking of lending margins (Chart VI-2-8). Moreover, the share of banks with net losses does not rise substantially (Chart VI-2-9). These results suggest that it is critically important, as a determinant of the profitability trend, whether the loan market conditions will further slacken because of loan demand developments during the medium- to long-term simulation period.

Chart VI-2-11: CET1 capital ratios and core capital ratios (baseline scenario)



Note: 1. The left-hand chart shows the CET1 capital ratios of internationally active banks. The middle and right-hand charts show the core capital ratios of domestic banks. The transitional arrangements are taken into consideration.
 2. "10th-90th percentile range" is in the decreasing loan demand case.

Capital adequacy ratios remain above regulatory requirements throughout the simulation period

even in the decreasing loan demand case (Chart VI-2-11).⁵² For domestic banks, however, core capital ratios continue to follow a moderate downward trend, as they cannot secure profits commensurate with the increase in risk-weighted assets and are distributing some of these profits through dividend payments.⁵³

Tail event scenario in 5 years' time

Setting the above medium- to long-term simulation results as a baseline scenario, stress testing is conducted assuming that a major stress event similar to the Lehman shock will occur in 5 years' time ("tail event scenario in 5 years' time"). That is, the model is simulated for the next 3 years, i.e., from fiscal 2024 to fiscal 2026. The size of the assumed shock is the same as that in the tail event scenario in Section A.

Chart VI-2-12: Net income ROA (tail event scenario in 5 years' time)

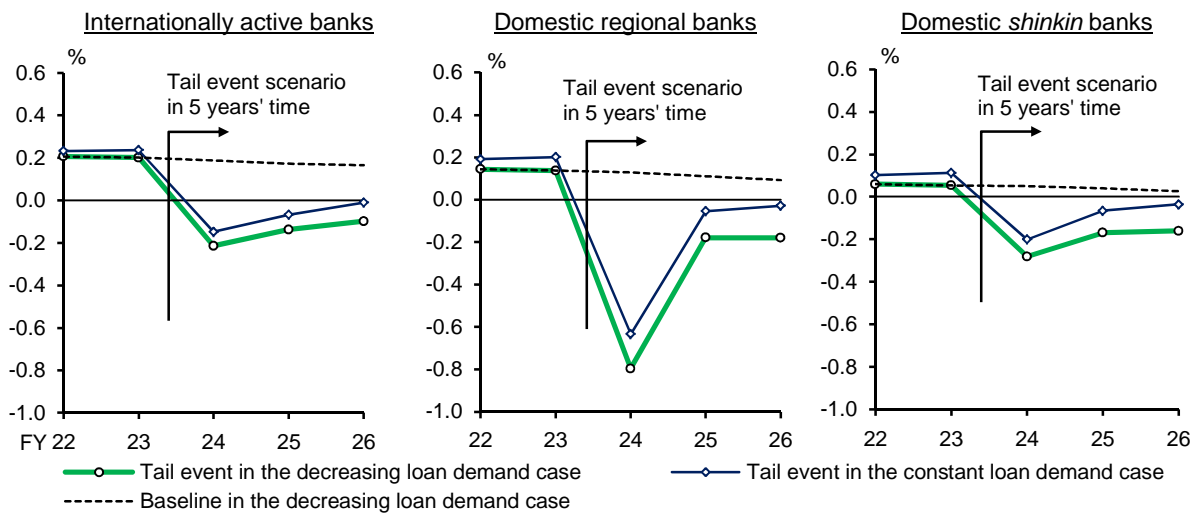
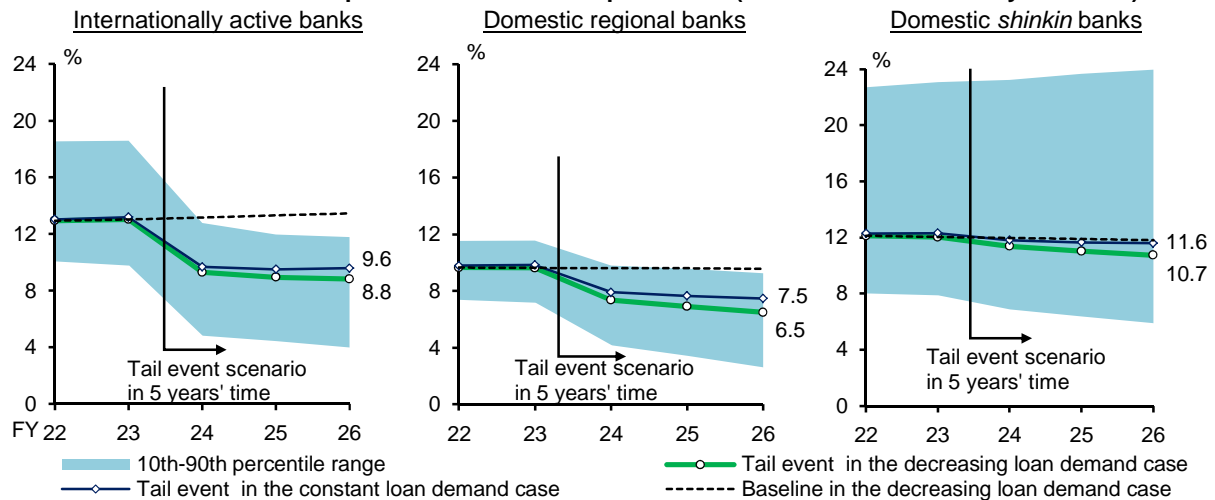


Chart VI-2-13: CET1 capital ratios and core capital ratios (tail event scenario in 5 years' time)



Note: 1. The left-hand chart shows the CET1 capital ratios of internationally active banks. The middle and right-hand charts show the core capital ratios of domestic banks. The transitional arrangements are taken into consideration.
 2. "10th-90th percentile range" is for the tail event in the decreasing loan demand case.

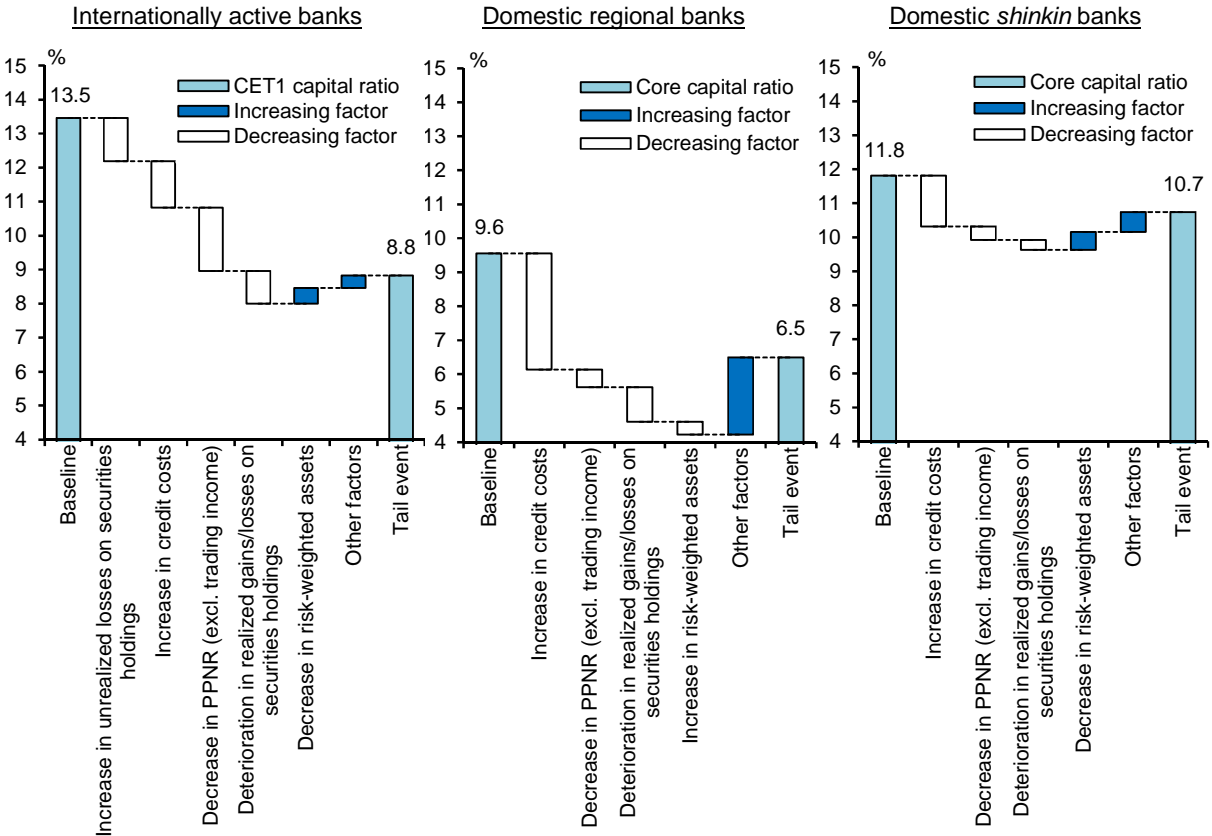
⁵² Capital adequacy ratios for the simulation period are calculated based on current regulatory requirements on capital.

⁵³ Financial institutions' dividend payout ratios throughout the simulation period are assumed to remain at the average level of the past 3 years as long as their net income is positive. Financial institutions with net losses are assumed to pay no dividends.

The simulation results based on this scenario are as follows. Financial institutions incur substantial net losses due to the deterioration in credit costs and losses on stock holdings, as well as the decline in PPNR (excluding trading income) (Chart VI-2-12).⁵⁴ Capital adequacy ratios decline, but they remain above regulatory requirements even in the decreasing loan demand case for all types of banks, including regional financial institutions (Chart VI-2-13).

However, in the decreasing loan demand case of "tail event scenario in 5 years' time," two features stand out in contrast to that of the "immediate tail event scenario" (Charts VI-2-14 and VI-1-8). First, domestic banks' capital adequacy ratios are significantly lower. This reflects (1) the lower capital adequacy ratios at the outset of the stress scenario, which is due to the cumulative effect of financial institutions' declining profitability until then; (2) a larger deterioration in credit costs in times of stress due to the increase in the share of loans to low-return borrowers, which is associated with a secular decline in loan demand; and (3) larger impairment losses on securities holdings in times of stress through the shrinking of the buffer of unrealized gains that results from successive rounds of realizing gains.⁵⁵

Chart VI-2-14: Decomposition of the CET1 capital ratio and the core capital ratio in the decreasing loan demand case (fiscal 2026)



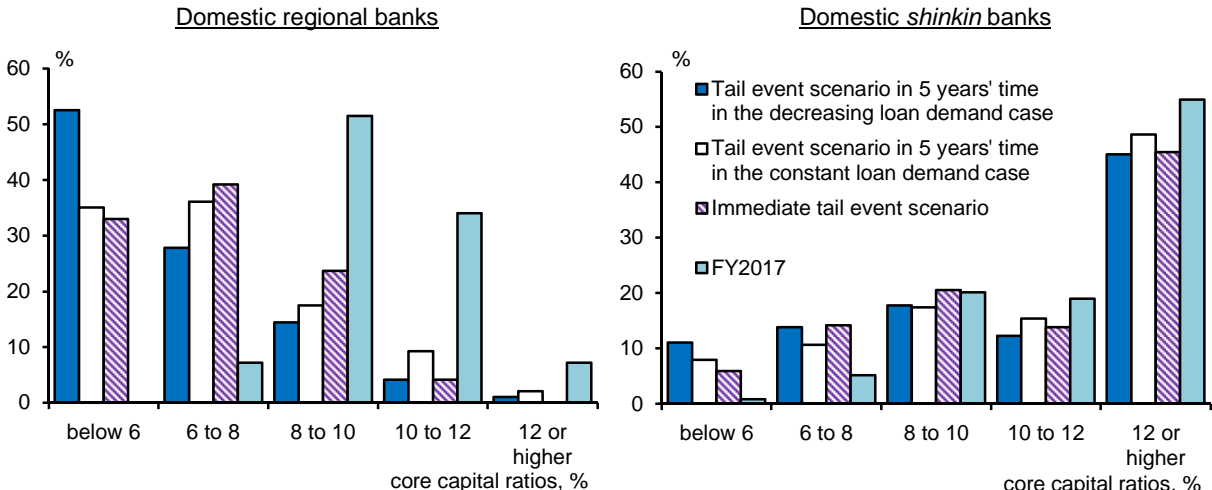
- Note: 1. The charts indicate the contribution of each factor to the difference between the capital adequacy ratios at the end of the simulation period (as at end-March 2027) under the baseline and tail event scenarios. "Increase in unrealized losses on securities holdings" takes tax effects into account.
2. The left-hand chart shows the CET1 capital ratio of internationally active banks. The other charts show the core capital ratio. The transitional arrangements are taken into consideration.
3. "Other factors" includes taxes, dividends, and CET1 regulatory adjustments.

⁵⁴ Comparing the decreasing loan demand case and the constant loan demand case, net losses are somewhat larger in the former case. This is because of the large increase in credit costs reflecting the greater share of loans to low-return borrowers in this case.

⁵⁵ In contrast, in the constant loan demand case, domestic banks' capital adequacy ratios in times of stress are almost the same as in the scenario where the tail event occurs immediately.

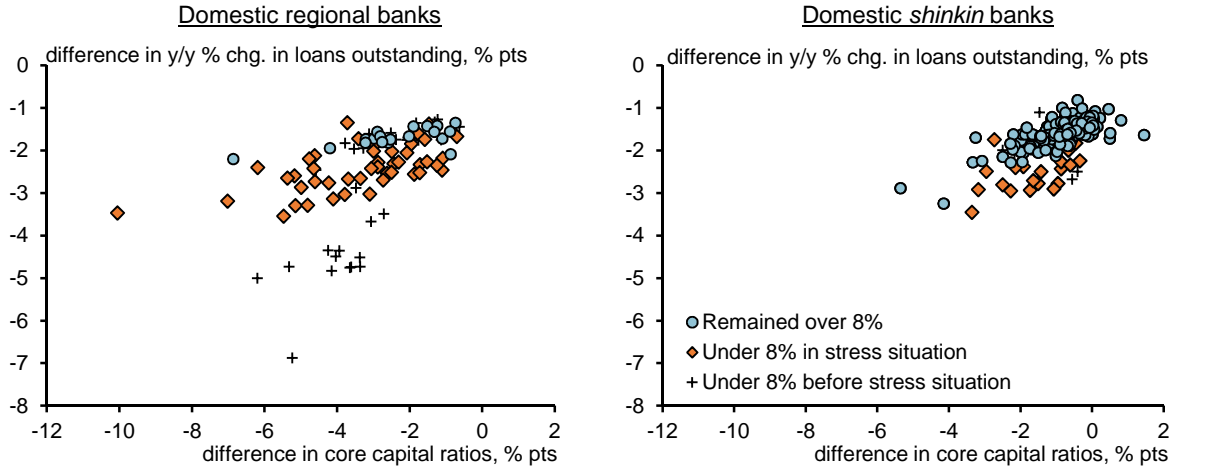
Second, although capital adequacy ratios overall remain above regulatory requirements in the tail event scenario in 5 years' time, the distribution of individual financial institutions, especially for regional banks, shows a substantially fatter downside tail; that is, the share of banks with low capital adequacy ratios is much larger than under the scenario in which the tail event occurs immediately (Chart VI-2-15). Even if their capital adequacy ratios remain above regulatory requirements, financial institutions that experience large falls in their capital adequacy ratios are projected to reduce their lending substantially in order to raise their capital adequacy ratios. This link between regional banks' core capital ratios and lending in times of stress leads to a decline in lending that is particularly large for banks whose capital adequacy ratios fall below 8 percent (Chart VI-2-16). Furthermore, the decline in loans outstanding on an aggregate basis is larger in the "tail event scenario in 5 years' time" than in the "immediate tail event scenario." This reflects an increase in the number of financial institutions that experience larger falls in their capital adequacy ratios (Chart VI-2-17). Therefore, from a macroprudential perspective, it is necessary to pay close attention to the possibility that downward pressure on the real economy may be amplified by the financial sector, even if the capital adequacy ratios of financial institutions as a whole are above regulatory requirements, depending on the size of the decline in their capital adequacy ratios and the distribution of individual financial institutions.

Chart VI-2-15: Distributions of core capital ratios



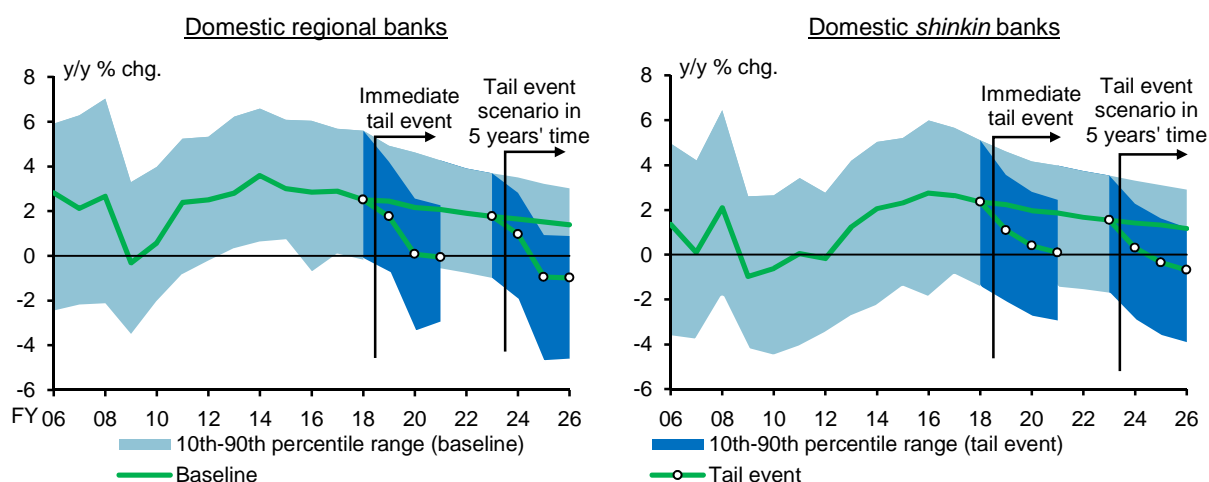
Note: Core capital ratios in the tail event scenarios are as at the end of the stress periods.

Chart VI-2-16: Core capital ratios and loans outstanding in the decreasing loan demand case (tail event scenario in 5 years' time)



Note: The vertical axis shows the difference in year-over-year changes in domestic loans outstanding between the tail event and baseline scenarios. The horizontal axis shows the difference in core capital ratios between the tail event and baseline scenarios. Data as at fiscal 2026.

Chart VI-2-17: Loans outstanding in the decreasing loan demand case



Note: Domestic loans outstanding.

Since the above medium- to long-term stress testing results substantially depend on the assumptions regarding economic and financial conditions, as well as financial institutions' behavior, these results are subject to a larger margin of error than those of the regular stress testing, in which the stress event occurs immediately. Moreover, as shown in the simulations of the constant loan demand case, it is possible that financial institutions' capacity to absorb losses will be reasonably well maintained even in the medium to long term, if loan market conditions stop slackening through changes in the external environment surrounding financial institutions' business and in the behavior of the financial institutions themselves. For example, it is likely that, relative to the results of the decreasing loan demand case, the resilience of the financial system would improve if firms' loan demand increased (which could occur as a result of a rise in the corporate sector's growth expectations), if financial institutions were successful at improving their profitability (which could be realized through cost reductions and increases in net non-interest income), and/or if they changed their capital policies, including dividend payout plans. In the simulation, both general and administrative expenses and net non-interest income for domestic banks are assumed to remain unchanged from current levels. Thus, if such expenses decreased and net non-interest income increased, domestic banks' profitability would improve. Moreover, as dividend payout ratios are assumed to remain at the average level of the past 3 years in the simulation, a reduction in the payout ratio could lead to higher capital adequacy ratios through the increase in retained earnings (Chart IV-5-3).

VII. Toward ensuring financial stability in the future

Japan's financial system has been maintaining stability on the whole. Financial institutions have maintained their active stance of risk taking both in lending and securities investment. Thus, they have been active in financial intermediation.

However, the profitability of domestic deposit-taking and lending activities, which are the core financial intermediation functions, has continued to decline. In response to this decline in domestic business profitability, major financial institutions have aggressively expanded their global activities and pursued group-wide strategies to provide comprehensive financial services. As a result, they have secured a certain profit level while also increasing their systemic importance. In particular, the degree of connectedness and resonance between Japanese and overseas financial systems has increased (see Box 3). At the same time, regional financial institutions have increased their overseas exposure through securities investment and have also become more active in risk taking particularly in domestic lending to middle-risk firms and the real estate industry. This risk taking has supported regional economies, but they have not generally been able to secure returns commensurate with the risks involved; consequently, their capital adequacy ratios and stress resilience have declined moderately. Should this situation persist, their capital base would be vulnerable in the future and this could restrain their financial intermediation activities.

The declining profitability in domestic deposit-taking and lending activities seems to be caused by the decline in the medium- to long-term potential growth rate associated with the shrinking population, as well as the prolonged low interest rate environment. In fact, this decline in profitability is a long-term macro-level phenomenon that started at the end of the 1990s, when the chronic excess savings in the corporate sector, which mostly reflect the sluggish growth expectations, began. This structural change in the savings and investment balance has led to a secular decline in demand for financial institutions' loans and therefore a slackening of loan markets. This change has been greater in regions with a more pronounced population decline and has sparked intensified competition between financial institutions in major urban areas, where demand remains strong, as they attempt to expand lending in such areas regardless of the location of their headquarters.

Based on the above observations, what is needed for a strong recovery in the profitability of financial institutions is increases in both the potential growth rate and growth expectations, as well as regional economic revitalization. In this regard, in recent years Japan has seen positive developments that could contribute to raising the potential growth rate, including an increase in firms' fixed investment as well as greater labor participation by women and the elderly. In addition, Japan has experienced regionally widespread economic expansion. To continue these developments, efforts by a wide range of entities are necessary, including firms' efforts to raise productivity, institutional reforms by the government, and efforts to stimulate innovation. Furthermore, financial institutions play an important role by providing consulting and advisory services to firms as well as services supporting households' wealth management. Financial institutions have already been intensifying such efforts, but it will likely take more time until this bears fruit and substantially improves their profitability.

Challenges for financial institutions

In order for the financial system to maintain stability into the future and carry out its financial intermediation functions effectively even in the event of stress, financial institutions need to address the following four business challenges.

First, financial institutions should strengthen efforts to raise their core profitability. This challenge is common to both major banks and regional financial institutions, but it is particularly important for regional financial institutions with high reliance on profits from domestic deposit-taking and lending. Specifically, they need to (1) enhance the provision of financial services such as consulting and advisory services for firms and wealth management services for households, (2) secure loan interest rates commensurate with the risks involved in the domestic lending -- their core business -- and increase their fee and commission income, and (3) drastically increase their business efficiency, for example, by overhauling their business processes and expense structures. Furthermore, to actively and effectively pursue such efforts, each financial institution would need to have effective options for merging or collaborating with other institutions and forming alliances with firms in other business areas.

Second, financial institutions should enhance their risk management in areas where they have actively increased their risk taking. To address credit risk, financial institutions need to strengthen their risk management of their domestic lending to middle-risk firms and the real estate industry, as well as their overseas lending (see Chapter IV, Sections A and C). Given that credit costs have started to increase recently, it has become more important that financial institutions manage loans based on the risk profile and future prospects of their credit portfolios and set appropriate loan-loss provisions. To address market risk, financial institutions need to enhance their risk management in response to increases in their holdings of investment trusts and investment funds and the resulting diversification and complexity of risks (see Chapter IV, Section B). To address liquidity risk, financial institutions need to secure stable funding bases and increase their resilience to stress so as to take into account the increase in their overseas exposure (see Chapter IV, Section D). Major financial institutions need to ensure a solid financial base in accordance with their increased systemic importance, enhance their business management on a global and group-wide basis, and prepare to deal with a stress event in an orderly manner, including developing stress testing and enhancing its effectiveness.

Third, financial institutions should adapt to digitalization (see Boxes 6 and 7). In Japan, various entities are currently engaged in making rapid progress in the area of cashless payment. In addition, financial institutions have gradually been making use of open application programming interfaces (APIs), artificial intelligence (AI), and cloud computing. The progress of digitalization could potentially undermine existing financial institutions' profit opportunities by encouraging the entry of non-financial firms to the financial sector and putting downward pressure on service fees. On the other hand, digitalization also provides financial institutions with tools that they can use to expand the frontiers of their financial services and radically increase their business efficiency. Financial institutions need to make clear policies regarding the use of digital technology and establish frameworks for cyber security, data protection, and anti-money laundering accordingly.

Finally, financial institutions should implement appropriate capital policies. Given that both investors and firms have prioritized capital efficiency and shareholder returns in recent years, striking the right balance between shareholder returns and capital levels is particularly important for regional banks whose profitability has continued to decline. Financial institutions need to develop business plans that appropriately take capital costs into account according to the governance structure, which differs between corporations and cooperative institutions. At the same time, they need to make clear capital policies, including those pertaining to sufficient capital levels, dividend payout plans, and the effective use of unrealized gains on securities, and improve communication with shareholders and a wide range of other stakeholders.

Actions by the Bank of Japan

In order to ensure the stability of the financial system, the Bank of Japan, through on-site examinations, off-site monitoring, and various other activities, will continue to provide support to financial institutions in their efforts to address the challenges mentioned above.⁵⁶

In conducting on-site examinations and off-site monitoring, the Bank will continue to focus on grasping financial institutions' profitability and financial soundness in the future and sharing its views with these institutions. In doing so, the Bank will concentrate on examining financial institutions' resilience to downside risks by conducting profit simulations and utilizing as necessary the results of its macro stress testing for individual financial institutions. The Bank will actively engage in dialogue, with financial institutions about which the Bank has concerns regarding their future profitability and financial soundness, about the capital levels necessary for the institutions to perform their financial intermediation functions in a stable manner into the future and what management policies can secure such capital levels, including their capital policies.

The Bank will hold seminars for financial institutions and support their efforts to put in place more sophisticated risk management and improve profitability, such as the use of digital technology and the reengineering of business processes.⁵⁷ The Bank will also conduct financial system research by strengthening its analysis from a macroprudential perspective. At the same time, it will make further improvements in stress testing by utilizing granular data, in collaboration with financial institutions.⁵⁸ Moreover, the Bank will, in coordination with overseas central banks and other organizations, enhance its framework for monitoring developments in global financial markets and overseas financial systems. It will also contribute to discussions on international financial regulations, including regarding the smooth implementation of the finalized Basel III framework and its impact assessment. As for measures related to transaction activities, the Bank will take necessary measures to ensure financial system stability, including carrying out its lender-of-last-resort function when deemed appropriate.⁵⁹

As financial institutions grapple with structural problems, it is important to develop an institutional framework for the financial system that adapts to structural changes such as digital technology innovations and to consider how government financial institutions should function. The Bank of Japan will hold discussions with the parties concerned, taking these issues into account.⁶⁰

⁵⁶ For more details on the basic approach applied in conducting on-site examinations in fiscal 2019, see "[On-Site Examination Policy for Fiscal 2019](#)," March 2019.

⁵⁷ In fiscal 2018, the Bank held many seminars and workshops covering a wide range of topics, such as (1) the improvement of financial technology through the adoption of IT, (2) making credit assessment more sophisticated, (3) supporting regional projects, (4) governance reforms, and (5) working-style reforms at financial institutions.

⁵⁸ For details, see "A Forecast Model for the Probability of Default Based on Granular Firm-Level Data and Its Application to Stress Testing," *Financial System Report Annex Series* (forthcoming; the Japanese version was released in March 2019).

⁵⁹ The Bank has a lender-of-last-resort function with regard to yen funds. Moreover, the Bank has a framework to allow for the extension of loans in the case of an emergency, by utilizing its foreign currency-denominated assets to extend loans in U.S. dollars and by utilizing bilateral local currency swap arrangements signed with authorities to extend loans in Australian and Singaporean dollars and the Chinese renminbi.

⁶⁰ As part of such efforts, the FSA and the Bank of Japan held meetings of the Council for Cooperation on Financial Stability in September 2018 and March 2019 to exchange views on the current situation of the financial system.

Box 1: Discontinuation of LIBOR and reform of interest rate benchmarks

In 2014, the Financial Stability Board (FSB) released a report entitled "Reforming Major Interest Rate Benchmarks" in response to the emergence of the LIBOR fixing scandal in 2012. Based on this, jurisdictions have pushed ahead with reforms in order to (1) improve the reliability and robustness of IBORs (LIBOR, TIBOR, and EURIBOR), which are existing major interest rate benchmarks that include bank credit risk,⁶¹ and (2) identify and use reference rates that are nearly risk-free (risk-free rates).

However, subsequently, in July 2017, the Chief Executive of the Financial Conduct Authority of the United Kingdom, Andrew Bailey, announced in a speech that panel banks would no longer be obliged to submit to LIBOR after 2021. As a result, the likelihood that LIBOR will cease at the end of 2021 has rapidly increased.⁶²

Since LIBOR is used as an interest rate benchmark for a variety of financial transactions, such as loans, bonds, and derivatives, discontinuation of LIBOR will have wide-ranging impacts (Charts B1-1 and B1-2).

Chart B1-1: Outstanding volume of transactions referencing key IBORs

Currency	Volume
USD LIBOR	150
GBP LIBOR	30
CHF LIBOR	6.5
EUR LIBOR	2
EURIBOR	150
JPY LIBOR	30
TIBOR	5

Note: Figures include overseas transactions.
Source: Market Participants Group, "Market Participants Group on Reforming Interest Rate Benchmarks."

Chart B1-2: Assets referencing JPY LIBOR

Asset class		Volume
Loans	Corporate loans(bilateral)	68
	Syndicated loans	75
Bonds	Floating rate notes	3
OTC derivatives	IR Swaps	2,453
	Swaption	235
	Basis swaps	197
	X-currency swaps	108

Note: 1. Figures include overseas transactions.
2. The volumes for OTC Derivatives show the outstanding notional amount.
Source: Market Participants Group, "Market Participants Group on Reforming Interest Rate Benchmarks."

For the five LIBOR currencies (U.S. dollar, yen, euro, sterling, and Swiss franc), central banks acting as secretariats have established deliberating bodies responsible for examining the reform of the respective benchmarks and the deliberations preparing for the discontinuation of LIBOR were conducted as part of the examination of the reform. The Bank of Japan became the secretariat for Japan in August 2018 and the Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks (referred to simply as the "Committee" hereafter), which comprises financial institutions, institutional investors, and non-financial corporates, was established to discuss the

⁶¹ In the case of TIBOR, reforms including integration and clarification of the calculation and determination process of the reference rates were completed in July 2017.

⁶² Reasons given by Mr. Bailey in his speech in July 2017 for why it would be difficult to continue with the publication of LIBOR despite the reform efforts were that (1) "the underlying market that LIBOR seeks to measure -- the market for unsecured wholesale term lending to banks -- is no longer sufficiently active," and (2) "panel banks feel understandable discomfort about providing submissions based on judgements with so little actual borrowing activity against which to validate those judgements." For details see Andrew Bailey, "The future of LIBOR," Financial Conduct Authority, July 2017.

appropriate choice and usage of Japanese yen interest rate benchmarks. The two major matters being examined by the Committee in preparation for the discontinuation of LIBOR are as follows:

- Transition to alternative interest rate benchmarks for reference in new contracts instead of LIBOR.
- Adaption of contractual fallback provisions for existing contracts that use LIBOR for reference, following the discontinuation of LIBOR.

A discontinuation of LIBOR would affect a wide range of business operations of financial institutions, and thereby institutional investors and nonfinancial corporations are also likely to be affected (Chart B1-3). With regard to yen interest rates, the Committee is planning to conduct a consultation around mid-2019 based on the results of the deliberations and will then publish the results of the consultation. Not only financial institutions but also other users of interest rate benchmarks such as institutional investors and nonfinancial corporations need to prepare well ahead of time for a discontinuation of LIBOR⁶³. In making preparations for business operations, taking advantage of the consultation opportunities and keeping a close eye on developments in the deliberations on reforms of interest rate benchmarks for other currencies may be helpful.

Chart B1-3: Business operations of financial institutions that could be affected by LIBOR discontinuation

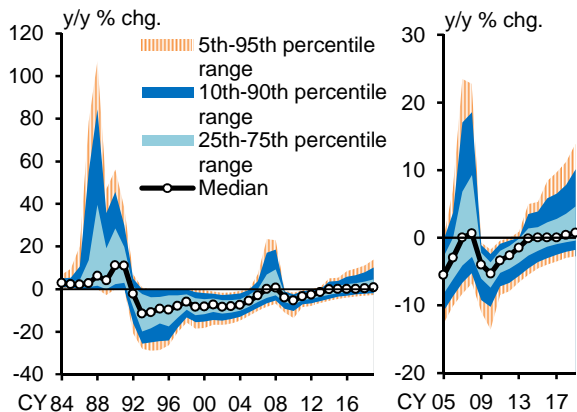
Scope of business	Examples of specific business operations that could be affected by LIBOR discontinuation
Products /transactions	Loans and sales of bonds referencing LIBOR
	Investment in bonds referencing LIBOR (e.g., subordinated debt and structured notes)
	Sales of OTC derivatives referencing LIBOR (e.g., IR and XCCY swaps)
Client relations	Explanation to clients about LIBOR discontinuation and amendment of existing contracts
Business management	Hedge accounting applied to each financial institution
	Risk management processes using LIBOR
IT systems and administrative procedures	System development (as required depending on an alternative rate to LIBOR)
	Revision of administrative procedures and company rules

⁶³ In the case of loan or other financial contracts that do not have a clause assuming a permanent discontinuation of LIBOR or where an explanation about the possibility of a discontinuation of LIBOR is not sufficiently given in advance to clients, legal risks among the parties involved may materialize. Moreover, in cases where LIBOR is used for financial institutions' internal risk management and employed in administrative procedures and IT systems, operational risks also may materialize. LIBOR is also used for hedging transactions in underlying assets such as loans and bonds through derivative transactions such as interest rate swaps, and so, depending on whether hedge accounting can continue to be applied in the case of a transition or fallback to alternative benchmarks, there is a risk that the valuation of financial assets will be affected, impacting profits.

Box 2: Developments in the real estate market

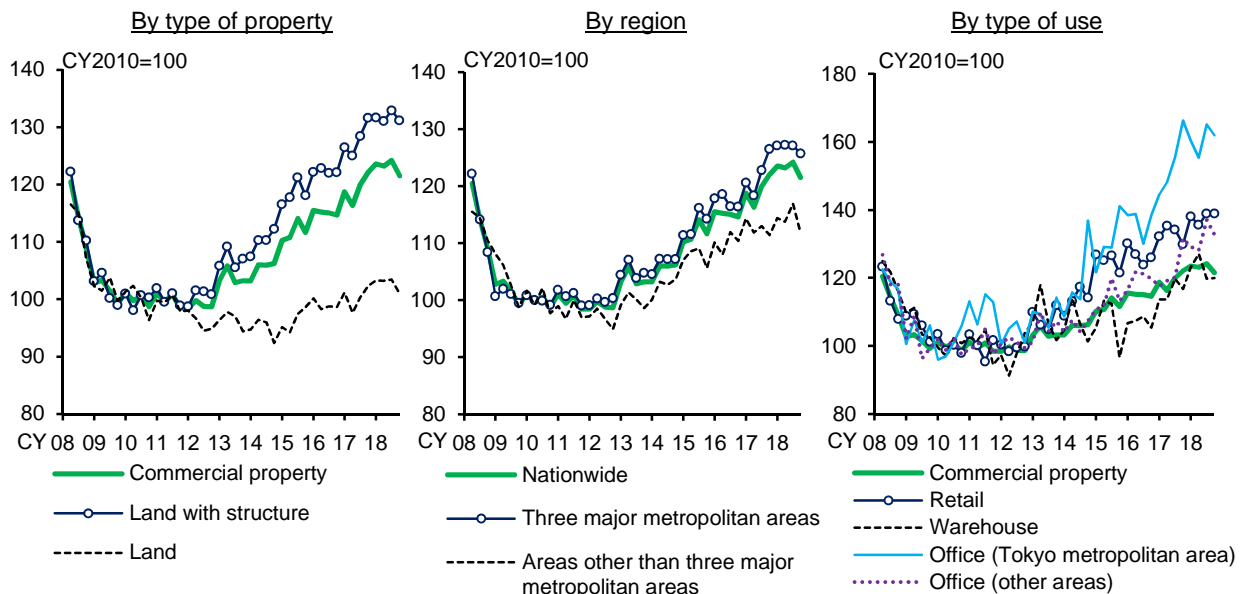
In this issue of the *Report*, a heat map of the Financial Activity Indexes shows that the *real estate loans to GDP ratio*, one of the real estate-related indicators, has turned "red," signaling overheating. In light of the experience of the bubble period from the late 1980s to the early 1990s, information on developments in the real estate market is important for assessing whether financial imbalances have built up. Thus, this box evaluates the recent developments in the real estate market by examining a wide range of indicators including prices, transactions, real estate firms' financial condition, and investors' stance.

Chart B2-1: Distribution of year-on-year rates of changes in commercial land prices



Note: 1. Year-on-year rates of changes in land prices in commercial areas.
 2. The data are based on figures at the beginning of January for each year. The latest data are as at the beginning of January 2019.
 Source: Ministry of Land, Infrastructure, Transport and Tourism, "Land market value publication."

Chart B2-2: Commercial property prices



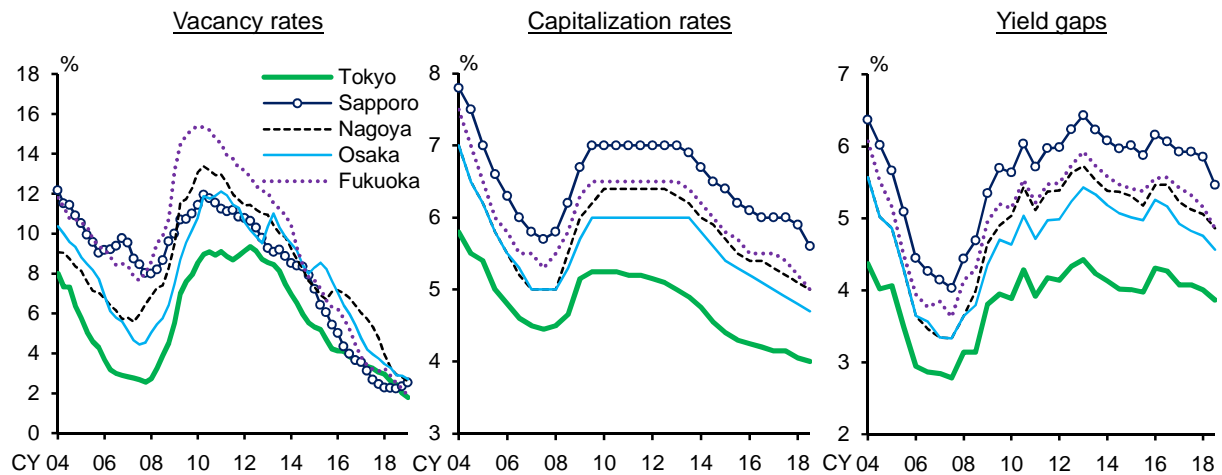
Note: 1. The middle chart covers commercial property. In the right-hand chart, "Retail," "Warehouse," "Office (Tokyo metropolitan area)," and "Office (other areas)" are the subcategories of "Land with structure."
 2. "Tokyo metropolitan area" covers Tokyo, Saitama, Chiba, and Kanagawa.
 3. "Office (other areas)" is estimated using the office price index and the number of transactions nationwide and in the Tokyo metropolitan area.
 4. Latest data as at the October-December quarter of 2018.
 Source: Ministry of Land, Infrastructure, Transport and Tourism, "Japan property price index."

First of all, the *land prices to GDP ratio* has continued to follow the same trend as in the past, and therefore indicates no nationwide overheating for land prices. Similarly, the distribution of changes in commercial land prices (appraisal prices) by location has not shown widening in the positive territory to the extent seen during the previous two real estate booms, although the distribution has

widened upward slightly (Charts III-4-4 and B2-1). However, prices of commercial real estate, which include both prices for land only and prices that include both the land and the buildings, have recently been increasing. This trend has been led by urban areas and offices in the respective breakdowns by region and type of use (Chart B2-2).

Thus, the office property market condition and investors' stance are examined below in detail. Investors' expected return has fallen below the level seen during the real estate boom around 2006-2007, as vacancy rates have fallen in many major cities. However, no excessive reduction in risk premiums is observed, as indicated by the roughly flat yield gap -- expected return minus JGB yield (Chart B2-3). In addition, inflows of funds from foreign investors have not gained momentum, although such inflows as part of investors' search for yield were observed, particularly for office properties in the Tokyo metropolitan area, until around last year (Chart B2-4).

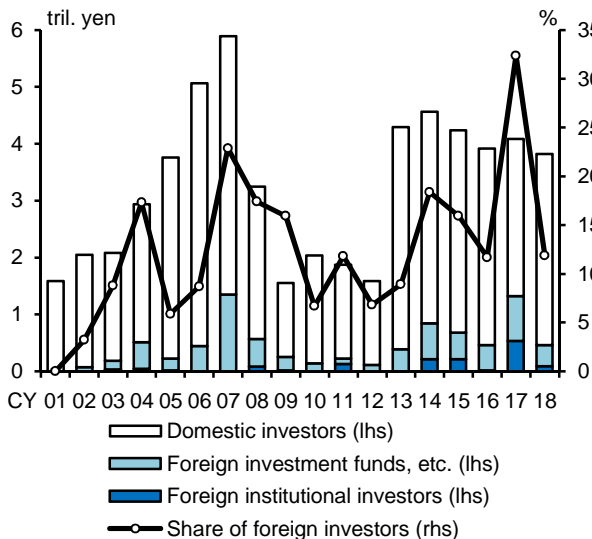
Chart B2-3: Vacancy rates and capitalization rates for office buildings



Note: Yield gaps = capitalization rates - government bond yields. The latest data in the left-hand chart are as at February 2019, and those in the middle and right-hand charts are as at October 2018.

Source: Bloomberg; Japan Real Estate Institute, "The Japanese real estate investor survey"; Miki Shoji.

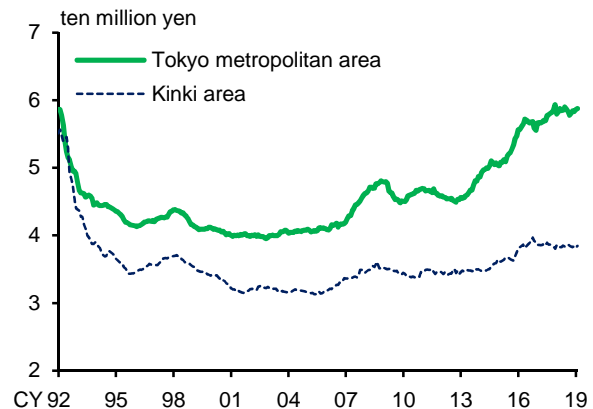
Chart B2-4: Value of real estate property acquisitions by domestic and foreign investors



Note: 1. "Share of foreign investors" is the ratio of the value of acquisitions by foreign investors to the total value of acquisitions in the domestic real estate market.
 2. "Foreign investment funds, etc." includes foreign REITs and developers.
 3. Latest data as at 2018.

Source: Japan Real Estate Institute.

Chart B2-5: Average sales prices of newly-built apartments

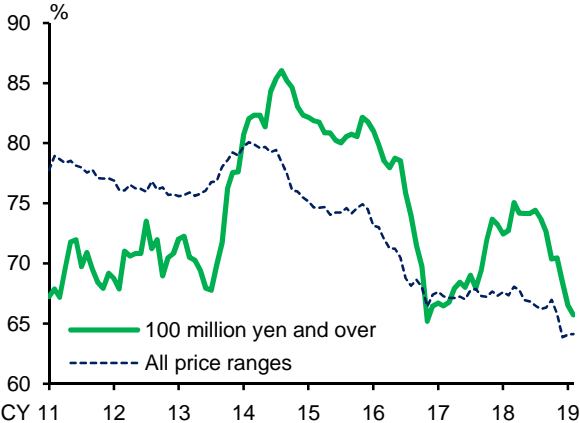


Note: 12-month backward moving averages. Latest data as at February 2019.

Source: Real Estate Economic Institute.

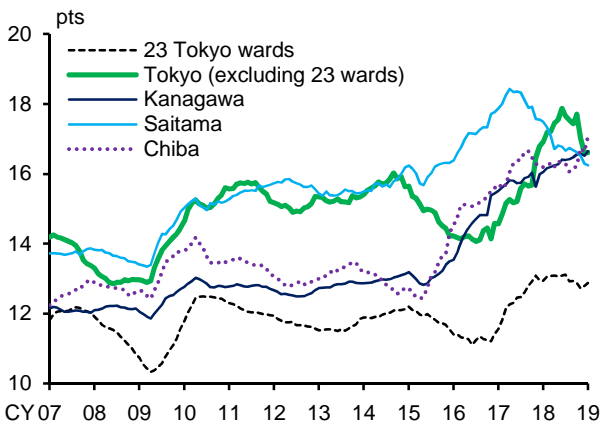
In the case of residential real estate, newly built apartment prices continued rising, especially in the Tokyo metropolitan area, but have recently been more or less flat (Chart B2-5). As a result of these persistently higher prices, sales of apartments have been sluggish, as evidenced by the relatively low percentage of newly built apartments sold. Such a weakness in the newly built apartment market has also been evident for high-priced newly built apartments, which were formerly supported by strong demand from foreign investors and wealthy individuals (Chart B2-6). The rental housing market also appears to be slackening, with vacancy rates in some areas rising, due partially to the recent increase in supply (Chart B2-7).

Chart B2-6: Percentage of newly-built apartments sold in Tokyo metropolitan area by sales price



Note: 12-month backward moving averages.
Latest data as at February 2019.
Source: Real Estate Economic Institute.

Chart B2-7: Vacancy rates for rental housing

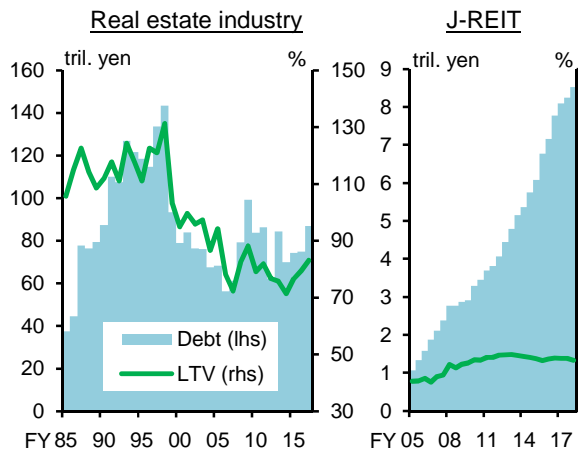


Note: Vacancy rates indicate the number of unoccupied rental units divided by the number of rental units seeking tenants. Latest data as at January 2019.
Source: TAS, "Residential market report."

Regarding the financial condition of real estate firms, J-REITs (in particular office-related ones) and large real estate firms have accumulated high levels of total liabilities, including those attributable to funding from sources other than banks, but have not increased to the levels observed during the bubble period. They have also not shown increases in their leverage (Chart B2-8). However, as financial institutions' lending stance has remained active, the distribution of growth rates of interest-bearing liabilities has recently widened upward among small and medium-sized real estate firms with relatively low creditworthiness; in fact, they have currently reached levels seen during the 2006-2007 real estate boom (Charts B2-9 and B2-10). While the default rate of real estate firms has remained low so far amid the prolonged economic expansion, its future course warrants attention because it is more prone to rise, especially for those with low creditworthiness, during an economic downturn than those of other industries (Chart B2-11). In addition, as mentioned in Section C of Chapter IV, there has been growing heterogeneity across borrowers' creditworthiness as measured by their income and asset holdings. Despite this situation, some cases have been observed where validity assessment of properties' future cash flow plans and follow-up monitoring are not sufficiently conducted. Close monitoring is warranted on the developments in borrowers' repayment capacity, including the recent rise in vacancy rates.

Finally, against the background of uncertainty over the domestic economy after the 2020 Tokyo Olympic Games and concerns over a slowdown of overseas economies, some real estate market participants have stated the view that the real estate market may have already peaked. So far, such a pessimistic outlook has not been widely adopted, because of the continuing existence of such favorable factors as ongoing redevelopment projects in metropolitan areas and strong latent demand from foreign investment funds and institutional investors (Chart B2-12).

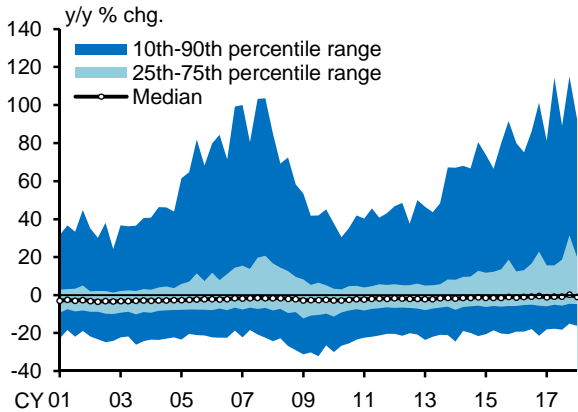
Chart B2-8: Financial leverage of real estate industry



Note: The latest data in the left-hand chart are as at fiscal 2017 and those in the right-hand chart cover financial statements of J-REITs from April 2018 to September 2018.

Source: Ministry of Finance; Nikkei Inc., "NEEDS-Financial QUEST."

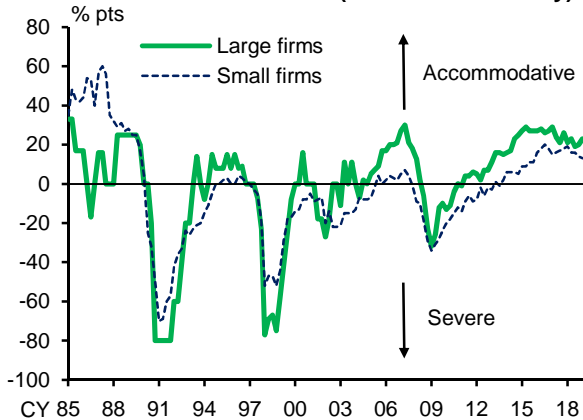
Chart B2-9: Debt financing by small and medium-sized real estate firms with low creditworthiness



Note: 1. Firms with low creditworthiness are defined as firms whose credit scores are from 0 to 42.
2. The latest data as at the January-March quarter of 2018.

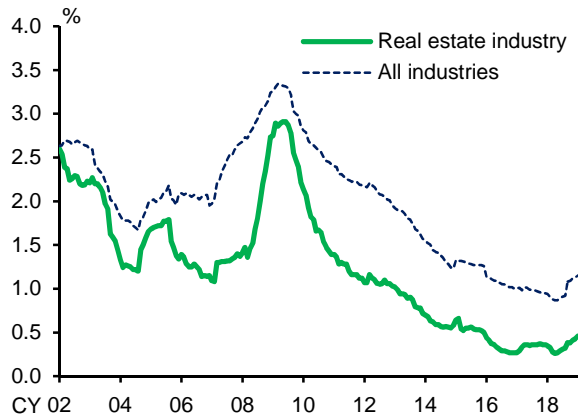
Source: CRD.

Chart B2-10: DI of lending attitudes of financial institutions (real estate industry)



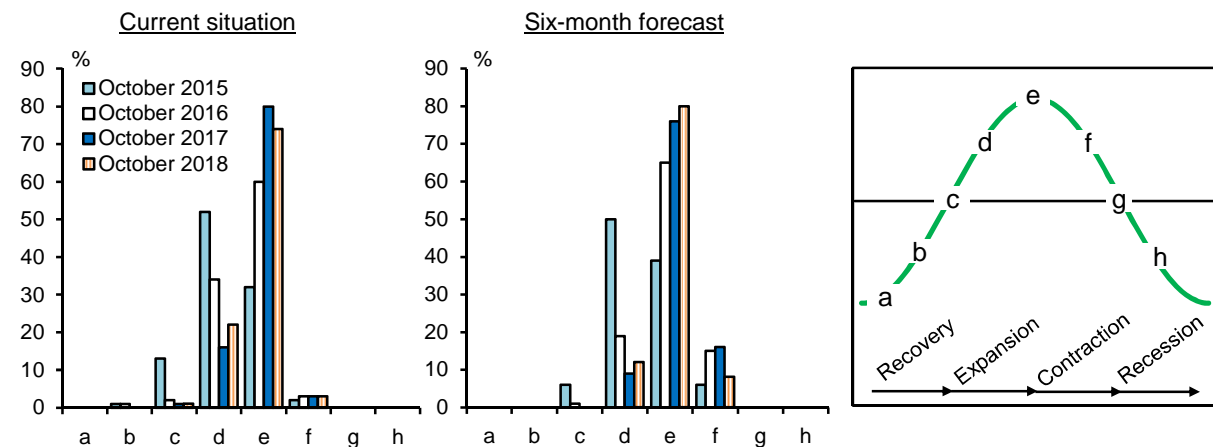
Note: Latest data as at March 2019.
Source: BOJ, "Tankan."

Chart B2-11: Default rates for real estate industry



Note: Latest data as at January 2019.
Source: The Risk Data Bank of Japan.

Chart B2-12: Real estate investors' assessment of the market cycle



Note: The charts indicate the proportion of real estate investors (including asset managers, banks, and developers) who select each given choice ("a" to "h" in the right-hand chart) as the current situation and six-month forecast of the Tokyo (Marunouchi and Otemachi) office market. The October 2018 survey covers 118 respondents.

Source: Japan Real Estate Institute, "The Japanese real estate investor survey."

Box 3: Global financial connectedness of Japanese banks

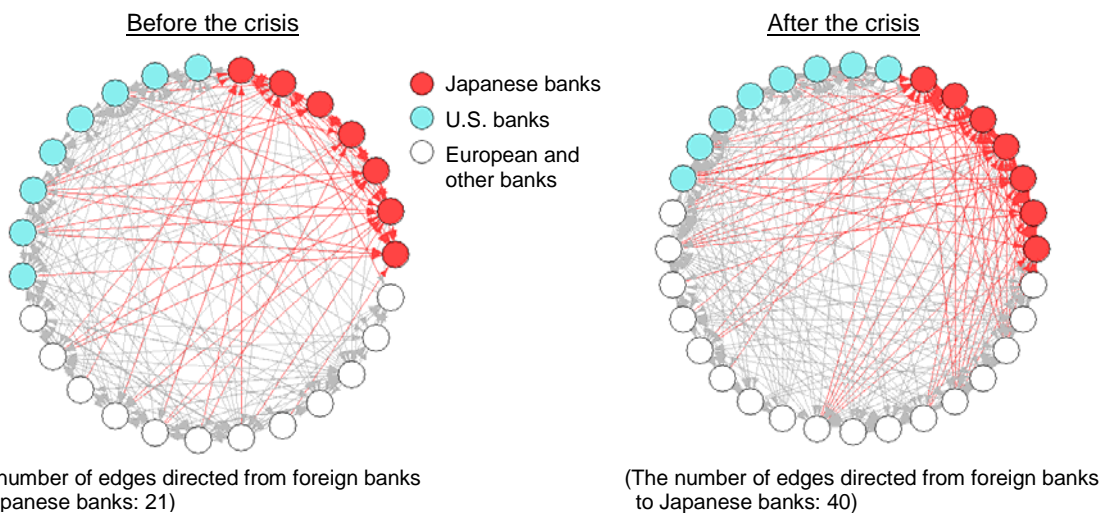
Major banks have increased their overseas exposure since the global financial crisis, and as a result, they have become more susceptible to stress originating from overseas markets than in the past. Potential effects from overseas include both direct impacts from overseas borrowers and indirect ones from overseas financial institutions, such as those due to a decrease in their capacity to supply foreign currencies to Japanese banks. This box examines how the impacts of stress originating abroad on major banks have changed between before and after the Lehman shock.

The analysis starts with a quantitative assessment of the degree of connectedness between Japanese major banks and foreign G-SIBs. Specifically, using daily stock market data, we examine how the connectedness of the volatilities of these large banks has changed between before and after the global financial crisis. An increase in such connectedness implies that stock market participants view the impacts of negative shocks as more likely to be transmitted. The estimation period is from 2003 to 2006 for the pre-crisis sample and from 2015 to 2018 for the post-crisis sample.

The estimation is based on a vector autoregressive (VAR) model.⁶⁴ This VAR model can grasp quantitatively how the stock price volatility of each bank is affected by those of other banks. To deal with the statistical problems associated with the excessive number of estimated parameters in a normal VAR model,⁶⁵ the VAR model is estimated using the LASSO (least absolute shrinkage and selection operator) approach. This approach extracts parameters with large explanatory power and estimates only the statistically important ones.

The estimated connectedness based on the above method can be visualized using a network graph (Chart B3-1). In this graph, banks are represented by nodes, and banks that were estimated

Chart B3-1: Network graphs of financial connectedness



Note: 1. The red lines are the edges directed to Japanese major banks. The edge width is proportional to the coefficient size.
2. "The number of edges directed from foreign banks to Japanese banks" is based on the banks for which data are available both before and after the crisis.

⁶⁴ On the estimation of financial connectedness using VAR models, see, for example, F. X. Diebold and K. Yilmaz, "On the Network Topology of Variance Decompositions: Measuring the Connectedness of Financial Firms," *Journal of Econometrics* 182(1), 2014: 119-134.

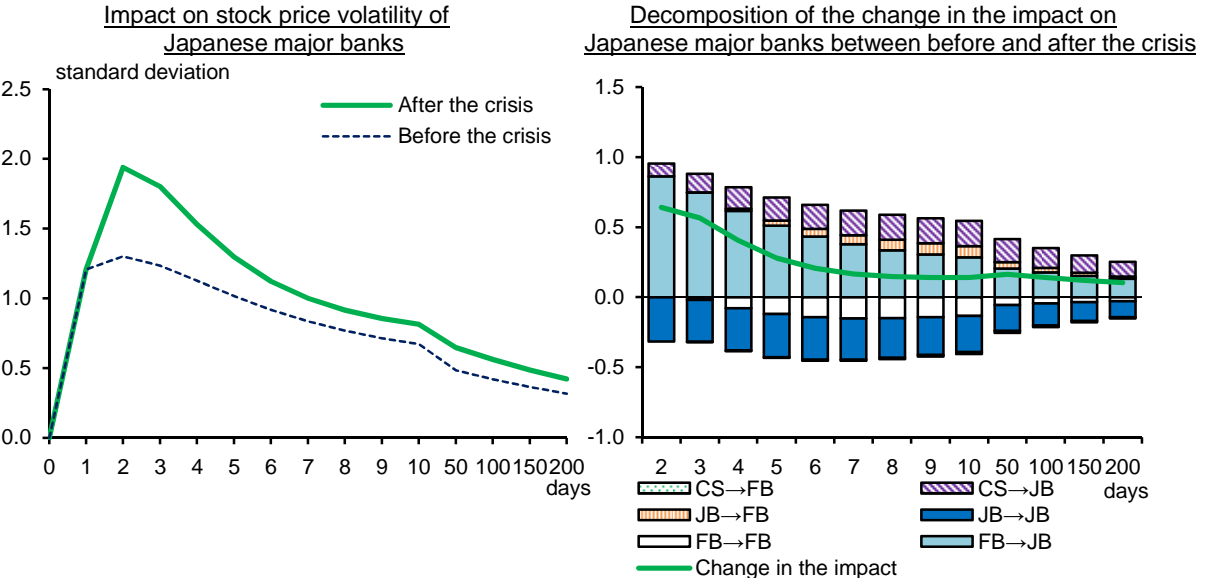
⁶⁵ Since the sample consists of around 30 banks, the number of parameters in a normal VAR model is approximately 900 even in the case where only one lag is included. Estimation errors are large when estimating an excessive number of parameters with a limited sample size.

to have statistically strong linkages are connected by edges, with the arrow pointing to the bank being affected by the other bank. A comparison between the periods before and after the crisis with its focus on Japanese major banks shows that the number of arrows pointing to Japanese major banks has increased notably after the crisis. This suggests that Japanese major banks have become more affected by foreign G-SIBs. On the other hand, the number of arrows pointing to foreign G-SIBs from Japanese major banks has not increased, suggesting that the effect of Japanese banks on foreign G-SIBs has remained basically unchanged.

Next we consider how and to what extent the change in financial connectedness revealed by the above estimation affects the transmission of shocks. For this purpose, stress in overseas credit markets is considered and its direct and indirect impacts on Japanese major banks are quantified. Specifically, credit spreads on U.S. high-yield corporate bonds are incorporated into the above-mentioned VAR model as exogenous shocks. Then, by estimating generalized impulse responses, the impact of a 200 bps rise in overseas credit spreads on Japanese major banks is compared between before and after the crisis.

The estimation results indicate that, in response to the stress originating from overseas credit markets, the stock price volatilities of Japanese major banks have increased in magnitude and length after the crisis relative to before it (Chart B3-2). Such a post-crisis increase in the negative impact on Japanese major banks is partly explained by the fact that the direct impact of a rise in credit spreads on major banks is greater; however, most of the greater impact is explained by second-round spillover effects through the increase in linkages with foreign G-SIBs. Specifically, a decomposition of the change in the impact between before and after the crisis shows that the increase in connectedness directed from foreign G-SIBs to Japanese major banks drives the amplified impact, outweighing the dampening effects from linkages between Japanese major banks and linkages between foreign G-SIBs.⁶⁶

Chart B3-2: Impact of an interest rate snapback through financial connectedness

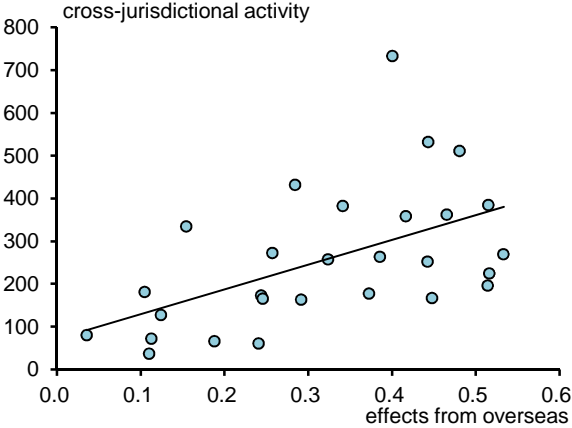


Note: 1. The data are averages of the impact on Japanese major banks for which data are available both before and after the crisis.
 2. "Before the crisis" is calculated by replacing the coefficients estimated for the period after the crisis with those estimated for the period before the crisis.
 3. In the right-hand chart, "FB" indicates foreign banks, "JB" indicates Japanese banks, and "CS" indicates credit spreads on U.S. high-yield bonds.

⁶⁶ One possible reason for the dampening effects of linkages between Japanese major banks and linkages between foreign G-SIBs is a decrease in connectedness within the same jurisdiction and/or country because of various regulatory reforms after the crisis, such as central clearing of standardized over-the-counter derivatives through central counterparties, higher capital buffer requirements for G-SIBs, and large exposure limits.

Such an increase in connectedness that amplifies the negative impact seems to be related to the expansion of Japanese major banks' overseas business. Specifically, (1) Japanese major banks have increased common exposure to foreign G-SIBs, and (2) in foreign currency funding markets, Japanese major banks have become more susceptible to the behavior of foreign G-SIBs. In fact, the estimates of the degree to which a bank is affected by overseas banks show a significant positive correlation with the bank's "cross-jurisdictional activity," which is one of the indicators constituting the G-SIB score (Chart B3-3).

Chart B3-3: Financial connectedness and G-SIB score indicator "cross-jurisdictional activity"



Note: 1. "Effects from overseas" is the sum of the coefficients on overseas banks in the estimated VAR model.
 2. "Cross-jurisdictional activity" is the simple average of the two G-SIB score indicators: cross-jurisdictional claims and cross-jurisdictional liabilities.
 Source: Office of Financial Research.

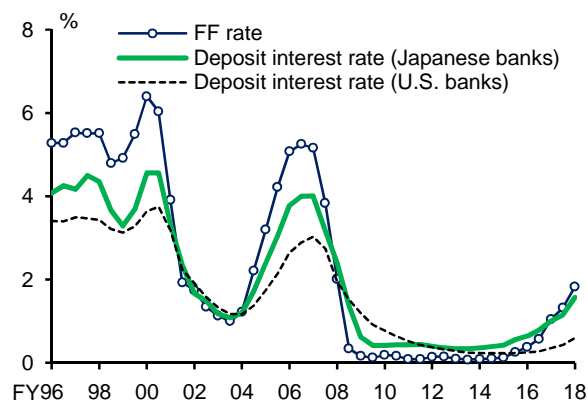
The above analysis suggests that (1) after the global financial crisis, connectedness between Japanese major banks and foreign G-SIBs has increased in a way that causes the impact of overseas banks on Japanese banks to rise; and that (2) for this reason, financial vulnerabilities originating from abroad, such as the stress in overseas credit markets considered here, are more likely to be transmitted to Japanese major banks, and thus to the domestic financial system. Therefore, it is important for major banks to carefully examine their risk management frameworks related to overseas investment and lending, keeping in mind the possibility of the transmission channels of overseas shocks continuing to grow in diversity and complexity.

Box 4: U.S. interest-rate increases and Japanese banks' U.S. dollar funding

This box, as a part of the assessment of Japanese banks' foreign currency funding liquidity risk, quantitatively examines developments in Japanese banks' U.S. dollar deposit balances and their interest rate sensitivity during the recent phases of U.S. interest-rate increases, comparing them with U.S. banks.

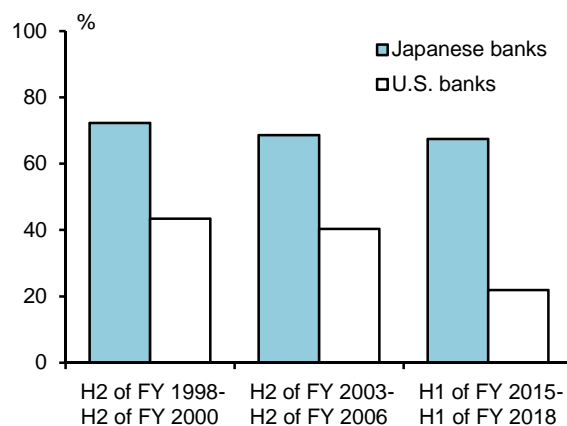
In the analysis of the "stability gap" in Chapter IV, client-related deposits are regarded as a stable source of funding, but such deposit balances are actually affected by the spread of deposit interest rates over the yields on financial assets that are close substitutes for bank deposits, such as short-term government bonds and MMFs. In general, during phases of interest-rate increases, banks raise deposit interest rates to restrain the shift of funds away from deposits to other financial assets. The degree to which banks raise deposit rates depends on the interest rate sensitivity of deposit balances, and the costs and availability of other funding tools. This can be confirmed by calculating the "pass-through rate" of market rates to deposits rates (= changes in deposit rates / changes in the federal funds rate). Banks with lower pass-through rates are considered to have more stable client bases for deposits; in other words, they can maintain their deposit balances by increasing deposit rates relatively slightly. Needless to say, because the U.S. dollar is a home currency for U.S. banks, U.S. banks start with relatively large client bases of individuals and corporations. Therefore their deposit funding has the following two favorable features: (1) transaction deposits, which have low interest rate sensitivity and are likely to be sticky, account for a large portion of their deposits; and (2) retail term deposits, which have relatively low interest rate sensitivity, account for a large part of their total term deposits. Given these features, it comes as no surprise that pass-through rates for U.S. banks are lower than those for Japanese banks. However, by comparing the pass-through rates between Japanese and U.S. banks and analyzing their time-series changes, we could gain a better understanding of the extent to which the stability of U.S. dollar funding at Japanese banks has increased.

Chart B4-1: U.S. market interest rates and dollar deposit interest rates



Note: 1. "Japanese banks" covers major banks, and deposits for these banks include those denominated in foreign currencies other than the U.S. dollar. This definition applies to all charts in Box 4.
2. Latest data as at the first half of fiscal 2018.
Source: FDIC; FRB; BOJ.

Chart B4-2: Pass-through rate to deposit interest rates during phases of interest rate hikes in the U.S.

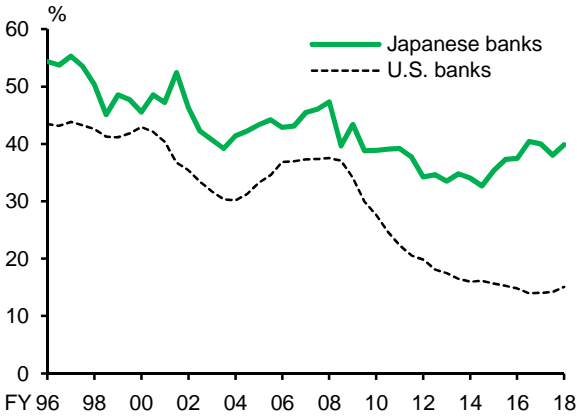


Note: Pass-through rate = change in deposit rates / change in the FF rate.
The horizontal axis shows the period in which pass-through rate is calculated.
Source: FDIC; FRB; BOJ.

First, developments in deposit interest rates in the current phase of U.S. policy rate hikes from the first half of fiscal 2015 to the first half of fiscal 2018 are compared with those in the past phases of main policy rate hikes (Chart B4-1). Based on calculations for these phases of policy rate hikes, it is observed that the pass-through rates of Japanese banks have decreased over time, albeit only

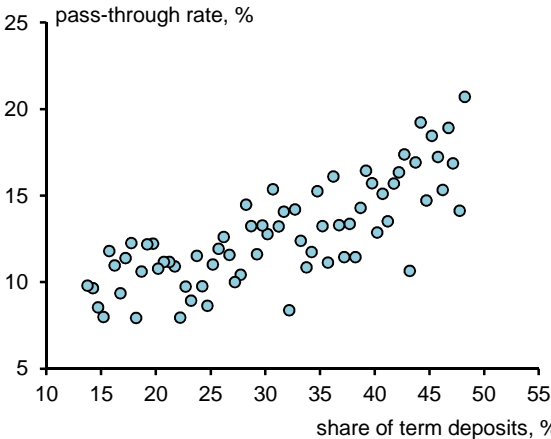
slightly (Chart B4-2). This decline in pass-through rates occurred even during the period when the required amount of funding for Japanese banks was increased substantially. This suggests that Japanese banks have been reasonably bolstering their deposit funding base so far. In contrast, U.S. banks' pass-through rates have remained quite low during the current rate-hike cycle. This is because a substantial amount of transaction deposits have stayed within U.S. banks, due to interest rates still being low. In fact, the share of term deposits among total deposits for U.S. banks has remained more or less unchanged at extremely low levels, from a historical perspective (Chart B4-3). This differs from the case of Japanese banks, which have shown a clear increase in share of term deposits from the recent extreme low. Such developments of term deposits can account for the difference in the pass-through rates between Japanese and U.S. banks. This positive relationship between a bank's share of term deposits and its pass-through rate is also confirmed by the fact that even U.S. banks with higher shares of term deposits tend to have higher pass-through rates (Chart B4-4).

Chart B4-3: Share of term deposits



Note: 1. Share of term deposits in total deposits including non-interest-bearing deposits.
 2. Latest data as at the first half of fiscal 2018.
 Source: FDIC; BOJ.

Chart B4-4: Share of term deposits and pass-through rate for U.S. banks



Note: 1. The chart indicates the average pass-through rate for each bank group defined by its share of term deposits.
 2. The share of term deposits is the average ratio of term deposits to total deposits including non-interest-bearing deposits from the July-September quarter of 2015 to the July-September quarter of 2018. Observations outside the 10th to 90th percentile range are excluded from the calculation.
 3. The pass-through rate is calculated using the data from the July-September quarter of 2015 to the July-September quarter of 2018.
 Source: FRB; S&P Global Market Intelligence.

Next, to estimate the interest rate sensitivity of deposit balances, panel estimation is conducted using data on deposit balances and deposit interest rates for individual Japanese and U.S. banks: 4,700 U.S. banks and 8 Japanese major banks during the period from the July-September quarter of 2015 to the July-September quarter of 2018 (Chart B4-5). The estimation equation is specified such that (1) from a macro perspective, interest-rate increases put downward pressure on the amount of deposits, and (2) the extent of the downward pressure on the deposits of a specific bank depends on its pass-through rate. The estimation results show that interest rate sensitivity is statistically significant and negative for all categories of banks, but is larger in absolute value for Japanese banks and the U.S. banks whose share of term deposits among total deposits is relatively large. This is consistent with the previous observation made with regard to Chart B4-4. Attention should be paid to how Japanese banks' pass-through rates will evolve in the future.

As Japanese major banks have aggressively expanded their overseas loans since the global

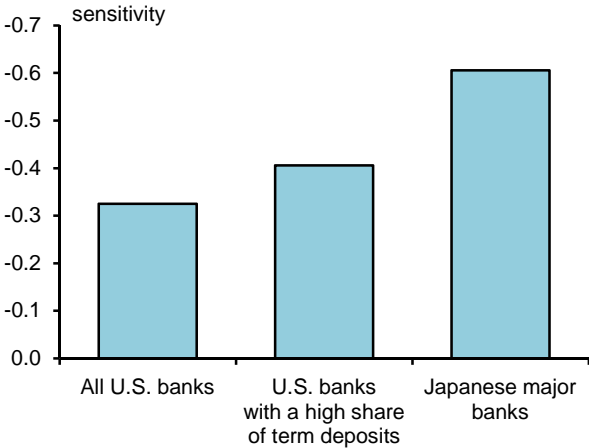
financial crisis, their required amount of foreign currency funding has increased substantially. The analysis in this box confirms that even under such an environment, Japanese banks have strived to bolster their deposit funding bases. The pass-through rates of market interest rates to deposit rates and the interest rate sensitivity of deposit balances are important factors not only for stable funding but also for profitability of overseas lending and securities investment. Thus, Japanese major banks should continue to bolster stable funding bases further.

Chart B4-5: Sensitivity of deposits outstanding to interest rates

Estimation equation

$$\begin{aligned}
 & Deposits\ outstanding_{i,t} \\
 & = \alpha * (FF\ rate_t - Deposit\ interest\ rate_{i,t}) \\
 & + \beta * Nominal\ GDP_t + \gamma + Fixed\ effect_i + \varepsilon_{i,t}
 \end{aligned}$$

Sensitivity to interest rates (α)



- Note: 1. The estimation period is from the July-September quarter of 2015 to the July-September quarter of 2018.
 2. Subscripts i and t in the estimation equation denote bank index and time period, respectively. The logarithm is taken for deposits outstanding and nominal GDP. A lagged explanatory variable is used in the estimation as an instrumental variable.
 3. "Banks with a high share of term deposits" indicates those for which the share is higher than the medium value of all observations.

Box 5: Stock market based evaluation of regional banks' profitability and financial soundness: P/B ratios and SRISK

This box quantitatively examines the reasons why the P/B ratios of listed regional banks and their holding companies have continued to decline for a prolonged period (Chart V-3-1). Moreover, using stock price information, this box estimates SRISK, an indicator measuring financial institutions' future stress resilience, in order to analyze the stock market view on the effects of declining profitability on their future financial soundness (Chart V-3-3).

According to standard stock valuation models, a firm's P/B ratio is determined by the stock market participants' view on the firm's future ROE relative to the cost of capital.⁶⁷ Based on this idea, this box presents a regression analysis that sets financial institutions' P/B ratios as a dependent variable. Following previous studies,⁶⁸ the regression chooses as the independent variables a range of variables that are likely to predict the future ROE and the cost of capital in addition to the ROE on a net income basis. Specifically, these variables include (1) bank-level financial indicators such as net interest income, net non-interest income, realized gains/losses on securities holdings, credit risk (unexpected losses) ratios, and net asset ratios,⁶⁹ (2) the number of borrowing firms as a structural factor determining the underlying demand for financial intermediation services; and (3) macroeconomic variables such as the unemployment rate and market interest rates (5-year JGB yields) as cyclical factors affecting bank profits. The analysis focuses on listed regional banks for which stock prices and financial indicators are available for the estimation period of fiscal 2003 to fiscal 2017 (63 banks as of fiscal 2017).

Chart B5-1: Estimation results for P/B ratios of regional banks

Explanatory variables	Dependent variable: P/B ratio
ROE	2.70 ***
Net interest income (past 3 fiscal years)	1.49 ***
Net non-interest income	3.29 ***
Realized gains/losses on securities holdings	1.17 ***
Number of borrowing firms in home prefecture	1.69 ***
Unemployment ratio in home prefecture	-0.11 ***
5-year JGB yield	0.11 ***
Credit risk ratio	-2.98 ***
Net asset ratio	7.95 ***
Adj.R2	0.77
S.E.	0.15

- Note: 1. The estimation period is from fiscal 2003 to 2017 (excludes observations with losses). The estimation includes fixed effects.
2. "Net interest income," "Net non-interest income," and "Realized gains/losses on securities holdings" are the ratios to net assets. "Number of borrowing firms" and "Unemployment ratio" are the prefecture-level data based on where banks' headquarters are located. "Credit risk ratio" is the ratio of unexpected losses to loans outstanding. The unexpected losses are calculated by using average default rates of the past 3 years. "Net asset ratio" is the ratio to total assets.
3. *** indicates statistical significance at the 1 percent level.

The estimation results yield the following three observations (Chart B5-1). First, improvements in the long-term trend in net interest income and an increase in net non-interest income have a positive impact on banks' P/B ratios. However, temporary profits such as realized gains on

⁶⁷ The cost of capital can be regarded as the expected rate of return required by shareholders when a firm makes investments. In theory, its P/B ratio will be greater than 1 if investors expect the firm to achieve an ROE in the future that exceeds the cost of capital; conversely, its P/B ratio will be less than 1 if investors expect the firm to realize an ROE that falls below the cost of capital.

⁶⁸ See, for example, Bilyana Bogdanova, Ingo Fender, and Előd Takáts, "The ABCs of bank PBRs: What drives bank price-to-book ratios?" *BIS Quarterly Review*, March 2018.

⁶⁹ To capture somewhat longer-term variation in net interest income, figures for three periods -- the current period and the two preceding periods -- are used as independent variables.

securities holdings have only a small impact. Second, improvements in the cyclical factors such as a decline in the unemployment rate and a rise in interest rates have a positive impact on P/B ratios. Meanwhile, structural factors, such as the decline in the number of borrowing firms, have a negative impact on P/B ratios as these factors put downward pressure on the demand for financial intermediation services. Third, improvements in banks' financial condition such as lower credit risk ratios and higher net asset ratios have a positive impact on P/B ratios, primarily by restraining capital costs. As mentioned in Section C of Chapter V, regional banks' P/B ratios have continued to decline even though their ROE in recent years has remained at a relatively high level from a historical perspective. Quantitative analysis shows that the decade-long decline in P/B ratios is explained mainly by the downward trend in net interest income, the secular decline in the number of borrowing firms, and the prolonged low interest rate environment. The developments in these variables seem to have led to market participants' pessimistic view on regional banks' future profitability (Charts V-3-1 and V-3-2).

Next, we investigate why the SRISK of regional banks increased and then remained high as seen in Chapter V by quantitative decomposition. Using the correlation between an aggregate stock price and an individual financial institution's stock price, SRISK measures the decline in the stock market value of the financial institution that would occur in the event of an overall stock market collapse. Then SRISK estimates the financial institution's capital shortfall by regarding this decline in the stock market value as the decline in capital.⁷⁰ Specifically, SRISK is determined by the following two factors: (1) the size of the shock to the stock price of an individual financial institution in the event of stress (Long-Run Marginal Expected Shortfall, LRMES), and (2) the financial leverage on a total market value basis (Leverage).⁷¹ The leverage on a market value basis is given by the ratio of the book value of debt to net assets divided by the P/B ratio:

SRISK of an individual financial institution (=capital shortfall in the event of stress)

$$= \alpha * \text{Size of shock to the individual stock price in the event of stress (LRMES)} \\ + \beta * \text{Financial leverage on a total market value basis (Leverage)} + \gamma$$

The above equation implies that the larger its SRISK is, (1) the larger is a financial institution's correlation with the market overall and hence the larger is the marginal decline in its stock price in the event of stress (LRMES), and (2) the larger is a financial institution's value of debt relative to its capital level (Leverage) where its stock market value is used as its capital.

Estimated SRISK (relative to total assets) for Japanese regional banks gradually rose from the mid-2000s onward and has remained high in recent years (Chart B5-2). LRMES, one of the two determinants of SRISK, has remained more or less unchanged in recent years, albeit with some fluctuations. Leverage, the other determinant for SRISK, rose substantially in the latter half of the 2000s and since then has remained high, albeit also with some fluctuations. The developments of

⁷⁰ SRISK can also be regarded as a form of stress testing based on stock market based evaluation. For details on SRISK, see Viral Acharya, Robert Engle, and Matthew Richardson, "Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks," *American Economic Review*, 2012.

⁷¹ LRMES takes into account the correlation between an individual financial institution's stock price and the overall stock prices. Here, following previous studies, LRMES is calculated as the percentage decline in a financial institution's stock price when the entire stock market price falls by 10 percent or more in 30 business days.

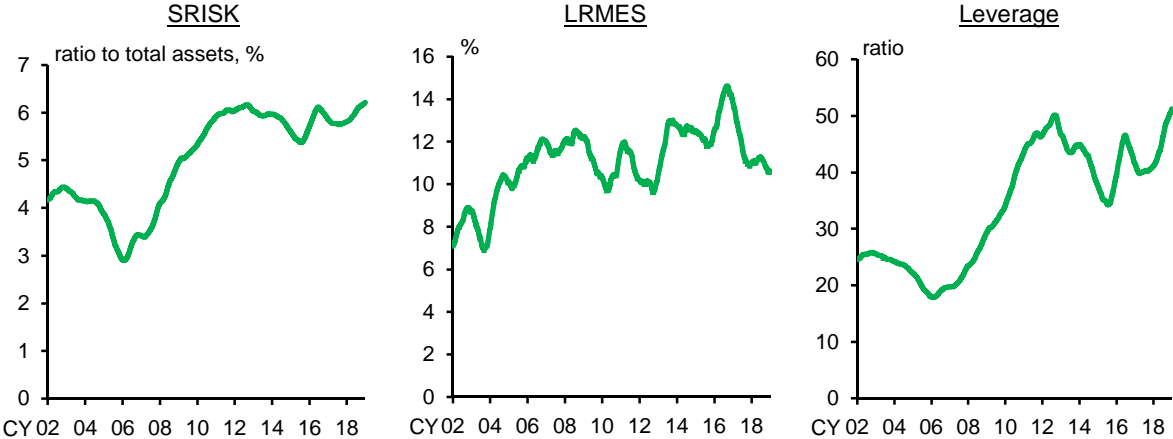
LRMES = Percentage decline in a financial institution's stock price when the entire stock market price falls

Leverage is calculated from a financial institution's stock market value and total debt as follows:

Leverage = (Total stock market value + Total debt) / Total stock market value = 1 + (Total debt / Net assets) / (P/B ratio)

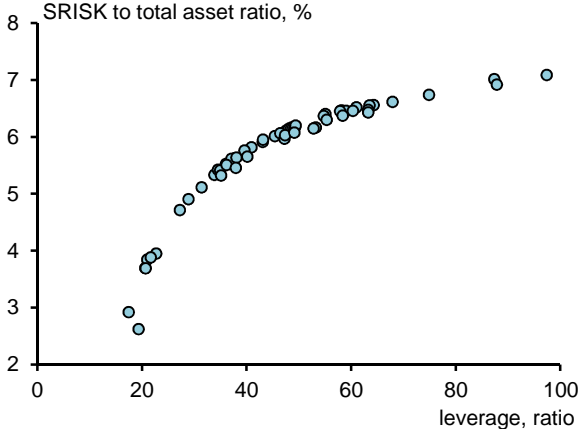
these two factors indicate that long-term movement in SRISK is mainly determined by Leverage. In fact, at the bank level, there is a clear positive correlation between SRISK and Leverage: as a financial institution's Leverage increases, its SRISK tends to become larger (Chart B5-3). Furthermore, long-term developments in Leverage can be decomposed into the contributions of the debt-to-net asset ratio on a book value basis (financial leverage) and the P/B ratio. Such a decomposition indicates the main reason for the high level of Leverage in recent years as being sluggishness of the P/B ratio (Chart B5-4).

Chart B5-2: SRISK of regional banks and its components



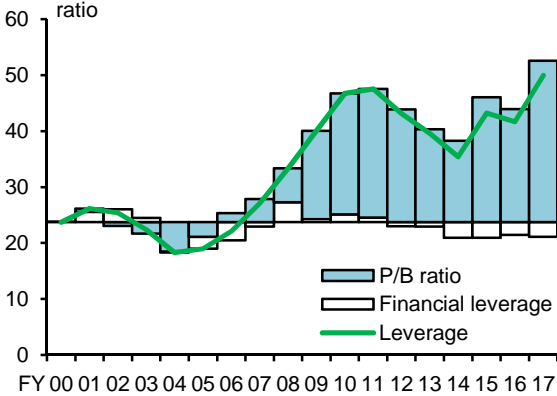
Note: 1. The chart indicates the median value among regional banks smoothed by using 200-day centered moving average for each indicator.
 2. Latest data as at end of 2018.
 Source: Bloomberg; BOJ.

Chart B5-3: SRISK and leverage of regional banks



Note: Average of 2018.
 Source: Bloomberg; BOJ.

Chart B5-4: Decomposition of leverage



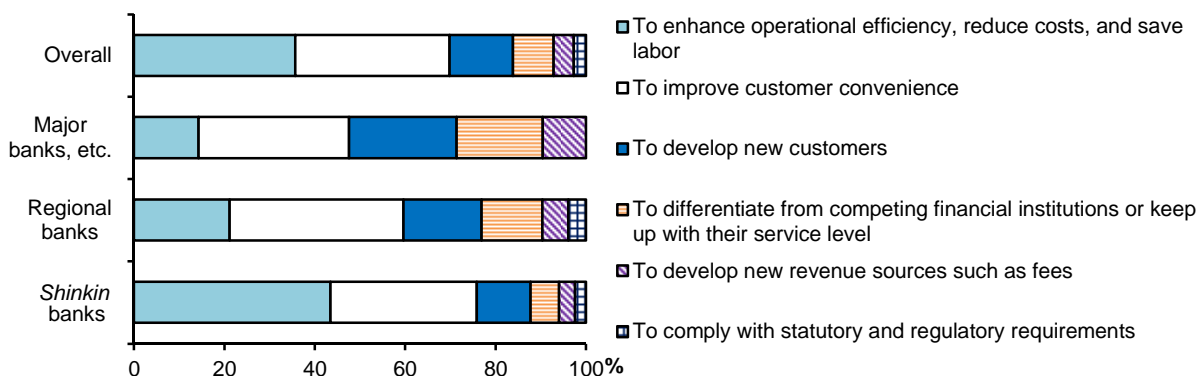
Note: The chart indicates factor contribution to changes in leverage starting from fiscal 2000. Approximation errors are included in the "P/B ratio" contribution. Median value among regional banks.
 Source: Nikkei Inc., "NEEDS-Financial QUEST"; BOJ.

Box 6: Financial institutions' use of IT and data: its directions and challenges

In dealing with the challenges and opportunities provided by digitalization, it is important for financial institutions to strategically address the following questions: (1) in what fields to utilize the remarkable recent advancement in digital technology and the big data that they have accumulated on customers; (2) how to combine these fields with the financial services they offer; and (3) how to overcome the related management challenges facing them (see Box 7). To find out how banks plan to address these issues, the Bank of Japan conducted a questionnaire survey of banks and *shinkin* banks about their efforts to utilize IT and data.⁷² This box presents some of the key findings.

First, with regard to financial institutions' objectives for IT and data utilization, clear differences by type of bank stand out. The most frequent answers overall for a question regarding the most important goals and effects are (1) "to enhance operational efficiency, reduce costs, and save labor," (2) "to improve customer convenience," and (3) "to develop new customers", in that order (Chart B6-1). However, by type of bank, "to develop new customers" and "to differentiate from competing financial institutions or keep up with their service level" make up relatively large shares of the replies for "major banks, etc.," which also includes Internet banks and the like. In contrast, for *shinkin* banks, "to enhance operational efficiency, reduce costs, and save labor" makes up the largest share. While improving customer convenience is high on the management agenda of all types of banks, "major banks, etc.," is active in using IT and data to increase market shares in new markets, whereas regional financial institutions tend to prioritize the use of digital technology as a cost reduction measure.

Chart B6-1: Goals and effects of IT and data utilization



Note: The most prioritized goals and effects of IT and data utilization. Percentage shares.

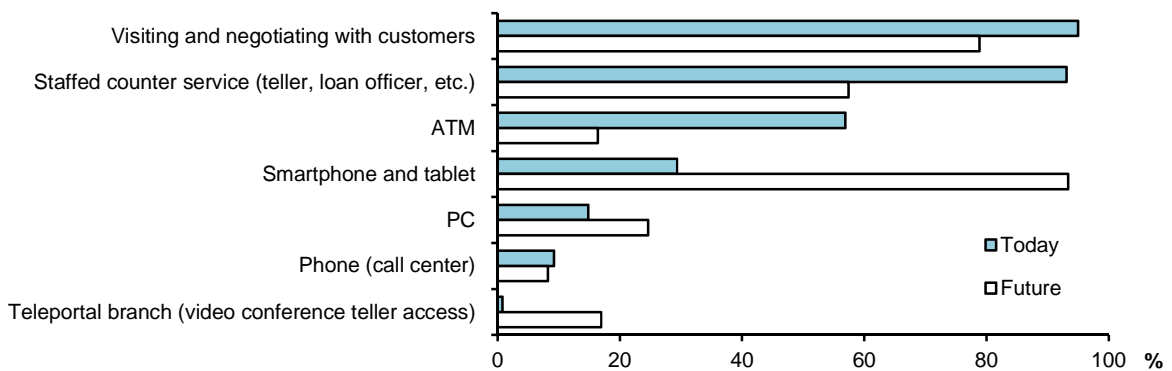
Source: BOJ.

Second, the survey results suggest that financial institutions are planning major changes in future business operations, based on advances in the utilization of digital technology. A comparison of important channels to contact customers between today and in the future shows that the roles of staffed counter services and machines such as ATMs are expected to decrease substantially and a clear trend toward switching to the use of smartphones and tablets can be observed, as one would naturally expect from financial institutions' recent efforts (Chart B6-2). Another feature is that no major change in the emphasis on "visiting and negotiating with customers" is expected in the future. Together, these results suggest that financial institutions are planning to enhance their operational efficiency using IT and data and to shift management resources such as personnel to

⁷² The survey covered a total of 378 major banks, including regional banks, second-tier regional banks, *shinkin* banks, and internet banks, all of which responded.

such areas as face-to-face relationships with customers and consulting and advisory services.

Chart B6-2: Important channels for contacting customers



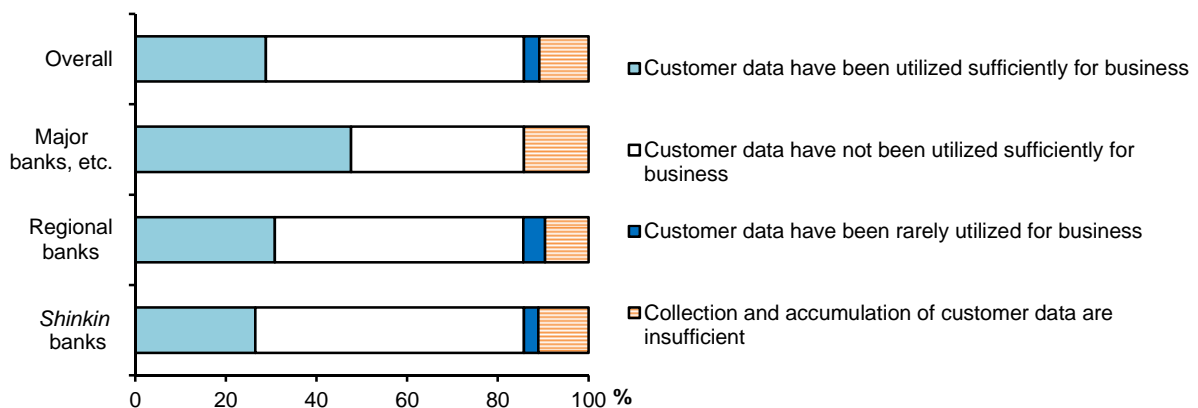
Note: Three customer channels regarded as most important today and in the future when utilization of IT and data have advanced. Percentage share of all financial institutions.

Source: BOJ.

Third, little progress has been observed in effective utilization of customer data, remaining a major management challenge, especially for regional financial institutions. The shares of financial institutions that replied "customer data have been utilized sufficiently for business" are less than 50 percent for "major banks, etc.," and only slightly more than 20 percent for regional banks and *shinkin* banks (Chart B6-3).

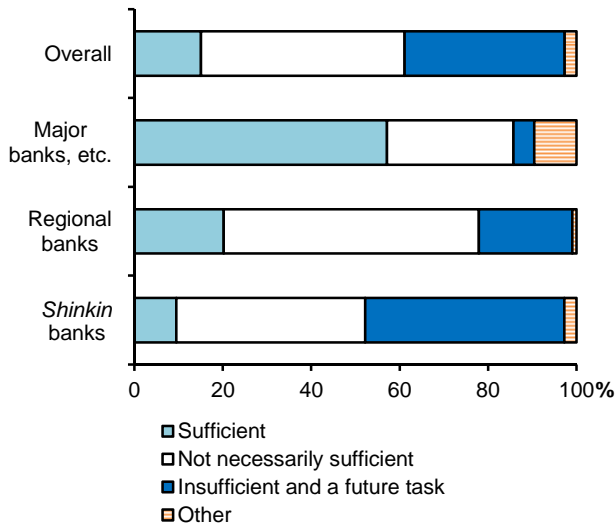
The reasons most cited by financial institutions for this are (1) a lack of human resources and know-how and (2) IT systems constraints regarding functionality and interconnectivity. These two issues are closely related. A majority of regional banks and *shinkin* banks replied that coherence between IT investment plans and personnel was either "not necessarily sufficient" or "insufficient and a future task" (Chart B6-4). Financial institutions cannot make effective IT investment unless they can secure the necessary IT personnel as planned. In addition, in implementing IT investment plans, it is necessary to arrange in advance a change in the allocation of management resources, such as the reassignment of staff, while assessing the effects of such investment. Regarding fields where human resource development will be needed in the future, the survey results show that "IT security" is ranked above "planning and development of strategic utilization of IT and data" and "data management and analysis" (Chart B6-5). Financial institutions appear to be strongly aware of the importance of cybersecurity and information management, and this importance is expected to increase further as part of risk management efforts in line with their progress in IT implementation in the future.

Chart B6-3: Utilization of customer data in business



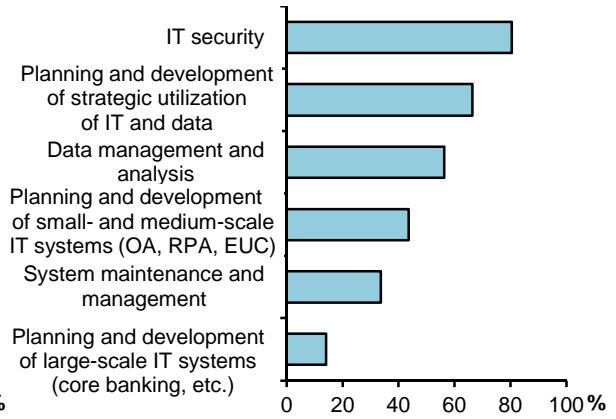
Source: BOJ.

Chart B6-4: Coherence between IT investment plans and personnel



Source: BOJ.

Chart B6-5: Fields where human resource development is needed



Note: Three fields where human resource development are most needed, based on IT and data utilization policy. Percentage share of all financial institutions.
Source: BOJ.

In light of the survey results, the Bank of Japan will encourage financial institutions to respond to the changes in risk profiles associated with IT and data utilization and business process reengineering through its on-site examinations and off-site monitoring, as well as seminars on various topics. It will also continue to support financial institutions' proactive efforts to improve operational efficiency and secure new revenue sources.

Box 7: The digitalization of retail payments and its impact on the banking industry

Advances in digital technology in recent years have wide-ranging impacts on people's lives and the business activities of firms. The banking industry has been no exception, with the environment surrounding the industry changing dramatically. Banking services can be classified into three business fields: (1) deposit and lending; (2) payment and settlement; and (3) financial transaction and asset management. Each field can be further divided into two customer fields: retail customers and wholesale customers. In all the three business fields, changes can be seen particularly on the retail side (Chart B7-1).⁷³ There are two reasons for this. First, in retail, the variety and form of services that could be offered traditionally have been limited because the per transaction amounts tend to be small and also transaction costs tend to be relatively high compared to wholesale ones. This means that retail transactions have much room for cost saving and service improvements from the use of digital technology. Second, new profit opportunities have opened up through the effective use of the information obtained from the large number of retail transactions, made possible as a result of the rapid increase in information processing capacity accompanying technological progress. These appear to have encouraged banks to embark on a variety of initiatives. For similar reasons, an increasing number of fintech and big tech companies have been making efforts to enter the field of financial services, including banking services, either alone or in partnership with existing financial institutions. For the management of established banks, digitalization could be an opportunity as well as a threat.

Chart B7-1: Digitalization in banking

Deposit and lending		Payment and settlement		Financial transaction and asset management	
Retail	Wholesale	Retail	Wholesale	Retail	Wholesale
Cash management service		Remittance & settlement system		Online trading / Electronic trading	
Crowdfunding		P2P remittance		Algorithmic trading / HFT	
Marketplace lending		Mobile wallet		Copy trading	
Mobile banking		E-money		Robo-advisor	
Credit scoring					

Source: BOJ.

An area that has seen much activity related to digitalization is the field of retail payments in particular. The rest of this box provides an overview of digitalization-driven changes in the environment for retail payments and how these will affect the banking industry.⁷⁴

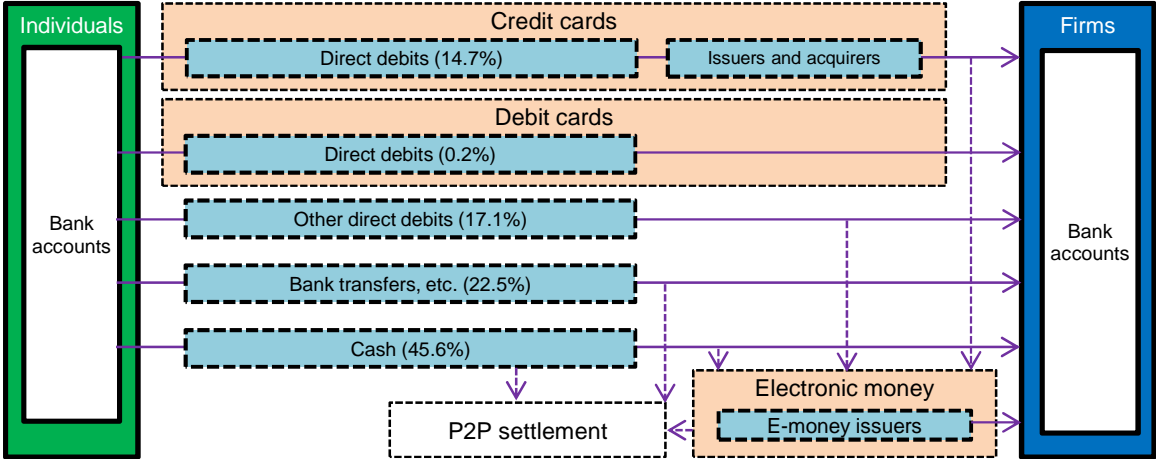
In Japan, the share of cash in retail payments has been particularly high, although various means of retail payment have been used. One reason for this is that banks have built extensive branch and ATM networks, providing highly convenient cash payment services linked to deposits at low

⁷³ In this box, banks include cooperative financial institutions (*shinkin* banks, credit cooperatives, agricultural cooperatives, fishery cooperatives, etc.), and retail includes small and medium-sized business customers.

⁷⁴ For recent developments in retail payments, see, for example, Bank of Japan, *Payment and Settlement Systems Report*, March 2019. The annex to the *Payment and Settlement Systems Report* (available only in Japanese) released by the Payment and Settlement Systems Department of the Bank in September 2018 examines the current situation of cashless payments.

cost. Also, even when payment methods other than cash are used, they ultimately involve bank accounts (Chart B7-2). For example, credit card payments are settled between bank accounts. In the case of electronic money, users prepay for issuer companies mainly in cash and the issuers transfer account balances to the companies that receive the electronic money.⁷⁵ In this sense, it can be said that bank deposits have served as a "hub" for retail payments.

Chart B7-2: Bank deposit and retail payment



- Note: 1. Figures in parentheses indicate the share of the payment values at the three major banks in 2017 of a total of about 85 trillion yen.
 2. Direct debits are financial transactions in which depositors allow their banks to transfer funds regularly and automatically to predetermined firms, on their request.
 3. "Other direct debits" includes utility charges, rent, mortgage payment, etc.

Source: Financial Services Agency; BOJ.

Meanwhile, many of the cashless payment services that have started recently link new interfaces based on QR codes with conventional existing payment types such as electronic money (prepayment), debit cards (payment at the time of transaction), and credit cards (deferred payment). These services are not substitutes for the hub function of bank deposits mentioned above, so their adoption would not greatly change payment functionality or types from the consumer's perspective. Instead, they can be regarded as an extension of existing business models by incorporating elements attached to payments such as (1) cost reductions for member stores, (2) customer retention by the circulation of electronic money and reward points, and (3) the collection of a wider range of payment data, marketing employing such data (sales promotions through advertising, coupons, etc.), and the extension of small loans.

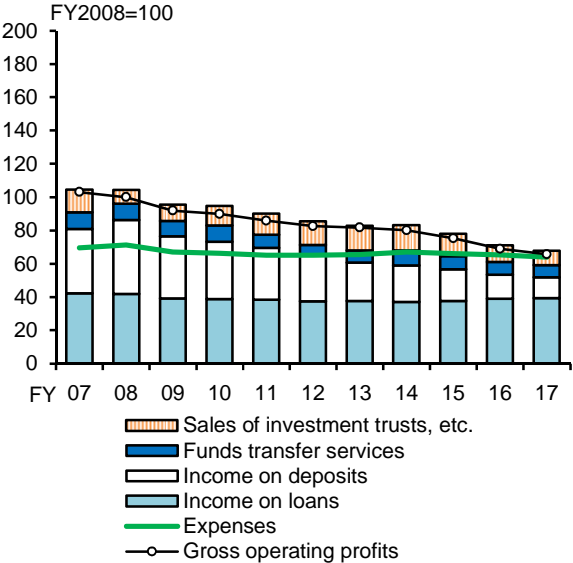
How will these new developments in the field of retail payment affect banks' profits? It is difficult to fully answer this question at the moment because of the various possible directions that change could take. For example, if the introduction of new means of cashless payment leads to an increase in circulation of electronic money and reward points, and if bank deposits become less involved in this process, then banks' income from remittance charges for retail payments could decline. However, at present, the contribution of retail payments to banks' profits is generally not large (Charts B7-3 and B7-4). The reason for this is that banks have provided account services that impose very little of the costs on retail customers by focusing on the benefits of account transactions from the perspective of their overall banking operations, such as the income they can earn on deposits as well as securing liquidity and a customer base.⁷⁶ Therefore, the extent to

⁷⁵ In this box, electronic money indicates electronic payment methods based on prepayment.

⁷⁶ Income on deposits is the income gained by raising funds through deposits at relatively low rates and investing it at market rates. It consists of the income that banks earn on the difference between deposit interest rates and market ones (the deposit spread) of different maturities and the income from the long-term investment of such highly sticky liquid deposits.

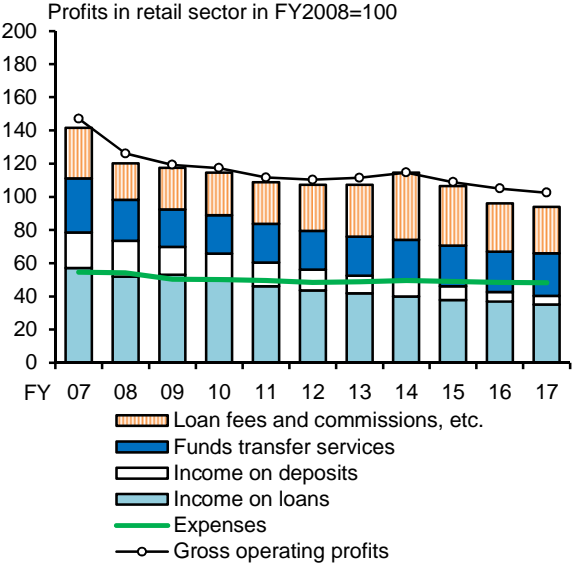
which such developments could directly push down bank profits through this channel is likely to be limited for the time being.

Chart B7-3: Profits in retail business sector among major banks



Note: Based on gross operating profits.
Source: BOJ.

Chart B7-4: Profits in wholesale business sector among major banks



Note: Based on gross operating profits.
Source: BOJ.

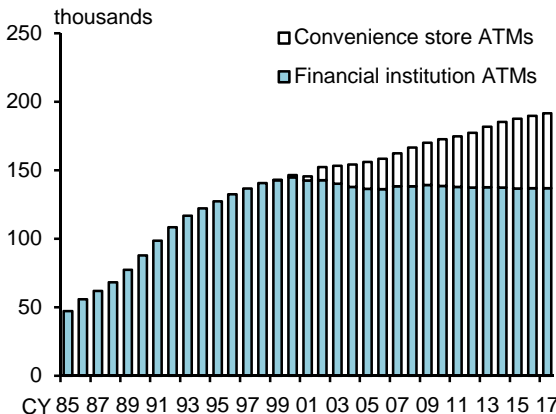
Another possibility is that banks can tie up with cashless payment firms and, in return for allowing the firms to access the banks' customer base and deposit base, the banks can earn commission fees from member stores and account withdrawal fees. In addition, such tie-ups allow banks to offer business support to firms that hold the banks' accounts and could lead to an improvement in individual customer convenience. However, as long as these services are offered through tie-ups, the potential gains arising from businesses that focus on payment-related opportunities, such as the collection and use of large-scale payment data, could easily fall not to the banks but mostly to the tie-up firms. For this reason, some banks have strived to expand their business models on their own by offering new cashless payment means or by building a more efficient and convenient new settlement infrastructure. If these efforts bear fruit, they may help to raise banks' profits. However, it is possible that competition in this business, including competition with entrants from other industries, will intensify further in the future.

Banks have become more aware of the need to improve the profitability of their deposits, which have functioned as retail payment hubs. As mentioned above, banks have not charged retail customers for the full costs of account services on the assumption that the costs can be covered by income on their deposits. However, under the prolonged low interest rate environment, income on deposits has fallen substantially (Chart B7-3). This being the case, the number of banks with their retail business falling into the red has increased, and the burden of providing deposit services, including maintaining branch and ATM networks, is increasing.

Against this background, banks are striving to reduce the costs of offering deposit services. For example, an increasing number of banks have been making efforts to improve the efficiency of traditionally paper-based tasks through the use of digital technology (AI, robotic process automation, optical character recognition, etc.). In addition, efforts to use customer incentives and control the amount of clerical work are also widely underway. Such efforts include the revision of fee structures for services that can be dealt with either via Internet banking, at ATMs, or at bank counters so as to guide customers to the lower-cost option. These also include the introduction of

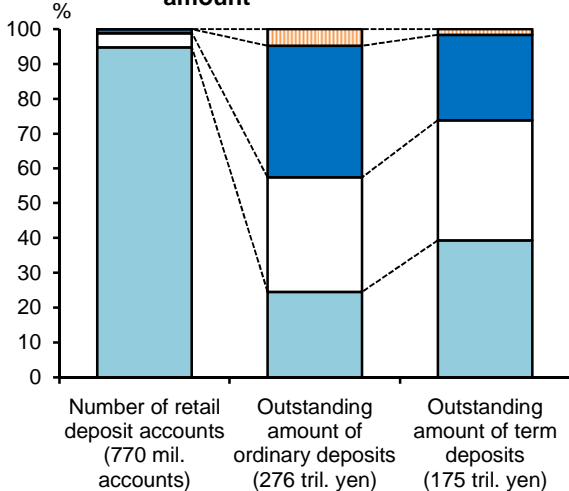
fees for services where needs are unique to the type of customer, such as currency exchange. Moreover, reviews of branch and ATM networks are widely underway, with banks in recent years making intensive efforts to revise their branch and ATM networks in response to a decrease in the demand for services, which includes a decrease in bank teller operations due to the emergence of new customer points of contact (Internet banking, convenience stores, etc.) and a decrease in the demand for cash due to the spread of cashless payment means such as credit cards and electronic money. Recently, banks have also made efforts to share ATMs with other banks and to switch from proprietary ATMs to jointly operated ATMs. The pace of decline in the number of ATMs (excluding convenience store ATMs), which so far has been moderate, may accelerate in the future (Chart B7-5).

Chart B7-5: Number of ATMs in Japan



Source: Center for Financial Industry Information Systems; Published data of each firm; BOJ.

Chart B7-6: Distribution of retail deposits by amount



Legend:
 ■ Over 100 mil. yen
 ■ 10 to 100 mil. yen
 ■ 3 to 10 mil. yen
 ■ Less than 3 mil. yen

Note: Figures in parentheses indicate the total number of accounts or the total outstanding amount by type of retail deposits.

Source: BOJ.

The spread of cashless payments has the potential to reduce the need to maintain extensive branch and ATM networks and to ease the burden of providing deposit services, but considerable uncertainty remains regarding the extent to which cashless payments will spread, given that not all people accept the use of digital technology to the same degree. Banks so far seem to have maintained a stance of avoiding measures to improve the profitability of deposit service operations that might affect a wide range of users. For example, banks have been reluctant to impose costs on accounts with small deposits, despite the fact that a smaller amount of deposits means a larger relative cost burden (Chart B7-6). While this decision by banks seems to reflect their awareness of their social role in retail payments, including the circulation of cash, it is necessary to examine the sustainability of deposit services from the perspective of society as a whole.

The above considerations show that close attention should continue to be paid to the impacts of changes in the retail payment environment on bank behavior.

Glossary

Financial statements of financial institutions

Net income = operating profits from core business + realized gains/losses on stockholdings + realized gains/losses on bondholdings – credit costs ± others (such as extraordinary gains/losses)

Operating profits from core business = pre-provision net revenue (PPNR) excluding trading income = net interest income + net non-interest income – general and administrative expenses

Net interest income = interest income – interest expenses

Net non-interest income = net fees and commissions + profits on specified transactions + other operating profits – realized gains/losses on bondholdings

Overall gains/losses on stockholdings = realized gains/losses on stockholdings + changes in unrealized gains/losses on stockholdings

Realized gains/losses on stockholdings = gains on sales of stocks – losses on sales of stocks – losses on devaluation of stocks

Overall gains/losses on bondholdings = realized gains/losses on bondholdings + changes in unrealized gains/losses on bondholdings

Realized gains/losses on bondholdings = gains on sales of bonds + gains on redemption of bonds – losses on sales of bonds – losses on redemption of bonds – losses on devaluation of bonds

Credit costs = loan-loss provisions + write-offs + losses on credit sales – recoveries of write-offs

Credit cost ratio = credit costs / total loans outstanding

Capital adequacy ratios of internationally active banks

Common equity Tier 1 (CET1) capital ratio = CET1 capital / risk-weighted assets

CET1 capital includes common equities and retained earnings.

Tier 1 capital ratio = Tier 1 capital / risk-weighted assets

Tier 1 capital includes CET1 capital and preferred equities that meet certain conditions.

Total capital adequacy ratio = Total capital / risk-weighted assets

Total capital includes Tier 1 capital and subordinated bonds that meet certain conditions.

Capital adequacy ratios of domestic banks

Core capital ratio = core capital / risk-weighted assets

Core capital includes common equities and retained earnings as well as preferred equities that meet certain conditions.