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Financial System FSR report



BANK OF JAPAN
OCTOBER 2022

The total of major banks, regional banks, and *shinkin* banks covered in this *Report* is as follows (as at end-September 2022).

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 62 member banks of the Regional Banks Association of Japan (Regional banks I) and the 37 member banks of the Second Association of Regional Banks (Regional banks II). *Shinkin* banks are the 247 *shinkin* banks that hold current accounts at the Bank of Japan.

This *Report* basically uses data available as at end-September 2022.

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Objectives of the *Financial System Report*

The Bank of Japan's semiannual *Financial System Report* has two main objectives. The first is to assess the stability of Japan's financial system. The second is to communicate with all related parties on the future tasks and challenges in order to ensure the system's stability.

The *Report* assesses the vulnerabilities of the financial system from a macroprudential perspective, by examining developments in financial and capital markets and financial intermediation and by analyzing the financial cycle and the resilience of financial institutions to stress. Within a macroprudential framework, institutional designs and policy measures are developed based on risk assessments in the financial system in order to ensure the stability of the overall financial system. In so doing, the interconnectedness of the real economy, financial and capital markets, and financial institutions' behavior are taken into account.

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 important input for the Bank in assessing risks in economic and price developments from a medium- to long-term perspective.

Motivations behind the October 2022 issue

This issue of the *Report* focuses on financial institutions' domestic and foreign lending and securities investment and assesses potential vulnerabilities in Japan's financial system by analyzing them from the following two perspectives.

First, the *Report* examines potential credit risk posed to financial institutions with regard to additional stress. In Japan, while demand for additional loans due to the pandemic has subsided on the whole, firms' financing stance has remained cautious. Outside Japan, as major banks have strived to expand their international business, loans to highly leveraged firms have been increasing. The recent rises in energy and raw material prices and foreign interest rates could put additional stress on these borrower firms.

Second, the *Report* examines the impact of the rise in foreign interest rates on financial institutions' foreign net interest income and valuation gains/losses on securities holdings. Many financial institutions have aimed at improving their profitability by enhancing securities investment. In the past few years, in addition to yen-denominated bonds, financial institutions have increased investments in foreign bonds and foreign bond investment trusts. For these institutions, the decline in interest and dividends on securities and the decrease in room for realizing gains could reduce their loss-absorbing capacity.

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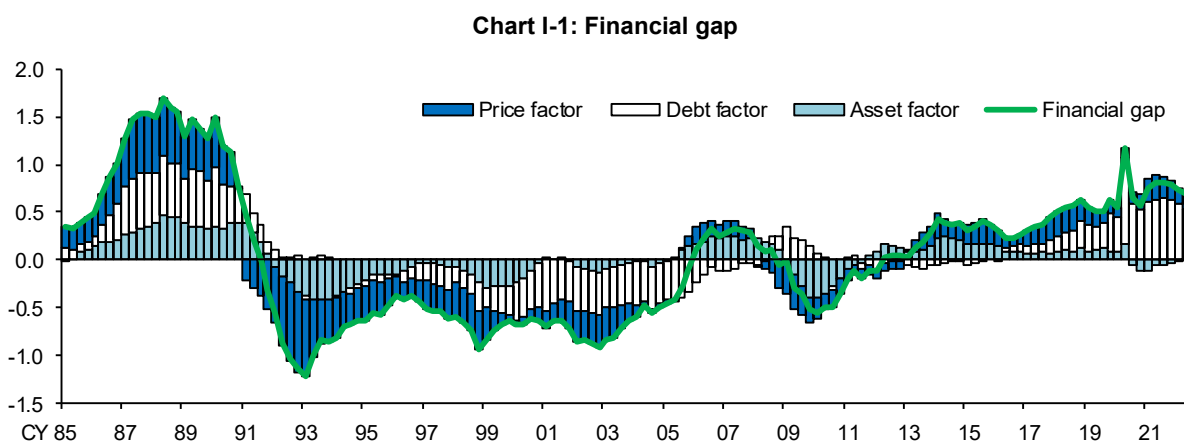
I. Executive summary: Stability assessment of Japan's financial system

Japan's financial system has been maintaining stability on the whole. Japanese financial institutions have kept sufficient capital and liquidity even under various types of stress since the outbreak of COVID-19, including supply constraints and rises in energy and raw material prices under the normalization of economic activity and the materialization of geopolitical risks. However, the period of stress may be prolonged further as policy rate hikes by central banks are continued and concerns about a slowdown in foreign economies are spreading. Financial and capital markets have continued to be nervous.

From a long-term perspective, if financial institutions' core profitability were to stagnate, financial intermediation could be impaired due to a decline in loss-absorbing capacity, or vulnerabilities in the financial system could increase through excessive risk-taking. To ensure the stability of Japan's financial system, it is necessary to examine these contraction and overheating risks in the financial system and address potential vulnerabilities appropriately.

The current phase of the financial cycle → Chapter III-C

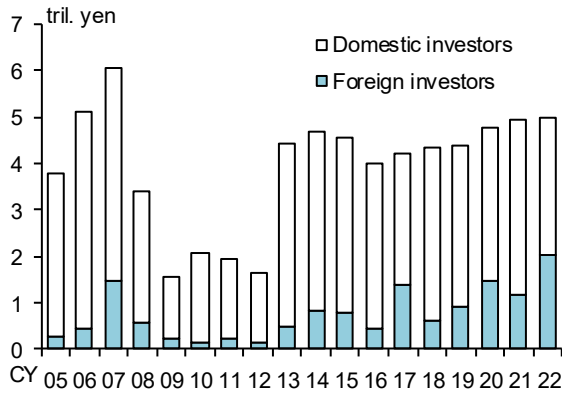
The financial gap, which captures the financial cycle, has been widening, albeit at a moderate pace, against the background of smooth functioning of financial intermediation. Almost a decade has passed in the current expansionary phase of the cycle, largely due to an increase in private debt (the "debt factor") (Chart I-1). In the current phase, however, the contribution of an increase in real investment (the "asset factor") and a rise in asset prices (the "price factor") has been limited. No major financial imbalances -- such as an increase in leverage, driven by the accumulation of private debt and active investment, together with an increase in asset prices -- can be observed.



Note: See Chart III-3-4.

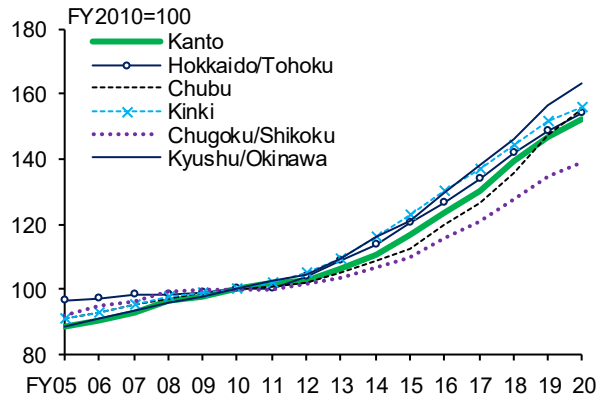
About half of the increase in total credit in the past decade can be explained by increases in household loans and real estate loans. Real estate loans by major banks have kept rising, particularly those to real estate investment funds (Chart I-2). This is because foreign investors have continued to engage in transactions at high prices against the background of relatively stable profitability in Japan's real estate market. Moreover, real estate loans by regional financial institutions have also continued to increase in parallel with investment in fixed assets by real estate leasing businesses (Chart I-3). In the real estate market, office rent has started to decline and the financial leverage of real estate leasing businesses has been increasing. Against this backdrop, attention should be given to the investment behavior of foreign investors and real estate leasing businesses.

Chart I-2: Real estate property acquisitions by domestic and foreign investors



Note: See Chart III-3-12.

Chart I-3: Outstanding amount of fixed assets for real estate leasing businesses

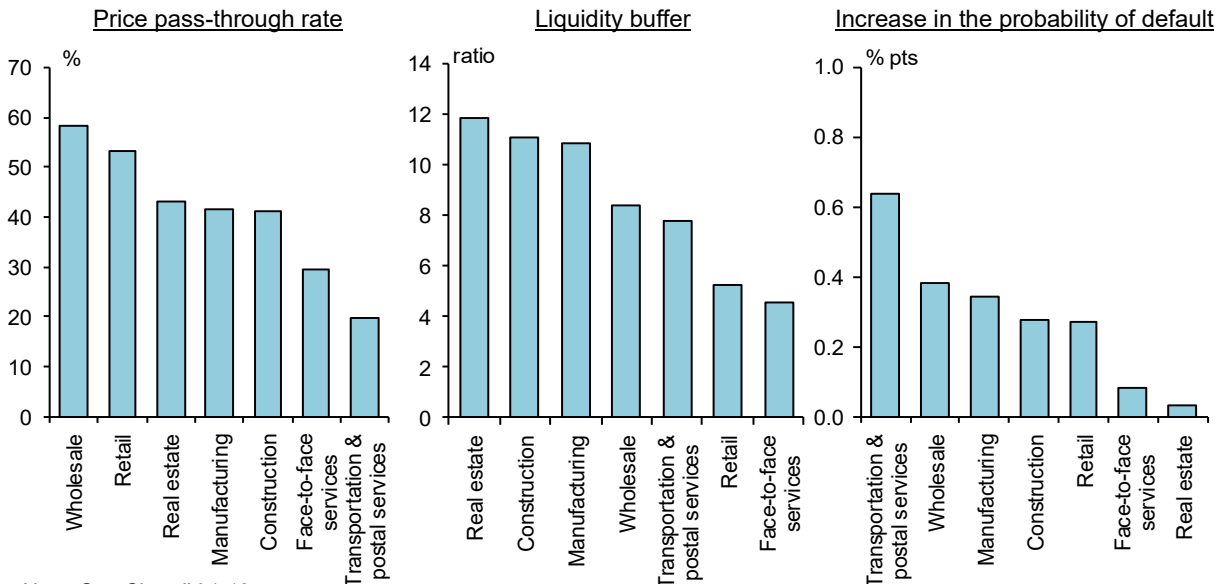


Note: See Chart III-3-18.

Domestic firms' financial condition under prolonged stress → Chapters III-A and IV-A

Even amid the prolonged period of stress, many firms have kept ample liquidity buffers. This is partly why defaults have been restrained at historically low levels. However, firms have faced higher raw material input costs due to the rise in import prices. For some of these firms that have had difficulty passing them on to sales prices, the probability of default (PD) could rise significantly. According to the analysis, the PD is likely to increase for (1) firms for which variable costs are sensitive to import prices due to their heavy dependence on imports, (2) firms with limited bargaining power in price negotiations with their counterparties, and (3) firms heavily affected by the pandemic and with resulting low liquidity buffers (Chart I-4).

Chart I-4: Cost resilience by industry

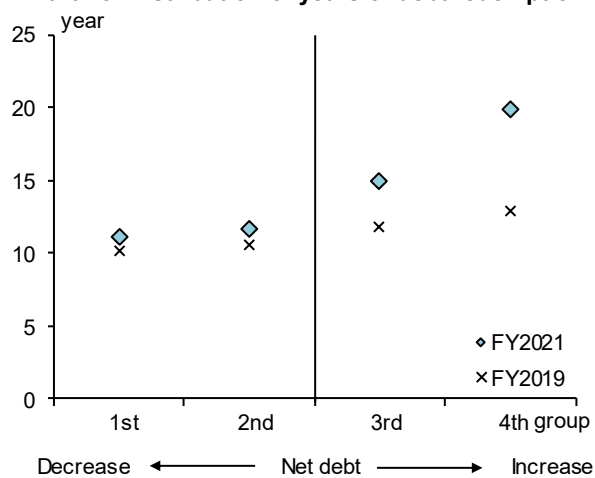


Note: See Chart IV-1-13.

Pandemic-related loans, including effectively interest-free loans, have strongly supported firms' finances during the pandemic. For many of these loans, repayment has already started. Small and medium-sized enterprises (SMEs) for which net debt has increased since the outbreak of the pandemic tend to have loans with longer durations (Chart I-5). They also tend to hold a lower liquidity buffer and are less resilient to additional stress (Chart I-6). Amid the prolonged period of

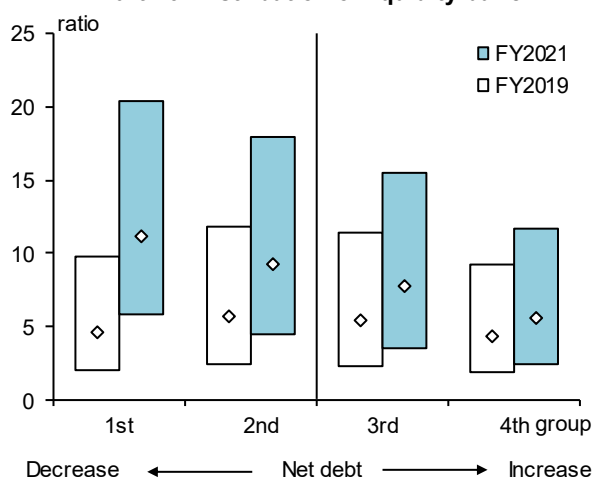
stress, financial institutions are expected to continue to encourage firms to improve their operating cash flow.

Chart I-5: Distribution of years of debt redemption



Note: The median values of years of debt redemption in each group, calculated as loan amounts in each year divided by operating cash flow in fiscal 2019. See Chart IV-1-16.

Chart I-6: Distribution of liquidity buffer

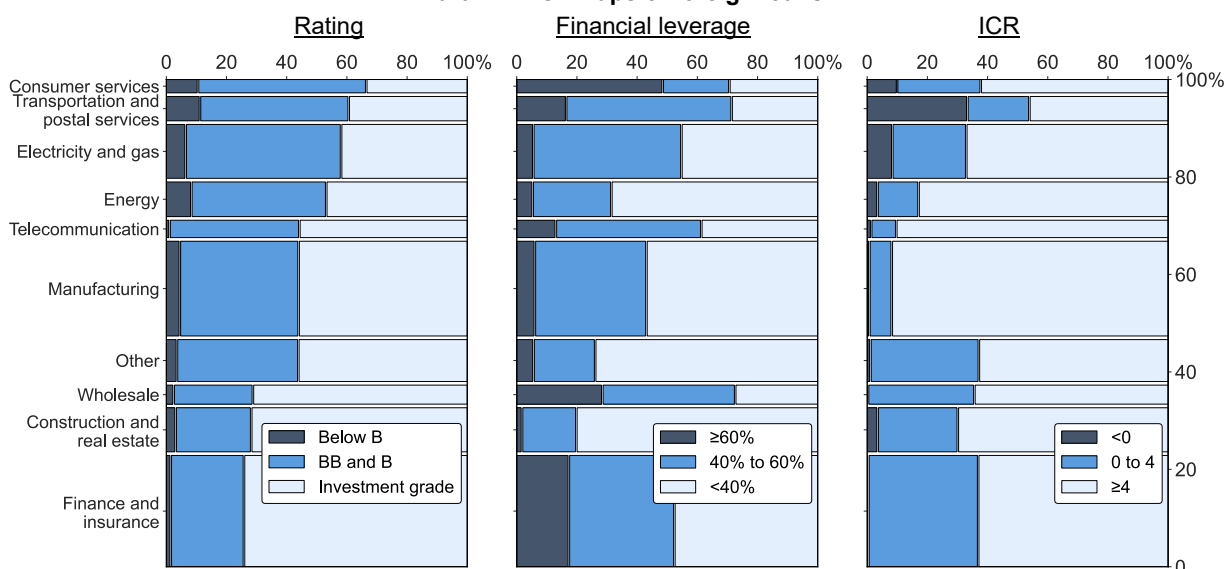


Note: The markers and bands indicate the median values and 25th-75th percentile of the ratios of cash reserves to monthly average administrative expenses in each group, respectively. See Chart IV-1-19.

Interest rate sensitivity of foreign loans → Chapters II-A and IV-B

The foreign loans maintain a high level of investment grade ratio. With foreign interest rates rising quickly, however, there is a risk that the creditworthiness of highly leveraged firms could deteriorate. A risk map visualizes relationships between the outstanding amount of foreign loans by industry, the borrower credit rating, and the borrower financial indicators (Chart I-7). It shows that even industries with a high share of investment grade firms have quite a few firms with high leverage and a low interest coverage ratio. Moreover, the recent growth in leveraged loans has been pushing up the shares of non-investment grade firms and highly leveraged firms in foreign loans.

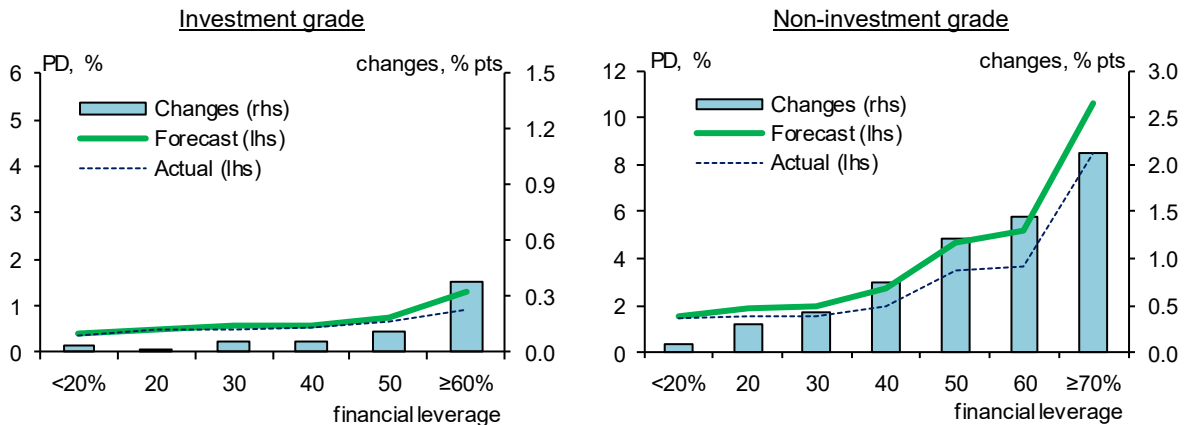
Chart I-7: Risk maps of foreign loans



Note: The vertical axis in each chart represents the share of the three major banks' foreign loans outstanding by industry. The horizontal axes represent, from left to right, the percentage shares of firms by rating, financial leverage (interest-bearing debt / total assets), and ICR (EBITDA / interest expenses), respectively. Data as at end-March 2022. See Chart IV-2-6.

As shown in the risk map, the foreign loan portfolios have a somewhat high percentage of highly leveraged firms, which are likely to be sensitive to interest rate rises. To quantify the sensitivity, an increase in firms' PD in response to an increase in funding costs is estimated. The result shows that the response of the PD tends to be more amplified, the higher firms' financial leverage (Chart I-8). It also shows that the default curve as a result of a rise in firms' funding costs shifts upward and its slope becomes steeper as firms' financial leverage increases. Financial institutions need to refine their credit risk management with regard to highly leveraged firms.

Chart I-8: Firms' default curves



Note: "Forecast" shows the estimated PD assuming a rise in funding costs. "Actual" is the PD as at June 2022. "Changes" represents the increase in the PD from "Actual" to "Forecast." See Chart IV-2-12.

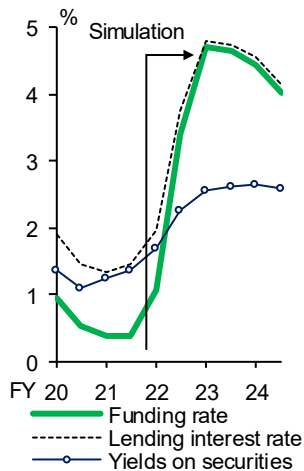
Financial institutions' resilience to foreign interest rate rises → Chapters IV-C and V

Financial institutions' valuation losses on securities have increased recently, and such losses could increase further depending on future developments in interest rates. In the short term, the rising cost of foreign currency funding could result in a negative spread between investment yields and funding rates of foreign currency. Among financial institutions that had increased their risk-taking on foreign currency interest rate to improve their profitability, there are some that are increasingly dependent on profits from foreign currency interest and dividends. Thus, attention should be given to a decline in the loss-absorbing capacity of such financial institutions in the event of deterioration in gains from securities investment.

The results of the macro stress testing indicate that Japanese financial institutions on the whole are resilient to stress events such as a substantially inverted yield curve in foreign markets. However, in such a stress event, foreign lending margins are squeezed substantially, and margins on securities investment turn negative (Chart I-9). In that case, the following factors are expected to contribute significantly to the decrease in foreign net interest income: the fall in loan-related and bond-related net interest income for internationally active banks, the fall in bond-related net interest income and investment trust dividends for domestic banks excluding *shinkin* banks, and the fall in investment trust dividends for domestic *shinkin* banks (Chart I-10). Moreover, the break-even credit cost ratios, which represent profit buffers, are expected to decline as a whole (Chart I-11).

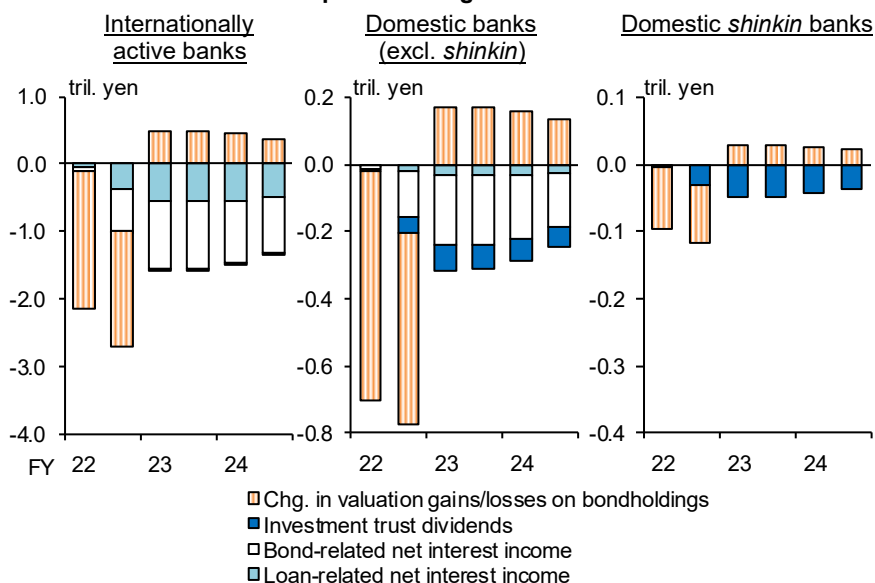
Since valuation gains/losses on bondholdings would deteriorate in the initial phase of interest rate rises, financial institutions' room for realizing gains could decline considerably (Charts I-10 and I-12). Such financial institutions would have difficulty in engaging in additional risk-taking, and their profitability would become more likely to decline. The functioning of financial intermediation could be impaired for some financial institutions.

Chart I-9: Foreign currency investment yield and funding rate



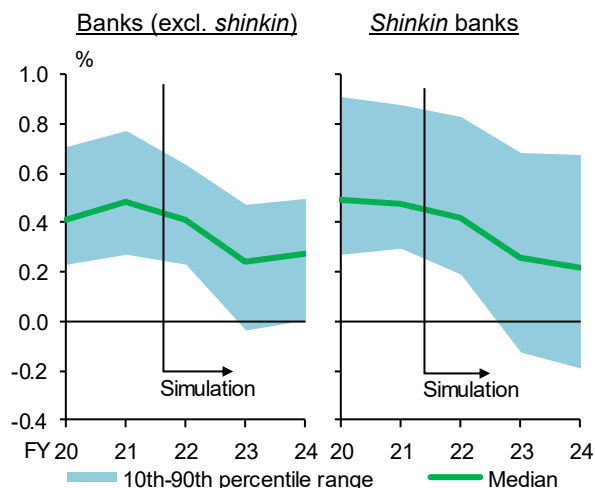
Note: See Chart V-2-7.

Chart I-10: Impact of foreign interest rate rises



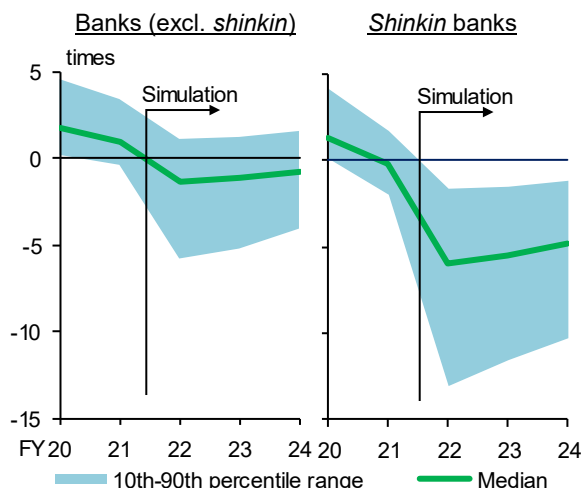
Note: The chart shows the direct impact of changes in yield curves from Jan.-Mar. 2022. See Chart V-2-8.

Chart I-11: Distribution of break-even credit cost ratios



Note: The break-even credit cost ratios are the ratios at which credit costs equal PPNR (excluding trading income). See Chart V-2-9.

Chart I-12: Distribution of room for realizing gains



Note: "Room for realizing gains" = valuation gains or losses on securities holdings / previous 3-year average of PPNR (excluding trading income). See Chart V-2-10.

The Bank of Japan will promote financial institutions' initiatives to address these potential vulnerabilities through on-site examinations and off-site monitoring. It will continue to closely monitor the impact of various risk-taking moves by financial institutions on the financial system from a macroprudential perspective.

II. Risks observed in financial and capital markets

- This chapter summarizes the developments in financial markets within Japan and abroad, mainly during the first half of fiscal 2022, and examines the risks associated with market developments.¹
- In global financial markets, market sentiment has remained cautious. Volatilities of U.S. and European bonds and stocks have been somewhat high. In stock and credit markets as well as emerging markets, declines in asset prices and outflows of funds have been observed amid concerns over repricing of risky assets with interest rates rising. Meanwhile, in commodity markets, prices of commodities, such as energy-related items and grains, have fluctuated considerably, mainly reflecting supply concerns that were heightened as a result of Russia's invasion of Ukraine and growing concerns over a slowdown in the global economy.
- Japanese financial markets have been generally calm, albeit with some fluctuations in tandem with foreign financial markets. Japanese long-term interest rates have been at around 0 percent with the Bank of Japan continuing Quantitative and Qualitative Monetary Easing (QQE) with Yield Curve Control. While Japanese stock prices have declined in tandem with those in the United States and Europe, the drop in Japan has been modest compared with the decline seen in those economies, as market participants have factored in the undervaluation of Japanese stock prices relative to those in the United States and the yen's depreciation. The credit spreads of corporate bonds have remained low and stable.
- Uncertainty about global financial markets remains high. In global financial markets, concerns have been raised about geopolitical risks and the spread of COVID-19, and whether it would be possible to contain inflation while sustaining economic growth. Under these circumstances, attention should be paid to the possibility that global financial conditions will tighten further through correction in asset prices and outflows of funds from emerging market economies.

A. Global financial markets

In global financial markets, market sentiment has remained cautious. Volatilities of U.S. and European bonds and stocks have been somewhat high. In stock and credit markets as well as emerging markets, declines in asset prices and outflows of funds have been observed amid concerns over repricing of risky assets with interest rates rising. Meanwhile, in commodity markets, prices of commodities, such as energy-related items and grains, have fluctuated considerably, mainly reflecting supply concerns that were heightened as a result of Russia's invasion of Ukraine and growing concerns over a slowdown in the global economy.

U.S. and European long-term interest rates

U.S. long-term interest rates rose considerably as market participants have focused on acceleration in the pace of withdrawal from monetary easing by the Federal Reserve (FRB) (Chart II-1-1). Meanwhile, federal funds futures curves have risen, especially in the near term, reflecting expectations for policy rate hikes, and the yield curve for U.S. Treasuries has flattened, as short-

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

II. Risks observed in financial and capital markets

A. Global financial markets

term yields in particular have risen (Charts II-1-2 and II-1-3). The volatility of U.S. Treasury bond futures has been somewhat high (Chart II-1-4).

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

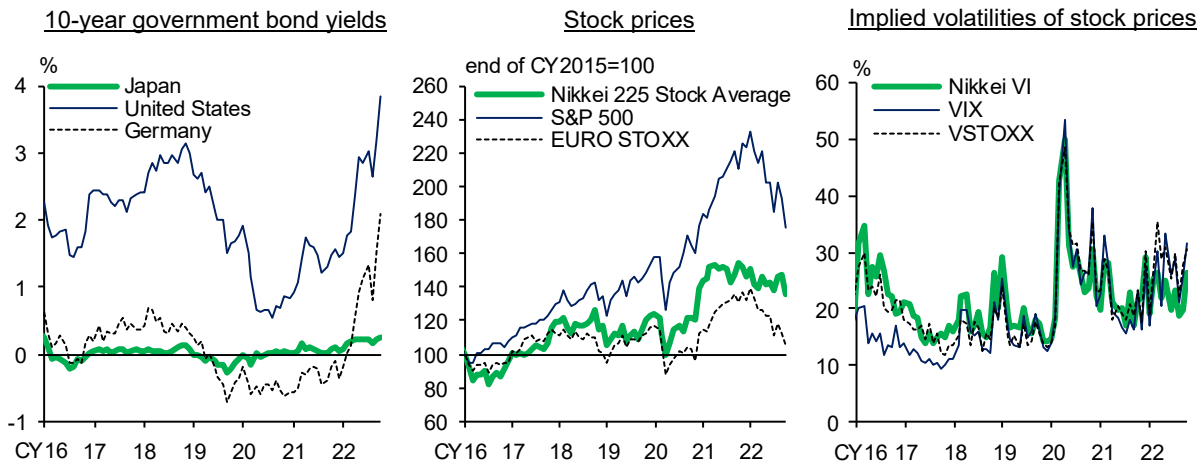


Chart II-1-2: Federal funds futures curves

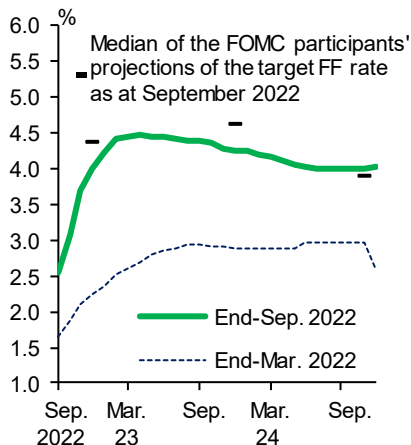


Chart II-1-3: U.S. Treasury yield curves

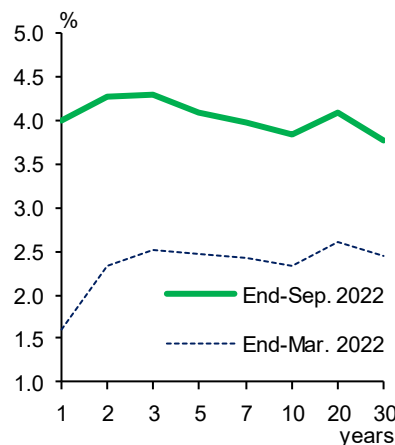
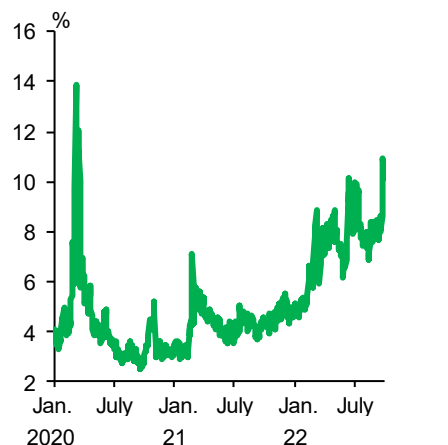


Chart II-1-4: Implied volatility of U.S. Treasury bond futures



Note: Implied volatility is calculated from options on U.S. Treasury bond futures. Latest data as at end-September 2022.

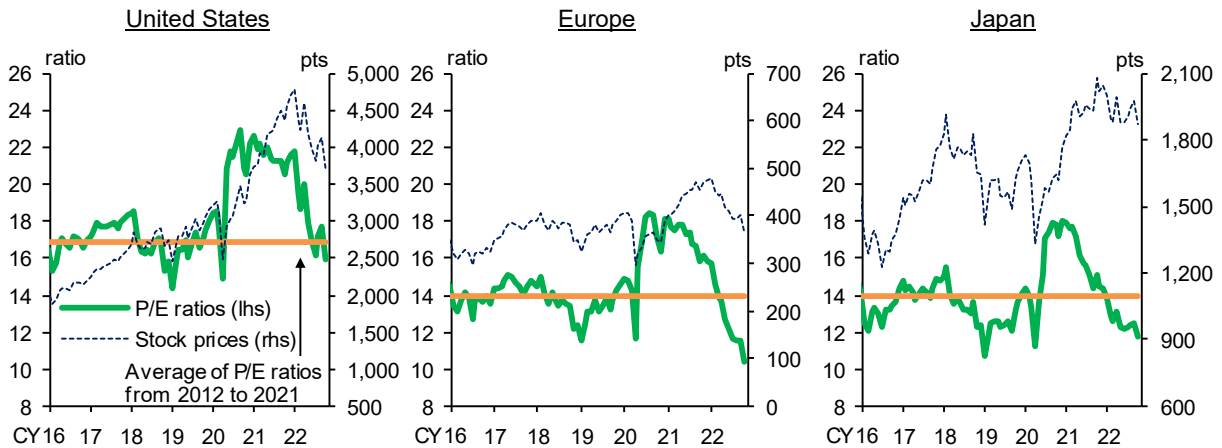
European long-term interest rates have also risen considerably as market participants have focused on acceleration in the pace of withdrawal from monetary easing by the European Central Bank (ECB) (Chart II-1-1).

U.S. and European stock prices

U.S. and European stock prices have declined significantly due to concerns over acceleration in the pace of withdrawal from monetary easing in the United States and Europe and an economic slowdown. The volatility of stock prices has generally been exceeding the 20 mark, a reference point in the market (Chart II-1-1). In this situation, price-earnings (P/E) ratios have declined significantly (Chart II-1-5). Expected earnings per share (EPS) for U.S. and European firms have

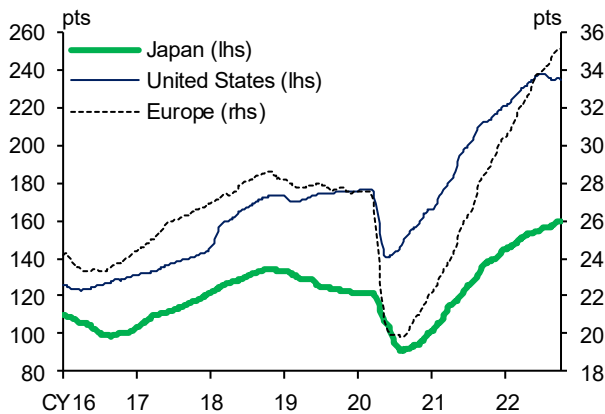
been rising, but those for U.S. firms have been more or less flat recently (Chart II-1-6). Net inflows in equity funds have come to a halt (Chart II-1-7).

Chart II-1-5: Stock prices and valuation



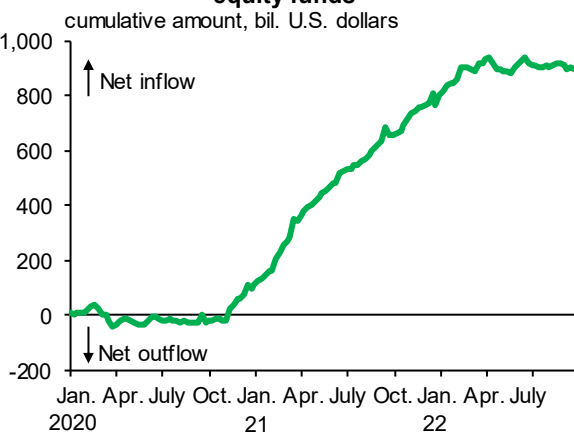
Note: "Stock prices" indicates the S&P 500 for the United States, the EURO STOXX for Europe, and the TOPIX for Japan. "P/E ratios" is calculated using expected EPS for the next 12 months. Latest data as at September 2022. Source: Refinitiv Datastream.

Chart II-1-6: Expected EPS



Note: "Japan," "United States," and "Europe" indicate expected EPS for the next 12 months of the TOPIX, the S&P 500, and the EURO STOXX, respectively. 4-week backward moving averages. Latest data as at end-September 2022. Source: Refinitiv Datastream.

Chart II-1-7: Net flows of U.S. and European equity funds



Note: The vertical axis indicates the cumulative amount from the beginning of 2020. Latest data as at September 28, 2022 (weekly data). Source: EPFR Global; Haver Analytics.

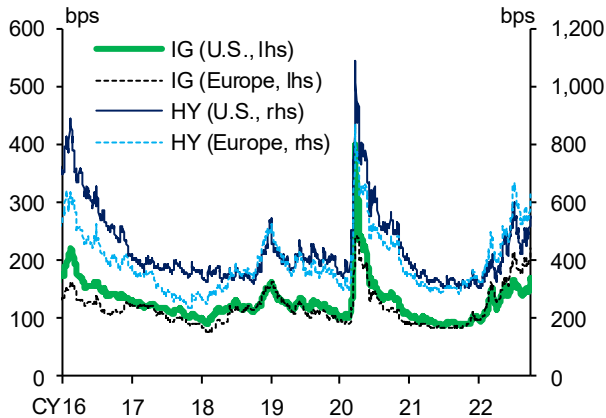
U.S. and European credit markets

In U.S. and European credit markets, credit spreads have widened, mainly among high-yield bonds, due to concerns over acceleration in the pace of withdrawal from monetary easing in the United States and Europe and an economic slowdown (Chart II-1-8). The prices of leveraged loans have declined amid concerns over a risk of deterioration in firms' debt repayment capacity (Chart II-1-9). (See Section B of Chapter IV for credit risks of foreign leveraged loans.)

II. Risks observed in financial and capital markets

A. Global financial markets

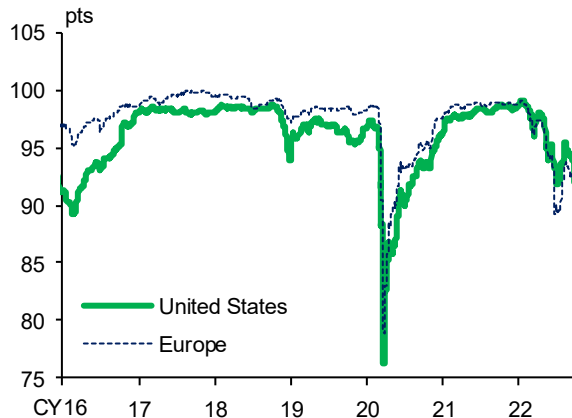
Chart II-1-8: Credit spreads on U.S. and European corporate bonds



Note: "IG" and "HY" indicate investment-grade bonds and high-yield bonds, respectively. Latest data as at end-September 2022.

Source: ICE Data Indices.

Chart II-1-9: Leveraged loan prices



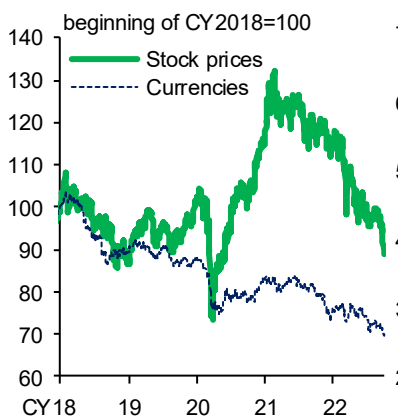
Note: The figures indicate the index of leveraged loan prices in the secondary markets. Latest data as at end-September 2022.

Source: LCD, an offering of PitchBook Data.

Emerging markets

Correction triggered by interest rate rises in the United States and Europe has also spread to emerging markets. In emerging markets, both stock prices and currencies have declined, and credit spreads of government bonds have widened (Charts II-1-10 and II-1-11). Both bond and equity funds have started to see net outflows from emerging markets (Chart II-1-12).

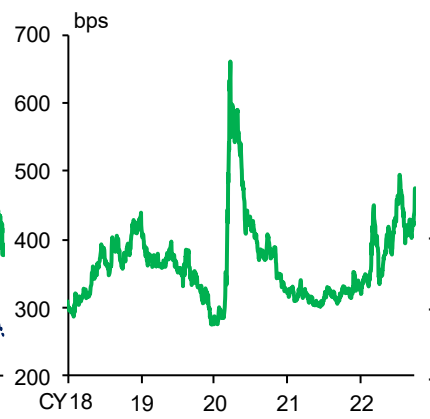
Chart II-1-10: Stock prices and currencies in emerging market economies



Note: "Stock prices" indicates the MSCI EM Local Index. "Currencies" indicates the J.P. Morgan EMCI Index. Latest data as at end-September 2022.

Source: Bloomberg.

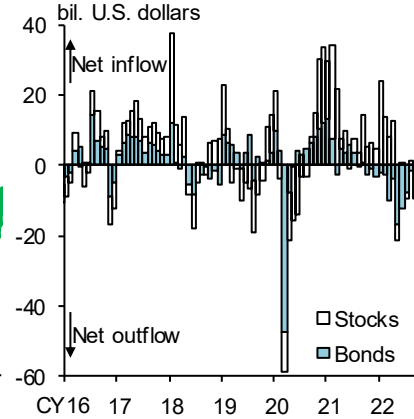
Chart II-1-11: Credit spreads in emerging market economies



Note: Yield spreads of the EMBI Global over U.S. Treasuries. Latest data as at end-September 2022.

Source: Bloomberg.

Chart II-1-12: Net flows of emerging market funds



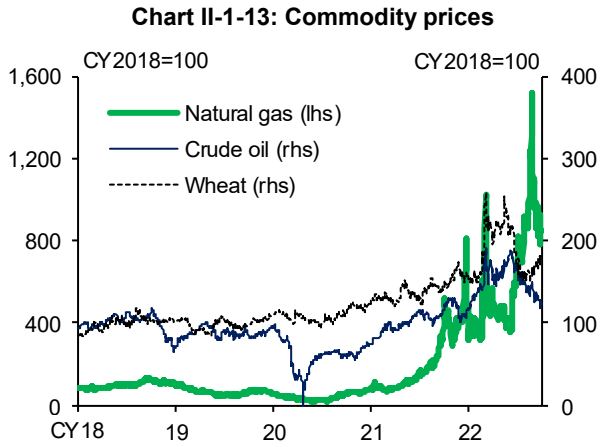
Note: Latest data as at September 2022.

Source: EPFR Global; Haver Analytics.

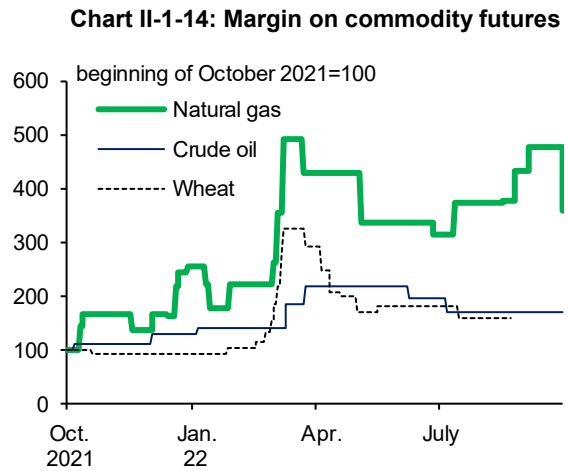
Commodity prices

Commodity prices have fluctuated considerably. Prices of energy such as crude oil and those of grains including wheat increased significantly, mainly reflecting heightened supply concerns as a result of Russia's invasion of Ukraine, and then decreased amid growing concerns over a slowdown in the global economy (Chart II-1-13). The amount of required margin in futures trading increased

considerably since early spring 2022 as a result of a sharp rise in the volatility of commodity prices (Chart II-1-14).



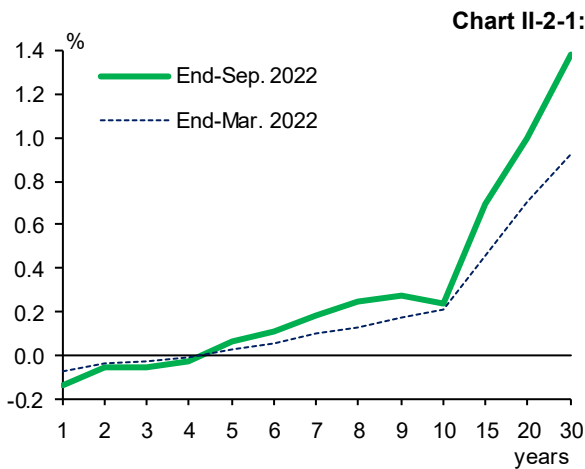
Note: "Natural gas," "Crude oil," and "Wheat" indicate Dutch TTF futures, WTI crude oil futures, and CBOT futures, respectively. Latest data as at end-September 2022.
Source: Bloomberg.



Note: 1. Required initial margin for each futures contract.
2. "Natural gas," "Crude oil," and "Wheat" indicate Dutch TTF futures, Brent futures, and CBOT futures, respectively.
3. The latest data for "Wheat" are as at August 22, 2022 and the latest data for the others are as at end-September 2022.
Source: CME Group Inc.; ICE.

B. Japanese financial markets

Japanese financial markets have been generally calm, albeit with some fluctuations in tandem with foreign financial markets. Japanese long-term interest rates have been at around 0 percent with the Bank of Japan continuing QQE with Yield Curve Control. While Japanese stock prices have declined in tandem with those in the United States and Europe, the drop in Japan has been modest compared with the decline seen in those economies, as market participants have factored in the undervaluation of Japanese stock prices relative to those in the United States and the yen's depreciation. The credit spreads of corporate bonds have remained low and stable.



Source: Bloomberg.

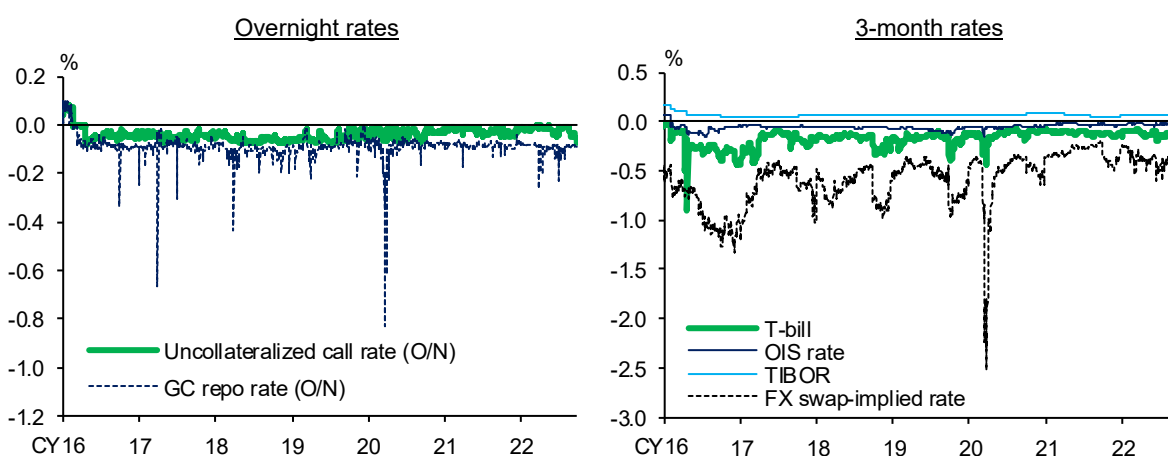
Short- and long-term interest rates

The yield curve for Japanese government bonds (JGBs) has risen somewhat, mainly in the super-

II. Risks observed in financial and capital markets
 B. Japanese financial markets

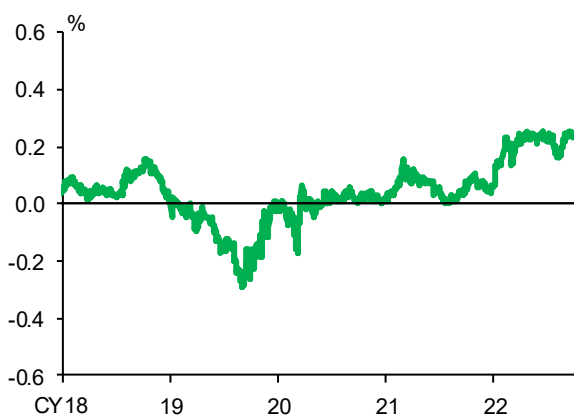
long-term zone, partly reflecting interest rate rises in the United States and Europe (Chart II-2-1). Under QQE with Yield Curve Control, however, the yield curve has been consistent with the current guideline for market operations, in which the short-term policy interest rate is set at minus 0.1 percent and the target level of 10-year JGB yields is around 0 percent. That is, the short-term yields of both overnight and term instruments have generally been in negative territory and the 10-year JGB yields have been around 0 percent, as the Bank has conducted necessary asset purchases in a flexible manner without setting upper limits and with fixed-rate purchase operations for consecutive days (Charts II-2-2 and II-2-3). Meanwhile, implied volatilities of swaptions have risen (Chart II-2-4).

Chart II-2-2: Short-term rates



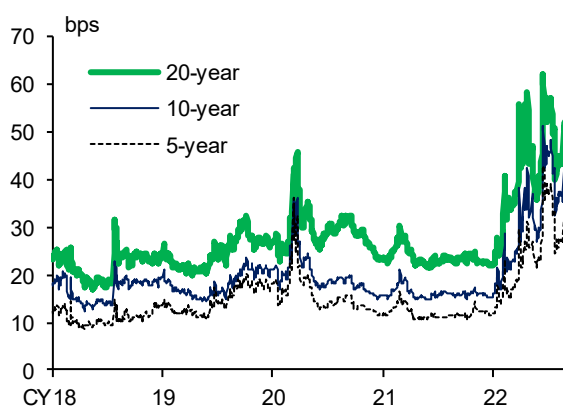
Note: 1. In the left-hand chart, the horizontal axis indicates the starting date of transaction settlement. Up to April 27, 2018, "GC repo rate (O/N)" indicates the T/N rate.
 2. In the right-hand chart, "FX swap-implied rate" is estimated based on the U.S. dollar funding rate (the OIS rate before January 3, 2019, and the SOFR thereafter) and FX swaps (forward spread).
 3. In both charts, the latest data are as at end-September 2022.
 Source: Bloomberg; Japan Bond Trading; JSDA; BOJ.

Chart II-2-3: 10-year JGB yields



Note: Latest data as at end-September 2022.
 Source: Bloomberg.

Chart II-2-4: Implied volatilities of swaptions



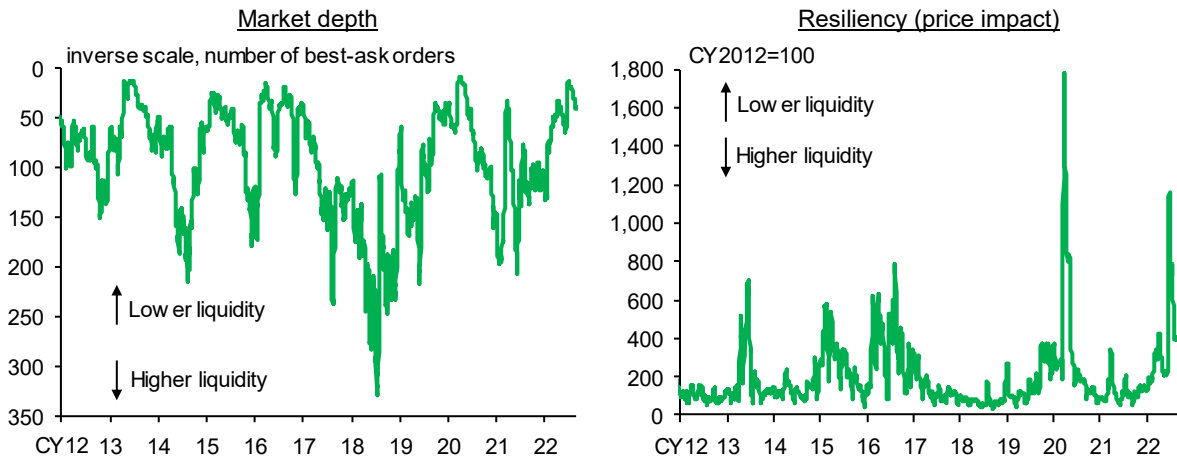
Note: Reference rates are yen LIBOR before October 1, 2021 and the uncollateralized call rate (O/N) thereafter. The expiry period is 6 months. Latest data as at end-September 2022.
 Source: Bloomberg.

Liquidity and functioning of JGB markets

As for the liquidity of JGB markets, liquidity indicators of market depth and resiliency deteriorated, mainly reflecting interest rate rises in the United States and Europe and a resultant increase in

volatility of Japanese long-term interest rates. Thereafter, those indicators have recovered somewhat, given the relaxation of the terms and conditions for the Bank's Securities Lending Facility of the cheapest-to-deliver issues (Chart II-2-5).² Inter-dealer transaction volume for cash JGBs has been low on the whole (Chart II-2-6). Meanwhile, according to the latest *Bond Market Survey* conducted in August 2022, the diffusion index for the degree of bond market functioning from the surveyed institutions' viewpoint has deteriorated from the previous round of the survey conducted in May 2022 and continues to be in deep negative territory (Chart II-2-7).

Chart II-2-5: Market depth and resiliency in JGB futures markets

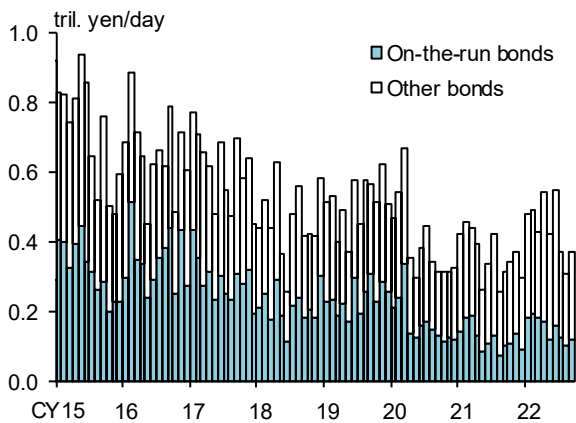


Note: 1. In the left-hand chart, the figures are the number of orders at the best-ask price with 1-minute frequency (median for each business day). In the right-hand chart, the figures indicate the price change per unit volume of transactions

2. 10-day backward moving averages. Latest data as at end-August 2022.

Source: Nikkei Inc., "NIKKEI NEEDS."

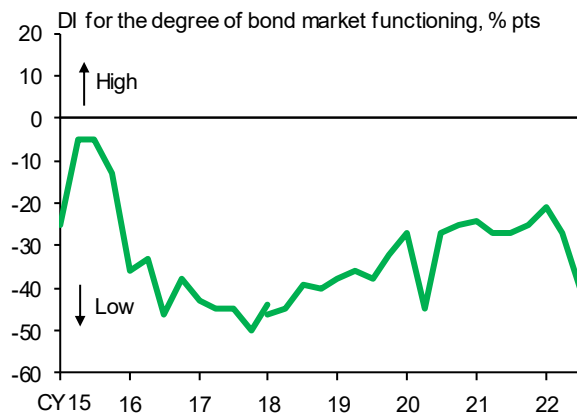
Chart II-2-6: Transaction volume in JGB markets



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 September 2022.

Source: Japan Bond Trading; QUICK.

Chart II-2-7: 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 August 2022 survey.

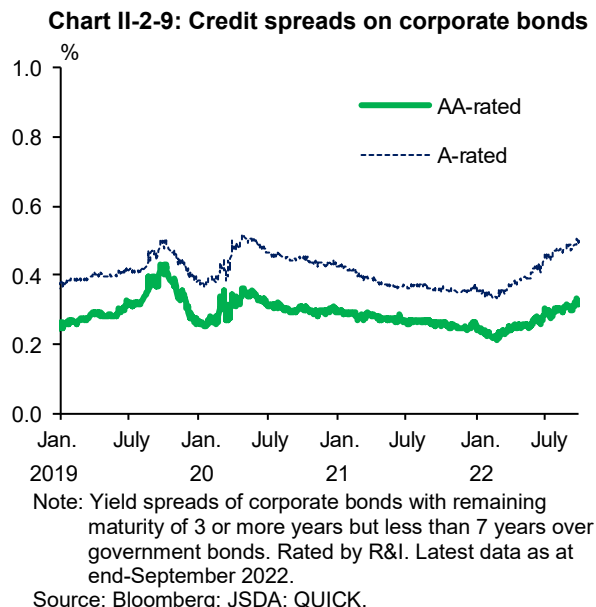
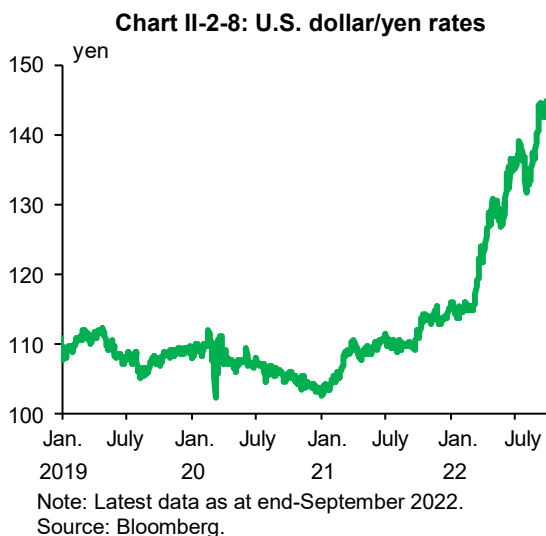
Source: BOJ.

² For details, see "Liquidity Indicators in the JGB Markets" on the Bank of Japan's website. The Financial Markets Department of the Bank generally updates and releases liquidity indicators of the JGB markets on a quarterly basis.

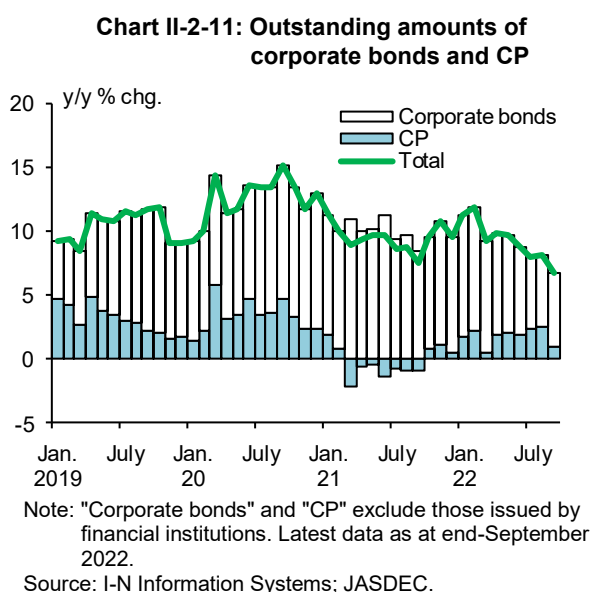
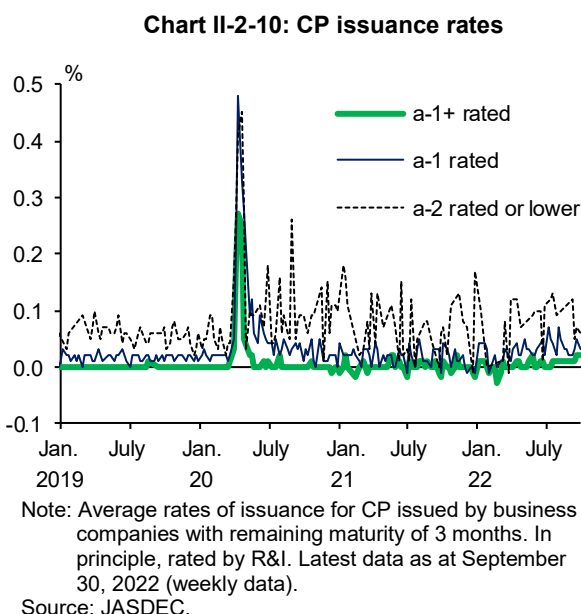
II. Risks observed in financial and capital markets
 B. Japanese financial markets

FX markets and stock and credit markets

In FX markets, the yen has depreciated against the U.S. dollar, mainly against the background of the divergence in monetary policies between the two countries and dollar purchases by Japanese importers (Chart II-2-8).



While Japanese stock prices have declined in tandem with those in the United States and Europe, the drop in Japan has been modest compared with the decline seen in those economies, as market participants have factored in the undervaluation of Japanese stock prices relative to those in the United States and the yen's depreciation (Charts II-1-1 and II-1-5). The expected EPS for Japanese firms has increased moderately (Chart II-1-6). Moreover, credit spreads of corporate bonds and issuance rates for CP have been low on the whole, even amid a widening of credit spreads abroad (Charts II-2-9 and II-2-10). The outstanding amounts of corporate bonds and CP have continued to rise, due in part to increased issuance of CP, mainly by Japanese importers of raw materials against the background of high commodity prices (Chart II-2-11).



III. Financial intermediation

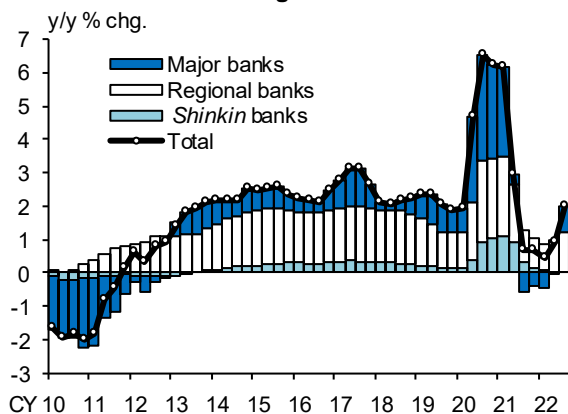
- Financial intermediation has been smoothly functioning in Japan. As for domestic loans, demand for additional loans due to the pandemic has subsided on the whole. Financial institutions have met demand for loans related to real estate, higher raw material input costs, and the resumption of economic activity. Foreign loans have increased, particularly to North America, as major banks have strived to expand their international business. Meanwhile, mainly reflecting the rise in foreign interest rates, financial institutions have maintained a restrained stance on securities investment.
- Non-bank financial intermediaries (NBFIs) such as insurance companies, pension funds, and securities investment trusts have managed assets with little reliance on external funding such as loans.
- The financial gap, which captures the financial cycle, has been widening, albeit at a moderate pace, against the background of smooth functioning of financial intermediation. In the current expansionary phase of the cycle, private debt has expanded but increases in real investment and rises in asset prices have been limited. No major financial imbalances can be observed in current financial activities. However, attention should continue to be paid to the tail risk posed by the financial cycle that could give rise to medium- to long-term swings in the real economy.

A. Financial intermediation by financial institutions

1. Domestic loans

Domestic loans by private financial institutions have increased by around 2 percent year-on-year (Chart III-1-1).³ The growth rate has risen moderately of late, following its temporal deceleration due to a pushback from the pandemic-driven surge in firms' precautionary loan demand. Demand

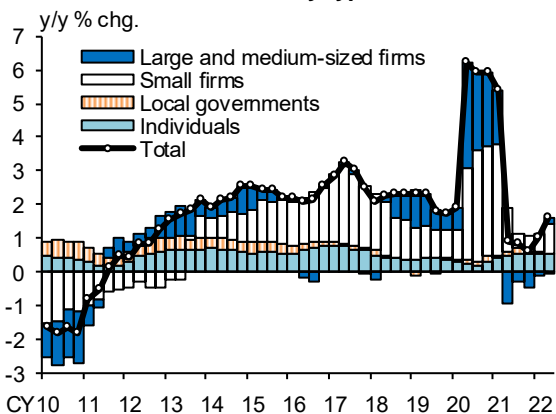
Chart III-1-1: Domestic loans outstanding among financial institutions



Note: Latest data as at the July-September quarter of 2022.

Source: BOJ.

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-June 2022.

Source: BOJ.

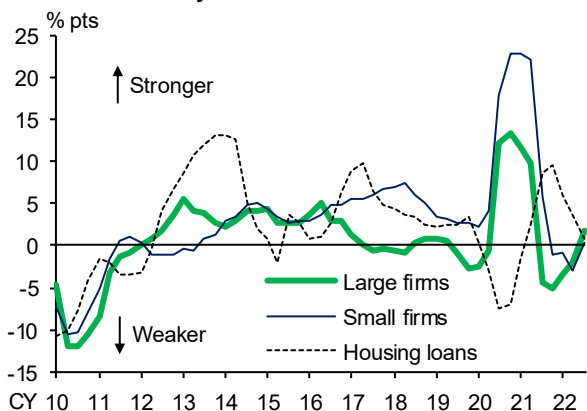
³ The increase in loans is partly attributable to the effect of the depreciation of the yen, which increases the yen-denominated value of foreign currency-denominated loans (foreign currency-denominated impact loans).

III. Financial intermediation
 A. Financial intermediation by financial institutions

for additional loans due to the pandemic has subsided on the whole.⁴ Financial institutions have met demand for loans related to real estate, higher raw material input costs, and the resumption of economic activity.

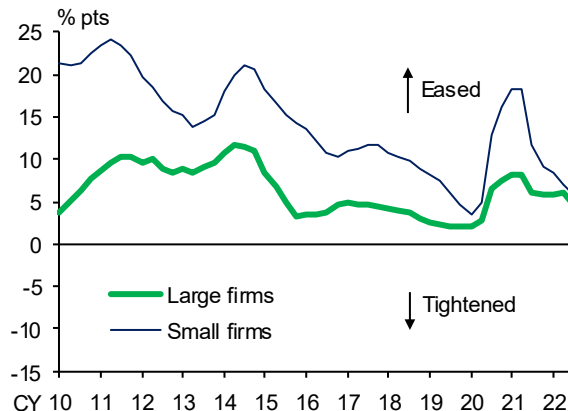
By type of firm and individual, loans to large and medium-sized firms have started to increase over the year, and loans to small firms have grown at an increasing rate (Charts III-1-2 and III-1-3). Loans to individuals have maintained their modest growth.

Chart III-1-3: DI of demand for loans as perceived by financial institutions



Note: 4-quarter backward moving averages.
 Latest data as at July 2022.
 Source: BOJ.

Chart III-1-4: DI of credit standards



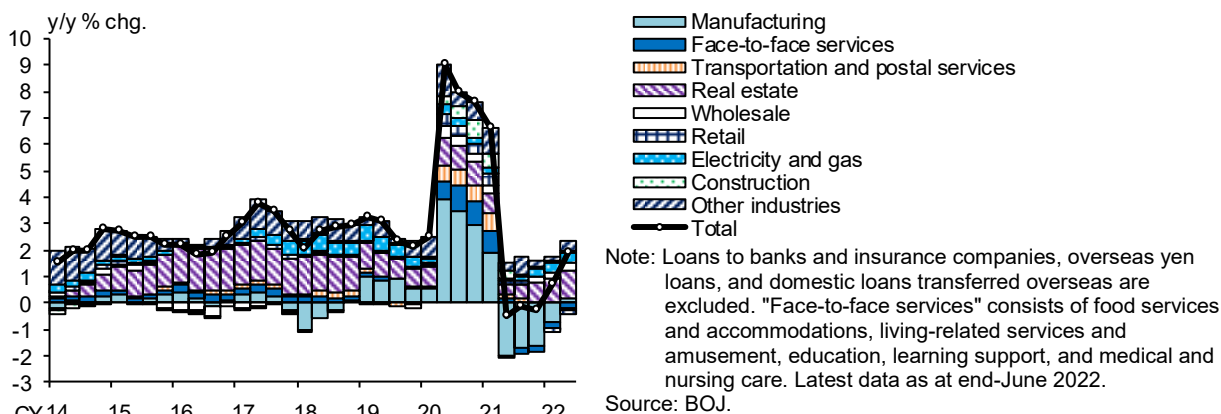
Note: 4-quarter backward moving averages.
 Latest data as at July 2022.
 Source: BOJ.

Meanwhile, the lending stance of financial institutions continues to be active (Chart III-1-4).

Loans by type of borrower

Loans to the real estate businesses have grown at an increasing rate. Loans to the manufacturing and wholesale industries have also accelerated their growth, reflecting firms' demand for loans related to higher raw material input costs and the resumption of economic activity (Chart III-1-5). For large and medium-sized firms and for small firms, loans for working capital have started to increase over the year and loans for business fixed investment have recovered somewhat (Chart III-1-6).

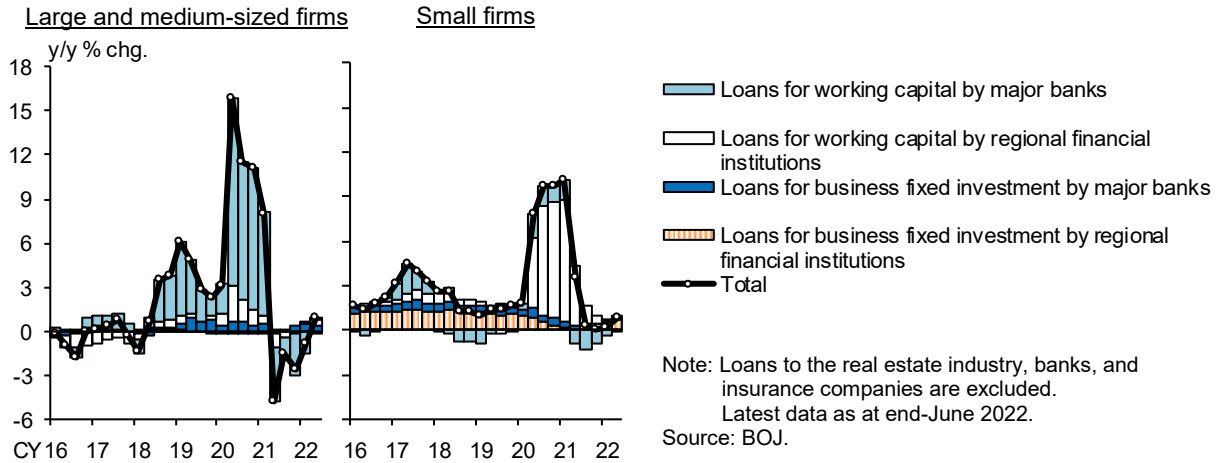
Chart III-1-5: Banks' corporate loans outstanding by industry



Note: Loans to banks and insurance companies, overseas yen loans, and domestic loans transferred overseas are excluded. "Face-to-face services" consists of food services and accommodations, living-related services and amusement, education, learning support, and medical and nursing care. Latest data as at end-June 2022.
 Source: BOJ.

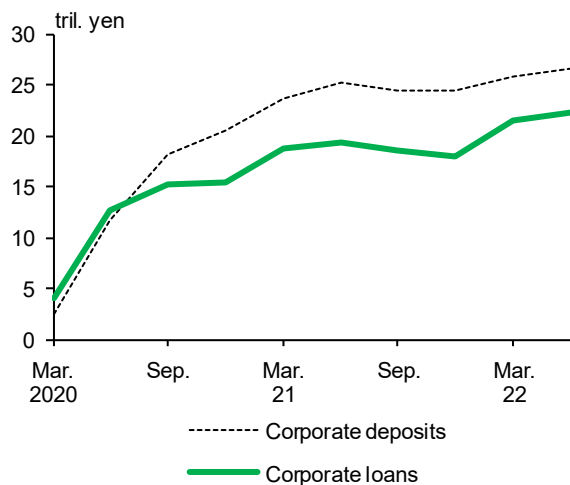
⁴ Corporate loans supported by public financing -- defined as the sum of loans by government-affiliated financial institutions and loans by private financial institutions guaranteed by credit guarantee corporations -- have been more or less flat since the previous year. Firms' demand for additional loans due to the pandemic has subsided on the whole.

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



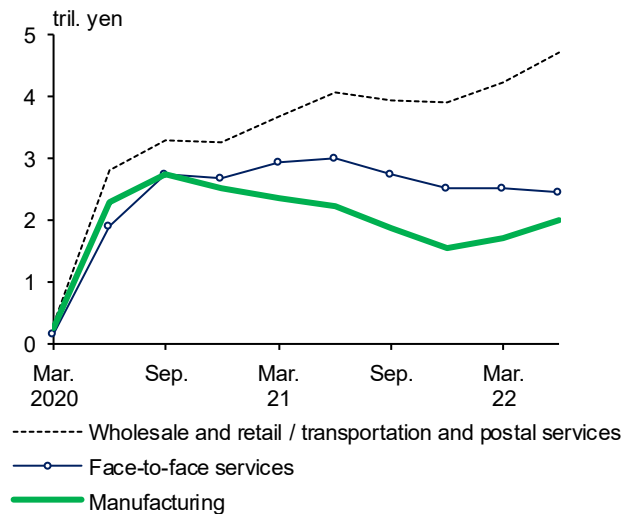
Corporate loans made by regional financial institutions, which serve many small firms, have increased moderately on the whole (Charts III-1-7 and III-1-8). Loans to some industries have started to increase due to higher raw material input costs and the resumption of economic activity. However, demand for additional loans has been modest on the whole, as many firms have secured on-hand liquidity for the time being. Indeed, corporate deposits have increased more than corporate loans since the start of the pandemic.

Chart III-1-7: Corporate loans by regional financial institutions



Note: The chart shows changes in the outstanding amount compared to 2019. Latest data as at end-June 2022. Source: BOJ.

Chart III-1-8: Regional financial institutions' corporate loans by industry



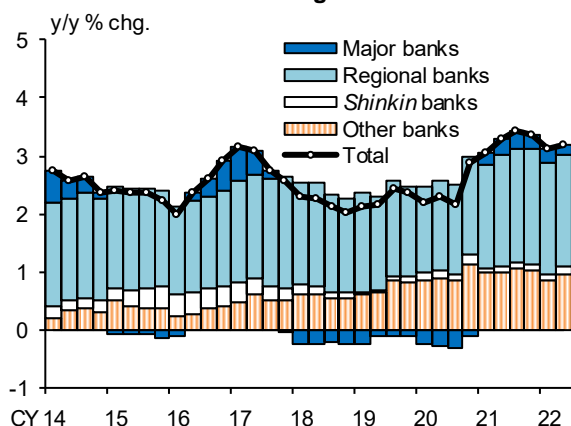
Note: 1. The chart shows changes in the outstanding amount compared to 2019. Latest data as at end-June 2022. 2. "Face-to-face services" consists of food services and accommodations, living-related services and amusement, education, learning support, and medical and nursing care. Source: BOJ.

Real estate-related loans

Housing loans -- which account for a large share of loans to individuals -- have continued to grow at a somewhat increased rate (Chart III-1-9). Financial institutions have actively met loan demand. The growth in housing loans has been driven by regional banks as well as internet-only banks, with the latter included in "other banks" in Chart III-1-9.

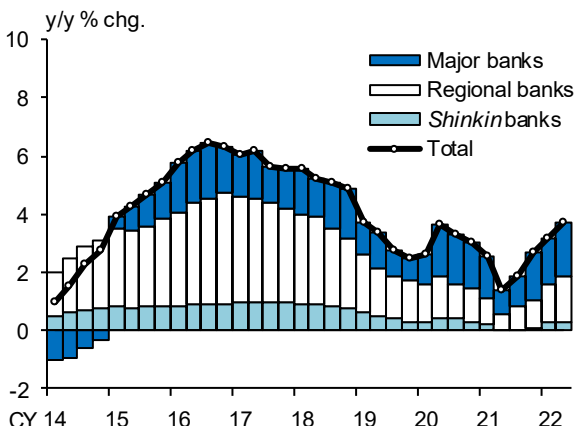
III. Financial intermediation
A. Financial intermediation by financial institutions

Chart III-1-9: Outstanding amount of housing loans among financial institutions



Note: "Other banks" covers domestically licensed banks but excludes major banks and regional banks.
Latest data as at end-June 2022.
Source: BOJ.

Chart III-1-10: Real estate loans among financial institutions



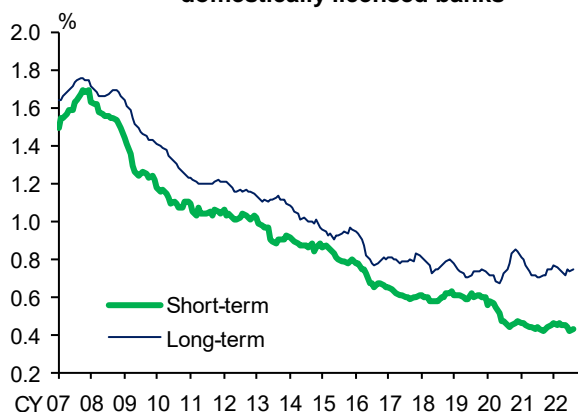
Note: Latest data as at end-June 2022.
Source: BOJ.

Loans to the real estate businesses have grown at an increasing rate, hitting successive record highs and standing at about 93 trillion yen as of the end of June 2022 (Chart III-1-10). Loans by major banks have continued to increase, particularly those to real estate investment funds and real estate investment trusts (REITs). Loans by regional banks to real estate leasing businesses have continued to increase.

Loan interest rates

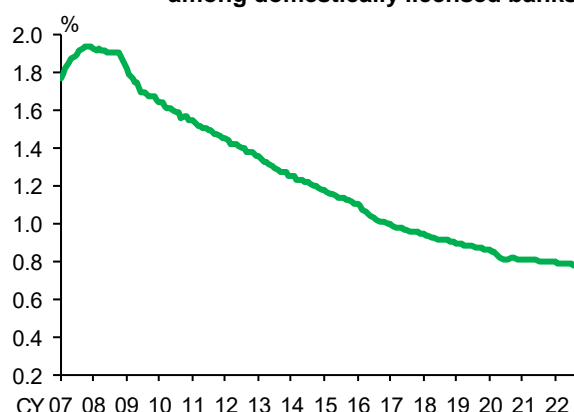
Financial institutions' average contract interest rates on new loans and discounts have been hovering around record low levels (Chart III-1-11). Meanwhile, the average interest rate on loans outstanding has been more or less flat (Chart III-1-12).

Chart III-1-11: Average contract interest rates on new loans and discounts among domestically licensed banks



Note: 6-month backward moving averages.
Latest data as at August 2022.
Source: BOJ.

Chart III-1-12: Average contract interest rates on outstanding loans and bills discounted among domestically licensed banks



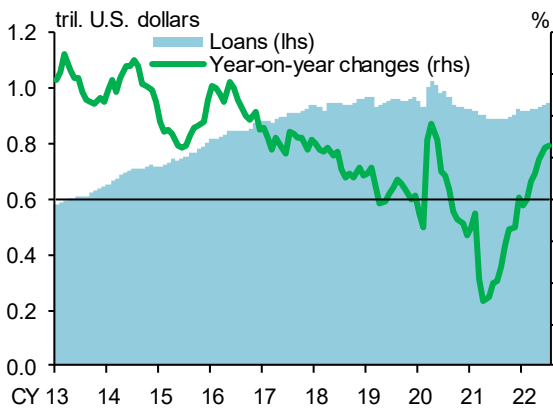
Note: Latest data as at August 2022.
Source: BOJ.

2. Foreign loans

Foreign loans have grown at an increasing rate, particularly to North America, as major banks have

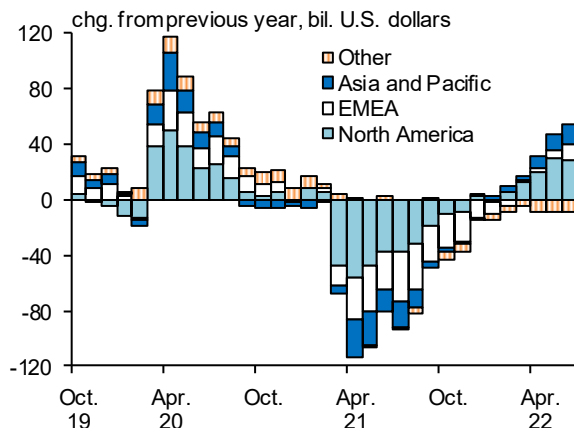
strived to expand their international business (Charts III-1-13 and III-1-14). Recently, loan demand encompassing a wide range has been observed, including (1) working capital due to the rise in raw material input costs and labor costs, (2) project finance and business fixed investment, and (3) loans borrowed upfront and a shift from funding from capital markets to borrowing amid continuing rises in market interest rates. Moreover, loans to commodity traders have been increasing. Reflecting elevated commodity prices, loan demand for working capital for procurement has been increasing. When commodity prices surged in early spring, committed lines were drawn down by commodity traders who aimed at meeting additional margin calls (see Box 2 for details).

Chart III-1-13: Foreign loans outstanding among major banks



Note: Covers internationally active banks.
 Latest data as at end-July 2022.
 Source: BOJ.

Chart III-1-14: Foreign loans outstanding of the three major banks by region



Note: "EMEA" includes Europe, the Middle East, and Africa.
 Latest data as at end-June 2022.
 Source: BOJ.

3. Securities investment

Mainly reflecting the rise in foreign interest rates, financial institutions have maintained a restrained stance on securities investment since the start of this year. The outstanding amount of securities investment has been declining (Chart III-1-15).

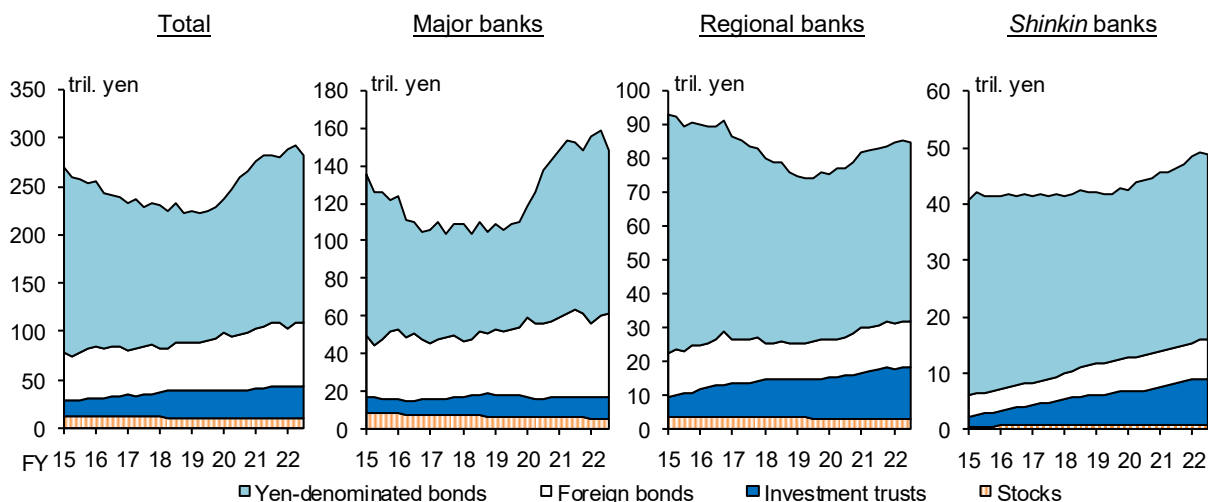
Major banks' holdings of yen-denominated bonds, including JGBs, municipal bonds, and corporate bonds, have declined due to the rise in interest rates and the decline in demand for collateral. As for foreign bonds, major banks' investment stance has remained restrained, reflecting concerns about the rise in foreign interest rates; however, calculated in yen terms, their holdings have increased due to the depreciation of the yen. Turning to investment trusts, major banks have reduced their holdings of stock investment trusts while purchasing inverse mutual funds amid the decline in foreign stock prices. Strategic stockholdings, i.e., stockholdings for the purpose of maintaining business ties with firms, have continued to fall, partly as a response to growing social awareness regarding corporate governance.

Regional financial institutions' holdings of yen-denominated bonds are unchanged. They have continued to reinvest the proceeds from the redemption of JGB holdings in yen-denominated bonds other than JGBs. As for foreign bonds, although regional banks in particular have reduced their holdings, reflecting concerns about the rise in foreign interest rates. Calculated in yen terms, however, their holdings have been more or less flat due to the depreciation of the yen. Regional financial institutions' holdings of investment trusts are generally unchanged. While regional financial institutions have continued to increase their holdings of multi-asset investment trusts with the aim

III. Financial intermediation
A. Financial intermediation by financial institutions

of raising their interest and dividend income, their investment stance has become somewhat cautious due to concerns about the rise in foreign interest rates.

Chart III-1-15: Outstanding amount of securities among financial institutions

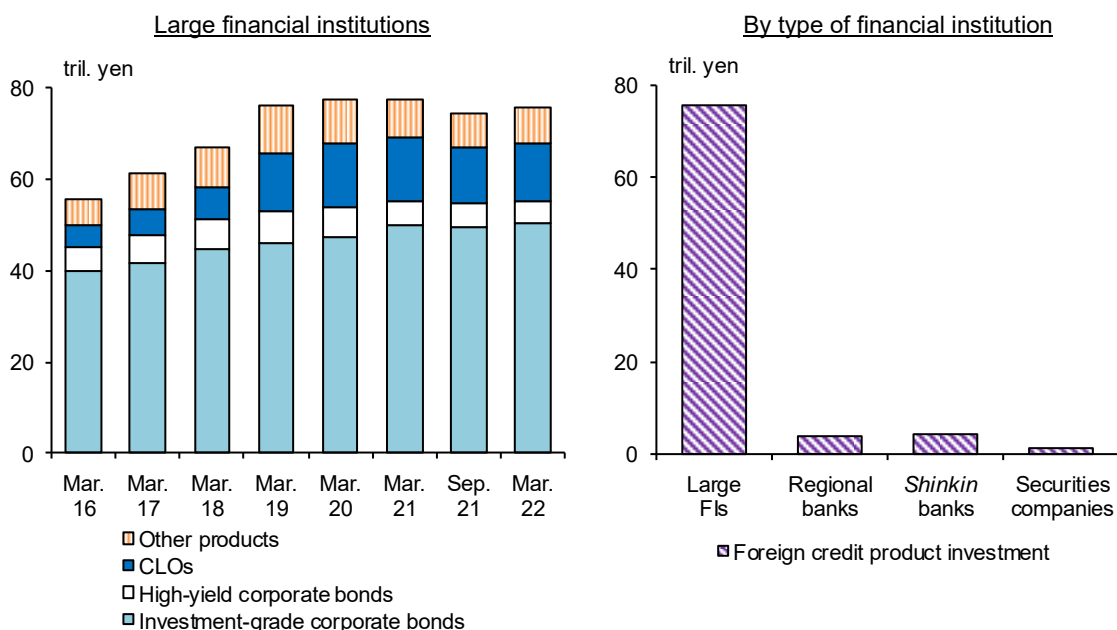


Note: 1. The data for "Investment trusts" include domestic and foreign investment, and some securities other than investment trusts.
2. The data for "Stocks" are based on the outstanding amount on a book value basis and exclude foreign stocks.
3. The data are the sum of figures for domestic and foreign branches, with the exception of those for major banks' "Stocks," which are figures for domestic branches. Latest data as at end-August 2022.

Source: BOJ.

Foreign credit products held by Japanese financial institutions, including Japan Post Bank and a central organization of financial cooperatives, have risen slightly due to an increase in holdings of collateralized loan obligations (CLOs) (Chart III-1-16). However, with credit spreads widening, some financial institutions have become cautious. Compared to large financial institutions, regional financial institutions continue to have little exposure to foreign credit products.

Chart III-1-16: Outstanding amount of foreign credit product investment among financial institutions



Note: 1. "Large financial institutions" includes major banks, Japan Post Bank, and a central organization of financial cooperatives.

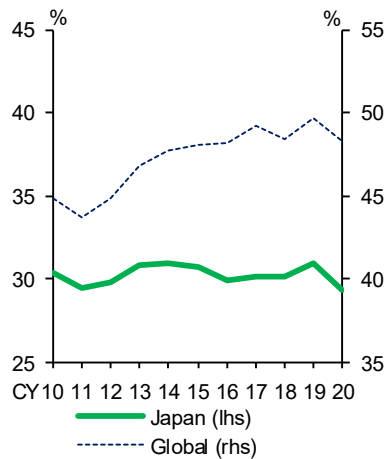
2. The data for "By type of financial institution" are as at end-March 2022.

Source: BOJ.

B. Financial intermediation by non-bank financial intermediaries

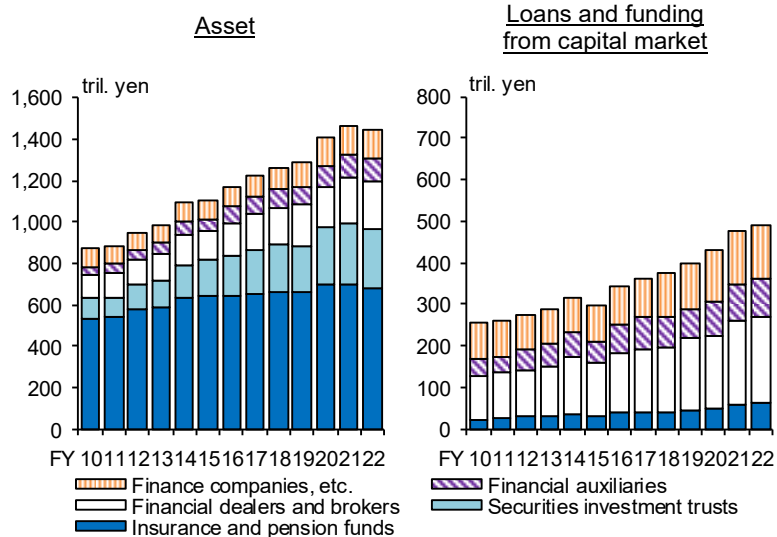
On a global basis, the share of financial assets held by NBFIs has risen to around 50 percent in recent years. On the other hand, in Japan, the share of NBFIs remains at about 30 percent, and depository financial institutions are still dominant in financial intermediation (Chart III-2-1).

Chart III-2-1: Share of financial assets held by NBFIs



Source: FSB; BOJ.

Chart III-2-2: Balance sheet of Japan's NBFIs



Note: "Financial auxiliaries" includes financial holding companies, stock exchanges, and financial instruments exchanges. "Financial companies, etc." includes finance companies, securities finance companies, and the resolution and collection corporation. Latest data as at end-June 2022.

Source: BOJ.

In Japan, nearly 70 percent of NBFIs' financial assets are held by insurance companies, pension funds, and securities investment trusts (Chart III-2-2). These entities have managed assets with little reliance on external funding such as loans. Financial dealers and brokers, whose amounts of assets are relatively small, have increased repo transactions on both the asset and liability sides in recent years. Securities companies and *tanshi* companies (money market brokers) have had increasing opportunities to broker arbitrage transactions between short-term money market transactions and current account deposits at the Bank of Japan. The following subsections examine developments involving insurance companies, pension funds, and securities investment trusts -- major NBFIs in Japan (see Box 3 for recent developments in crypto-assets).

1. Insurance companies and pension funds

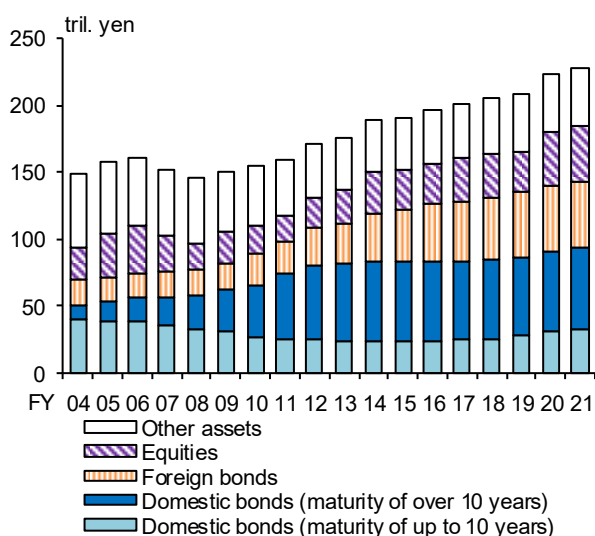
Life insurance companies have continued to invest in super-long-term JGBs, with a view to reducing the duration mismatch between assets and liabilities (Chart III-2-3). They have also continued foreign securities and alternative investments to secure profits. As for currency-hedged foreign securities, due to a rise in U.S. dollar hedging costs, life insurance companies have sold some of their U.S. Treasuries and shifted their investment to higher yield products such as U.S. corporate bonds and European government bonds. Even with the depreciation of the yen, life insurance companies' attempt to increase their exposure to foreign exchange risk has been limited. Currency hedge ratios of their foreign securities investment have remained flat (Chart III-2-4).

Pension funds have continued to invest in foreign securities while rebalancing their portfolios in response to changes in stock prices, although the growth has decelerated, reflecting the rise in U.S.

III. Financial intermediation
 B. Financial intermediation by non-bank financial intermediaries

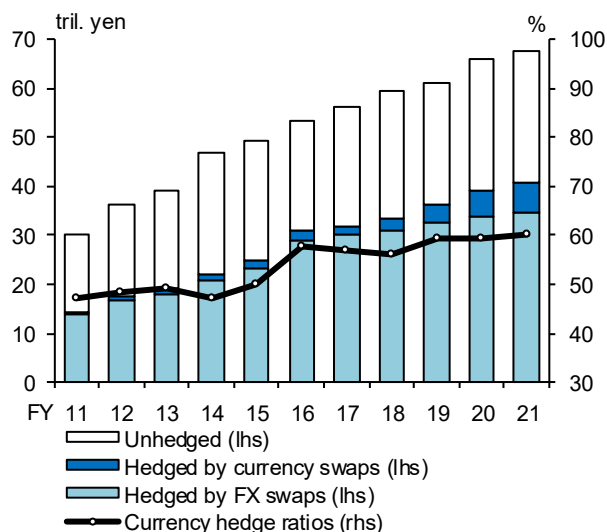
dollar hedging costs (Charts III-2-5 and III-2-6).⁵ Corporate pension funds have maintained their cautious investment stance, with many of them having secured net assets in excess of policy reserves. The Government Pension Investment Fund (GPIF), which is in charge of managing the assets of public pension funds such as employees' pension funds and the national pension fund, has been rebalancing its portfolio in response to changes in stock prices in line with the basic portfolio allocation, which determines the fund's portfolio share of each asset class from the perspective of safe and efficient asset management over a long-term investment horizon.

Chart III-2-3: Investment assets outstanding among life insurance companies



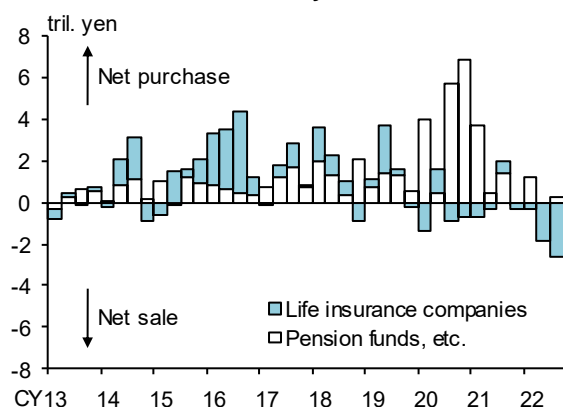
Note: "Other assets" includes cash and deposits, loans, investment trusts, and real estate. The figures cover nine major life insurance companies. Based on general accounts. Source: Published accounts of each company.

Chart III-2-4: Currency hedge ratios for foreign securities investment among life insurance companies



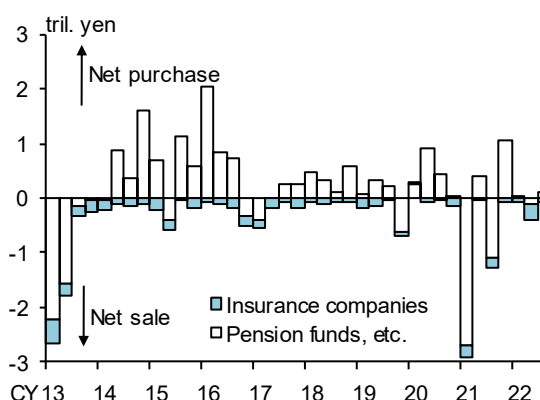
Note: Covers nine major life insurance companies. Estimated based on general accounts. Source: Published accounts of each company.

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



Note: "Pension funds, etc." indicates trust accounts of banks and trust banks. Latest data as at July-August 2022. Source: Ministry of Finance.

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



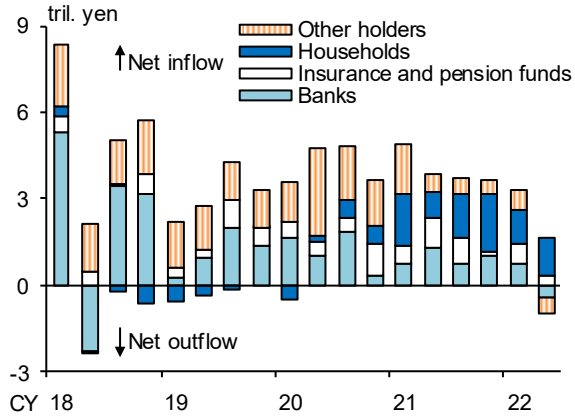
Note: "Pension funds, etc." indicates banking and trust accounts of trust banks. Latest data as at July-August 2022. Source: Tokyo Stock Exchange.

⁵ Japan's pension funds primarily follow simple investment strategies consistent with the policy asset mix or the basic portfolio allocation, instead of those that make use of leverage, such as liability-driven investment strategies.

2. Securities investment trusts

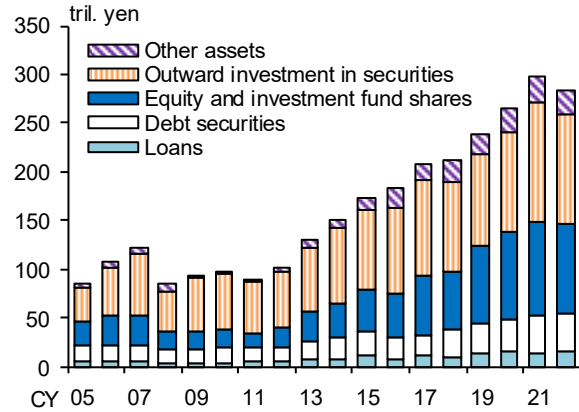
Japanese investment trusts have continued to see steady inflows of funds (Chart III-2-7). Assets under management have continued on an uptrend (Chart III-2-8). However, their market value has been more or less flat due to the recent decline in stock prices.

Chart III-2-7: Net flows of investment trusts



Note: Latest data as at the April-June quarter of 2022.
Source: BOJ.

Chart III-2-8: Investment assets outstanding among investment trusts



Note: Latest data as at end-June 2022.
Source: BOJ.

C. Financial cycle

As confirmed in the preceding sections, financial intermediation has been smoothly functioning. This section examines whether such financial intermediation and the resultant increase in private debt have led to a buildup of financial imbalances that could cause a significant downturn in future economic activity.

1. The financial cycle and risks to economic growth

First, a heat map is used to assess whether the current phase of the financial cycle shows any signs of overheating or contraction. Using three different colors, the heat map depicts whether various Financial Activity Indexes (FAIXs) point to an overheating or contraction of activity based on the degree to which the indexes deviate from their trends. The latest heat map shows that 11 out of the 14 FAIXs are "green," which signals neither an overheating nor a contraction, and the three remaining FAIXs are "red," which signals an overheating (Chart III-3-1).⁶ Compared with the previous issue of the *Report*, the *household loans to GDP ratio* has turned from "red" to "green."

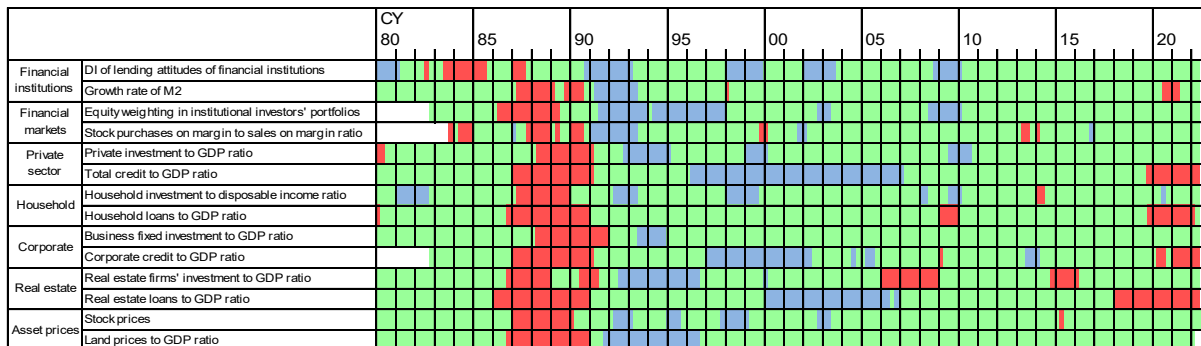
The three FAIXs that are "red" -- the *total credit to GDP ratio*, the *corporate credit to GDP ratio*, and the *real estate loans to GDP ratio* -- all have nominal GDP in the denominator and credit (private debt) in the numerator. Reflecting these features, the decrease in economic activity and active measures to support corporate financing since the start of the pandemic have pushed up these indexes (Chart III-3-2). Moreover, firms' cautious financing stance, which has continued since the

⁶ The heat map in Chart III-3-1 represents a mechanical assessment of whether financial activity is overheating or contracting. Specifically, the colors represent the following: (1) red indicates that an index is above its upper threshold; (2) blue indicates that an index is below its lower threshold; (3) green indicates no signs of either extreme; and (4) white indicates that no data for that period are available. For details on the FAIXs, see Ito, Y., Kitamura, T., Nakamura, K., and Nakazawa, T., "New Financial Activity Indexes: Early Warning System for Financial Imbalances in Japan," Bank of Japan Working Paper, no. 14-E-7, April 2014.

III. Financial intermediation
C. Financial cycle

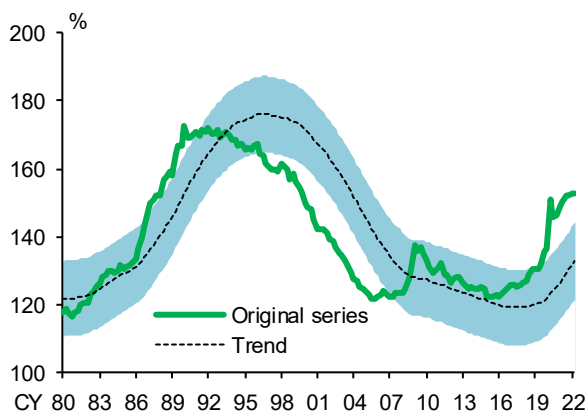
start of the pandemic, has also exerted upward pressure on the indexes. As seen in Section A of this chapter, many SMEs have held on-hand liquidity through borrowings and other external financing. Such cautious behavior of firms is one of the reasons why "net corporate credit" (gross corporate credit minus firms' cash and deposits) has hardly expanded despite the increase in gross corporate credit since the start of the pandemic (Chart III-3-3). It can be assessed that the three "red" FAIXs do not reflect overheating of financial activities.

Chart III-3-1: Heat map



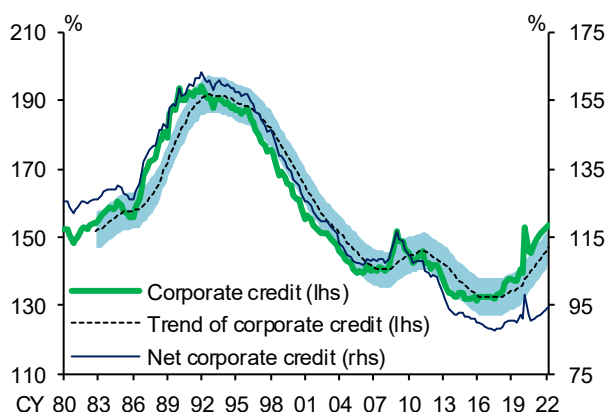
Note: The latest data for stock prices are as at the July-September quarter of 2022. The latest data for the land prices are as at the January-March quarter of 2022. The latest data for the other indexes are as at the April-June quarter of 2022.
Source: Bloomberg; Cabinet Office; Japan Real Estate Institute; Ministry of Finance; Tokyo Stock Exchange; BOJ.

Chart III-3-2: 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. Latest data as at the April-June quarter of 2022.
Source: Cabinet Office; BOJ.

Chart III-3-3: Corporate credit to GDP ratio

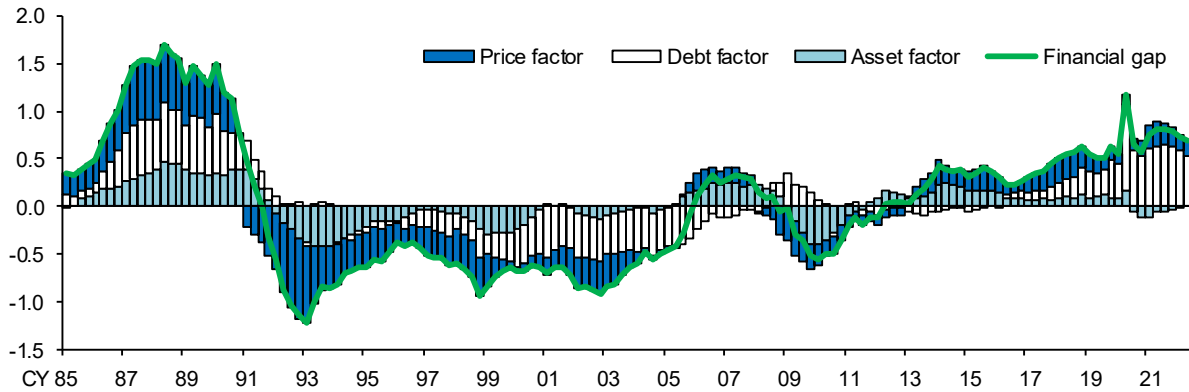


Note: 1. "Trend of corporate credit" is calculated using 3-year backward moving averages. The shaded area indicates the root mean square of the deviation from the trend.
2. "Net corporate credit" is the ratio to GDP of gross corporate credit excluding firms' cash and deposits.
3. Latest data as at the April-June quarter of 2022.
Source: Cabinet Office; BOJ.

Next, the "financial gap" is used to quantitatively examine changes in the financial cycle, where the gap is a summary measure of the 14 FAIXs in terms of deviation from their trends, aggregated by taking a weighted average (Chart III-3-4).⁷ The financial gap is clearly positive, albeit below the level during the bubble period in the late 1980s. Almost a decade has passed since the financial gap turned positive in the early 2010s. Moreover, the positive gap has been widening, albeit at a moderate pace.

⁷ In Chart III-3-4, larger weights are assigned to indexes that have a higher correlation with other indexes in calculating the weighted average of individual FAIXs. The weights vary based on changes in the degree of correlation over time.

Chart III-3-4: Financial gap



Note: "Asset factor" consists of indexes of fixed investment by the private sector, households, firms, and real estate businesses. "Debt factor" consists of indexes of their debt financing. "Price factor" consists of the remaining indexes. Latest data as at the April-June quarter of 2022 (land prices to GDP ratio is imputed by the previous period's value). Source: BOJ.

Decomposing the financial gap into three factors shows that the bubble period in the late 1980s featured an increase in leverage, driven by the accumulation of private debt (the "debt factor") and active investment (the "asset factor"), together with an increase in asset prices (the "price factor"), giving rise to a widening of the positive financial gap. After the bubble burst, the financial gap turned and remained negative for a long time as the decline in asset prices induced deleveraging and a large amount of loans became non-performing. In contrast, in the current phase, although the "debt factor" has contributed to the widening of the financial gap, the contribution of the "asset factor" and the "price factor" has been limited. No major financial imbalances can be observed in current financial activities.

However, attention should continue to be paid to the tail risk posed by the financial cycle that could give rise to medium- to long-term swings in the real economy. To examine this tail risk, "GDP-at-risk" (GaR) is quantified by estimating the probability distribution of future GDP growth rates.⁸ The distribution of GDP growth rates over the next year shows that the left tail of the distribution, which represents the probability of an economic downturn, is somewhat thick; but the downside risks are restrained on the whole owing to the positive financial gap (left panel of Chart III-3-5). In other words, in the short run, domestic accommodative financial conditions underpin economic activity, although it is subject to downward pressure exerted by the tightening of global financial conditions in response to policy rate hikes. On the other hand, from a medium-term perspective -- i.e., over the next three years -- the distribution is skewed to the left, toward an economic downturn (right panel of Chart III-3-5). This pattern has been observed since before the pandemic. These observations suggest that private debt could result in balance sheet adjustment pressures and increase the risk of an economic downturn.

The current phase of the positive financial gap is the longest in the post-bubble period. If rebalancing private debt and economic activity were to slow after the effects of the pandemic

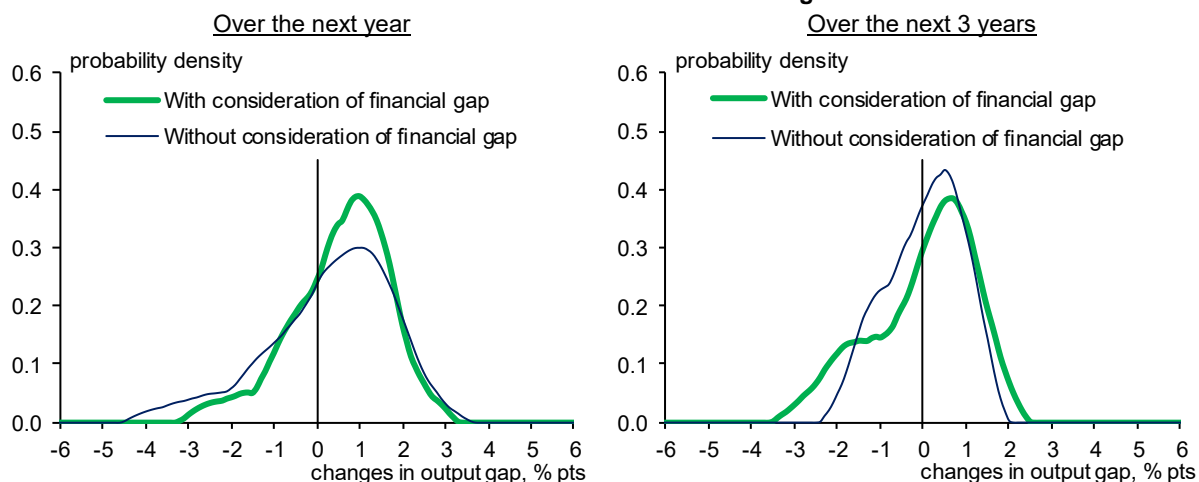
⁸ GaR applies the value-at-risk (VaR) approach, a method for assessing the risk associated with financial assets, to the GDP growth rate. Specifically, the regression equation used to estimate GaR here is as follows:

$$\left(\begin{array}{c} \text{Changes in the output gap} \\ \text{over the next } X \text{ years} \end{array} \right) = \alpha \left(\begin{array}{c} \text{Changes in the output gap} \\ \text{from the previous period} \end{array} \right) + \beta(\text{Financial gap}) + \gamma(\text{U.S. NFCI}) + \delta.$$

For details on the GaR approach, including the underlying rationale, estimation method, and caveats regarding its use, see Section B of Chapter IV and Box 1 of the October 2018 issue of the *Report*.

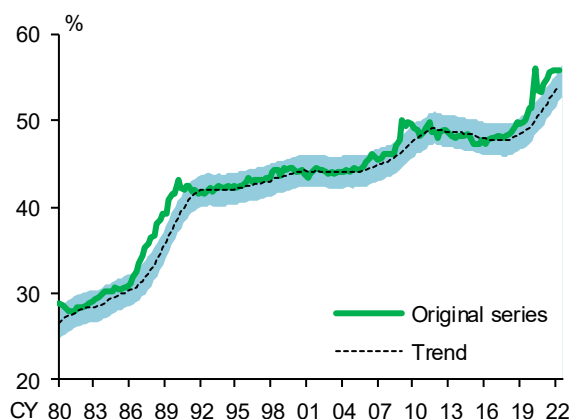
subside and if the *total credit to GDP ratio* were to remain "red" for a further prolonged period, greater vigilance would be required against a possible buildup of major financial imbalances (Chart III-3-2).⁹ The recent rise in total credit is attributable not only to corporate credit but also to household loans, such as housing loans, and real estate loans (Charts III-3-6 and III-3-7). In fact, about half of the increase in total credit in the past decade can be explained by increases in household loans and real estate loans. The *household loans to GDP ratio*, which has turned "green," has continued to be above the trend. Given that financial institutions are actively providing housing loans and other real estate-related loans, it is necessary to carefully monitor the continued increase in lending amid the rise in property prices in the real estate market, including the housing market.

Chart III-3-5: Risks to future economic growth



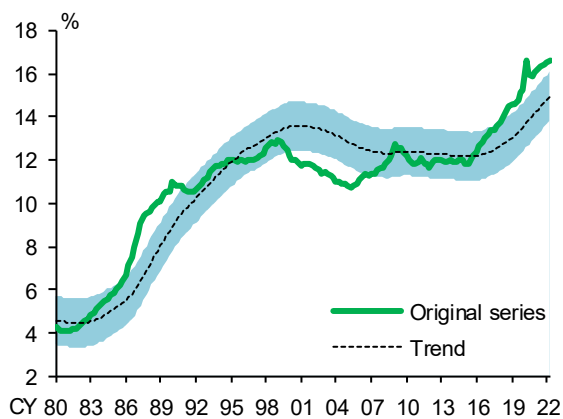
Note: 1. "With consideration of financial gap" is based on output gap, financial gap and U.S. NFCI for the April-June quarter of 2022.
2. "Without consideration of financial gap" is calculated assuming that the value of financial gap is zero.

Chart III-3-6: Household loans 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 multiplied by 1.25.
2. Latest data as at the April-June quarter of 2022.
Source: Cabinet Office; BOJ.

Chart III-3-7: 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. Latest data as at the April-June quarter of 2022.
Source: Cabinet Office; BOJ.

⁹ Cross-country evidence of banking crises since 1980 shows that the probability of a subsequent crisis tends to be greater the longer the total credit to GDP ratio signals "red" for a protracted period or when that ratio and certain other financial activity indexes simultaneously signal "red." For details, see Box 1 in the April 2021 issue of the *Report*.

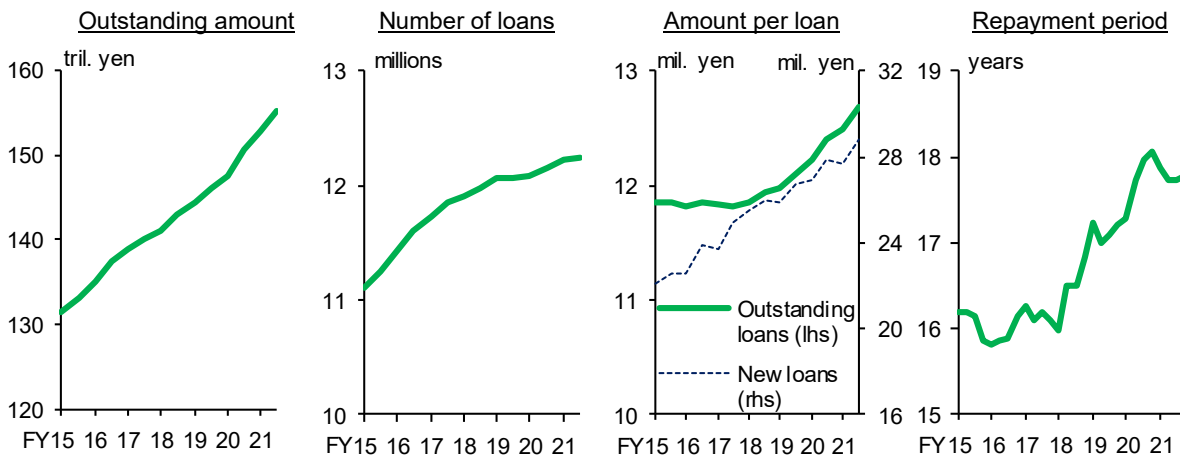
2. The financial cycle and the real estate market

The following examines housing loans and real estate loans, which have contributed to the prolonged expansionary phase of the financial cycle (see Box 1 for an international comparison of housing loan markets).

Increase in housing loans

The outstanding amount of housing loans, which account for the largest part of household debt, has continued to increase, reaching an all-time peak (Chart III-3-8). The increase over the past few years has been driven not only by a rise in the number of loans, but also by an increase in loan sizes, i.e., the amount per loan. Even as property prices have continued to rise, partly due to higher material prices, younger generations in particular have been taking out larger housing loans than in the past using joint loans for couples. Moreover, the growing use of no down payment loans and loans that also cover various expenses is another reason for the increase in loan sizes. These larger-sized loans often have longer repayment periods.

Chart III-3-8: Housing loans



- Note: 1. Repayment period is calculated as the outstanding amount of housing loans divided by annual repayments. 4-quarter backward moving averages.
 2. In principle, covers domestically licensed banks and *shinkin* banks. The latest data for "New loans" in the amount per loan and repayment period are as at the January-March quarter of 2022, and those for the others are as at end-March 2022.

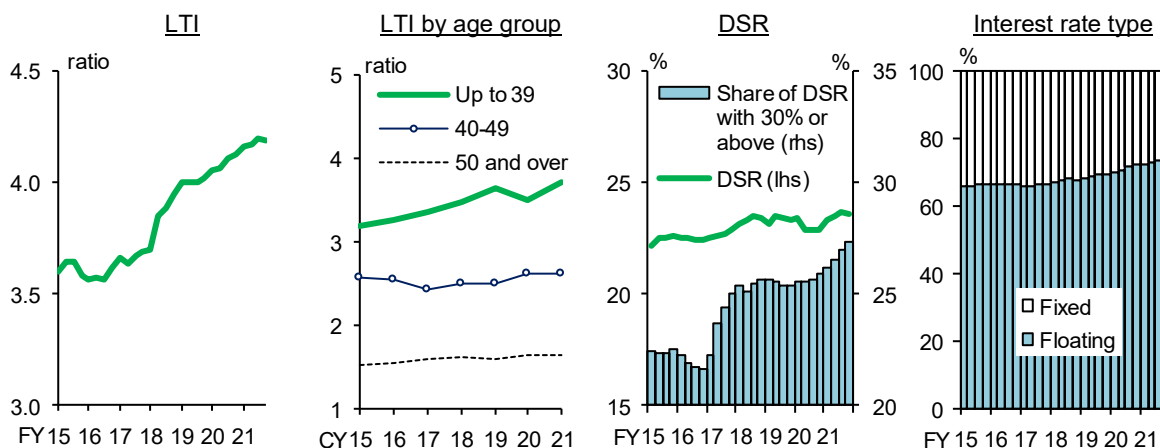
Source: BOJ.

As housing loan sizes have become larger, some changes are being observed in the characteristics of housing loans (Chart III-3-9). The loan-to-income (LTI) ratio -- the ratio of loans to borrowers' annual income at the time of loan origination -- has shifted upward in recent years. The rise in the LTI is partly attributable to the tendency for younger households to take out loans and those with relatively lower incomes to take out larger-sized loans. Changes are also observed in the debt servicing ratio (DSR) -- the ratio of annual repayments to annual income at the time of loan origination. While the average DSR has remained more or less flat, the share of housing loans with a DSR of 30 percent or above has been slowly rising. Meanwhile, floating-rate housing loans have continued to be dominant.

From the perspective of financial institutions and credit guarantee corporations, the increase in the outstanding amount of housing loans could lead to an increase in credit risk. So far, housing loan delinquency rates have been at historically low levels (Chart III-3-10). However, the higher the DSR, the more likely borrowers are to default on their housing loans. When the DSR exceeds 20 percent, the default rate tends to increase to some degree compared to when the DSR is below 20 percent.

Housing loan profitability has been below 1 percent, although risks are more diversified in housing loans than in corporate loans and, based on the track record, it seems unlikely that housing loans will give rise to a large amount of credit costs. Financial institutions need to keep a close eye on these structural changes in debt characteristics.

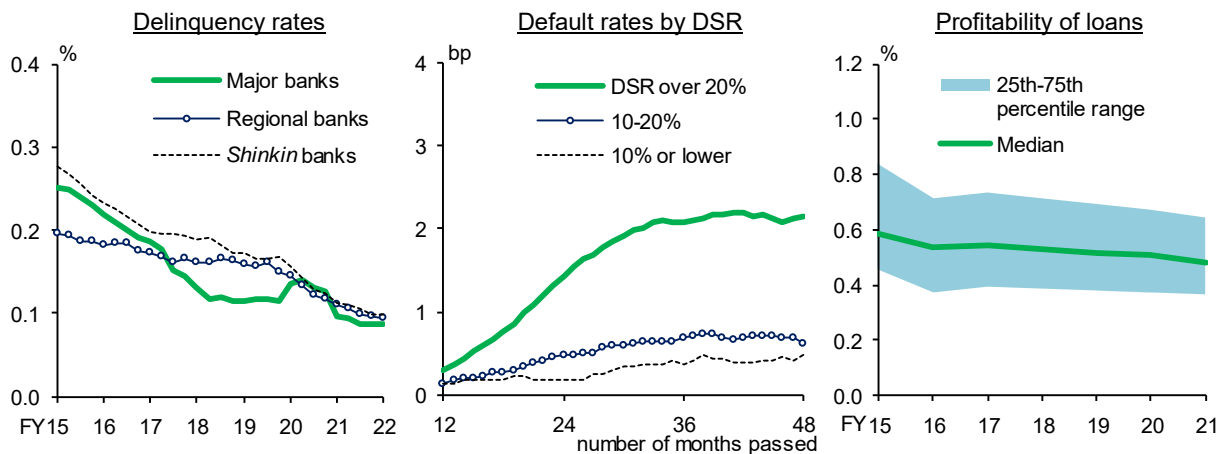
Chart III-3-9: Characteristics of housing loans



- Note: 1. "LTI" covers major banks, regional banks, and *shinkin* banks. 4-quarter backward moving averages. Latest data as at the January-March quarter of 2022.
 2. "LTI by age group" covers two-or-more-person households with liabilities. Latest data as at 2021.
 3. "DSR" covers major banks, regional banks, and *shinkin* banks. 4-quarter backward moving averages. Latest data as at the January-March quarter of 2022.
 4. The share of the outstanding amount of housing loans by "Interest rate type" covers major banks and regional banks. Latest data as at end-March 2022.

Source: Ministry of Internal Affairs and Communications; BOJ.

Chart III-3-10: Credit risk of housing loans



- Note: 1. "Delinquency rates" is the share of loans overdue by more than three months. Seasonally-adjusted. Latest data as at end-June 2022.
 2. "Default rates by DSR" is the share of the number of prepayment-requested loans among mortgage-backed securities (launched since 2013) of Japan Housing Finance Agency. 12-month backward moving averages.
 3. "Profitability of loans" is calculated as: interest rates on housing loans - funding costs - group credit insurance premiums (which is assumed to be 0.3%). Covers regional banks and *shinkin* banks.

Source: Japan Housing Finance Agency; BOJ.

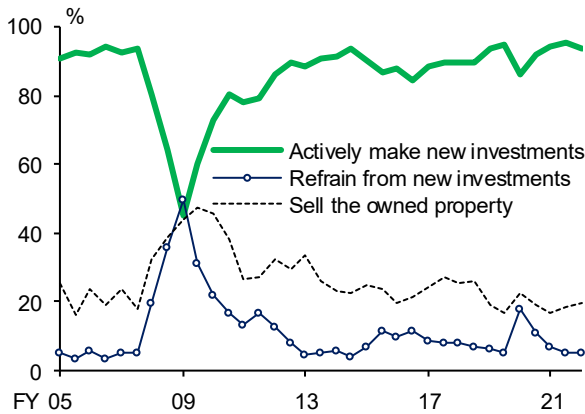
Increase in real estate loans

Real estate loans have continued to increase, driven by major banks' lending to foreign investors and by regional financial institutions' lending to small and medium-sized real estate leasing businesses (Chart III-1-10). According to interviews with financial institutions, their lending standards have not

eased, but many of them have been actively engaged in real estate lending, with corporate lending being sluggish.

In the real estate transaction market, many investors have been active in making new investments despite concerns over repricing of real estate prices (Chart III-3-11). Foreign investors in particular have continued to engage in trades at high prices, and the pace of property acquisitions in the first half of 2022 exceeded that in 2007, just before the global financial crisis (GFC) (Chart III-3-12). While U.S. funds used to make up the majority, more recently the composition of foreign investors has been diversifying, with institutional investors and Asian funds each accounting for a quarter of investment (Chart III-3-13). Moreover, the presence of institutional investors -- insurance companies, pension funds, and sovereign wealth funds -- that are assumed to hold real estate for the long term has been growing. As a result, the share of long-term investments with an assumed holding period of more than 10 years has increased.

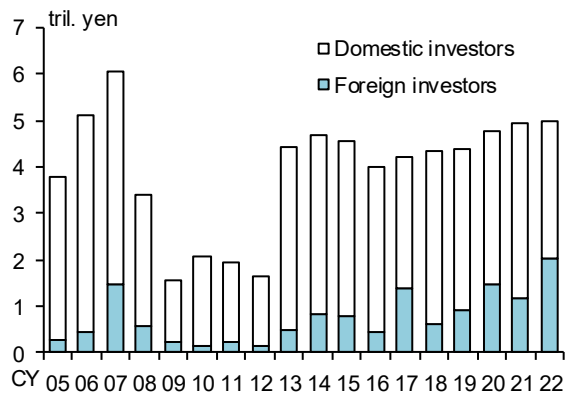
Chart III-3-11 Real estate investment stance for the year ahead



Note: The chart indicates the proportion of real estate investors who selected each given choice (including multiple answers). Latest data are based on the April 2022 survey.

Source: Japan Real Estate Institute.

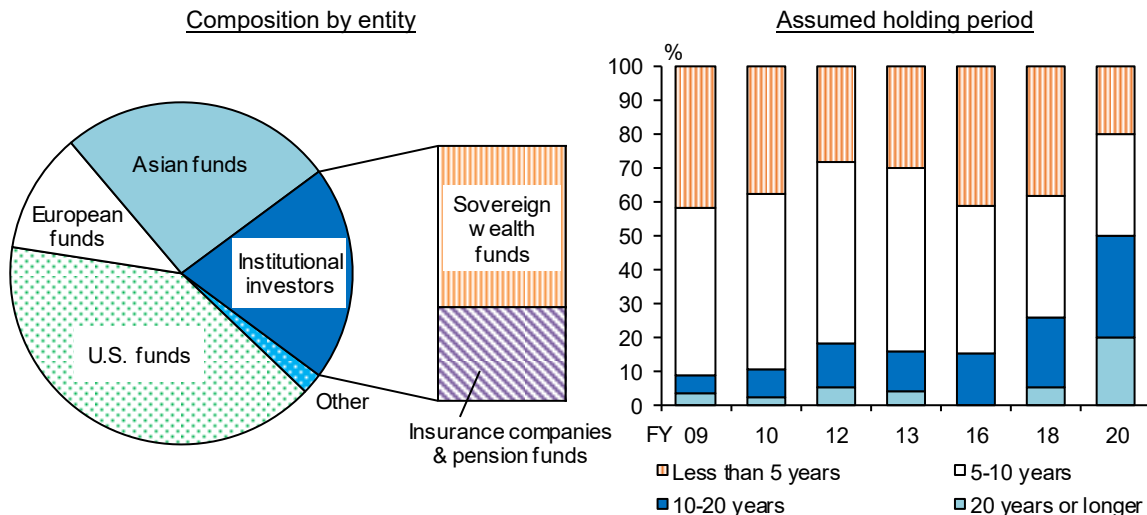
Chart III-3-12: Real estate property acquisitions by domestic and foreign investors



Note: The latest data are annualized values for the first half of 2022.

Source: Japan Real Estate Institute.

Chart III-3-13: Composition by entity and assumed holding period of foreign investors



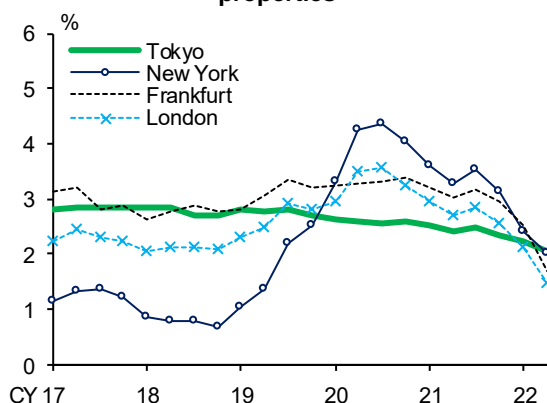
Note: 1. The reference period of "composition by entity" is from January 2020 to June 2022.

2. "Assumed holding period" is based on the survey of top foreign investors in Japan in terms of transaction value.

Source: Ministry of Land, Infrastructure, Transport and Tourism; Nikkei real estate market information DEAL SEARCH.

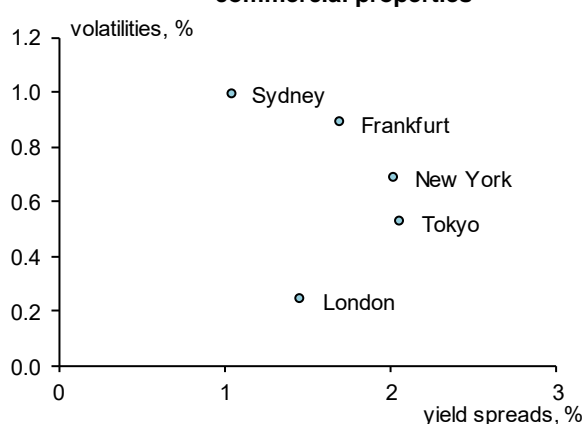
One of the reasons for the active stance of foreign investors in property acquisitions is relatively stable profitability in Japan's real estate market, as opposed to clearly declining profitability in foreign real estate markets. In major foreign cities, yield spreads (the difference between property yields and government bond yields), which represent the profitability of real estate investment, have been narrowing (Chart III-3-14). This is due to the decline in property yields resulting from higher property prices and the increase in interest rates. In contrast, in the Tokyo market, the yield spread has remained above 2 percent, reflecting the relatively slow pace of property price rises and the low and stable long-term interest rates. Moreover, the relatively low volatility of investment returns has also induced inflows of funds from foreign investors (Chart III-3-15).

Chart III-3-14: Yield spreads of commercial properties



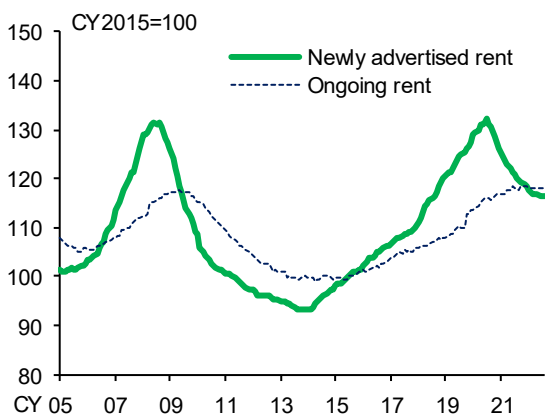
Note: Yield spreads = grade-A office yields - 10-year government bond yields. Latest data as at the April-June quarter of 2022.
Source: Bloomberg; JLL.

Chart III-3-15: Returns and volatilities of commercial properties



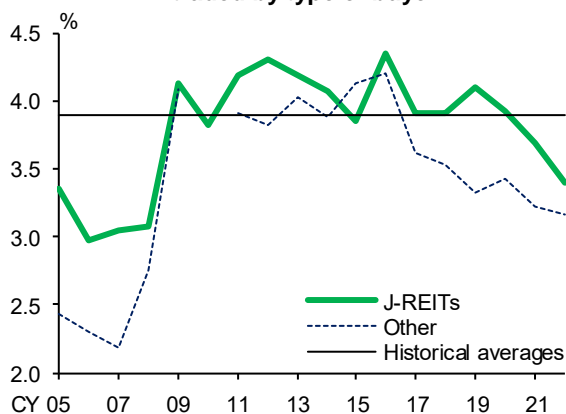
Note: The vertical axis shows the standard deviations of grade-A office yields since 2010, while the horizontal axis shows the yield spreads of the April-June quarter of 2022.
Source: Bloomberg; JLL.

Chart III-3-16: Office rents



Note: 1. "Newly advertised rent" indicates the average office rent offered in the Tokyo business area.
2. "Ongoing rent" indicates the office space rental price in the Tokyo area within the Services Producer Price Index (excluding the effects of the consumption tax hike).
3. Latest data as at August 2022.
Source: Miki Shoji Co., Ltd.; BOJ.

Chart III-3-17: Yield spreads on individual properties traded by type of buyer



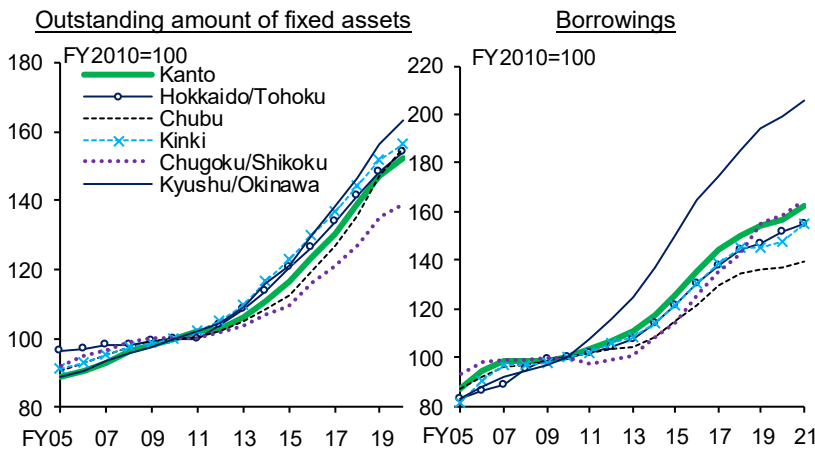
Note: Calculated based on "Nikkei real estate market information DEAL SEARCH." The differences in the characteristics of individual properties (type of use, location, age, total floor area, number of aboveground and basement floors) are controlled in the estimation. Latest data as at end-June 2022.

The increased depth of foreign investors is expected to contribute to the stability of the Japanese real estate market. At the same time, it could also increase the interconnectedness between the domestic and foreign real estate markets through global portfolio rebalancing. Recently, newly advertised rents for office space have started to decline ahead of ongoing rents in Japan's real estate market (Chart

III-3-16). Moreover, yield spreads have dropped to below the historical average even for J-REITs, which are domestic stable investors (Chart III-3-17). Given the increased presence of foreign investors, close attention should be paid to their investment behavior and its effects on the Japanese real estate market.

Meanwhile, in the real estate leasing market, fixed assets held by real estate leasing businesses have continued to increase (Chart III-3-18). Nationwide, the pace of investment has been accelerated for nearly a decade, compared to the period up to the early 2010s. This active investment in fixed assets partly reflects the fall in the burden of interest payments on loans under the low interest rate environment. Reflecting the reduction in the interest-bearing burden, current profits of the leasing business have shown no notable decline in any of the regions, although operating profits, which represent the profitability of leasing properties, declined in a wide range of regions (Chart III-3-19).

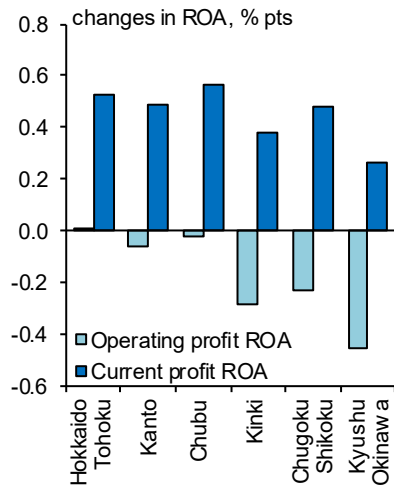
Chart III-3-18: Outstanding amount of fixed assets and borrowings for real estate leasing businesses



Note: 1. In the left-hand chart, the data are aggregated based on the location of head offices of small and medium-sized leasing businesses with capital of less than 100 million yen, while, in the right-hand chart, they are aggregated based on the location of head offices of regional banks and *shinkin* banks.
 2. Latest data for the left-hand chart and right-hand chart are as at fiscal 2020 and fiscal 2021, respectively.

Source: CRD Association; BOJ.

Chart III-3-19: Profitability of real estate leasing businesses



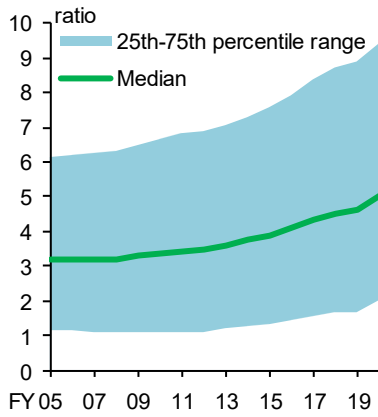
Note: The vertical axis shows changes in ROA from fiscal 2010 to fiscal 2020. The figures show medians for small and medium-sized leasing businesses.

Source: CRD Association.

As pointed out in the previous issue of the *Report*, the income of real estate leasing businesses tends to be less affected by business cycles than that of real estate transaction businesses.¹⁰ However, the financial leverage of real estate leasing businesses has been increasing steadily. Over the past few years, the ratio of loans relative to rental income (revenue), i.e., the LTI ratio, has been on an increasing trend (Chart III-3-20). Moreover, at many financial institutions, the profitability of lending to real estate leasing businesses has been declining (Chart III-3-21). At some financial institutions, net interest income from such lending has become smaller than expenses. Among regional financial institutions, there are some for which the share of real estate loans exceeds 30 percent. With the profitability of both leasing properties and lending to real estate leasing businesses declining, financial institutions need to further enhance the effectiveness of their credit management. Such measures include monitoring supply and demand conditions in the real estate market in each region, and tightening a limit control of the share of loans to the real estate industry if necessary.

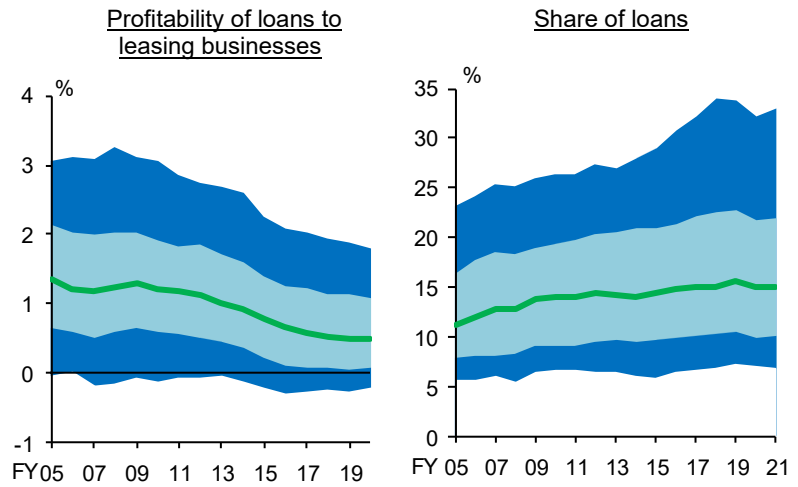
¹⁰ For details, see Section E of Chapter IV of the April 2022 issue of the *Report*.

Chart III-3-20: LTI of real estate leasing businesses



Note: The chart shows the distribution of small and medium-sized leasing businesses. Latest data as at fiscal 2020.
Source: CRD Association.

Chart III-3-21: Profitability and share of loans to real estate businesses



Legend: 10th-90th percentile range (dark blue), 25th-75th percentile range (light blue), Median (green)

Note: 1. The left-hand chart shows the distribution of profitability of financial institutions. Profitability is calculated as: interest rates for loans – overhead ratios for the domestic business – Japanese yen funding costs. Latest data as at fiscal 2020.
2. The right-hand chart shows the distribution of major banks, regional banks, and *shinkin* banks. Latest data as at fiscal 2021.
Source: Teikoku Databank; BOJ.

IV. Risks faced by financial institutions

- Financial institutions' domestic and foreign loans have kept the shares of normal loans and IG loans high. However, attention should be given to changes in the environment surrounding the financial system, such as higher raw material input costs in Japan and a rise in funding costs abroad, and resulting stress on firms' financial condition.
- With regard to domestic lending, many firms have kept ample liquidity buffers, and this is partly why defaults have been restrained at historically low levels even amid the prolonged period of stress. However, firms have faced higher raw material input costs. For some of these firms that have had difficulty passing them on to sales prices, the PD could rise significantly. Some firms that were severely affected by the pandemic have seen their liquidity buffers shrink. Financial institutions are expected to continue to encourage firms to improve their operating cash flow.
- The foreign loan portfolios consist mainly of IG loans. Meanwhile, the shares of non-IG firms and highly leveraged firms are somewhat high, and these firms are likely to be sensitive to foreign interest rate rises. In particular, in response to a rise in funding costs, the PD tends to increase more for non-IG firms with high financial leverage. The increase in the PD as a result of a rise in funding costs suggests that firms may be now more vulnerable to additional shocks than before. Financial institutions need to refine their credit risk management.
- The rise in foreign interest rates has been affecting financial institutions' securities portfolios; by increasing valuation losses on foreign interest rate products, and by raising the cost of foreign currency funding and narrowing the spread between investment yields and funding rates. Depending on future interest rate developments, valuation losses could increase further and the spread between investment yields and funding rates could become negative, reflecting the difference in the pass-through rate of market interest rates.
- In addition to these risks, financial institutions need to continue to properly manage funding liquidity risk and risks posed by changes in the business environment.

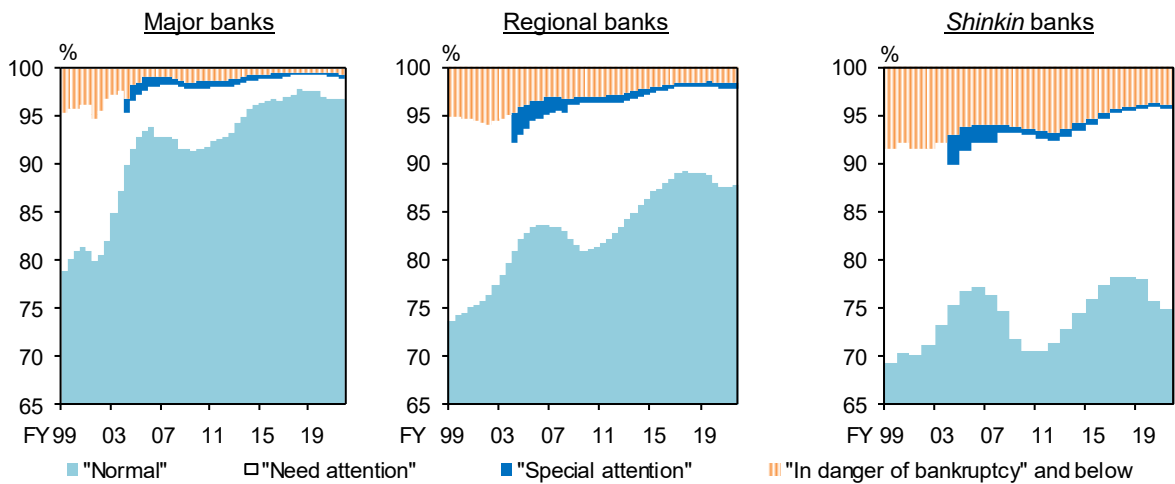
A. Domestic credit risk

The credit risk posed to financial institutions has remained low. In their loan portfolios, the shares of normal loans have somewhat declined since the start of the pandemic, but they have remained high, as they have exceeded the peak before the GFC at major and regional banks (Chart IV-1-1).

The share of unsecured and unprovisioned loans at major banks has been low, at about 1 percent, partly because major banks made additional loan-loss provisions for some large borrowers and Russia-related loans (Chart IV-1-2). The shares at regional banks and *shinkin* banks have been in the range of 3-4 percent and 4-5 percent, respectively, since they have made use of effectively interest-free loans, which are fully guaranteed, and made precautionary loan-loss provisions by the end of fiscal 2021. In addition, the shares of unsecured and unprovisioned loans to large borrowers, which are classified as "need attention" and below, have been low on the whole (Chart IV-1-3). The shares stand at slightly less than 2 percent in total at regional and *shinkin* banks, although cash position and financial condition have deteriorated for some borrowers in the face-to-face services industry (food, accommodation, and consumer services). Meanwhile, the default rate has been at a historically low level and credit cost ratios have remained low for all types of banks (Charts IV-1-4 and IV-1-5).

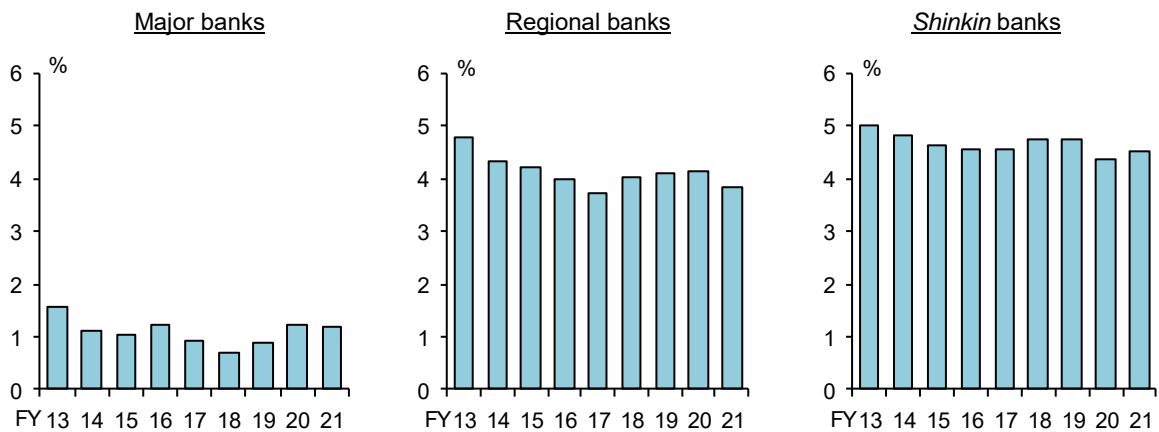
IV. Risks faced by financial institutions
A. Domestic credit risk

Chart IV-1-1: Breakdown of loans by borrower classification



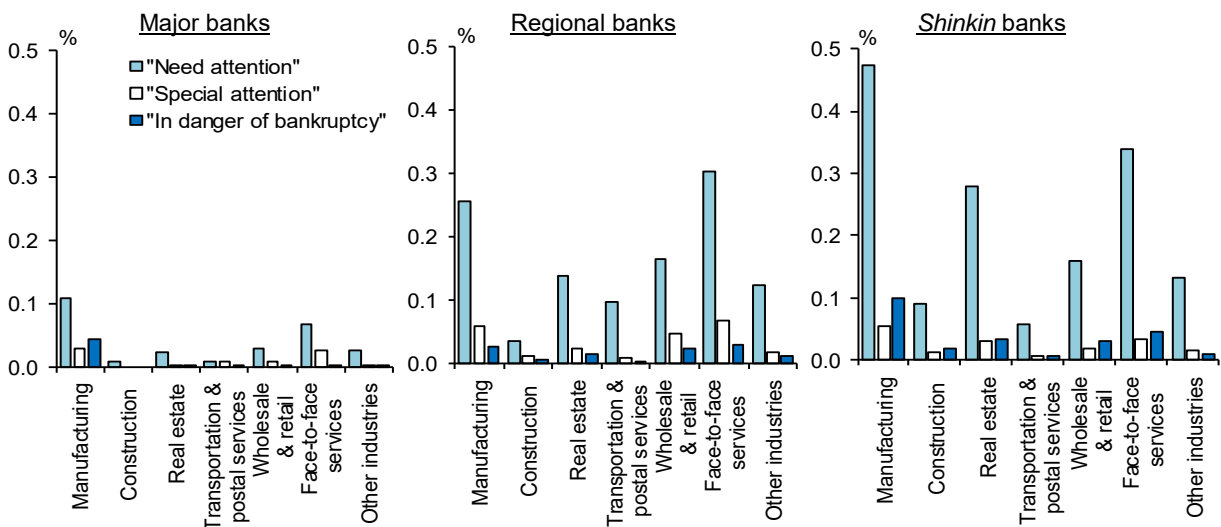
Note: "Need attention" indicates "Need attention excluding special attention" from fiscal 2004.
Latest data as at end-March 2022.
Source: BOJ.

Chart IV-1-2: Unsecured and unprovisioned ratios of overall loans



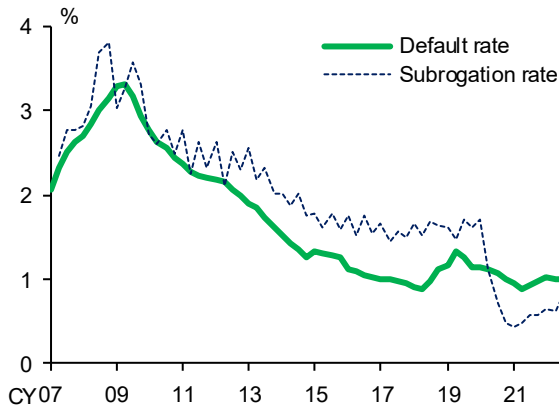
Note: The figures indicate the ratios of unsecured and unprovisioned loans classified as "need attention" and below overall.
Source: BOJ.

Chart IV-1-3: Unsecured and unprovisioned ratios of large-scale loans



Note: 1. The figures indicate the ratios of unsecured and unprovisioned loans to overall loans. Data as at end-March 2022.
2. For major banks, the large-scale loans consist of the top 100 borrowers classified as "need attention" and below. For regional banks and *shinkin* banks, the large-scale loans consist of the top 50 borrowers in each borrower classification.
Source: BOJ.

Chart IV-1-4: Firms' default

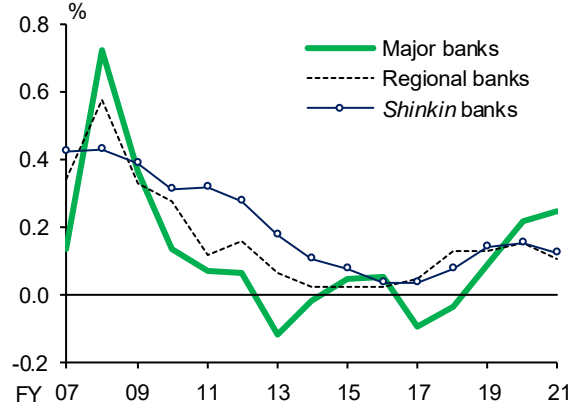


Note: 1. "Default rate" indicates the ratio of borrowers that meet the conditions for the first time, such as becoming delinquent for 3 months or longer, or being downgraded to the borrower classification of "in danger of bankruptcy" and below. Latest data as at July 2022.

2. "Subrogation rate" is the ratio of borrowers subrogated by credit guarantee corporations. Latest data as at July-August 2022.

Source: Japan Federation of Credit Guarantee Corporations; The Risk Data Bank of Japan.

Chart IV-1-5: Credit cost ratios by type of bank



Source: BOJ.

Credit risk on loans has been kept low on the whole. However, borrower firms have been under various types of stress for a protracted period, including (1) the COVID-19 pandemic, (2) supply constraints and rises in energy and raw material prices under the normalization of economic activity, (3) rising commodity and grain prices reflecting Russia's invasion of Ukraine, and (4) continuing policy rate hikes by central banks and resultant growing concerns about a slowdown in foreign economies. This section examines potential credit risk over the protracted period of stress.

1. Firms' financial condition

Many firms have secured ample on-hand liquidity (Charts III-1-7 and III-3-3). However, firms' financial condition has been affected by various types of stress. In fiscal 2020, when the pandemic started, firms' sales declined sharply as economic activity contracted substantially (Chart IV-1-6).¹¹ The pandemic had a particularly large impact on the non-manufacturing sector, especially the face-to-face services industry, and can be regarded as an industry-specific shock. In contrast, the recent rise in raw material input costs has been a macroeconomic shock that affects a wide range of industries. The increase in variable costs associated with the rise in raw material input costs has been an additional factor that negatively affects the financial condition of many firms, not only in the industries particularly affected by the pandemic but also in other industries, including the manufacturing sector, since fiscal 2021.

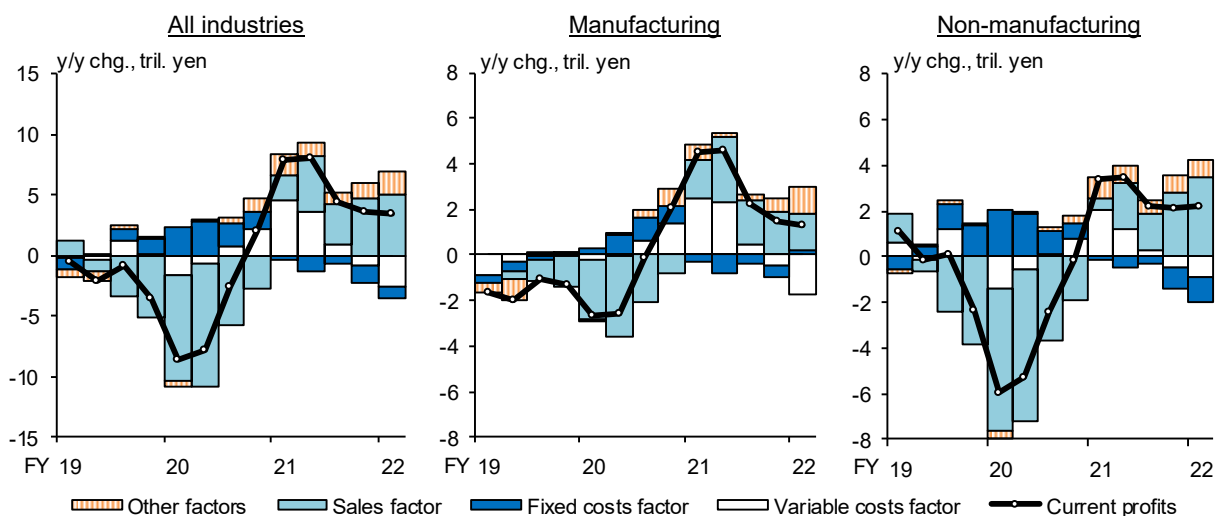
¹¹ In Chart IV-1-6, current profits (π) are decomposed as follows:

$$\Delta\pi = \left(1 - \frac{V}{S}\right) \times \Delta S - \Delta \frac{V}{S} \times S - \Delta F,$$

where fixed costs (F) are the sum of labor costs, depreciation, and interest expenses, and variable costs (V) are the sum of the cost of sales and administrative expenses (excluding fixed costs). S represents firms' sales. The first term on the right-hand side represents "Sales factor," the contribution of changes in sales to changes in current profits, while the second term shows "Variable costs factor" and the third term corresponds to "Fixed costs factor." "Other factors" represents the contribution of the remaining factors, such as changes in non-operating profits as well as the residual of the above decomposition.

IV. Risks faced by financial institutions
A. Domestic credit risk

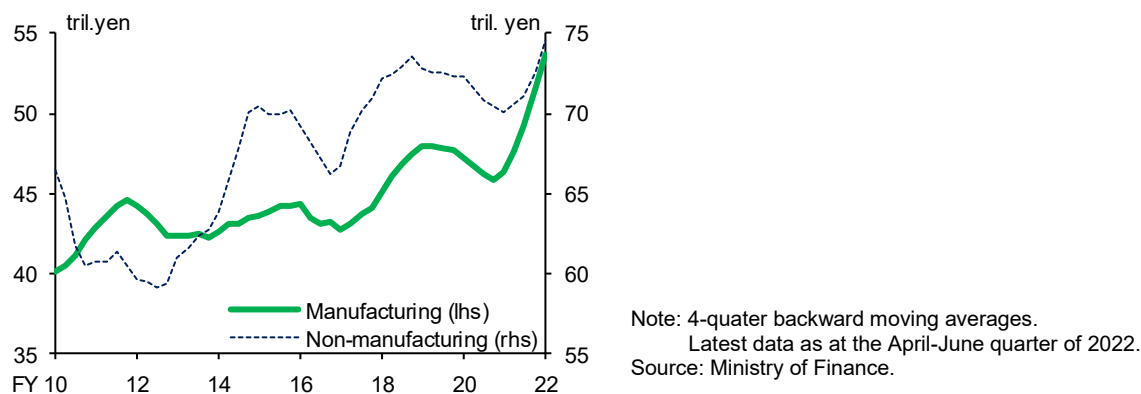
Chart IV-1-6: Firms' current profits



Note: 2-quarter backward moving averages. Latest data as at the April-June quarter of 2022.
Source: Ministry of Finance.

Supply constraints have been another factor that has a negative impact on firms' financial condition. To ensure a stable supply of products in the face of frequent supply chain disruptions, manufacturers in particular have been building up inventory assets such as raw materials and work in process (Chart IV-1-7). The resulting increase in inventory costs -- the cost of maintaining and managing inventories and the cost of settling accounts payable -- has been putting pressure on firms' cash position. So far, these additional negative factors have not led to a substantial increase in lending by financial institutions to firms, but some firms have increased external funding such as loans or CP issuance (see Section B of Chapter II and Section A of Chapter III).

Chart IV-1-7: Firms' inventory



Note: 4-quarter backward moving averages.
Latest data as at the April-June quarter of 2022.
Source: Ministry of Finance.

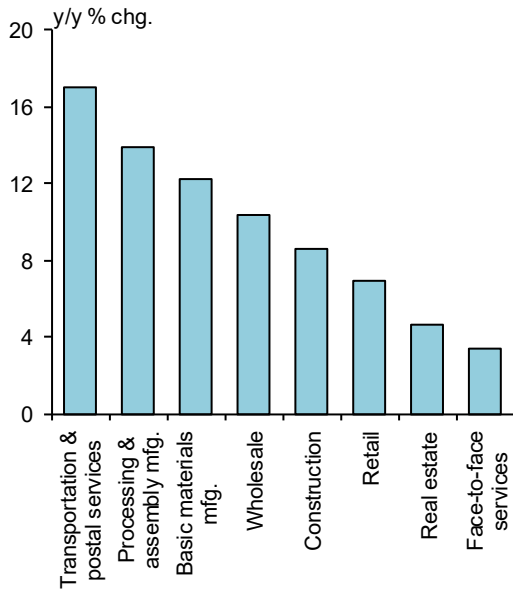
2. Price pass-through and firms' probability of default

As a result of the increase in import prices since the start of fiscal 2022, firms' variable costs are estimated to have increased substantially, especially in industries that are highly energy-dependent (Chart IV-1-8).¹² At the same time, some firms find it difficult to pass on this increase in variable costs to sales prices. A survey by Teikoku Databank shows that, while the price pass-through rate

¹² In Chart IV-1-8, the rate of increase in variable costs by industry is calculated by (1) regressing for each industry the year-on-year rate of change in variable costs for SMEs on the year-on-year rate of change in import prices and (2) multiplying the coefficients thus obtained by the rate of increase in import prices since the start of fiscal 2022.

is 80 percent or more for only slightly more than one-fifth of firms, it is less than 50 percent for almost three-fifths (Chart IV-1-9).

Chart IV-1-8: Variable costs by industry



Note: The year-on-year rates of change in variable costs estimated in response to the increase in the import prices in fiscal 2022.
Source: BOJ.

Chart IV-1-9: Price pass-through rate

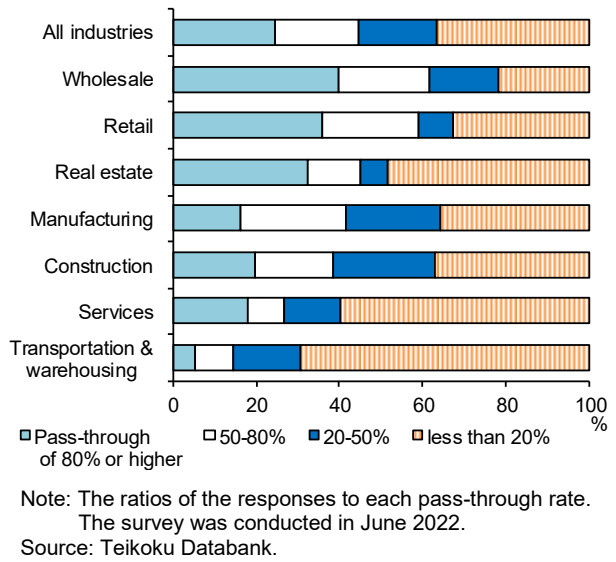
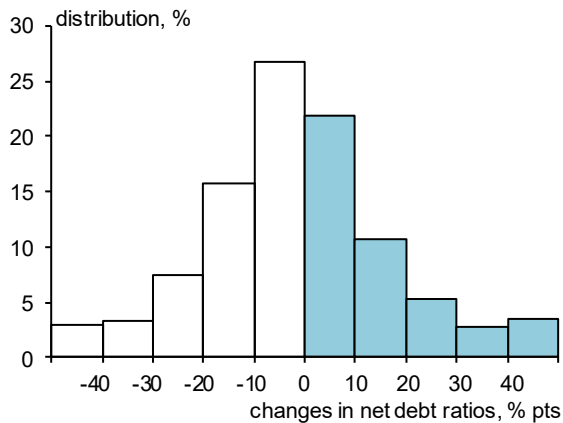
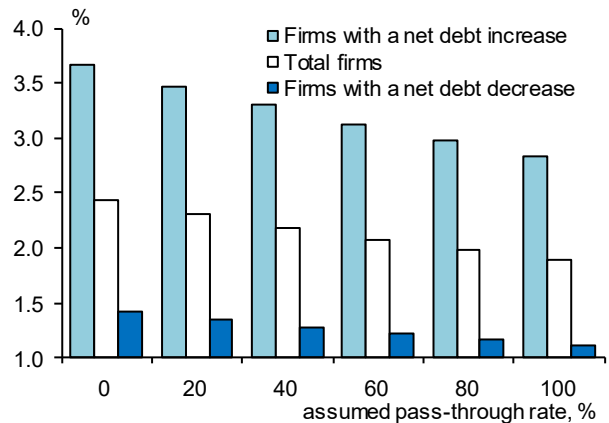


Chart IV-1-10: Distribution of SMEs' net debt



Note: The chart shows the distribution of changes (from fiscal 2019 to 2021) in the ratios of net debt to total assets.
Source: CRD Association.

Chart IV-1-11: Default curves



Note: The estimated PD based on assumed pass-through rate.

The impact of increased variable costs on firms' financial condition differs substantially, depending on the price pass-through to sales. If firms' operating profits fell as a result of their limited capacity to pass on price increases, their creditworthiness would be impaired due to a shortage of short-term liquidity (the sum of cash reserves at the beginning of the fiscal year and operating cash flow) and a decline in their capacity to pay interest (i.e., their ICR), and their PD would likely increase. Since the start of the pandemic, more than 40 percent of SMEs have seen their net debt (borrowings minus cash and deposits) increase (Chart IV-1-10). One possibility is that the more firms' net debt has increased, the more likely they are to default. To examine this issue, the extent to which the PD rises is estimated for firms that face an increase in variable costs, as shown in

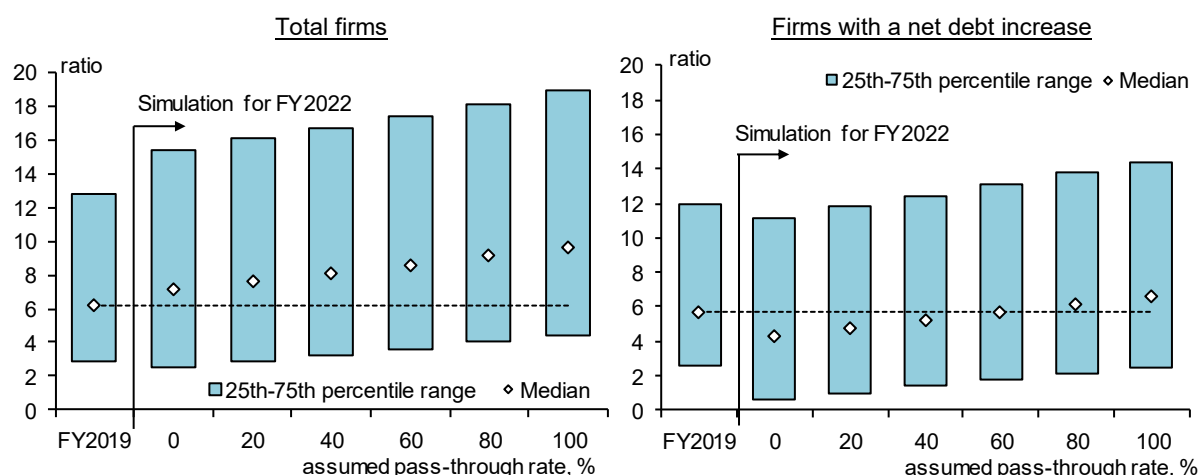
IV. Risks faced by financial institutions
 A. Domestic credit risk

Chart IV-1-8, given an assumed price pass-through rate, with all else held constant.¹³ In this exercise, the PD is defined as the probability that, within the next one year, one of the following will occur for the first time: (1) a firm will become delinquent for three months or longer, (2) a firm will be downgraded to a borrower classification of "special attention" or below, or (3) a firm will be subject to subrogation by a credit guarantee corporation.

The simulation results show that the lower the firms' price pass-through rate, the higher their PD (Chart IV-1-11). For firms overall, if the price pass-through rate is lowered to 0 percent from 100 percent, the PD becomes more than 0.5 percentage points higher. This pattern is more pronounced for firms that experienced an increase in net debt since the start of the pandemic. These firms have two features: relative to other firms that experienced a decrease in net debt, (1) their PD is higher and (2) their PD increases more as the price pass-through rate decreases.

In addition to their price-setting behavior, firms' PD depends largely on the size of their liquidity buffer. Firms that saw a decrease in net debt are those that increased their cash and deposits more than their borrowings, thus securing an ample liquidity buffer. Conversely, firms with a net debt increase have seen shrinkage in liquidity buffers that were built up by pandemic-related loans and subsidies. According to the simulation results, more than half of firms overall would have a liquidity buffer equal to or greater in fiscal 2022 than in fiscal 2019, just before the start of the pandemic, regardless of their price pass-through rate, where the liquidity buffer is measured by the ratio of cash reserves to administrative expenses (Chart IV-1-12). However, the liquidity buffers of some firms that saw an increase in their net debt would fall below the level just before the pandemic in fiscal 2019 if their pass-through rate falls below 40 percent.

Chart IV-1-12: Distribution of liquidity buffer



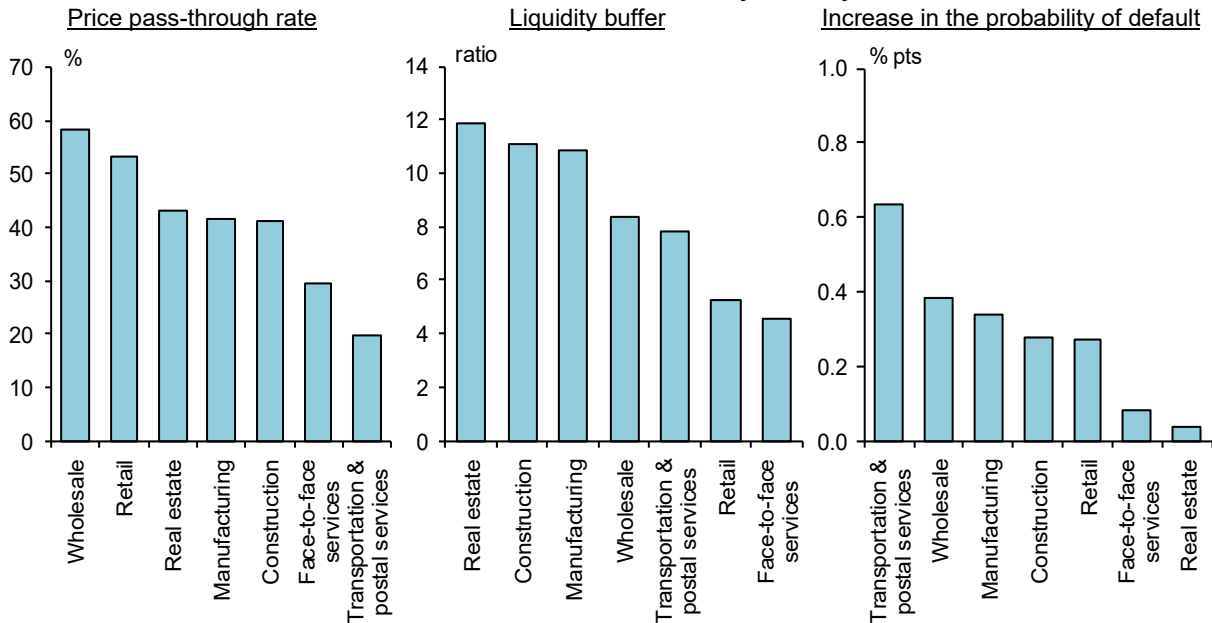
Note: "Liquidity buffer" is calculated as the ratios of cash reserves to monthly average administrative expenses. The dotted lines indicate median values of the actual level of fiscal 2019. Source: CRD Association.

The simulated increase in the PD differs substantially across industries, reflecting differences in the increase in variable costs, the difficulty of passing on cost increases, and the amount of cash reserves (Charts IV-1-8 and IV-1-13). At an individual firm level, the PD is likely to increase for (1) firms for which variable costs are sensitive to import prices due to their heavy dependence on

¹³ The analysis here covers about 420,000 firms, for which financial information for fiscal 2021 is available, among the firms contained in the CRD Association's Credit Risk Database for SMEs. The PD model was estimated on the basis of whether a firm defaulted within the next one year as the dependent variable and firms' short-term cash shortage/surplus ratio, financial leverage, borrowing interest rate, and ICR as explanatory variables (the estimation period is from 2002 to 2019). For more details on the PD model, see Box 4 in the October 2020 issue of the *Report*.

imports, (2) firms with limited bargaining power in price negotiations with their counterparties, and (3) firms heavily affected by the pandemic and with resulting low liquidity buffers.

Chart IV-1-13: Cost resilience by industry



- Note: 1. The left-hand chart indicates the price pass-through rate by industry based on Chart IV-1-9.
 2. The middle chart indicates the median value of the liquidity buffer in each industry calculated based on Chart IV-1-12 and the price pass-through rate in the left-hand chart.
 3. The right-hand chart indicates the increase in the PD calculated based on Chart IV-1-11 and the price pass-through rate in the left-hand chart.

Source: CRD Association; Teikoku Databank.

Nearly half of SMEs have increased their cash and deposits more than their borrowings since the start of the pandemic, and their ample liquidity buffers have been one factor in keeping defaults at historically low levels. However, if firms begin struggling with securing operating cash flow in a stable manner as the period of stress drags on, their cash and deposits may decline and their liquidity buffers may shrink. Financial institutions need to continue to monitor developments in firms' liquidity buffers and encourage firms to improve their operating cash flow.¹⁴

3. Characteristics of SMEs in debt

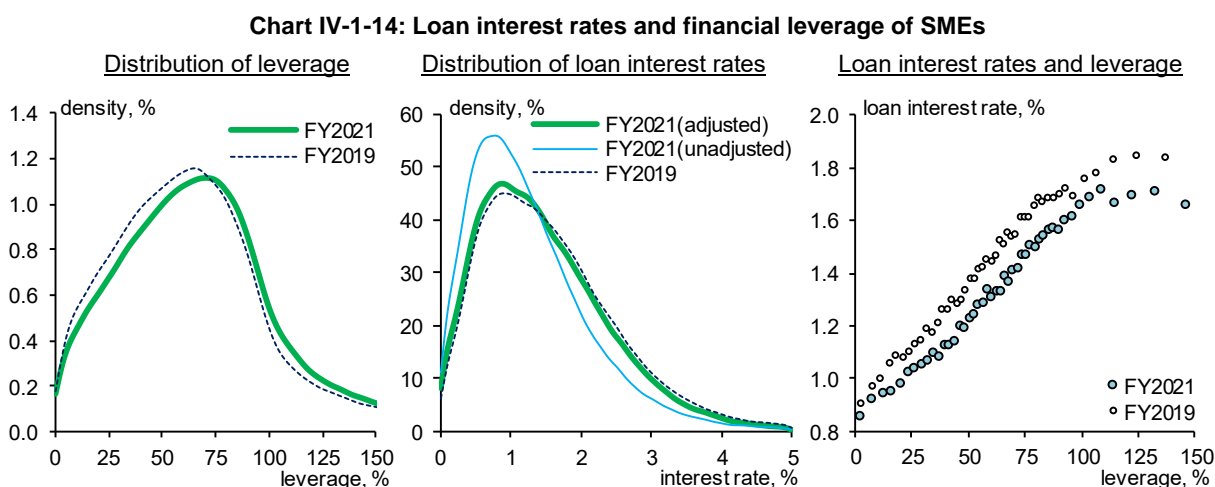
Pandemic-related loans, including effectively interest-free loans, have strongly supported firms' financing during the pandemic. For many of these loans, repayment has already started. Financial institutions are expected to support firms in an effort to improve firms' financial condition and facilitate their loan repayment by enhancing debt governance over borrower firms. As part of these efforts, it is worth examining the risk characteristics of borrower firms, especially those for which net debt has increased since the start of the pandemic.

Creditworthiness and loan interest rates

Since the start of the pandemic, it has been frequently observed that newly set loan interest rates deviate from firms' creditworthiness. The distribution of SMEs' financial leverage (loans/total assets), which is one indicator of firms' creditworthiness, has shifted upward as firms have

¹⁴ From the perspective of ensuring that both economic activities and firms' funding continue in a stable manner, possible means to ease the inventory costs for firms include shortening the duration of inter-firm credit and using accounts receivable for funding.

increased borrowing to secure financing since the start of the pandemic (left panel of Chart IV-1-14). The percentage of SMEs with financial leverage of 75 percent or more is almost 5 percentage points higher than in fiscal 2019, just before the pandemic.



Note: 1. "Leverage" in the left- and right-hand charts are calculated as loans / total assets.
2. In the right-hand chart, firms are grouped into 2-percentile bins based on their leverage in each year. The dots represent the median values of loan interest rates for each group.
Source: CRD Association.

On the other hand, SMEs' loan interest rates have declined further since the start of the pandemic. Reflecting the impact of effectively interest-free loans, their distribution has shifted left substantially in the direction of lower interest rates compared to fiscal 2019, indicating a fall in the financial burden on firms (middle panel of Chart IV-1-14).¹⁵ Even after adjusting for the impact of effectively interest-free loans, the distribution has shifted left slightly in the direction of lower interest rates. The plot of loan interest rates against financial leverage also shows that loan interest rates have declined regardless of firms' financial leverage (right panel of Chart IV-1-14). Moreover, it has been observed that once firms' financial leverage exceeds a certain level, loan interest rates become less likely to carry a premium that corresponds to the creditworthiness of the borrower.¹⁶ This balance between loan interest rates and financial leverage may also reflect that, since the start of the pandemic, in providing the financial support, financial institutions have reduced or waived interest rates and granted repayment moratoria, which has reduced the amount of interest payments.

Debt repayment burden

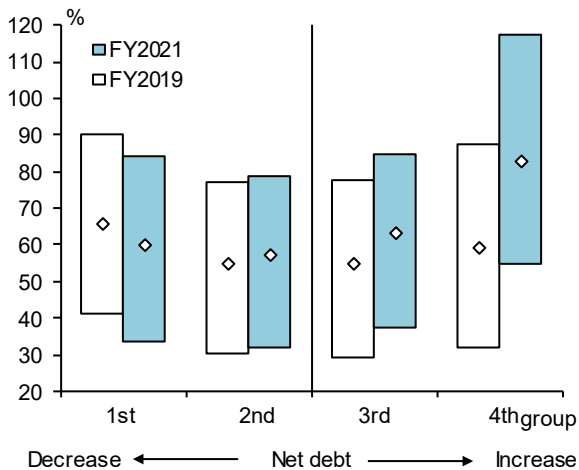
Since the start of the pandemic, the financial leverage of SMEs has increased more for firms that have seen an increase in net debt. According to the data on SMEs from the Credit Risk Database (CRD) of the CRD Association, as of fiscal 2021, the amount of debt exceeded that of cash and

¹⁵ The loan interest rates shown in Chart IV-1-14 are the effective borrowing rates (interest rates paid by firms) calculated by dividing firms' total interest expenses by their total borrowings. When adjusting for the impact of effectively interest-free loans, all incremental borrowing from fiscal 2020 onward was regarded as effectively interest-free loans, and it was assumed that the fiscal 2019 borrowing rates were applied to this incremental borrowing. Therefore, the decline in the adjusted borrowing rates primarily reflects the decrease in the amount of interest payments due to interest rate reductions and repayment moratoria.

¹⁶ This appears to be due to the fact that financial institutions are (1) setting relatively low contract interest rates or (2) agreeing to interest rate reductions or exemptions in response to requests from firms with high financial leverage. Another possibility is that (3) by setting lower interest rates, they may be tapping demand for funds from firms that are more sensitive to loan interest rates. For more details, see Section A of Chapter VI of the April 2018 issue of the *Report*.

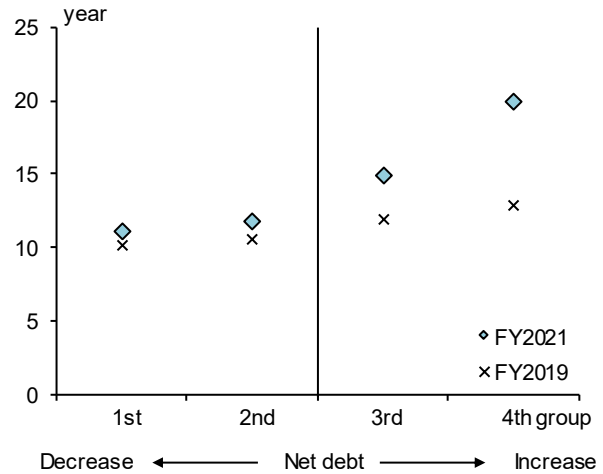
deposits at almost 80 percent of SMEs. About half of these SMEs are firms for which net debt has increased since the start of the pandemic. Among such firms there is a higher proportion of highly leveraged firms than among other firms with a net debt decrease (Chart IV-1-15). Moreover, firms with a net debt increase have loans with longer durations, and in the group with a substantial increase in net debt, loan duration has exceeded 20 years for many firms (Chart IV-1-16). These observations suggest that it has become more difficult for firms with a net debt increase to improve their financial condition in terms of financial leverage and loan duration.

Chart IV-1-15: Distribution of financial leverage



Note: The markers and bands indicate the median values and 25th-75th percentile of financial leverage in each group, respectively.
Source: CRD Association.

Chart IV-1-16: Distribution of years of debt redemption



Note: The median values of years of debt redemption in each group, calculated as loan amounts in each year divided by operating cash flow in fiscal 2019.
Source: CRD Association.

Creditworthiness and financial leverage

Many of the firms with a net debt increase have had low creditworthiness since before the pandemic. Such firms mainly account for those within the group of the top 10 percent PD, and the fraction of firms that remain in this group has been gradually increasing in recent years (left panel of Chart IV-1-17). This suggests that it had become difficult for such firms to improve their credit rating even before the pandemic. In addition, almost 20 percent of firms with a net debt increase are firms that had been downgraded in the past, and some had already received financing support from financial institutions (middle panel of Chart IV-1-17). While credit scores have improved somewhat for firms with a net debt decrease, they have declined for many firms with a net debt increase (right panel of Chart IV-1-17). These observations suggest that more efforts than ever to revitalize business are required to help improve the financial condition of firms with a net debt increase.

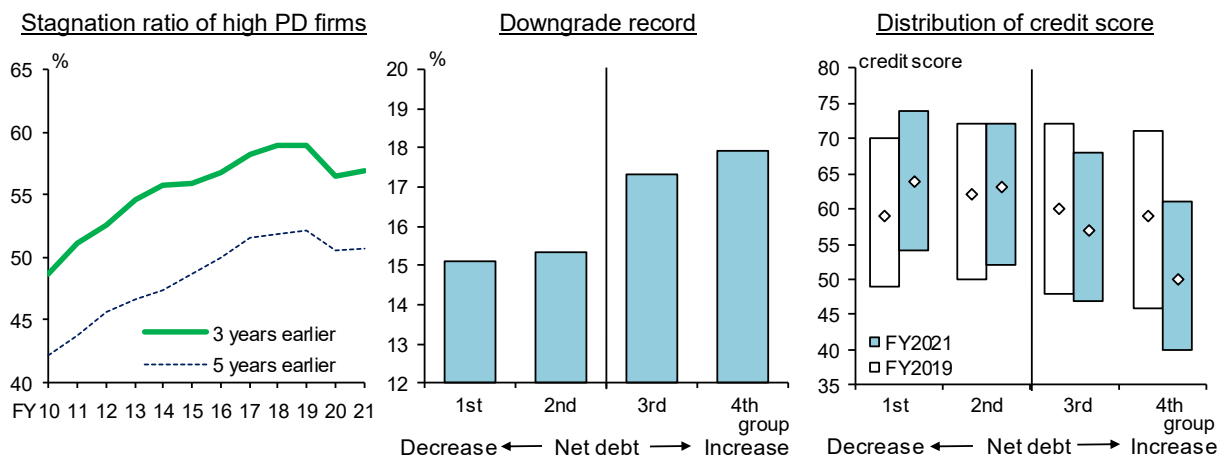
Firms with a net debt increase also feature a declining trend in profitability, i.e., gross profits per employee (Chart IV-1-18). Many such firms have incurred a profitability decline, while the profitability of other firms -- those with a net debt decrease -- is generally unchanged. For firms with a net debt increase, the decline in their profitability due to changes in the business environment since the start of the pandemic appears to have led to a decline in their operating cash flow and a deterioration in their financial condition. Their low profitability also suggests that an improvement in their productivity per employee is needed. To increase profitability, support for digitalization and other measures that aim at improving operating efficiency is needed more by firms with a net debt increase than by other firms.

Firms with a net debt increase that experienced a decrease in cash and deposits have a lower

IV. Risks faced by financial institutions
 B. Foreign credit risk

liquidity buffer than other firms and are less resilient to additional stress (Chart IV-1-19). As mentioned earlier, the presence of a liquidity buffer is an important factor in avoiding default during a protracted period of stress. Financial institutions therefore need to monitor firms' liquidity buffers and make efforts to provide support to firms. Such efforts will also help to restrain potential credit risk posed to financial institutions.

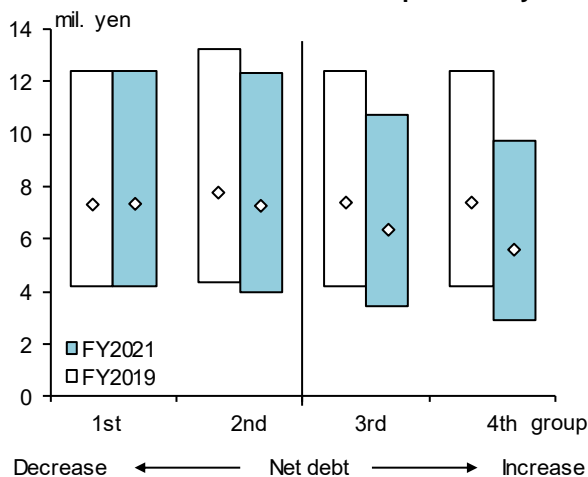
Chart IV-1-17: SMEs credit assessment



Note: 1. The left-hand chart shows the ratio of firms classified in the top 10 percent PD at each time point that were classified in the same category three or five years earlier.
 2. The middle chart indicates the ratio of firms that experienced a downgrade to "special attention" or below until fiscal 2019 in each group.
 3. In the right-hand chart, the markers and bands indicate the median values and 25th-75th percentile of credit score calculated by the CRD Association (from 0 to 100) in each group, respectively.

Source: CRD Association.

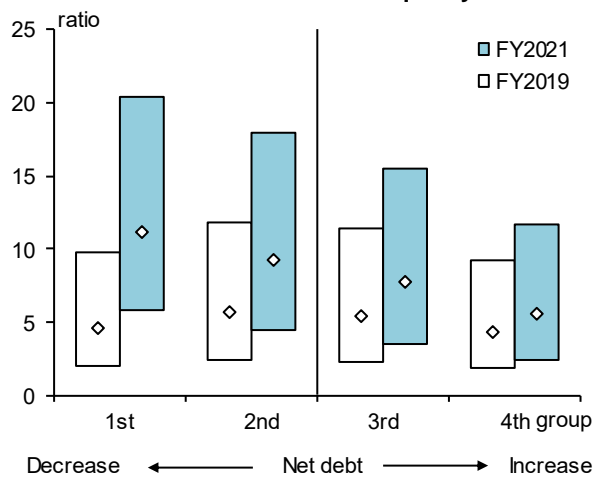
Chart IV-1-18: Distribution of profitability



Note: The markers and bands indicate the median values and 25th-75th percentile of profitability in each group, respectively. Profitability is calculated as gross operating profit per employee.

Source: CRD Association.

Chart IV-1-19: Distribution of liquidity buffer



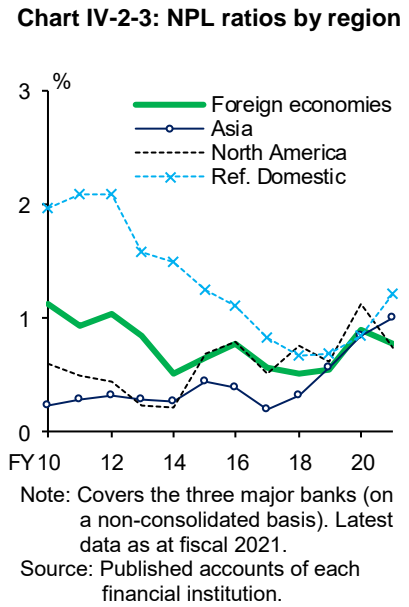
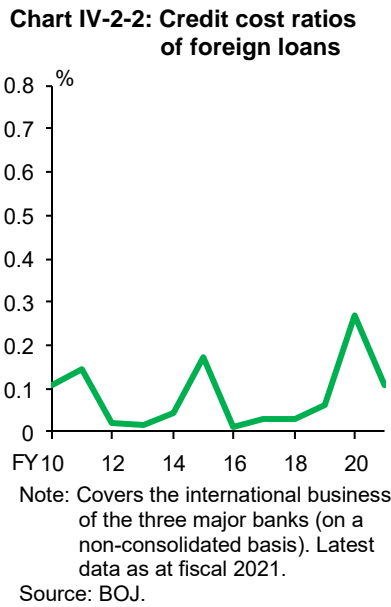
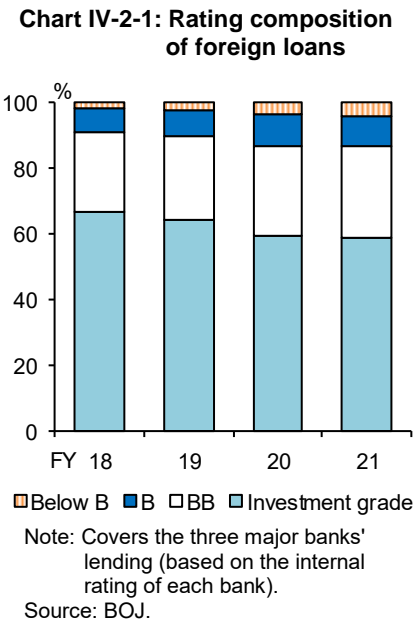
Note: The markers and bands indicate the median values and 25th-75th percentile of the ratios of cash reserves to monthly average administrative expenses in each group, respectively.

Source: CRD Association.

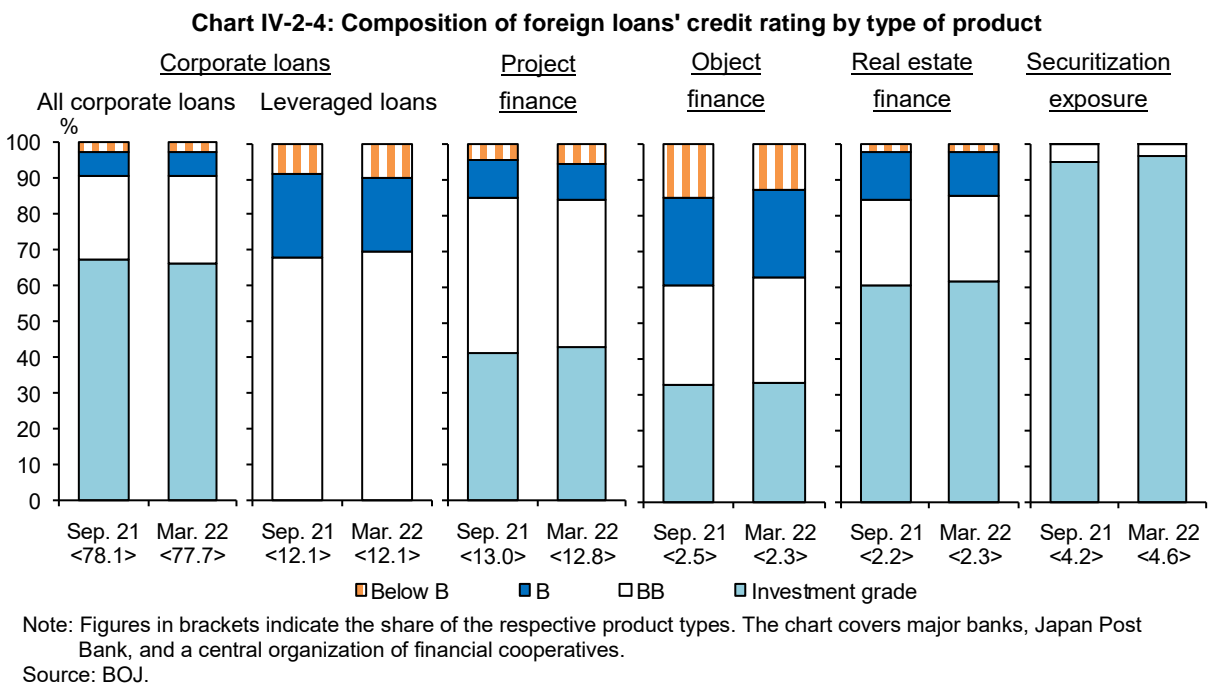
B. Foreign credit risk

While foreign loans have been on an uptrend as major banks have strived to expand their international business, the credit risk on such loans has remained low to date. Their loan composition by rating shows that the share of non-investment grade (non-IG) loans has remained at around 40 percent despite various stress events, such as the pandemic and Russia's invasion

of Ukraine (Chart IV-2-1). Although Russia-related loans to the energy as well as electricity and gas industries have been downgraded, downgrades of loans to consumer services as well as transportation and postal services, which have been negatively affected by the pandemic, have been limited to date. Against this background, credit cost ratios and non-performing loan ratios have remained at relatively low levels (Charts IV-2-2 and IV-2-3).



There has been no major change to credit risk of foreign loans by type of product (Chart IV-2-4). IG loans have continued to account for almost 70 percent of corporate loans. Regarding project finance loans and object finance loans, which entail relatively high risk, the share of non-IG loans has been declining somewhat. Project finance loans, the major part of which consists of energy-related loans, have seen improvements in cash flows due to the rise in energy prices, although Russia-related loans were downgraded. As for object finance loans, a large part of which consists of aircraft financing loans, aircraft-related demand is expected to pick up.



1. Risk map of foreign loans

The share of IG loans has been kept high. However, with foreign interest rates rising quickly, firms' creditworthiness could deteriorate, especially for highly leveraged firms. Since major banks have focused on extending leveraged loans, some of their borrowers have relatively high leverage, and the risk of these borrowers being downgraded in the future might not be small. In fact, there is a clear link between firms' financial indicators and their credit rating: even with the same initial rating, the higher the firms' financial leverage (interest-bearing debt/total assets), the lower their ratings tend to be when their ICR worsens (Chart IV-2-5).

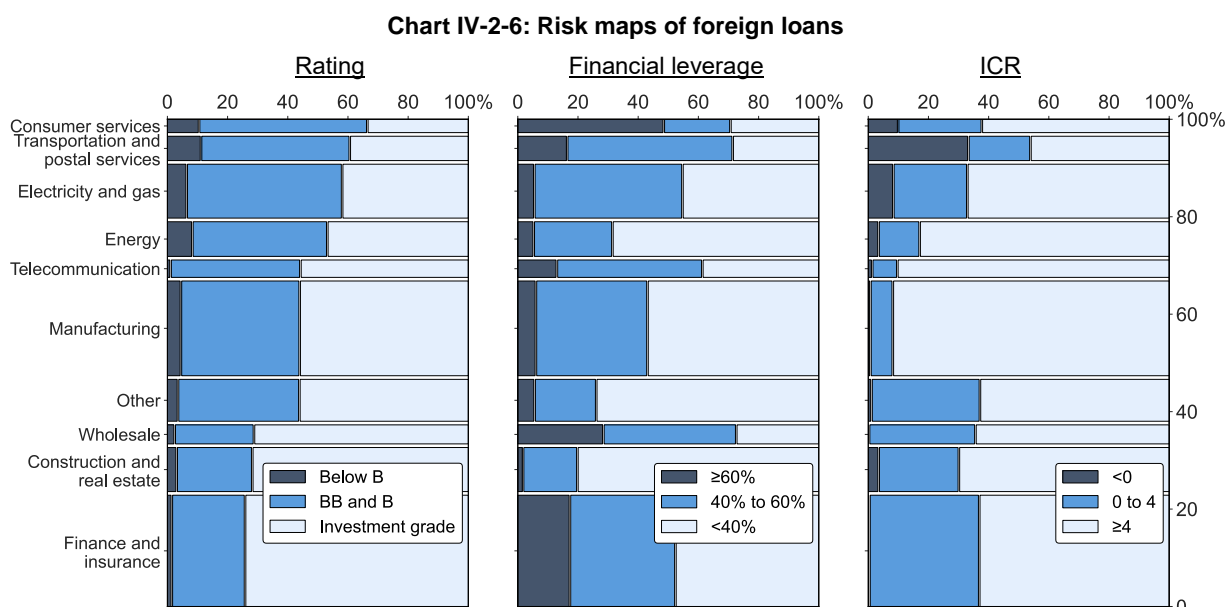
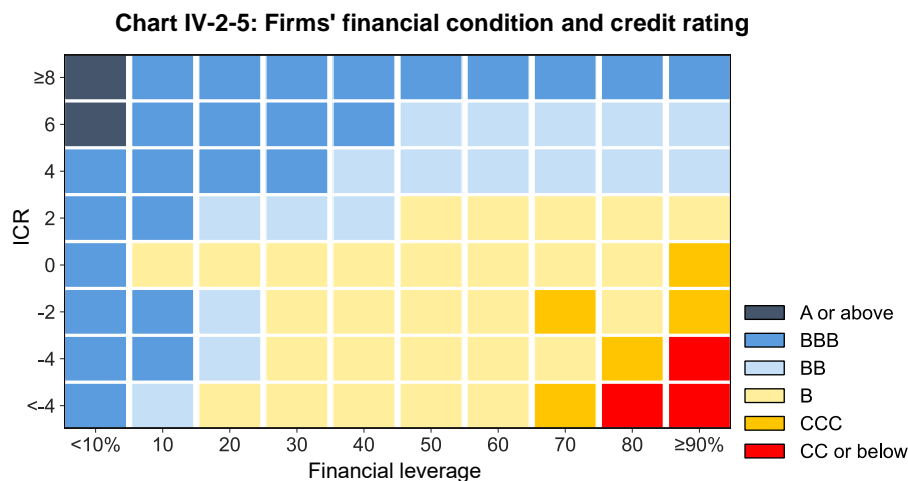


Chart IV-2-6 shows a risk map that visualizes relationships between the three major banks' outstanding amount of foreign loans by industry, the borrower credit rating, and the borrower

financial indicators. In the chart, the vertical axes represent the share of each industry in the three major banks' foreign loans outstanding while the horizontal axes represent, from left to right, the percentage shares of firms by rating, financial leverage (interest-bearing debt/total assets), and ICR (EBITDA/interest expenses), respectively.¹⁷ The darker the shade of blue in the chart, the higher the financial risk. Based on the risk map, the following three points are worth noting.

Non-IG firms with high financial leverage

First, industries that have been negatively affected by the pandemic have high shares of non-IG firms, highly leveraged firms, and low-ICR firms. The share of non-IG firms in consumer services as well as transportation and postal services had been relatively high even before the pandemic. It rose further due to the pandemic and has remained high. Although the amount of loans outstanding to these industries is not large, a further rise in interest rates could impair these loans, giving rise to a deterioration in foreign loan portfolios.

IG firms with high financial leverage

Second, even industries with a high share of IG firms have quite a few firms with high leverage and a low ICR. The left panel of Chart IV-2-6 shows that the finance and insurance industry (excluding banks), which accounts for the largest portion of foreign loan portfolios, has the highest share of IG firms at slightly more than 70 percent, which is significantly higher than the share of IG firms in overall loans outstanding (60 percent). On the other hand, the middle and right-hand panels show that the share of firms with high leverage and a low ICR in the finance and insurance industry is as high as in other industries.

In recent years, loans to the finance and insurance industry have increased, driven mainly by loans to investment funds (Chart IV-2-7). Lending to investment funds is one of the areas that major banks have been focusing on, and like major financial institutions in the United States and Europe, Japan's major banks have been actively meeting funding needs of such funds. Specifically, major banks have been providing subscription finance, a form of committed lines of credit, and making bridge loans that are necessary for the funds until they collect capital from investors. In doing so, major banks intend to strengthen their relationships with institutional investors that set up and manage these funds and gain ancillary business. While loans outstanding to large funds account for only 20 percent of overall loans extended to foreign large borrowers in the finance and insurance industry, the share of non-IG loans to large funds is close to 50 percent. Financial institutions therefore need to manage risks associated with loans to the funds differently from other types of loans to the finance and insurance industry (Chart IV-2-8). In fact, haircuts for loans to the funds are set in a conservative manner.

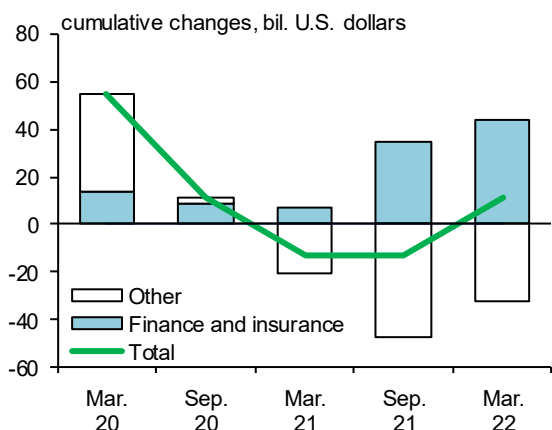
In addition, the wholesale industry also has a high share of highly leveraged firms despite having a high share of IG firms. This reflects the increase in financial leverage resulting from commodity traders drawing down their committed credit lines when they were faced with a rise in funding costs and additional margin requirements when commodity prices surged in early spring. Although the amount of loans outstanding to the wholesale industry as a whole is not large, the loan amount per borrower has become larger and some borrowers have relatively high financial leverage. Moreover,

¹⁷ In Chart IV-2-6, due to data constraints, the figures in the middle and right panels are for firms with an external credit rating, which may not necessarily correspond to all borrowers of the three major banks. However, since there are no major differences between the composition of internal ratings by the three major banks in the left panel and the composition of external ratings by credit rating agencies, the impact of the data constraints on the description in the main text likely is limited.

IV. Risks faced by financial institutions
 B. Foreign credit risk

since the commodity market is oligopolistic, there is a risk that funding liquidity shortages at some commodity traders could lead to a decline in liquidity in the overall market (see Box 2).

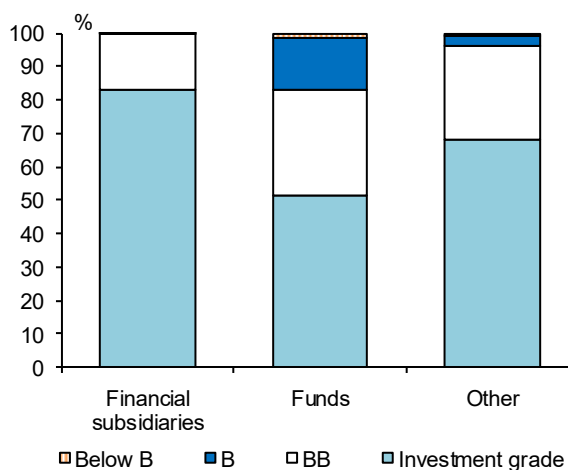
Chart IV-2-7: Changes in foreign loans by industry



Note: Shows cumulative changes in foreign loans from end-September 2019. Covers the three major banks' lending.

Source: BOJ.

Chart IV-2-8: Rating composition of loans to finance and insurance



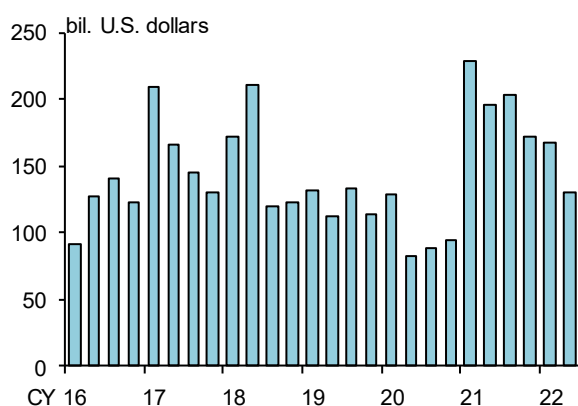
Note: Covers the three major banks' large borrowers (based on the internal rating of each bank). Data as at end-March 2022.

Source: BOJ.

Borrowers of leveraged loans

Third, the recent growth in leveraged loans made by major banks has pushed up the shares of non-IG firms and highly leveraged firms in their foreign loan portfolios. Major banks have strengthened their originate-to-distribute business of syndicated loans and also have actively worked on extending leveraged loans (Chart IV-2-9). Recently, prices of leveraged loans and CLOs, which are securitized products backed by leveraged loans, have fallen sharply, reflecting concerns over deteriorating corporate profits due to high funding costs and raw material input costs, and major banks have taken a more cautious stance with regard to new loans (Chart II-1-9). However, leveraged loans already account for about 10 percent of foreign loan portfolios (Chart IV-2-4).

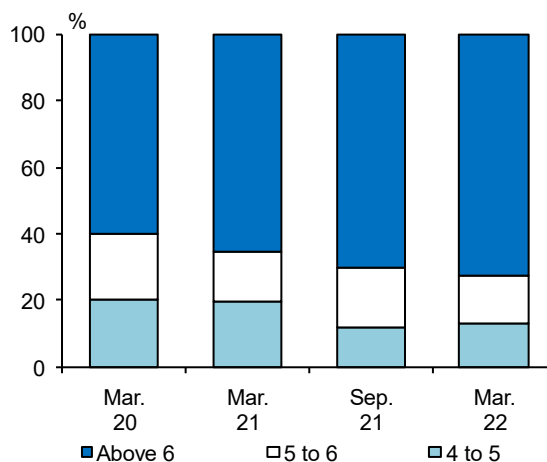
Chart IV-2-9: Amount of leveraged loans originated



Note: The amount of leveraged loans originated in the United States. Latest data as at the April-June quarter of 2022.

Source: LCD, an offering of PitchBook Data.

Chart IV-2-10: Composition of leveraged loans by leverage ratio



Note: The leverage ratio is measured as interest-bearing debt / EBITDA. Covers the three major banks.

Source: BOJ.

In the leveraged loan market, covenant-lite loans -- that is, loans with fewer financial covenants imposed on the borrower -- have become common, and the number of higher-leverage loans has increased in the past few years. With regard to the three major banks' leveraged loans, the share of those with leverage (interest-bearing debt/EBITDA) of more than 6 times has been on the rise (Chart IV-2-10). The increase in the number of these high-leverage loans has likely been driven by the three major banks' efforts to expand their business with institutional investors by extending leveraged loans to non-IG firms sponsored by the institutional investors and their affiliated funds.

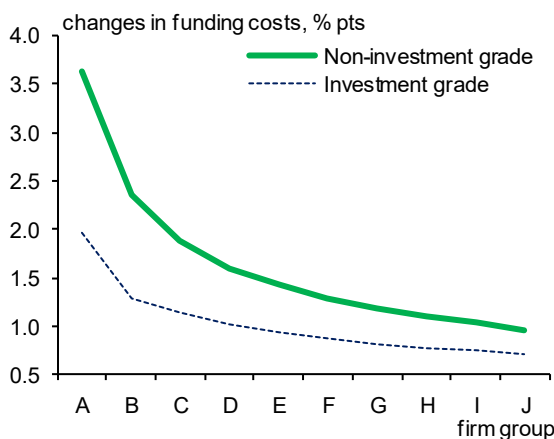
2. Rising interest rates and firms' probability of default

Heterogeneity in funding costs

As shown in the risk map, while the foreign loan portfolios of major banks consist mainly of IG loans, the share of highly leveraged firms is somewhat high, and these firms are likely to be sensitive to interest rate rises. Moreover, the impact of rising interest rates is not uniform but is likely to differ across firms to some extent. For example, for firms that lack access to the corporate bond market and that have a low proportion of long-term fixed-rate funding, funding costs tend to change in tandem with market interest rates. Firms that are about to roll over short-term borrowings at fresh interest rates or issue bonds may need to pay higher credit spreads in line with market interest rates.

The estimate obtained by using financial data from 4,000 foreign firms suggests that the rise in the 2-year U.S. interest rate (of 2.8 percentage points) over the past year likely pushes up funding costs by more than 1 percentage point on average over the year ahead (Chart IV-2-11).¹⁸ There is large heterogeneity in the increase in firms' funding costs, with some firms' funding costs rising by over 3.5 percentage points, well above the increase in market interest rates, and others seeing little or no increase in their funding costs. Moreover, the increase in funding costs is larger for non-IG than IG firms due to larger additional credit spreads.

Chart IV-2-11: Changes in funding costs by firm group



Note: IG and non-IG firms are, respectively, grouped into 5-percentile bins (up to the median) based on the estimated increase in their funding costs in descending order. The lines show the median values for each group.

Source: Haver Analytics; Moody's; Refinitiv Eikon; S&P Global Market Intelligence.

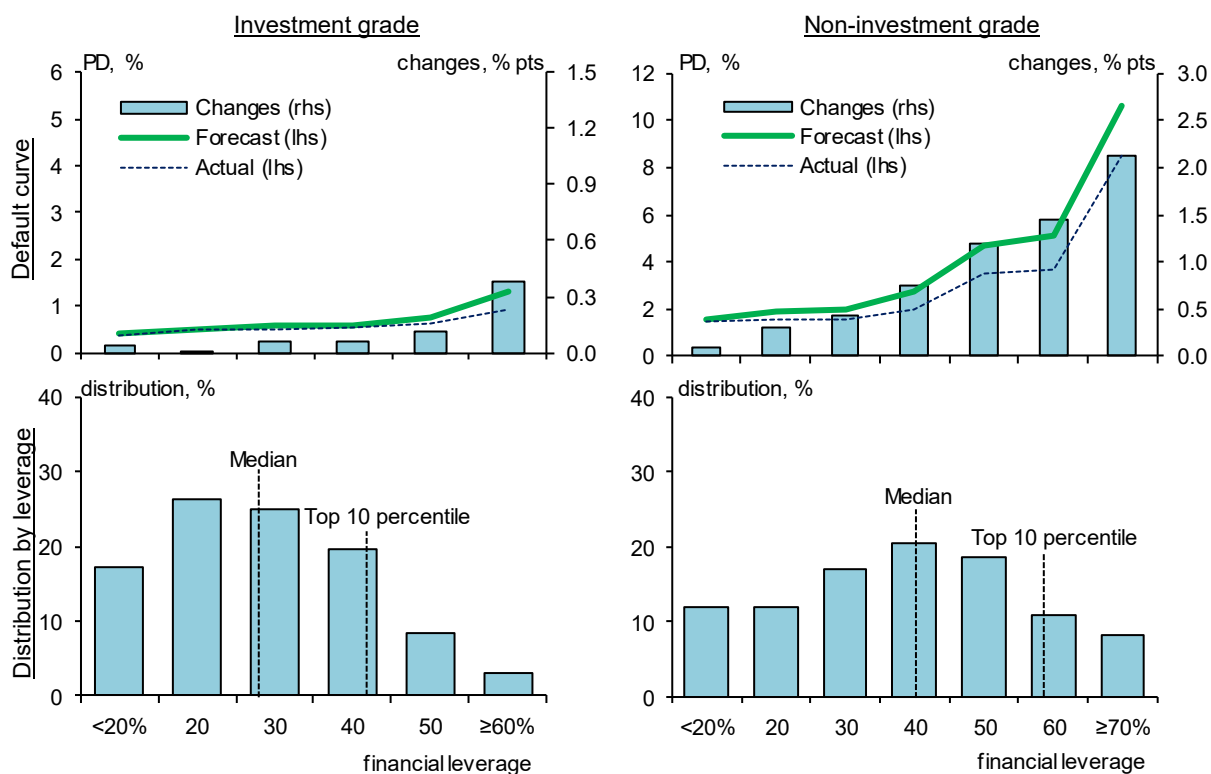
¹⁸ Chart IV-2-11 shows the results of panel estimates of the interest rate sensitivity of funding costs of individual firms. The estimates use funding costs as the dependent variable and the 2-year U.S. interest rate as the explanatory variable, controlling for U.S. macroeconomic factors (estimation period: January-March quarter 2000 to April-June quarter 2022). The estimated interest rate sensitivity is then multiplied by the increase in the 2-year U.S. interest rate to calculate the increase in firms' funding costs.

Heterogeneity in probability of default

While higher funding costs weaken firms' ICR, the resulting change in their creditworthiness differs even across firms facing the same increase in funding costs, because of heterogeneity in the original level of ICR depending on their financial condition. In general, firms with higher financial leverage and a larger debt burden are more likely to have a lower ICR than firms with lower financial leverage, and a further decline in the ICR is more likely to lead to an increase in their PD. In addition, even among firms with the same level of financial leverage, the extent to which their PD rises can differ between IG and non-IG firms.

The estimate suggests that, for both IG and non-IG firms, an increase in the PD in response to the estimated increase in funding costs is larger the higher the firms' financial leverage (Chart IV-2-12).¹⁹ Moreover, the response of the PD tends to be more amplified, the higher firms' financial leverage. This feature is more pronounced among non-IG firms. For firms in the top 10 percentile points in terms of their financial leverage among the three major banks' large borrowers, the increase in the PD is only 0.1 percentage point for IG firms, whereas it is about 1.5 percentage points for non-IG firms.

Chart IV-2-12: Firms' default curves and distribution by financial leverage



Note: 1. "Forecast" in the upper charts shows the estimated PD assuming a rise in funding costs. "Actual" is the PD as at June 2022. "Changes" represents the increase in the PD from "Actual" to "Forecast."
 2. The lower charts show the distribution by financial leverage of the three major banks' large borrowers (as at end-March 2022).

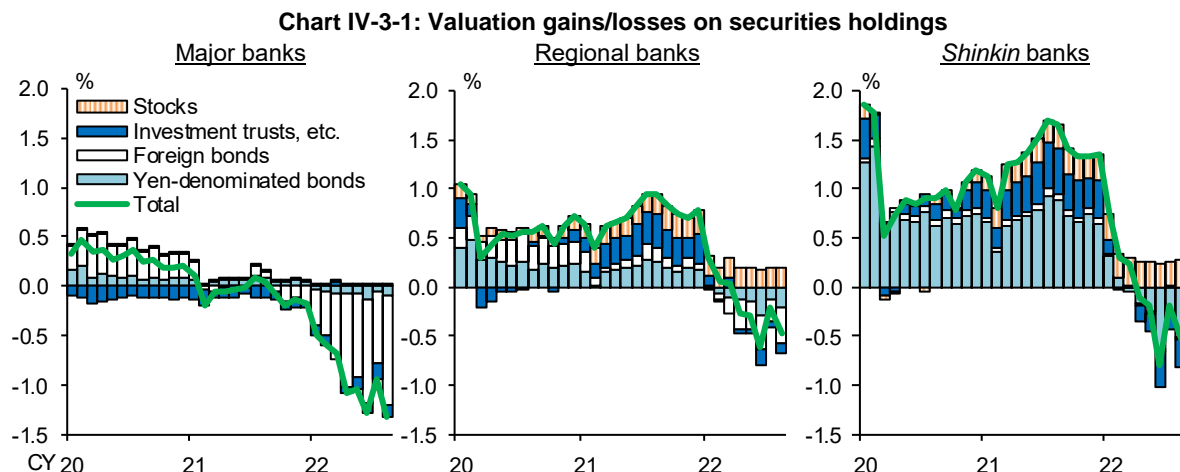
Source: Haver Analytics; Moody's; Refinitiv Eikon; S&P Global Market Intelligence; BOJ.

¹⁹ Chart IV-2-12 shows the results of estimating the impact of a deterioration in ICRs due to the estimated increase in funding costs on the probability distribution of firms' credit ratings using a rating classification model based on machine learning techniques (gradient boosting decision tree). Here, only an increase in funding costs is assumed; that is, it is assumed that there are no macro shocks that could lead to a decline in revenues. The default curves in the upper panels show the PD of firms for each leverage level, where the actual default rate for each rating category was weighted by the estimated probability distribution of firms' credit ratings and aggregated for each leverage level.

The estimation results indicate that if firms' funding costs rise and the PD increases, the default curve shifts upward in their financial leverage and its slope becomes steeper. If any additional shock that increases firms' financial leverage were to occur, the already high PD of highly leveraged non-IG firms would rise to a greater extent. This suggests that non-IG firms facing higher funding costs may be more vulnerable to additional shocks. Financial institutions need to refine their credit risk management with regard to highly leveraged firms, such as in their use of predictive analysis of existing loans and in decisions on additional financing.

C. Market risk associated with securities investment

Valuation losses on securities have increased for all types of financial institutions (Chart IV-3-1). Financial institutions have increased investments in foreign bonds, foreign bond investment trusts, and super-long-term yen-denominated bonds since the mid-2010s, and they have incurred valuation losses on these securities. Going forward, as withdrawal from monetary easing continues in the United States and Europe, valuation losses could increase further as foreign interest rates rise and risky assets are repriced accordingly. In addition, the rising cost of foreign currency funding including foreign exchange hedging costs could result in a negative spread between investment yields and funding rates. Against this background, this section examines financial institutions' market risks, focusing in particular on foreign currency interest rate risk.



Note: The ratio of valuation gains/losses on securities (excluding strategic stockholdings) to risk-weighted assets.
 Latest data as at end-August 2022.
 Source: BOJ.

1. Yen interest rate risk

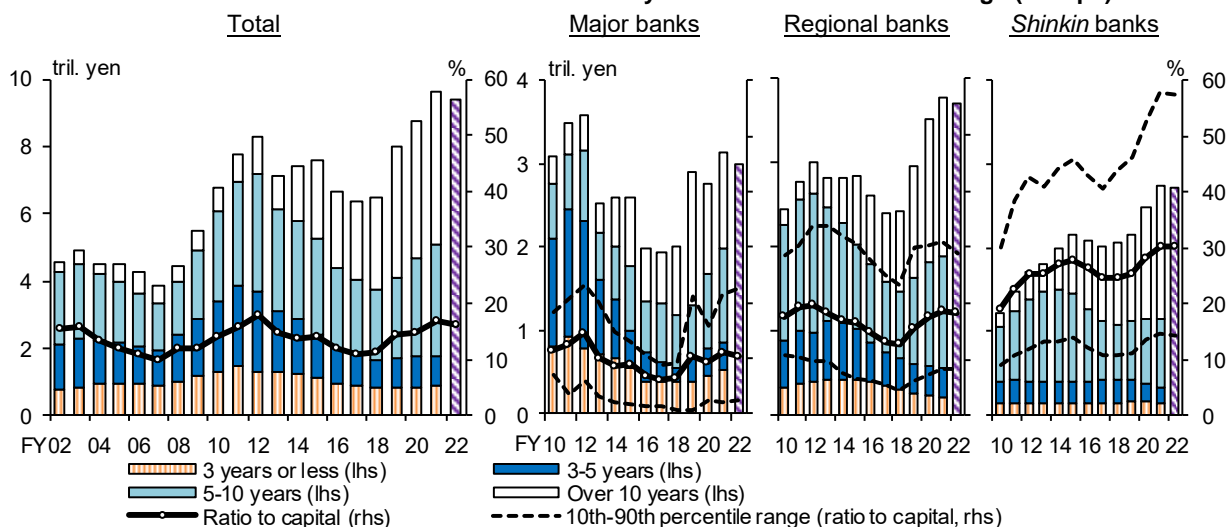
The amount of interest rate risk associated with financial institutions' investments in yen-denominated bonds, in terms of 100 basis point value (BPV), has been close to the highest level since records began in fiscal 2002 (Chart IV-3-2).²⁰ The increase in the amount of risk in recent years can be explained by two factors. First, the outstanding amount of bond investments has increased for all types of financial institutions. Second, regional financial institutions in particular have lengthened the duration of bond portfolios to compensate for the decline in interest income

²⁰ In Chart IV-3-2, 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.

IV. Risks faced by financial institutions
 C. Market risk associated with securities investment

due to the large amount of high-yield bonds that came due. The ratio of the amount of risk to the amount of capital has risen to around 10 percent for major banks, around 20 percent for regional banks, and around 30 percent for *shinkin* banks. Across regional banks and *shinkin* banks, the ratio has been dispersed widely.

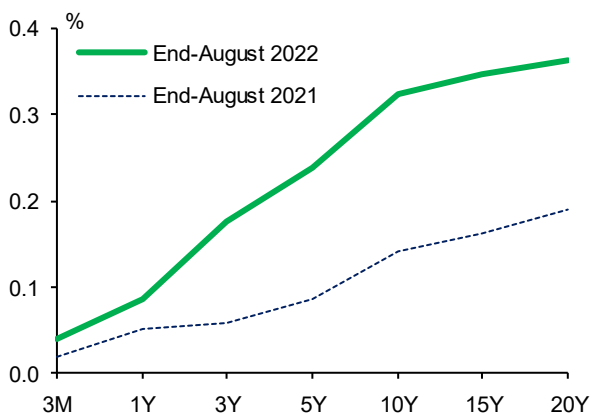
Chart IV-3-2: Interest rate risk associated with yen-denominated bondholdings (100bpv)



Note: 1. 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 2022 are estimated as at end-August 2022.
 2. "Ratio to capital" is calculated using 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 all others (excluding the transitional arrangements).

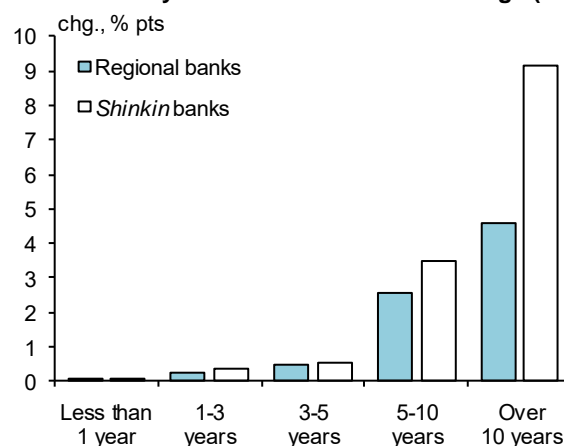
Source: BOJ.

Chart IV-3-3: Volatility curve of yen interest rate



Note: Historical volatility of swap rates with the past 1-year observation period.
 Source: Bloomberg.

Chart IV-3-4: Interest rate risk associated with yen-denominated bondholdings (VaR)



Note: Changes in the ratio of VaR to capital from end-August 2021 to end-August 2022.
 Source: Bloomberg; BOJ.

The effect of rising foreign interest rates has also spilled over to Japan, and the volatility of domestic interest rates has increased, especially in the super-long term (Chart IV-3-3). Under these circumstances, the VaR of regional financial institutions' yen-denominated bond investments has increased significantly, driven by those with a maturity over 10 years (Chart IV-3-4).²¹ Given the increased interconnectedness of domestic and foreign financial markets, it is important to note that

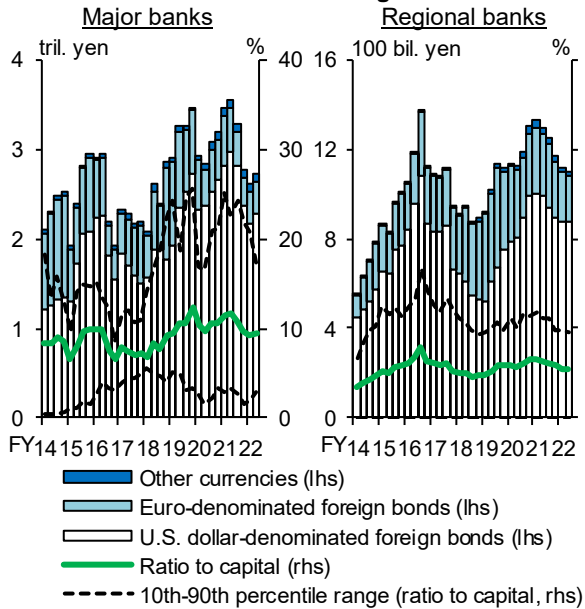
²¹ Chart IV-3-4 shows the historical VaR (with a 99 percent confidence level and a 1-year holding period) for swap rates based on the outstanding amount of yen-denominated bonds in each period.

fluctuations in foreign market interest rates can increase the interest rate risk associated with yen-denominated bond investments. Many financial institutions allocate economic capital based on VaR rather than BPV. Going forward, financial institutions need to assess risks from various perspectives, employing risk measurement methods, such as VaR, that align with the transmission of particular shocks, as well as BPV that is used in interest rate risk in the banking book (IRRBB).

2. Foreign currency interest rate risk

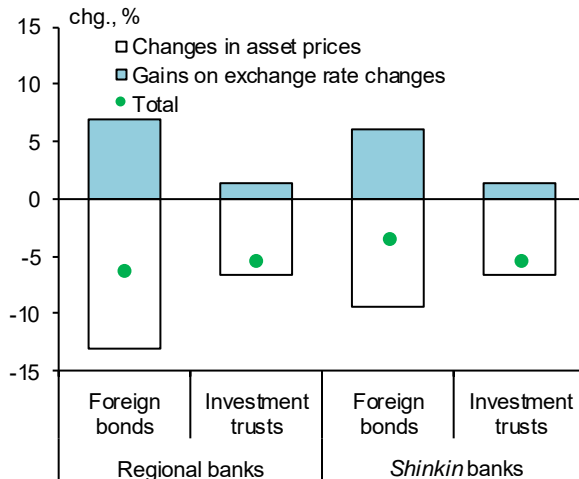
The amount of interest rate risk associated with foreign currency-denominated bond investments has decreased for both major banks and regional banks (Chart IV-3-5).²² Reflecting concerns about rises in foreign interest rates, these banks have reduced the outstanding amount of long-term bonds accumulated in the past and shortened the duration of bond portfolios. As a result, the amount of such risk has been limited to about 10 percent and 5 percent of their capital, for major banks and regional banks, respectively.

Chart IV-3-5: Interest rate risk of foreign currency-denominated foreign bonds



Note: 1. Interest rate risk is a 200 basis point value in the banking book. Off-balance-sheet transactions are included for major banks. Latest data as at end-August 2022.
2. "Ratio to capital" is calculated using CET1 capital for internationally active banks and core capital for domestic banks (excluding the transitional arrangements).
Source: BOJ.

Chart IV-3-6: Decomposition of changes in valuation gains/losses in valuation gains/losses



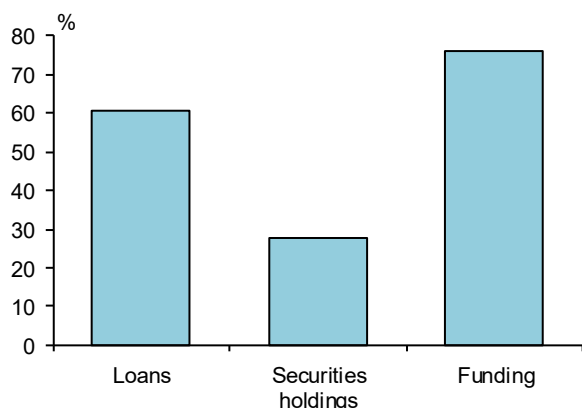
Note: The figures are changes in valuation gains/losses on securities holdings at end-August 2022 compared to end-December 2021. "Changes in asset prices" includes changes in the outstanding amount.
Source: BOJ.

During the current phase of rising interest rates, the depreciation of the yen so far has worked to mitigate regional financial institutions' valuation losses on foreign currency-denominated investment products (Chart IV-3-6). However, depending on future exchange rate developments, valuation losses could increase further. Also, the pass-through rate of rising market interest rates

²² The interest rate risk of foreign currency-denominated foreign bonds in Chart IV-3-5 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. Similarly, 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 are both 2 percentage points.

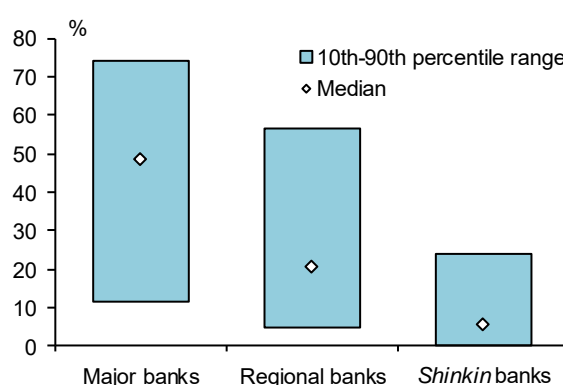
is higher for funding rates than for investment yields, reflecting differences between financial institutions' investment and funding structures (Chart IV-3-7). Therefore, depending on future interest rate developments, the spread between investment yields and funding rates could become negative and investment profits might turn into losses. Among financial institutions that had increased risk-taking on foreign currency interest rates to improve their profitability, there are quite a few for which foreign currency interest and dividends accounted for more than 50 percent of their overall profits from interest and dividends on securities (Chart IV-3-8).

Chart IV-3-7: Pass-through rates of market interest rates



Note: Pass-through rates of the U.S. 3-month rate, which are calculated using the Financial Macro-econometric Model. Covers major banks and regional banks.
 Source: BOJ.

Chart IV-3-8: Contribution to profits of foreign currency-denominated interest and dividends



Note: The ratio of foreign currency-denominated interest and dividends to overall interest and dividends as at fiscal 2021.
 Source: BOJ.

Some financial institutions have been reducing their outstanding amount of investment to avoid a negative spread, while others have been replacing low-yielding securities with relatively high-yielding credit products and longer-term bonds. As a result, some of the foreign currency interest rate risk has already been booked as realized losses or been transformed into market credit risk and duration risk. Financial institutions need to appropriately manage foreign currency interest rate risk, including these changes in their risk profile.

Foreign currency interest rate risk of investment trusts

Quite a few regional financial institutions had increased risk-taking on foreign currency interest rates by accumulating multi-asset and foreign bond investment trusts. Some regional banks have held foreign currency interest rate risk that includes risk associated with investment trusts, amounting to more than 10 percent of their capital (Chart IV-3-9). Meanwhile, *shinkin* banks have increased risk-taking on foreign currency interest rates through investment trusts even more than regional banks, and investment trusts account for two-thirds of their foreign currency interest rate risk.

The overall gains and losses of investment trusts can be affected not only by the risk characteristics of the invested assets, but also by foreign currency funding costs as well as exchange rate fluctuations. In fact, the performance of U.S. bond investment trusts has worsened. Valuation on the assets held by these trusts has deteriorated due to rising market interest rates, and their foreign currency hedging costs, which represent funding costs, have increased (Charts IV-3-10 and IV-3-11). The deterioration in the performance of investment trusts could lead to dividend cuts and declines in net asset values. In the case of fixed dividend products, bad performance is entirely reflected to the decline in net asset values. Moreover, if an investment trust with valuation losses

comes due, the valuation losses will be realized losses. Financial institutions need to have a system in place to conduct cross-sectional checks of various risk factors and to monitor developments in overall profits and losses, including the risk of a negative spread and the risk of valuation losses.

Chart IV-3-9: Foreign currency interest rate risk of regional financial institutions

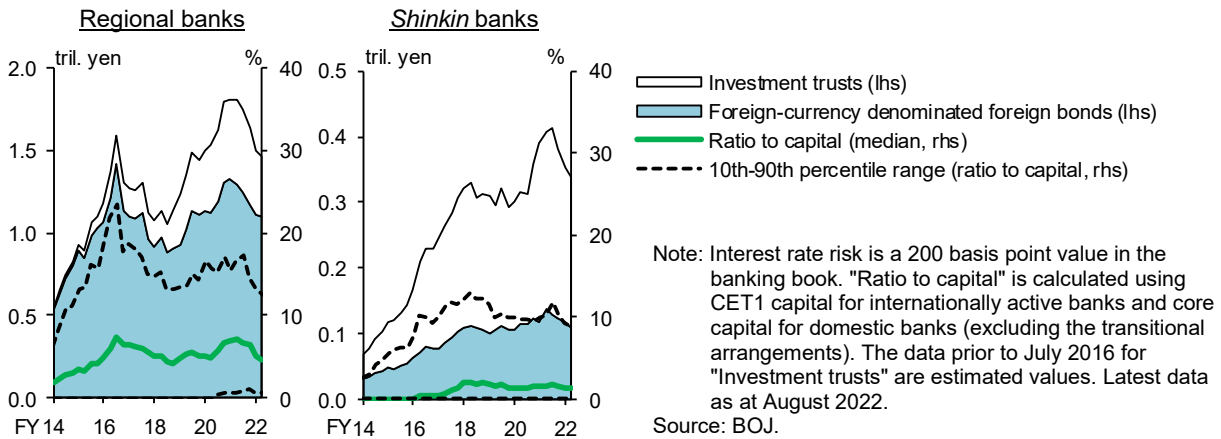


Chart IV-3-10: Total returns in U.S. bond investment trusts

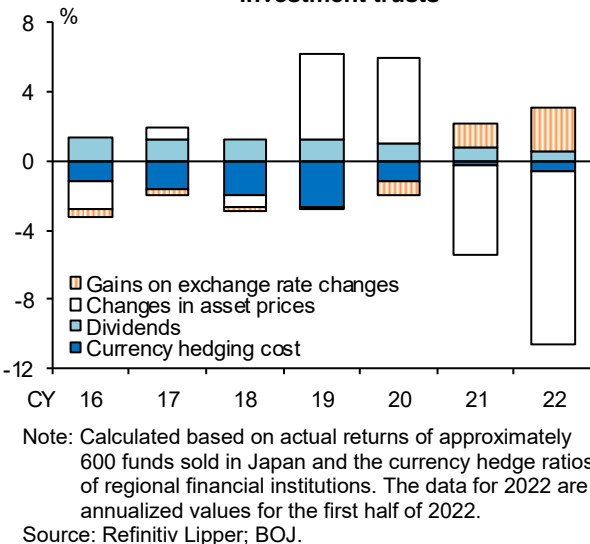
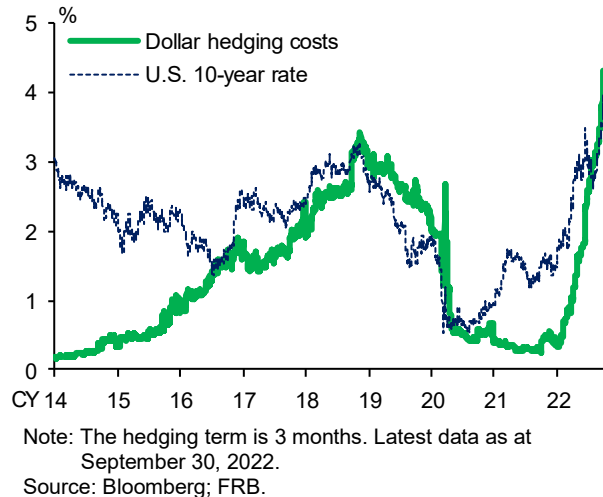


Chart IV-3-11: Currency hedging costs



3. Market risk associated with stockholdings

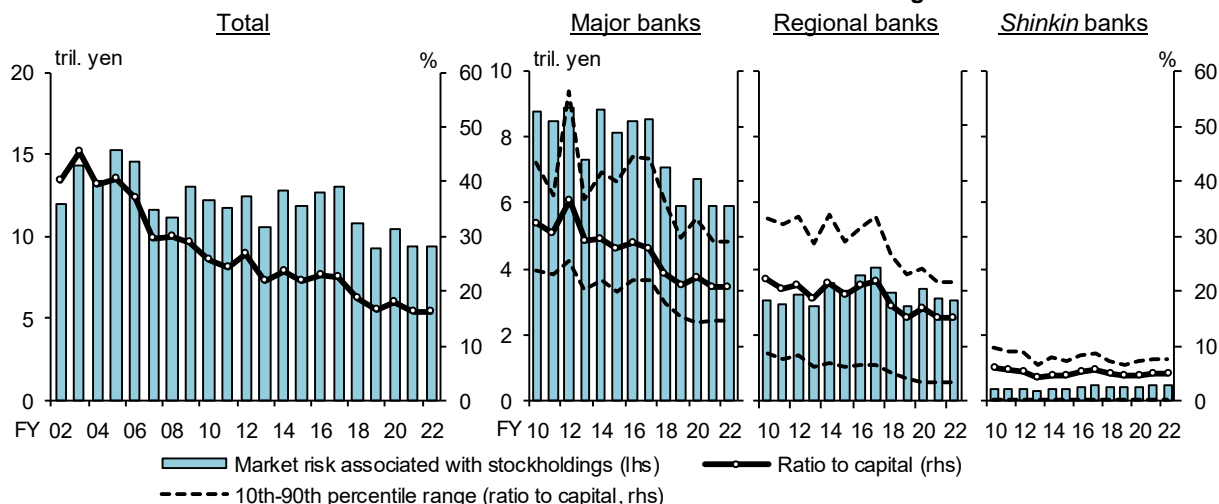
Financial institutions have continued to decrease their strategic stockholdings. Nevertheless, for major banks and regional banks, the amount of market risk associated with stockholdings remains at around 20 percent of their capital, which is sufficiently large to have a substantial impact on their balance sheets and profits (Chart IV-3-12). If market volatility were to increase further, market risk associated with stockholdings could increase even more.

There are a few changes that make strategic stockholdings more difficult. Recently, proxy voting guidelines have been introduced, in which proxy advisory firms recommend against the election of top executives at companies with excessive strategic stockholdings. Moreover, with the finalization of the Basel III regulations, the risk weighting of stocks will be gradually increased from the current 100 percent to 250 percent from 2024 onward. Under these circumstances, some financial institutions have established quantitative holding criteria for strategic stockholdings and

IV. Risks faced by financial institutions
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implemented stricter controls.²³ Financial institutions need to continue to make an objective assessment of the purpose and costs of strategic stockholdings. They also need to manage the market risk associated with stockholdings, including strategic stockholdings, within an appropriate range in line with their financial soundness.

Chart IV-3-12: Market risk associated with stockholdings



Note: 1. "Market risk associated with stockholdings" is VaR with a 99 percent confidence level and a 1-year holding period, and excludes risk associated with foreign currency-denominated stockholdings.
 2. "Ratio to capital" is calculated using CET1 capital for internationally active banks from fiscal 2012 onward, core capital for domestic banks from fiscal 2013 onward, and Tier 1 capital for all others (excluding the transitional arrangements).
 3. The data for fiscal 2022 are estimated using the outstanding amount of stockholdings as at end-August 2022 and stock prices up to end-August 2022.

Source: BOJ.

4. Risk associated with foreign credit product investment

On the whole, financial institutions have managed their foreign credit product portfolios in a risk-conservative manner (Chart III-1-16). Reflecting recent declines in the price of leveraged loans, which are assets underlying CLOs, some financial institutions have become more cautious in their investment.

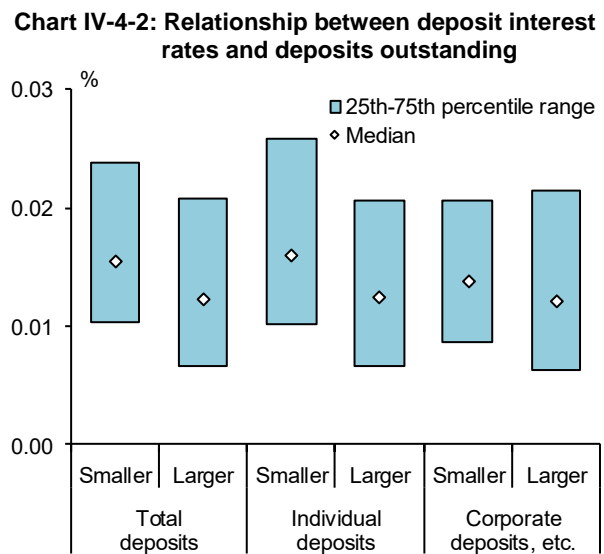
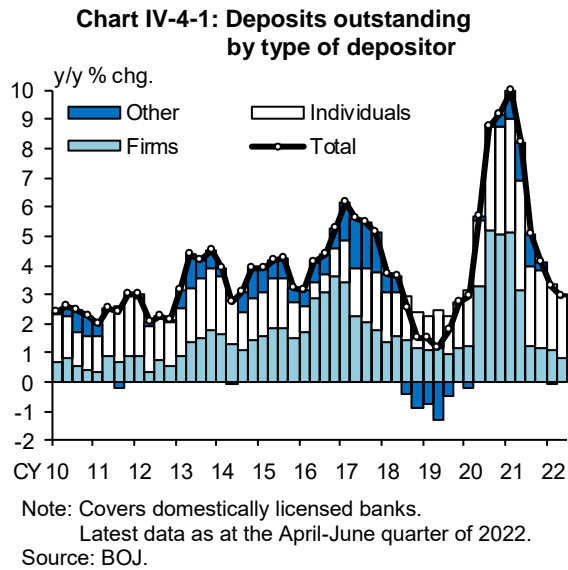
As for the quality of leveraged loans, there have been no significant changes in measures of overcollateralization or interest coverage so far. The creditworthiness of CLOs with high credit ratings, which are the investment target by Japanese financial institutions, has been stable. Against this background, some financial institutions have increased their investment in foreign credit products to earn higher investment yields. However, as examined in the previous section, firms that take out leveraged loans are highly leveraged and vulnerable to a rise in interest rates. Financial institutions that engage in foreign credit product investment need to continuously improve their risk management while taking into account the effect of interest rate rises and economic developments on foreign credit markets.

²³ According to the Bank's survey on regional banks, 20 percent of regional banks have established quantitative holding criteria for strategic stockholdings. Of these, one-third use the ratio of the outstanding amount of holdings to net assets, one-third use the ratio of the amount of risk to allocated capital, and the rest use the ratio of the amount of risk-weighted assets to capital as their holding criteria.

D. Funding liquidity risk

1. Yen funding liquidity risk

Financial institutions have sufficient yen funding liquidity. Their yen funding continues to be highly stable because the majority of funding is sourced from stable retail deposits and the outstanding amount of deposits is far larger than total loans outstanding. Deposits by both individuals and firms have continued to grow and remained high, mainly reflecting increases in various subsidies, benefits, and loans since the start of the pandemic (Chart IV-4-1).



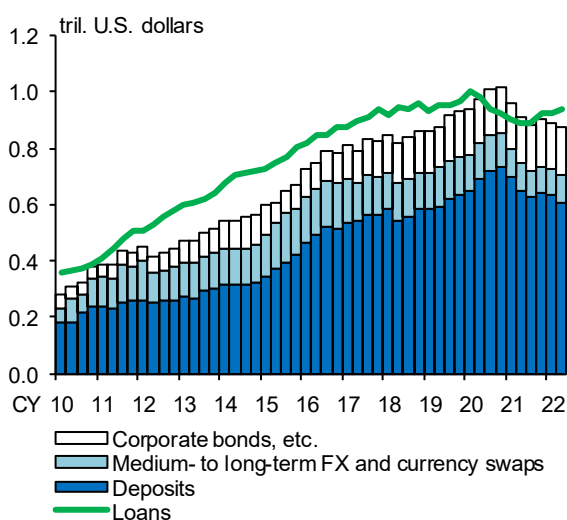
Yet, there is uncertainty about the stickiness of the deposits that have increased since the start of the pandemic. Many financial institutions tentatively assume some part of these deposits as highly sticky core deposits. Views about the stickiness of such deposits differ across financial institutions. It is therefore necessary for each financial institution to grasp in detail changes in its deposits as firms decrease precautionary demand for funds and households ease their restrained stance on consumption. Financial institutions that have taken on interest rate risk on the asset side, based on the presumption that their core deposits have increased on the liability side, may need to rebalance their assets depending on a change in deposits.

Moreover, large heterogeneity is observed in a change in deposits among regional financial institutions. Even though deposits have increased at financial institutions as a whole, they have decreased at some institutions, reflecting differences in the business environment such as demographic change. These financial institutions tend to offer higher deposit interest rates, including those on time deposits (Chart IV-4-2). It is therefore necessary to closely monitor the impact of the business environment on yen funding liquidity.

2. Foreign currency funding liquidity risk

The stability of foreign currency funding has been maintained. The "stability gap," a measure of the stability of foreign currency investment and funding structure, has been positive and widened somewhat at major banks amid the continued rise in foreign lending, where the gap is defined as the difference between the outstanding amount of loans and the outstanding amount of stable funding, such as through deposits and corporate bonds (Chart IV-4-3). In order to restrain widening of the stability gap, major banks have attempted to secure relatively sticky deposits by raising deposit interest rates. Moreover, despite the rise in dollar funding premiums, major banks have been increasing long-term funding using currency swaps.

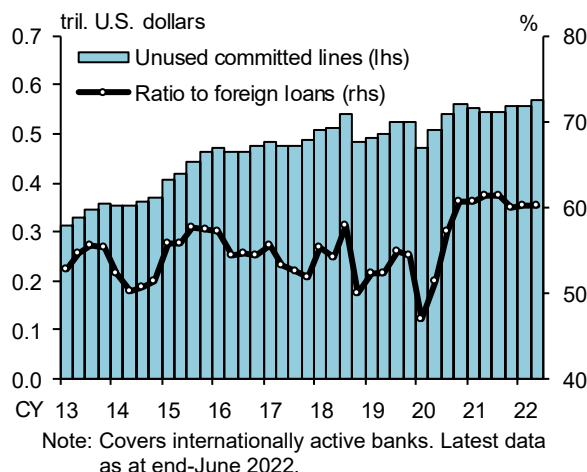
Chart IV-4-3: Stability gap among major banks



Note: 1. "Corporate bonds, etc." and "Medium- to long-term FX and currency swaps" indicate funding maturing in over 1 year from end-June 2012 onward, with funding maturing in over 3 months prior to that time.
 2. Covers internationally active banks. Latest data as at end-June 2022.

Source: BOJ.

Chart IV-4-4: Committed lines among major banks



Source: BOJ.

Major banks have increasingly extended committed lines of credit, and the ratio of unused committed lines to foreign outstanding loans has reached 60 percent (Chart IV-4-4). As a result, major banks' foreign currency funding liquidity has become more susceptible to contingent drawdowns from committed lines. As seen in Section A of Chapter III and Section B of this chapter, committed lines were drawn down in early spring in response to the surge in commodity prices. In general, emergency drawdowns from committed lines occur at times of market stress. With global financial conditions tightening, attention needs to be paid to the possibility of an unexpected surge in foreign currency funding needs and to the dollar funding market liquidity in such a situation.

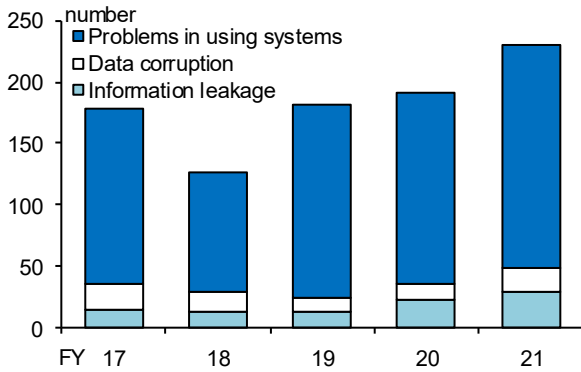
E. Risks posed by changes in the business environment

1. Cyber risk

The threat of cyberattacks remains elevated, partly due to the increased cyber risk following Russia's invasion of Ukraine. In fiscal 2021 the number of cyberattacks against critical infrastructure in Japan, which could cause "information leakage," "data corruption," and "problems in using systems," was the highest in the past five years (Chart IV-5-1). The number of ransomware attacks

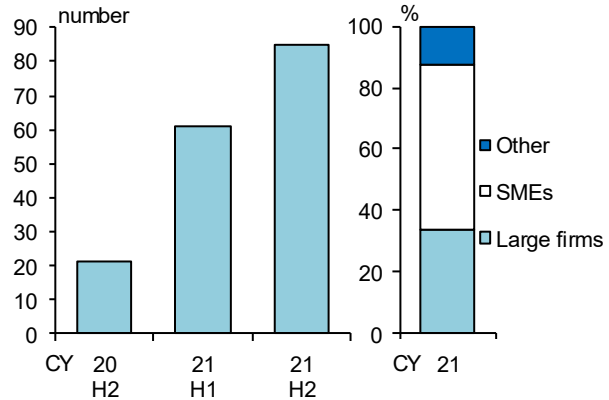
on businesses has also increased considerably over the past year (Chart IV-5-2). With SMEs accounting for half of the total number of damages in 2021, cyberattacks are damaging not only large firms but increasingly also SMEs.

Chart IV-5-1: Number of cyberattacks on critical infrastructure



Note: Number of reports to NISC from critical infrastructure providers.
Source: National Center of Incident Readiness and Strategy for Cybersecurity (NISC).

Chart IV-5-2: Number of ransomware attacks



Source: National Police Agency.

The most notable cases are "supply chain attacks": attacks targeting sites where cybersecurity measures are weaker than at the headquarters, and attacks on service providers that result in the spread of damage to a large number of user firms. Moreover, with the advances in digitalization and growth in new financial services, serious cyberattacks have taken place in the fields of crypto-asset transactions, cashless payment, and cloud services in recent years. Under these circumstances, in June 2022, the government newly designated some funds transfer service providers and prepaid card issuers as critical infrastructure service providers.

The threat of cunning cyberattacks is likely to continue. Stopping cyberattacks completely is difficult, if not impossible. What is important is to limit the potential damage as much as possible by reducing the risk of information leakage and avoiding the suspension of critical business operations. Against this background, the Bank has been examining the status of financial institutions' cybersecurity management frameworks mainly through on-site examinations. This fiscal year, as part of its joint surveys with the Financial Services Agency (FSA) of some major financial institutions, the Bank will deepen its dialogue with these institutions, focusing on specific topics such as governance. Moreover, in cooperation with the FSA, the Bank has been encouraging regional financial institutions to conduct self-assessments of their cybersecurity management frameworks. In undertaking these initiatives, the Bank will continue to encourage financial institutions to strengthen their measures against cyber risk.

2. Climate-related financial risks

From the financial side, two perspectives are required in addressing climate change. One is to ensure the stability of the financial system by appropriately managing climate-related financial risks that could affect the resilience of financial institutions.²⁴ The other is to ensure the smooth

²⁴ Of climate-related financial risks, risks of losses due to physical phenomena are referred to as physical risks and risks of losses due to changes that occur in the transition process to a carbon-neutral economy are called transition risks.

IV. Risks faced by financial institutions

E. Risks posed by changes in the business environment

functioning of financial intermediation by supporting financial institutions' client firms in their decarbonization efforts.

Global efforts toward addressing climate-related financial risks are underway, in line with the FSB Roadmap for Addressing Climate-related Financial Risks (Chart IV-5-3). The annual report released in July 2022 confirmed progress made in the areas of firm-level disclosures, data, vulnerabilities analysis, and regulatory and supervisory practices and tools. In the area of disclosures, the International Sustainability Standards Board (ISSB), which was established in November 2021, is aiming to finalize standards for climate-related disclosures and general sustainability-related disclosures by the end of this year, with a view to improving the comparability and consistency of disclosed information. In Japan, the Sustainability Standards Board of Japan (SSBJ) was established in July 2022 and is participating in discussions on the formulation of international disclosure standards and the domestic application of such standards. In the area of regulation and supervision, the Basel Committee on Banking Supervision (BCBS) has progressed its comprehensive examination. It formulated and released 18 principles on corporate governance, internal control frameworks, and risk assessments.

Chart IV-5-3: Recent efforts on climate-related financial risks

Blocks	Event
Firm-level disclosures	• The International Sustainability Standards Board (ISSB) published two exposure drafts on its climate-related and sustainability-related disclosure standards (March 2022).
Data	• The Network for Greening the Financial System (NGFS) released "Final Report on Bridging Data Gaps" (July 2022).
Vulnerabilities analysis	• BOE published the results of the bottom-up type scenario analysis conducted by the major U.K. banks and insurers (May 2022).
	• ECB published the results of the bottom-up type stress test conducted by banks subject to the single supervisory mechanism (July 2022).
	• FSA and BOJ published "Pilot Scenario Analysis Exercise on Climate-related Risks based on Common Scenarios" (August 2022).
Regulatory and supervisory practices and tools	• The Basel Committee on Banking Supervision (BCBS) published a document "Principles for the Effective Management and Supervision of Climate-related Financial Risks" (June 2022).

Also in Japan, efforts to address climate-related financial risks have been steadily progressing. Major financial institutions have enhanced their capacity to conduct scenario analyses. In line with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), the three major banks have released TCFD reports and disclosed the estimated impact of climate-related financial risks based on their own scenario analyses. This is a leading initiative among global systemically important banks (G-SIBs). Moreover, a growing number of regional financial institutions, particularly regional banks, have endorsed the TCFD recommendations and have enhanced disclosure based on the TCFD framework (Chart IV-5-4). These initiatives by financial institutions have been prompted partly by the revision to Japan's Corporate Governance Code, which requires that companies listed on the Prime Market of the Tokyo Stock Exchange should enhance climate-related disclosure.

Among relevant authorities, the FSA released in July 2022 the "Supervisory Guidance on Climate-related Risk Management and Client Engagement," which showcased examples of financial institutions' climate-related risk management and their support for clients' responses to climate

change. In addition, in August, the Bank and the FSA released the results of a pilot scenario analysis exercise conducted by major financial institutions.²⁵ The objective of the exercise was not to provide a quantitative assessment of climate-related financial risks; rather, it focused on identifying issues for future improvement in the scenario analyses. The exercise demonstrated financial institutions' capacity to conduct analyses based on common scenarios. It also revealed the importance of ensuring more comparability of risks across banks; for example, by encouraging the use of common assumptions.

Chart IV-5-4: Regional financial institutions' efforts

		share, %				
		Done	Planned			No plan
		Until FY2021	FY2022	FY2023	TBD	
Endorse TCFD recommendations	Regional banks	71	16	0	10	3
	<i>Shinkin</i> banks	0	1	0	20	79
Release SDGs declaration	Regional banks	87	0	0	5	8
	<i>Shinkin</i> banks	83	2	0	8	8

Source: BOJ.

To support efforts to address climate change on the financial front, financial institutions are expected to provide (1) green finance, i.e., financing for projects that contribute to decarbonization, (2) sustainability-linked finance, i.e., financing for entities that are engaged in initiatives that contribute to decarbonization, and (3) transition finance, i.e., financing where the use of funds and the initiatives of entities contribute to step-by-step decarbonization. In promoting transition finance, entities are required to transparently disclose their transition strategies toward decarbonization based on scientific evidence to rule out any greenwashing. Reflecting Japan's industrial structure, carbon-related credit accounts for a certain share of credit portfolios of Japanese major financial institutions. It is essential to accelerate transition financing in order to promote decarbonization. A roadmap is also needed as a reference to assess whether client firms' transition strategies in each area are qualified for financing.

Against this background, Japanese major financial institutions are actively involved in international initiatives taken by private organizations. One of these, the Glasgow Financial Alliance for Net Zero (GFANZ), has been examining transition plans for each sector and a framework for transition finance. In addition, the Ministry of Economy, Trade and Industry (METI) and other related ministries and agencies have begun discussions to expand the sector-specific roadmaps released in 2021.

The Bank will engage in in-depth dialogue with financial institutions regarding (1) the identification and management of climate-related financial risks, (2) measures to enhance the quality and quantity of disclosure based on the TCFD recommendations, and (3) engagement with corporate customers in pursuit of decarbonization. Moreover, the Bank will encourage financial institutions to develop their climate scenario analyses in line with their size and characteristics, taking into account insights obtained from the aforementioned pilot scenario analysis exercise based on common scenarios as well as international discussions on regulations, supervision, and risk management related to climate-related financial risks.

²⁵ In this common scenarios exercise, a bottom-up approach was adopted, in which financial institutions conduct the analysis with their own models based on common scenarios. For details, see FSA and Bank of Japan, "Pilot Scenario Analysis Exercise on Climate-Related Risks Based on Common Scenarios," August 2022.

- IV. Risks faced by financial institutions
- E. Risks posed by changes in the business environment

3. Interest rate benchmark reform

U.S. dollar LIBOR is still widely used by Japanese financial institutions and business corporations, although its publication will cease at the end of June 2023. The transition away from U.S. dollar LIBOR and its use during the transition need to be addressed globally in a harmonized manner. Relevant parties in Japan are also expected to follow guidelines provided by U.S. authorities and working groups. The FSA and the Bank will continue to cooperate and engage in dialogue with relevant parties, including financial institutions. With this, they will be able to address the transition within the timeframe until the end of June 2023, taking into account initiatives by U.S. authorities and other parties.²⁶

The publication of yen LIBOR ceased at the end of 2021 as scheduled, and since then transactions referencing alternative benchmarks have been made without any particular problems.²⁷ The use of synthetic yen LIBOR is limited to only a small number of contracts. However, the transition to alternative interest rate benchmarks needs to be addressed, as the publication of synthetic yen LIBOR will cease at the end of December 2022.

²⁶ See FSA and Bank of Japan, "Summary of Results of the Third Survey on the Use of LIBOR," March 2022, and FSA, "Preparing for the Transition Away from USD, GBP, CHF, and EUR LIBOR," June 2021.

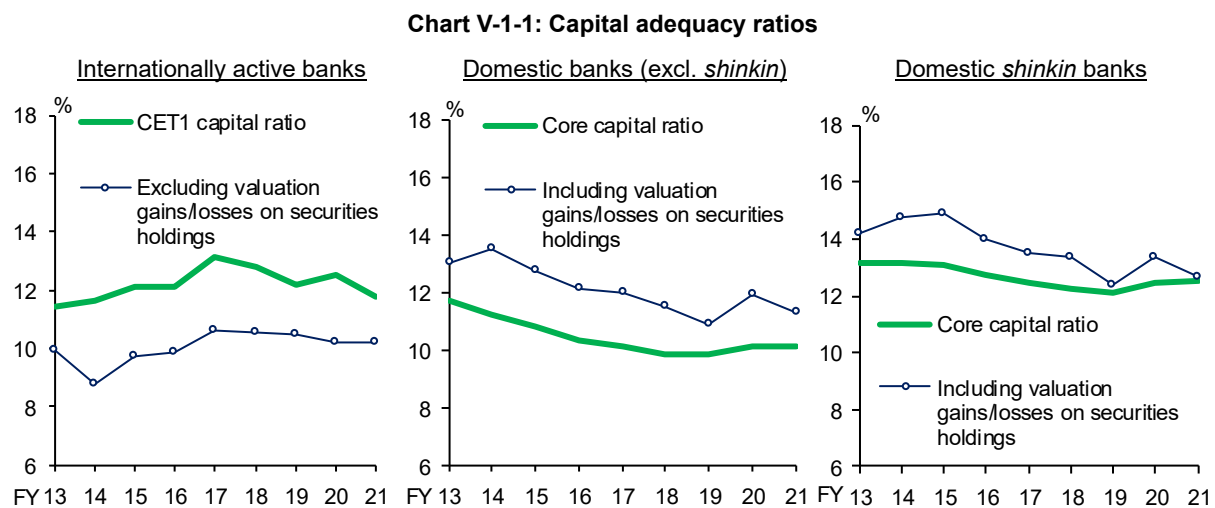
²⁷ For details, see Bank of Japan and FSA, "Review of JPY LIBOR Transition and Future Initiatives," *Bank of Japan Review Series*, No. 2022-E-4, May 2022.

V. Resilience of the financial system

- With regard to loss-absorbing capacity, financial institutions' capital exceeds regulatory requirements and their profitability has been on an improving trend. Moreover, loan-loss provision ratios have been relatively high in the past few years, partly because financial institutions have enhanced their precautionary loan-loss provisioning since the start of the pandemic. However, attention should be paid to the fact that room for realizing gains on securities holdings has been declining on the whole, partly due to the rise in foreign interest rates.
- Given financial institutions' loss-absorbing capacity, macro stress testing is conducted under two downside scenarios: a "financial stress scenario," which assumes stress similar to the GFC, and an "inverted yield curve scenario," which assumes a substantially inverted yield curve in foreign markets.
- The results of the macro stress testing indicate that Japanese financial institutions on the whole are resilient to these stress events, and that Japan's financial system remains stable. It should be noted, however, that capacity to absorb losses differs substantially among financial institutions. For some financial institutions that have experienced a decline in their loss-absorbing capacity in terms of both foreign net interest income and valuation gains/losses on securities holdings due to the rise in foreign interest rates, the functioning of financial intermediation could be impaired.

A. Financial institutions' capacity to absorb losses

Ahead of the macro stress testing in the next section, this section examines financial institutions' loss-absorbing capacity from various perspectives.



Note: The charts are calculated on a consolidated basis. The transitional arrangements are taken into consideration.
Source: BOJ.

1. Capital adequacy

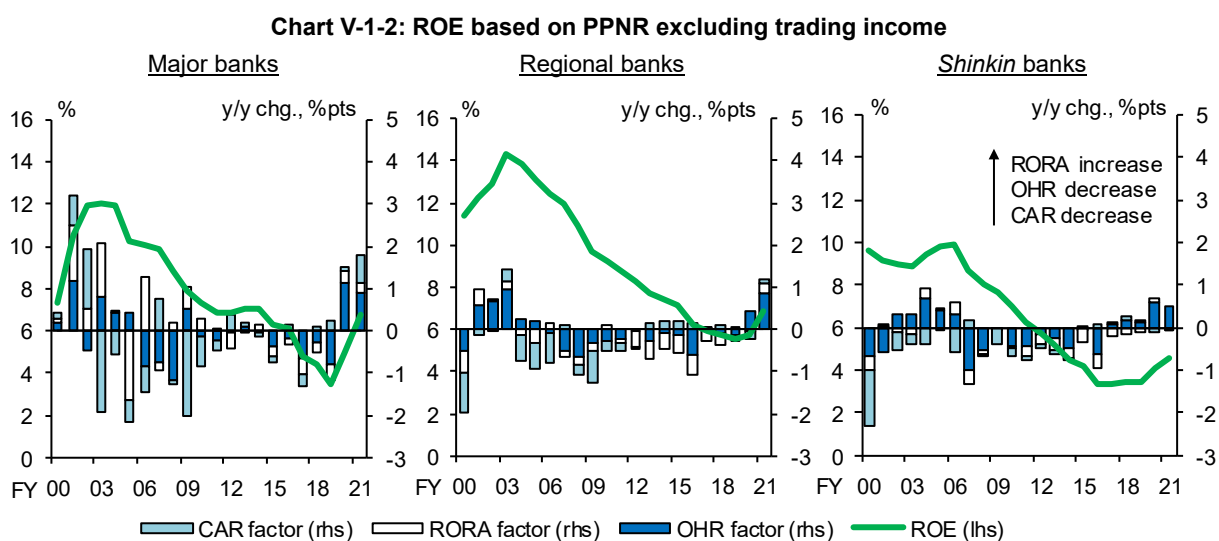
The capital adequacy ratios of financial institutions have been sufficiently above the regulatory requirements for all types of banks (Chart V-1-1). Both the CET1 capital ratio of internationally active banks and the core capital ratio of domestic banks substantially exceeded the regulatory

requirements at the end of fiscal 2021.²⁸ As a whole, financial institutions have sufficient capital bases, which will enable them to continue risk-taking. With regard to the finalization of the Basel III regulations, although the increase in the risk weight for stockholdings will lower the capital adequacy ratios of, in particular, financial institutions that adopt the standardized approach, financial institutions will likely be able to address the change, as the risk weight will be raised in a phased manner.

2. Loss-absorbing capacity

Profit buffers

Financial institutions' return on equity (ROE), based on pre-provision net revenue (PPNR) excluding trading income, had been on a downtrend for many years, but recently it has started to increase (Chart V-1-2).²⁹ A key factor for the improvement in the ROE for all types of banks is the improvement in their OHRs (overhead costs/gross operating profits), which represent operating efficiency. One reason for the improvement in regional financial institutions' OHRs is that they have accelerated efforts to strengthen their business base under the "Special Deposit Facility to Enhance the Resilience of the Regional Financial System" (see Box 4 for more on the operating efficiency of regional financial institutions).



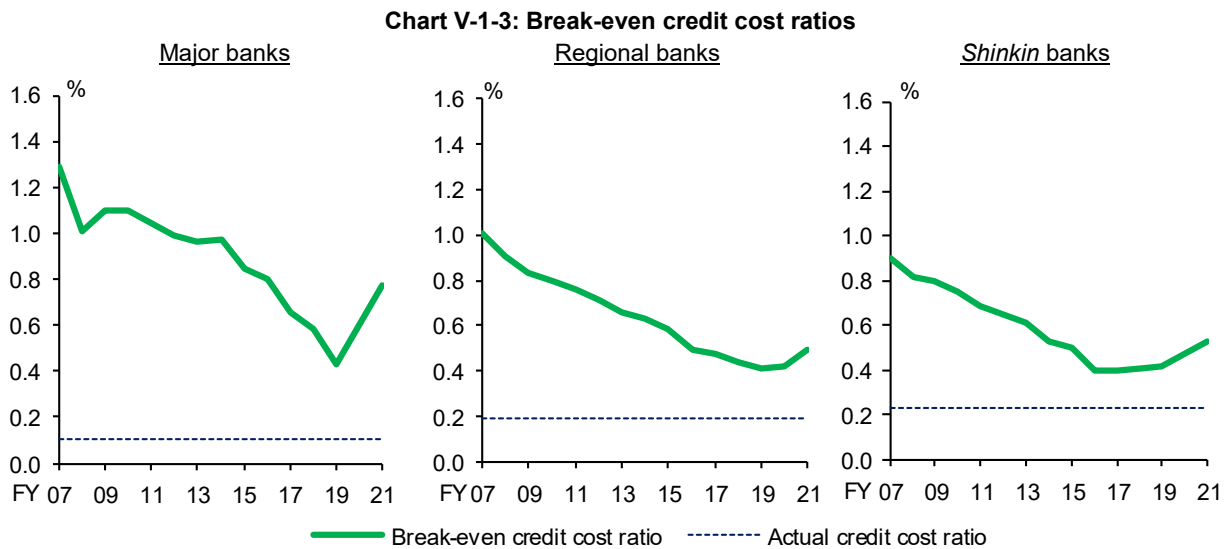
Note: From fiscal 2012, profits and losses from investment trusts due to cancellations are excluded.
The latest data are as at end-March 2022.
Source: BOJ.

As a result of the improvement in OHRs, break-even credit cost ratios (PPNR excluding trading income/loans outstanding) have also been improving (Chart V-1-3). The break-even credit cost

²⁸ Internationally active banks and domestic banks are required to maintain a CET1 capital ratio of 4.5 percent and a core capital ratio of 4 percent, respectively. Internationally active banks are also required to meet capital buffer regulations, including the requirement of a capital conservation buffer of 2.5 percent, a countercyclical capital buffer of 0 to 2.5 percent, and a capital buffer for global systemically important banks (G-SIBs) of 1 to 2.5 percent or domestic systemically important banks (D-SIBs) of 0.5 percent.

²⁹ In Chart V-1-2, changes in ROE based on PPNR excluding trading income are decomposed into the contribution of (1) changes in the return on risk-weighted assets (RORA factor; gross operating profits from core business/risk-weighted assets), (2) changes in the overhead ratio (OHR factor; PPNR excluding trading income/gross operating profits from core business), and (3) changes in capital risk ratio (CAR factor; risk-weighted assets/capital).

ratio represents credit costs that can be absorbed by PPNR excluding trading income in a single fiscal year, relative to loans outstanding. The higher the ratio, the greater financial institutions' capacity to absorb losses. While the capital adequacy ratio represents financial institutions' loss-absorbing capacity on a stock basis, the break-even credit cost ratio captures their short-term loss-absorbing capacity on a flow basis (i.e., on the basis of their profits). For all types of banks, the break-even credit cost ratios have been on an uptrend and are well above their past averages of actual credit cost ratios, reflecting the increases in PPNR excluding trading income that have been driven by the improvement in OHRs.³⁰



Note: "Break-even credit cost ratio" is the ratio at which credit costs equal PPNR (excluding trading income). PPNR from fiscal 2012 onward excludes profits and losses from investment trusts due to cancellations. "Actual credit cost ratio" is the average from fiscal 2005 to the latest year.

Source: BOJ.

Room for realizing gains

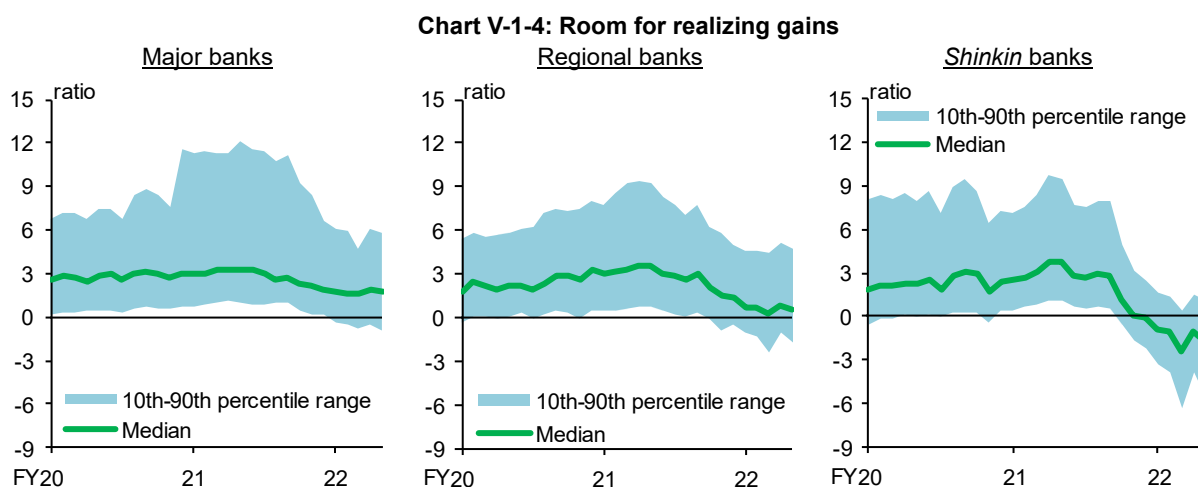
Although valuation gains/losses on securities holdings are not included in the regulatory capital for domestic banks, they can function as a capital buffer on an economic value basis (Chart V-1-1). In fact, when financial institutions incur losses such as credit costs, a fair number of financial institutions secure net income by realizing gains on securities. The "room for realizing gains" -- defined as net valuation gains/losses on securities holdings divided by the past average of PPNR excluding trading income -- has fallen substantially due to the recent rise in interest rates (Chart V-1-4). It has turned negative for some financial institutions.

Regional financial institutions have increased their securities investment to improve profitability under the prolonged low interest rate environment. Thus, the recent valuation losses on securities holdings are particularly pronounced at financial institutions that had accumulated domestic super-long-term bonds and foreign interest rate products (Chart V-1-5). For these institutions, it is not easy to flexibly rebalance their portfolios since their profitability is low and room for realizing gains is limited. This could lead to a further increase in valuation losses on securities holdings.

With regard to loss-absorbing capacity, financial institutions' capital exceeds regulatory requirements and their profit buffers have been on an improving trend. Moreover, loan-loss provision ratios for unsecured loans have been relatively high in the past few years, partly because

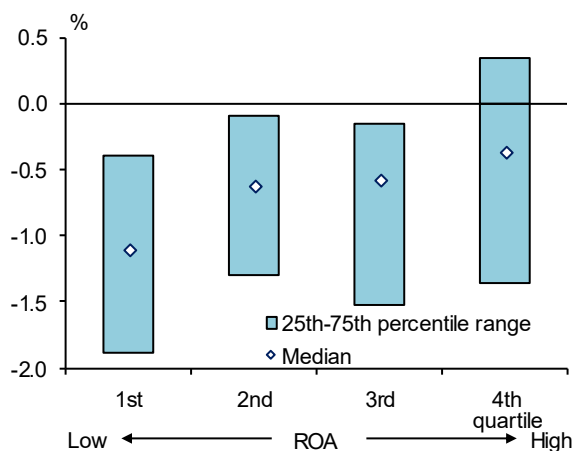
³⁰ For details on financial institutions' financial results for fiscal 2021, see "Financial Results of Japan's Banks for Fiscal 2021," *Financial System Report Annex Series*, September 2022.

financial institutions have enhanced their precautionary loan-loss provisioning since the start of the pandemic (Chart V-1-6). However, attention should be paid to the fact that room for realizing gains on securities holdings, which can be used to offset losses in a relatively flexible manner, has been declining on the whole.



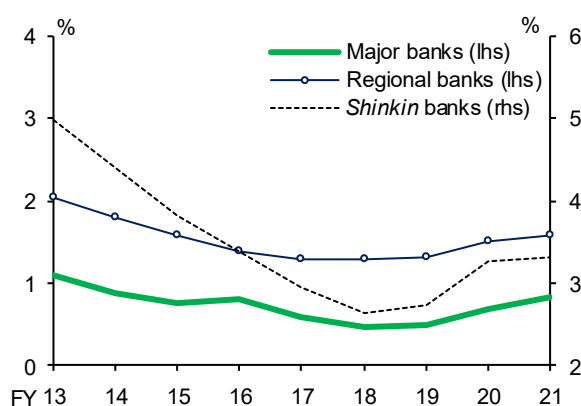
Note: "Room for realizing gains" = valuation gains or losses on securities holdings / PPNR excluding trading income (3-year backward moving averages). Latest data as at August 2022.
Source: BOJ.

Chart V-1-5: Valuation gains/losses on securities holdings and ROA



Note: The chart shows the distribution of valuation gains/losses on securities holdings (excluding strategic stockholdings) divided by risk-weighted assets in each quartile of net income ROA.
Source: BOJ.

Chart V-1-6: Loan-loss provision ratios among financial institutions



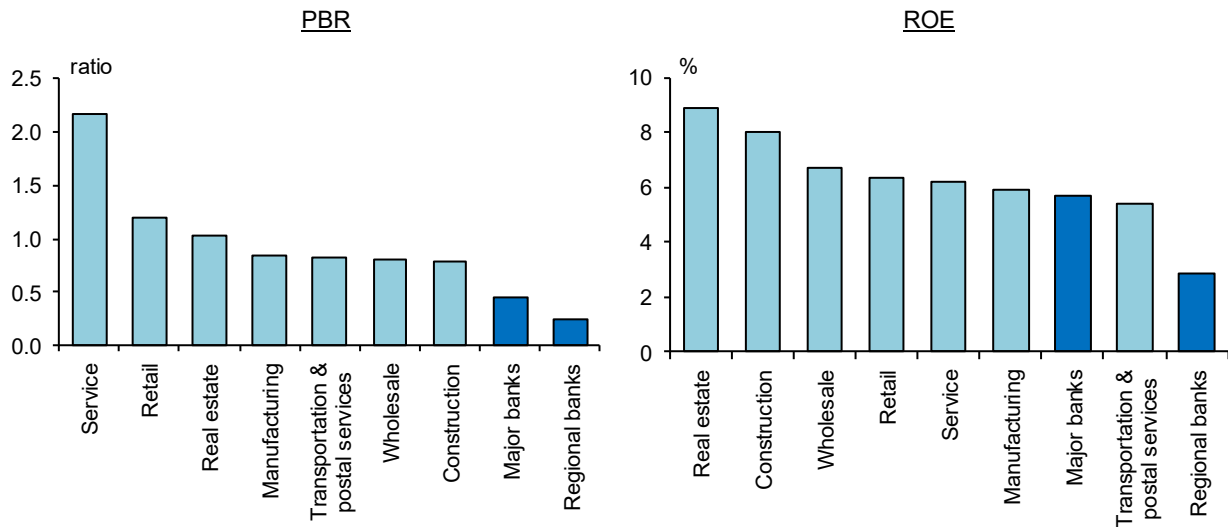
Note: Loan-loss provisions are compared to unsecured loan amounts.
Source: BOJ.

3. Balance between capital bases and profitability

To perform financial intermediation activity in a sustainable manner, financial institutions need to maintain sufficient capital bases and at the same time secure a certain level of profitability sustainably. As shown in Chart V-1-2, while financial institutions' ROE has started to increase, it remains at a historically low level. This is because the RORA, which shows their investment efficiency, has remained low despite the improving trend in the OHR, which represents their operating efficiency.

For Japanese listed banks, price-to-book ratios (PBRs), which represent banks' ROE relative to their cost of capital, have been below 1 and lower than the PBRs in other industries (Chart V-1-7). This implies that stock market participants would have the following view: it is unlikely for these banks to achieve an ROE commensurate with their cost of capital. If their ROE were to stagnate, financial intermediation could be impaired due to a decline in loss-absorbing capacity, or vulnerabilities in the financial system could increase through excessive risk-taking. To improve financial institutions' ROE in a sustainable manner, they need to improve their RORA by setting interest rates in line with the associated risks and by diversifying profit sources such as strengthening their non-interest services.

Chart V-1-7: Valuations by industry



Note: The chart shows the averages of the median values from fiscal 2019 to 2021 in each industry.
Source: Nikkei Inc., "NEEDS-Financial QUEST."

B. Macro stress testing

This section comprehensively examines the stability of the financial system using macro stress testing. Macro stress testing aims to dynamically examine the resilience of the financial system and the impact on financial intermediation under specific hypothetical stress events.^{31,32}

The stress testing assumes two downside scenarios: a "financial stress scenario" and an "inverted yield curve scenario." The "financial stress scenario" assumes acute stress such as the GFC, and it has been examined regularly. The "inverted yield curve scenario" is motivated by the fact that financial institutions' exposure to foreign interest rates has increased in terms of both foreign lending and securities investment as reported in Chapters III and IV. The scenario assumes that interest rates in the United States and Europe become substantially inverted, and its impact on the financial system is examined. In the United States and Europe, with inflation remaining high, central banks have accelerated the pace of policy rate hikes. If policy rate hikes were required beyond

³¹ The simulation utilizes the Financial Macro-econometric Model (FMM) developed by the Financial System and Bank Examination Department of the Bank. For the basic structure of the model, see "The Financial Macro-econometric Model (FMM, March-2020 Version): Overview and Recent Developments," *Financial System Report Annex Series*, August 2020.

³² The stress testing targets 109 banks and 247 *shinkin* banks (accounting for approximately 80 to 90 percent of total loans outstanding of depository financial institutions). The simulation period is from the April-June quarter of 2022 through the January-March quarter of 2025. For the main economic and financial variables for and simulation results of the assumed scenarios, refer to the "Scenario Tables" on the Bank's website.

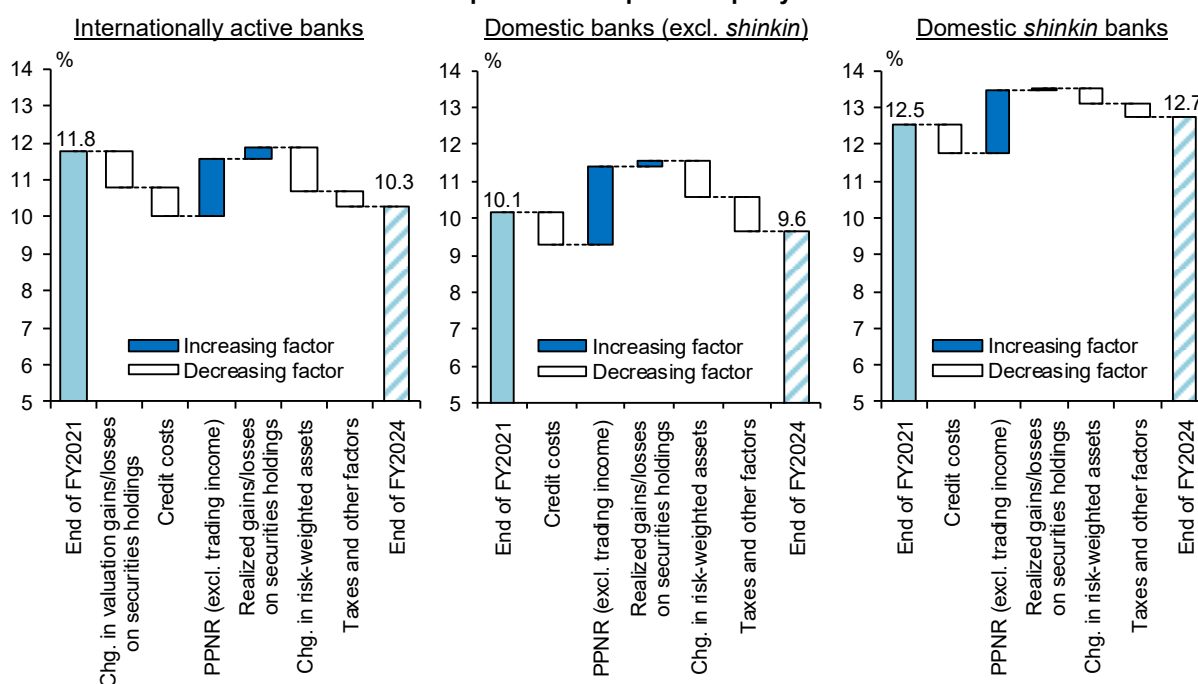
what markets have factored in, the risk of a downturn in the domestic and foreign economies -- originating from foreign economies -- would increase and the yield curve would be inverted further.

These downside scenarios are hypothetical and designed to effectively examine the resilience of the financial system. They represent neither the Bank's outlook for the future economic and financial environment, asset prices, and policy conduct, nor the likelihood of the outcome.

1. Baseline scenario

The baseline scenario assumes that Japan's economy recovers as foreign economies continue to recover, based on average forecasts by several research institutions and market expectations as of September 2022. Compared to the baseline scenario in the previous issue of the *Report*, the assumed pace of growth in domestic and foreign economies is somewhat slower due to the impact of the rise in commodity prices and foreign interest rates. The baseline scenario takes into account the effects of corporate financing support measures implemented since the start of the pandemic, including the policy measures taken by the government and the Bank as well as lending by financial institutions, as in the previous issue of the *Report*.³³ As for financial variables, it is assumed that all of the currently available information on the outlook for the domestic and foreign economies is appropriately priced in by financial markets. Specifically, the baseline scenario assumes that market interest rates evolve in line with the rates implied by the forward rate curve in the July-September

Chart V-2-1: Decomposition of capital adequacy ratio: Baseline



- Note: 1. The charts indicate the contribution of each factor to the difference between the capital adequacy ratios at end-March 2022 and the end of the simulation period (as at end-March 2025) under the baseline scenario.
 2. The left-hand chart shows the CET1 capital ratio of internationally active banks. The middle and right-hand charts show the core capital ratio of domestic banks. The transitional arrangements for domestic banks are taken into consideration.

³³ Specifically, the baseline scenario assumes that benefits from the government (including those scheduled to be made in fiscal 2022) support corporate profits and that resulting credit costs are kept restrained. Regarding effectively interest-free loans, the scenario assumes that the outstanding amount (as of end-March 2022) is repaid over a period of five years and that firms start to pay interest from fiscal 2023, which lowers their ICRs. The effects of corporate financing support measures are assumed in the same manner in the financial stress scenario and the inverted yield curve scenario.

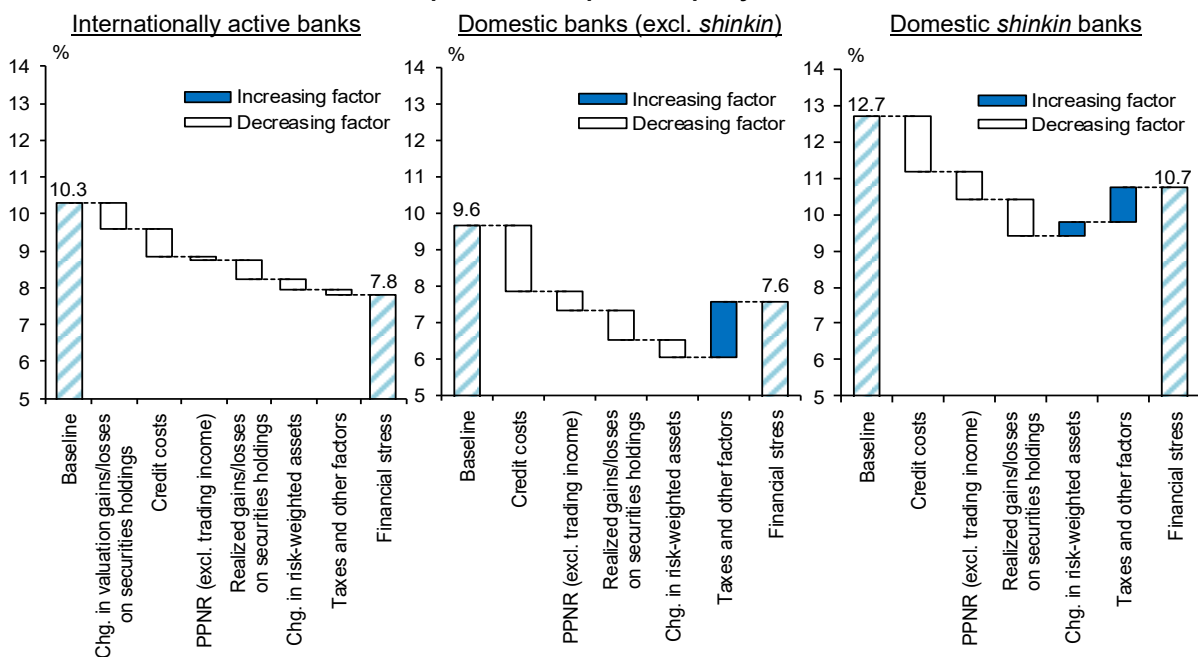
quarter of 2022, and that other financial variables (stock prices, crude oil prices, exchange rates, and various credit spreads) are unchanged from their levels in that quarter.

The simulation results indicate that capital adequacy ratios at the end of fiscal 2024 -- the end of the simulation period -- remain sufficiently above the regulatory requirements for all types of banks (Chart V-2-1). However, the decline in the ratio for internationally active banks is more than 1 percentage point, which is somewhat large. The decline for internationally active banks is larger than that for domestic banks. This is because, reflecting rises in foreign interest rates, (1) the increase in foreign currency funding costs reduces their PPNR excluding trading income and (2) their valuation gains/losses on securities holdings deteriorate.

2. Financial stress scenario

The financial stress scenario assumes that global financial markets experience a negative shock in the October-December quarter of 2022 comparable to that during the GFC. Regarding financial variables, it is assumed that, with domestic and foreign interest rates declining to record low levels, prices of risky assets plummet and the yen appreciates in foreign exchange markets.^{34,35} Moreover, reflecting the substantial repricing in financial markets and a slowdown in foreign economies similar to that seen during the GFC, Japan's economy decelerates endogenously in the model.

Chart V-2-2: Decomposition of capital adequacy ratio: Financial stress



Note: 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 2025) under the baseline scenario and the financial stress scenario.

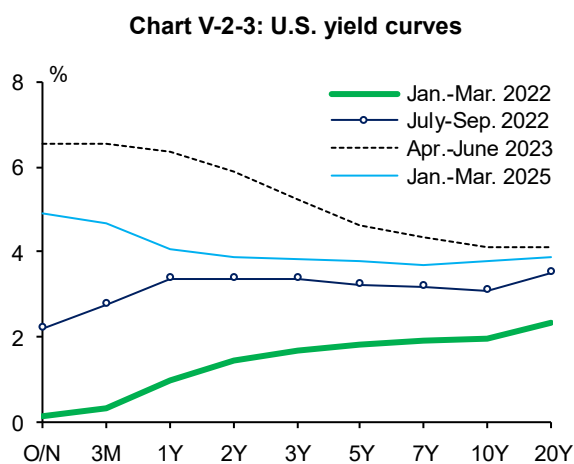
³⁴ Regarding U.S. corporate bonds and securitized products, it is assumed that the pass-through rate of spreads on low-rated bonds to spreads on high-rated bonds rises to the same level as at the time of the market turmoil in March 2020.

³⁵ In the previous issue of the *Report*, main channels through which exchange rate fluctuations directly affect the balance sheets and profits/losses of financial institutions were two-fold: (1) the impact of changes in the yen-denominated value of foreign loans on loan-related net interest income and risk-weighted assets and (2) the impact via foreign currency translation adjustments for foreign subsidiaries. In addition to these channels, this *Report* takes into account (3) the impact of exchange rate fluctuations via price fluctuations in foreign currency-denominated securities on net interest income, realized gains/losses, valuation gains/losses, and risk-weighted assets. In doing so, the impact of differences in hedge ratios against foreign exchange risk among financial institutions with respect to valuation gains/losses on securities holdings is also incorporated.

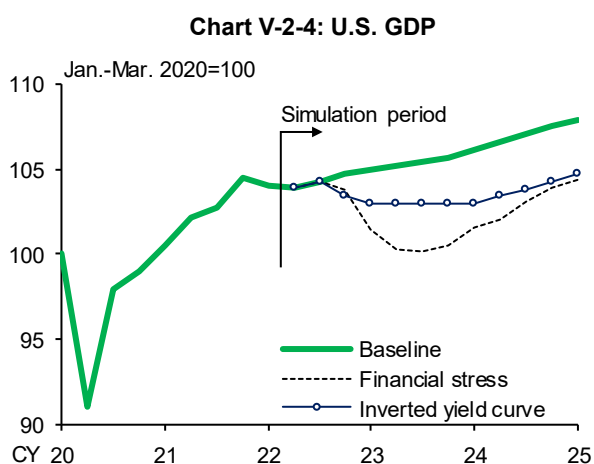
The simulation results indicate that capital adequacy ratios at the end of fiscal 2024 remain above regulatory levels on average for all types of banks, although they are substantially lower than in the baseline scenario (Chart V-2-2). For internationally active banks, higher credit costs, realized losses on securities holdings, and a deterioration in valuation gains/losses on securities holdings mainly account for the decrease in the capital adequacy ratio.

3. Inverted yield curve scenario

The inverted yield curve scenario assumes that interest rates in the United States and Europe become substantially inverted (Chart V-2-3). Specifically, it is assumed that the U.S. federal funds rate rises to a range of 6-7 percent, in line with the upper end of the confidence interval in the FOMC projections (as of September 2022), and then remains high for a while before decreasing toward the end of the simulation period. The interest rates for other maturities are assumed to be formed in line with the pure expectations hypothesis and move in a manner consistent with developments in policy rates. It results in a roughly 1 percentage point increase in long-term interest rates and substantially inverted yields for most of the simulation period. Similarly, interest rates in Europe are assumed to become inverted like those in the United States. Meanwhile, crude oil prices are assumed to rise further in the short run and prices of risky assets to fall as the real economy deteriorates.³⁶



Source: FRB.



Source: BEA; IMF; Japan Center for Economic Research.

Turning to the real economy, both the U.S. and European economies are assumed to decelerate. The growth rate of the U.S. economy is assumed to turn slightly negative within fiscal 2022, in line with the lower end of the confidence interval in the FOMC projections, and remain zero thereafter for a certain period (Chart V-2-4). In the model, Japan's economy slows down endogenously due to the rise in foreign interest rates and deterioration in foreign economies, and roughly follows the same pace of growth as the U.S. economy.

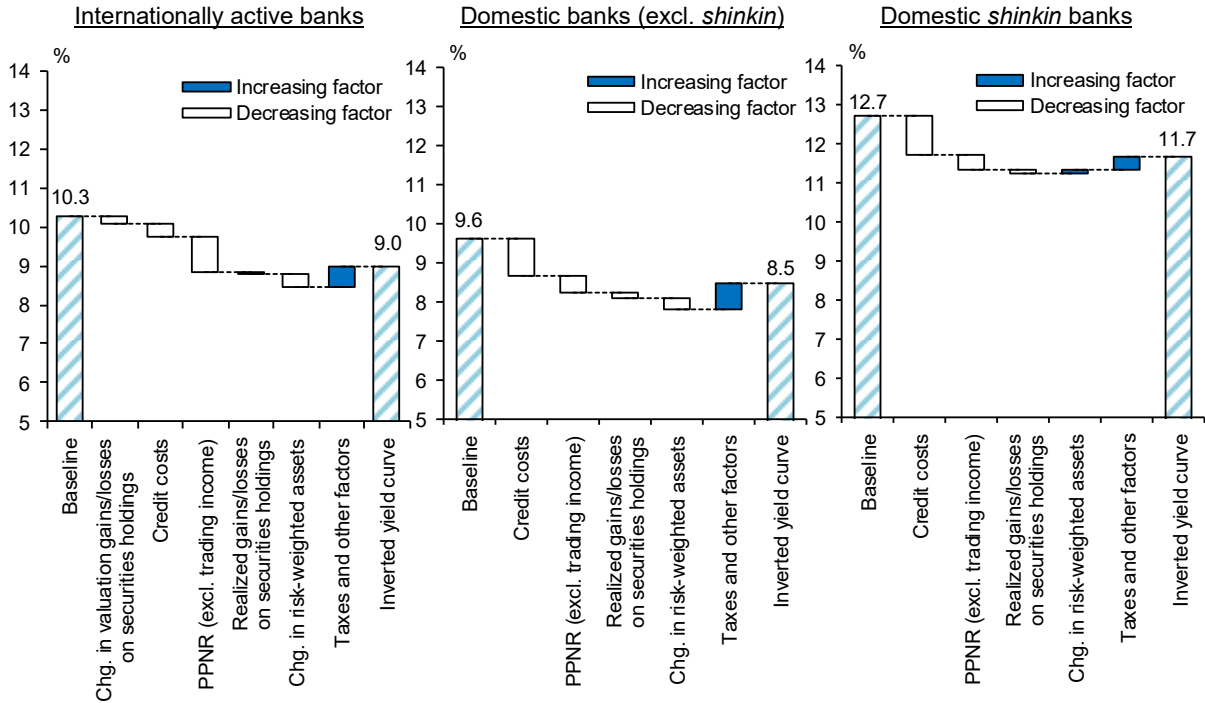
The simulation results indicate that, although the capital adequacy ratios at the end of fiscal 2024 are lower than in the baseline scenario for all types of banks, the decrease is relatively modest compared to the financial stress scenario (Chart V-2-5).³⁷ It can be judged that the stability of the

³⁶ The simulation explicitly incorporates a channel in which higher crude oil prices exert downward pressure on domestic corporate profits, thereby reducing firms' fixed investment and increasing financial institutions' credit costs.

³⁷ Regarding investment trust dividends, since the impact of rising foreign interest rates on investment trust dividends and net asset values is not modeled in the FMM, it is calculated separately and added to the simulation

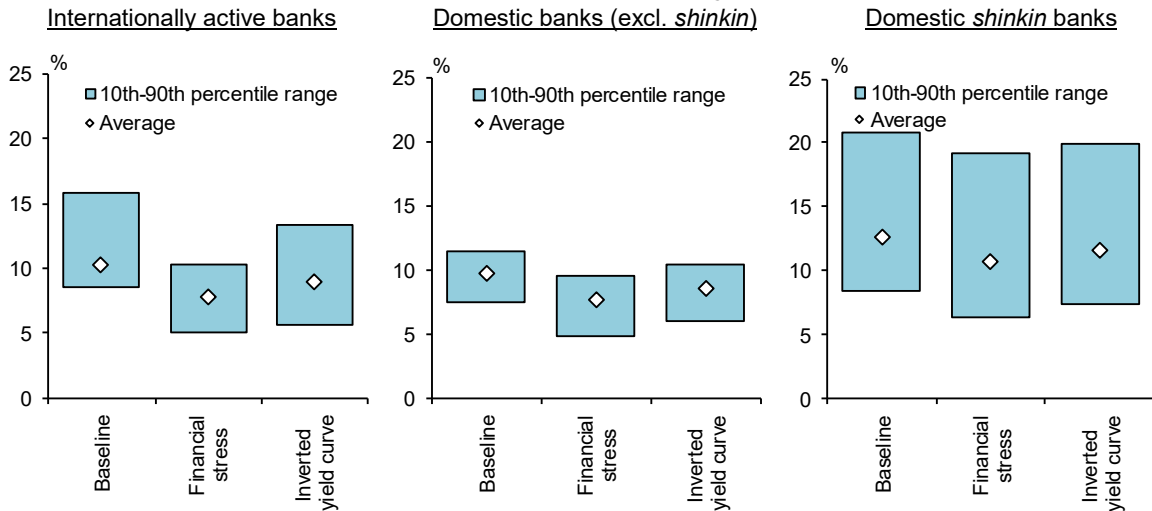
financial system as a whole is maintained even under a substantially inverted yield curve in foreign markets. That said, some financial institutions end up having capital adequacy ratios below the 8 percent mark in markets (Chart V-2-6).

Chart V-2-5: Decomposition of capital adequacy ratio: Inverted yield curve



Note: 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 2025) under the baseline scenario and the inverted yield curve scenario.

Chart V-2-6: Capital adequacy ratios



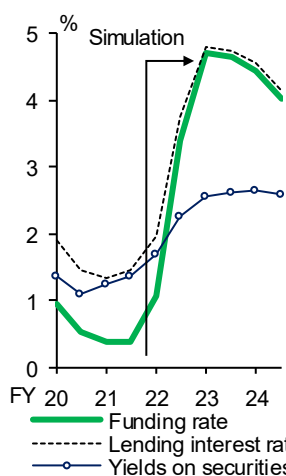
Note: The markers and bands indicate the averages and the 10th-90th percentile ranges of capital adequacy ratios, respectively.

results of the inverted yield curve scenario. Specifically, under the assumption that the entire impact of rising foreign interest rates is reflected in dividends, the impact of rising foreign interest rates on investment trust dividends was obtained: (1) by calculating the ratio of the net interest income on foreign bonds to the amount of foreign currency interest rate risk for regional banks overall and (2) multiplying this by the amount of foreign currency interest rate risk on investment trusts held by each individual bank.

Direct impact of an inverted yield curve

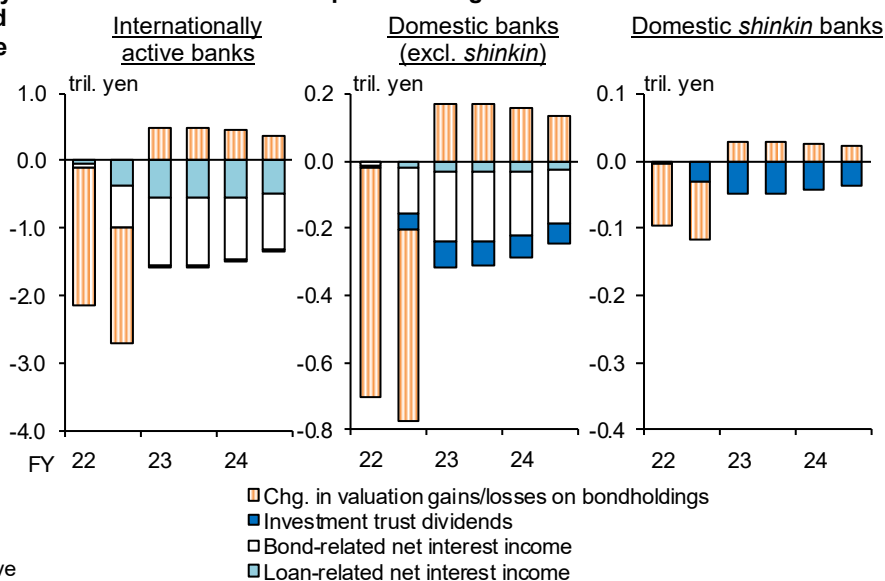
Although capital adequacy ratios at the end of the simulation period remain above the levels in the financial stress scenario, there is considerable downward pressure during the simulation period on financial institutions' PPNR excluding trading income and valuation gains/losses on securities holdings. To start with, given the substantially inverted yield curve in foreign markets, the margin between foreign currency investment yields and funding rates shrinks substantially (Chart V-2-7). As pointed out in Section C of Chapter IV, while the pass-through rate of market interest rates to funding rates is high, that to investment yields is relatively low. As a result, lending margins are squeezed substantially, and margins on securities investment turn negative for most of the simulation period.³⁸ As for the direct impact of rising foreign interest rates on foreign net interest income, changes in both loan-related and securities-related net interest income contribute to the decline in foreign net interest income for all types of banks throughout the simulation period (Chart V-2-8).³⁹ Reflecting differences in the composition of asset portfolios, the following factors contribute significantly to the decrease in foreign net interest income: the fall in loan-related and bond-related net interest income for internationally active banks, the fall in bond-related net interest income and investment trust dividends for domestic banks excluding *shinkin* banks, and the fall in investment trust dividends for domestic *shinkin* banks.

Chart V-2-7: Foreign currency investment yield and funding rate



Note: Covers internationally active banks and domestic banks (excl. *shinkin*).

Chart V-2-8: Impact of foreign interest rate rises



Note: The chart shows the direct impact of changes in yield curves from Jan.-Mar. 2022.

Moreover, in the simulation's initial phase of interest rate rises, valuation gains/losses on bondholdings deteriorate substantially for all types of banks. The simulation abstracts from the effect of hedging against rising interest rates, but even if hedging were taken into account, valuation gains/losses on bondholdings would likely worsen significantly. This is because hedging against rising interest rates with floating-rate notes is unlikely to be effective when the yield curve flattens.

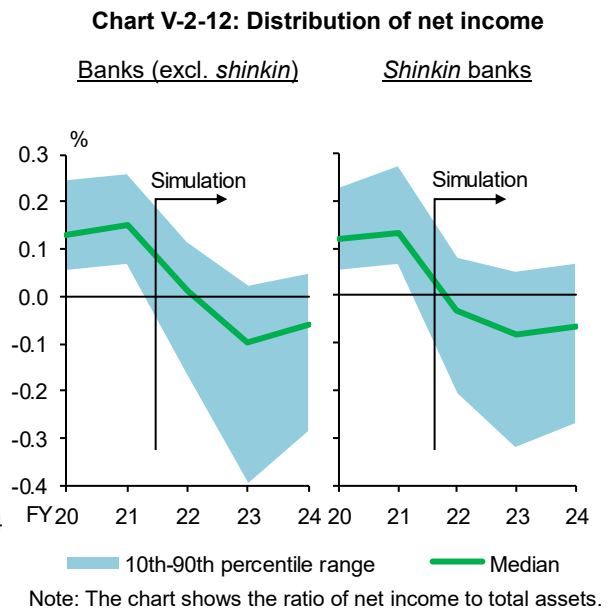
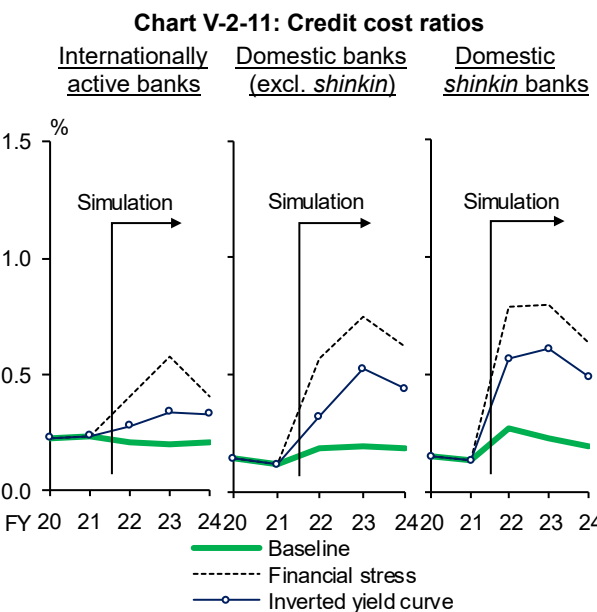
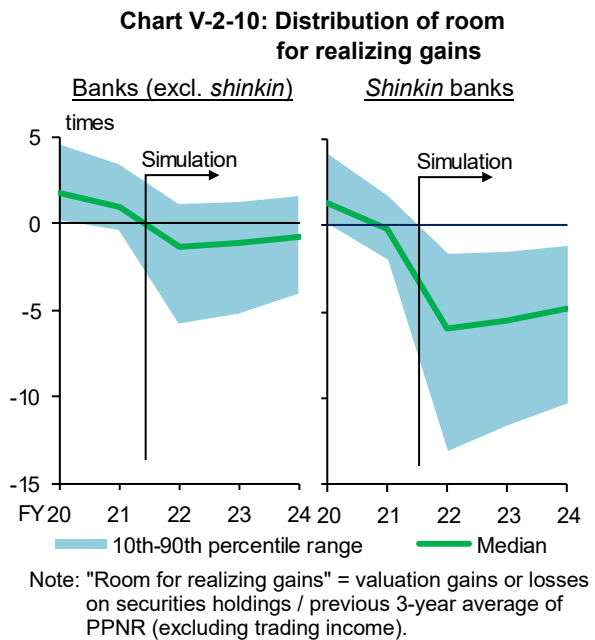
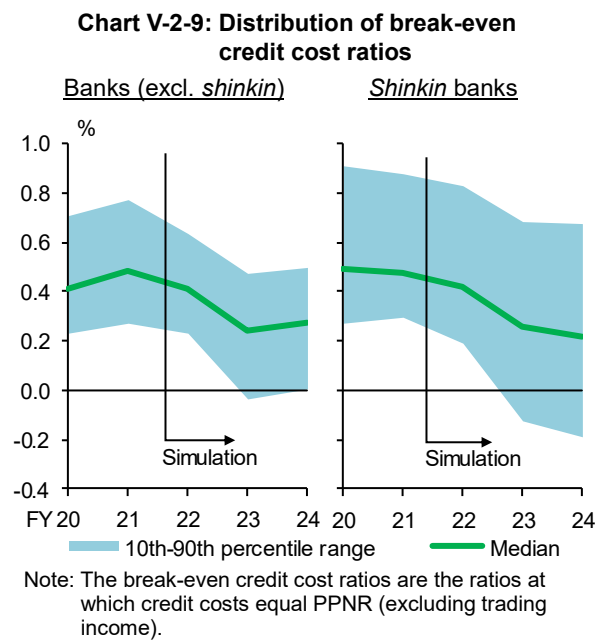
³⁸ During previous periods of rising interest rates, lending margins have tended to narrow as loans with relatively small spreads have increased.

³⁹ Chart V-2-8 extracts only the impact of the rise in foreign interest rates and does not reflect the impact of the slowdown in foreign economies. For *shinkin* banks, the impact of higher foreign interest rates on loan-related and bond-related net interest income is ignored in the FMM since there are no *shinkin* banks with international operations that obtain foreign currency funding.

From fiscal 2023 through the end of the simulation period, valuation gains/losses on bondholdings improve as proceeds from bond redemptions are reinvested and long-term interest rates decline.

Impact on loss-absorbing capacity

In the simulation, the decline in foreign net interest income leads to a deterioration in financial institutions' profit buffers. The distribution of the break-even credit cost ratios, which represent profit buffers, shows a decline overall (Chart V-2-9). For some banks, the ratio even becomes negative, indicating a deficit in PPNR excluding trading income. This means that for a large number of financial institutions, their PPNR excluding trading income in one fiscal year can no longer cover their credit costs.



Moreover, financial institutions' room for realizing gains in terms of net valuation gains on securities holdings declines markedly due to the deterioration in valuation gains/losses on securities holdings, especially foreign bonds. Partly since securities portfolios (the outstanding amount and composition

of products) are assumed to be constant and no flexible replacement of products is assumed in the simulation, the room for realizing gains turns negative for many financial institutions (Chart V-2-10). In particular, the room for realizing gains declines substantially for financial institutions with large securities portfolios relative to their profitability and a large share of risky assets such as TLAC bonds in their investment.

Credit costs in the inverted yield curve scenario are relatively modest compared to the financial stress scenario (Chart V-2-11). However, since the yield curve inversion reduces financial institutions' loss-absorbing capacity, even a modest increase in credit costs leads to a significant deterioration in net income (Chart V-2-12). The simulation results imply that the decline in financial institutions' loss-absorbing capacity in terms of both profit buffers and room for realizing gains makes them more vulnerable to additional stress during the simulation period.

Impact on financial intermediation

The deterioration in capital adequacy ratios and net income makes financial institutions more cautious in their lending. The simulation results suggest that for financial institutions with substantial net income losses the decline in loans outstanding relative to the baseline scenario is larger than for other financial institutions (Charts V-2-13 and V-2-14). As pointed out in the previous section, the recent valuation losses on securities holdings have been particularly large for financial institutions that had increased their holdings of foreign interest rate products to improve their profitability. Financial institutions for which room for realizing gains has fallen would have difficulty in engaging in additional risk-taking, and their profitability would become more likely to decline. Thus, the functioning of financial intermediation could be impaired for some financial institutions.

Chart V-2-13: Domestic loans outstanding

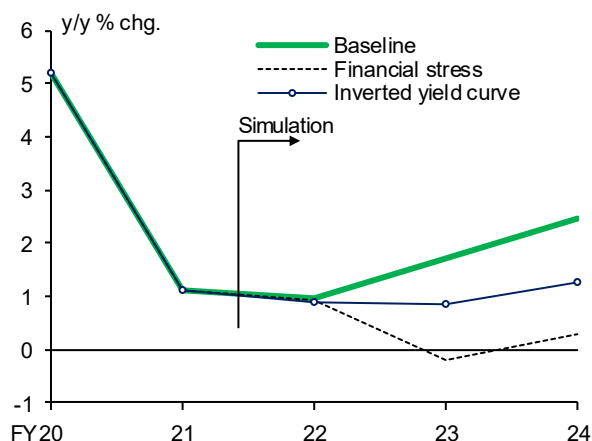
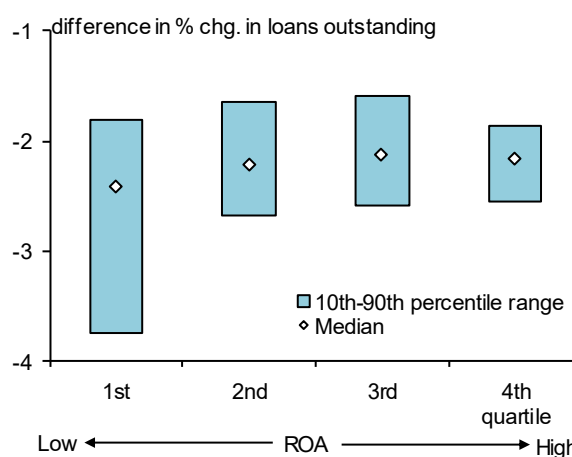


Chart V-2-14: Loans outstanding and ROA



Note: The markers and bands in each quartile of net income ROA (the averages of fiscal 2021-2023) indicate the medians and the 10th-90th percentile ranges of differences in changes in loans outstanding from 2021 to 2024 relative to the baseline scenario, respectively.

4. Evaluation of the resilience of the financial system

The results of the macro stress testing indicate that Japanese financial institutions on the whole are resilient to stress events such as financial stress similar to that experienced during the GFC or a substantially inverted yield curve in foreign markets, and that Japan's financial system remains stable. The resilience of the financial system has been underpinned by the increase in financial institutions' capital since the GFC and by that in their precautionary loan-loss provisioning since the

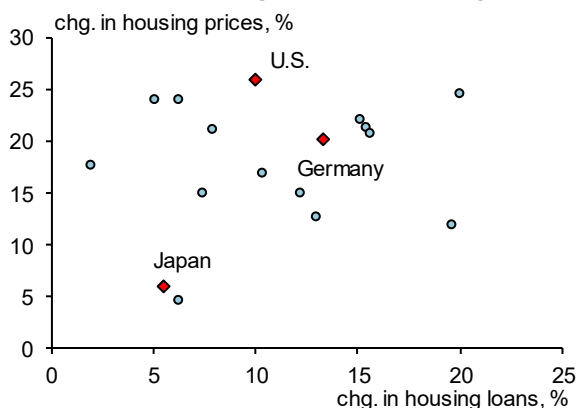
start of the pandemic. It should be noted, however, that capacity to absorb losses differs substantially among financial institutions. Under a situation such as the inverted yield curve scenario, the functioning of financial intermediation could be impaired for some financial institutions due to a deterioration in their net income and capital adequacy ratios.

Even with a substantially inverted yield curve in foreign markets, financial institutions would be able to curb a decline in foreign net interest income and a deterioration in valuation gains/losses on securities holdings by raising the pass-through of market interest rates to investment yields, and by flexibly replacing debt securities with valuation losses. In fact, in the case of lending, some financial institutions have increased lending to firms with relatively low ratings, for which it is easier to charge credit spreads. In the case of securities investment, some institutions have increased investment in higher-yielding super-long-term bonds and credit products. However, attention should be given to changes in risk profiles as a result of rebalancing investment portfolios. It is becoming increasingly important for financial institutions to be equipped to appropriately manage a variety of risks, including these changes in risk profiles.

Box 1: International comparison of housing loan markets

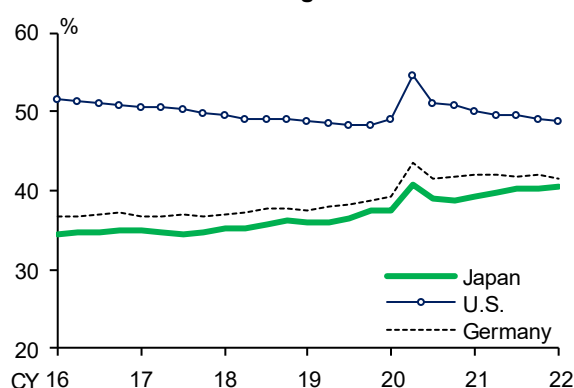
One of the key issues that arises during discussions on global financial stability is the vulnerability of household debt. In particular, the outstanding amount of housing loans, which account for the largest part of household debt, has continued to increase even amid the rise in housing prices since the start of the pandemic (Chart B1-1). While this trend has been observed in many advanced economies, the pace of increase in housing loans, the debt repayment capacity of the household sector, and the environment surrounding the housing market vary across countries. When examining the vulnerability of household debt, the issues that warrant attention differ from country to country.

Chart B1-1: Housing loans and housing prices



Note: The vertical and horizontal axis show changes from 2019 to 2021. The chart covers the 17 OECD countries for which data are available.
Source: OECD.

Chart B1-2: Housing loans to GDP ratio



Source: Bundesbank; Cabinet Office; ECB; FRB; Haver Analytics; BOJ.

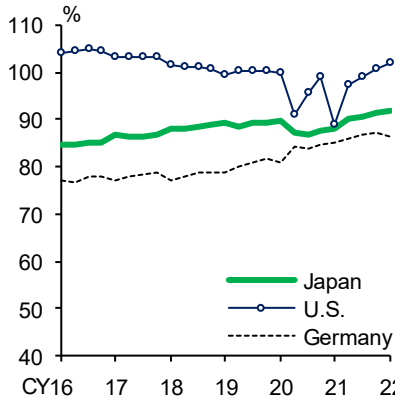
To start with, the ratios of housing loans to GDP in Japan, the United States, and Germany are compared. This comparison shows that the ratio is highest for the United States, while that for Japan is about the same as that for Germany (Chart B1-2). In the United States, the ratio of housing loans to GDP has hardly changed since before the pandemic. Although the growth rate in housing loans has been quite high, economic activity grew at a similar pace as housing loans. In contrast, in Japan and Germany, housing loans have continued to increase despite a decline in economic activity. As a result, the *household loans to GDP ratio* in Japan has been above the past trend, as seen in Section C of Chapter III.

Next, characteristics of household debt are compared. Since the start of the pandemic, while the loan-to-income (LTI) ratio -- the ratio of loans outstanding to disposable income -- is more or less unchanged in the United States, it has risen moderately in Japan and Germany (Chart B1-3). However, like the ratio of housing loans to GDP examined earlier, the LTI ratios in Japan and Germany are not conspicuously high. Meanwhile, the debt servicing ratios (DSRs) -- the ratio of annual repayments to disposable income -- for all three countries have been stable at relatively low levels (Chart B1-4). The burden of additional interest payments likely has been limited even amid the rise in housing loans. Looking at a breakdown of household debt, while housing loans account for a large part in Japan and Germany, consumer loans account for a relatively large share in the United States (Chart B1-5). When considering the vulnerability of household debt, it is necessary to monitor developments in consumer loans as well.

Lastly, comparing housing price valuations suggests that valuations of housing prices are becoming increasingly stretched abroad. The housing price to rent ratios in the United States and Germany have been rising at a faster pace than in Japan (Chart B1-6). Moreover, while housing prices in Japan

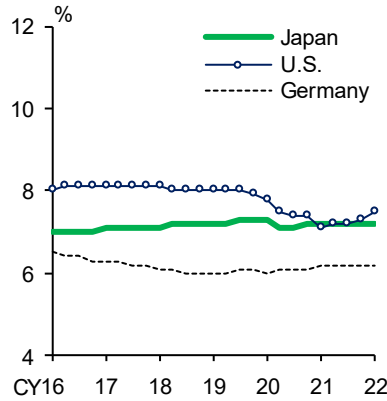
have risen roughly at the same pace as construction costs, in the United States and Germany, housing prices have far outpaced construction costs (Chart B1-7).

Chart B1-3: LTI ratio for households



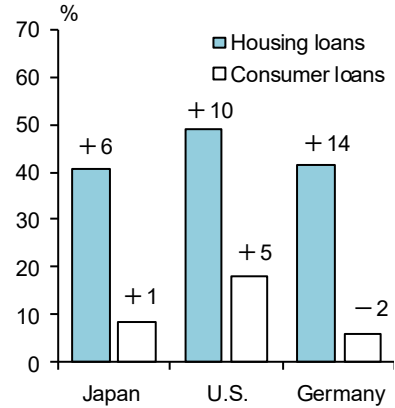
Note: Shows the household debt to disposable income ratio.
Source: Bundesbank; Cabinet Office; ECB; FRB; Haver Analytics; BOJ.

Chart B1-4: DSR for households



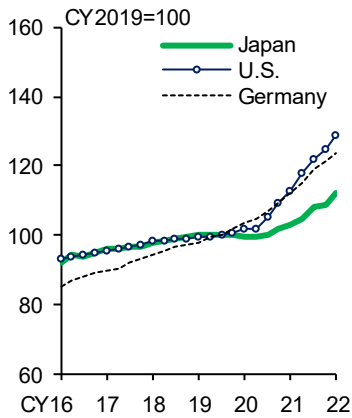
Note: Shows the ratio of annual repayments to disposable income.
Source: BIS.

Chart B1-5: Household debt to GDP ratio



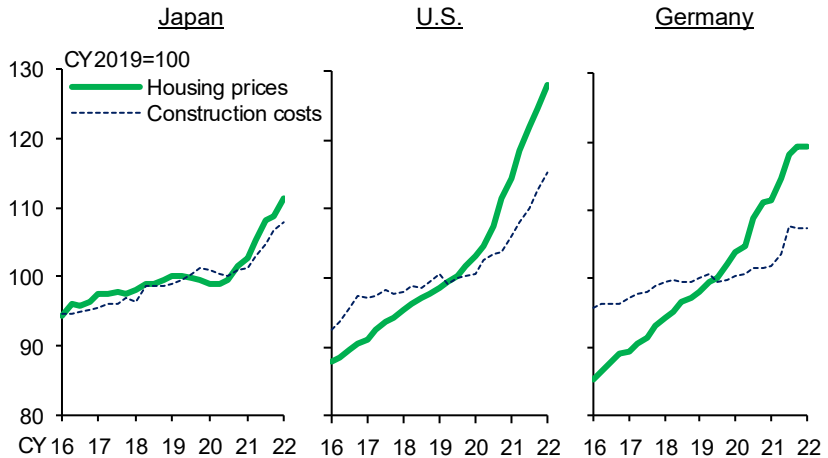
Note: The data are as at the January-March quarter of 2022. The figures indicate changes in loan amount from 2019 to 2021.
Source: Bundesbank; Cabinet Office; ECB; FRB; Haver Analytics; BOJ.

Chart B1-6: Housing price to rent ratio



Note: Latest data as at the January-March quarter of 2022.
Source: Ministry of Internal Affairs and Communications; OECD.

Chart B1-7: Housing prices and construction costs

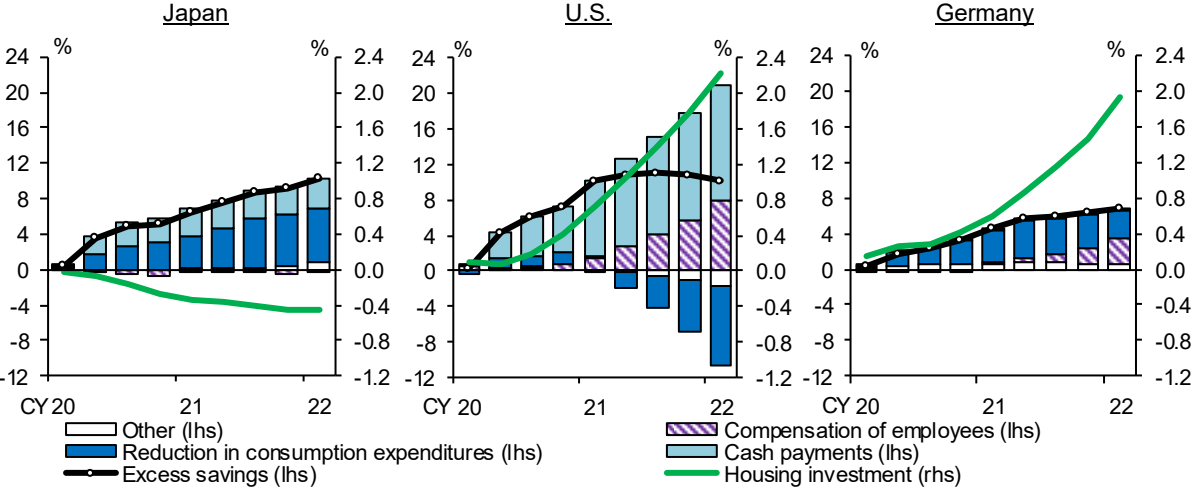


Note: Housing prices and construction costs are deflated by the consumer price index in each country. Latest data as at the January-March quarter of 2022.
Source: Haver Analytics; OECD.

These developments suggest that the rise in housing prices in the United States and Germany may be the result not only of supply-side factors but also of demand-side factors. Especially in the United States, it has been pointed out that housing investment appears to have been boosted by the improvement in employee income and the increase in household savings since the start of the pandemic (Chart B1-8). Countries where interest rates are rising, like the United States and Germany, may see some repricing of housing prices with stretched valuation going forward through weaker housing investment. In this regard, in Japan, the pace of increase in housing loans has been more modest than the other countries and a stretched valuation of housing prices as seen in foreign countries has not been observed. In Japan's housing loan market, there are no vulnerabilities such

as those seen in foreign countries at this point. However, developments in household debt continue to warrant close monitoring.

Chart B1-8: Saving balance of households



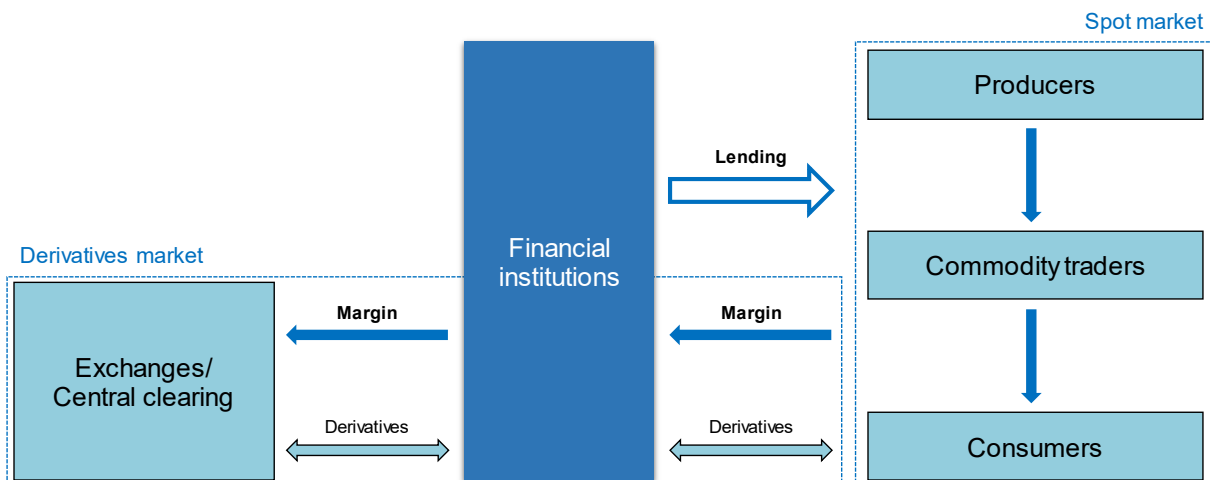
Note: The ratio of cumulative changes to GDP from 2019 onward. "Reduction in consumption expenditures" is calculated based on consumption expenditures. "Cash payments" is calculated based on income redistributions.
 Source: BEA; Cabinet office; Eurostat; OECD.

Box 2: Transmission channels of risk from commodity markets

Commodity markets have shown large swings since Russia's invasion of Ukraine, with commodity prices surging as volatility has increased. This box overviews the structure of commodity markets and, through a case study of the recent surge in prices, considers the potential impact of sudden swings in commodity markets on the financial system.

The commodity market consists of a spot market and a derivatives market (Chart B2-1). In the spot market, commodity traders purchase physical commodities from producers, store and process them, and then resell and deliver them to consumers. In the derivatives market, on the other hand, commodity traders and other related companies, as well as investors such as investment funds, hedge the risk of price fluctuations associated with spot transactions. Financial institutions are involved in the commodity market by (1) providing the necessary funds for spot and derivatives transactions in the form of trade credit and committed lines of credit, (2) trading over-the-counter derivatives to hedge spot prices, and (3) providing intermediation services via exchanges and central clearing for exchange-traded transactions.

Chart B2-1: Structure of commodity markets

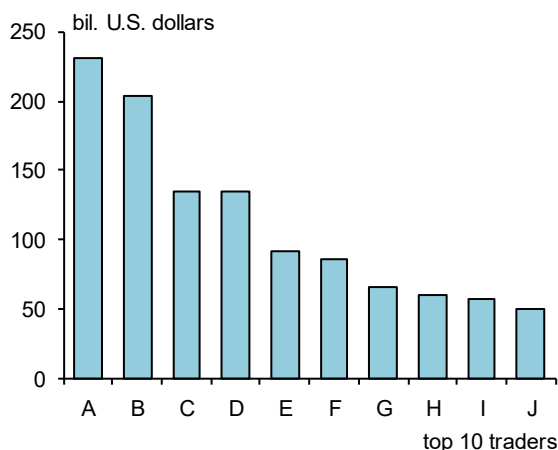


Following Russia's invasion of Ukraine in February 2022, commodity prices soared, especially for natural gas and wheat, of which Russia and Ukraine are major producers, as supply concerns increased (Chart II-1-13). Commodity prices had already been on an upward trend as economic activity began to improve following the decline in economic activity in the wake of the pandemic. The materialization of geopolitical risks further pushed up the prices, with major commodities hitting record highs overall. Together with the surge in commodity prices, volatility also increased, resulting in a sharp rise in margin requirements. Commodity traders and others that had hedged against the risk of falling spot prices through derivatives trading were required to post substantial additional margin (Chart II-1-14).

Against this background, it has been pointed out that the recent surge in commodity prices is due not only to the supply and demand for physical commodities, but also to this sharp rise in margin requirements. Commodity traders and others that were required to post additional margin drew down their committed credit lines with banks and reduced positions with higher hedging costs, which led to a decline in market liquidity and amplified price volatility. The commodity market, unlike other financial markets, has been oligopolistic, which likely has increased the market impact of individual transactions on market prices when liquidity has declined.

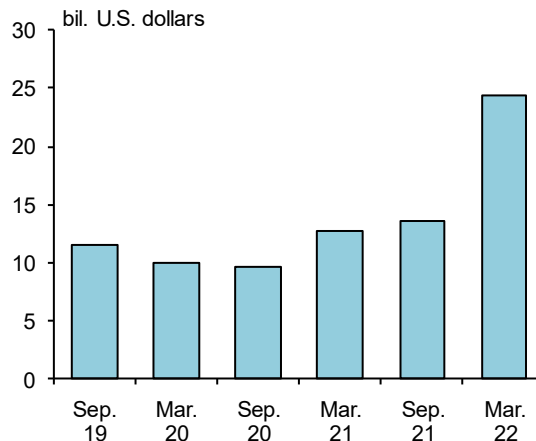
In fact, commodity trading is led by only a few dozen major commodity traders (Chart B2-2). Moreover, transactions are concentrated among just a few of them. A small number of firms, which play a prominent role in the market, as well as commodity funds faced funding liquidity constraints from additional margin requirements. This likely led to amplified volatility in market prices through a feedback loop between funding liquidity and market liquidity.

Chart B2-2: Major commodity traders' revenues



Note: Shows commodity traders' revenues in fiscal 2021.
Source: S&P Global Market Intelligence;
Published accounts of each company.

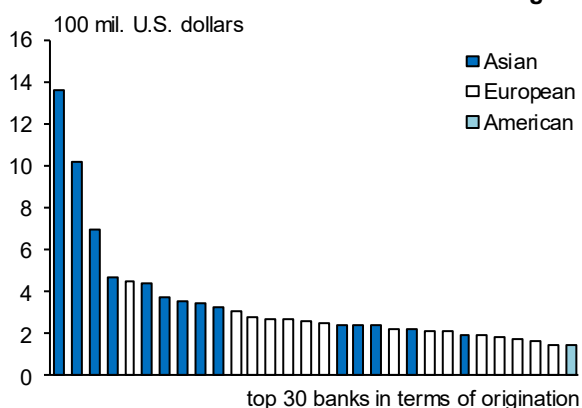
Chart B2-3: Lending to commodity traders among major banks



Note: Covers large borrowers of the three major banks.
Source: BOJ.

Moreover, the growing concerns in commodity supply chains have also had a certain impact on the banking system through lending to commodity traders. Financial institutions including Japanese ones largely increased their lending to commodity traders, driven by drawdowns of committed credit lines (Chart B2-3). The regional composition of lenders to commodity traders is diversified, with Asian financial institutions including Japan accounting for 50 percent of loans, European peers for 40 percent, and U.S. peers for 10 percent (Chart B2-4). Loans are concentrated among a small number of Asian financial institutions.

Chart B2-4: Lending to commodity traders by bank



Note: Shows the origination amount of syndicated loans to commodity traders since 2020 by bank.
Source: Dealogic.

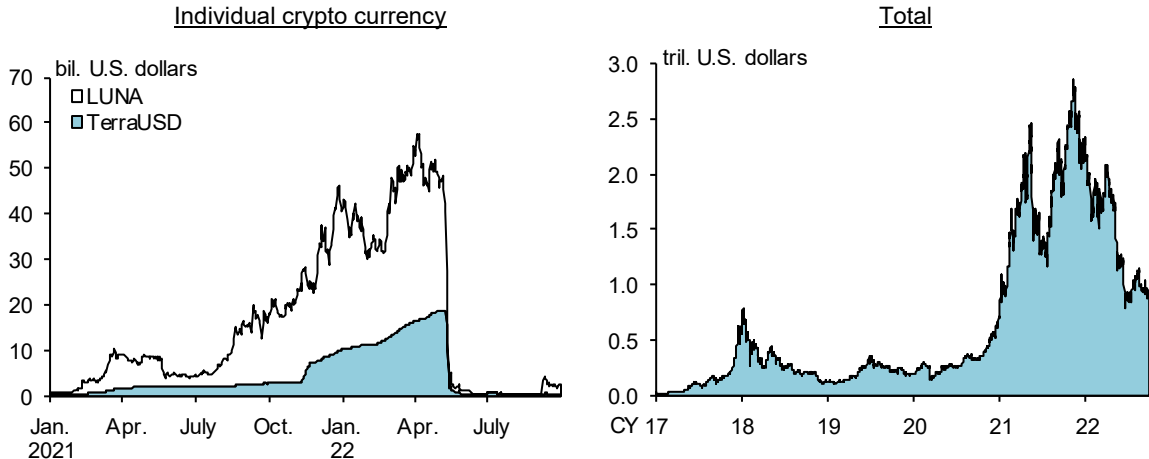
This event of price surges can be considered a result of the feedback loop between funding liquidity and market liquidity that is frequently observed in financial markets. Since some financial institutions have reduced their positions in the commodity market in response to the recent market swings, market liquidity is lower than normal and market volatility may be even higher in the near future. In addition, for quite a few financial institutions that provide large loans to commodity traders, settlement

currency in the commodity markets is not their home currency. So far, there has been no noticeable impact on the FX swap market and other foreign currency funding markets. However, close monitoring is required on whether liquidity in foreign currency funding markets will decline as a knock-on effect in future periods of stress.

Box 3: Recent developments in crypto-assets

In May 2022, TerraUSD, a crypto-asset, and LUNA, an underlying crypto-asset that backs TerraUSD, collapsed. In the wake of a downward deviation of TerraUSD from its U.S. dollar peg, a run occurred. The market capitalization of the two -- which stood at 60 billion dollars as of April -- plummeted to nearly zero in only a week (Chart B3-1). At the same time, the market capitalization of total crypto-assets fell by 50 percent, losing about 1 trillion dollars in a short period of time.

Chart B3-1: Crypto market cap



Note: Latest data as at end-September 2022.
Source: Coin Dance; CoinGecko.

The crash in crypto-assets has revealed their vulnerability. A run occurred on crypto-assets created by new technology, which reminds us of the fact that crypto-assets are subject to the same inherent risks as the traditional financial system. As shown by past financial crises such as the GFC, despite advances in financial technology and the emergence of new types of financial products, financial assets, and transaction entities, the risks inherent in financial transactions themselves do not change. This is why regulations and management frameworks to address financial risks are required. Based on these considerations, the Financial Stability Board (FSB) in July 2022 released the "FSB Statement on International Regulation and Supervision of Crypto-asset Activities."

The statement emphasizes the principle of "same activity, same risk, same regulation." In line with this principle, the relevant domestic and foreign authorities have endeavored to formulate policies for the regulation and supervision of crypto-assets. The Basel Committee on Banking Supervision (BCBS) has published a public consultation and proposed that crypto-assets failing to meet classification conditions should be subject to higher capital requirements. With regard to financial market infrastructures, the Committee on Payments and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO) jointly released guidance titled "Application of the Principles for Financial Market Infrastructures to Stablecoin Arrangements." Moreover, the Financial Action Task Force (FATF) has released a series of recommendations setting out anti-money laundering and counter-terrorist financing (AML/CFT) standards with regard to crypto-assets.

Alongside these international efforts, Japan has advanced legislation to regulate and supervise crypto-assets. Under the amended Payment Services Act in 2017, a registration system for crypto-asset exchangers was introduced and identity verification was made mandatory. Subsequently, the Japan Virtual and Crypto assets Exchange Association was approved as a self-regulatory body in 2018, and relevant laws were amended in 2020 to promote the protection of customers' crypto-

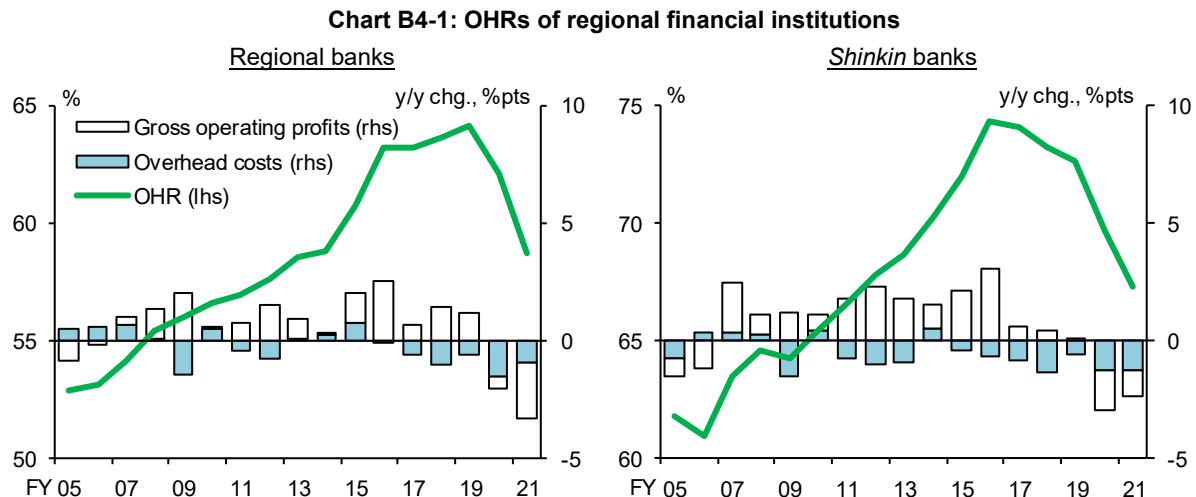
assets. Moreover, in view of the possibility that the issuers and intermediaries of specific stablecoins, which are indexed to the value of a legal currency, can differ, relevant laws were amended in 2022 based on the principle of "same activity, same risk, same regulation." Thus, steady progress has been made to establish an institutional framework that is essential for the sound development of crypto-assets and their markets.

So far, on a global basis including Japan, the linkages between the ecosystem of crypto-assets and decentralized finance (DeFi), the underlying technology for crypto-assets, and the traditional financial system have been limited. Also, the impact of the turbulence in crypto-asset markets on the traditional financial system has been limited.⁴⁰ However, as crypto-assets and DeFi develop further, the linkages between the crypto-asset and DeFi ecosystem and the traditional financial system are likely to increase. Identifying and appropriately addressing financial risks associated with this ecosystem will encourage sound innovation and contribute to the development of the overall financial system.

⁴⁰ The FSB has highlighted several channels through which crypto-assets pose financial risks: (1) financial sector exposures to crypto-assets, (2) wealth effects of crypto-assets, (3) confidence effects through which developments concerning crypto-assets could impact investor confidence in crypto-asset markets, and (4) crypto-assets' use in payments and settlements. However, the FSB assessed that the risks posed via all of these channels were limited at this point. For details, see FSB, "Assessment of Risks to Financial Stability from Crypto-assets," February 2022.

Box 4: Operating efficiency of regional financial institutions

Regarding financial institutions' performance, their ROE, which measures their capital efficiency, is better thanks to an improvement in financial institutions' OHR, which gauges their operating efficiency (Chart V-1-2). In particular, OHRs of regional financial institutions have improved substantially of late after having deteriorated for 15 years since the mid-2000s (Chart B4-1).⁴¹ This box outlines the features of and reasons for the improvement in regional financial institutions' OHRs.



Note: The bar graph shows the contributions of overhead costs and gross operating profits to the changes in OHRs.
Source: BOJ.

The features of the improvement in regional financial institutions' OHRs can be summarized in the following three points. The first is the rate of improvement in OHRs. Those of both regional banks and *shinkin* banks have improved substantially by slightly more than 5 percent from fiscal 2019 to fiscal 2021. In recent years, OHRs have improved at an unprecedented pace.

The second point is that the improvements in OHRs are led by those in both overhead costs and gross operating profits. Regional financial institutions were not able to halt the deterioration in OHRs; although regional financial institutions have been working on reducing overhead costs for a long time and have actually reduced costs almost every year, gross operating profits deteriorated at a faster rate. However, over the past two years, OHRs have improved significantly in a well-balanced manner. Not only have financial institutions reduced costs, they have also improved revenue. Simultaneous improvement in overhead costs and gross operating profits has not been observed for a long time.

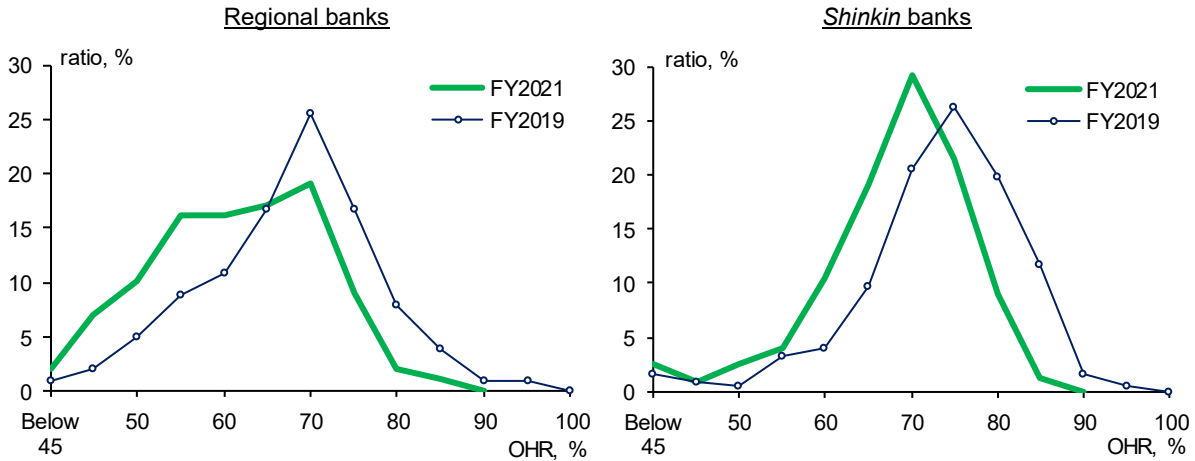
The third point is that OHRs have been improving at almost all regional and *shinkin* banks. For both, the distribution of OHRs has substantially shifted toward the left, i.e., toward the improvement side (Chart B4-2). The median OHR for fiscal 2021 has declined to the lower 60 percent range for regional banks and the lower 70 percent range for *shinkin* banks. Among regional banks, almost 40 percent have an OHR of below 60 percent, and the left tail of the distribution is becoming thicker.

Reasons for the improvement in OHRs are that the pace of decline in net interest income has decelerated and the uptrend for net non-interest income is becoming steady, particularly at some regional banks. Regional banks' income from fees and commissions in fiscal 2021 marked a record high, reflecting an increase in income from wholesale business, particularly loan-related services

⁴¹ The OHRs shown in Charts B4-1 and B4-2 are based on the OHRs used for the Bank's Special Deposit Facility. The overhead costs in the numerator exclude depreciation and deposit insurance premiums, while the gross operating profits in the denominator exclude gains/losses on bondholdings such as JGBs, profits/losses from investment trusts due to cancellations, and special remuneration.

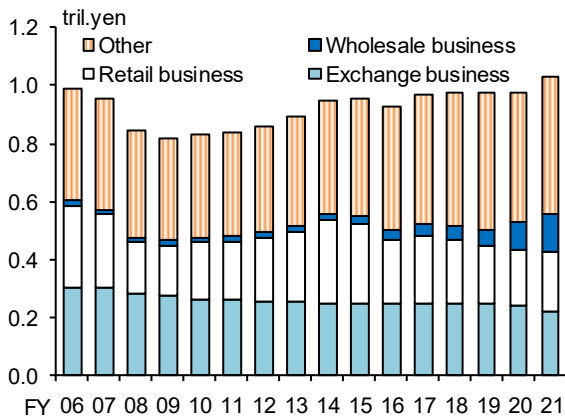
such as syndicated loans and covenants (Chart B4-3). In order to meet diversifying customer needs, regional banks in recent years have strengthened organizational arrangements to provide services by forming alliances and collaborating with external organizations, which is leading to profits.

Chart B4-2: Distribution of OHRs



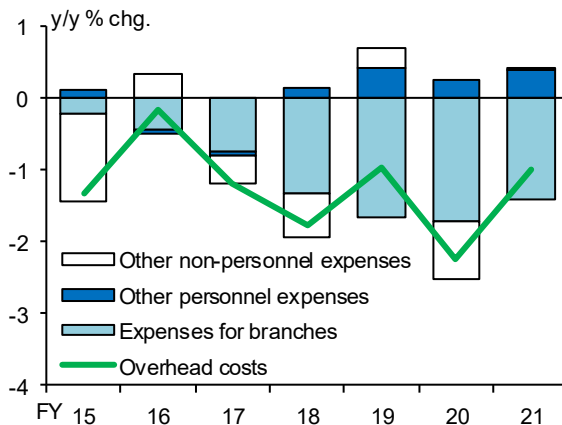
Source: BOJ.

Chart B4-3: Income from fees and commissions of regional banks



Source: BOJ.

Chart B4-4: Overhead costs of regional banks



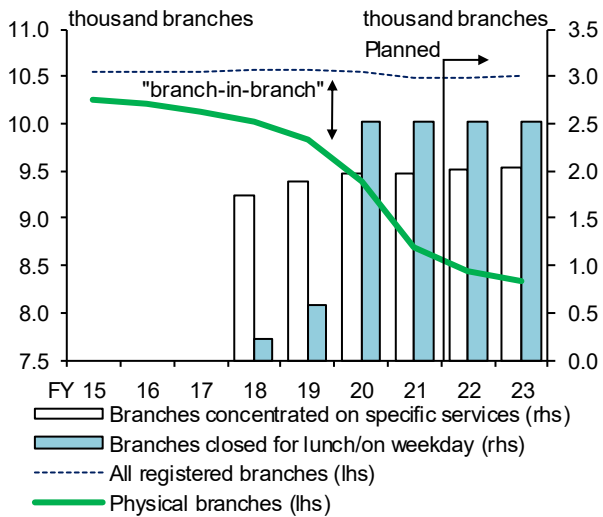
Source: BOJ.

In terms of overhead costs, regional financial institutions have been lowering costs by reorganizing branch networks. As mentioned earlier, overhead costs had already been on a downtrend. In the past few years, the decline in expenses for branches (personnel and non-personnel expenses) has been making a larger contribution to the decline in overall costs, converting physical branches to "branch-in-branches" (Chart B4-4). Among regional banks, nearly 2,000 out of 10,000 physical branches have already been closed through "branch-in-branch" consolidation (Chart B4-5). Further "branch-in-branch" consolidation is scheduled, albeit at a slower pace, from this year onward. The costs of operating existing branches are also reduced by concentrating back-office operations in headquarters and reducing the number of ATMs, in addition to concentrating on specific services. The number of branches that close for lunch and on weekday has also been on the rise.

These changes in both profits and costs likely reflect not only efforts by financial institutions' management but to some extent also changes in the external environment. With regard to interest services, lending to firms has increased since the start of the pandemic as a result of a rise in precautionary demand for funds. As for non-interest services, with client firms increasingly reorganizing their business, financial institutions need to urgently enhance their services to support

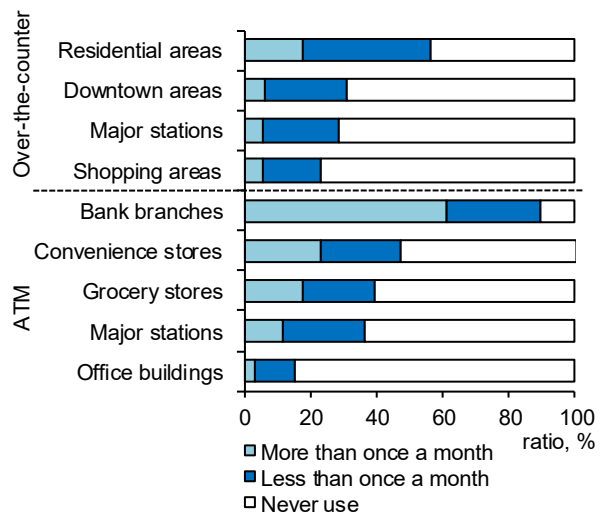
these firms. Moreover, in terms of overhead costs, the shift from in-person to non-in-person services in society more widely has created more leeway for financial institutions to further reorganize their branch networks (Chart B4-6). Financial institutions need to continue to flexibly review their management strategies to find the right balance in terms of the way financial services are provided in the future and in terms of their operating efficiency, while also making use of the Bank's Special Deposit Facility.

Chart B4-5: Number of branches of regional banks



Source: BOJ.

Chart B4-6: Frequency of bank use by location



Note: Based on 2021 survey.
Source: Japanese Bankers Association.

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)

Gross operating profits from core business = core gross operating profits = net interest income + net non-interest income

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 valuation 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 valuation 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.