BOJ Reports & Research Papers

Financial System Report

BANK OF JAPAN

OCTOBER 2020

The total of major banks, regional banks, and *shinkin* banks covered in this *Report* is as follows (as at end-September 2020).

Major banks comprise the following 10 banks: Mizuho Bank, MUFG Bank, Sumitomo Mitsui Banking Corporation, Resona Bank, Saitama Resona Bank, Mitsubishi UFJ Trust and Banking Corporation, Mizuho Trust and Banking Company, Sumitomo Mitsui Trust Bank, Shinsei Bank, and Aozora Bank. Regional banks comprise the 64 member banks of the Regional Banks Association of Japan (Regional banks I) and the 38 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 2020.

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Objectives of the *Financial System Report* and motivations behind the October 2020 issue of the *Report*

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

The *Report* provides a regular assessment of the financial cycle and the resilience of financial institutions to stress, and analyzes the vulnerabilities of the financial system from a macroprudential perspective. Within a macroprudential framework, institutional designs and policy measures are devised based on analyses and assessments of risks in the financial system as a whole, taking into account the interconnectedness of the real economy, financial markets, and financial institutions' behavior, in order to ensure the stability of the overall financial system.

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

COVID-19 continues to have a significant impact on the global economy and financial markets. This October 2020 issue of the *Report* discusses current developments in financial markets and the financial intermediation activities of Japanese financial institutions amid the ongoing impact of the outbreak. It then analyzes and assesses the impact on Japan's financial stability as well as the risks posed by the outbreak. It also discusses the issues and challenges that warrant close vigilance going forward. The analysis reflects the following features: (1) the current stress stems from the shock to the real economy resulting from the major restrictions on people's activities due to COVID-19; (2) the impact of this shock differs significantly depending on firm size and industry; and (3) the powerful fiscal and monetary policy measures by the Japanese government and the Bank have been effective.

Contents

I. Executive summary: Assessment of the stability of Japan's financial system and discussion of future challenges

Current assessment of the stability of Japan's financial system

Japan's financial system has been maintaining stability on the whole, while COVID-19 continues to have a significant impact on economic and financial activity at home and abroad.

The Japanese government and the Bank of Japan, in close cooperation with overseas authorities, have swiftly implemented large-scale fiscal and monetary policy measures to support economic activity and maintain the functioning of financial markets. With regard to regulation and supervision, flexible actions have been taken to encourage financial institutions to smoothly provide funds necessary to support economic activity. Although corporate and household financing is under considerable stress due to the severe downward pressure on the real economy, the smooth functioning of financial intermediation has been maintained due to financial institutions' robust financial bases both in terms of capital and liquidity as well as such policy and supervisory measures. Financial markets have generally started to regain stability after they were significantly destabilized in March 2020, although they have remained sensitive to uncertainty.

Future risks and caveats

Looking ahead, even in the case where the economic recovery remains very moderate, Japan's financial system is likely to remain highly robust. However, developments in the spread of COVID-19 and their impact on the domestic and overseas economies are subject to considerable uncertainty. Under the severe stress event of the persistently stagnated pace of economic recovery and significant adjustments in financial markets, a deterioration in financial institutions' financial soundness and the resultant impairment of the smooth functioning of financial intermediation could pose a risk of further downward pressure on the real economy. In this regard, the following three risks warrant particular attention. From a macroprudential perspective, it is important to prepare for these risks and do the utmost to ensure the stability of the financial system and the smooth functioning of financial intermediation.

The first risk is an increase in credit costs due to the potentially prolonged economic downturn at home and abroad. In Japan, a rise in defaults will likely be restrained for some time even though substantial declines in corporate sales and profits and an increase in corporate debt have continued. This is because firms have strengthened their financial bases both in terms of capital and cash reserves in recent years and because various measures to support corporate financing have been highly effective. However, if the economic downturn was prolonged, firms could continue to see a decline in their debt servicing capacity. In particular, close attention should be paid to the impact on lending to areas where vulnerabilities accumulated before the COVID-19 outbreak; namely, (1) lending to middle-risk firms with lower returns, (2) lending to the real estate industry, and (3) lending to high-leverage projects related to large-scale merger and acquisition (M&A) deals.

The overall credit quality of the overseas loan portfolios of Japanese banks has remained high. On a more granular level, however, Japanese banks have sizeable exposure to energy-related project finance loans, which are susceptible to a decline in crude oil prices, and to object finance loans for the acquisition of aircraft, which face a decline in global demand. In addition, large exposure to firms with lower profitability has been on an uptrend as Japanese banks have been actively increasing overseas loans. Careful risk management is essential given that the current downturn in overseas economies is more severe than that during the global financial crisis (GFC).

The second risk is a deterioration in gains/losses on securities investment due to substantial adjustments in financial markets. Under the prolonged low interest rate environment in Japan, Japanese financial institutions have been actively taking on market risk, particularly for domestic and overseas credit products and investment funds, to search for yield. As financial markets have started to regain stability, the losses on financial institutions' securities investments have been limited so far. However, there are some cases where unrealized losses on particular products have increased. As uncertainty regarding financial markets remains high, it is necessary to review whether the existing risk management frameworks functioned well under the market adjustments in March 2020 and to push ahead with efforts to enhance the effectiveness of the frameworks.

The third risk is destabilization of foreign currency funding due to the tightening of foreign currency funding markets mainly for the U.S. dollar. Japanese banks have worked to ensure their funding stability by, for example, extending the term of market funding and enhancing corporate client-related deposits as they have expanded overseas loans in recent years. Their efforts as well as the enhancement of the U.S. dollar liquidity swap line arrangements by six central banks helped to prevent major disruptions to foreign currency funding in March even when their foreign currency-denominated loans increased sharply due to the withdrawal of funds from committed lines. As foreign currency funding markets are still vulnerable to shocks, Japanese banks need to make continuous efforts to strengthen their foreign currency funding bases and liquidity management.

Challenges for financial institutions and actions by the Bank of Japan

Future developments in the spread of COVID-19 and their impact on the domestic and overseas economies remain highly uncertain. Against this backdrop, the major challenge for financial institutions is to smoothly fulfill their financial intermediation function by balancing their financial soundness and risk taking. Careful assessment of the sustainability of the borrowers' businesses, in addition to the provision of swift liquidity support, will become increasingly important. In this respect, providing effective support tailored to the needs of borrowers by assisting with their core business and financing as well as facilitating their business succession, transfer, and restructuring will become more essential. These initiatives will promote more efficient allocation of resources, thereby contributing to an improvement in the productivity and vitality of the national and local economies. Financial soundness is one of the primary foundations for financial institutions to play these roles. (1) Strengthened management of the three risks mentioned above, (2) adequate loan-loss provisioning based on the sustainability of borrowers' businesses, and (3) sound capital planning under considerable uncertainty are the keys to maintaining their financial soundness.

The environment surrounding Japanese society is undergoing major changes, including population declines and aging, digital transformation and working-style reforms, as well as heightened interest in climate change. In the medium to long run, financial institutions are expected to contribute to achieving a sustainable society in the post-COVID-19 era by offering higher value-added financial services. To face the challenges, they need to step up their efforts to enhance operating efficiency and business bases.

The Bank of Japan, in close cooperation with the Japanese government and overseas financial authorities, will make efforts to ensure the stability of the financial system and the smooth functioning of financial intermediation. From a medium- to long-term perspective, the Bank will actively support financial institutions' initiatives by preparing institutional frameworks for the financial system and taking measures to facilitate digital transformation.

II. Risks observed in financial and capital markets

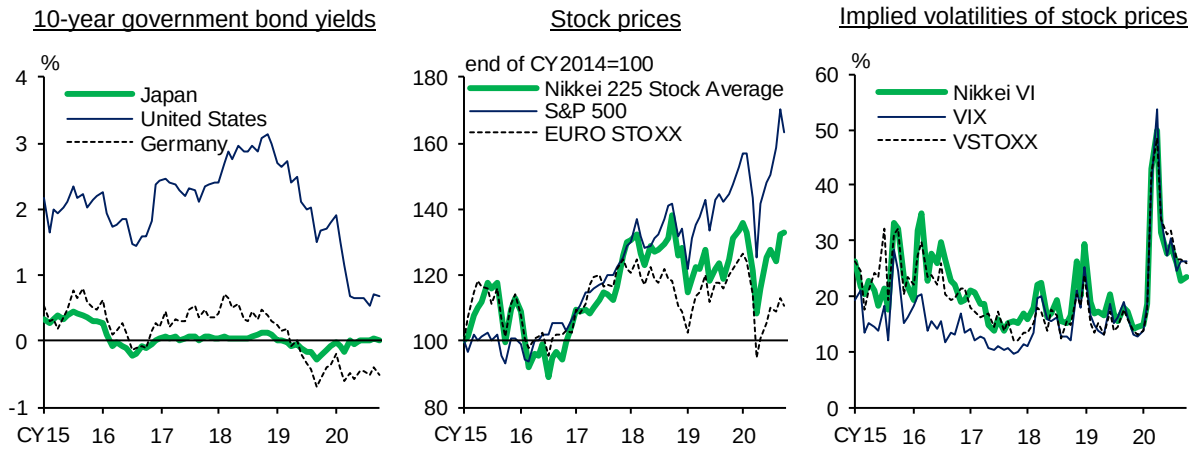
This chapter summarizes the developments in financial markets within Japan and abroad, mainly during the first half of fiscal 2020, and examines the risks observed from market developments.[1]

A. Global financial markets

Global financial markets have generally started to regain stability since they were significantly destabilized mainly due to the outbreak of COVID-19 in March 2020.[2] Thereafter, stock prices have risen and volatilities have decreased in the United States and Europe, mainly reflecting a resumption of economic activity and aggressive fiscal and monetary policies taken in each country and region. The credit spreads have also narrowed in these economies. Meanwhile, long-term interest rates have been stable at low levels even amid the significant increase in the amount of issuance of government bonds in these economies. Regarding emerging market economies, the credit spreads of their government bonds have narrowed amid rises in stock prices and the appreciation of their currencies.

However, financial markets have remained sensitive, given the uncertainty as to when the spread of the virus will subside. The pace of recovery of risky asset prices is highly diverged, depending on the sector and on the country and region, as the impact of the disease is diverged among regions. Some market participants have expressed concern about the overvaluation of risky asset prices, mainly stock prices. Attention should be paid to the effects of growing concerns about a prolonged impact of COVID-19 and geopolitical risks on the prices of stocks and credit products and on emerging markets, given the high degree of uncertainty concerning global financial markets (Chart II-1-1).

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



Note: Latest data as at end-September 2020.
Source: Bloomberg.

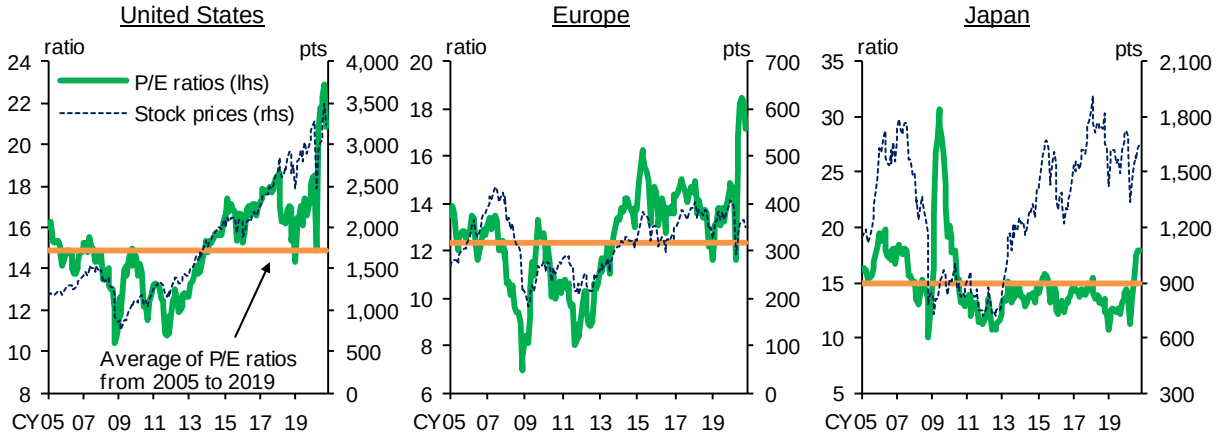
[1] In Japan, the fiscal year starts in April and ends in March of the following year.

[2] For details, see Okamoto, T., "Disruption in the U.S. Treasury Market and Its Effects on the Japanese Government Bond Market: Spread of COVID-19 and Financial Markets (1)," *Bank of Japan Review Series*, no. 20-J-9, August 2020 (available only in Japanese); and Kawasumi, Y. and Kataoka, M., "Disruption in U.S. Money Markets and Its Global Spillover: Spread of COVID-19 and Financial Markets (2)," *Bank of Japan Review Series*, no. 20-J-10, August 2020 (available only in Japanese).

U.S. and European stock prices

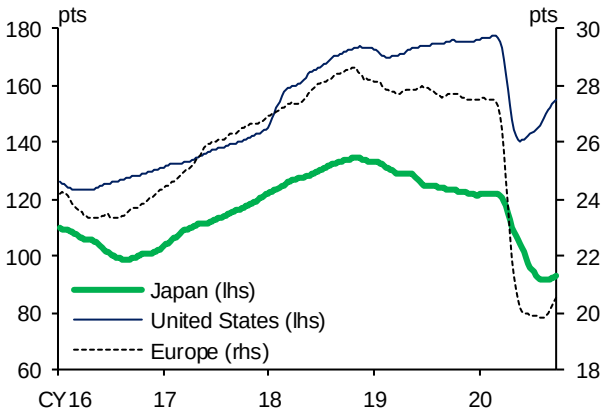
U.S. and European stock prices have risen significantly with the improvement in risk sentiment, mainly reflecting a resumption of economic activity and aggressive fiscal and monetary policies taken in each country and region (Chart II-1-1). Meanwhile, expected earnings per share (EPS) for U.S. and European firms have declined considerably, reflecting the ongoing impact of COVID-19, and views on corporate earnings in the short run have become cautious. Price earnings (P/E) ratios have increased sharply and some market participants have expressed concern about the overvaluation of U.S. and European stock prices. In addition, volatility has remained high, albeit at a lower level than that observed in March (Charts II-1-2 and II-1-3).

Chart II-1-2: Stock prices and valuation



Note: 1. "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.
2. Latest data as at end-September 2020.
Source: Datastream from Refinitiv.

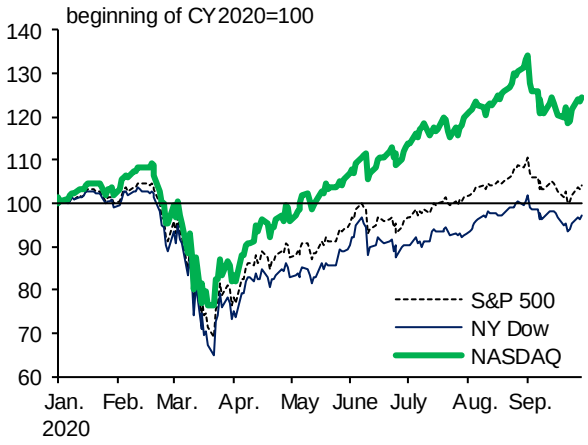
Chart II-1-3: Expected EPS



Note: 1. "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.
2. Latest data as at end-September 2020.
Source: Datastream from Refinitiv.

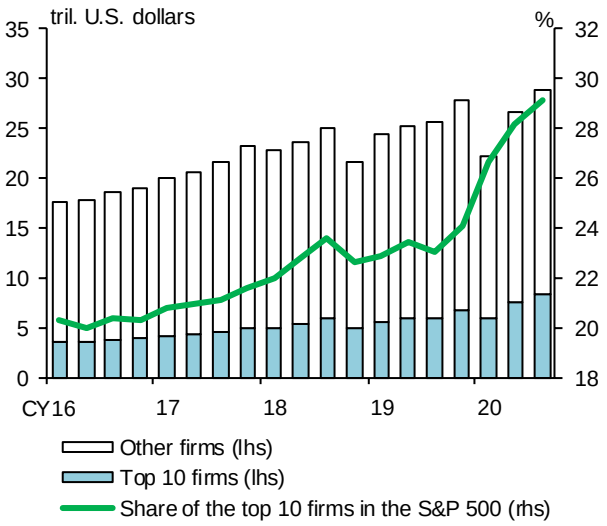
Looking at U.S. stock prices in detail, NASDAQ has shown a significant increase since March and has recorded historical highs. As the background to these developments, market participants have pointed out that NASDAQ includes many stocks of firms that are expected to grow at high rates in the COVID-19 era. The overall performance of Standard & Poor's (S&P) 500 Index has been led by some stocks with high market values. A decomposition by sector highlights the significant contribution of the IT sector and large differences in performance among sectors. In September, stock prices showed some signs of adjustments mainly in the sectors that had been largely contributing to the overall growth (Charts II-1-4, II-1-5, and II-1-6).

Chart II-1-4: U.S. stock prices



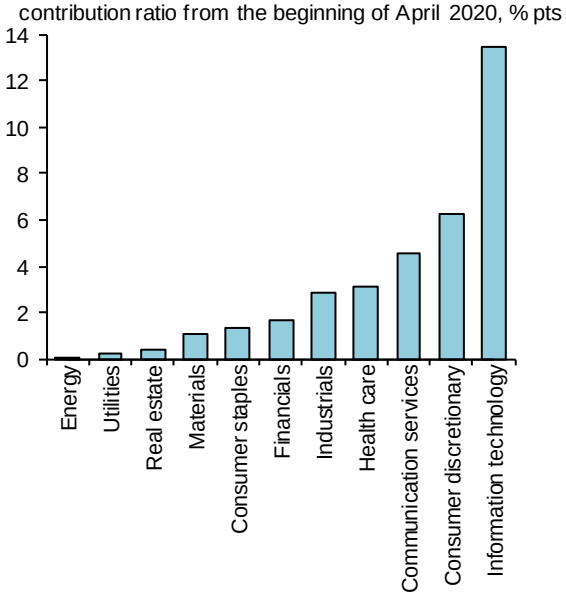
Note: Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-5: Total market value of S&P 500



Note: 1. On a free-float market capitalization basis.
2. "Top 10 firms" indicates the sum of the free-float total market values of the 10 largest firms in the S&P 500 at each point in time.
3. Latest data as at end-September 2020.
Source: Bloomberg.

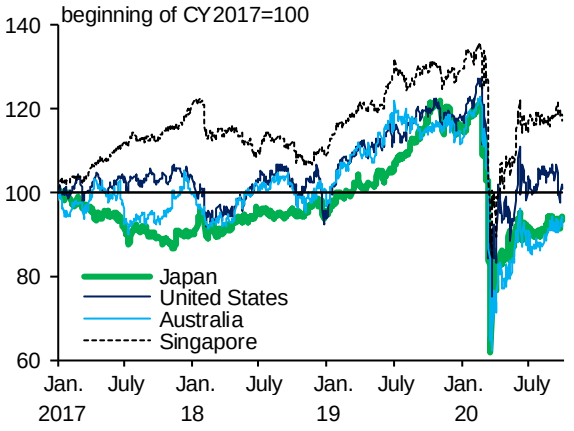
Chart II-1-6: Decomposition of S&P 500 by sector



Note: Latest data as at end-September 2020.
Source: Bloomberg.

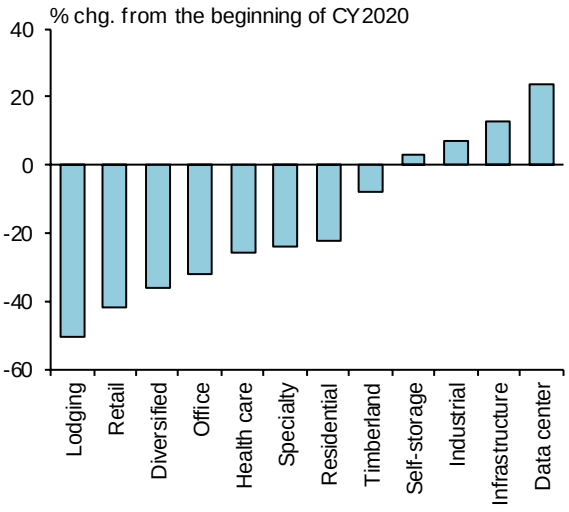
In the real estate investment trust (REIT) market, a "risk-off" mode among market participants has subsided and REIT prices have been picking up in many countries and regions (Chart II-1-7). Looking at the REIT prices by sector, those of industrial facilities, which include data centers and logistics facilities such as warehouses, have been recovering relatively fast, as they have been benefiting from stay-at-home demand in the COVID-19 era. On the other hand, the prices of REITs related to lodging and offices have remained at somewhat lower levels than those before the COVID-19 outbreak (Chart II-1-8). This reflects a decline in demand for lodging due mainly to voluntary stay-at-home behavior and concern over the impact that widespread implementation of working from home will have on demand for offices.

Chart II-1-7: REIT indices



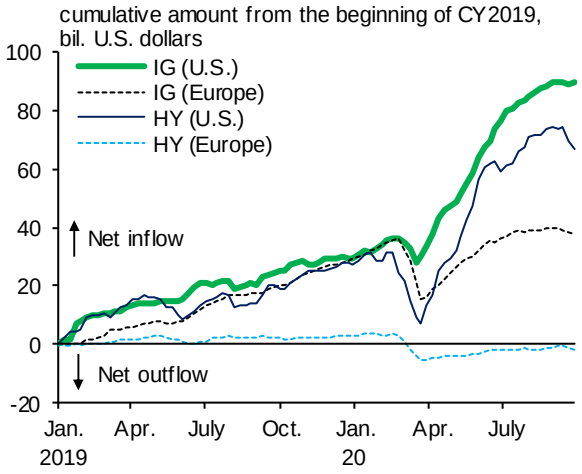
Note: 1. "Japan," "United States," "Australia," and "Singapore" indicate the TSE REIT Index, the FTSE NAREIT All Equity REIT Index, the S&P/ASX 200 A-REIT Index, and the FTSE Straits Times Real Estate Investment Trust Index, respectively.
2. Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-8: U.S. REIT performance by sector



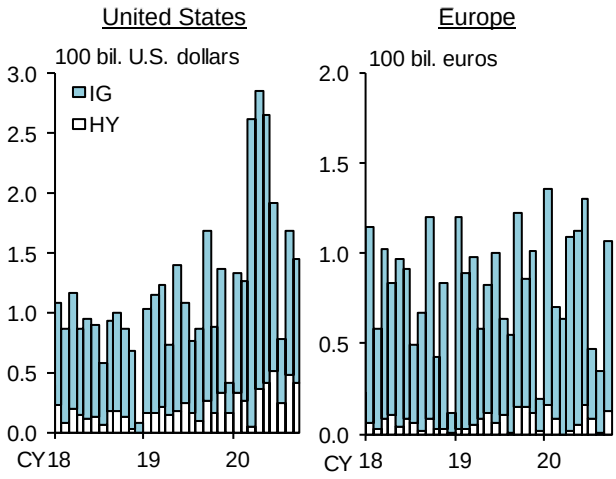
Note: Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-9: Net flows in U.S. and European corporate bond funds



Note: 1. "IG" and "HY" indicate investment-grade corporate bonds and high-yield bonds, respectively.
2. Latest data as at September 30, 2020 (weekly data).
Source: EPFR Global; Haver Analytics.

Chart II-1-10: Issuance of U.S. and European corporate bonds



Note: 1. "IG" and "HY" indicate investment-grade corporate bonds and high-yield bonds, respectively.
2. Latest data as at September 2020.
Source: Dealogic.

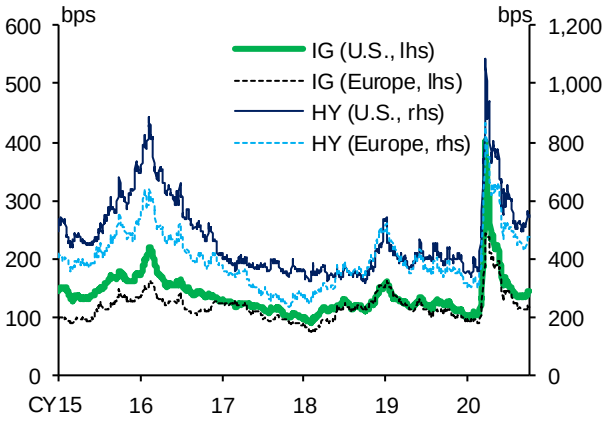
U.S. and European credit markets

In U.S. and European credit markets, a large net inflow of funds has been observed on the whole, with interest rates remaining low globally and investors continuing to search for yield (Chart II-1-9). The issuance of corporate bonds temporarily showed a rapid increase, especially in the United States, as firms' demand for funds remained strong (Chart II-1-10). Credit spreads have narrowed significantly, with purchases of corporate bonds by the Federal Reserve (FRB) and the European Central Bank (ECB) contributing to underpinning the sentiment. However, they have remained at higher levels, mainly for non-investment-grade corporate bonds (high-yield bonds), compared to those before the COVID-19 outbreak (Chart II-1-11). That said, the prices of leveraged loans have

not recovered to the levels before the outbreak, although they have risen significantly (Chart II-1-12). Meanwhile, defaults of high-yield bonds and leveraged loans increased mainly in the April-June quarter of 2020 (Chart II-1-13).

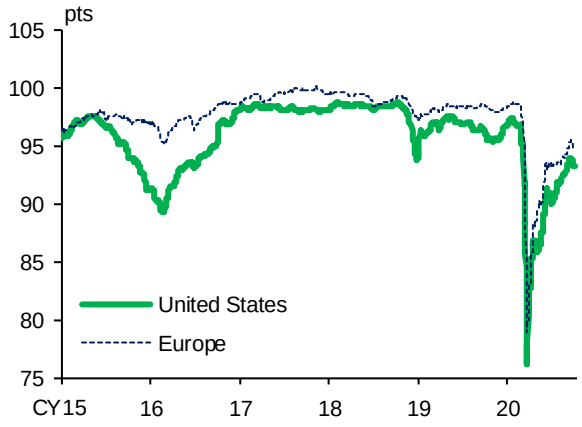
Looking at U.S. corporate bond spreads by sector, those in the energy sector have narrowed due in part to a rebound in crude oil prices; however, they have remained at high levels. In addition, in sectors such as hotels and leisure, the spreads have been at higher levels than those before the COVID-19 outbreak, as the impact of the disease is likely to be significant in those sectors (Chart II-1-14).

Chart II-1-11: Credit spreads on U.S. and European corporate bonds



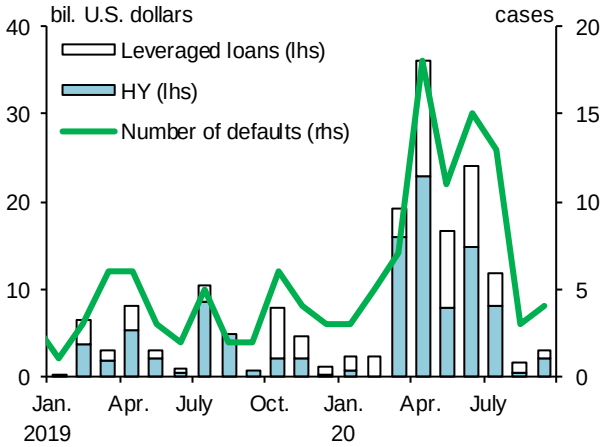
Note: 1. Calculated by ICE Data Indices. "IG" and "HY" indicate investment-grade corporate bonds and high-yield bonds, respectively.
2. Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-12: Leveraged loan prices



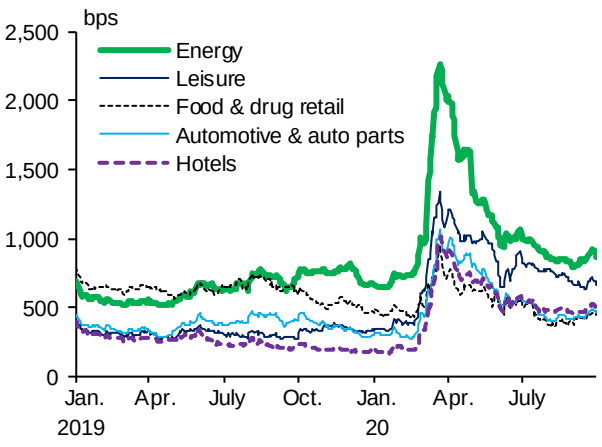
Note: 1. The figures indicate the index of leveraged loan prices in the secondary markets (the S&P/LSTA Leveraged Loan Index for the United States and the S&P European Leveraged Loan Index for Europe).
2. Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-13: Amount and number of U.S. high-yield bond and loan defaults



Note: Latest data as at September 2020. "HY" indicates high-yield bonds.
Source: J.P. Morgan.

Chart II-1-14: U.S. corporate bond spreads by sector



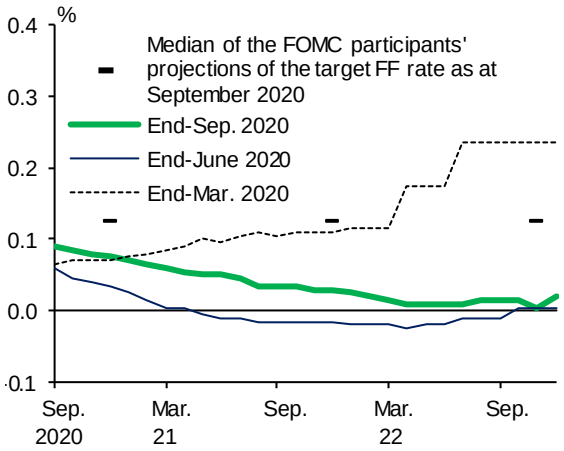
Note: 1. Calculated by ICE Data Indices. Covers high-yield corporate bonds.
2. Latest data as at end-September 2020.
Source: Bloomberg.

U.S. and European long-term interest rates

In the United States, long-term interest rates have been stable at low levels (Chart II-1-1). This mainly reflects expectations that accommodative financial conditions will be maintained even as

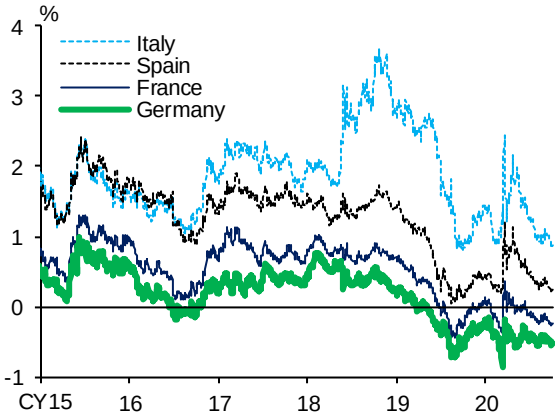
the issuance of U.S. Treasuries has been expanded on the back of aggressive fiscal policies (Chart II-1-15). In Europe, yields on German government bonds have also remained at low levels. Yields on government bonds of peripheral European countries have declined mainly reflecting the agreement on a recovery plan for Europe and continued bond purchases by the ECB (Chart II-1-16). Under these circumstances, the liquidity of the U.S. and European government bond markets has improved, due in part to the positive impact of policy responses taken by the FRB and ECB (Charts II-1-17 and II-1-18).

Chart II-1-15: Federal funds futures curves



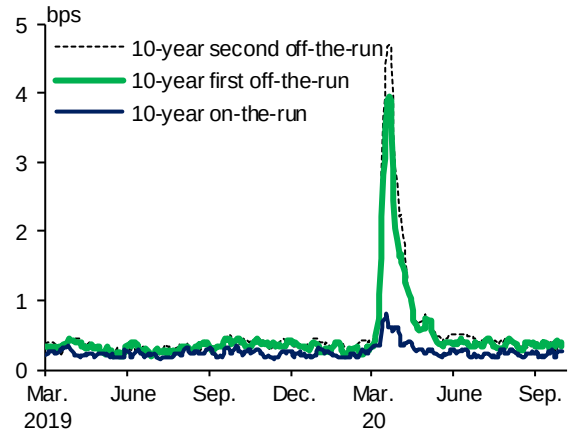
Source: Bloomberg; FRB.

Chart II-1-16: 10-year European government bond yields



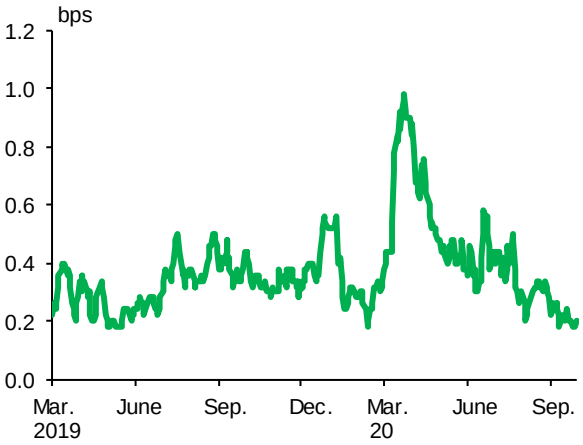
Note: Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-17: Bid-ask spreads on U.S. Treasuries



Note: 1. 5-day backward moving averages.
2. Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-18: Bid-ask spread on German government bonds



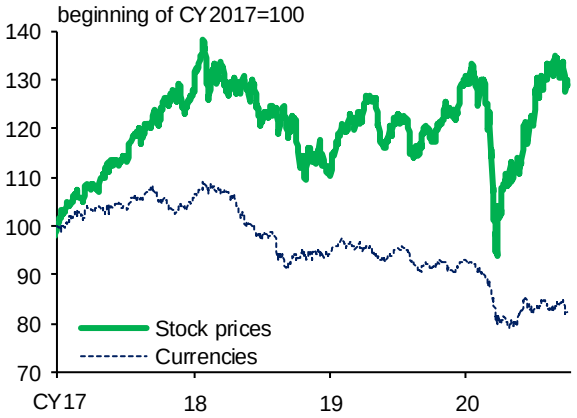
Note: 1. 5-day backward moving averages. 10-year on-the-run issues.
2. Latest data as at end-September 2020.
Source: Bloomberg.

Emerging markets

In emerging markets, stock prices have risen and currencies have appreciated on the whole, given the moves to resume economic activity (Chart II-1-19). Credit spreads of government bonds in emerging market economies have narrowed after they temporarily expanded significantly. However, they have remained at higher levels compared to those before the COVID-19 outbreak (Chart II-1-20). Divergence has increased in the development of credit default swap (CDS) spreads by country and region, partly owing to structural differences of, for example, external debt and spare fiscal

capacity, in addition to differences in the magnitude of the spread of COVID-19 in each country and region (Chart II-1-21). Meanwhile, looking at bond and equity fund flows to emerging market economies, significant outflows have come to a halt (Chart II-1-22).

Chart II-1-19: Stock prices and currencies in emerging market economies

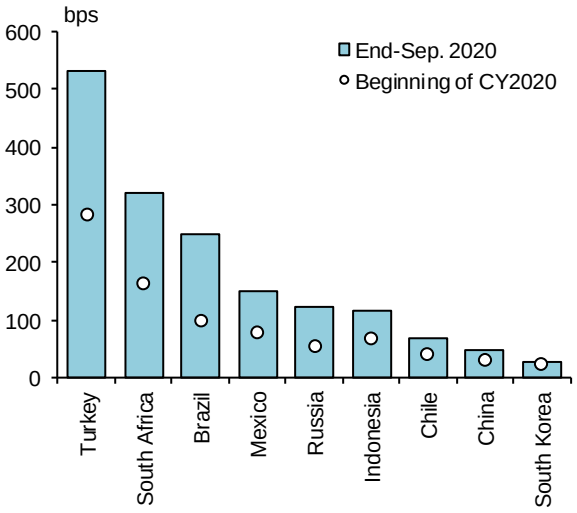


Note: 1. "Stock prices" indicates the MSCI EM Local Index. "Currencies" indicates the J.P. Morgan EMCI Index.
2. Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-20: Credit spreads in emerging market economies

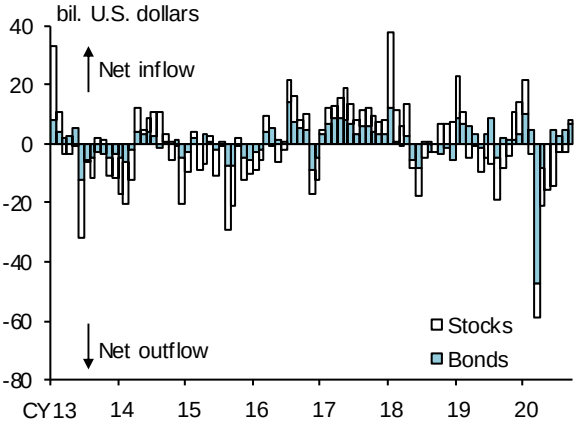
Note: 1. Yield spreads of the EMBI Global over U.S. Treasuries.
2. Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-1-21: CDS spreads in emerging market economies



Source: Bloomberg.

Chart II-1-22: Net flows in emerging market funds



Note: Latest data as at September 2020.
Source: EPFR Global; Haver Analytics.

B. Japanese financial markets

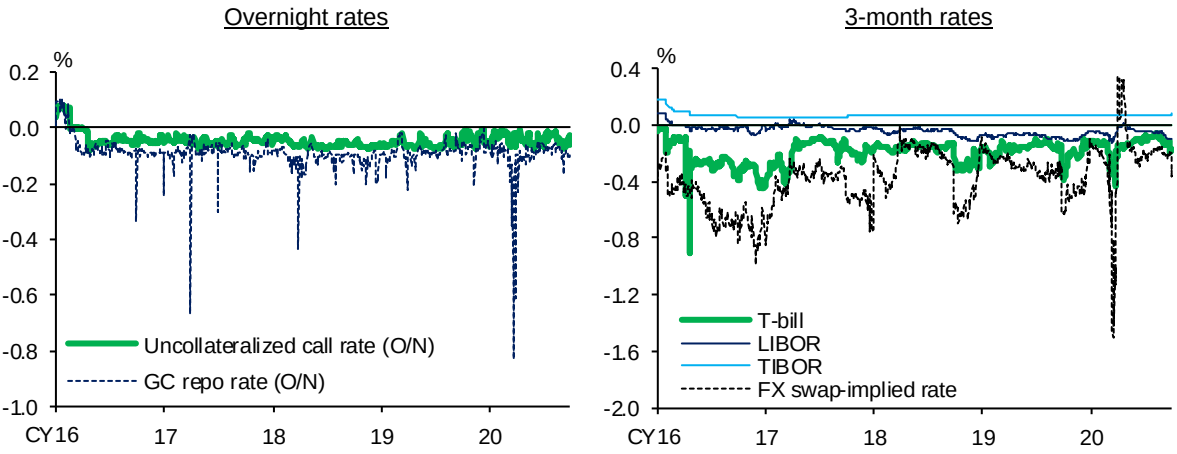
In Japanese financial markets, both short- and long-term interest rates were generally stable during the first half of fiscal 2020 as the Bank of Japan has enhanced monetary easing since March 2020. During the observation period, Japanese stock prices have risen.

Short- and long-term interest rates

Short-term interest rates, on both overnight and term instruments, have been in negative territory on

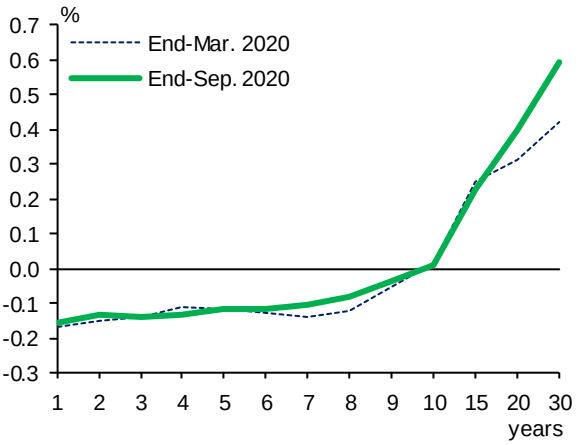
the whole (Chart II-2-1). Under QQE with Yield Curve Control, the slope of the yield curve for JGBs has been in line with the current guideline for market operations, in which the short-term policy interest rate is set at minus 0.1 percent and the target level of 10-year JGB yields is around 0 percent. Interest rates have risen somewhat, mainly in the super-long-term zone, as the amount of JGB issuance has increased (Charts II-2-2 and II-2-3).

Chart II-2-1: 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 U.S. dollar LIBOR and FX swap (forward spread).
3. In both charts, the latest data are as at end-September 2020.
Source: Bloomberg; Japan Bond Trading; JSDA; BOJ.

Chart II-2-2: JGB yield curves



Source: Bloomberg.

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

Note: Latest data as at end-September 2020.
Source: Bloomberg.

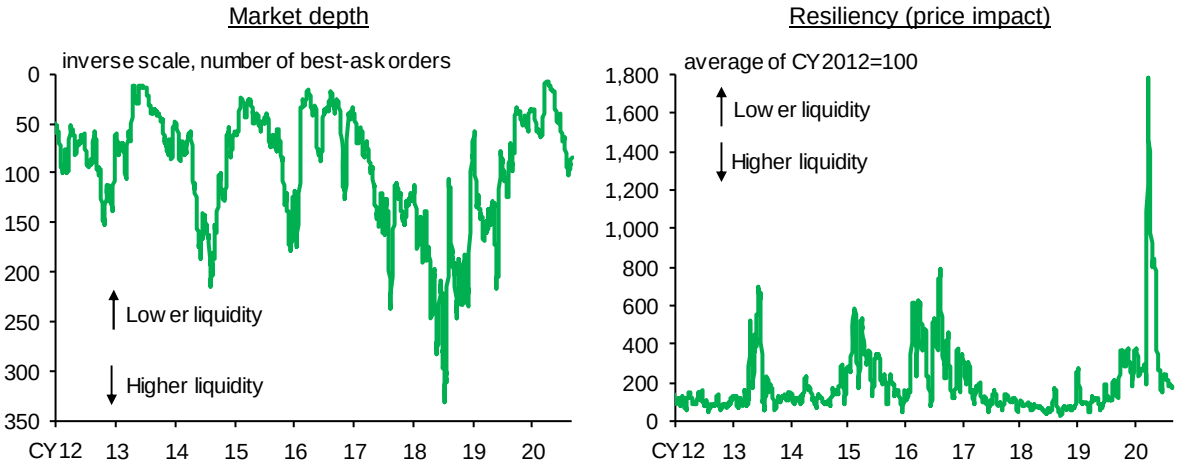
Liquidity and functioning of JGB markets

The liquidity and functioning of JGB markets have been recovering from a state of significant deterioration. Liquidity indicators of market depth and resiliency have improved (Chart II-2-4).[3] Under these circumstances, the latest *Bond Market Survey* (August 2020) shows that the diffusion index for the degree of bond market functioning from the surveyed institutions' viewpoint has

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

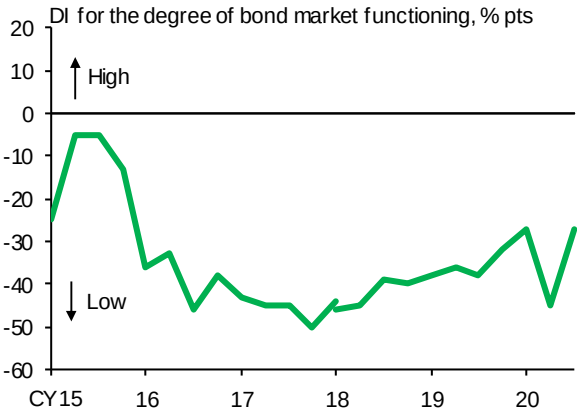
significantly increased, although remaining negative, since the previous round of the survey conducted in May (Chart II-2-5). Meanwhile, inter-dealer transaction volume for cash JGBs has continued to be at a somewhat lower level as volatility has remained low (Chart II-2-6).

Chart II-2-4: Market depth and resiliency in JGB futures markets



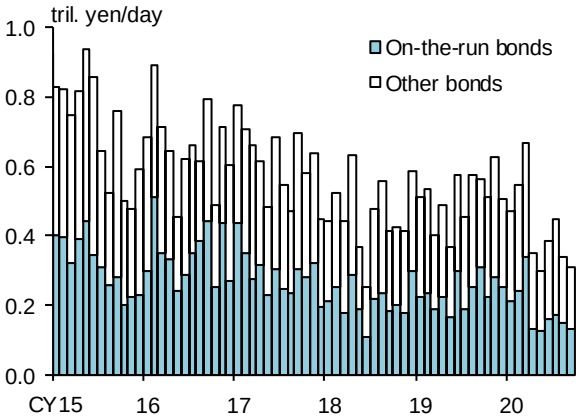
Note: 1. In the left-hand chart, the figures are the number of orders at the best-ask price with 1-minute frequency (median for each business day). In the right-hand chart, the figures indicate the price change per unit volume of transactions for each business day.
2. 10-day backward moving averages. Latest data as at end-August 2020.
Source: Nikkei Inc., "NEEDS."

Chart II-2-5: Bond market survey



Note: 1. Based on the proportion of responding institutions selecting a given choice, the DI is calculated as follows: DI for the degree of current bond market functioning = "high" - "low."
2. The data from February 2018 onward cover major institutional investors. The latest data are based on the August 2020 survey.
Source: BOJ, "Bond market survey."

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

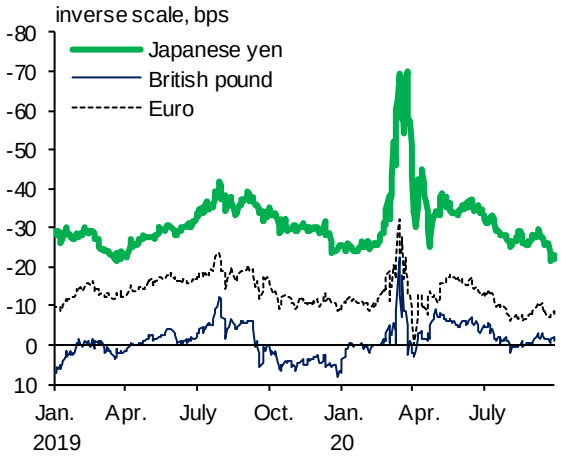


Note: Inter-dealer transaction volume for cash JGBs (2-, 5-, 10-, 20-, 30-, and 40-year JGBs) via Japan Bond Trading. Latest data as at September 2020.
Source: Japan Bond Trading; QUICK.

U.S. dollar funding environment

Premiums for U.S. dollar funding through the dollar/yen foreign exchange swap market regained stability partly due to the provision of a large amount of U.S. dollars by the central bank of each country and region through the standing U.S. dollar liquidity swap line arrangements. Thereafter, they have generally remained at the same levels as before the COVID-19 outbreak (Chart II-2-7).

Chart II-2-7: U.S. dollar funding premiums

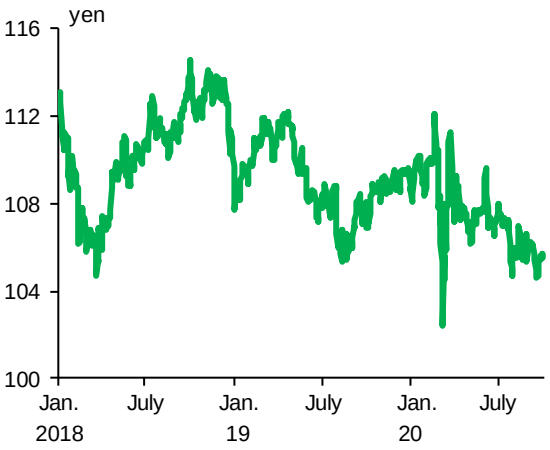


Note: 1. 1-year cross-currency basis swaps.
2. Latest data as at end-September 2020.
Source: Bloomberg.

FX markets and stock and credit markets

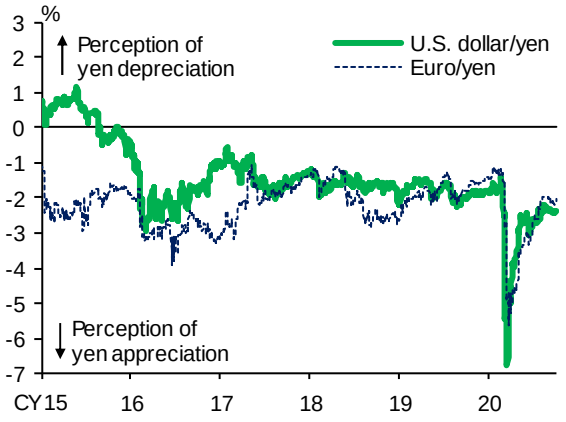
In FX markets, the yen has generally been in the range of 104-110 yen to the U.S. dollar, albeit with fluctuations (Chart II-2-8). Risk reversals imply that market participants' vigilance against the yen's appreciation has relaxed since around March 2020, although remaining at a higher level compared to that before the COVID-19 outbreak (Chart II-2-9).

Chart II-2-8: U.S. dollar/yen rates



Note: Latest data as at end-September 2020.
Source: Bloomberg.

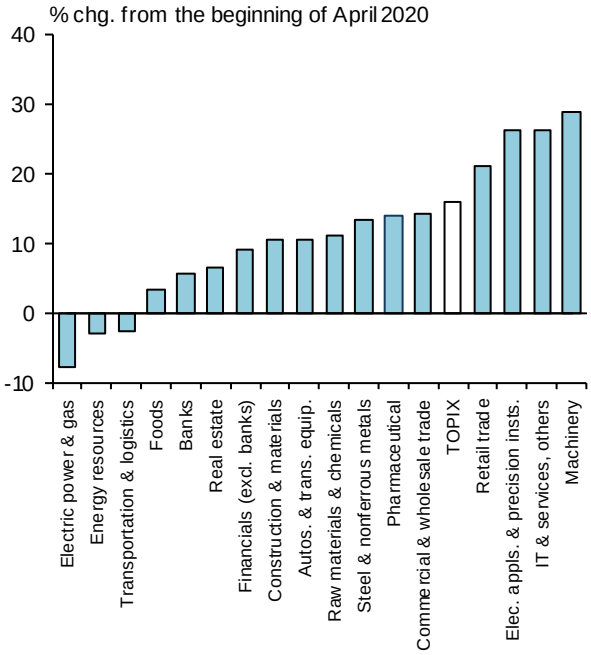
Chart II-2-9: Risk reversals



Note: Deviation between implied volatilities (1-year) of yen put and call options. Latest data as at end-September 2020.
Source: Bloomberg.

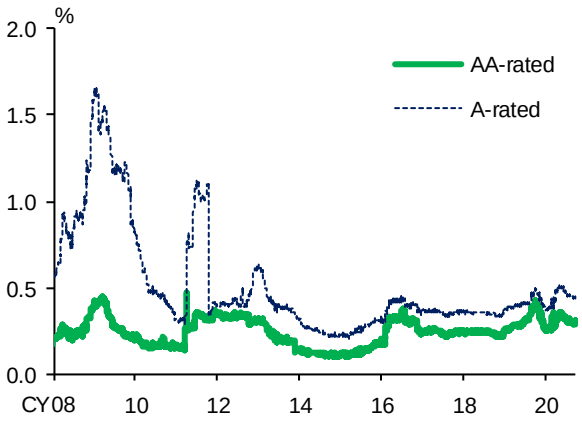
Japanese stock prices have risen in tandem with U.S. and European stock prices (Charts II-1-1 and II-1-2). A breakdown by sector shows large increases in electric appliances and precision instruments as well as "IT & services, others" because IT-related firms included in these sectors are expected to benefit from stay-at-home demand. On the other hand, sectors such as transportation and logistics, which include air and land transportation, and real estate, have been weak due to concern over the impact of COVID-19 (Chart II-2-10). Meanwhile, credit spreads of corporate bonds have been almost flat (Chart II-2-11). Issuance rates for CP have been recovering on the whole after they temporarily saw a rise in the beginning of April.

Chart II-2-10: Japanese stock price performance by sector



Note: Latest data as at end-September 2020.
Source: Bloomberg.

Chart II-2-11: Credit spreads on corporate bonds



Note: 1. Yield spreads of corporate bonds with remaining maturity of 3 or more years but less than 7 years over government bonds. Rated by R&I.
2. Latest data as at end-September 2020.
Source: Bloomberg; JSDA; QUICK.

III. Examination of financial intermediation

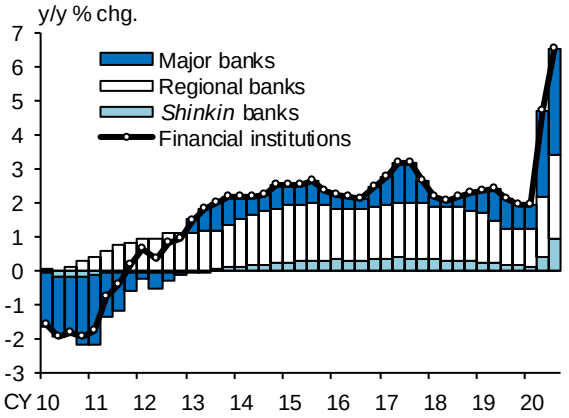
This chapter examines developments in financial intermediation, mainly based on information that was available in the first half of fiscal 2020, focusing on financial intermediation by financial institutions (i.e., banks and *shinkin* banks) and institutional investors (i.e., life insurance companies, pension funds, and securities investment trusts) as well as developments in investment in financial assets and funding activities by the private non-financial sector (i.e., firms and households).

A. Financial intermediation by financial institutions

1. Domestic loans

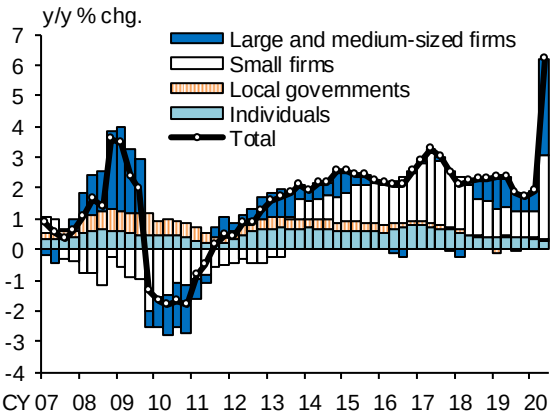
Private financial institutions' domestic loans outstanding have grown rapidly, with growth accelerating to an annual rate of around 6.5 percent in the July-September quarter of 2020, as firms' demand for working capital has increased, reflecting a decline in cash flow from operating activities due to the spread of COVID-19 (Charts III-1-1, III-1-2, and III-1-3). Loans to firms have expanded substantially for all firm sizes, due in part to the increased demand for funds extended for precautionary purposes amid the continued uncertainty about future developments. Total committed lines -- credit that can be drawn on as necessary -- have increased sharply (Chart III-1-4). While loans to individuals have continued to increase, the pace of increase has been slowing.

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



Note: Latest data as at the July-September quarter of 2020.
Source: BOJ, "Principal figures of financial institutions."

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

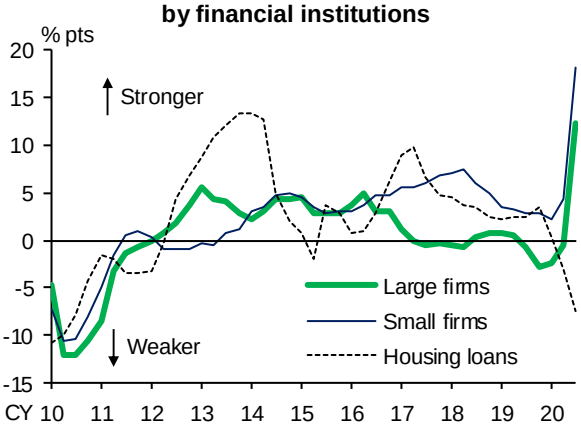


Note: Loans to banks and insurance companies are excluded.
Latest data as at end-June 2020.
Source: BOJ.

By type of bank, major banks, regional banks, and *shinkin* banks have all seen a substantial increase in the annual growth rate of domestic loans outstanding. The lending stance of financial institutions has become even more active (Chart III-1-5). Most recently, such substantial increase at major banks has paused, as moves particularly by large firms to secure working capital for the foreseeable future have come to a standstill.

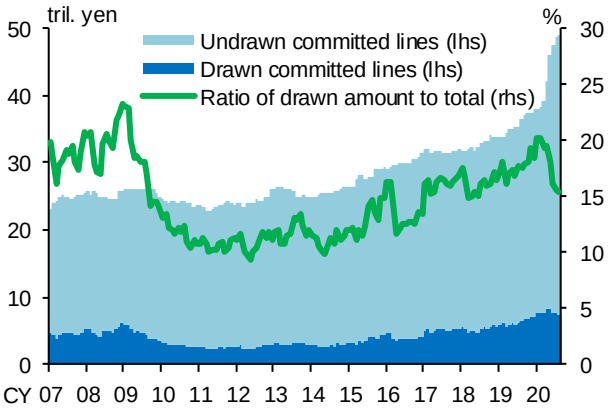
The amount of loans extended by government-affiliated financial institutions has also increased considerably to meet the higher demand for funds resulting from the spread of COVID-19 (Chart III-1-6).

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



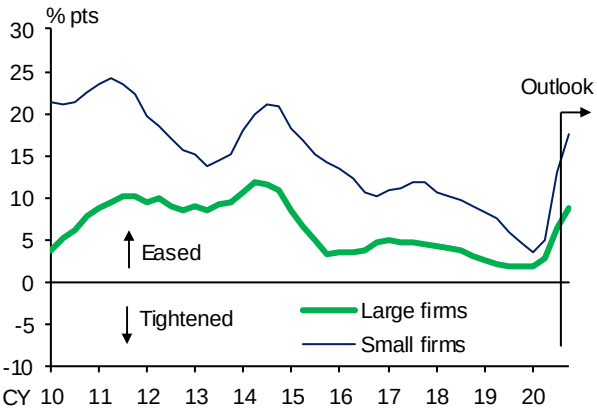
Note: 1. Based on the proportion of responding financial institutions selecting each given choice, the DI is calculated as follows:
DI = "substantially stronger" + 0.5 * "moderately stronger" − 0.5 * "moderately weaker" − "substantially weaker."
2. 4-quarter backward moving averages. Latest data as at July 2020.
Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

Chart III-1-4: Committed lines



Note: Latest data as at end-August 2020.
Source: BOJ.

Chart III-1-5: DI of credit standards



Note: 1. Based on the proportion of responding financial institutions selecting each given choice, the DI is calculated as follows:
DI = "considerably eased" + 0.5 * "somewhat eased" − 0.5 * "somewhat tightened" − "considerably tightened."
2. 4-quarter backward moving averages. Latest data as at July 2020.
Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

Chart III-1-6: Loans extended by government-affiliated financial institutions

tril. yen

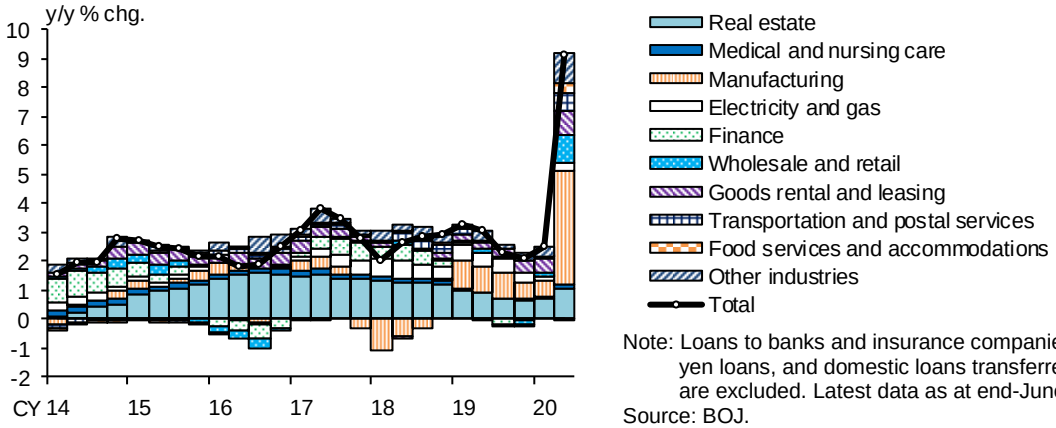
	End-August 2020
Japan Finance Corporation	11.2
Development Bank of Japan	1.9
Shoko Chukin bank	1.6

Note: The figure for Japan Finance Corporation is based on the cumulative amount of loans extended since the end of February 2020 by "micro business and individual unit," "agriculture, forestry, fisheries and food business unit" and "small and medium enterprise (SME) unit." The figures for Development Bank of Japan and Shoko Chukin bank are based on the cumulative amounts of loans related to COVID-19 under the crisis response operations.
Source: Published accounts of each financial institution.

Developments in loans by type of borrower

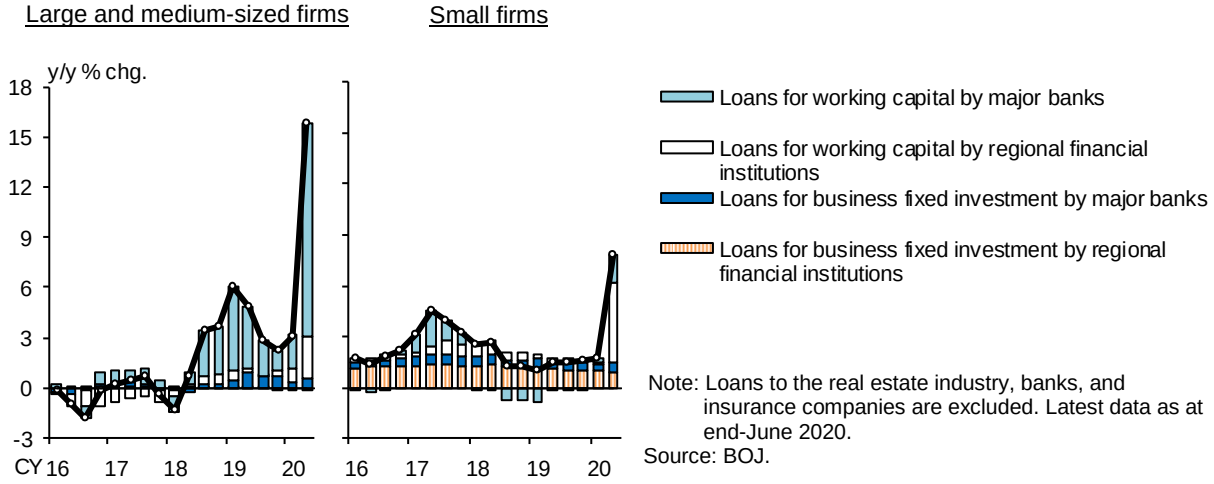
Loans to firms in a wide range of industries, such as manufacturing, wholesale and retail, transportation and postal services, food services and accommodations, and real estate have increased (Chart III-1-7). Loans (other than those to real estate firms, which will be discussed later) to firms of all sizes have increased substantially, especially for working capital (Chart III-1-8).

Chart III-1-7: Banks' corporate loans outstanding by industry



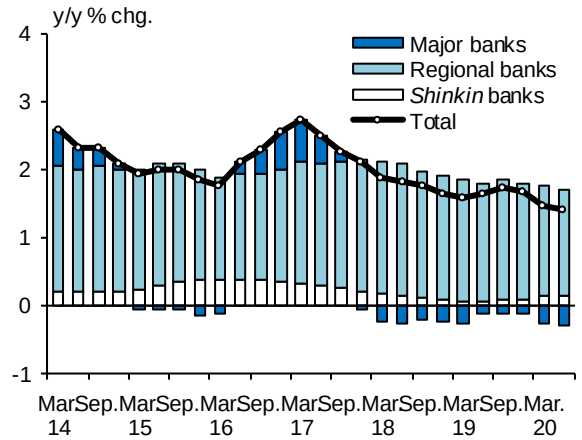
Note: Loans to banks and insurance companies, overseas yen loans, and domestic loans transferred overseas are excluded. Latest data as at end-June 2020.
Source: BOJ.

Chart III-1-8: Corporate loans outstanding by size of firm and type of loan



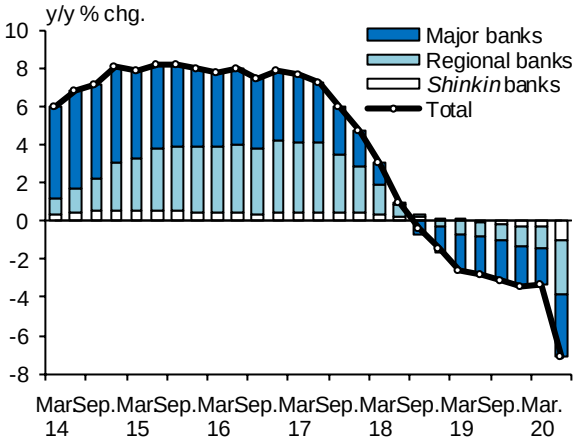
Note: Loans to the real estate industry, banks, and insurance companies are excluded. Latest data as at end-June 2020.
Source: BOJ.

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



Note: Latest data as at end-June 2020.
Source: BOJ.

Chart III-1-10: Outstanding amount of card loans among financial institutions



Note: Latest data as at end-June 2020.
Source: BOJ.

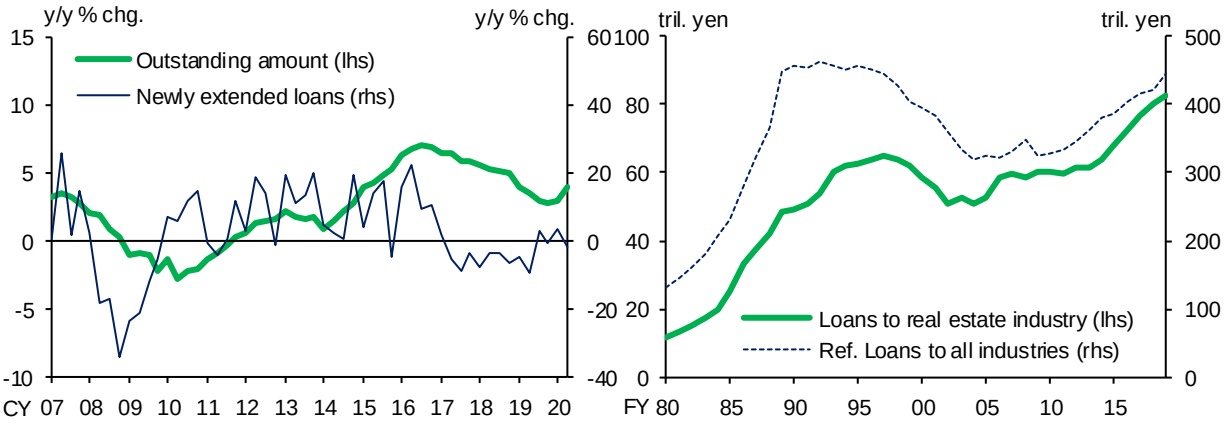
With regard to loans to individuals, housing loans -- which account for a large share of loans to individuals -- continued to grow at an annual rate of around 2 percent, driven by regional banks. However, housing loans have recently been decelerating somewhat, partly because housing suppliers scaled down their sales activities amid the ongoing impact of COVID-19 (Chart III-1-9).

While the annual growth rate of card loans has been negative since mid-2018, reflecting financial institutions' review of marketing strategies and their tightening of screening, the annual rate of decline has recently increased substantially, due in part to a drop in private consumption caused by the spread of the disease (Chart III-1-10).

Developments in real estate loans

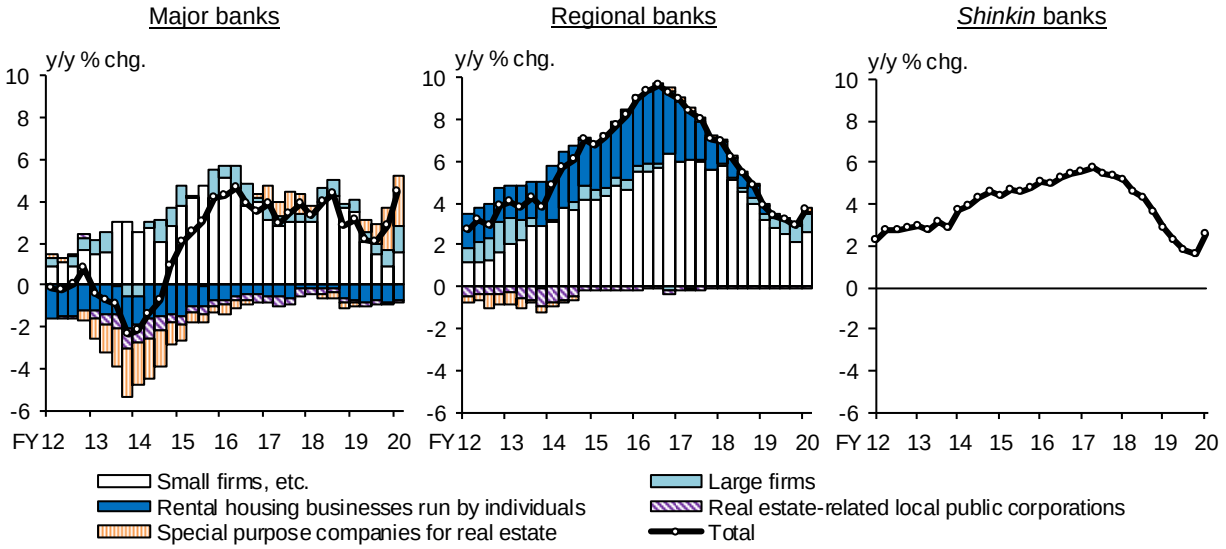
The growth in the outstanding amount of loans to the real estate industry has recently accelerated to annual growth of around 4 percent, partly because, as in other industries, demand for working capital, including precautionary demand, has grown due to the spread of COVID-19 (Chart III-1-11).

Chart III-1-11: Real estate loans among financial institutions



Note: 1. The right-hand chart covers domestic banks only to extend the time scale.
2. In the left-hand chart, the latest data for "Outstanding amount" are as at end-June 2020 and the latest data for "Newly extended loans" are as at the April-June quarter of 2020. In the right-hand chart, the latest data are as at end-March 2020.
Source: BOJ.

Chart III-1-12: Breakdown of real estate loans



Note: Latest data as at end-June 2020.
Source: BOJ.

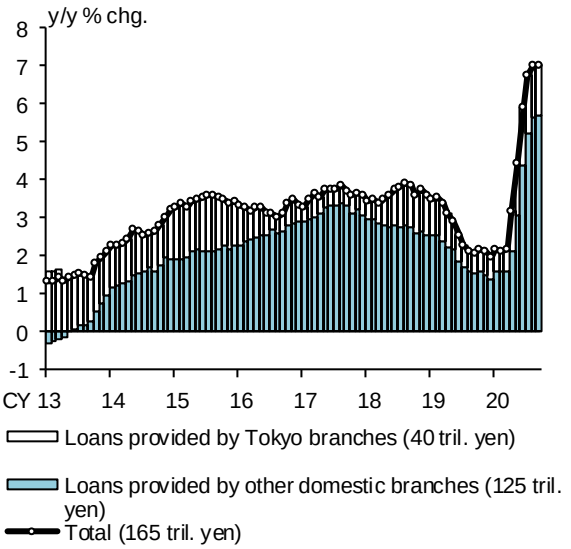
By type of bank, the growth in loans outstanding has accelerated at both major banks and regional banks. For major banks, the main contributor is loans to large firms, while for regional banks, it is

loans to small and medium-sized enterprises (SMEs), including asset management companies founded by individuals (Chart III-1-12).[4]

Financing support for small firms by regional financial institutions

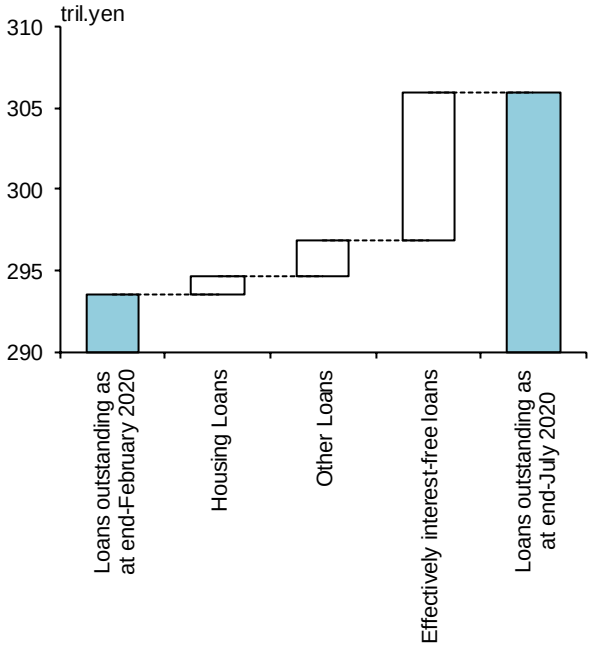
Regional financial institutions have been active in providing financing support to local firms, as small firms' cash flows from operating activities have decreased substantially since the COVID-19 outbreak (Chart III-1-13). In order to meet demand for working capital in a wide range of industries,

Chart III-1-13: Corporate loans provided by regional banks



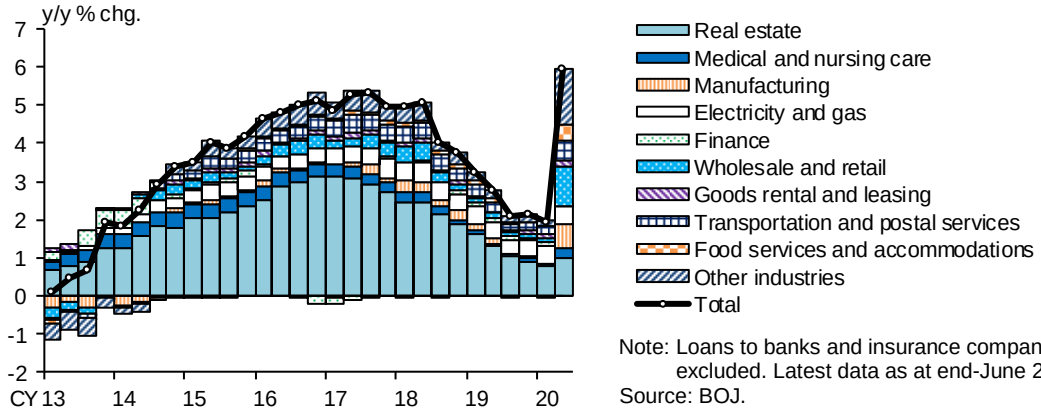
Note: 1. Latest data as at September 2020.
2. The figures in parentheses indicate the amounts outstanding as at September 2020.
Source: BOJ.

Chart III-1-14: Changes in composition of loans outstanding of regional financial institutions



Note: 1.Loans to local governments are excluded.
2 Effectively interest-free loans are based on the amount approved by the credit guarantee corporations.
Source: BOJ.

Chart III-1-15: Regional banks' loans outstanding to small firms by industry



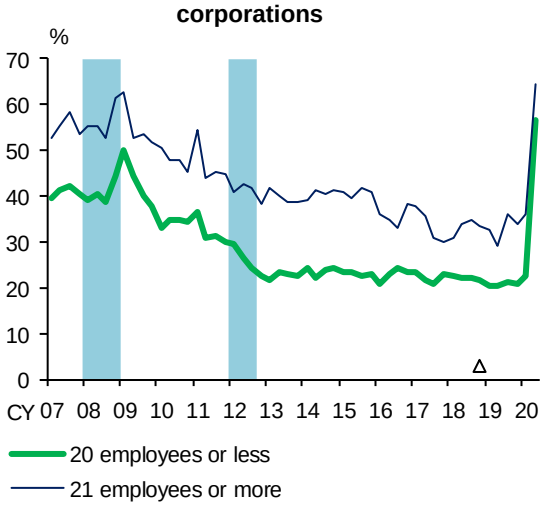
Note: Loans to banks and insurance companies are excluded. Latest data as at end-June 2020.
Source: BOJ.

[4] In some statistics, loans to holding companies of large firms are included in loans to SMEs because, for example, these companies have only a small number of regular employees.

regional financial institutions have sharply increased their loans outstanding. They have provided regular loans (not guaranteed by credit guarantee corporations), as well as effectively interest-free loans (guaranteed by credit guarantee corporations; see Box 1) since May 2020 (Charts III-1-14 and III-1-15). In addition, regional financial institutions have been establishing and increasing overdraft limits, changing the terms and conditions of existing loans, and providing support for the business activities of small firms.

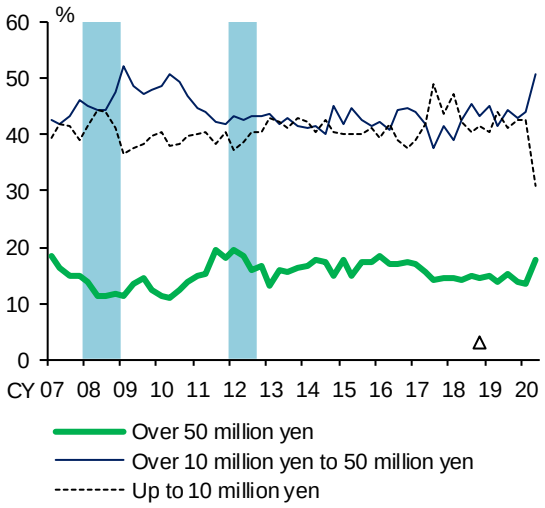
According to a survey of firms that received loans guaranteed by credit guarantee corporations, the share of firms that obtained new loans surpassed the peak observed during the GFC owing to the active financing support for firms led by regional financial institutions (Chart III-1-16). The breakdown by loan amount per firm indicates that the share of firms borrowing "up to 10 million yen" has decreased substantially, while considerable increases can be observed in the shares of firms borrowing "over 10 million yen to 50 million yen" and "over 50 million yen." These results suggest a wide take-up of loans based on government programs such as the program of effectively interest-free loans, which are capped at 40 million yen per firm (Chart III-1-17).

Chart III-1-16: Share of firms that newly borrow money among firms with loans guaranteed by credit guarantee corporations



Note: 1. The figures are seasonally adjusted. Latest data as at the April-June quarter of 2020.
2. The shaded areas indicate recession phases, and the triangle on the right bottom corner of the chart indicates the recent peak, October 2018.
Source: Cabinet Office; Japan Finance Corporation.

Chart III-1-17: Breakdown by loan amount of firms receiving loans guaranteed by credit guarantee corporations



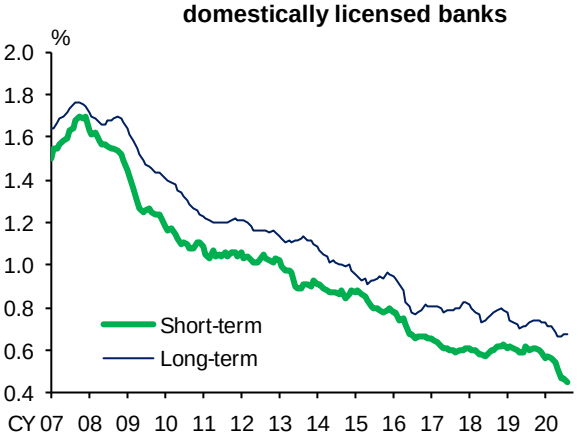
Note: 1. The figures are seasonally adjusted. Latest data as at the April-June quarter of 2020.
2. The shaded areas indicate recession phases, and the triangle on the right bottom corner of the chart indicates the recent peak, October 2018.
Source: Cabinet Office; Japan Finance Corporation.

Developments in loan interest rates

Financial institutions' average contract interest rates, both short-term and long-term, on new loans and discounts have recently declined somewhat (Chart III-1-18). Amid the spread of COVID-19, downward pressure on loan interest rates has come not only from an increase in loans to large firms, which provide lower profit margins for financial institutions, but also from loan disbursements through special loan programs offering preferential rates.[5] Meanwhile, average interest rates on loans outstanding have continued to decline moderately (Chart III-1-19).

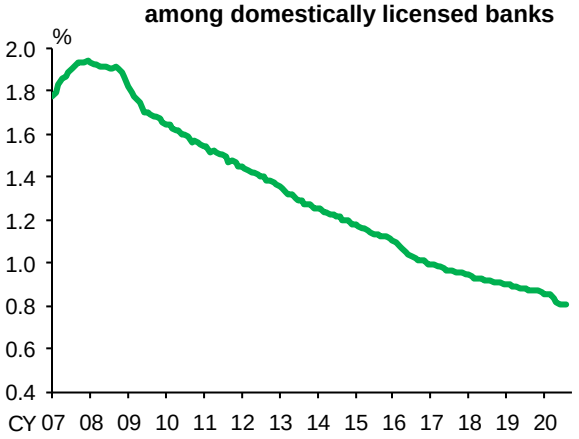
[5] See Box 1 for details on the impact of effectively interest-free loans on loan interest rates.

Chart III-1-18: Average contract interest rates on new loans and discounts among domestically licensed banks



Note: 6-month backward moving averages. Latest data as at August 2020.
Source: BOJ, "Average contract interest rates on loans and discounts."

Chart III-1-19: Average contract interest rates on outstanding loans and bills discounted among domestically licensed banks



Note: Latest data as at August 2020.
Source: BOJ, "Average contract interest rates on loans and discounts."

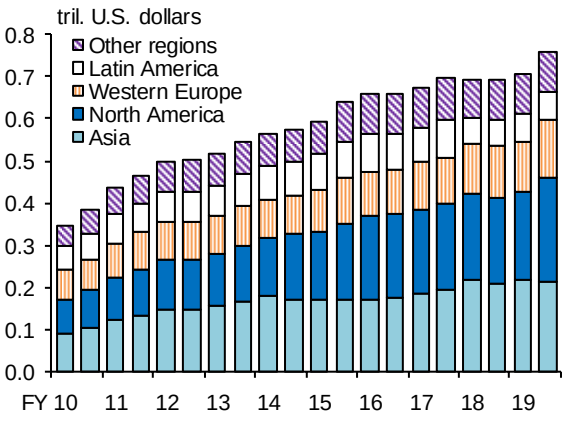
2. Overseas loans

Overseas loans have remained on an increasing trend, as Japanese banks, major banks in particular, have expanded their global activities and their support for Japanese firms' overseas business expansion since the GFC. However, before the COVID-19 outbreak, the growth in these loans had decelerated. This is because Japanese banks have increased their focus on improving profitability by, for example, restraining the extension of less profitable loans and increasing loans with higher margins in their loan portfolios, due to intensified competition with overseas counterparts and an increase in the required amount of foreign currency funding.

Since March 2020, the global outbreak of COVID-19 has led to a large increase in the drawdown of committed lines, particularly by major non-Japanese firms in sectors such as automobiles and energy (Chart III-1-20). Currently, repayments of such drawdowns are in progress (Chart IV-4-3).

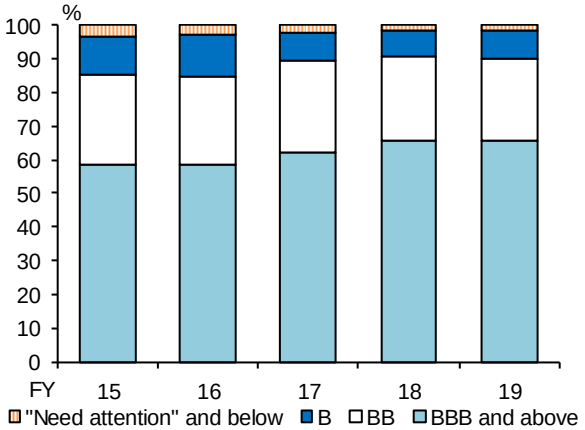
The breakdown of overseas loans by credit rating shows investment-grade loans (BBB and above) account for about 70 percent, indicating that the overall credit quality of the overseas loan portfolios has remained high (Chart III-1-21).

Chart III-1-20: Overseas loans outstanding of the three major banks by region



Source: Published accounts of each bank.

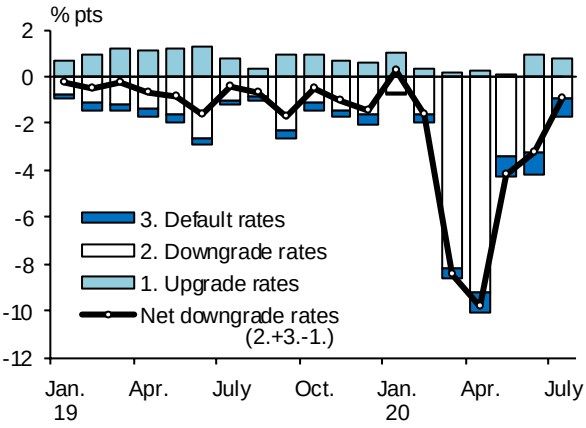
Chart III-1-21: Composition of the three major banks' overseas loans by credit rating



Source: BOJ.

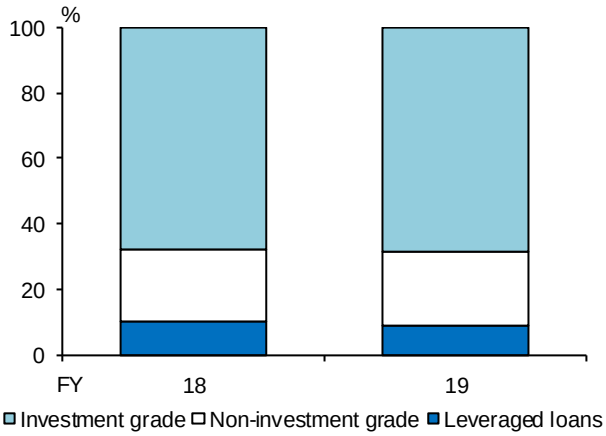
With regard to leveraged loans, which carry relatively high risk, some downgrades were already observed at the end of March, when the impact of COVID-19 started to emerge (Chart III-1-22). Although the share of leveraged loans in total overseas loans is small (Chart III-1-23), close attention needs to be paid to how the quality of loan assets and credit costs will be affected by the spread of the disease.

Chart III-1-22: Rating transition of non-investment-grade firms in United States and Europe



Note: "Non-investment-grade firms" refers to firms with a credit rating of BB or lower.
Source: Moody's.

Chart III-1-23: Composition of outstanding amount of large financial institutions' overseas credit lending by credit rating



Note: 1. "Large financial institutions" includes major banks, Japan Post Bank, and a central organization of financial cooperatives.
2. The data are based on the outstanding amount at fiscal year-end.
3. "Non-investment grade" excludes leveraged loans.
Source: BOJ.

3. Securities investment

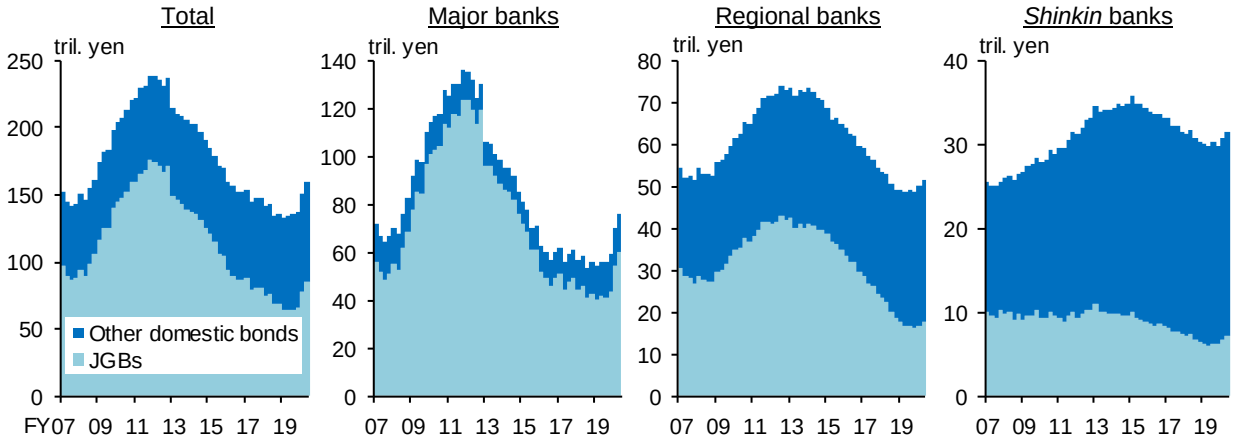
Financial institutions' holdings of yen-denominated bonds, including JGBs, municipal bonds, and corporate bonds, have increased, led by major banks, although yen interest rates have been low on the whole (Chart III-1-24). Financial institutions have increased their holdings of treasury discount bills (T-Bills) to, for example, keep their current account deposit balances at the Bank of Japan from increasing and meet demand for collateral. They have also increased investments in super long-term JGBs and yen-denominated bonds other than JGBs, both of which are showing positive yields, in order to secure net interest income.

Holdings of foreign bonds (calculated in yen terms) at major banks have decreased compared to March 2020 because of sales aimed at locking in gains in response to the drop in overseas interest rates in April (Chart III-1-25). On the other hand, regional banks have increased their holdings of these bonds somewhat, reflecting their aim to secure yields that are higher than those on yen-denominated bonds even if currency-hedging costs are taken into account amid the widening differential between long- and short-term interest rates. *Shinkin* banks have increased their holdings of foreign bonds, in particular those denominated in yen that offer positive yields.

Financial institutions' holdings of investment trusts were on a secular upward trend, but they have recently remained almost unchanged (Chart III-1-26). Major banks' holdings have decreased. This reflects a reduction in holdings of stock investment trusts in March due to volatility in the stock market caused by the COVID-19 outbreak and their continued caution about investing in such investment trusts since then. In addition, some major banks reduced their holdings of inverse

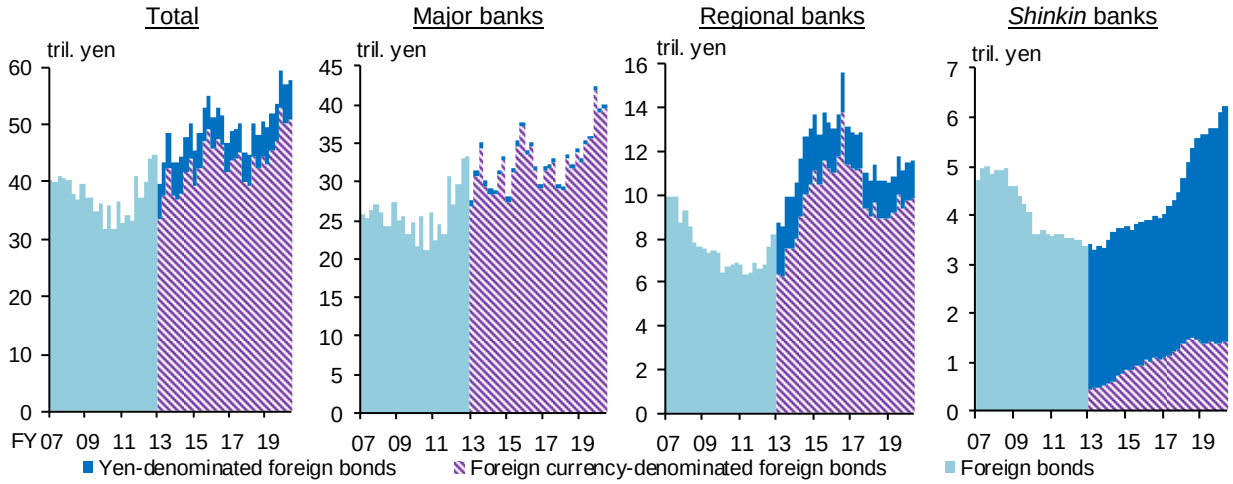
mutual funds and ETFs together with the sale of foreign bonds to lock in gains. Regional financial institutions' holdings of investment trusts have slightly increased, as these institutions have continued to increase their holdings of multi-asset investment trusts while restraining their holdings of stock investment trusts.[6]

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



Note: The data are the sum of figures for domestic and overseas branches, based on the outstanding amount at month-end. Latest data as at end-August 2020.
Source: BOJ.

Chart III-1-25: Outstanding amount of foreign bonds among financial institutions



Note: 1. "Foreign bonds" is the sum of figures for "Foreign currency-denominated foreign bonds" and "Yen-denominated foreign bonds." The data up to March 2010 are figures for foreign securities.
2. The data are the sum of figures for domestic and overseas branches, based on the outstanding amount at month-end. Latest data as at end-August 2020.
Source: BOJ.

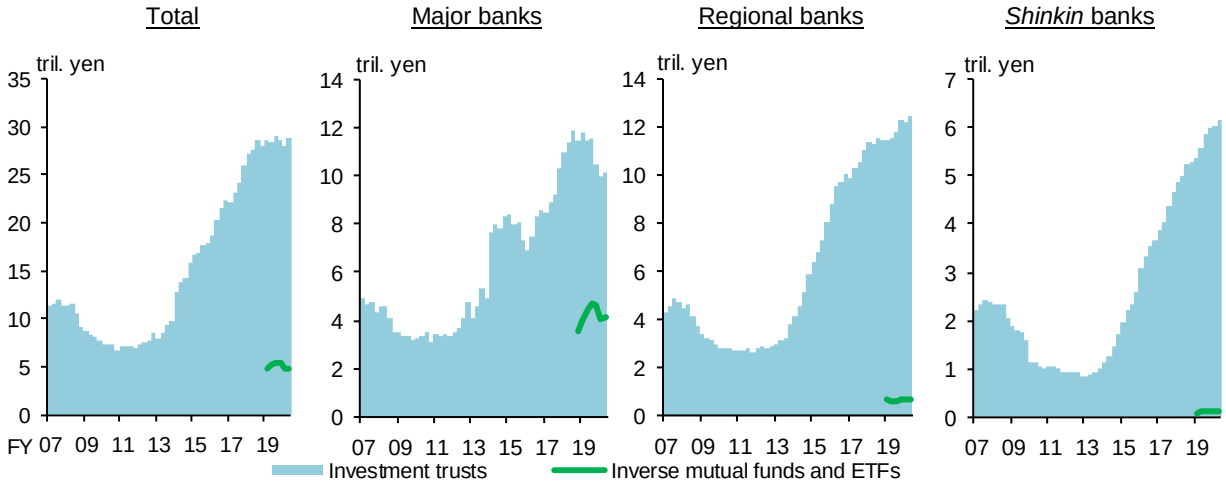
Major banks and regional banks have continued to gradually reduce their strategic stockholdings, i.e., stockholdings for the purpose of maintaining business ties with firms. As a result, their outstanding amounts of stockholdings have been on a moderate downward trend (Chart III-1-27). *Shinkin* banks' outstanding amount of stockholdings has also declined slightly.

The outstanding amount of overseas credit products held by Japanese financial institutions as a whole, including Japan Post Bank and a central organization of financial cooperatives, continued its secular upward trend, but it has recently remained largely unchanged (Chart III-1-28). A large

[6] For more on multi-asset investment trusts, see "Characteristics of Multi-Asset Investment Trusts and Caveats for Risk Management," *Financial System Report Annex Series*, July 2020 (available only in Japanese).

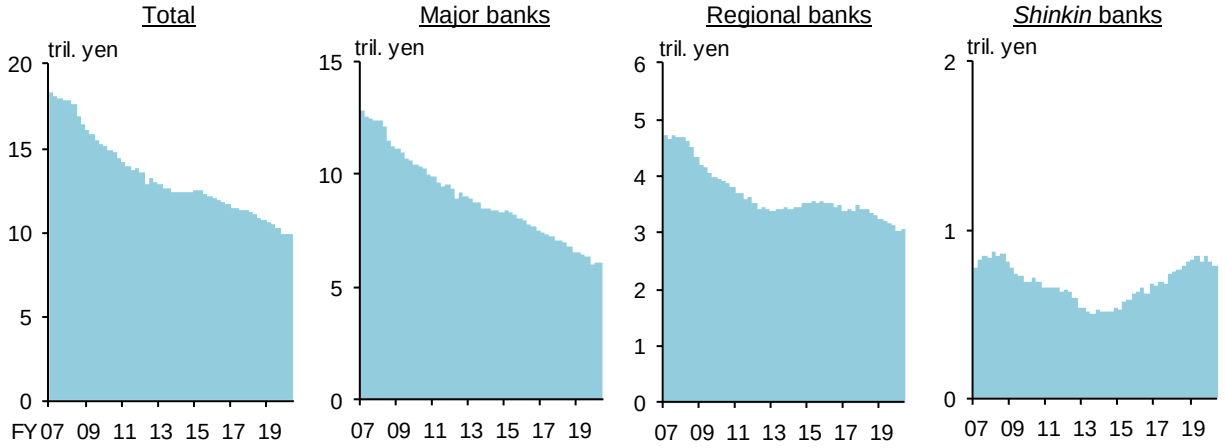
number of financial institutions have reduced the amount of new investments since the deterioration in credit market conditions in March following the COVID-19 outbreak. Compared to large financial institutions, regional financial institutions have little exposure to overseas credit products.

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



Note: 1. The data include some securities other than investment trusts.
2. The data are the sum of figures for domestic and overseas branches, including domestic and foreign investment trusts, based on the outstanding amount at month-end. Latest data as at end-August 2020.
Source: BOJ.

Chart III-1-27: Outstanding amount of stockholdings among financial institutions



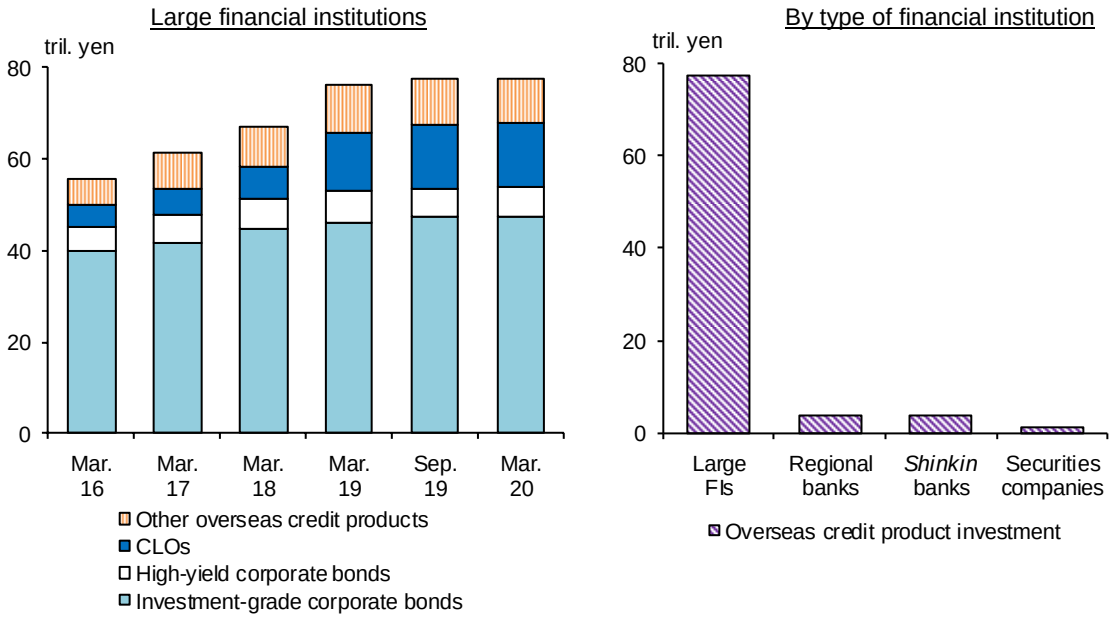
Note: 1. Based on the outstanding amount on a book value basis at month-end. The data exclude foreign stockholdings.
2. The data for major banks are figures for domestic branches and the data for other banks are the sum of figures for domestic and overseas branches. Latest data as at end-August 2020.
Source: BOJ.

The outstanding amount of overseas credit product investment by large financial institutions by credit rating indicates that there has generally been no major change in the share of holdings by credit rating. The overall credit quality of large financial institutions' portfolios remains high. These institutions' holdings of securitized products, including collateralized loan obligations (CLOs)[7], consist almost entirely of AAA-rated tranches, i.e., tranches with the highest credit rating, and about 90 percent of bond holdings consist of investment-grade bonds (BBB and above) (Chart III-1-29). That said, bonds with a BBB rating, the lowest investment-grade rating, account for about 40

[7] CLOs are securitized products backed by leveraged loans.

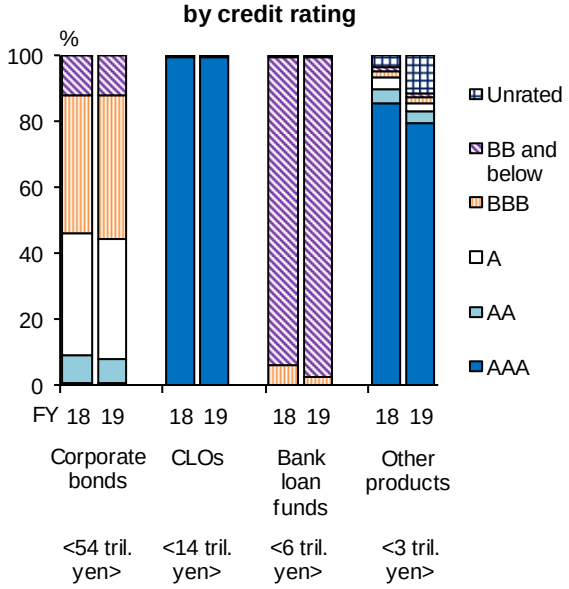
percent of total bond holdings, and some institutions hold bank loan funds, which are predominantly backed by non-investment-grade (BB or below) loans.[8] Although the creditworthiness of corporate debt is under downward pressure due to the spread of COVID-19, there has been no clear deterioration of the portfolio quality of large financial institutions' overseas credit products so far.

Chart III-1-28: Outstanding amount of overseas 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. Data for "By type of financial institution" are as at end-March 2020.
Source: BOJ.

Chart III-1-29: Composition of overseas credit product investment among large financial institutions by credit rating



Note: 1. Covers major banks, Japan Post Bank and a central organization of financial cooperatives.
2. The figures in parentheses indicate the outstanding amount as at end-fiscal 2019.
3."Other products" includes RMBS, CMBS, and ABS etc.
Source: BOJ.

[8] Bank loan funds are investment products that invest in loan obligations, representing loans extended by banks and other financial institutions to firms. In many cases, they invest in non-investment-grade loan obligations.

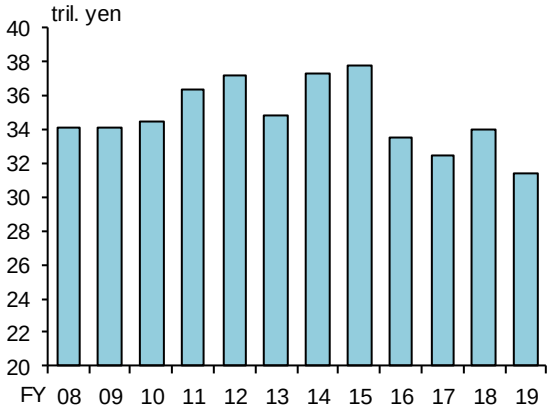
B. Financial intermediation by institutional investors

1. Insurance companies and pension funds

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

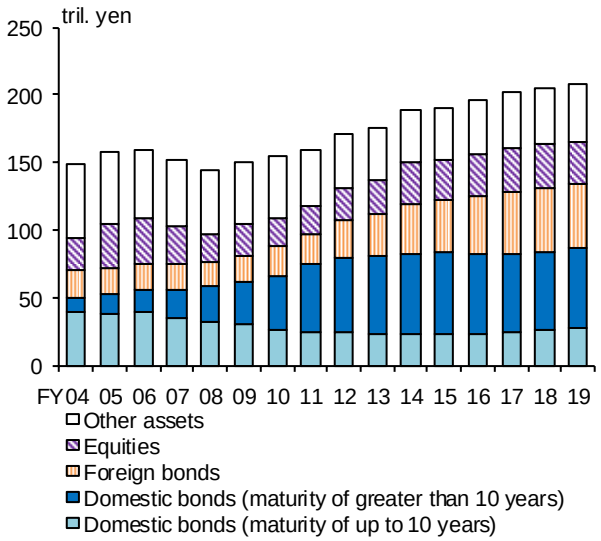
The premium income of life insurance companies, which is a fund source for their investments, has declined recently. This reflects weak sales of a specific type of insurance products and foreign currency-denominated insurance products, in addition to the continued sluggishness in sales of yen-denominated savings-type products (Chart III-2-1). The weak sales of the specific type of

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



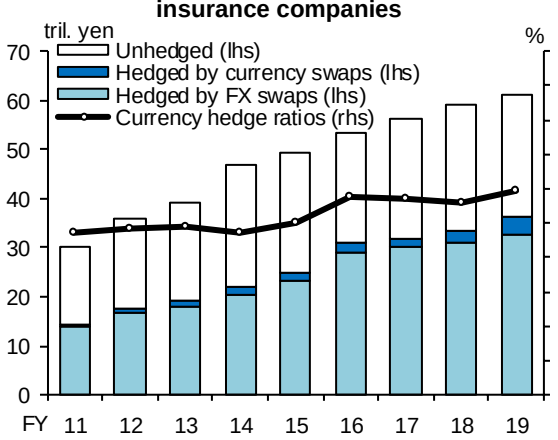
Source: The Life Insurance Association of Japan.

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



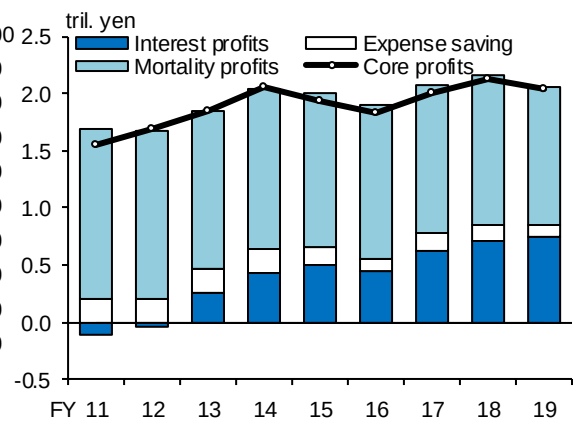
Note: 1. "Other assets" includes cash and deposits, loans, investment trusts, and real estate.
2. Covers nine major life insurance companies. Based on general accounts.
Source: Published accounts of each company.

Chart III-2-3: 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-2-4: Core profits among life insurance companies



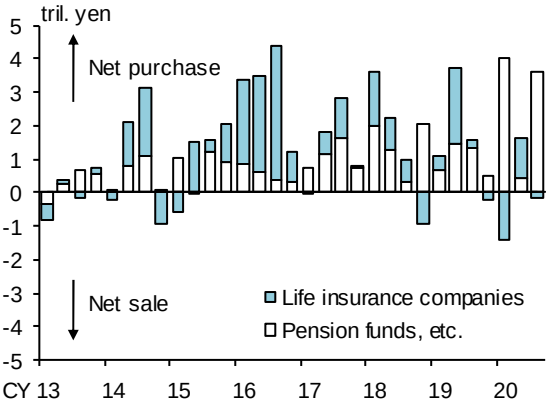
Note: Covers four major life insurance companies.
Source: Published accounts of each company.

insurance products and foreign currency-denominated insurance products are due to a change in taxation rules and a decline in overseas interest rates, respectively. Against this background, life insurance companies have moderately increased their holdings of investment assets, even though some insurance companies have sold foreign bonds in response to the decline in overseas interest rates since March (Chart III-2-2). Specifically, insurance companies have generally continued to increase their investment in foreign bonds and investment funds, both of which offer relatively high yields, while they have shown less appetite for purchasing domestic bonds amid the prolonged low interest rate environment. Meanwhile, life insurance companies have slightly increased the share of currency-hedged foreign securities in their foreign securities portfolios, as U.S. dollar hedging costs have generally remained at a reduced level (Chart III-2-3).

Life insurance companies' core profits, which represent their profitability, have remained stable (Chart III-2-4).

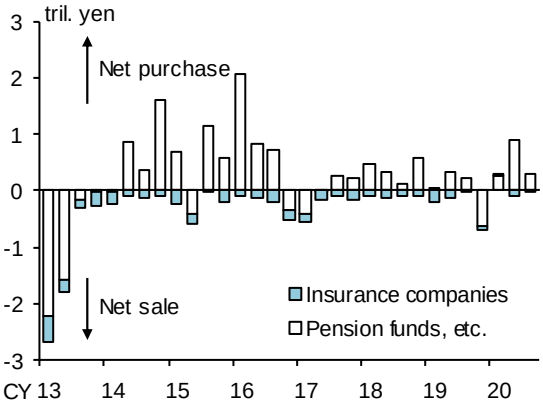
Pension funds have continued to invest in foreign securities and domestic stocks (Charts III-2-5 and III-2-6). Specifically, the Government Pension Investment Fund (GPIF) -- which is in charge of managing the assets of public pension funds such as employees' pension funds and the national pension fund -- announced in April 2020 that it would increase the portfolio share of foreign bonds by changing its basic portfolio allocation, which determines the portfolio share of each asset class from the perspective of safe and efficient asset management over a long-term investment horizon.[9] Meanwhile, corporate pension funds have essentially maintained their investment stance.

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



Note: 1. "Pension funds, etc." indicates trust accounts of banks and trust banks.
2. Latest data as at July-August 2020.
Source: Ministry of Finance.

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



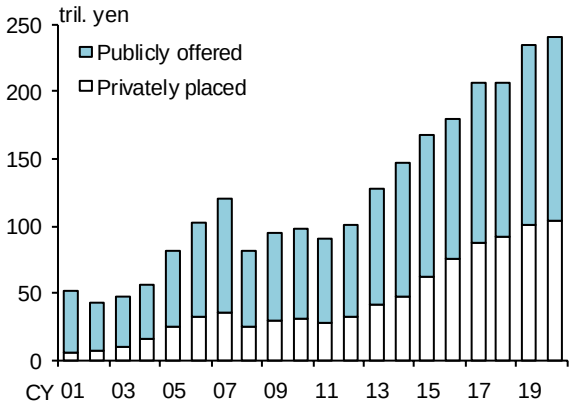
Note: 1. "Pension funds, etc." indicates banking and trust accounts of trust banks.
2. Latest data as at July-August 2020.
Source: Tokyo Stock Exchange.

2. Securities investment trusts

The amount of assets held by investment trusts temporarily decreased substantially, reflecting the plunge in prices of a wide range of risky assets including stocks in March 2020. However, the outstanding amounts of both publicly offered and privately placed investment trusts have increased, as the subsequent market recovery has led to an increase in market values and to an inflow of funds (Chart III-2-7). By type of holder, banks' holdings of investment trusts have continued to increase (Chart III-2-8).

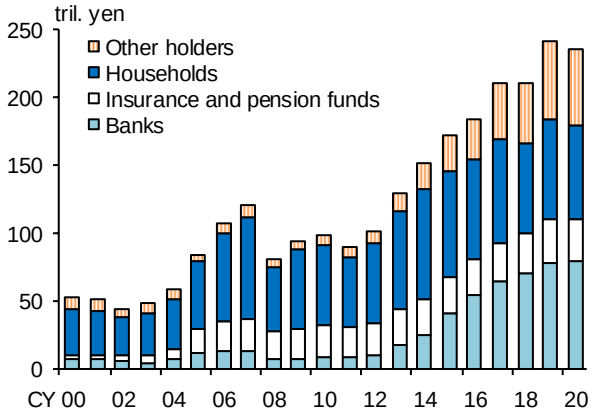
[9] The GPIF is one of the largest institutional investors in the world, with total assets of about 162 trillion yen as of end-June 2020. The assets are managed both externally and internally.

Chart III-2-7: Assets among investment trusts



Note: 1. Includes publicly offered REITs (from 2007) and privately placed REITs (from 2013).
2. The latest data for REITs are as at end-July 2020 and the latest data for other assets are as at end-August 2020.
Source: The Investment Trusts Association, Japan.

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



Note: Latest data as at end-June 2020.
Source: BOJ, "Flow of funds accounts."

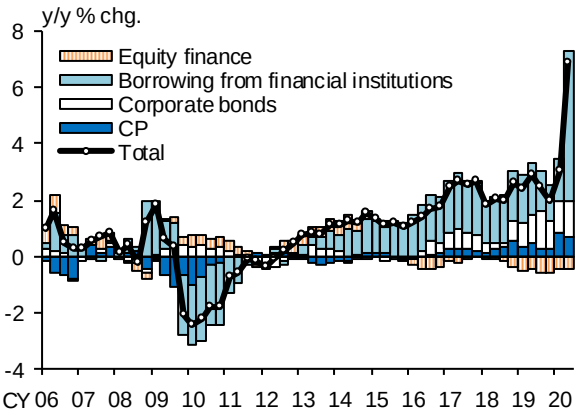
C. Investment in financial assets and funding activities by the private non-financial sector

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

1. Corporate sector

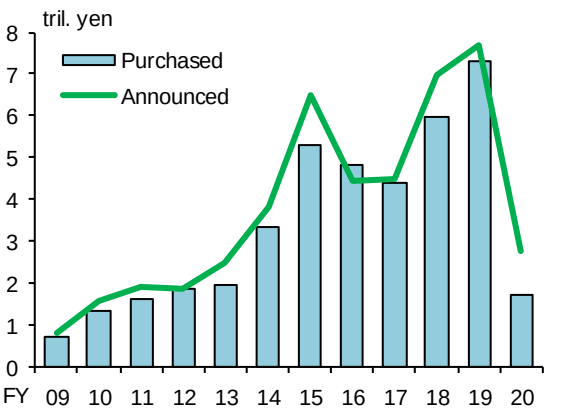
The total volume of funding in the corporate sector has been growing substantially at an annual rate of about 7 percent (Chart III-3-1). Since March 2020, funding through borrowing from financial

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



Note: 1. "Equity finance" indicates net changes in the book values of shares and other equities of private nonfinancial corporations.
2. "Borrowing from financial institutions" excludes borrowing by banks and insurance companies. "CP" and "Corporate bonds" cover those issued by ordinary industrial corporations.
3. Latest data as at end-June 2020.
Source: I-N Information Systems; JASDEC; BOJ.

Chart III-3-2: Amount of stock buybacks



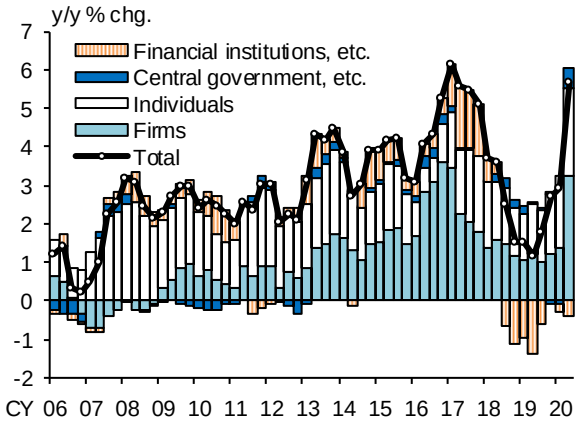
Note: The data include stocks listed on the domestic stock exchanges. Based on the announcement date. Latest data as at April-August 2020.
Source: I-N Information Systems.

institutions and through the issuance of corporate bonds and CP has increased markedly due to growing demand for precautionary funds caused by the spread of COVID-19. Although issuance rates briefly increased and issuances had to be temporarily postponed in some cases, issuance conditions in the corporate bond and CP markets have generally remained favorable due in part to the Bank's decision to increase purchases of these products and extend the remaining maturity of corporate bonds to be purchased.

Equity financing through the stock market has been lackluster (Chart III-3-1). This is due to significant declines in initial public offerings (IPOs) of stocks and public offerings (POs) of REITs, reflecting heightened uncertainty about future performance. Firms have reduced announced and executed stock buybacks in an attempt to secure liquidity (Chart III-3-2).

Deposits in the corporate sector have grown significantly, reflecting the increase in corporate fund raising (Chart III-3-3).

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

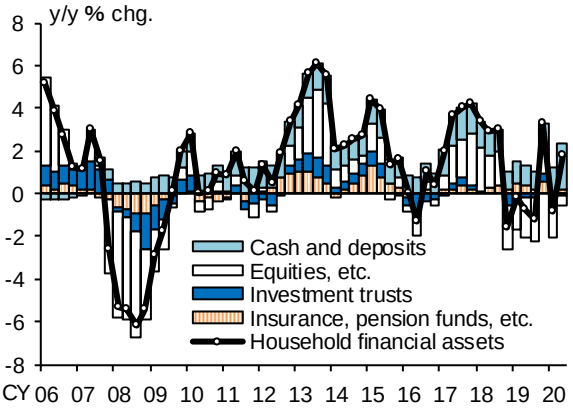


Note: 1. Covers domestically licensed banks. "Financial institutions, etc." includes NCDs.
2. Latest data as at the April-June quarter of 2020.
Source: BOJ.

2. Household sector

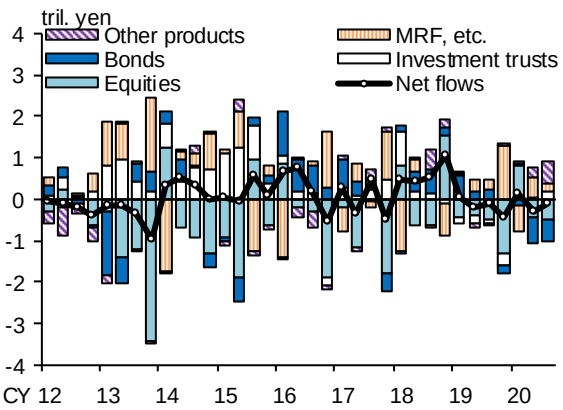
With regard to household financing, the growth in housing loans has decelerated somewhat due to the spread of COVID-19 and card loans have decreased significantly, mainly due to the decline in

Chart III-3-4: Amount of household assets



Note: Latest data as at end-June 2020.
Source: BOJ, "Flow of funds accounts."

Chart III-3-5: Capital flows by product among major securities companies



Note: 1. "Investment trusts" indicates the sum of stock investment trusts and wrap products. "MRF, etc." includes bond investment trusts.
2. Covers retail customers' assets held at 17 major securities companies that hold current accounts at the BOJ. Latest data as at July-August 2020.
Source: BOJ.

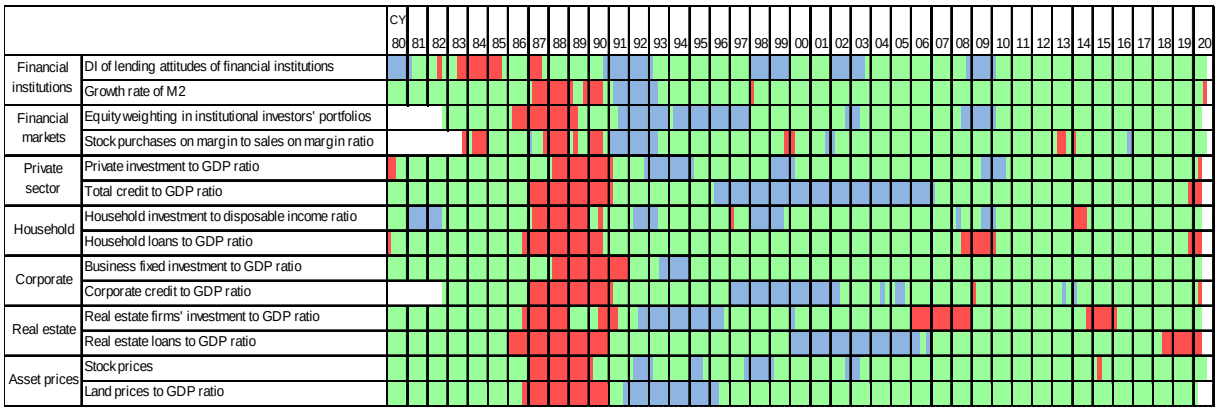
private consumption (Charts III-1-9 and III-1-10). At the same time, increased use of government loan programs by small business owners has been observed (Chart B1-1).

Households have maintained a cautious investment stance overall. The outstanding amount of cash and deposits in household assets has recently shown a significant increase mainly due to the government's special cash payments to all individuals living in Japan as part of its Emergency Economic Measures for Response to COVID-19 (Charts III-3-3 and III-3-4). Regarding equities, the household sector registered a net outflow of funds due to sales aimed at locking in gains amid the recovery in stock prices in the April-June quarter. Bonds also registered a net outflow of funds because financial institutions have changed their marketing policies and scaled down their operations after the government's declaration of a state of emergency (Chart III-3-5).

D. Assessment of the financial cycle

This section examines Japan's current financial cycle based on the financial intermediation activities described in the previous sections, using the heat map and other tools that are regularly employed in the *Report*.

Chart III-4-1: Heat map

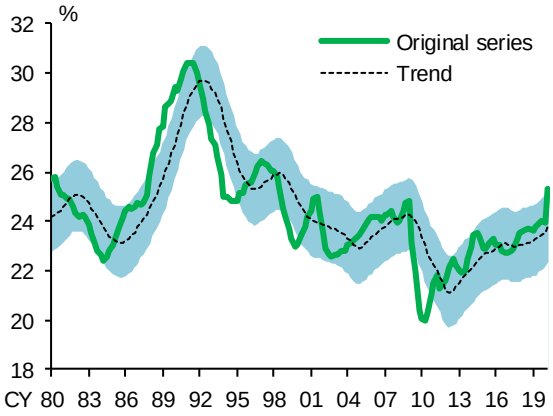


Note: The latest data for the DI of lending attitudes of financial institutions, growth rate of M2, stock purchases on margin to sales on margin ratio, and stock prices are as at the July-September quarter of 2020. The latest data for the land prices to GDP ratio are as at the January-March quarter of 2020. The latest data for the other indicators are as at the April-June quarter of 2020.
Source: Bloomberg; Cabinet Office, "National accounts"; Japan Real Estate Institute, "Urban land price index"; Ministry of Finance, "Financial statements statistics of corporations by industry"; Tokyo Stock Exchange, "Outstanding margin trading, etc."; BOJ, "Flow of funds accounts," "Loans and bills discounted by sector," "Money stock," "*Tankan*."

The heat map is a tool to regularly monitor and assess developments in Financial Activity Indexes (FAIXs), comprising indicators that deviated substantially from their trend during the bubble period in the late 1980s, for the early detection of financial imbalances caused by overheating of financial activities. In the current heat map, eight out of the 14 FAIXs are "green," which signals neither overheating (a certain upward deviation from the trend) nor a contraction (a certain downward deviation from the trend), while six FAIXs are "red." Among those, the following four FAIXs have turned from "green" in the previous issue of the *Report* to "red" as they have shown a large upward deviation from the trend: the *private investment to GDP ratio*, the *growth rate of M2*, the *household loans to GDP ratio*, and the *corporate credit to GDP ratio* (Charts III-4-1, III-4-2, III-4-3, III-4-4, and

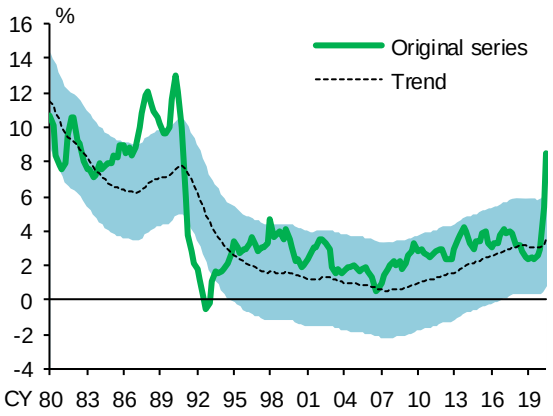
III-4-5).[10,11,12] The *total credit to GDP ratio* and the *real estate loans to GDP ratio* were "red" in the previous issue (Charts III-4-6 and III-4-7).

Chart III-4-2: Private investment to GDP ratio



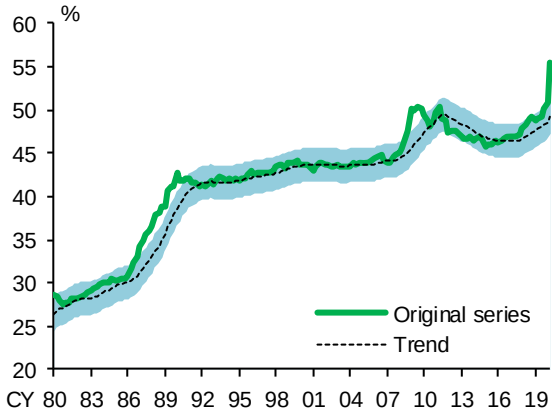
Note: 1. "Trend" is calculated using 3-year backward moving averages. The shaded area indicates the root mean square of the deviation from the trend.
2. 4-quarter backward moving averages. Latest data as at the April-June quarter of 2020.
Source: Cabinet Office, "National accounts."

Chart III-4-3: Growth rate of M2



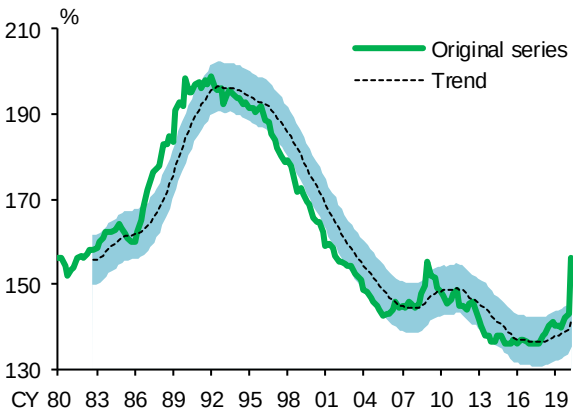
Note: 1. "Trend" is calculated using the one-sided HP filter. The shaded area indicates the root mean square of the deviation from the trend.
2. Latest data as at the July-September quarter of 2020.
Source: BOJ, "Money stock."

Chart III-4-4: Household loans to GDP ratio



Note: 1. "Trend" is calculated using 3-year backward moving averages. The shaded area indicates 1.25 times the root mean square of the deviation from the trend.
2. 4-quarter backward moving averages. Latest data as at the April-June quarter of 2020.
Source: Cabinet Office, "National accounts"; BOJ, "Flow of funds accounts."

Chart III-4-5: Corporate credit to GDP ratio



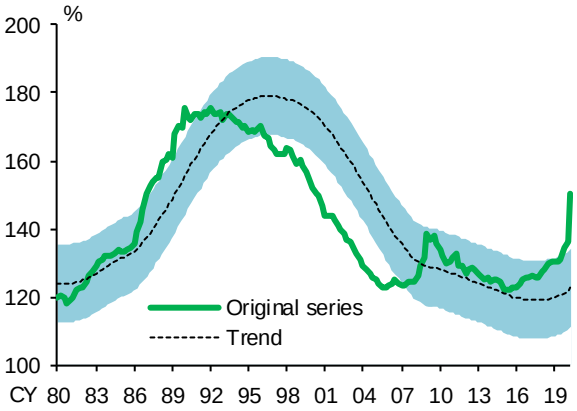
Note: 1. "Trend" is calculated using 3-year backward moving averages. The shaded area indicates the root mean square of the deviation from the trend.
2. 4-quarter backward moving averages. Latest data as at the April-June quarter of 2020.
Source: Cabinet Office, "National accounts"; BOJ, "Flow of funds accounts."

[10] In Chart III-4-1, the colors represent the following: (1) red indicates that an indicator is above its upper threshold; (2) blue indicates that an indicator 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.

[11] Among the FAIXs that have turned "red" since the previous *Report*, the *growth rate of M2* turned "red" in the July-September quarter of 2020, the *household loans to GDP ratio* was "red" from the October-December quarter of 2019 to the April-June quarter of 2020, and the others were "red" as of the April-June quarter. This is the first time since the January-March quarter of 1991 that five FAIXs are "red" in the same quarter.

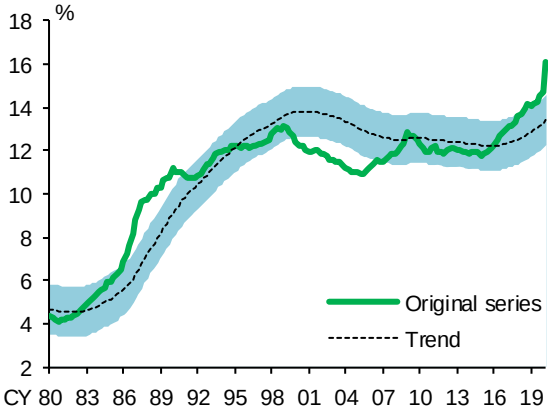
[12] The *household loans to GDP ratio* shows "red" from the October-December quarter of 2019 in this issue of the *Report* because, in the *Flow of Funds Accounts*, the figures for consumer credit on the liability side of households were retroactively revised upward due to the change in the estimation method.

Chart III-4-6: Total credit to GDP ratio



Note: 1. "Trend" is calculated using the one-sided HP filter. The shaded area indicates the root mean square of the deviation from the trend.
2. 4-quarter backward moving averages. Latest data as at the April-June quarter of 2020.
Source: Cabinet Office, "National accounts"; BOJ, "Flow of funds accounts."

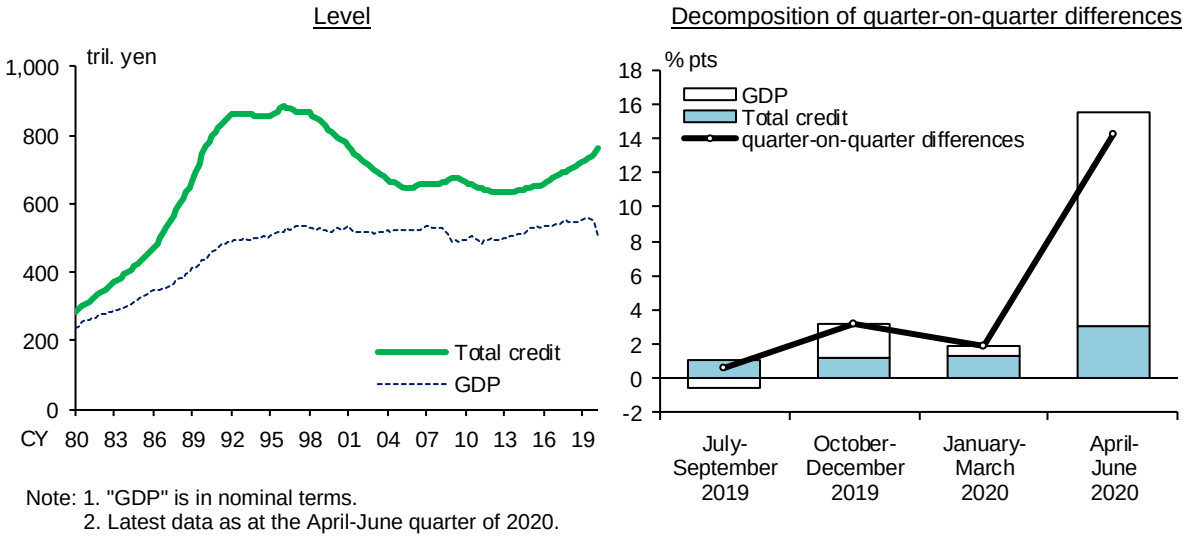
Chart III-4-7: Real estate loans to GDP ratio



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. 4-quarter backward moving averages. Latest data as at the April-June quarter of 2020.
Source: Cabinet Office, "National accounts"; BOJ, "Loans and bills discounted by sector."

Considering the causes that initiated the changes in the FAIXs, it would be inappropriate to jump to the conclusion that the six red FAIXs signal a growing risk of a build-up of financial imbalances. First, the five red FAIXs except for the *growth rate of M2* were the result of a sharp decline in nominal GDP in the April-June quarter of 2020 due to the spread of COVID-19, as these FAIXs use nominal GDP as the denominator to measure the level of financial activities relative to economic activity (Chart III-4-8). Given that economic activity has been generally recovering since the July-September quarter, the impact on the denominator of these FAIXs will likely dissipate gradually. Second, the five red FAIXs other than the *private investment to GDP ratio* relate to credit or money. These red FAIXs were the result of active financial intermediation activities mainly based on strong measures to support corporate financing to ensure the operating liquidity of firms that face a substantial decline in sales due to the impact of the disease. The nature and background of the credit increase is much different from the bubble period in the late 1980s.

Chart III-4-8: Numerator and denominator of total credit to GDP ratio



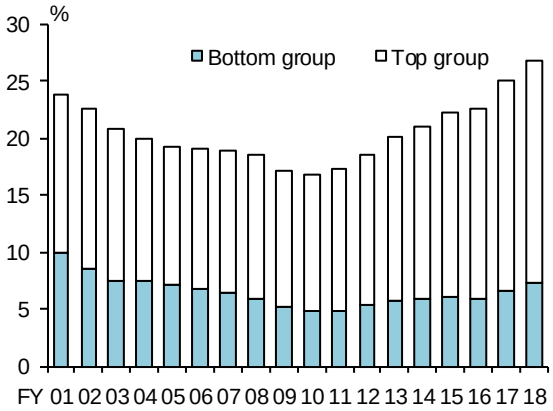
Note: 1. "GDP" is in nominal terms.
2. Latest data as at the April-June quarter of 2020.
Source: Cabinet Office; BOJ.

The amount of credit to households and firms can change not only due to demand for funds for housing investment and business equipment investment, which are to be repaid from medium- to

long-term earnings, but also due to demand for funds, depending on the gap in the timing of earnings and expenditures. An increase in the amount of credit could indicate a growing risk of the accumulation of financial imbalances, for example, if the growth in the earnings that constitute a fund source for repayment was evaluated to exceed the potential and expected growth rates of the economy based on overly optimistic prospects or if the demand for short-term real estate transactions increased based on excessive expectations for a rise in real estate prices, as seen during the bubble period. However, the current situation is not the result of an increase in loans based on such overly optimistic expectations. Instead, it is the result of financial institutions' response to meet the demand for working capital that has increased at an exceptional speed and to an exceptional extent, reflecting sharp declines in sales and earnings due to the impact of COVID-19. Under these circumstances, it is not appropriate to interpret the red FAIXs as a signal of overheating of financial activities; they represent vigorous financial intermediation activities to underpin firms' operating liquidity as a result of, for example, measures to support corporate financing.

As the economy recovers from the severe downturn, the demand for working capital, which has increased sharply, will slow down. Going forward, attention needs to be paid to the fact that the *total credit to GDP ratio* and the *real estate loans to GDP ratio* were "red" before the COVID-19 outbreak. As indicated in the previous issues of the *Report*, in recent years, financial institutions have been actively taking risks mainly in (1) lending to middle-risk firms, (2) lending to rental real estate businesses, and (3) lending to high-leverage projects such as large-scale M&A deals. As a result, credit growth has outpaced economic growth, and in this situation, lending to low-return borrowers, for which the loan interest rate is not necessarily high enough to cover the credit risk, was on an uptrend (Chart III-4-9). It is necessary to closely monitor how the spread of COVID-19 and the resultant increase in lending will affect the existing vulnerabilities. It warrants attention that the current level of lending might end up causing excessive credit relative to the real economy, if the disease has a deeper and longer impact that leads to a substantial decline in the growth rate of the economy.

Chart III-4-9: Loan share of low-return borrowers

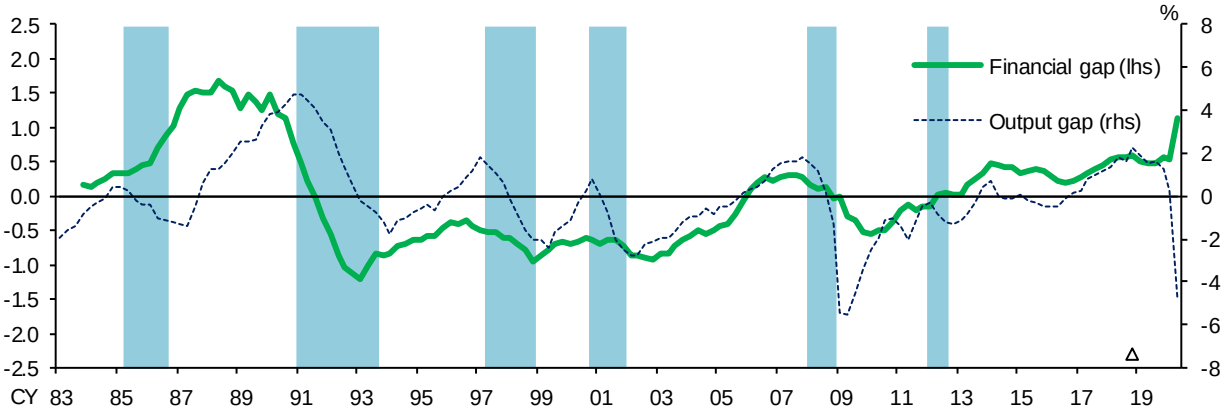


Note: 1. The chart indicates the share of loans to low-return borrowers among all loans to small firms.
2. Low-return borrowers are classified into "Bottom group," consisting of those whose ROA was at the bottom 25 percent of firms for the past 2 years or whose leverage ratio was at the top 25 percent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

Regarding the "financial gap," which is constructed by calculating the weighted average of the deviation rates of individual FAIXs in the heat map from their trends, the positive gap has increased further, reflecting the developments in the FAIXs mentioned above (Chart III-4-10). Looking at

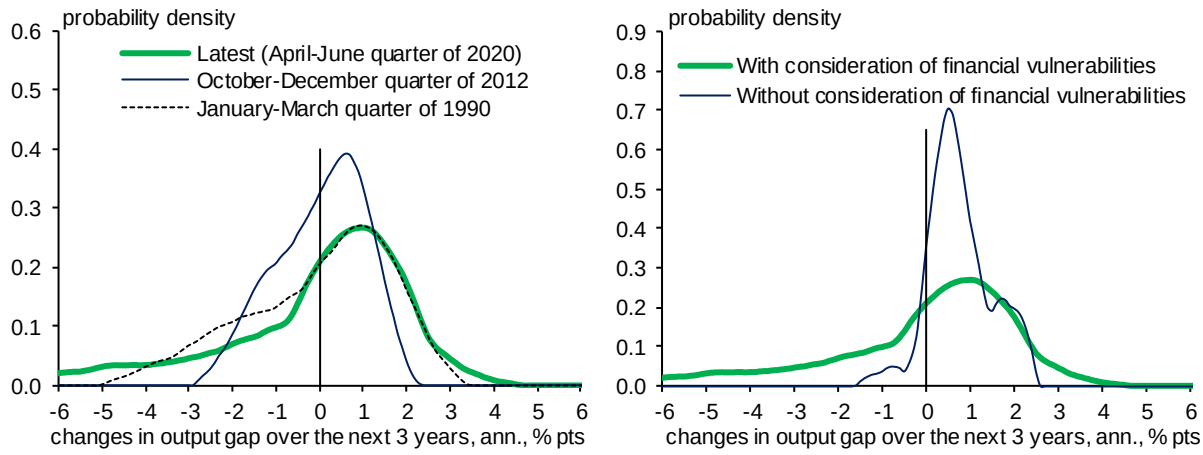
"GDP-at-risk" (GaR),[13] the estimated probability distribution of GDP growth over the next 3 years conditional on these developments in the financial gap has exhibited a fatter tail on the downside exceeding that observed during the bubble period (Chart III-4-11). A fatter tail is observed in the April-June quarter of 2020 not only because the positive financial gap has widened but also because the output gap has worsened more rapidly and substantially than that during the GFC and fallen into negative territory. In normal times, this result would suggest a considerable increase in tail risk in the real economy. However, given that the widening of the positive financial gap does not necessarily indicate a growing risk of financial imbalances in the current situation, as suggested by the red FAIXs earlier, there is a possibility that the GaR does not necessarily represent the magnitude of the current tail risk. Attention needs to be paid to the possibility that developments in the spread of COVID-19 and their impact on the domestic and overseas economies could lead to full-fledged financial adjustments through the existing vulnerabilities underlying developments in the financial gap.

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



Note: Latest data as at the April-June quarter of 2020. The shaded areas indicate recession phases, and the triangle on the right bottom corner of the chart indicates the recent peak, October 2018.
Source: Cabinet Office; BOJ.

Chart III-4-11: Comparison of risks to economic growth by period



Note: The distributions in the right-hand chart are as of the April-June quarter of 2020.

[13] Specifically, the regression equation for GaR is as follows:

$$\begin{pmatrix}\text{changes in the output gap}\\ \text{over the next } Y \text{ years}\end{pmatrix} = \alpha\begin{pmatrix}\text{changes in the output gap}\\ \text{from the previous period}\end{pmatrix} + \beta(\text{financial gap}) + \gamma(\text{U.S. NFCI}) + \delta.$$

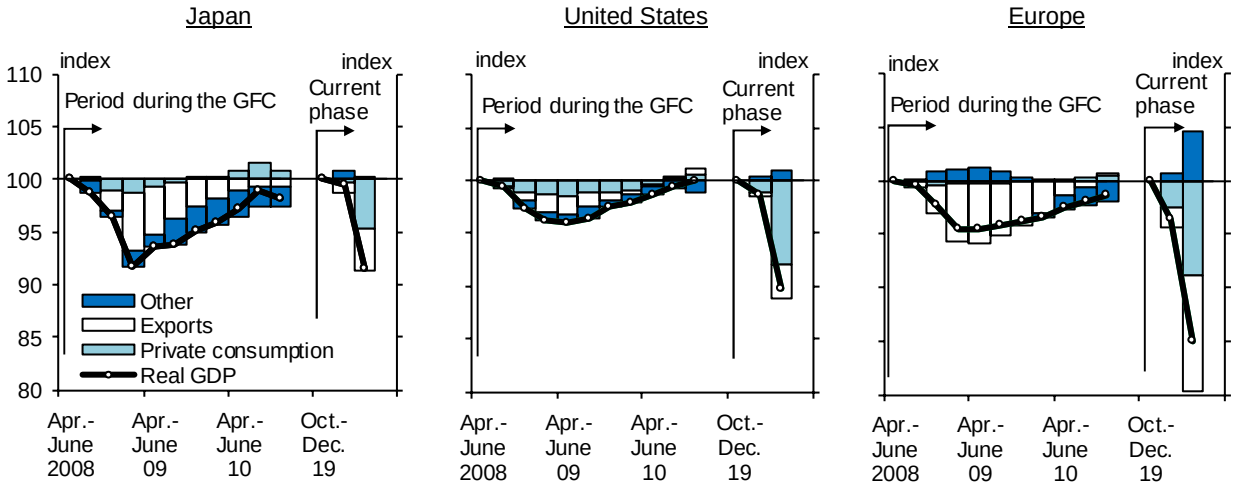
For details on the GaR approach, including the underlying rationale, estimation method, and caveats regarding its use, see Chapter IV and Box 1 of the October 2018 issue of the *Report*.

IV. Risks and vulnerabilities in the financial system

This chapter examines the risk profiles and vulnerabilities of Japan's financial system based on the developments in financial intermediation activities discussed in Chapters II and III.

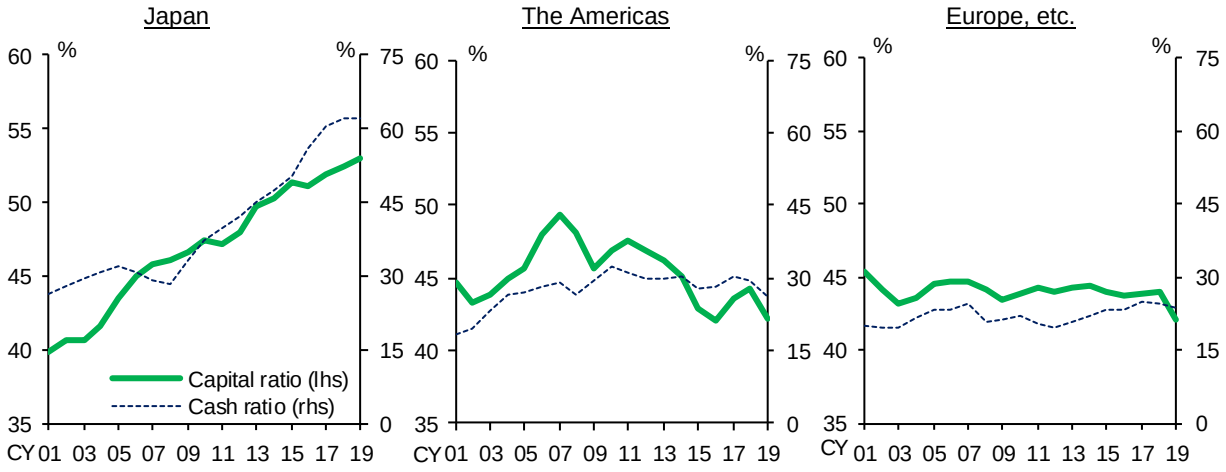
In response to the COVID-19 pandemic, countries around the world have taken preventive measures against the spread of infections, such as imposing stay-at-home restrictions and suspending business and production activities. As a result, both Japan's economy and overseas economies in the first half of 2020 experienced the largest fall in output since the end of World War II. The current stress stems from the shock to the real economy resulting from the major restrictions on people's activities due to COVID-19, and global GDP has fallen sharply, mainly due to the drop in consumption. Particularly, in the United States and Europe, where relatively strict public health measures have been implemented, the fall in output is much larger than that observed during the GFC (Chart IV-1-1).

Chart IV-1-1: GDP levels in current phase and during GFC



Note: Indexation with the real GDP in the April-June quarter of 2008 set as 100 for the period during the global financial crisis and that in the October-December quarter of 2019 set as 100 for the current phase.
Source: BEA; Cabinet Office; Eurostat.

Chart IV-1-2: Capital ratio and cash ratio of firms by region



Note: 1. "Capital ratio" and "Cash ratio (= cash and cash equivalents / current liabilities)" are the median of the financial indicators of major companies included in S&P Capital IQ.
2. "Europe, etc." includes the Middle East and Africa.
Source: S&P Global Market Intelligence.

However, even under such severe stress, financial intermediation activities in Japan have maintained a scale necessary to support economic activity. In this regard, three reasons are particularly noteworthy: (1) the government and the Bank of Japan have swiftly taken strong policy actions; (2) financial institutions have considerable resilience in terms of both capital and liquidity; and (3) Japanese non-financial corporates as a whole continued to strengthen their financial base via the build-up of their liquidity and capital against the backdrop of the moderate economic expansion over the past few years. The trend of the third factor is apparent in a comparison with the Americas and Europe (Chart IV-1-2).

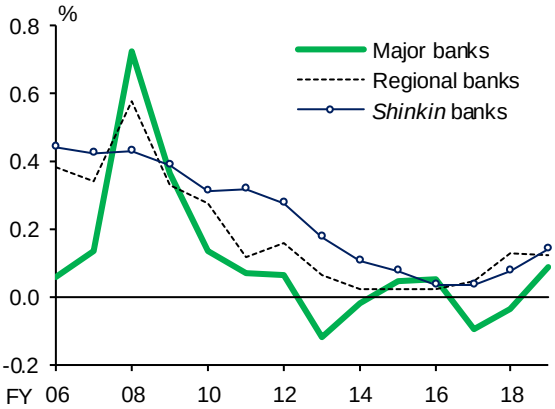
Going forward, the Japanese and overseas economies are expected to gradually improve, supported by the fulfillment of pent-up demand, the accommodative financial conditions, and the governments' economic and fiscal policies. However, the pace of improvement is expected to remain moderate according to the forecasts of market participants and international organizations. Looking ahead, it is extremely unclear how long it will take for the pandemic to subside, and it is highly uncertain how households and firms both in Japan and abroad will behave as people voluntarily take measures to prevent the spread of infections. In particular, it is possible that economic activity could substantially contract again should there be a further spread of infections.

Against this background, the following are the key risks to the stability of Japan's financial system: (1) an increase in credit costs due to the economic downturn at home and abroad; (2) a deterioration in gains/losses on securities investment due to substantial adjustments in financial markets; and (3) destabilization of foreign currency funding due to the tightening of foreign currency funding markets mainly for the U.S. dollar. This chapter examines these risks. In addition, an overview of risks posed by structural changes in the business environment surrounding financial institutions, such as the impact of digital transformation, will be provided.

A. Domestic credit risk

The credit cost ratios of Japanese financial institutions remained low before the COVID-19 outbreak, although they have shown signs of picking up, especially for regional financial institutions (Chart IV-1-3). The low credit cost is essentially explained by the fact that Japanese firms as a whole have continued to reduce their financial leverage and improve their financial soundness (Chart IV-1-2).

Chart IV-1-3: Credit cost ratios by type of bank

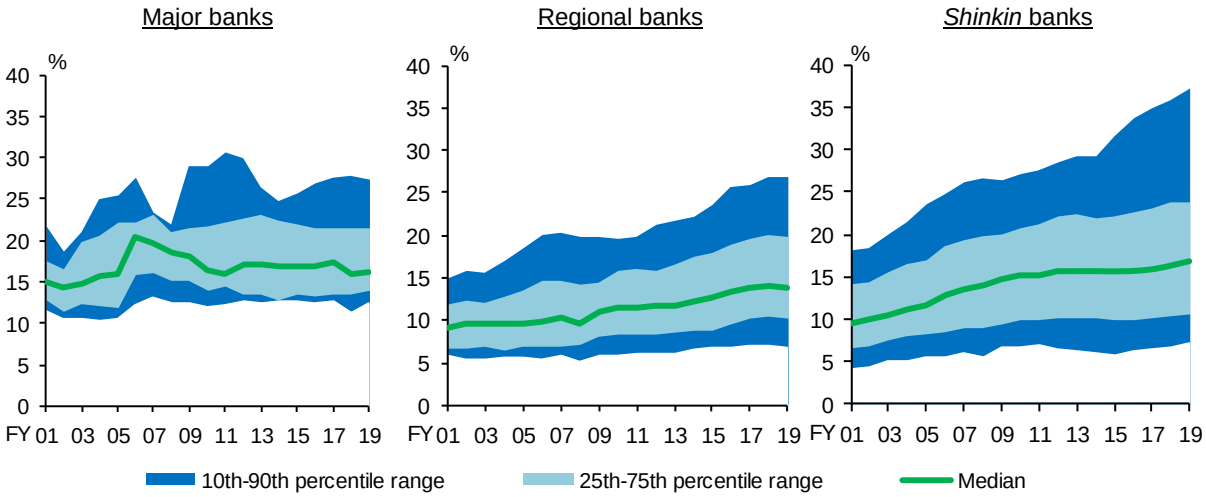


Note: Latest data as at fiscal 2019.
Source: BOJ.

On the flip side, under the prolonged low interest rate environment, Japanese financial institutions have increased domestic loans to middle-risk firms, loans to rental real estate businesses, and loans related to high-leverage projects such as large-scale M&A deals (Charts III-4-9 and IV-1-4). If such loans turn out to be excessive relative to the borrowers' debt servicing capacity, there is a

high risk that the economic downturn due to the spread of the disease could lead to an increase in bankruptcies and defaults. Keeping these points in mind, this section examines the impact of the spread of the disease on financial institutions' domestic credit risk.

Chart IV-1-4: Ratio of real estate loans to total loans

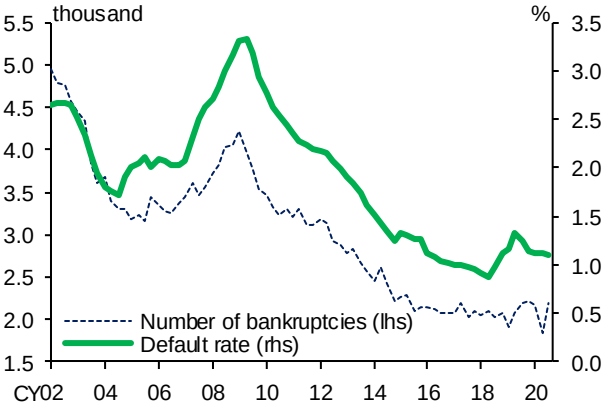


Note: Latest data as at end-March 2020.
Source: BOJ.

1. Impact of the spread of COVID-19 on firms' finances

The spread of COVID-19 has led to a substantial fall in firms' operating cash flow (CF), and in their profits, especially in industries such as food, accommodation, and consumer services, which are particularly susceptible to measures to prevent the spread of infections. Such a decline has exerted considerable stress on firms' operating liquidity and capital. However, the rise in defaults for the corporate sector as a whole has been restrained owing to the fact that: (1) firms were able to maintain ample liquidity and capital before the outbreak against the backdrop of the moderate economic expansion over the past few years; and (2) the government and the Bank have taken prompt and powerful policy actions and financial institutions have actively provided loans to support corporate financing (Chart IV-1-5).

Chart IV-1-5: Number of bankruptcies and default rate



Note: 1. "Number of bankruptcies" indicates the quarterly total. "Default rate" indicates the quarterly average.
2. Latest data for "Number of bankruptcies" are as at July-August 2020 (converted into quarterly amounts). Latest data for "Default rate" are as at July 2020.
Source: The Risk Data Bank of Japan; Tokyo Shoko Research.

In this section, the first simulation assesses the quantitative impact of the spread of COVID-19 on firms' finances such as liquidity and capital. Then, the second simulation analyzes the extent to which a rise in firms' default rates is restrained by the impact of corporate financing support through the measures implemented in response to the spread of the disease.

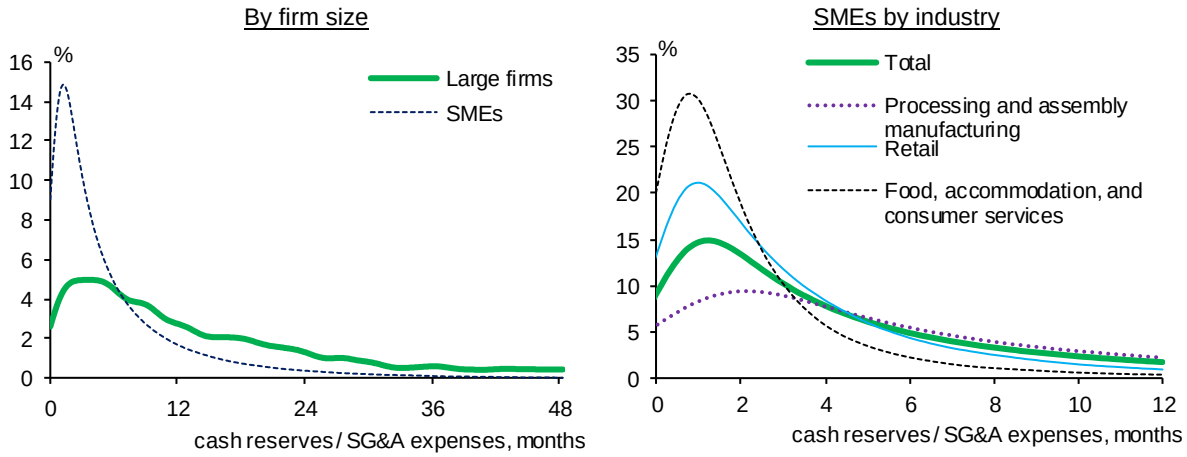
It should be noted that careful consideration is required when interpreting the simulation results as a certain number of firms decide to go out of business voluntarily considering their going concern capabilities even though they are eligible for measures to support corporate financing.

Simulation analysis of the impact of the spread of COVID-19 on firms' finances

a. Objectives of the analysis

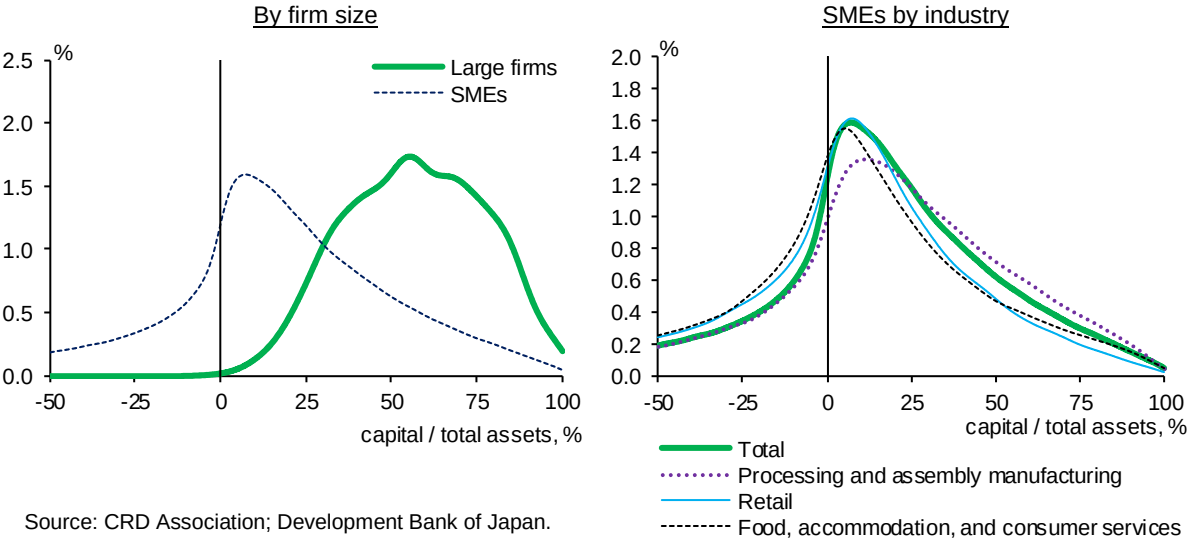
The magnitude of the impact of the pandemic on firms' liquidity and capital mainly depends on: (1) their liquidity and capital before the COVID-19 outbreak; (2) the severity of the decline in sales due to the spread of the disease; (3) and the reduction in costs brought about by the decline in sales. However, these factors are highly heterogeneous among firms and are also likely to differ depending on firm size and industry.

Chart IV-1-6: Distribution of cash reserves to SG&A expenses ratios



Source: CRD Association; Development Bank of Japan.

Chart IV-1-7: Distribution of capital ratios



Source: CRD Association; Development Bank of Japan.

For example, the distribution of firms' liquidity and capital for fiscal 2018, i.e., before the outbreak, by size and industry shows that large firms tended to have more ample liquidity and capital than

SMEs (Charts IV-1-6 and IV-1-7).[14] Furthermore, looking at SMEs by industry, for example, the cash reserves of about 80 percent of SMEs in food, accommodation, and consumer services, which have been heavily affected by COVID-19, fell below 3 months of selling, general, and administrative (SG&A) expenses. The proportion is higher than in other industries (right panel in Chart IV-1-6).

The following presents a simulation analysis using firm-level data to accurately assess the impact of the spread of the disease on firms' liquidity and capital while incorporating firms' heterogeneity and differences by firm size and industry.

b. Methodology and assumptions

In the first step of the analysis, the simulation assumes that the increase in the proportion of firms that could make losses and the proportion of firms whose net operating cash outflow during the year could exceed their cash reserves at the beginning of the fiscal year. This counterfactual simulation is run under a set of assumptions on the speed of the decline in firms' sales and costs in fiscal 2020, assuming that none of the measures to support corporate financing are implemented (the estimation incorporating measures to support corporate financing will be discussed in Subsection 2 below).

Chart IV-1-8: Assumed sales changes (by firm size and industry)

year-on-year change, %

	Large firms	SMEs
All industries	-8.8	-22.0
Basic materials manufacturing	-11.2	-21.3
Processing and assembly manufacturing	-11.3	-22.2
Construction	-6.4	-21.1
Real estate	-2.8	-21.6
Wholesale	-6.6	-21.1
Retail	-3.6	-13.1
Transportation and communications	-6.2	-15.7
Food, accommodation, and consumer services	-16.5	-47.0
Other nonmanufacturing	-6.4	-23.1
All firms	-14.4	

Source: Development Bank of Japan; Nikkei Inc., "NEEDS-Financial QUEST"; S&P Global Market Intelligence; Published accounts of each firm; BOJ.

For the simulation, the assumptions regarding the sales declines in fiscal 2020 are as follows. For large firms, the forecasts for individual listed firms are used, while for SMEs, the industry-level forecasts from the *Tankan* (Short-Term Economic Survey of Enterprises in Japan), adjusted by private-sector forecasts for real GDP growth, are used (Chart IV-1-8).[15] Key features of the firms' sales since the outbreak of COVID-19 are as follows: (1) the percentage decline for SMEs is much larger than that for large firms, meaning that the shock to SMEs is more severe; and (2) among SMEs, not only those in food, accommodation, and consumer services, which have been most severely affected by measures to prevent the spread of infections, but also those in the manufacturing industry are expected to have seen a large fall in sales (see Box 2 for a comparison

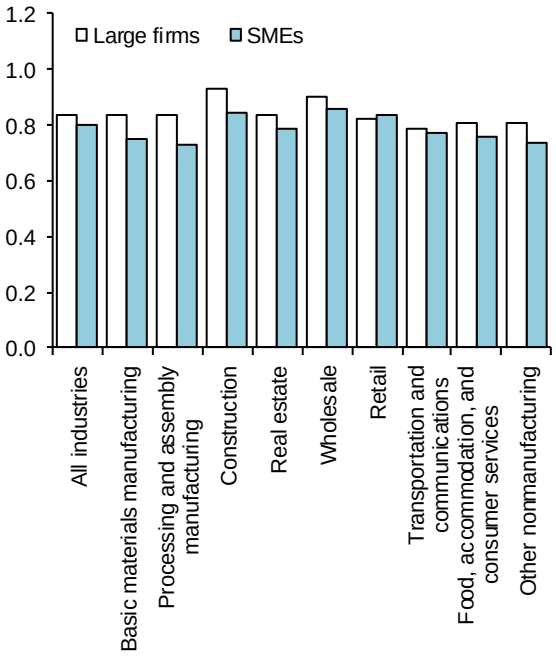
[14] The analysis used firm-level data from the DBJ Financial Database of Listed Firms of the Development Bank of Japan, which covers about 3,700 listed firms, and from the Credit Risk Database (CRD) of the CRD Association, which covers about 2.5 million SMEs. The simulation covers about 2,400 firms and about 730 thousand SMEs from the respective data sets.

[15] Using private-sector forecasts for real GDP growth (-5.8 percent; August *ESP Forecast*) and the forecasted decline in the sales of large firms overall (8.8 percent), the estimated decline in the sales of SMEs overall is 22.0 percent. By using the forecasted decline in the sales of SMEs overall stated in the June 2020 *Tankan* (7.6 percent) as well as industry weights stated in the *Tankan*, larger industry-level sales declines than those forecasted in the June 2020 *Tankan* are assumed for the analysis that follows. Since the estimates are premised on past relationships, they should be interpreted with a certain margin of error.

with the GFC).

As for costs, many firms tend to see a reduction in both personnel and non-personnel costs when their sales decline. Therefore, the elasticities of costs with respect to a change in sales by firm size, industry, and cost item are estimated. Using these estimates that reflect past average behavior of firms, the fall in costs is estimated under the abovementioned assumptions regarding sales (Chart IV-1-9).

Chart IV-1-9: Cost elasticity to sales changes (by firm size and industry)



Note: 1. The chart indicates the coefficients β of the following fixed effects model estimates, which are all significant at the 1 percent level. Subscripts i and t denote a firm and a fiscal year, respectively.

$$\mathrm{dlog}(\text{Operating costs})_{i,t} = \mathrm{c} + \beta \mathrm{dlog}(\text{Sales})_{i,t} + \alpha_i + \text{Error}_{i,t}$$

2. The estimation period is from fiscal 1957 to 2018 for large firms and from fiscal 2002 to 2018 for SMEs.
3. The simulations use similar estimates by cost breakdown (costs of sales, labor costs, etc.).

Source: CRD Association; Development Bank of Japan.

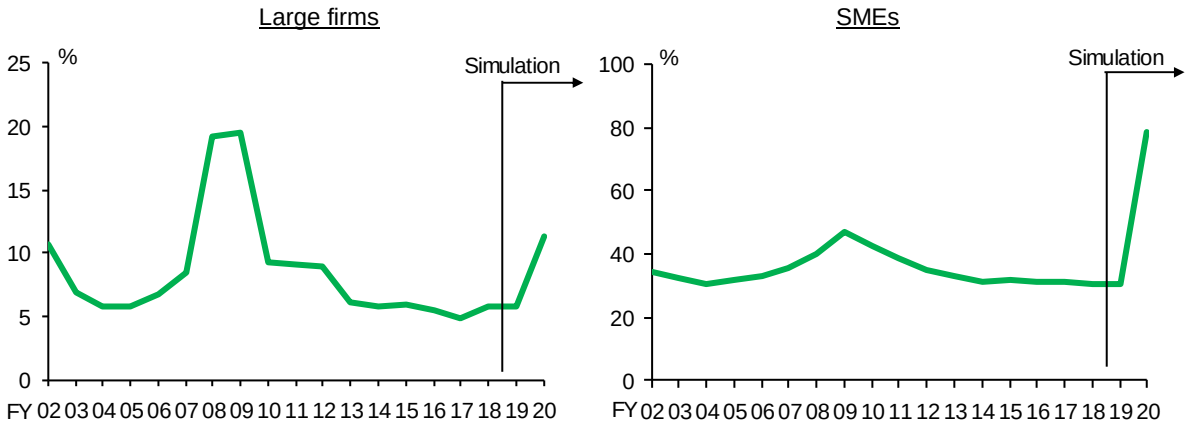
c. Simulation results

Based on the assumptions just described, firm-level simulations were conducted to examine to what extent firms' profits, liquidity, and capital would be affected. The first set of results shows that the share of firms making losses in fiscal 2020 among large firms could increase by only around 5 percentage points, while, among SMEs, it could increase by more than 40 percentage points, so that about three quarters of all SMEs make losses (Chart IV-1-10). The results indicate that SMEs in particular experience severe stress due to the spread of COVID-19 in terms of their profits and operating CF. Thus, in contrast with the GFC, when it was domestic large manufacturers that faced relatively strong stress as a result of the rapid appreciation of the yen and the sharp drop in exports, this time, the severity of the stress is most pronounced among SMEs.

To assess the resilience of firms' liquidity in the face of such stress, their cash reserves are compared with the estimated net operating cash outflow (Chart IV-1-11). Among large firms, the share of firms facing potential cash shortages, i.e., firms whose estimated net operating cash outflow during the year exceeds their cash reserves at the beginning of the fiscal year, could remain almost unchanged. On the other hand, the share of SMEs facing potential cash shortages could rise from around 8 percent in the previous fiscal year to around 20 percent. Given that during the GFC, the share of SMEs facing potential cash shortages rose from around 9 percent to about 14 percent, the increase in the current phase can be regarded as large. However, even among SMEs, the share of firms facing potential cash shortages in the counterfactual simulation does not increase to the same extent as the share of firms making losses. This likely reflects the fact that the number of firms that built up a buffer of cash reserves continued to increase. Meanwhile, the results for

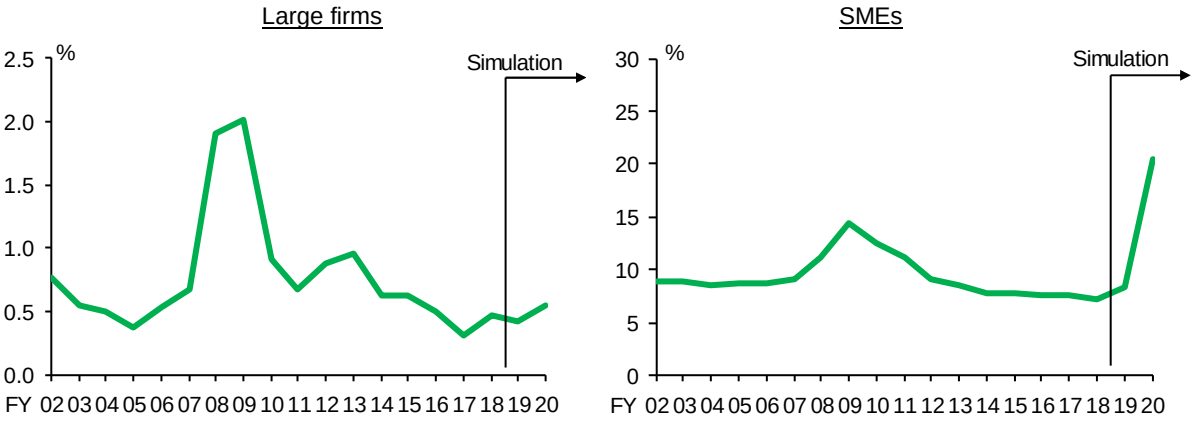
SMEs by industry suggest that the increase in the share of firms facing cash shortages is particularly pronounced in food, accommodation, and consumer services, where firms tend to have less cash reserves than in other industries, and where the decline in operating CF is particularly large (Chart IV-1-12).

Chart IV-1-10: Share of firms with current losses



Note: Figures after fiscal 2019 represent the simulation results based on firms' financial condition as at fiscal 2018. The values for fiscal 2019 show the results without any changes in sales while those for fiscal 2020 show the results with the assumed sales changes shown in Chart IV-1-8. The same applies to subsequent charts.
Source: CRD Association; Development Bank of Japan.

Chart IV-1-11: Share of firms facing cash shortages



Note: Firms facing cash shortages are defined as firms whose net operating cash outflow during the year exceeds their cash reserves at the beginning of the fiscal year.
Source: CRD Association; Development Bank of Japan.

Chart IV-1-12: Share of firms facing cash shortages by industry

%

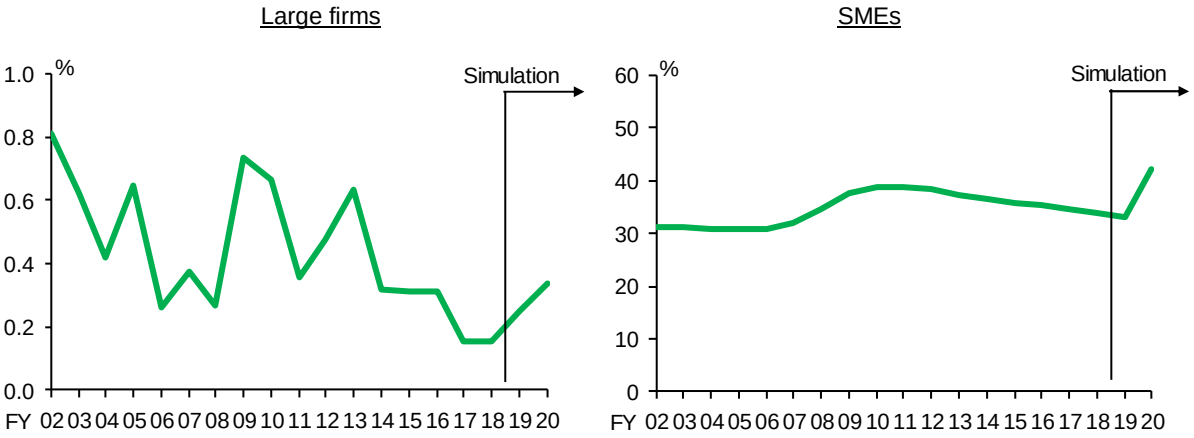
	Large firms	SMEs
All industries	0.5	20.5
Basic materials manufacturing	0.8	22.1
Processing and assembly manufacturing	0.4	16.4
Construction	0.8	15.3
Real estate	0.0	8.2
Wholesale	0.0	16.3
Retail	1.7	19.5
Transportation and communications	0.6	12.7
Food, accommodation, and consumer services	0.8	53.6
Other nonmanufacturing	0.0	23.5

Note: The chart indicates simulation results for fiscal 2020.

The second set of results focuses on the firms' resilience in terms of their capital, i.e., the change

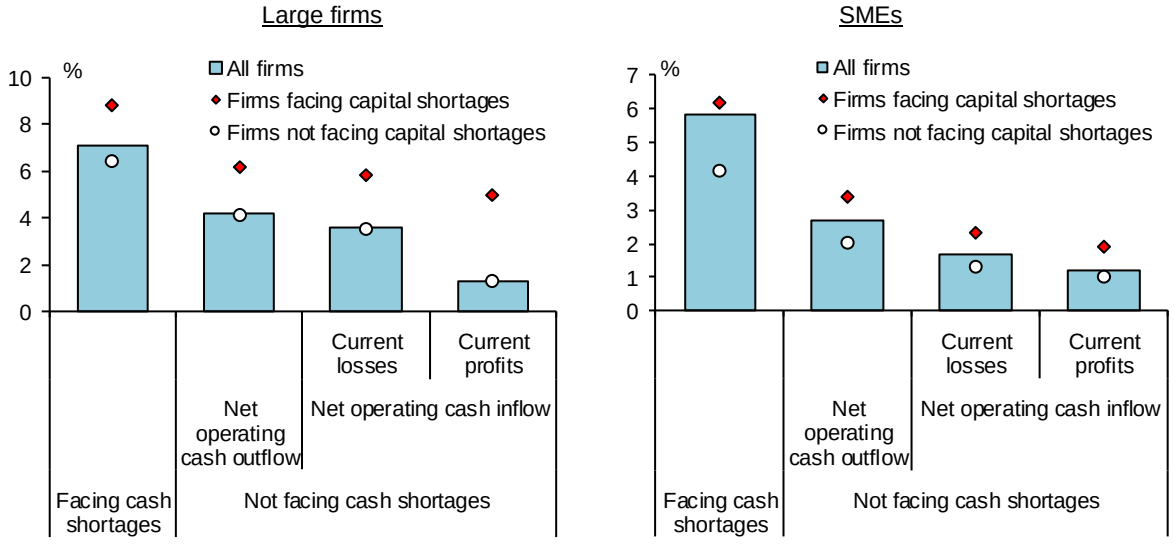
in the share of firms facing capital shortages in fiscal 2020 is simulated. The share increases only slightly among large firms, while the increase in the share among SMEs is relatively large at around 9 percentage points (Chart IV-1-13). However, SMEs continued to build up their capital buffer, as they did for liquidity. Thus, the increase in the share of firms facing capital shortages turns out to be similar to that during the GFC, despite the fact that the stress on SMEs in the current phase is larger than during the GFC.

Chart IV-1-13: Share of firms facing capital shortages



Note: 1. Firms facing capital shortages is defined as firms whose (net assets at the beginning of the fiscal year) + (current profit) * (1 - the effective tax rate) is negative.
2. For recent developments in the share of SMEs with negative net worth, see Chart 1-3-7 in the following report: Small and Medium Enterprise Agency, ed., "2019 White Paper on Small and Medium Enterprises in Japan," April 2019.
Source: CRD Association; Development Bank of Japan.

Chart IV-1-14: Firms' default rates by financial status

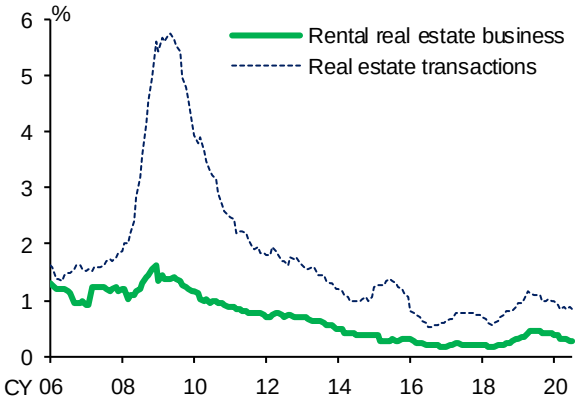


Note: 1. The left panel shows 1-year EDF as at the end of the fiscal year. The reference period is from fiscal 1998 to 2018.
2. In the right panel, default is defined as being downgraded to the borrower classification "special attention" or below, overdue, or subrogated in the following 1-year period. The reference period is from fiscal 2002 to 2017.
Source: CRD Association; Development Bank of Japan; Moody's.

The past data show that, for both large firms and SMEs, the more serious firms' liquidity conditions, the higher their default rates tend to be a year ahead. Firms' liquidity conditions deteriorate such as through negative current profits, net operating cash outflow, and operating cash outflow

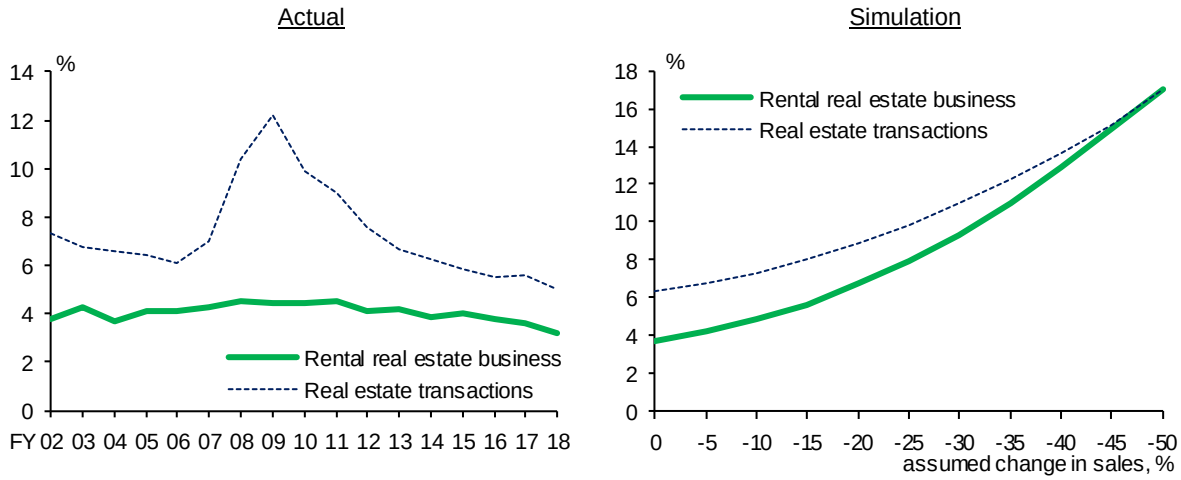
exceeding firms' cash reserves. Moreover, this pattern is more pronounced the more serious firms' capital shortages and capital problems are (Chart IV-1-14).[16]

Chart IV-1-15: Default rates for real estate industry



Note: Latest data as at July 2020.
Source: The Risk Data Bank of Japan.

Chart IV-1-16: Share of real estate firms facing cash shortages



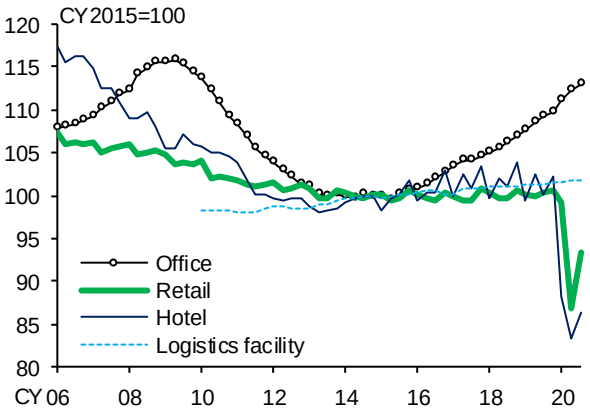
Note: Covers SMEs. "Simulation" is based on firms' financial condition as at fiscal 2018.
Source: CRD Association.

These analyses are applied to the rental real estate business, to which financial institutions had been actively increasing their lending before the COVID-19 outbreak. Unlike firms engaged in real estate transactions, firms engaged in rental real estate business did not see a notable rise in default rates during the GFC (Chart IV-1-15). One reason is that the rental income of firms engaged in the rental real estate business remained relatively stable at the time, and the share of rental real estate firms that suffered cash shortages did not increase as it did for firms engaged in real estate transactions. A simulation reveals the sensitivity of the shares of firms facing potential cash shortages in real estate transactions and in the rental real estate business in response to the fall in sales. In the rental real estate business, a decline of up to around 10 percent hardly increases the share. However, for a decline in sales larger than that, the share of firms facing potential cash shortages increases non-linearly, and when the sales decline reaches about 25 percent, such share doubles from the current level (Chart IV-1-16). Real estate rents for hotels and retail stores have fallen substantially since the outbreak. Moreover, earnings projections for J-REITs by sector show that the earnings of those investing in hotels are forecasted to fall by around 30 percent

[16] In Chart IV-1-14, using a firm's stock price and related information, Moody's expected default frequency (EDF) measures the probability of the firm defaulting over a specific period of time in the future, based on the market value of the firm's assets and liabilities payable.

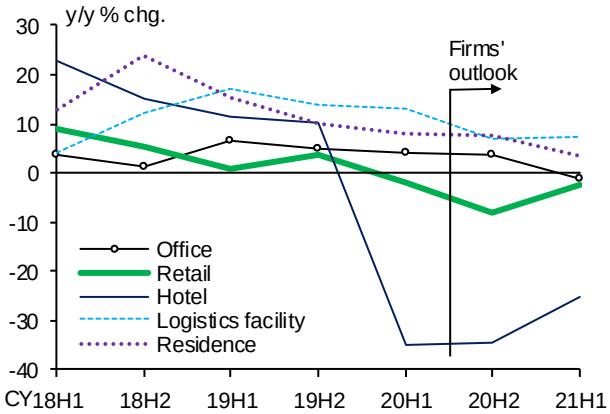
year-on-year from the first half of 2020 to the first half of 2021, and the earnings of REITs that invest in other types of properties are also weakening overall. Therefore, future trends in rental income warrant close attention (see Charts IV-1-17 and IV-1-18 as well as Box 3).

Chart IV-1-17: Developments in real estate rent



Note: The chart shows the quarterly averages. The latest data represent the July-August 2020 average.
Source: BOJ.

Chart IV-1-18: Earnings projections for J-REITs



Note: Covers J-REITs that announced financial statements from April to August 2020. The figures are calculated by aggregating each J-REIT's operating income. 20H1 indicates the latest financial statements. The classification is based on the main real estate owned by each J-REIT.
Source: Nikkei Inc., "NEEDS-Financial QUEST"; Published accounts of each firm.

In sum, the fall in sales due to the spread of COVID-19 appears to be exerting greater stress on the liquidity and capital of SMEs than the stress observed during the GFC. The simulation results indicate that, nevertheless, the share of firms running out of cash reserves and facing potential capital shortages would have increased to a lesser extent than the share of firms making losses even if there had been no measures to support corporate financing.

2. Impact of the measures to support corporate financing

Outline and scale of the measures to support corporate financing

This subsection examines to what extent the measures to support corporate financing implemented in response to the spread of COVID-19 have been effective in mitigating the negative impact on firms' liquidity and capital and in preventing a rise in firms' probability of default (PD). In the current phase, the policy actions of the government and the Bank, as well as the active provision of loans by financial institutions in line with those policy actions, have helped to support corporate financing. The government passed two supplementary budgets (each worth 117 trillion yen). In particular, the second supplementary budget has enhanced the provision of financial support to SMEs, such as subsidies for rent and personnel expenses, as well as the provision of effectively interest-free loans by private financial institutions since May (Chart IV-1-19).

According to the simulation in the previous subsection, the decline in Japanese firms' overall current profits resulting from the spread of the disease amounts to over 40 trillion yen on an annual basis; on the other hand, the scale of the program to provide effectively interest-free loans through government-affiliated financial institutions and private financial institutions is more than twice that amount (Chart IV-1-20). Thus, it is likely that, in aggregate, the scale of support to respond to firms' liquidity problems has been sufficient, at least during the current fiscal year, under the most recent

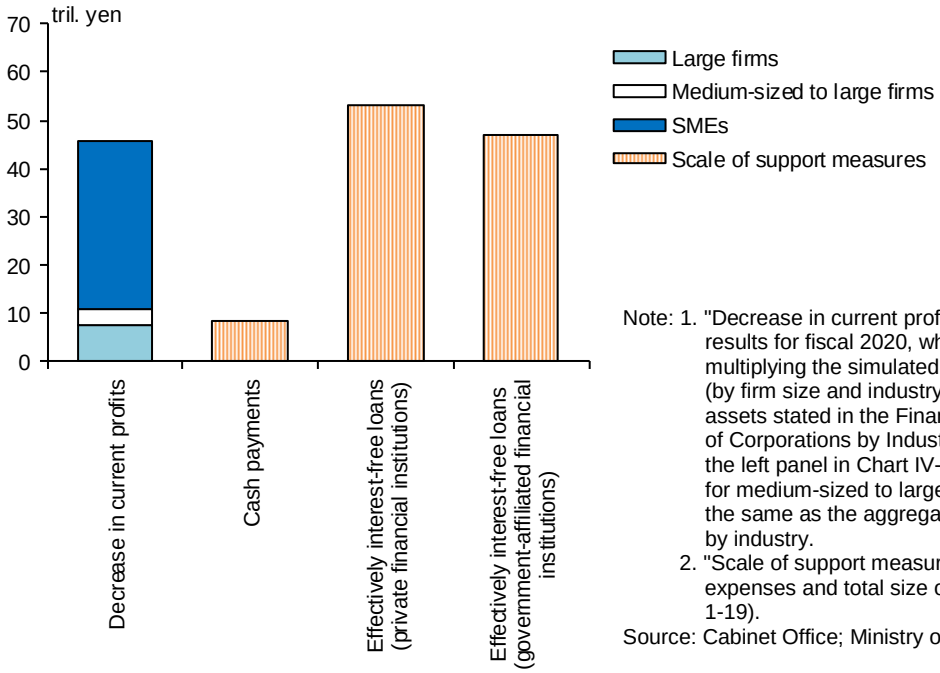
baseline scenario assumed in the previous subsection. It should be noted, however, that there is considerable uncertainty regarding the outlook for the Japanese and overseas economies.

Chart IV-1-19: Contents of major measures to support corporate financing

	Major measures to support corporate financing	Overview of measures	Fiscal expenses and total size of measures	
			First supplementary budget	Second supplementary budget
Cash payments	Subsidies for sustaining businesses	Cash payments for SMEs and sole proprietors (up to 2 mil. yen)	2.3 tril. yen	1.9 tril. yen
	Rent assistance subsidy	Cash payments for supporting rent payments (up to 6 mil. yen)	-	2.0 tril. yen
	Expansion of employment adjustment subsidies program, etc.	Subsidy rates increased for leave allowance (up to 100% for SMEs and up to 75% for large firms)	0.8 tril. yen	1.3 tril. yen
Tax measures	Special tax measures such as tax payment moratorium	National and local taxes and/or social insurance contributions possibly deferred for one year	26 tril. yen	-
Financial measures	Effectively interest-free loans by government-affiliated financial institutions	Interest subsidies provided to government-affiliated financial institutions	Approx. 15 tril. yen	Approx. 33 tril. yen
	Effectively interest-free loans by private financial institutions	Interest subsidies provided to private financial institutions through local governments' loan programs	Approx. 24 tril. yen	Approx. 28 tril. yen
	Crisis response loans to medium-sized and large firms by government-affiliated financial institutions	Long-term loans with preferential interest rates through government-affiliated financial institutions	Approx. 5 tril. yen	Approx. 5 tril. yen
	Equity support by government-affiliated financial institutions and funds	Equity support mainly through subordinated loans and capital injections	-	Approx. 12 tril. yen

Source: Cabinet Office; Ministry of Finance.

Chart IV-1-20: Firms' profit decrease and scale of support measures



Note: 1. "Decrease in current profits" indicates simulation results for fiscal 2020, which are estimated by multiplying the simulated result to total asset ratios (by firm size and industry) by the amount of total assets stated in the Financial Statements Statistics of Corporations by Industry (the same applies to the left panel in Chart IV-1-22). The sales changes for medium-sized to large firms are assumed to be the same as the aggregated figures for large firms by industry.
2. "Scale of support measures" is the amount of fiscal expenses and total size of measures (see Chart IV-1-19).
Source: Cabinet Office; Ministry of Finance.

Simulation analysis of the impact of the measures to support corporate financing

a. Objectives of the analysis

Even though the support available in aggregate may be sufficient, many of the support measures

have an upper limit on the support provided to individual firms. Therefore, depending on the size of the decrease in sales, there may be some firms that cannot resolve their potential cash shortages with the public support measures alone. Accordingly, using the baseline scenario for the decline in sales assumed in the preceding subsection, this subsection presents a simulation to examine the share of firms that still cannot resolve their cash shortages even with the help of the public support measures secured by the first and second supplementary budgets. The impact of the support measures becomes visible by comparing the simulation results here with those in the preceding subsection that assume the absence of the support measures.

b. Methodology and assumptions

The assumptions of the analysis are as follows. The analysis focuses on the impact of cash payments and effectively interest-free loans. Other measures, for example, the deferral of payments of social security contributions and taxes, are out of scope.

Regarding the size of firms, the analysis focuses on SMEs. This is because (1) the analysis in the previous subsection showed that the number of large firms that are likely to face liquidity and capital shortages is limited, and (2) the impact of support measures such as cash payments will be larger for SMEs than for large firms.

Chart IV-1-21: Assumptions on how to utilize major measures to support corporate financing

	Assumptions for calculating amounts of each firm's subsidies and borrowing
Subsidies for sustaining businesses	All SMEs are assumed to be eligible for the program since all of them are assumed to face a severe sales decline of 50% in a certain month in 2020 (the same shall apply below). Each eligible firm is assumed to receive 2 million yen, which amount is less than the upper limit in the program.
Rent assistance subsidy	Each eligible firm receives the amount calculated by multiplying the amount of its rent payments for 6 months and its subsidy rate. The upper limit of the amount is 6 million yen. The monthly rent payments are calculated by using rental fee payments and estimated real estate share in the payments. The subsidy rate is set depending on the amount of monthly payments (2/3 for 0.75 million yen or less, and 1/3 for over 0.75 million yen).
Expansion of employment adjustment subsidies program	Each eligible firm receives the amount calculated by multiplying the number of days of store/office closure and the amount of daily leave allowance where the subsidy rate is 100%. The number of days of store/office closure is calculated by multiplying the average number of business days (120 days) in the target period and the firm's simulated reduction of personnel expenses. The amount of daily leave allowance is calculated by using actual records of personnel expenses, the average number of business days in a year (240 days), and the allowance rate (assumed to be 0.6), but the upper limit of the amount is 15 thousand yen times the number of firm employees.
Effectively interest-free loans through government-affiliated and private financial institutions	Each eligible firm borrows the amount of the simulated deficit of operating CF less the aggregated amount of subsidies above. The upper limit is 40 million yen.

Note: These assumptions are based on information as at June 12 when the second supplementary budget was enacted.
Source: Cabinet Office; Financial Services Agency; Ministry of Economy, Trade and Industry; Ministry of Finance; Ministry of Health, Labour and Welfare.

It is assumed that SMEs can receive the full amount of cash payments available based on the formula (Chart IV-1-21).[17] In addition, it is also assumed that SMEs can obtain a loan of up to 40 million yen from a government-affiliated or private financial institution, when the firms are expected to face potential cash shortages even after receiving cash payments.[18]

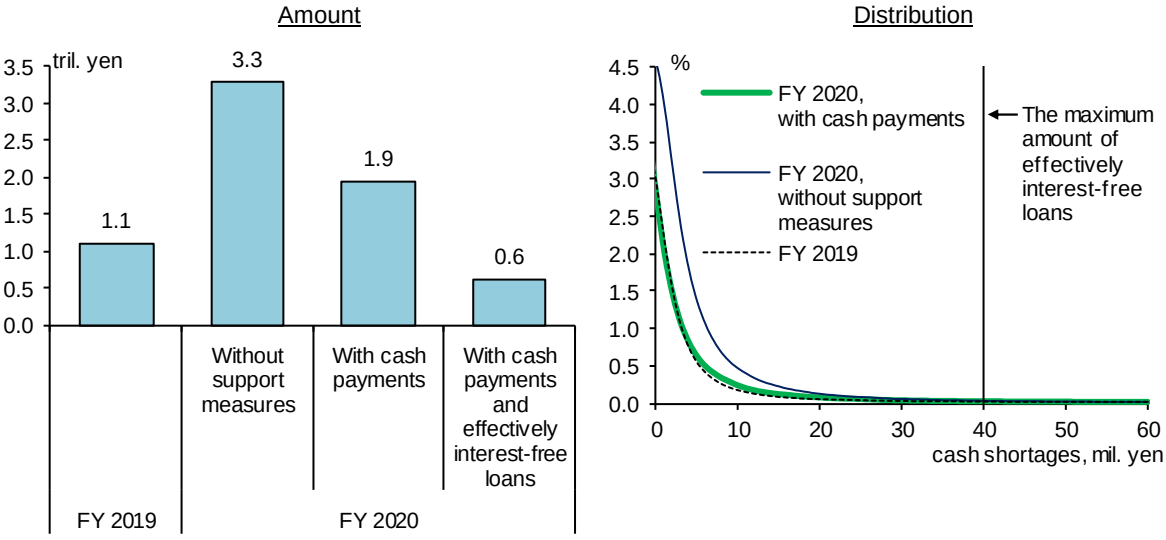
[17] The calculation of the available amount of cash payments is based on information as at the enactment of the second supplementary budget. Therefore, additional measures taken afterward, such as the payout of subsidies for sustaining businesses from contingency funds for COVID-19 and the extension of the expansion of the employment adjustment subsidies program were not incorporated.

[18] For short-term loans that are due within one year, it is assumed that repayment of the entire principal is deferred.

c. Simulation results

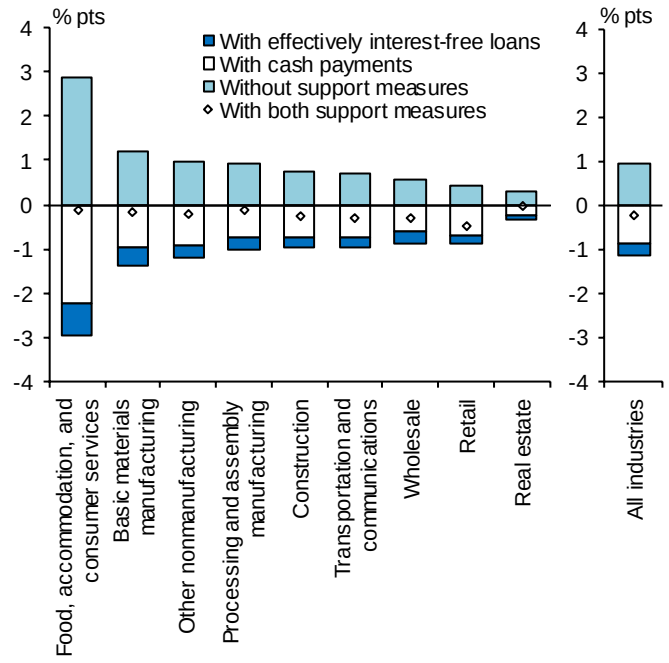
Based on the above assumptions, the simulation results suggest that SMEs' potential cash shortages increase by a total of about 2.2 trillion yen compared to fiscal 2019 due to the spread of COVID-19. This amount falls below the scale of available cash payments. Moreover, among those firms that face cash shortages even after receiving cash payments, the share of firms that cannot resolve their cash shortages with the help of effectively interest-free loans is limited (Chart IV-1-22). These findings are consistent with the fact that, despite the severe stress on the sales of SMEs in general, a sharp rise in defaults has so far been avoided compared to other stress events such as the GFC.

Chart IV-1-22: Impact of support measures on cash shortages (SMEs)



Next, the industry-level PD model is estimated to quantify the impact on the PD of potential cash shortages due to the spread of COVID-19, as well as the impact of the support measures that are expected to suppress a rise in the PD (for details of the model, see Box 4).

Chart IV-1-23: Impact on PD by industry (SMEs)



Note: "With both support measures" indicates the deviation of PD from the baseline (without shock) simulation. "With effectively interest-free loans" takes into consideration additional loans (up to a maximum total of 40 million yen) for firms facing cash shortages even if they receive cash payments. Borrowings that exceed the cash shortage are not taken into account.

The estimation results suggest that for food, accommodation, and consumer services, which have been experiencing the most severe liquidity stress and in which there are many firms that have less cash reserves than firms in other industries, the PD increases by around 3 percentage points, if there had been no support measures. The level of the PD could have reached considerably higher than the peak reached during the GFC of about 2 percentage points. As for other industries, the PD increases by around 1 percentage point without any support measures even in the industries where firms experience relatively severe stress (Chart IV-1-23).

Looking at the impact of the support measures in terms of suppressing a rise in the PD, the results show that the support measures during this period almost fully offset any upward pressure on the PD caused by liquidity stress, including for food, accommodation, and consumer services, which have been experiencing the most severe stress (Chart IV-1-23). Looking at a breakdown of the impact of the support measures, cash payments substantially contribute to the elimination of the cash shortages generated by the decline in sales in the current fiscal year assumed in the analysis here. If firms increase their borrowing, their financial leverage deteriorates and their future repayment burden increases; however, they can avoid such a situation to a considerable degree by making use of the cash payment program.

3. Caveats

There are several important caveats regarding the interpretation of the above analysis.

First, the forecast of the future sales decline is subject to considerable uncertainty, since the forecast depends on developments in the spread of COVID-19 and the size of their impact on the Japanese and overseas economies. If the severity of the economic downturn exceeds the level indicated the current private-sector forecasts on which the simulation is built, and the sales decline is greater than assumed here, the sectors that experience tighter financing may increase and the impact may broaden, potentially giving rise to additional effects through inter-firm credit networks, such as chain bankruptcies.[19] Moreover, since the simulation is conducted on rather bold assumptions about the measures to support corporate financing as outlined above, the estimates of the quantitative impact of the measures need to be interpreted with a certain margin of error.

If the impact of the spread of the disease becomes more severe and prolonged, there is a risk that bankruptcies and defaults may increase among firms for which financial institutions have been actively taking risks, such as middle-risk firms and rental real estate businesses. It is thus necessary to closely monitor future developments. It is also necessary to pay attention to the possibility that defaults of large firms, even if limited in number, may have a severe impact on financial institutions' credit costs, as such defaults could cause large losses.

Second, for simplicity, it is assumed that SMEs in the same industry experience the same magnitude of decline in sales (for large firms, current forecasts for individual firms are used). For firms facing more severe stress than the average firm in the same industry, the negative impact on their liquidity and capital is likely to be more severe than assumed in the analysis. Moreover, the assumptions regarding firms' cost elasticities are based on the data previously observed. Since firms are facing unprecedented acute stress, it may be difficult for them to take the type of cost-cutting measures suggested by past averages. Meanwhile, since the PD model is estimated based on observations that include those in normal times, the estimated response of default rates

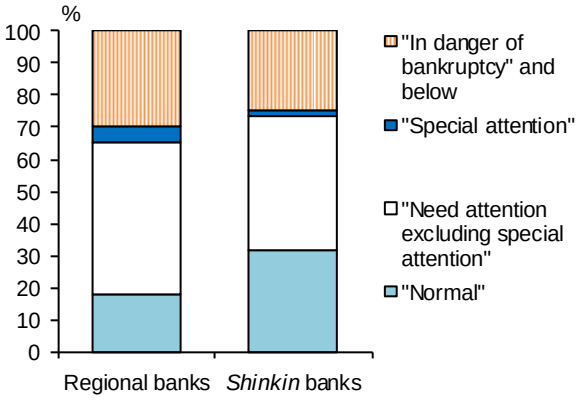
[19] Another possible channel is where a large firm's capital may be affected through the impairment of goodwill if a firm acquired by the large firm sees a decline in profits due to the spread of the disease. However, this channel is not considered in the simulation here.

represents the average of that in normal times and times of stress. It should be noted that the estimation does not exclusively focus on the responses in times of stress.

Third, the analysis focuses on firms' liquidity during the current fiscal year only. Firms that experience a decrease in sales and need to increase borrowing to compensate for dwindling cash reserves will see a deterioration in their financial leverage and an increase in their future repayment burden. This is not a major problem if their sales recover in the future. However, if sales remain sluggish and firms cannot make up for the lost sales in the future, then even if they can avoid liquidity problems in the short term, their creditworthiness will suffer in the medium to long term. Given the extremely high uncertainty regarding the future course of COVID-19 and economic developments, it is very difficult for financial institutions -- which need to deal with firms' liquidity issues, and do so in a timely manner -- to make credit decisions by carefully examining in each individual case whether a firm's sales are likely to recover in the future.

These difficulties can already be seen in, for example, the survey of regional financial institutions regarding the characteristics of firms whose lending conditions have been revised since the COVID-19 outbreak. The survey indicates that borrowers classified as "in danger of bankruptcy" and below make up a certain share among those whose lending conditions have been revised (Chart IV-1-24). While regional financial institutions are currently making every effort to provide financing support to firms, how to manage the credit risk associated with borrowers whose lending conditions have been revised may become an issue in the future.

Chart IV-1-24: Composition of firms with restructured loans by borrower classification



Note: A survey on credit costs conducted in fiscal 2020. The chart aggregates firms with restructured loans that were requested after March 10, 2020 (as at end-June 2020).
Source: BOJ.

Fourth, due to analytical limitations and simplifications, the simulation here cannot fully reflect the divergence in severity that individual SMEs face. In reality, demand recovery may not be realistic for all firms and in fact some of them have decided to go out of business.

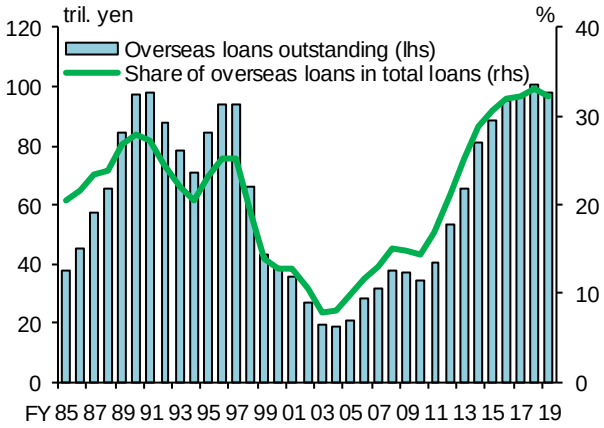
For the time being, it is necessary to carefully monitor the business conditions of SMEs and corporate financing, while taking into account these caveats.

B. Overseas credit risk

Japanese banks' overseas lending, most of which is by major banks, has increased since the GFC, and both loans outstanding and the share that overseas loans account for in loan portfolios overall remain near record levels from a long-term perspective (Chart IV-2-1). Regarding overseas loans, Japanese banks have been shifting their focus from increasing lending volumes to increasing profitability. As the spread of COVID-19 is currently exerting strong downward pressure on the

global economy, in the current phase, credit risk related to overseas lending demands even more vigilance than before.

Chart IV-2-1: Overseas loans outstanding of major banks



Source: BOJ.

As mentioned earlier, the quality of Japanese banks' overseas loan portfolios has remained high on the whole, with investment-grade loans (rated BBB and above) accounting for about 70 percent of the total (Chart III-1-21). At the same time, however, as it has been pointed out to date, there are issues that require attention in financial institutions' risk management, such as the acceleration of growth in leveraged loans, which have relatively low creditworthiness, and the low credit ratings of many natural resource- and energy-related project finance loans as well as object finance loans for the acquisition of vessels and aircraft.[20]

It is increasingly clear that the impacts of the spread of COVID-19 on firms' financial soundness both at home and abroad vary across industries and regions. This section therefore provides an overview of the characteristics of the overseas lending of Japanese banks (the three major banks) by industry, region, and type of loan through comparison with the loan portfolios of their overseas counterparts. This section then documents the impacts of the spread of the disease on borrowers' creditworthiness to demonstrate the implications for Japanese banks' credit risk associated with overseas loans, and issues that warrant particular attention going forward in considering the credit risk associated with large overseas borrowers.

Japanese banks' overseas loans by industry, region, and type of loan

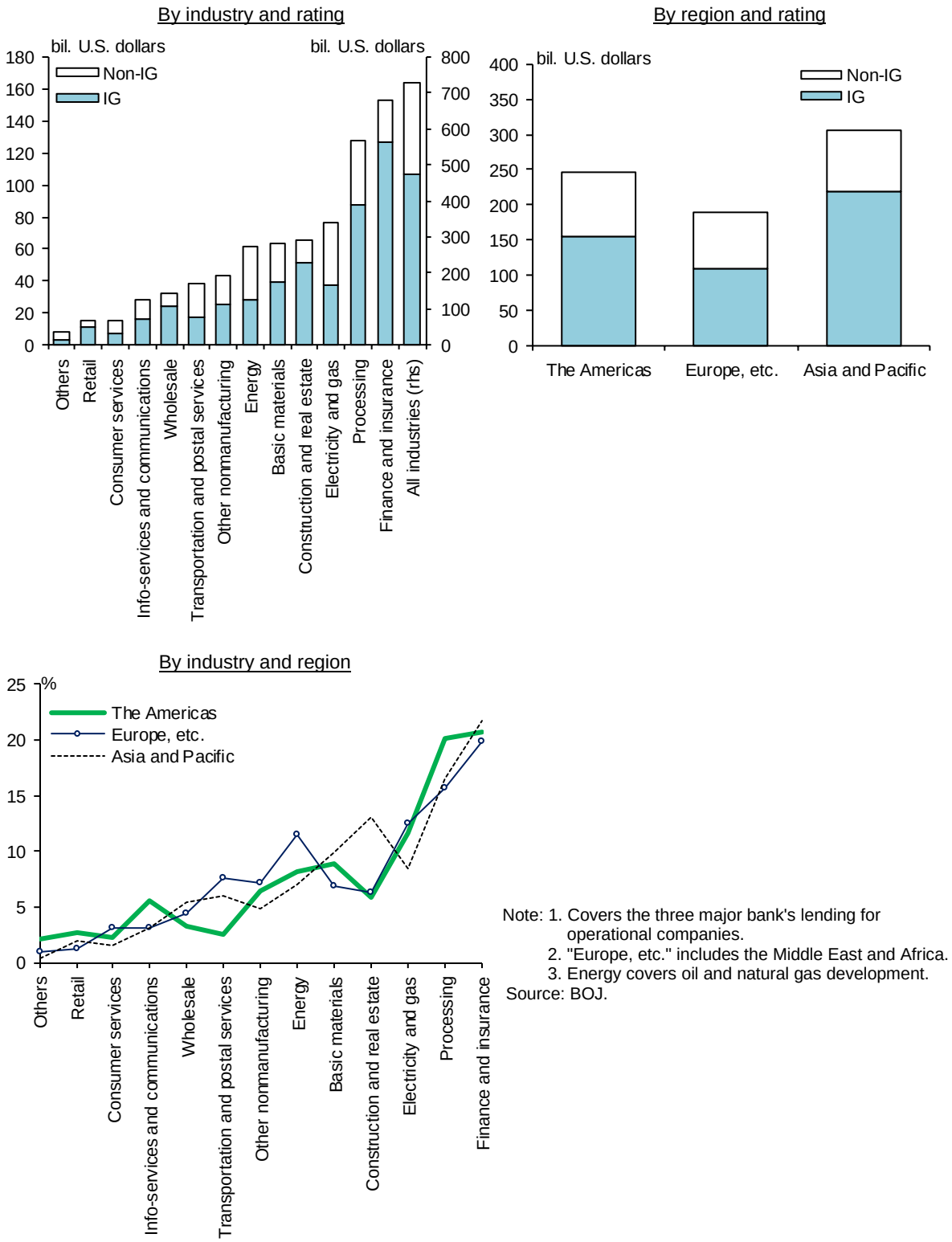
To start with, an overview of Japanese banks' overseas loans by industry, region, and type of loan is provided. Beginning with loans by industry, loans to firms in the finance and insurance industry make up the largest amount of loans outstanding, followed by those to firms in the processing manufacturing and electricity and gas industries. The lending volume is relatively small to firms in retail, consumer services, and transportation and postal services, which are likely to have been directly affected by preventive measures against the spread of COVID-19. The share of loans to non-investment-grade firms ("non-IG share" hereafter), which are relatively vulnerable to an economic downturn, by industry shows that the share of transportation and postal services, which have been directly affected by the preventive measures, and the share of the energy sector, which has been affected by the fall in crude oil prices, are relatively high (Chart IV-2-2).

By region, loans to Asia and the Americas make up large shares, while those to Europe, including

[20] For details, see Financial System and Bank Examination Department of the Bank of Japan and Supervision Bureau of the Financial Services Agency, "Developments in Overseas Credit Investment and Lending by Japanese Financial Institutions: An Overview Based on the Joint Survey by the Bank of Japan and the Financial Services Agency," *Bank of Japan Review Series*, no. 20-E-2, June 2020.

the Middle East, make up a slightly smaller share. Turning to the non-IG share by region, the share of loans to Asia is relatively low. While there are no major differences in the industry composition of loans across regions, loans to the processing manufacturing industry in the Americas, the energy industry in Europe, including the Middle East, and the construction and real estate industry in Asia make up a relatively high share.

Chart IV-2-2: Overseas loans outstanding by credit rating, industry, and region

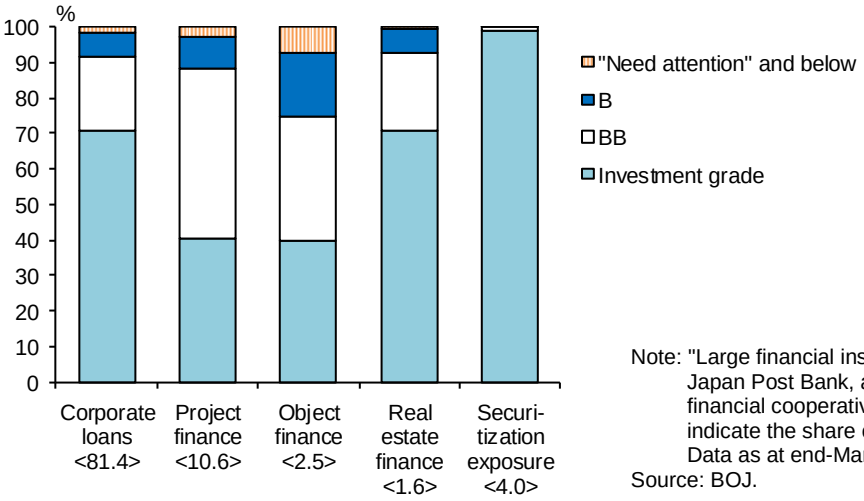


Note: 1. Covers the three major bank's lending for operational companies.
2. "Europe, etc." includes the Middle East and Africa.
3. Energy covers oil and natural gas development.
Source: BOJ.

By type of loan, corporate loans account for 80 percent of the total. Looking at the non-IG share by

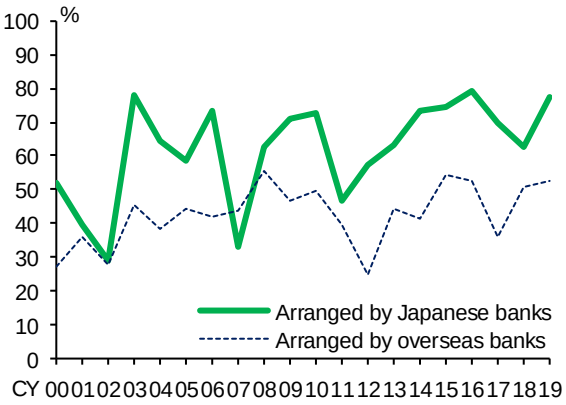
type of loan, the non-IG shares for project and object finance loans are higher than that for corporate loans (Chart IV-2-3). The industry composition of project and object finance loans shows that in project finance, natural resource- and energy-related loans, and in object finance, loans for aircraft, make up about half of the total (Chart IV-2-4).

Chart IV-2-3: Composition of overseas loans by type of product and credit rating among large financial institutions



Note: "Large financial institutions" includes major banks, Japan Post Bank, and a central organization of financial cooperatives. The figures in parentheses indicate the share of the respective product types. Data as at end-March 2020.
Source: BOJ.

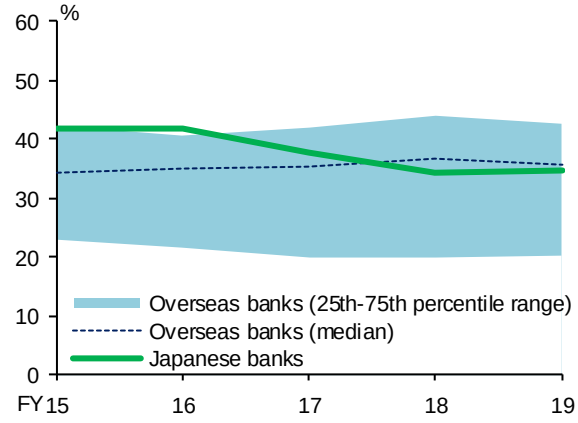
Chart IV-2-4: Share of energy-related projects in project finance



Note: 1. Calculated based on the outstanding amount of the deals at the time of origination.
2. "Arranged by Japanese banks" means project finance which were arranged by the three major banks, and "Arranged by overseas banks" are the rest.
Source: Dealogic.

Comparison with major overseas banks

Chart IV-2-5: Non-IG ratio of Japanese banks' overseas lending and overseas banks' lending

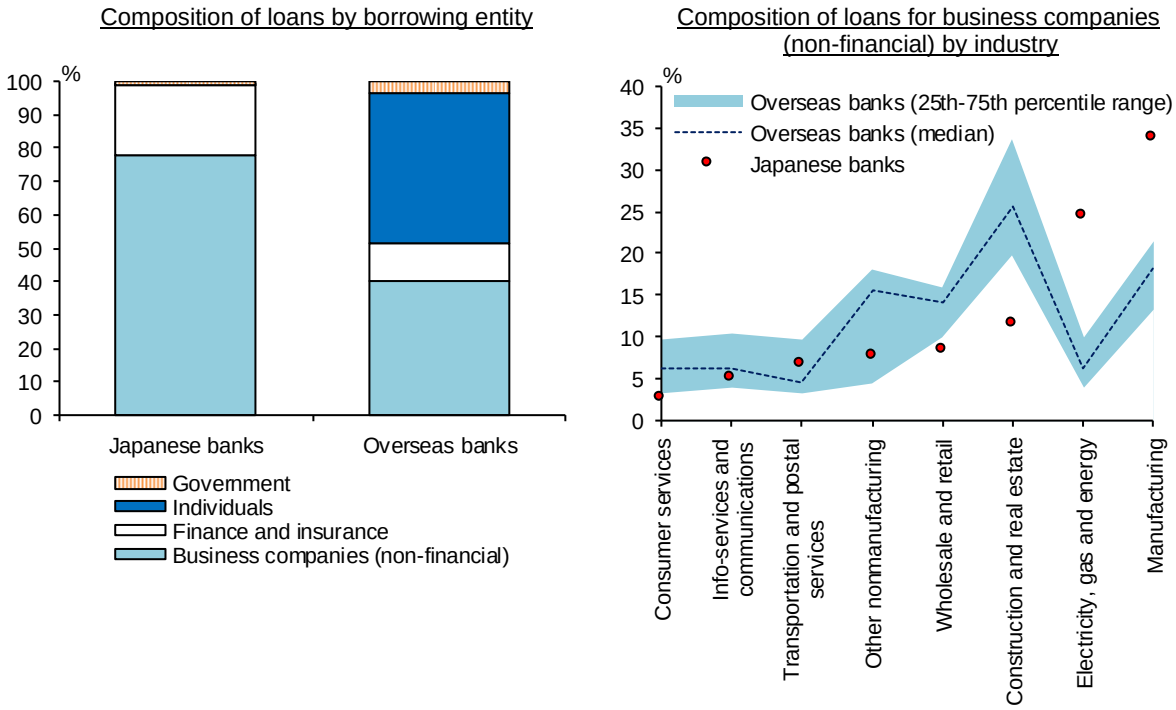


Note: 1. Basically, covers lending for business companies.
2. "Japanese banks" covers the three major banks. "Overseas banks" covers the following 23 G-SIBs with outstanding loans listed by rating in their disclosures: Banco Santander, Bank of America, Bank of New York Mellon, Barclays, BNP Paribas, BPCE, Citigroup, Crédit Agricole, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, ING, JPMorgan Chase, Morgan Stanley, Royal Bank of Canada, Société Générale, Standard Chartered, State Street, Toronto Dominion Bank, UBS, Uni Credit and Wells Fargo.
Source: Published account of each bank; BOJ.

Next, the characteristics of Japanese banks' overseas corporate loan portfolios are examined by comparing their loan portfolios with those of overseas G-SIBs. Regarding the non-IG share in overall corporate loans, the share for Japanese banks has been generally in line with the median of overseas banks, suggesting that Japanese banks do not seem to have a larger share of non-IG loans than overseas banks (Chart IV-2-5).

Meanwhile, a comparison of the industry breakdown of corporate loans (to nonfinancial corporations) shows that, for Japanese banks, overseas loans to firms in manufacturing as well as electricity, gas, and energy account for a larger share than for overseas banks, while loans to firms in construction and real estate, consumer services, and wholesale and retail account for a smaller share (Chart IV-2-6).

Chart IV-2-6: Composition of loans by industry



Note: 1. "Japanese banks" covers the three major banks. "Overseas banks" covers the following 14 G-SIBs with outstanding loans listed by industry in their disclosures: Bank of America, BNP Paribas, Crédit Agricole, Credit Suisse, Deutsche Bank, HSBC, ING, JPMorgan Chase, Morgan Stanley, Royal Bank of Canada, Standard Chartered, Toronto Dominion Bank, UBS and Wells Fargo.
2. Energy covers oil and natural gas development.
Source: Published accounts of each bank; BOJ.

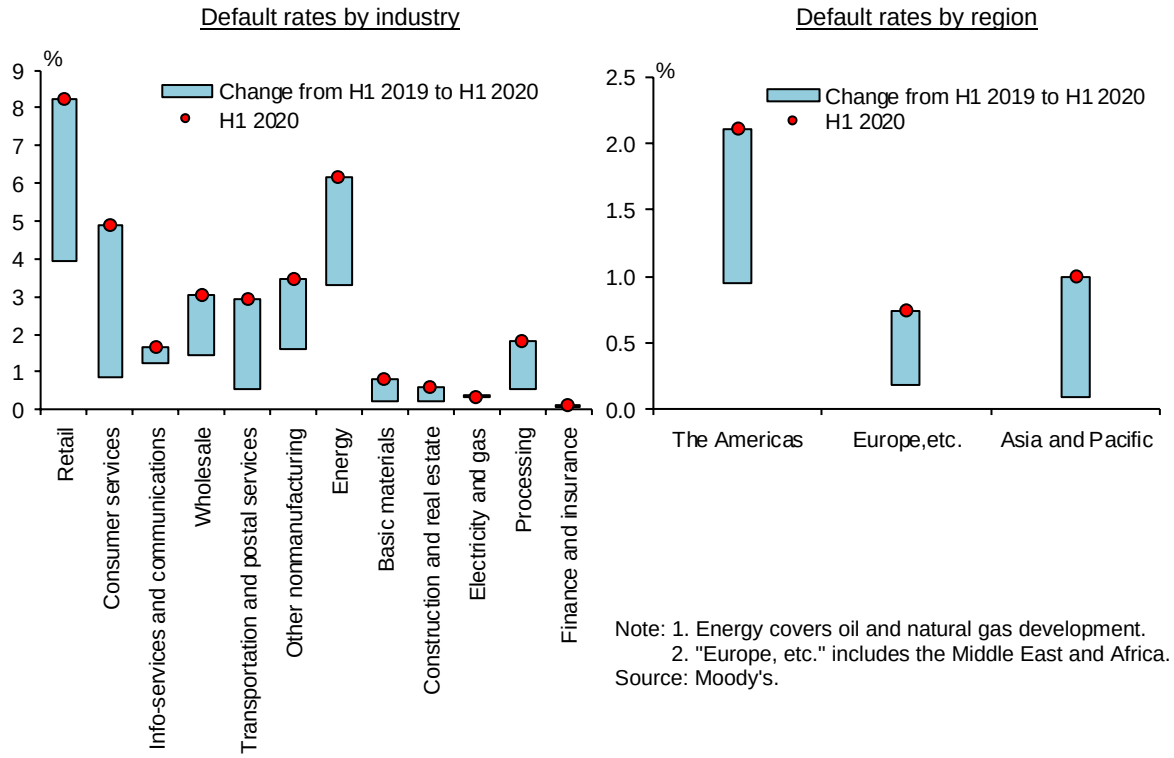
Impact of the spread of COVID-19 on the overseas loan portfolios of Japanese banks

Next, the impact of the spread of COVID-19 on the credit risk associated with the overseas loan lending portfolios of Japanese banks is examined. The data on the recent corporate bond default rates and earnings for the first half of 2020 (January to June), which includes the period since the spread of COVID-19, are analyzed first. Then, the data related to the credit quality of project finance loans and object finance loans are analyzed.

Corporate bond default rates increased from the first half of 2019 to the first half of 2020, particularly in retail (especially clothing, etc.) and consumer services, which were hit hard by the preventive measures against the spread of the disease, as well as energy, which was affected by the drop in crude oil prices (left panel of Chart IV-2-7). By region, corporate bond default rates have risen mainly in the Americas (right panel of Chart IV-2-7). Looking at the relationship between these

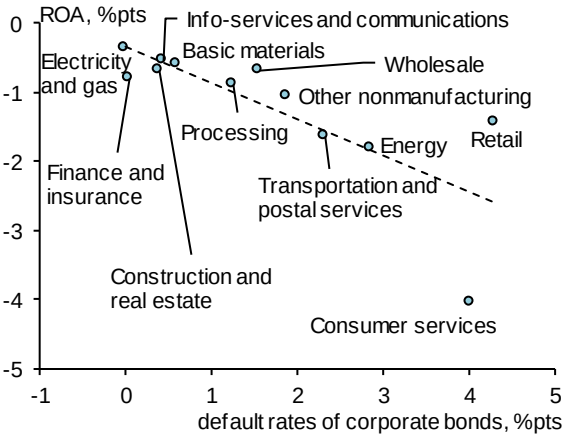
changes in corporate bond default rates and changes in firms' return on assets (ROA), the larger the decrease in ROA in an industry, the larger the increase in corporate bond default rates tends to be. This suggests a close link between a deterioration in profitability due to the spread of the disease and a decline in firms' creditworthiness (Chart IV-2-8).

Chart IV-2-7: Default rates by industry and region



Note: 1. Energy covers oil and natural gas development.
2. "Europe, etc." includes the Middle East and Africa.
Source: Moody's.

Chart IV-2-8: Changes in default rates and ROA



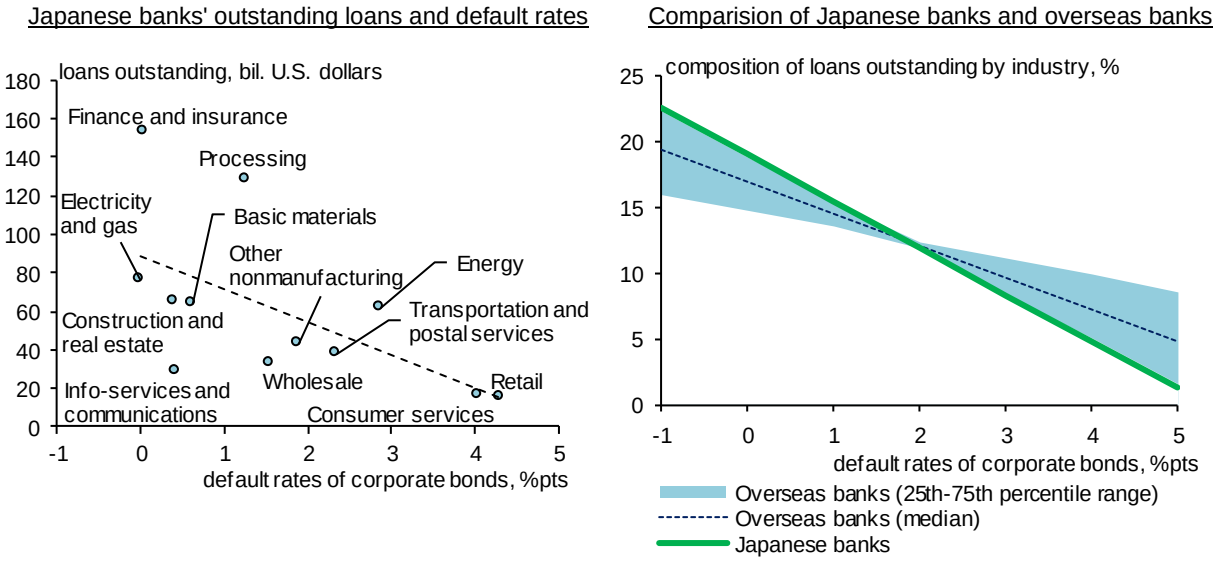
Note: The default rates of corporate bonds and ROA are the changes from H1 2019 to H1 2020.
Source: Moody's; S&P Global Market Intelligence.

On the other hand, a negative correlation can be found in the relationship between the size of changes in corporate bond default rates by industry in the first half of 2020 and Japanese banks' loans outstanding by industry as of the end of March 2020 (left panel of Chart IV-2-9). This suggests that the larger the impact of the spread of the disease on firms' creditworthiness in a particular industry, the smaller the share of that industry in Japanese banks' overseas corporate loans.

Although the same pattern is observed for overseas banks, the pattern is more pronounced for Japanese banks: i.e., industries in which the spread of the disease had a large impact on firms' creditworthiness make up a smaller share of corporate loans (right panel of Chart IV-2-9). These

findings suggest that the creditworthiness of Japanese banks' overseas corporate loan portfolios is less influenced by the spread than their overseas counterparts.

Chart IV-2-9: Outstanding loans and default rates by industry



Note: 1. The default rates of corporate bonds are the changes from H1 2019 to H1 2020.
2. The left-hand chart covers the three major banks. Loans outstanding as at end-March 2020.
3. "Overseas banks" in the right-hand chart covers G-SIBs with outstanding loans listed by industry in their disclosures (the same as in Figure IV-2-6). "Japanese banks" in the figure is the linear regression line of corporate bond default rates against the composition of loans outstanding by industry of the three major banks (corresponding to the dotted lines in the left-hand chart). "Overseas banks (median)" and "Overseas banks (25th-75th percentile range)" are the median and 25th-75th percentile range of the linear regression line for each overseas bank, respectively.
Source: Moody's; published accounts of each bank; BOJ.

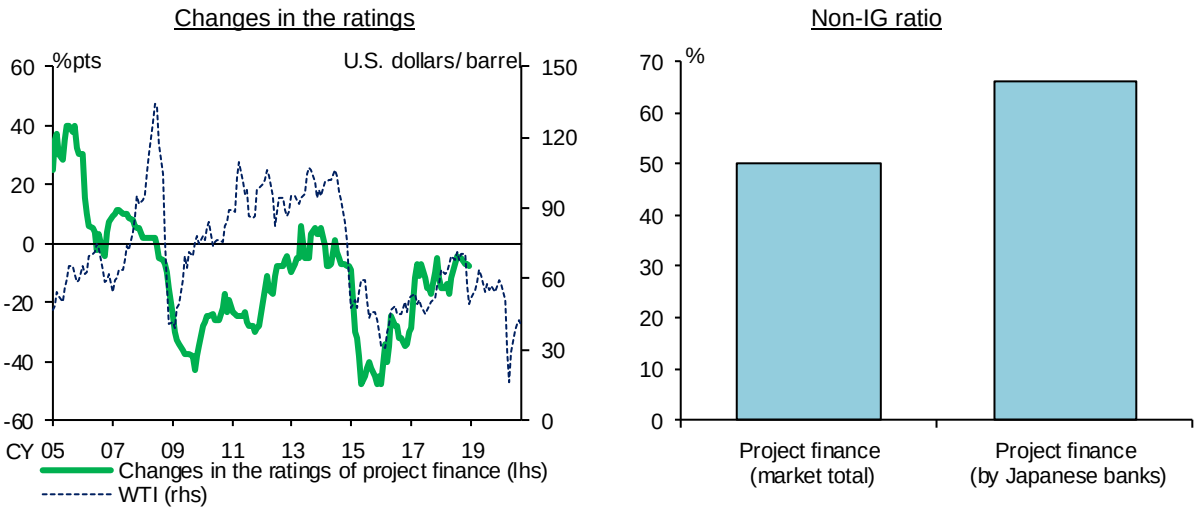
However, the above assessment is applicable only for the most recent period based on corporate bond default rates and earnings data by industry for the first half of 2020, and the creditworthiness of Japanese banks' overseas corporate loan portfolios may not necessarily continue to be less likely to be affected than those of their overseas counterparts. In the past recessions, there were cases where industries were only slightly affected at the time a shock occurred but were substantially impacted by the subsequent developments. In assessing the credit risk associated with Japanese banks' overseas lending, close attention needs to be paid to developments in firms' business performance if the spread of the disease continues, particularly in industries accounting for a large amount of loans outstanding.

Next, Japanese banks' loans for natural resource- and energy-related project financing are examined. Changes in the rating of energy-related project finance loans (the difference between the number of upgrades and downgrades) shows that there were major downgrades when crude oil prices fell sharply in 2009 and 2015 (left panel of Chart IV-2-10). Crude oil prices have plummeted since the beginning of 2020, and although they have recently recovered slightly, they remain sluggish. The non-IG share of Japanese banks' resource- and energy-related project finance loans is higher than that of the market overall. If crude oil prices remain sluggish, there is a risk that firms' creditworthiness will deteriorate further, especially in projects with relatively high costs for exploration, extraction, and refining and weak ability to generate cash flow (right panel of Chart IV-2-10).

Finally, aircraft-related object financing is examined. Conventionally, the creditworthiness of aircraft-related object finance loans tends to be relatively stable even when the creditworthiness of air transportation-related companies, as seen at present, deteriorates significantly (Chart IV-2-11). The reason is, on one hand, the credit risk associated with aircraft leasing object finance loans is

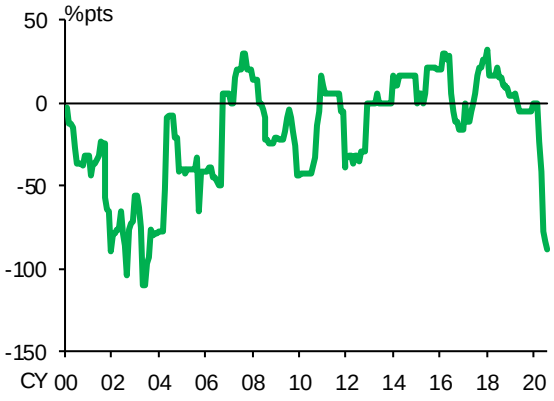
determined essentially by global demand for air transportation services, given that aircraft are used as collateral in general. Even if demand for air transportation services falls in a particular region or the creditworthiness of a particular airline falls, aircraft can be leased in other regions and to other airlines. The creditworthiness of air transportation-related companies, on the other hand, is also affected by factors other than the demand for air transportation services, such as a surge in fuel or labor costs.

Chart IV-2-10: Changes in ratings and non-IG ratio of energy-related project finance



Note: 1. Latest data for "Changes in the ratings of project finance" and "WTI" in the left-hand chart are as at December 2018 and September 2020, respectively.
2. Japanese banks in the right-hand chart covers the three major banks. The non-IG ratio for the market total and for that by the Japanese banks are as at end-2018 and as at end-March 2020, respectively.
3. The changes in ratings are calculated by subtracting the total number of notches downgraded per project divided by the number of projects from the total number of notches upgraded per project divided by the number of projects over the past year, and then multiplying by 100.
Source: EIA; Moody's; BOJ.

Chart IV-2-11: Changes in corporate loan ratings of air transportation-related firms

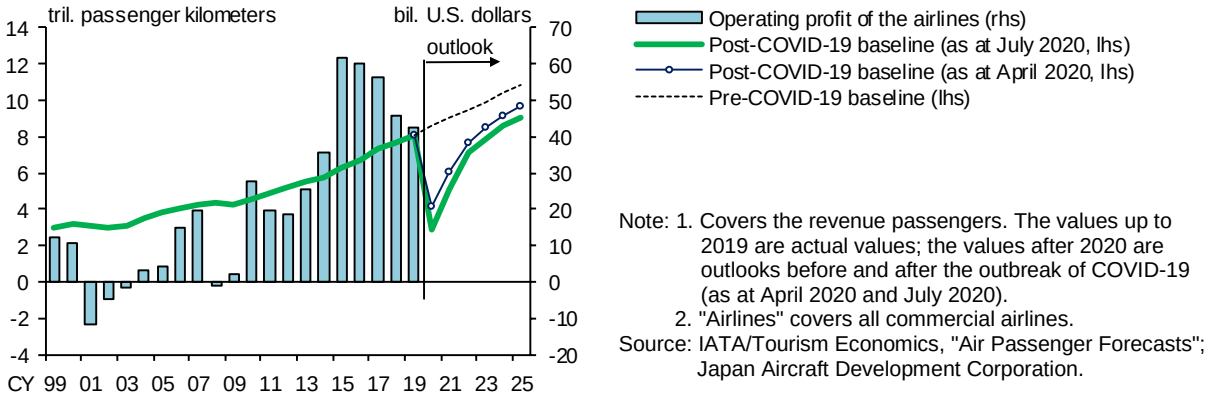


Note: The changes in ratings is calculated by subtracting the total number of notches downgraded per firm divided by the number of firms from the total number of notches upgraded per firm divided by the number of firms over the past year, and then multiplying by 100. Latest data as at end of July-2020.
Source: Moody's.

Demand for air transportation services grew steadily for a long time except for the flat demand observed in periods such as in the wake of the 9/11 terrorist attacks in the United States and during the GFC. The spread of COVID-19 has significantly pushed down the outlook for air transportation demand globally on an unprecedented scale. The outlook for air transportation services as of July 2020 was revised further downward from that as of April 2020 (Chart IV-2-12). The fundamentals that underpinned the creditworthiness of these object finance loans, i.e., a steady increase in global demand for air transportation services, have eroded. Under these circumstances, bankruptcies and government bailouts of overseas air transportation-related firms have been seen. Thus, attention

needs to be paid to the possibility that the creditworthiness of aircraft-related object financing is affected by the delayed recovery of global demand through the fall in aircraft prices, which are highly dependent on the model and age of the aircraft, and leasing fees.

Chart IV-2-12: Trends and outlook of demand for air transportation



Note: 1. Covers the revenue passengers. The values up to 2019 are actual values; the values after 2020 are outlooks before and after the outbreak of COVID-19 (as at April 2020 and July 2020).
2. "Airlines" covers all commercial airlines.
Source: IATA/Tourism Economics, "Air Passenger Forecasts"; Japan Aircraft Development Corporation.

Japanese banks' credit risk associated with large borrowers

As seen above, the amount of Japanese banks' overseas corporate loans outstanding to industries in which default rates have risen substantially is quite small, and so far, the impact of the spread of the disease on Japanese banks seems to have been relatively limited compared to major overseas banks. However, since the impact of the spread of the disease appears to differ greatly from firm to firm even within the same industry, this section examines the risk profiles of large overseas borrowers of Japanese banks using matched financial data (see Box 5 for details). Specifically, firms' debt servicing capacity, as measured by the interest coverage ratio (ICR), and the stress resilience of their working capital availability, as measured by the ratio of current assets and current liabilities (current ratio), are examined by comparing them with the medians of those of firms in the same industry.

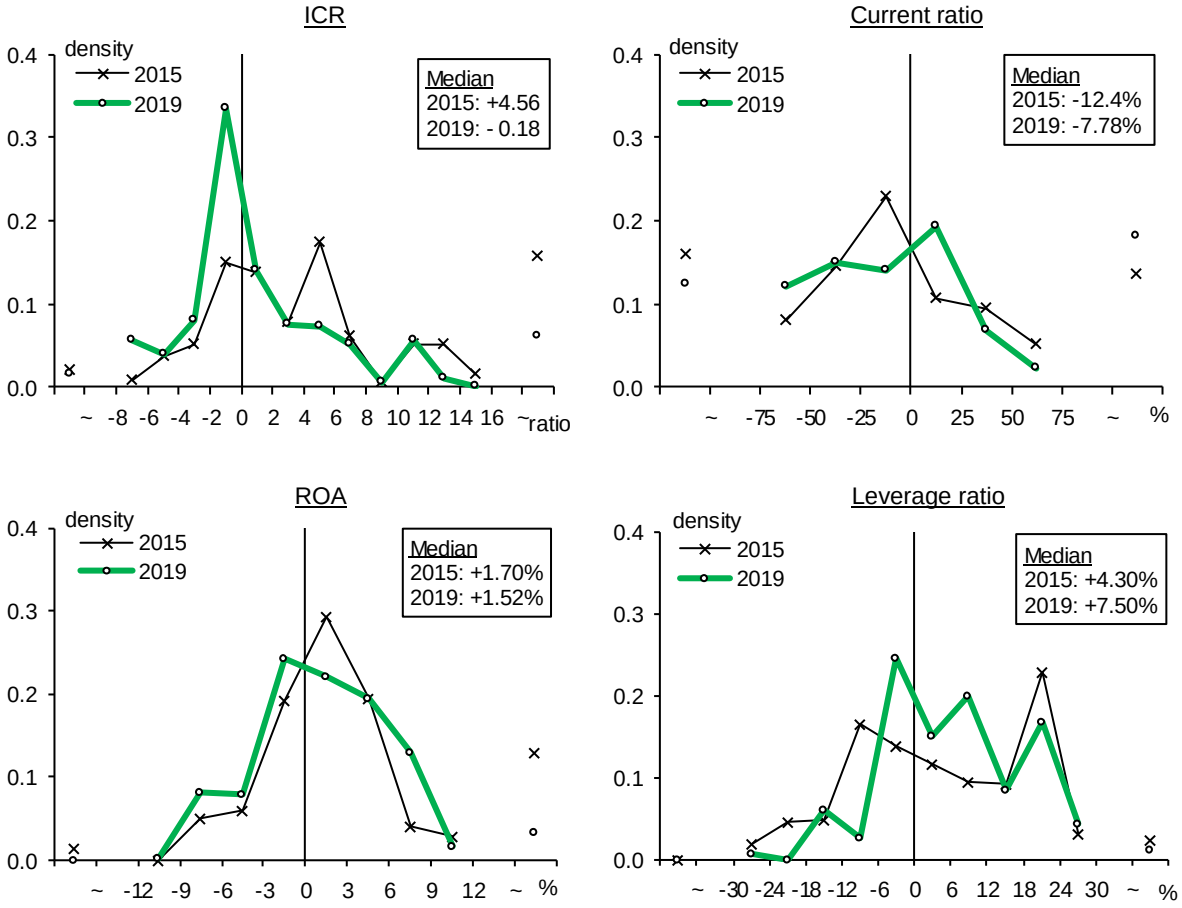
The results indicate that Japanese banks' large overseas borrowers currently tend to have a slightly lower ICR and a lower current ratio than their medians of firms in the same industry. Decomposing the ICR into its components shows that both their ROA, an indicator of their profitability, and their leverage ratio, an indicator of their financial leverage, are relatively high (their capital ratio is relatively low) (Chart IV-2-13).

Of these indicators, the ICR, the ROA, and the leverage ratio have been on a deteriorating trend in recent years. While, as mentioned above, the quality of Japanese banks' overseas loan portfolios on the whole remains high, the analysis here suggests that, as Japanese banks have expanded their overseas lending, the advantages of Japanese banks' large borrowers, namely, relatively high profitability and debt servicing capacity, has tended to gradually become less pronounced. In addition, looking at the current market outlook for future profitability, the assessment for Japanese banks' large overseas borrowers tends to be slightly more downbeat than that for other firms in the same industry (Chart IV-2-14).

This suggests that, as a result of the spread of the disease, the relatively high profitability of Japanese banks' large overseas borrowers, one of their advantages, may weaken further. This should be borne in mind when considering Japanese banks' overseas credit risks associated with their large borrowers. Moreover, in an environment where the Japanese and overseas economies have declined significantly and the recovery is expected to be gradual, the performance and

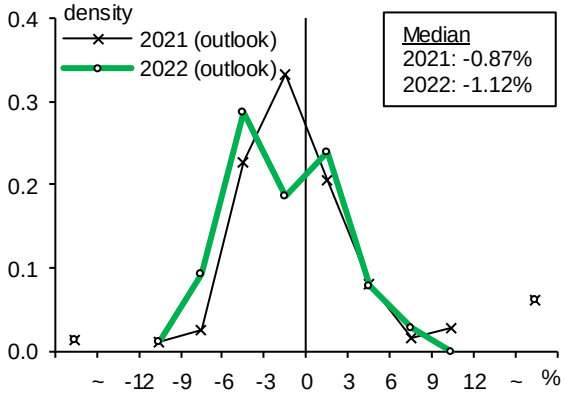
creditworthiness of those large borrowers whose profitability and financial soundness are materially inferior to their peers warrant greater attention.

Chart IV-2-13: Distributions of financial indicators of Japanese banks' large borrowers (2015 and 2019)



Note: 1. Covers the three major banks. Japanese banks' large borrowers are as at end-March 2020.
2. Each value represents the deviation from the median for the companies in the same industry.
Source: S&P Global Market Intelligence; BOJ.

Chart IV-2-14: Distributions of outlook of ROA of Japanese banks' large borrowers (2021 and 2022)



Note: 1. Covers the three major banks. Japanese banks' large borrowers are as at end-March 2020.
2. ROA represents the deviation from the median for the companies in the same industry.
3. Borrowers are limited to companies for which future earnings (EBITDA) forecasts are available. Total assets are based on actual figures for the first half of 2020.
Source: S&P Global Market Intelligence; BOJ.

C. Market risk associated with securities investment

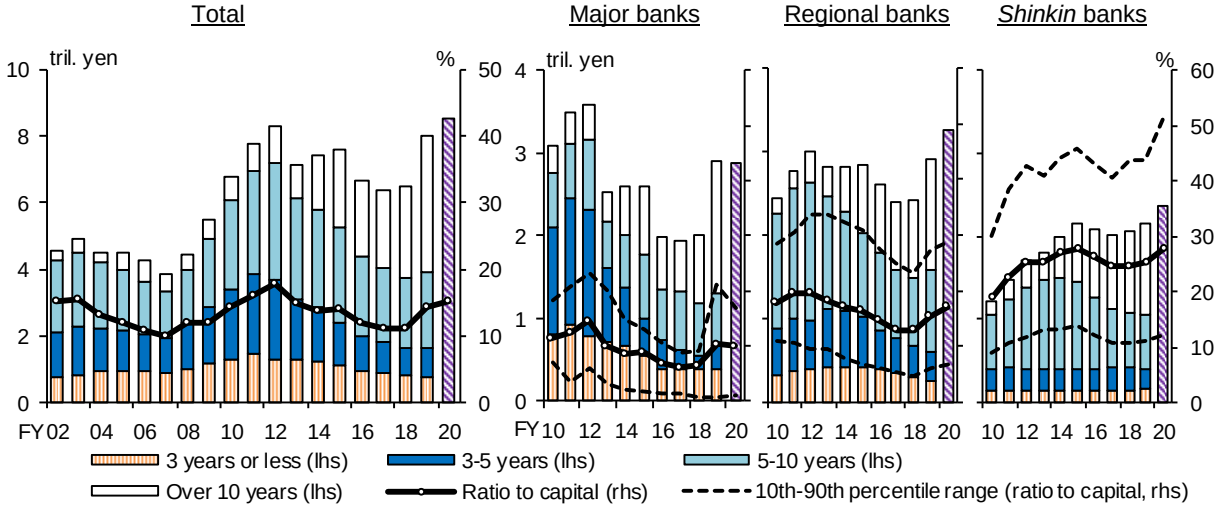
Under the prolonged low interest rate environment, Japanese financial institutions have been actively taking on market risk, particularly for overseas credit products and investment trusts, to secure profit margins. In the wake of the COVID-19 outbreak, tension in domestic and overseas

financial markets has temporarily heightened. So far, the impact of the market strains on Japanese financial institutions' overall realized gains/losses on securities holdings has been limited. This is because financial markets have regained some stability since April and because some financial institutions have had gains on sales of bonds due to the drop in overseas interest rates. Since the spread of the disease, financial institutions have become increasingly cautious about investing in overseas credit products and investment trusts. Therefore, major re-adjustments in financial markets can induce substantial losses since the outstanding amounts for these products are substantial. Against this background, this section examines market risk associated with securities investment.

Yen interest rate risk

The amount of interest rate risk associated with the yen-denominated bond investments of financial institutions had been declining after reaching a peak in fiscal 2012. However, it reverted to increase mainly due to the increase in the duration of bond portfolios under the continued low interest rate environment (Chart IV-3-1). [21] Although regional financial institutions in particular sold yen-denominated bonds to lock in gains as stock prices plunged until end-March 2020 due to the impact of COVID-19, the amount outstanding of financial institutions' yen-denominated bond investment has increased due partly to demand for collateral. The ratio of the amount of interest rate risk associated with yen-denominated bond investments to the amount of capital has been at around 10 percent for major banks, in the range of 15-20 percent for regional banks, and in the range of 25-30 percent for *shinkin* banks. Moreover, the heterogeneity in this ratio among financial institutions has been quite high for all types of banks.

Chart IV-3-1: Interest rate risk associated with yen-denominated bondholdings among financial institutions



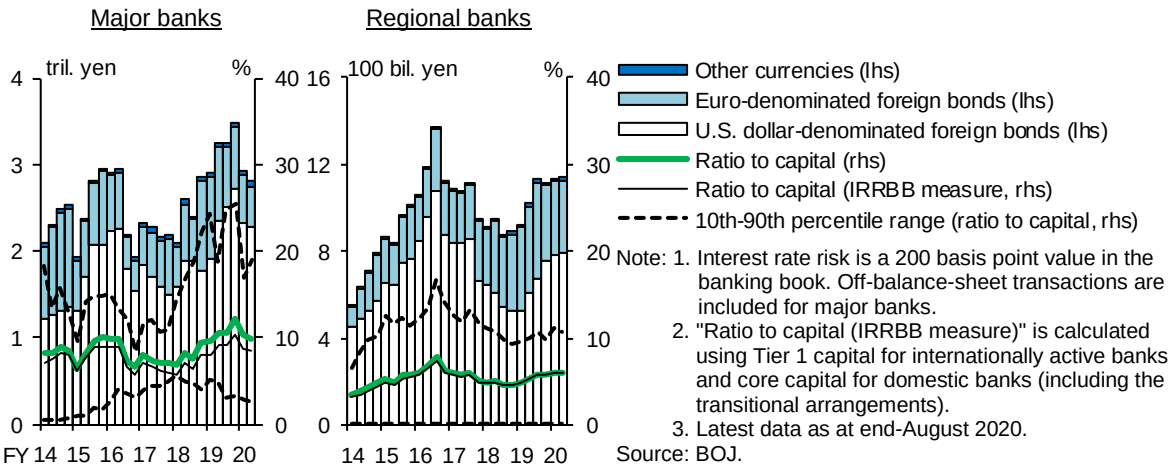
Note: 1. Interest rate risk is a 100 basis point value in the banking book. Convexity and higher order terms are taken into account. The data for fiscal 2020 are estimated as at end-August 2020.
2. Capital represents common equity Tier 1 (CET1) capital for internationally active banks from fiscal 2012 onward, core capital for domestic banks from fiscal 2013 onward, and Tier 1 capital for internationally active banks and domestic banks before fiscal 2012 and fiscal 2013, respectively (excluding the transitional arrangements related to the Basel III framework). Unless otherwise noted, subsequent charts are based on the same definition.
Source: BOJ.

[21] In Chart IV-3-1, changes in the economic value of bondholdings are calculated assuming a parallel shift in the yield curve in which the interest rates for all maturities rise by 1 percentage point. One of the interest rate risk scenarios assumed in the FSA's public notice about interest rate risk in the banking book (IRRBB) employs an upward parallel shift of 1 percentage point.

Foreign currency interest rate risk

The amount of interest rate risk associated with foreign currency-denominated bond investments by financial institutions has been on an uptrend on the whole, although it declined from March 2020 because major banks in particular sold such bonds to lock in gains in response to the fall in overseas interest rates. The ratio of the amount of interest rate risk associated with foreign currency-denominated bonds to the amount of capital has been limited to about 10 percent for major banks (Chart IV-3-2).[22] As for regional financial institutions, overseas interest rate risk is the main risk factor for about 25 percent of their investment trust holdings, as will be discussed later. Thus, it remains important for regional financial institutions to manage their foreign currency interest rate risk, including that associated with investment trusts (Chart IV-3-6).

Chart IV-3-2: 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.
2. "Ratio to capital (IRRBB measure)" is calculated using Tier 1 capital for internationally active banks and core capital for domestic banks (including the transitional arrangements).
3. Latest data as at end-August 2020.

Source: BOJ.

Market risk associated with stockholdings

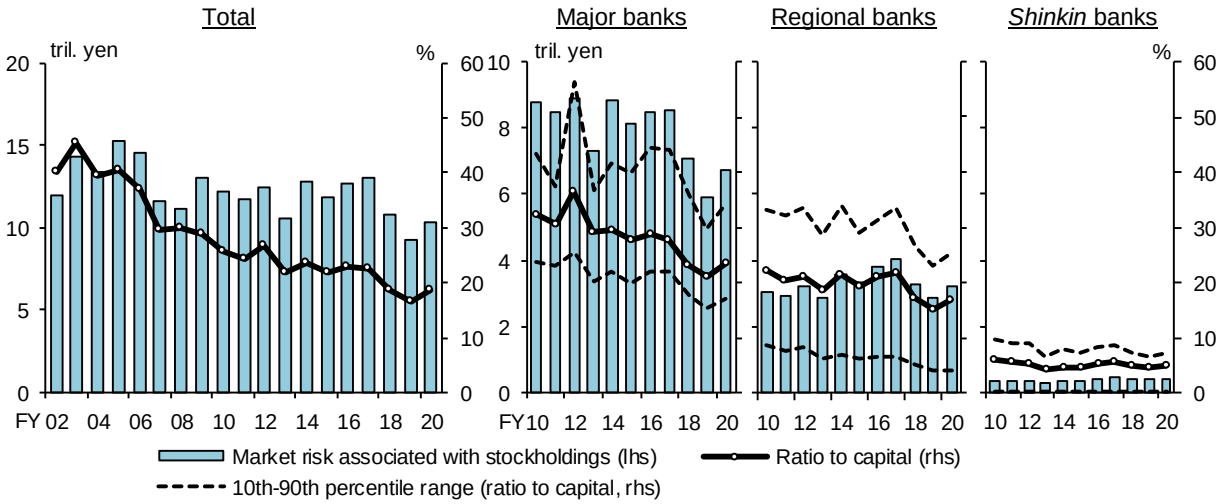
The amount of market risk associated with stockholdings has hovered around its lowest level since fiscal 2002 due to the gradual decline in financial institutions' exposure as a result of a reduction in strategic stockholdings. However, recently, it has increased somewhat due to the increased volatility in stock prices in the first half of 2020 (Charts IV-3-3 and IV-3-4).[23] The ratio of the amount of market risk associated with stockholdings to the amount of capital has been around 20 percent both for major banks and regional banks. Market risk associated with stockholdings thus remains at a level that is large enough to have a substantial impact on financial institutions' financial soundness and profits. As will be discussed in Chapter V, unrealized gains on stockholdings have declined at many financial institutions mainly due to the decline in stock prices at end-March 2020, and thus room for locking in gains has decreased for all types of banks. A further increase in market volatility can push up the market risk associated with stockholdings. Financial institutions need to make an objective assessment of the purpose and costs of strategic stockholdings and control their

[22] The FSA's public notice with regard to IRRBB sets an upward parallel shift as one of the scenarios for calculating interest rate risk, assuming the changes in the interest rates of the U.S. dollar and the euro to both be 2 percentage points. Similarly, the interest rate risk of foreign currency-denominated foreign bonds in Chart IV-3-2 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.

[23] In Chart IV-3-3, the market risk associated with stockholdings is calculated using VaR with a 99 percent confidence level and a 1-year holding period. Volatility is calculated based on the observed data of the past 5 years.

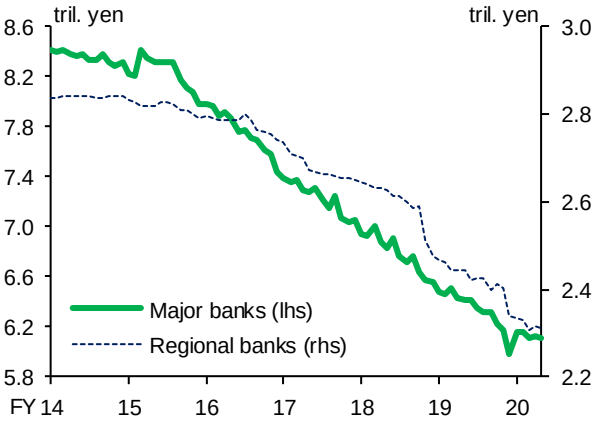
exposure to the market risk associated with stockholdings, including strategic stockholdings, within an appropriate range according to their financial soundness.

Chart IV-3-3: Market risk associated with stockholdings among financial institutions



Note: 1. "Market risk associated with stockholdings" is value-at-risk with a 99 percent confidence level and a 1-year holding period, and excludes risk associated with foreign currency-denominated stockholdings.
2. The data for fiscal 2020 are estimated using the outstanding amount of stockholdings as at end-August 2020 and stock prices up to end-August 2020.
Source: BOJ.

Chart IV-3-4: Strategic stockholdings among financial institutions



Note: Excludes stocks of subsidiaries and affiliated companies. Latest data as at end-August 2020.
Source: BOJ.

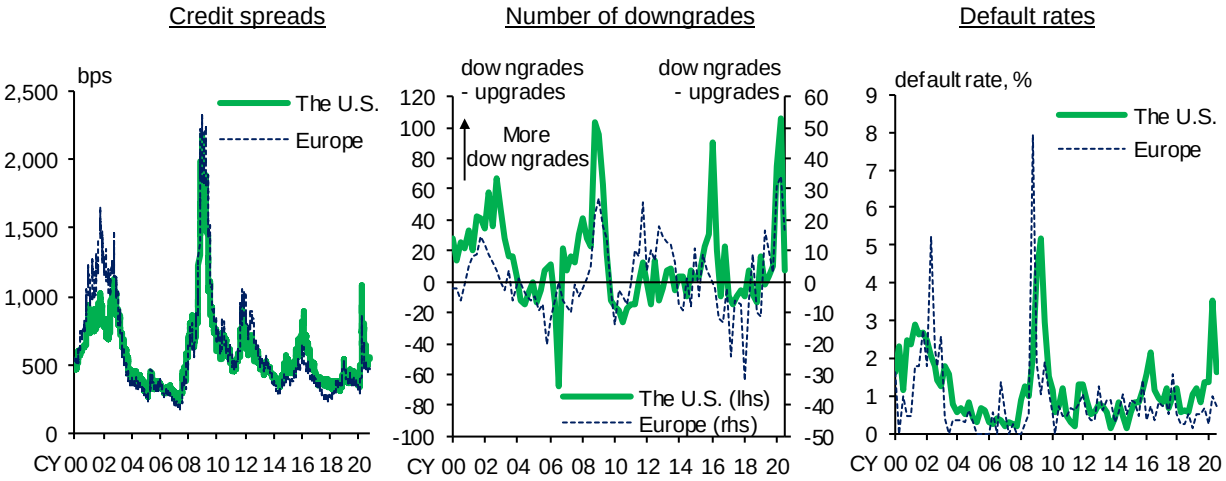
Risk associated with overseas credit product investment

Under the prolonged low interest rates in recent years, Japanese financial institutions, large financial institutions in particular, have become active in investing in overseas credit products, such as high-yield bonds and CLOs backed by leveraged loans. As discussed in Chapter II, overseas credit markets have recently started to regain stability, partly due to the positive impact of policy actions by governments and central banks, after undergoing large adjustments, including the sharp widening of credit spreads in mid-March 2020. In the financial results of large financial institutions, impairment losses and deterioration in unrealized gains/losses associated with their overseas credit product investment have been limited so far.

It should be noted, however, that overseas credit markets saw significant deterioration in some indicators from January (Chart IV-3-5). Therefore, major re-adjustments in financial markets can

induce large losses for Japanese financial institutions. Specifically, a widening of credit spreads could easily lead to unrealized losses as there is less room for a further decline in overseas interest rates, which tend to contribute to netting out such losses. In addition, a further downgrading of overseas credit products could lead to larger impairment losses and an increase in risk assets (a decline in capital adequacy ratios) at financial institutions. There is also a risk that, if it becomes difficult to refinance CLOs and leveraged loans for some reason, for example, due to investors' more cautious stance, the default rates could increase sharply.[24] Given these vulnerabilities associated with overseas credit product investment, financial institutions engaged in such investment need to make efforts to continuously improve their risk management by appropriately examining the overall functioning of overseas credit markets, while taking into account the developments in their own foreign currency funding liquidity.[25]

Chart IV-3-5: Developments in high-yield bonds (rated BB and lower) in the U.S. and Europe



Note: Latest data as at end-September 2020 in the left panel, and as at July-September 2020 (up to September 6, 2020) in the middle and right panels.
Source: Bloomberg; Moody's.

Other market risk including that associated with investment trust holdings

In recent years, regional financial institutions in particular have actively increased the weight of investment trusts in their securities investment portfolios. The increase in investment trust holdings was previously driven by investment trusts whose main risk factor is overseas interest rate risk, but the recent pronounced increase is in investment trusts subject to a wide range of market risks, such as those related to stocks, credit, real estate, and foreign exchange (Chart IV-3-6).

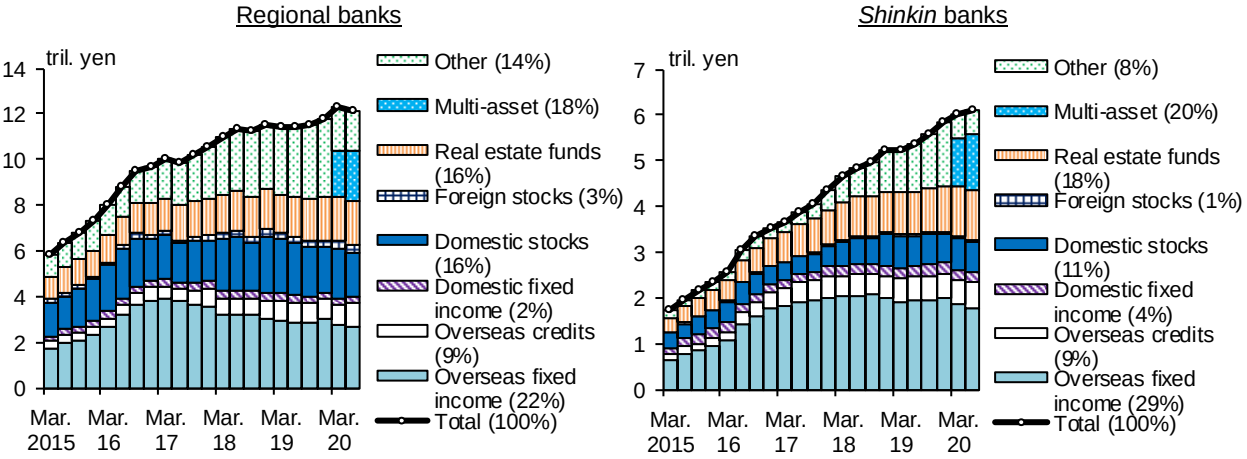
Some regional financial institutions have increased their holdings of multi-asset investment trusts, which invest across multiple different asset types such as domestic and foreign bonds and stocks, and this trend has remained unchanged even after the COVID-19 outbreak. Multi-asset investment trusts basically aim to enhance returns by rebalancing their portfolios while controlling the risk of price declines within a certain range. Some of these trusts change their asset allocation at a high

[24] For details, see Box 2 in the October 2019 issue of the *Report*.

[25] For the current situation and challenges regarding Japanese financial institutions' risk management frameworks for overseas credit product investment, see Financial System and Bank Examination Department of the Bank of Japan and Supervision Bureau of the Financial Services Agency, "Developments in Overseas Credit Investment and Lending by Japanese Financial Institutions: An Overview Based on the Joint Survey by the Bank of Japan and the Financial Services Agency," *Bank of Japan Review Series*, no. 20-E-2, June 2020.

frequency in response to market changes, making it difficult for financial institutions to gauge and measure changes in the amount of risk in a timely manner. In addition, before the COVID-19 outbreak, there were some cases in which multi-asset investment trusts were not always successful in diversifying risks in times of stress accompanied by large market volatility.

Chart IV-3-6: Breakdown of outstanding amount of investment trusts



Note: 1. Based on book values. The figures in parentheses in the chart indicate the share of the respective product types in the latest period.
2. "Other" includes foreign securities.
3. Up to end-December 2019, "Other" includes "Multi-asset."
4. Latest data as at end-June 2020.
Source: BOJ.

When financial institutions invest in investment trusts with complex designs, they should fully understand their risk profiles and continue to improve their risk management frameworks through risk quantification and close monitoring, and make practical and organizational plans for contingency response in the event of significant losses.

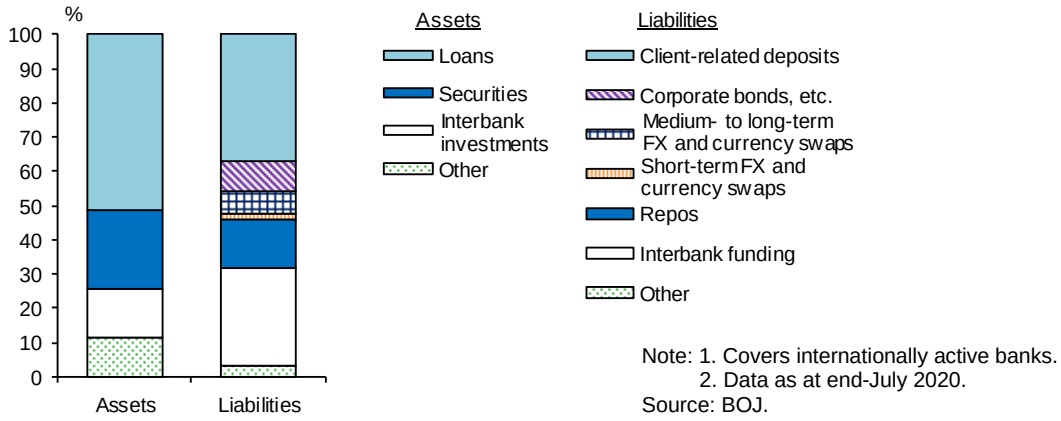
D. Foreign currency funding risk

In recent years, Japanese banks have been actively expanding their overseas business in an attempt to increase profitability, and in the process, they have strengthened business ties with non-Japanese firms, for example, by establishing committed lines. As a result, Japanese banks' foreign currency funding needs have increased substantially. Japanese banks' foreign currency funding tends to be more dependent on market funding than their yen funding, since they do not have a stable funding basis in the form of retail deposits. Against this background, Japanese banks have been making steady efforts to increase the stability of foreign currency funding.

The foreign currency balance sheets of Japanese major banks (Chart IV-4-1) indicate that, whereas loans with relatively long maturities constitute more than half of the foreign currency assets, client-related deposits account for the largest share of foreign currency liabilities at slightly less than 40 percent, followed by interbank funding through CDs and CP. A useful indicator for assessing the stability of this asset and liability structure is the "stability gap," which is the difference between the amount of illiquid loans (=assets) and that of stable funding through client-related deposits, medium- to long-term FX and currency swaps, and corporate bonds (=liabilities). The stability gap had steadily decreased due to increases in client-related deposits and corporate bond issuance through early 2020 and turned negative in February for the first time since January 2010, when the data first became available (Chart IV-4-2).

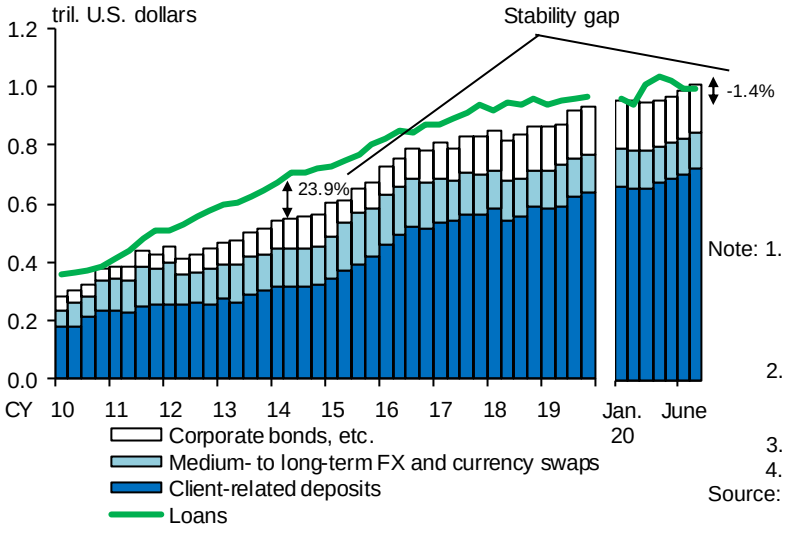
Since March 2020, Japanese banks' overseas loans have increased, as major non-Japanese firms in sectors such as automobiles and energy have drawn funds from their committed lines due to the outbreak of COVID-19 (Chart IV-4-3).

Chart IV-4-1: Major banks' foreign currency-denominated balance sheet



Note: 1. Covers internationally active banks.
2. Data as at end-July 2020.
Source: BOJ.

Chart IV-4-2: Stability gap among major banks



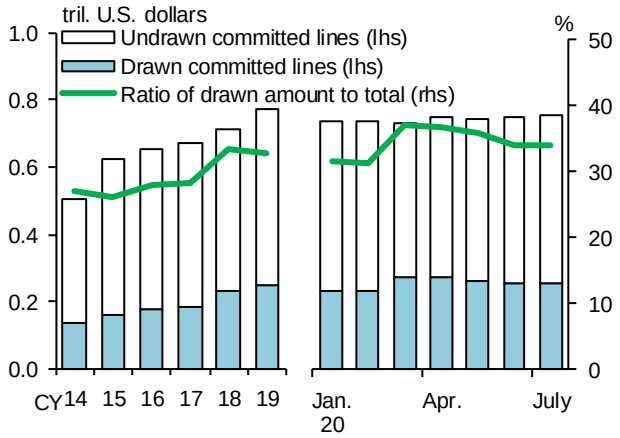
Note: 1. Until end-March 2012, "Corporate bonds, etc." and "Medium- to long-term FX and currency swaps" indicate funding maturing in more than 3 months and thereafter, funding maturing in more than 1 year.
2. The figures indicate the ratios of the gaps to the loans (as at end-April 2014 and end-July 2020).
3. Covers internationally active banks.
4. Latest data as at end-July 2020.
Source: BOJ.

With regard to Japanese banks' foreign currency funding, there was no notable decline in client-related deposits, reconfirming that such deposits represent a relatively sticky source of funding even under stress. On the other hand, funding through the CD and CP markets has deteriorated as inflows of cash from money market funds, which are major cash providers, have lessened. The liquidity of the FX and currency swap markets has also deteriorated substantially (Chart IV-4-4).

Against this background, since mid-March, the Bank of Japan, in coordination with the FRB, the Bank of Canada, the Bank of England (BOE), the ECB, and the Swiss National Bank, has enhanced the provision of liquidity through the standing U.S. dollar liquidity swap line arrangements. Specifically, the Bank has reduced loan rates for U.S. Dollar Funds-Supplying Operations from overnight index swap (OIS) rates + 50 basis points to OIS + 25 basis points. It has also introduced operations with a three-month (84-day) maturity in addition to the conventional 7-day maturity, and has increased the frequency of 7-day operations from the conventional once a week to once a day. As a result of Japanese banks' efforts to increase the stability of foreign currency funding as

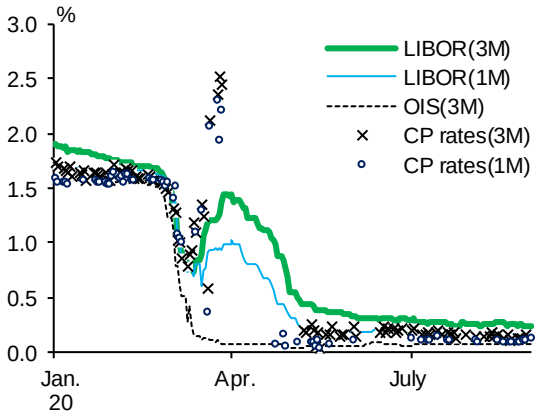
mentioned above as well as these policy measures (Chart IV-4-5), major disruptions to foreign currency funding have been prevented.

Chart IV-4-3: Committed lines among major banks



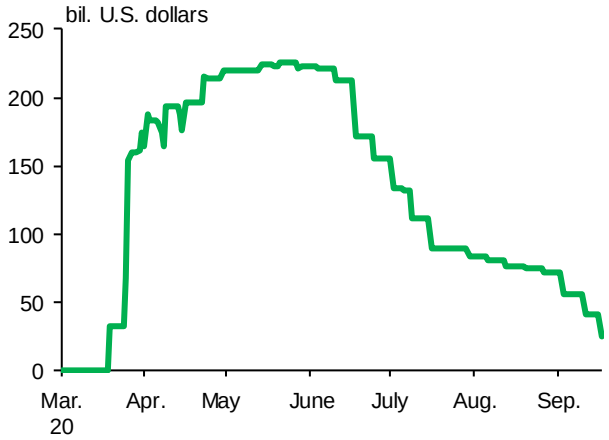
Note: 1. Covers internationally active banks.
2. In both charts, the data are as at year-end or month-end. Latest data as at July 2020.
Source: BOJ.

Chart IV-4-4: Financial CP rates



Note: Latest data as at 31 August.
Source: Bloomberg; FRB.

Chart IV-4-5: Outstanding amount of U.S. Dollar Funds-Supplying Operations



Note: Latest data as at 17 September.
Source: BOJ.

Japanese banks that aim to expand their overseas business need to review their strategies for committed lines, as they tend to see a sudden increase in withdrawals under stress, and to make efforts to further increase the stability of their foreign currency funding. On the other hand, although long-term funding through corporate bonds and currency swaps is more stable than funding through short-term means such as CDs and CP as well as FX swaps, it negatively affects banks' profitability due to increased funding costs. The challenge is, therefore, how to balance stable foreign currency funding with considerations for profitability.

Addressing this challenge will not be easy and likely require, for example, efforts to acquire demand deposits from corporate customers, which tend to be stickier and involve lower funding costs than market funding, as well as efforts to diversify funding providers in the interbank market. Moreover, Japanese banks need to establish a framework for the timely collection of necessary data to improve the efficiency with which funds are used within their groups and strengthen arrangements for liquidity risk management.

E. Risks posed by structural changes in the business environment surrounding financial institutions

Finally, this section addresses risks posed by structural changes in the business environment surrounding financial institutions, focusing on recent developments and prospects regarding digital transformation, climate change, and interest rate benchmark reform.

Digital transformation

In recent years, there have been advancements in the digital transformation of the financial sector. While some countries have already seen significant advances in the application of digital technologies to financial services, Japan has also seen financial institutions expand their use of those technologies, such as artificial intelligence (AI) and robotic process automation (RPA), rapid progress in the use of cashless payment methods, and the spread of the provision of services through open application programming interfaces (API).

On one hand, this progress in the digital transformation has the potential to offer a wide range of benefits to the economy and society through higher value-added, more efficient, and inexpensive financial services. In terms of financial institutions' business, it has the potential to significantly change the services they provide, their operational procedures, and the organizational structures that support these services and procedures. On the other hand, if confidence in financial transactions is undermined as a result of a serious cyber incident, there is a risk that these benefits may diminish instantaneously. Moreover, from a longer-term perspective, the digital transformation has the potential to significantly change the fundamental structure of finance, for example, in the form of the expansion of financial activities in borderless cyberspace, the emergence of new financial service providers such as digital platform providers and fintech operators, and the increase in financial infrastructure that does not involve a central authority such as a central bank or a central counterparty. While the digital transformation may help to promote the stability and efficiency of the financial system, it may also result in increasing vulnerabilities while the structural change is taking place.

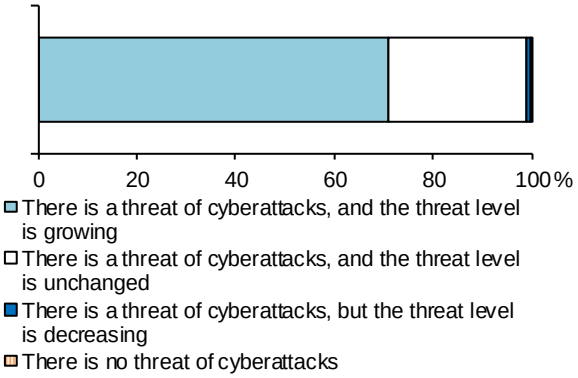
Furthermore, the growing global need for "non-face-to-face" and "contactless" services following the recent spread of COVID-19 has helped accelerate the pace of the digital transformation of finance. Financial institutions, therefore, need to properly manage the following risks associated with the digital transformation in order to maximize the benefits of digital technologies.

The first risk associated with the digital transformation is cyber risk. Cyber risk differs from the other risk categories already considered in this chapter in the following respects: (1) financial institutions may be hit by a cyberattack that goes beyond, in terms of technological aspects and scale, the self-defenses they have put in place, given the rapid sophistication of cyberattacks; (2) a failure that takes place in a computer system of one financial institution may instantaneously propagate to other financial institutions and to the entire financial system if a cyberattack is successful, since all financial institutions are linked through financial settlement networks, etc.; and (3) the quantification of such a risk is difficult and, moreover, there remains a risk that the capital accumulation of individual financial institutions for loss absorption may not be sufficient to deal with the ramifications.

As in other countries, cyberattacks in Japan are on the rise. In a survey of financial institutions conducted by the Bank of Japan (September 2019), about 40 percent of respondents answered that they had experienced cyberattacks since 2017, while about 70 percent of respondents said that the threat of cyberattacks was increasing (Charts IV-5-1 and IV-5-2). Moreover, there have been cases of fraudulent withdrawal of deposits from banks that are associated with cashless payment services and online securities transactions. Cyberattacks are rapidly becoming more complex and sophisticated. Recently, phishing attacks that exploited the spread of COVID-19 have increased substantially worldwide. Moreover, while teleworking is increasingly implemented as a

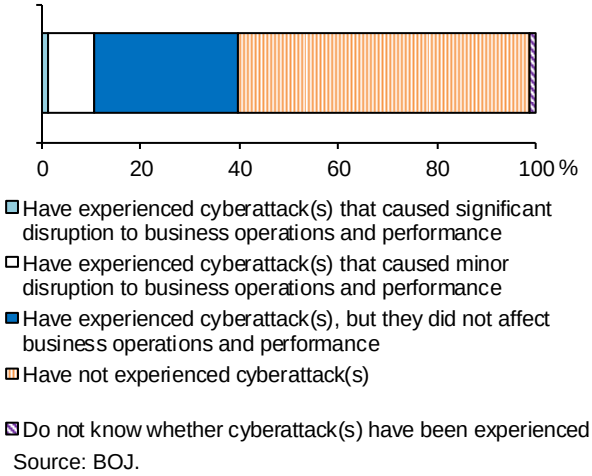
way of avoiding exposure to the virus, ransomware attacks targeting vulnerabilities in related devices have also been increasing. From a risk management perspective, financial institutions need to be aware that there are issues regarding the data governance of information assets, including personal data, not only in terms of those held by themselves but also those managed by third parties, such as outsourcing contractors, including cloud service providers, and partners involved in API connections and cashless services.

Chart IV-5-1: Financial institutions' recognition of threat of cyberattacks



Source: BOJ.

Chart IV-5-2: Cyberattacks targeting financial institutions



Source: BOJ.

Moreover, in recent years, the idea of "operational resilience" has been gaining traction. This idea refers to the ability of financial institutions to carry out important tasks even under a cyberattack or a computer system failure. Its aim is, in addition to building self-defenses against threats, to increase the resilience of the system by preparing measures that minimize damage before an incident occurs and by regularly testing the effectiveness of these measures, considering that perfect protection from threats is difficult to achieve.

The second risk is the strategic risk associated with digitalization. In order to adapt to structural changes in the business environment, financial institutions need to formulate a strategy, such as choosing between developing operations exclusively in-house and collaborating with external partners to respond to the changes in each business domain. Accordingly, they face the risk that their strategy greatly influences the future of their business. Digital technologies are rapidly progressing against the backdrop of improvements in processing capacities in computing, higher speeds and larger capacities of communication technologies, the spread of distributed technologies, and the rapid accumulation of digital data. Financial institutions hold various types of data, including a vast amount of transaction data and text data, and digital technologies provide them the opportunity to expand their service frontier and improve the efficiency and profitability of their operations. In particular, the spread of smartphones and the introduction of AI have greatly broadened non-face-to-face customer contact points and made it possible to automate non-routine operations, acting as the driving force behind the transformation of services that used to be centered on "documents, manual processing, and cash" toward services that are centered on "digital, automated processing, and cashless." Moreover, when further advancing the digital transformation, it is important for financial institutions to provide more customer-oriented financial services and to improve customer satisfaction via the experience of the services (i.e., improving the value of customer experiences). Since these developments also lead to improvement in financial institutions' business efficiency, the operational resources freed up in this process can alternatively be used to provide higher value-added financial services, including face-to-face services. It is also notable, however, that, due to competition with other financial institutions that

are ahead of the curve in the digital transformation and with major non-bank companies (so-called Big Tech companies) that hold a vast amount of customer data and have advantages in collecting, analyzing, and utilizing such data, in the medium to long term, financial institutions' business and profit base may be affected. In addition, the number of customers that use branches and ATM networks -- the traditional channel through which financial institutions have been interacting with customers -- is declining steadily, and the costs of maintaining such networks, as well as conventional host computer systems, as compared with the benefits of keeping them, may become a competitive burden for traditional financial institutions.

In fact, in recent years, the number of banks -- not only those overseas but also in Japan -- that use cloud services and provide online banking services via mobile apps has been increasing. In addition, there are published business proposals for digital banks, which do not have branches and offer essentially all transactions online via smartphones and other devices, and neobanks, which are fintech service providers that offer customers the use of the online banking services of existing banks via mobile apps through open APIs.[26] These developments regarding such digital banks and neobanks are considered to reflect the efforts of conventional financial institutions to address issues about the digital transformation described above. Under these changing circumstances, it is becoming increasingly important to ensure fair competitive conditions between financial institutions and non-financial firms offering financial services and to identify non-competitive and competitive areas between them.

When implementing their digital strategies, it is important for financial institutions not only to secure business resources (expenses and human resources) that promote the research and acquisition of technology and IT investment, but also to reexamine organizational arrangements, including the establishment of a dedicated department. In this regard, financial institutions need to swiftly establish clear business strategies and steadily move forward with them.

In addition, advances in digital technologies are having a major impact on anti-money laundering measures, both in terms of increasing threats and improving prevention capabilities. Financial institutions need to further improve their ability to respond to these changes brought about by these technological advances.

Climate-related risks

There is growing international awareness about the impact of climate change on financial institutions' business conditions and financial system stability. The major event that triggered the increase in awareness was the launch of the Task Force on Climate-related Financial Disclosures (TCFD) in December 2015. Against this background, an increasing number of central banks, such as the Banque de France, the BOE, De Nederlandsche Bank, and the ECB, have conducted or are planning to conduct stress testing incorporating climate-related risks. In June 2020, the Network for Greening the Financial System (NGFS; established in December 2017), a group that mostly consists of central banks and financial supervisors and that the Bank of Japan joined as a member in November 2019, released climate-related scenarios regarding temperature trajectories and emission price developments. An increasing number of private-sector banks have been attempting to quantitatively assess transition risks and physical risks using the knowledge held by academics and non-life insurance industries. Some of them have incorporated their quantitative assessment into their risk management.

[26] In Japan, there are examples of both having been set up in the form of subsidiaries and affiliates of existing banking groups, etc.

It can be challenging, however, to measure climate-related risks using the conventional risk management methods, including stress testing, as the assessment of climate-related risks differs significantly from that of conventional financial risks. For example, it requires (1) relevant data to be available for analysis, (2) mappings from the climate change scenarios to macroeconomic and financial variables, and (3) the assessment of climate-related risks by borrower characteristic for investment and lending and for business portfolios. In fact, the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) each conducted a survey covering financial authorities and international organizations in 2019-2020.[27] The two surveys showed that, although monitoring and research regarding climate-related financial risks have started in a good number of jurisdictions, (1) the degree of progress differs among jurisdictions, (2) quantitative measurement and assessment of climate-related risks are limited, and (3) only a limited number of jurisdictions have explicitly incorporated climate-related financial risks into the risk assessment of financial institutions and the financial system. It is expected that the way of conducting the analysis and application will be established as the knowledge and experience, both in the public and private sector, accumulate and the understanding of climate-related risks and the discussion of analytical methodologies deepen. The Bank of Japan will promote better understanding of the implications of climate-related risks for financial institutions and the financial system through discussions in international forums, including the NGFS, the FSB, and the BCBS.

Interest rate benchmark reform

London Interbank Offered Rate (LIBOR) is used in a broad range of financial transactions, but it is scheduled to cease at end-2021.[28] Although preparations for the transition to alternative benchmarks may have been affected by the spread of COVID-19 to some extent, it is necessary to steadily prepare for LIBOR cessation while being aware of the limited time available until end-2021.[29] Among these preparations, tasks requiring efforts by the market as a whole, such as the development of alternative benchmarks, are being addressed based on deliberations by, for example, the Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks, for which the Bank of Japan acts as the secretariat.[30] In parallel with these market-wide initiatives, it is of utmost importance for individual LIBOR users, such as financial institutions, institutional investors, and nonfinancial corporates, to press ahead with their own preparations.

Against this background, the Financial Services Agency (FSA) and the Bank have been jointly working on various initiatives to encourage private-sector efforts to prepare for LIBOR cessation. One such example is the survey on the use of LIBOR jointly conducted by the two entities in

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[27] For details of the survey results, see the FSB, "Stocktake of Financial Authorities' Experience in Including Physical and Transition Climate Risks as Part of Their Financial Stability Monitoring," July 2020 (https://www.fsb.org/wp-content/uploads/P220720.pdf), and the BCBS, "Climate-Related Financial Risks: A Survey on Current Initiatives," April 2020 (https://www.bis.org/press/p200430.htm).

[28] For details on the reform of interest rate benchmarks and market-wide initiatives, see Box 1 in the April 2019 issue of the *Report* as well as the pages of the Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks on the BOJ website.

[29] In March 2020, the Working Group on Sterling Risk-Free Reference Rates and the U.K. authorities announced that the target date for LIBOR transition remained the end of 2021. In July, the FSB reiterated its view that remaining dependencies on LIBOR should be removed by the end of 2021.

[30] The consultation with market participants conducted by the Committee showed that term risk-free reference rates received the strongest support as alternative benchmarks to JPY LIBOR. For details, see Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks, "Final Report on the Results of the Public Consultation on the Appropriate Choice and Usage of Japanese Yen Interest Rate Benchmarks," November 2019. Subsequently, the committee selected QUICK Corp. as the entity responsible for calculating and publishing prototype rates for term risk-free reference rates. The publication of prototype rates began on May 26.

October-December 2019. The aim of this survey was to accurately ascertain financial institutions' outstanding balances of financial instruments and transactions that reference LIBOR, the adoption of alternative benchmarks, and the status of establishing a managerial framework and allocating staff to prepare for LIBOR cessation. The two entities released the "Summary of Survey Results on the Use of LIBOR and Main Actions Needed" in March 2020.[31] In June, the FSA and the Bank jointly sent the representatives of major financial institutions a notification, the "Dear CEO" letter, in which the two entities presented the CEOs of financial institutions with necessary preparations to be made by the financial institutions and requested them to compile related materials such as transition plans, thereby deepening dialogue with financial institutions and other relevant parties.[32]

There are various issues that need to be addressed by financial institutions, while there is only about a year until end-2021. In August 2020, the Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks released the Draft Roadmap to Prepare for the Discontinuation of LIBOR in Japan.[33] Based on the roadmap, individual financial institutions need to be aware of the limited time available and accelerate their preparations while involving their corporate clients.[34] The Bank, in cooperation with the FSA, will continue to support market-wide initiatives, including those aimed at increasing the resilience of term risk-free reference rates. In addition, through continuing to conduct surveys on the use of LIBOR,[35] as well as interviews and other activities, the Bank will identify the degree of preparation of individual financial institutions and, as necessary, individually encourage them to accelerate their preparations. At the same time, the Bank will raise public awareness of LIBOR cessation through various opportunities and channels, aiming to gain the understanding that cooperation by a wide range of entities other than financial institutions will also be necessary. By doing so, the Bank will provide support for efforts by relevant parties toward the reform of interest rate benchmarks.

[31] For details, see the Financial System and Bank Examination Department of the Bank and the Strategy Development and Management Bureau and Supervision Bureau of the FSA, "Financial Institutions' Preparedness for LIBOR Cessation and Future Actions with a Focus on the Results of the Joint Survey by the Financial Services Agency and the Bank of Japan," *Bank of Japan Review Series*, no. 20-E-6, August 2020.

[32] The content of the letter is made available on the FSA's and the Bank's websites. Those financial institutions that are not addressed in the letter are also expected to make necessary preparations by referring to the published letter.

[33] See Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks, "Second Public Consultation on the Appropriate Choice and Usage of Japanese Yen Interest Rate Benchmarks: Considering the developments since the publication of the final report on the results of the last public consultation," August 2020. In addition to the draft roadmap for LIBOR transition, the publication indicates the committee's recommendations for the specific treatment of alternative reference rates for cash products (loans and bonds) referencing JPY LIBOR at the time of LIBOR cessation, as well as initiatives to improve the robustness of term risk-free reference rates. Market participants and interest rate benchmark users are required to prepare for LIBOR cessation, taking into account the contents of the public consultation and the deliverables based on the results of the public consultation (which will be released later).

[34] The necessary preparations for LIBOR cessation differ depending on the use of LIBOR at individual financial institutions. Thus, the time frame shown in the draft roadmap is a non-binding target. Nevertheless, financial institutions are expected to make preparations in line with the roadmap to ensure a smooth transition. Meanwhile, since such preparations will be necessary not only for the yen but for other LIBOR currencies, including the U.S. dollar and the euro, due attention should also be paid to overseas initiatives.

[35] At present, the second round of the survey on the use of LIBOR is scheduled to be sent out during the January-March quarter of 2021, with the reference date of LIBOR exposure as of end-December 2020. The main purpose is to update the progress made in financial institutions' preparations for LIBOR transition since the first round of the survey in end-June 2019.

V. Examination of financial institutions' stress resilience

This chapter examines the stress resilience of the financial system. To start with, financial institutions' profitability and capital adequacy are examined, mainly based on information from their financial reports through fiscal 2019. Financial institutions' profitability is not only a determinant of their capacity to return profits to shareholders, etc., but also a source of their capacity to absorb losses. Given that the spread of COVID-19 did not fully take hold until early 2020, the financial reports through fiscal 2019 primarily contain information for the period before the spread. That said, there are some items in the financial reports that have already been greatly affected by the significant market turmoil in March 2020, driven by the spread of the disease.

Next, this chapter examines how the spread of the disease affects the stability of the financial system and the functioning of financial intermediation using macro stress testing.[36] In this issue of the *Report*, the model and scenarios have been refined based on the analyses in the previous chapters so as to incorporate the impact of the spread more accurately.

A. Financial institutions' profitability and capital adequacy

1. Profitability

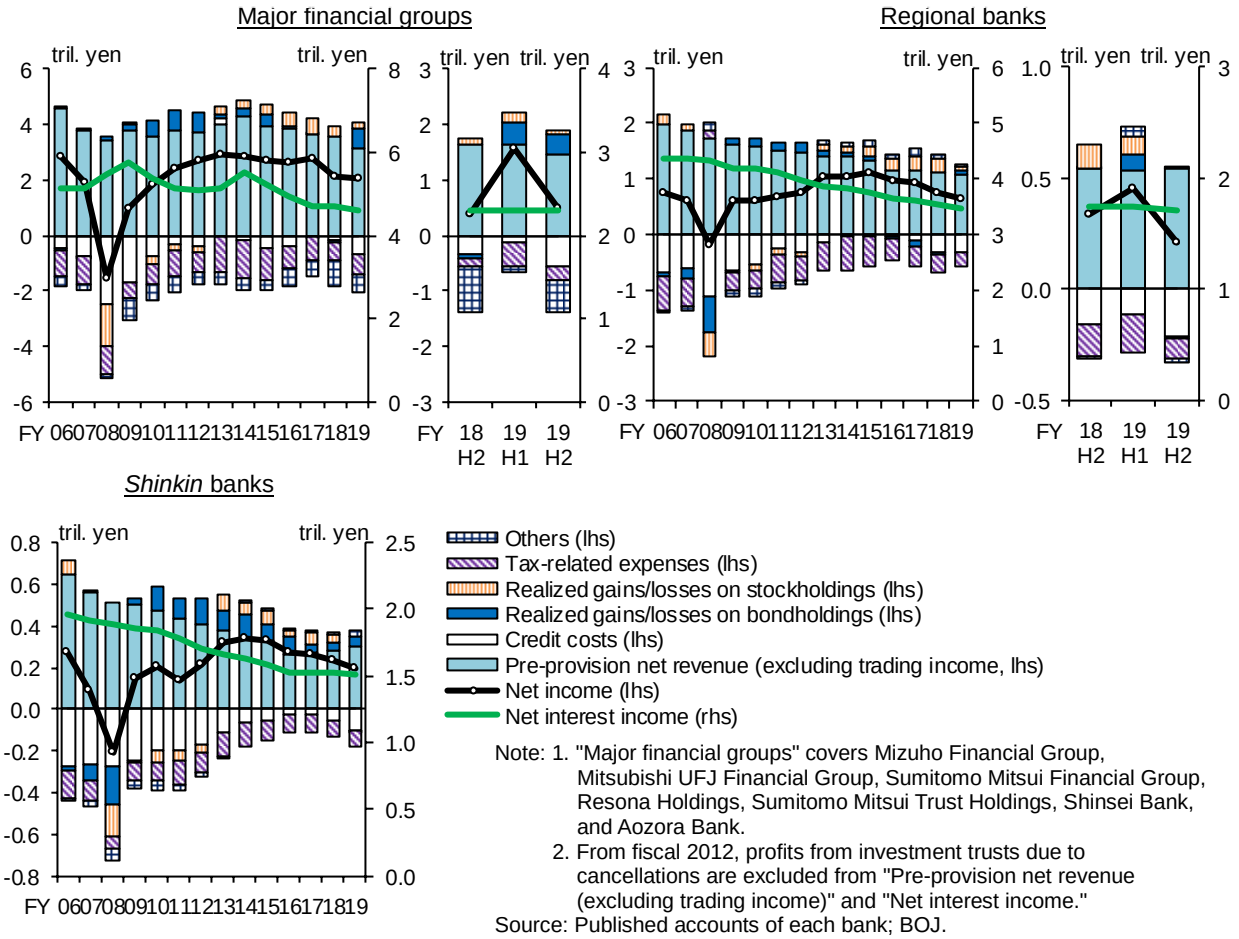
Financial institutions' net income has been on a moderate downward trend (Chart V-1-1). Pre-provision net revenue (PPNR) excluding trading income, which shows financial institutions' core profitability, has continued to decline. This is due to the downward trend in domestic net interest income caused by the shrinking of deposit-lending margins, as well as to continued low levels of net non-interest income. Credit costs had been declining since the GFC, and thereby had been underpinning profits, but have been increasing in recent years (Chart IV-1-3). In fiscal 2019, credit costs, especially at major banks, increased further, reflecting the impact of precautionary loan-loss provisioning linked to the spread of the disease. On the other hand, realized gains/losses on securities holdings, particularly realized gains on bondholdings, have improved recently.

A closer look at domestic deposit-lending margins shows that they have continued to shrink, particularly at regional financial institutions, under the prolonged low interest rate environment. Fierce competition among financial institutions with active lending stance explains the shrinkage (Chart V-1-2).

Next, developments in overall gains/losses on securities holdings are revisited, along with financial institutions' risk management practices, especially for those in the January-March quarter of 2020, when financial markets were volatile due to the spread of the disease. The results of a survey of regional financial institutions revealed that there were quite a few cases where the losses on securities investments breached the thresholds set in the loss-cut rule, mainly with regard to stocks and investment trusts during the period. The breaches were particularly pronounced at *shinkin* banks, which had been increasing their risk taking with respect to investment trusts and other products (Chart V-1-3). Looking at realized gains/losses on sales of securities in March 2020, when financial markets were highly volatile, regional banks made losses mainly on sales of investment trusts, especially J-REITs, while at *shinkin* banks, losses on sales of stocks and investment trusts were offset by gains on sales of bonds (Chart V-1-4).

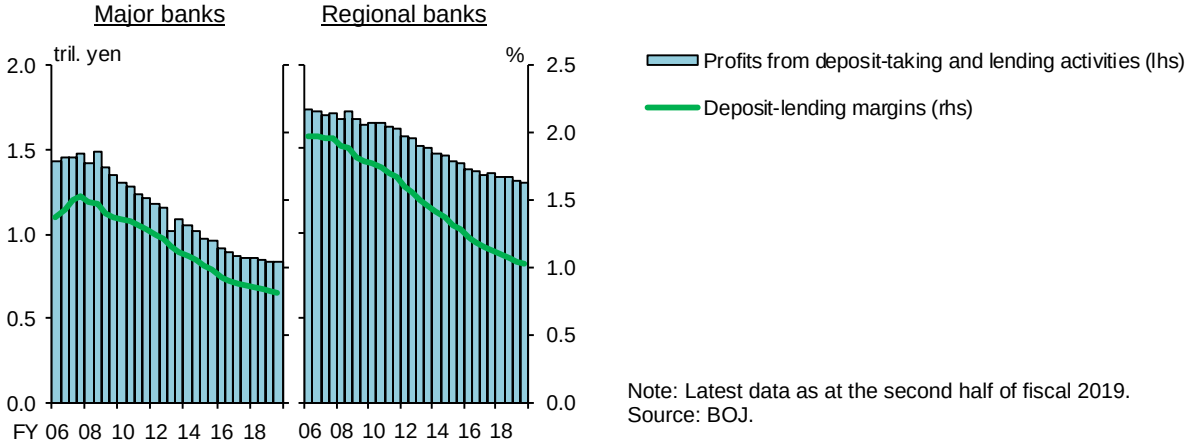
[36] The simulation utilizes the Financial Macro-econometric Model (FMM) developed by the Financial System and Bank Examination Department of the Bank. For the basic structure of the model, see "The Financial Macro-econometric Model (FMM, March-2020 Version): Overview and Recent Developments," *Financial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

Chart V-1-1: Developments in and decomposition of net income



Note: 1. "Major financial groups" covers Mizuho Financial Group, Mitsubishi UFJ Financial Group, Sumitomo Mitsui Financial Group, Resona Holdings, Sumitomo Mitsui Trust Holdings, Shinsei Bank, and Aozora Bank.
2. From fiscal 2012, profits from investment trusts due to cancellations are excluded from "Pre-provision net revenue (excluding trading income)" and "Net interest income."
Source: Published accounts of each bank; BOJ.

Chart V-1-2: Profits from domestic deposit-taking and lending activities and their margins



Note: Latest data as at the second half of fiscal 2019.
Source: BOJ.

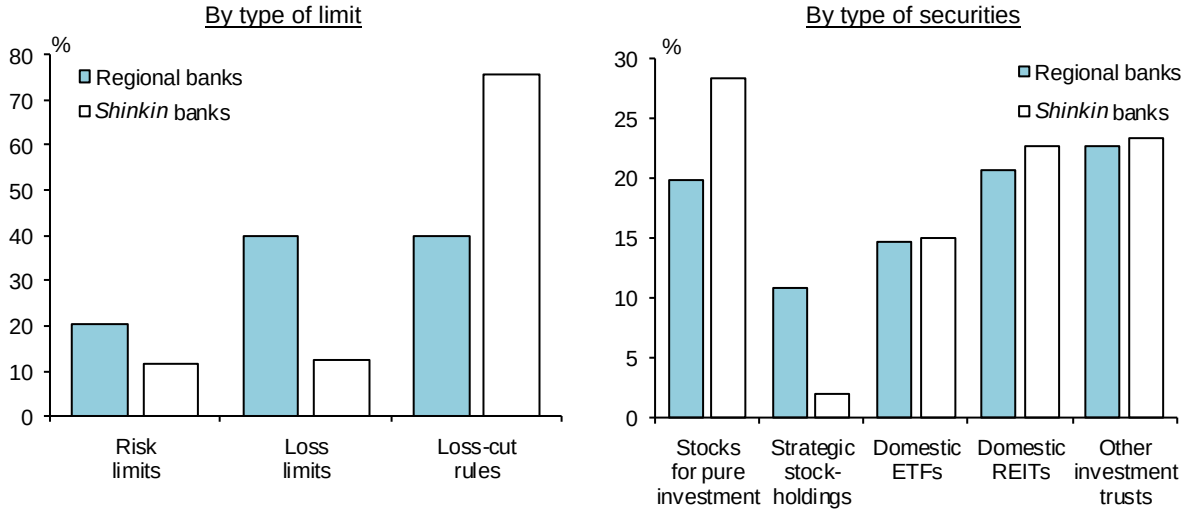
Amid the continued decline in the profitability of domestic deposit-taking and lending activities, the net earnings of many regional financial institutions have been underpinned by gains on sales of securities, mainly yen-denominated bonds. In recent years, however, room for locking in gains on securities has been decreasing (Chart V-1-5).[37,38] As mentioned above, due mainly to the realization

[37] "Room for locking in gains" here is defined, for each type of bank, as unrealized gains/losses on available-for-sale securities holdings divided by realized gains/losses on sales of securities (3-year backward moving average). The value for "room for locking in gains" here, therefore, is an aggregate value, and a negative value does not mean that, in practice, individual banks cannot realize gains at all.

[38] The share (median) of realized gains/losses on securities holdings (the total of realized gains/losses on

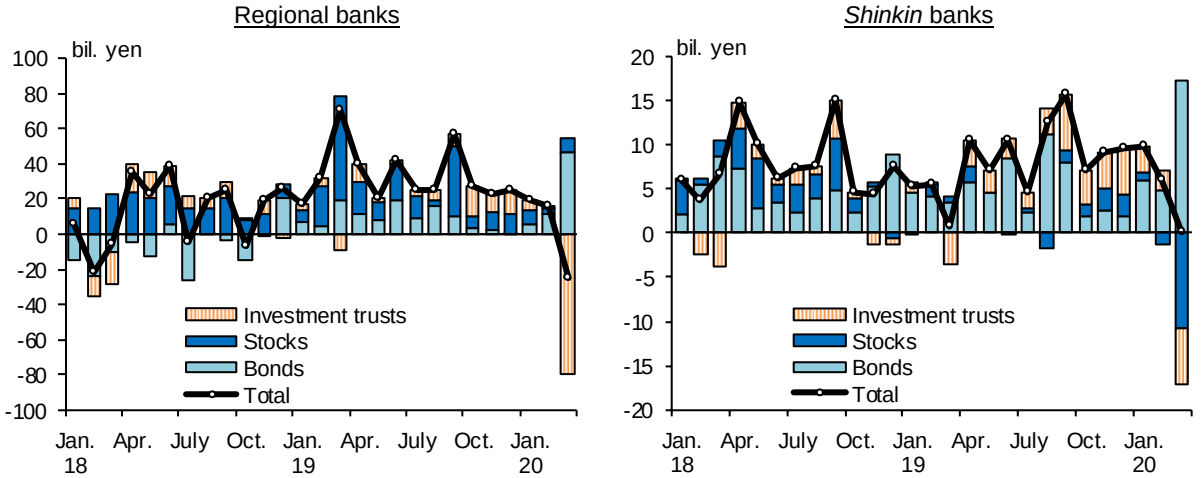
of gains on sales of securities in response to the destabilization of financial markets amid the spread of COVID-19, regional financial institutions' room for locking in gains on securities has further declined. From the end of March 2019 to the end of June 2020, the share of financial institutions with no room for locking in gains on securities increased from about 3 percent to about 10 percent among regional banks and from about 3 percent to about 15 percent among *shinkin* banks (Chart V-1-6). Although unrealized gains/losses on securities have improved to some extent as financial markets have regained stability, the importance of improving core profitability has increased for regional financial institutions. That said, the dividend payout ratios of all types of financial institutions have been gradually increasing as financial institutions have continued to prioritize stable dividend payouts despite the downward trend in their core profitability (Chart V-1-7).

Chart V-1-3: Market risk limit breaches in January-March quarter of 2020



Note: A survey on the risk management of securities conducted in fiscal 2020.
Source: BOJ.

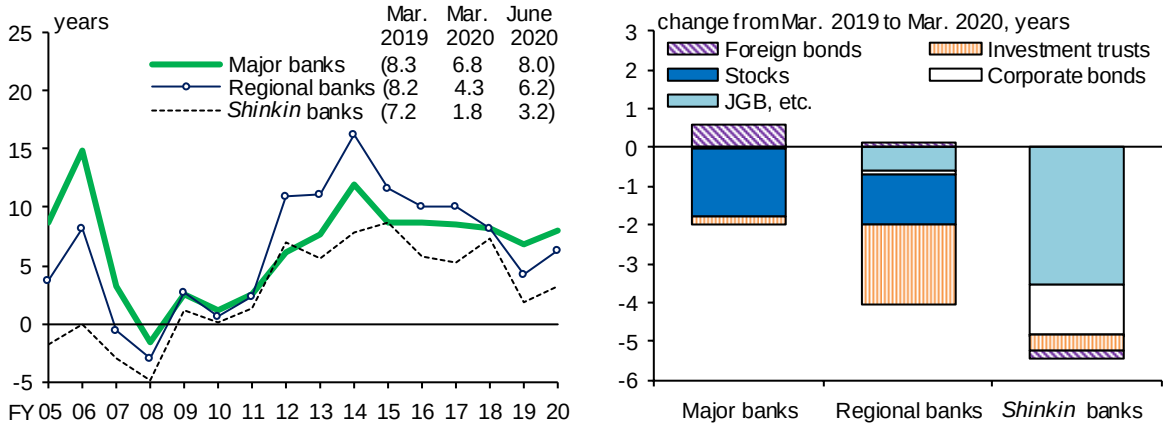
Chart V-1-4: Developments in realized gains/losses on sales of securities among regional financial institutions



Note: 1. "Bonds" indicates the sum of domestic bonds, U.S. dollar-denominated foreign bonds, and Euro-denominated foreign bonds. "Stocks" indicates domestic stocks. "Investment trusts" indicates investment trust beneficiary certificates. "Total" indicates the sum of "Bonds," "Stocks," and "Investment trusts," excluding other securities.
2. Latest data as at end-March 2020.
Source: BOJ.

bondholdings, stockholdings, and investment trusts) in pre-tax net income in fiscal 2019, was around 25 percent for regional banks and around 35 percent for *shinkin* banks.

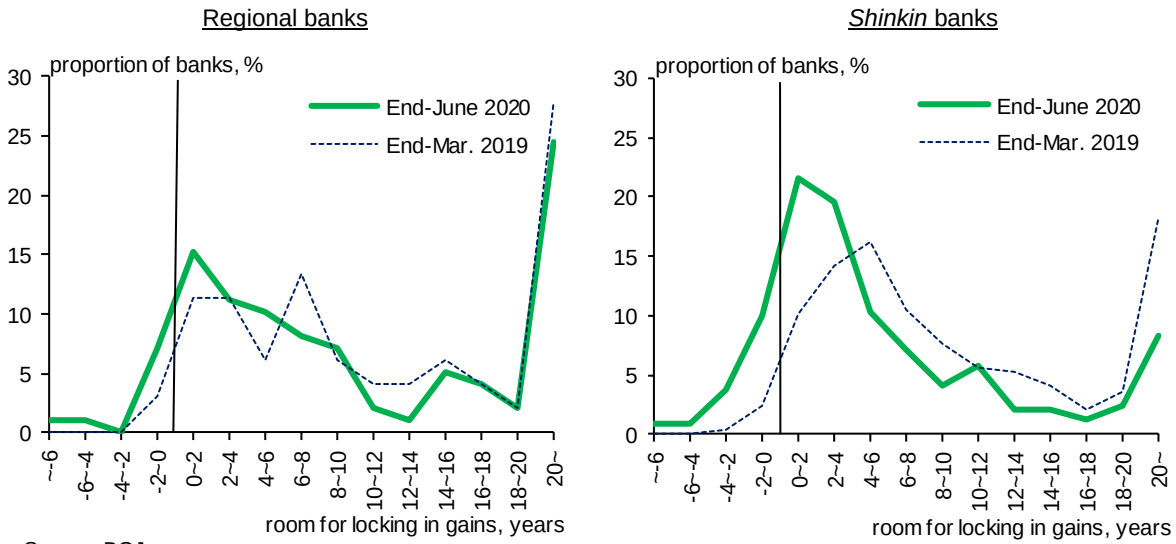
Chart V-1-5: Room for locking in gains



Note: 1. "Room for locking in gains" = unrealized gains/losses on available-for-sale securities holdings / realized gains/losses on sales of securities (3-year backward moving average). Subsequent charts are based on the same definition.
2. "JGB, etc." indicates the sum of JGBs, local government bonds, government-guaranteed bonds, and authority bonds. "Investment trusts" includes investment trust beneficiary certificates and other securities.
3. After fiscal 2012, realized gains/losses on sales of securities include gains/losses from investment trusts due to cancellations.
4. Median by bank type. The data for fiscal 2020 are as at end-June 2020.

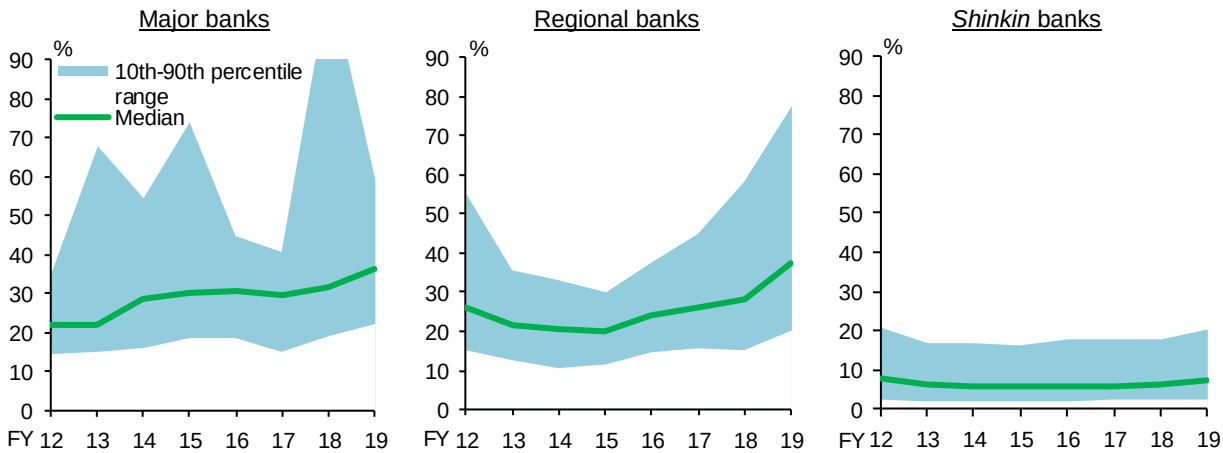
Source: BOJ.

Chart V-1-6: Distribution of room for locking in gains



Source: BOJ.

Chart V-1-7: Dividend payout ratios by type of bank



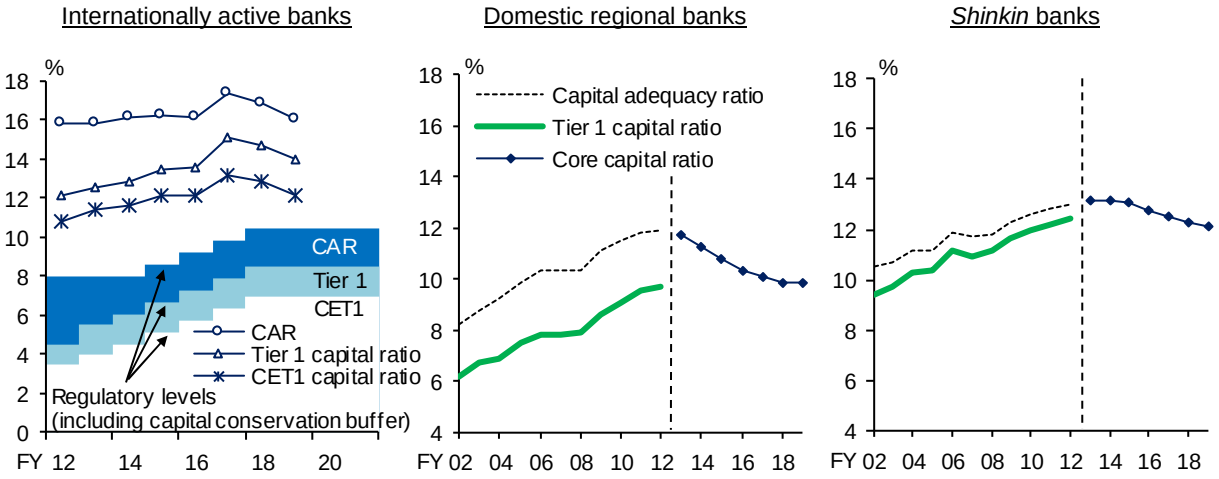
Note: 1. The figures are counted on a financial group consolidated basis for banks affiliated with financial holding companies.
2. Dividends of *shinkin* banks cover dividends on common shares.

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

2. Capital adequacy

The capital adequacy ratios of financial institutions have been sufficiently above the regulatory requirements for all types of banks, although their levels have been falling in recent years (Chart V-1-8).[39] The reason is that their retained earnings have been growing at a slower pace than their risk-weighted assets (Chart V-1-9). Meanwhile, the capital level of the financial system as a whole is adequate relative to the amount of various types of risk financial institutions take and financial institutions have sufficient loss absorption capacity (Chart V-1-10).[40]

Chart V-1-8: Financial institutions' capital adequacy ratios



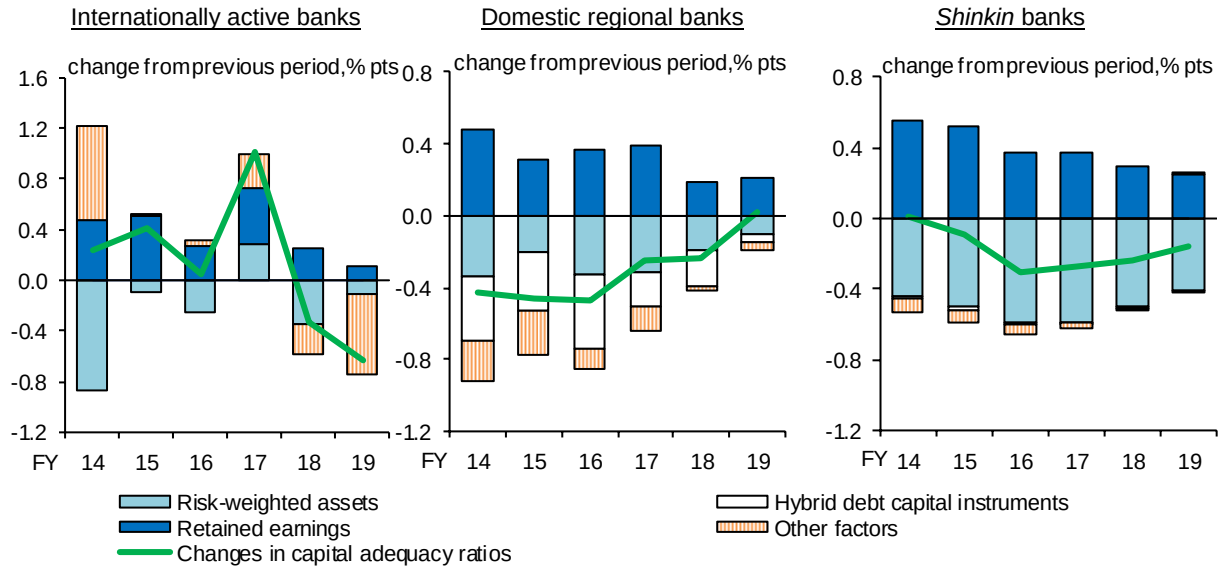
Note: "CAR" indicates the total capital adequacy ratio. Classifications of internationally active banks and domestic banks are as at each time point for Basel III's regulatory ratios, and are as at end-fiscal 2013 for regulatory ratios before Basel III. The charts are calculated on a consolidated basis. Latest data as at end-March 2020. The transitional arrangements are taken into consideration.

Source: BOJ.

[39] 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 designed to build up an additional buffer to prevent credit supply constraints under stress conditions. The capital buffer regulations include 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. Banks are able to use their buffers as necessary to maintain lending to the real economy. For details, see the "Newsletter on buffer usability" released by the Basel Committee on Banking Supervision on October 31, 2019.

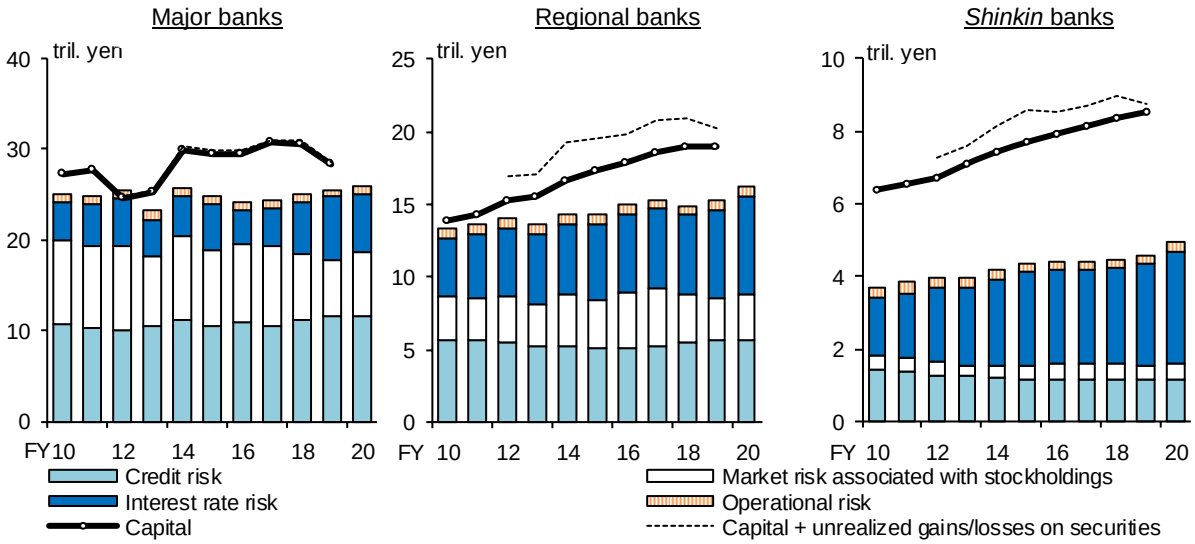
[40] The same method and parameters (such as confidence level and holding period) are used for all financial institutions in calculating the amount of risk they bear. Thus, the amount of risk presented here does not necessarily match the amount of risk calculated internally by financial institutions themselves as part of their risk management process.

Chart V-1-9: Factors of changes in capital adequacy ratios



Note: The transitional arrangements are taken into consideration.
Source: BOJ.

Chart V-1-10: Risks borne and amount of capital by type of bank



Note: 1. "Credit risk" includes risks of foreign currency-denominated assets. "Market risk associated with stockholdings" and "Interest rate risk" (parts of off-balance-sheet transactions are included) in the left-hand chart include foreign currency-denominated risk. "Capital + unrealized gains/losses on securities" is the sum of capital and unrealized gains/losses on securities (tax effects taken into account) for domestic banks.
2. As for the fiscal 2020 data, (1) credit risk, foreign currency interest rate risk (excluding the risk associated with foreign currency-denominated bondholdings), and operational risk are as at end-March 2020, and the following data are estimated: (2) market risk associated with stockholdings and interest rate risk associated with yen- and foreign currency-denominated bondholdings as at end-August 2020, and (3) yen interest rate risk (excluding the risk associated with yen-denominated bondholdings) as at end-June 2020.
Source: BOJ.

B. Macro stress testing

Based on the financial vulnerabilities and risks identified and examined in the previous sections, this section examines the sufficiency of financial institutions' capacity to absorb losses using macro stress testing.[41]

[41] The stress testing targets 112 banks and 247 *shinkin* banks (accounting for approximately 80 to 90 percent of total loans outstanding). The simulation period is 3 years, from April-June 2020 through January-March 2023. The major economic variables for the scenarios employed in the stress testing can be downloaded from the Bank's

Up until the previous issue of the *Report*, the stability of the financial system was assessed by examining its robustness assuming financial and economic stress at home and abroad to an extent similar to that during the GFC. However, given that Japan's real economy is already under strong stress due to the continued impact of COVID-19, the risks associated with financial stability at present essentially depend on developments in the spread of the disease and the size of their impact on the domestic and overseas economies. Therefore, this issue of the *Report* examines the robustness of financial institutions with several scenarios regarding the pace of the future recovery of the domestic and overseas economies and the corresponding response of financial markets. The assumed scenarios are purely hypothetical and are designed to effectively examine the stress resilience of financial institutions. They represent neither the Bank of Japan's outlook for the future economic and financial environment or asset prices, nor the likelihood of the outcome. In particular, the stress testing takes into account the impact of measures to facilitate corporate financing, such as the policy responses of the government and the Bank of Japan as well as lending by financial institutions; however, potential future policy responses are not incorporated into the scenarios. This further implies that the assumed scenarios are purely hypothetical and are designed for quantitatively assessing the impact of the shocks on the stability of the financial system via the real economy and financial markets.

1. Macro stress testing scenarios and their rationale

Particularly, four scenarios regarding the severity of the stress on the real economy and financial markets are employed: a baseline scenario, a downside scenario, a severe downside scenario (markets), and a severe downside scenario (real economy) (Chart V-2-1). The baseline scenario assumes that the real economy recovers in line with the average outlook by research institutions and markets. On the other hand, the downside scenario assumes quite strong stress, where the economic recovery remains very moderate, and this adversely affects financial markets. The last two scenarios consider even tougher situations than the downside scenario and are employed to grasp the impact under additional stress in financial markets or the real economy, given that there are substantial uncertainties regarding future developments in the real economy and financial markets.

Chart V-2-1: Scenarios for simulation

	Real economy	Financial variables
Baseline scenario	Average forecasts of professionals and markets	Unchanged from the level at end-August 2020
Downside scenario	"Slower recovery" compared to the baseline	Historical average reaction (50th percentile)
Severe downside scenario (markets)	"Slower recovery" compared to the baseline	Highly sensitive reaction (90th percentile)
Severe downside scenario (real economy)	"Stagnant recovery" compared to the baseline	Historical average reaction (50th percentile)

Note: Long- and short-term interest rates evolve in line with the forward rates under the baseline scenario while they fall to the lowest level observed until August 2020 under the downside scenarios.

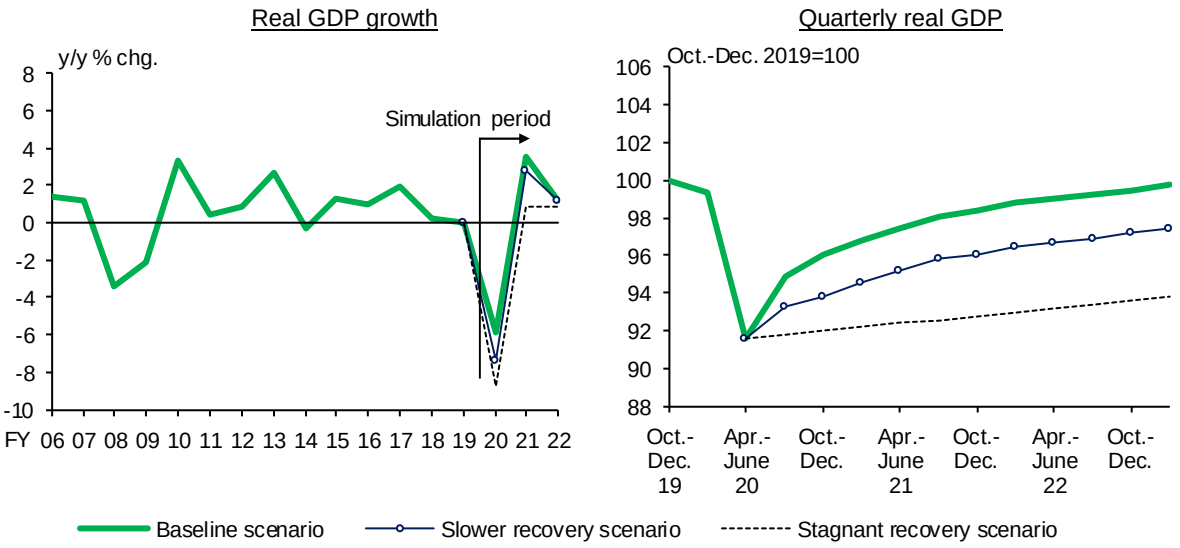
website at https://www.boj.or.jp/en/research/brp/fsr/fsr201022.htm.

Assumptions regarding the real economy

To start with, the baseline scenario is based on average forecasts of several research institutions and financial markets as of August 2020. Although there is no change in the methodology of setting up the scenario from previous *Reports*, the assumptions made in the scenario have changed. In previous *Reports*, it was assumed that "with overseas economies continuing to grow moderately on the whole, Japan's economy will continue on an expanding trend." In contrast, given that strong stress has already materialized, in this *Report*, it is assumed that "the domestic and overseas economies, having deteriorated substantially, will improve moderately through the materialization of pent-up demand -- demand that has been contained thus far -- and through the support of accommodative financial conditions and government economic measures."

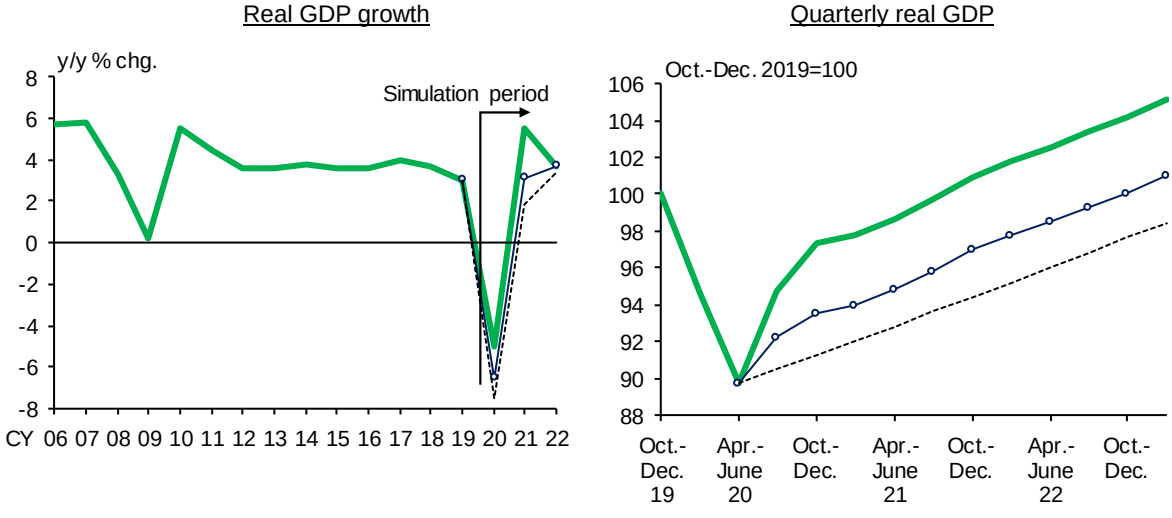
In this scenario, the real GDP growth in Japan and other countries is assumed to bottom out from the April-June quarter of 2020 and the pace of growth throughout the simulation period is assumed to stay above the historical average. The level of GDP at home and abroad gradually returns to the level before the spread of COVID-19, forming a V-shape recovery path. However, since the pace of the real GDP recovery is moderate, the V-shape is not symmetrical and the real GDP does not return to its pre-COVID-19 level until around the end of the simulation period (Charts V-2-2 and V-2-3).

Chart V-2-2: Economic scenarios for simulation (Japan)



Source: Cabinet Office; Japan Center for Economic Research, "ESP forecast."

Chart V-2-3: Economic scenarios for simulation (Overseas)



Source: IMF.

Next, the downside scenario assumes that the real economy is exposed to further negative shocks that slow the pace of the economic recovery at home and abroad. Specifically, it is assumed that the spread of the disease acts as a drag on economic activity at home and abroad through various channels for some time. This gives rise to new shocks that slow the pace of the recovery in the second half of 2020 relative to the baseline. Under this scenario, the real GDP growth rate in the second half of 2020 is half of that in the baseline scenario but the rate thereafter is identical to the growth rate in the baseline scenario (Charts V-2-2 and V-2-3). This scenario assumes the recovery to be substantially slow since pent-up demand, which usually occurs after a major shock, materializes quite gradually.

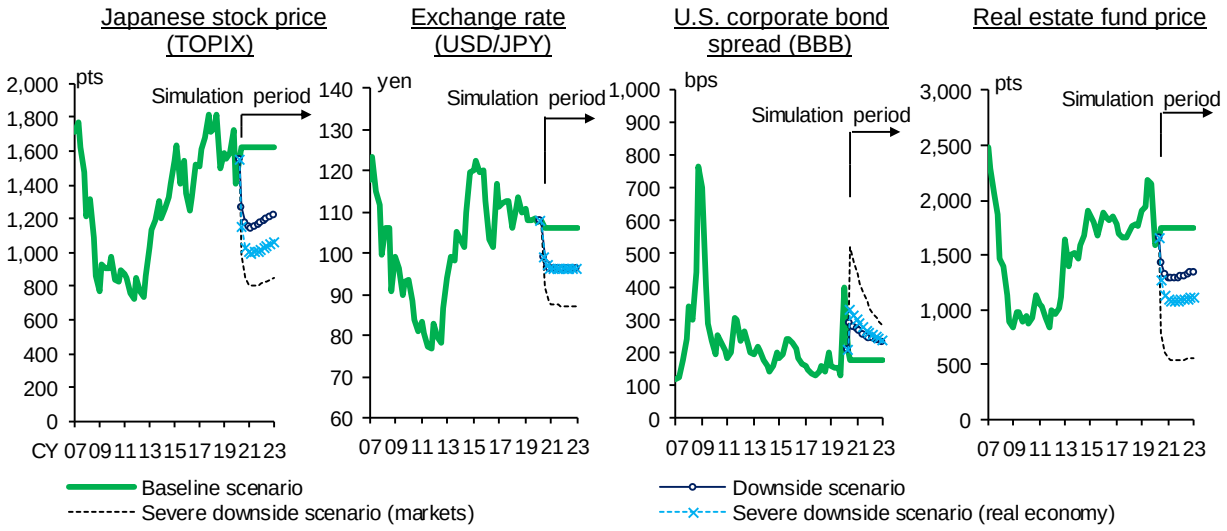
Future developments in the spread of the disease and their impact on the domestic and overseas economies are subject to considerable uncertainty. The severity of the depressive pressure on the domestic and overseas economies in the downside scenario is roughly the same as that assumed by major overseas central banks in their stress testing. That said, a severe downside scenario (real economy) is additionally employed so as to grasp the possible magnitude of the impact in the case where additional adverse shock hits the real economy on top of the stress considered in the downside scenario.

In this severe downside scenario (real economy), it is assumed that the growth rates of the domestic and overseas economies from the July-September quarter of 2020 onward only reach their historical averages due, for example, to a substantial resurgence of COVID-19 infections during the simulation period. In this stagnant recovery scenario, it takes even longer for real GDP to return to the pre-COVID-19 level than in the downside scenario (Charts V-2-2 and V-2-3). Normally, after a large negative shock, the rise in pent-up demand tends to push the economy back to its pre-shock level. In that sense, the assumption here is an extremely weak scenario since it assumes that pent-up demand barely arises due to severe restrictions on economic activity by, for example, the re-introduction of strict public health measures in response to the resurgence in infections.

Assumptions regarding the financial variables

The baseline scenario assumes that the impact of the major downturn in the domestic and overseas economies in the first half of 2020 and currently available information on the outlook for the domestic and international economies are appropriately priced in by financial markets. On this basis, it is assumed that government bond yields evolve in line with the forward rates implied by the yield curve as of late August, and that the Tokyo Stock Price Index (TOPIX), foreign exchange rates, and credit spreads in Japan and abroad all remain unchanged from their August 2020 levels (Chart V-2-4).

Chart V-2-4: Financial market scenarios for simulation



Note: Real estate fund price indicates the TSE REIT Index.
Source: Bloomberg.

The downside scenario assumes that financial markets adjust the pricing by considering an additional negative shock to the real economy as a negative surprise. The magnitude of the market reactions, such as the decline in stock prices, the appreciation of the yen, and the widening of various credit spreads, is linked to the significance of the shock to the real economy.[42] The degree of the linkage is based on average market reactions to such surprises in the past. However, there is uncertainty regarding how seriously financial markets would take the additional negative shock and react to it. Another severe downside scenario, severe downside scenario (markets), is introduced to grasp the impact in the case where markets take more seriously an additional negative shock to the real economy that slows the pace of the recovery (Chart V-2-1). The scenario assumes a one-in-ten likelihood that financial markets react with strong sensitivity.

Once the negative surprise has been reflected in financial variables, it is assumed in this scenario that they revert to their long-term average at a pace suggested by the historical data. Note that data from past stress periods show that the pace at which financial variables revert to their long-term averages tends to be faster in stress periods than the historical averages. This pattern may be linked to the fact that substantial financial market stress tends to be followed by policy responses. The three downside scenarios assume that the pace at which financial variables revert to their long-term averages is similar to the historical averages so as to assess the magnitude of the impact when the downside scenarios materialize and, hypothetically, no additional policy responses are taken.

The extent of the response observed in financial variables based on these assumptions in the downside scenario is about half as large as during the GFC, while under the severe downside scenario (markets), it is almost as severe as during the GFC (Chart V-2-4).

[42] Specifically, for variables that have a significant impact on financial institutions' financial soundness, such as stock prices and credit spreads in Japan and abroad, a statistical method called quantile regression is used to estimate statistical relationships describing the response of those financial variables to changes in the output gap in Japan and abroad. The values for these variables used in the simulations are then obtained by employing these relationships and the difference in the decline in the output gap assumed in each downside scenario. Meanwhile, in each of the downside scenarios, short- and long-term interest rates in Japan and abroad are assumed to fall from the July-September quarter of 2020 to their historic lows and stay at that level through the end of fiscal 2022. Exchange rates are assumed to fluctuate in line with the difference in the decline in two-year interest rates between Japan and the United States.

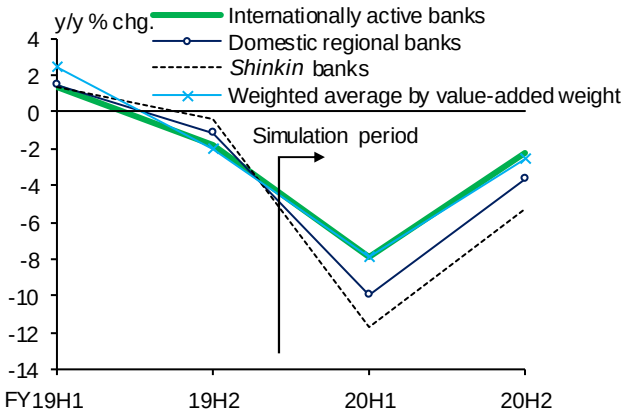
2. Characteristics of the stress testing in this *Report*

For the macro stress testing in this *Report*, the model and scenario were refined in the following four respects based on the characteristics of the impact of the spread of COVID-19 on the financial system identified in the analysis of the preceding chapters.

First, in estimating firms' sales, which form the basis for credit cost estimation, heterogeneity in the impact of the pandemic by industry, firm size, and country or region, as seen in Sections A and B of Chapter IV, is explicitly taken into account.[43,44]

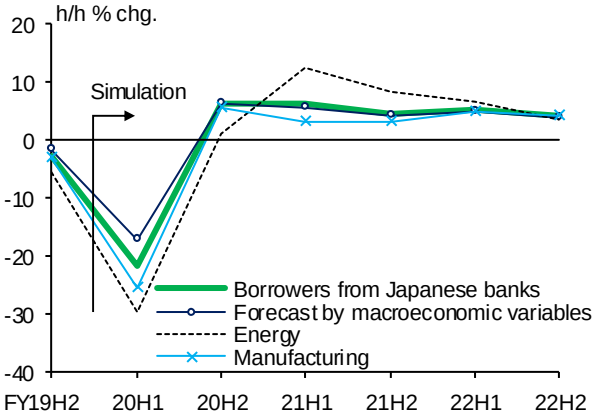
Regarding domestic borrowers, it is possible to quantitatively capture the greater sales declines of domestic regional banks and *shinkin* banks under the current situation, where SMEs, major borrowers of these institutions, are exposed to stronger stress than large firms (Chart V-2-5). Moreover, regarding Japanese banks' overseas borrowers, their weighted average of the decline in the sales outlook is slightly larger than that for all industries due to the relatively large decline in the sales outlook in the manufacturing and energy industries, which account for large shares of Japanese banks' overseas loans (Chart V-2-6).[45]

Chart V-2-5: Borrowing firms' sales forecasts



Note: The figures are calculated by taking the weighted average of Japanese firms' half-year sales outlook stated in the June 2020 *Tankan* survey (year-on-year basis, by industry and by firm size). The weight for each type of bank is based on lending amounts by industry and firm size at end-March 2020. The value-added weight is based on 2016 Economic Census for Business Activity.
Source: Ministry of Economy, Trade and Industry; Ministry of Internal Affairs and Communications; BOJ.

Chart V-2-6: Sales forecasts of U.S. firms



Note: Forecasts under the baseline scenario. The figures for "Borrowers from Japanese banks" are calculated by taking the weighted average of sales forecasts based on Japanese banks' lending amounts by industry at end-March 2020. The loans to project finance are classified into lending to the energy industry. "Forecast by macroeconomic variables" is firms' aggregate sales forecasted by using macroeconomic variables including real GDP.
Source: S&P Global Market Intelligence; BOJ.

[43] Specifically, for the domestic credit cost estimates, previous issues of the *Report* used nominal GDP as a proxy for all bank types to represent stress in financing. In contrast, in the macro stress testing in this *Report*, estimates of the sales outlook by firm size and industry weighted by loans outstanding of each bank type by firm size and industry were used.

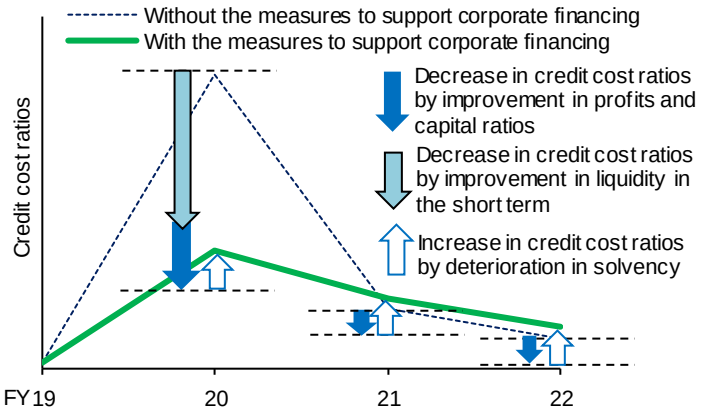
[44] For the estimation of overseas credit costs, based on similar reasoning as that for domestic credit costs, GDP forecasts by region and demand component as well as oil price forecasts were used to estimate sales by region (the United States, Europe, and Asia) and industry (manufacturing, consumer services, energy, and other). These estimates were then weighted by Japanese banks' overseas loans outstanding by region and industry to obtain more detailed estimates than before. Note that with regard to the sales outlook by industry for Asia, except for the energy industry, the outlook estimated by aggregate GDP was used due to data limitations.

[45] Here, in addition to corporate loans, project finance loans were also considered. Meanwhile, Chapter IV, based on corporate bond default rates and earnings data, highlighted that while at present, the overseas corporate loan portfolios of Japanese banks may have been less affected than those of their overseas counterparts, the estimation results here with regard to the sales outlook for Japanese banks' borrowers suggest that, in assessing Japanese banks' credit risks related to overseas loans, close attention needs to be paid to developments in firms' business performance, particularly in industries accounting for a large amount of loans outstanding.

Second, in estimating credit costs, it is explicitly taken into account that, in the short term, measures to facilitate corporate financing implemented by the government and the Bank of Japan as well as lending by financial institutions will lower firms' default rates. In the long term, it is considered that the increase in firms' debt under those measures will raise default rates if the deterioration in profits was prolonged and firms' debt servicing capacity declined further.

Specifically, the model is revised so that it can explicitly capture the impact on firms' creditworthiness of stress on their operating liquidity stemming from the sharp decrease in sales. In addition, thanks to the impact of the financing support measures, it is assumed that there will be no increase in bankruptcies due to funding difficulties despite the decline in nominal GDP in fiscal 2020. Moreover, it is assumed that the support provided to SMEs, such as through cash payments, mitigates the deterioration in their interest coverage ratio (ICR), which represents their debt servicing capacity (Chart V-2-7). It is also assumed that loans extended as part of the corporate financing support measures in fiscal 2020 will not be repaid until the end of fiscal 2022, given that they are mainly long-term loans. As a result, plateaued debt continues to exert downward pressure on the ICR.

Chart V-2-7: Impact of measures to support corporate financing



Third, among the financing support measures, the effectively interest-free loans guaranteed by the credit guarantee corporations are assumed to increase financial institutions' net interest income.[46] At the same time, the credit costs are not assumed to increase in the event of borrowers' default on such loans. In addition, the risk-weighted assets for such loans are not assumed to increase either. While other loans are similar in that they lead to an increase in net interest income, they differ in that they could lead to an increase in financial institutions' credit costs and risk-weighted assets.

Fourth, in addition to the interest rate risk and stock price risk already taken into account in previous *Reports*, the market risk exposures related to domestic and overseas credit investment and investment trusts, the prices of which fell sharply when financial markets became volatile due to the spread of COVID-19, are now explicitly taken into account in the scenario setting and model revisions.

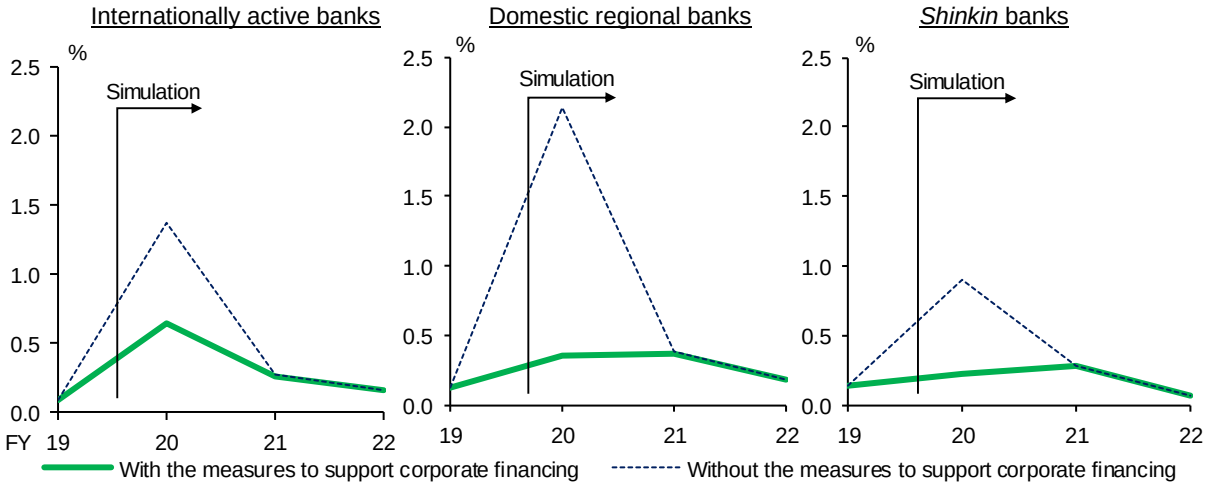
[46] To simplify the quantitative analysis of the impact of the effectively interest-free loan program, which is mainly aimed at SMEs, it is assumed that the size of the program is identical to the net increase in loans outstanding by regional financial institutions since the start of fiscal 2020. In practice, part of the increase in lending by regional financial institutions seen since the spread of COVID-19 is the result of regional financial institutions taking on risks themselves (Chart III-1-14 and Box 1). The assumption is made to facilitate the quantitative analysis of the macro impact of the effectively interest-free loan program while avoiding making the analysis too complex, but it should be noted that, under this assumption, the proactive lending stance of regional financial institutions is not sufficiently taken into account.

3. Results of stress testing

Baseline scenario

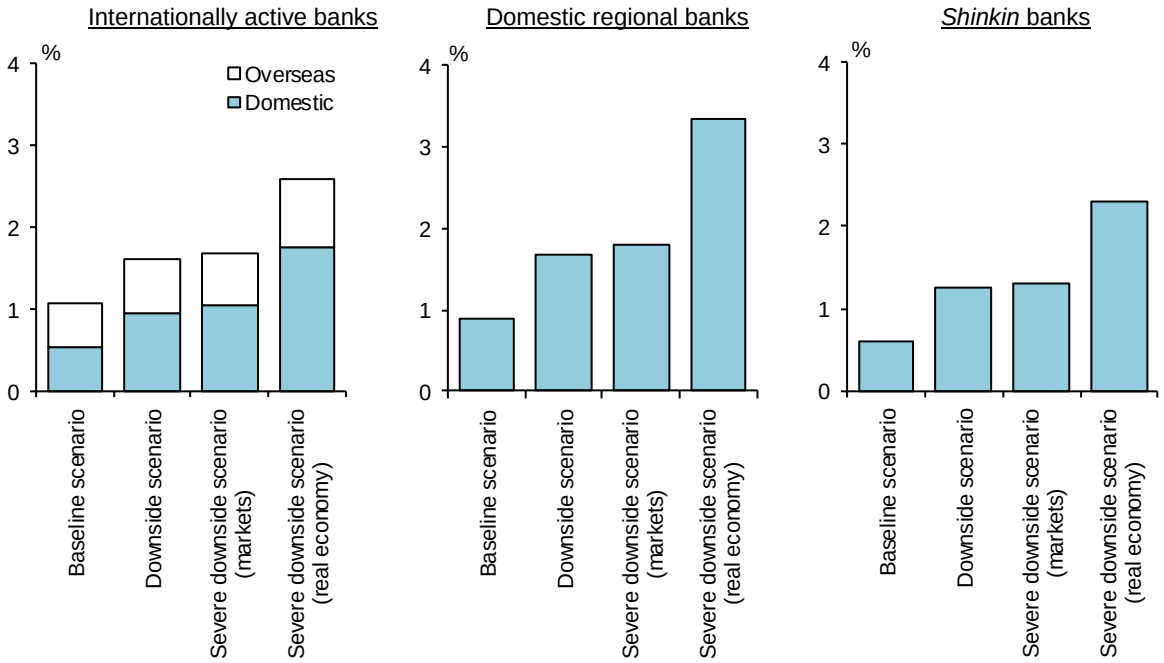
The simulation results under the baseline scenario show that the credit cost ratios peak in fiscal 2020 for internationally active banks and in fiscal 2021 for domestic regional banks and *shinkin* banks, and then decline moderately in fiscal 2022, the final year of the simulation (Chart V-2-8). The cumulative credit cost ratios rise to about 1 percent for all types of banks for the 3 years from fiscal 2020 to 2022 (Chart V-2-9). These simulations of the credit cost ratios include the impact of policy measures examined in the previous chapters. In fiscal 2020, the corporate financing support measures roughly offset the upward pressure on credit costs through the depletion of operating liquidity and the decline in firms' debt servicing capacity due to the deterioration in their profits. Without the contribution of corporate financing support measures, the credit cost ratios in fiscal 2020 could increase substantially for all types of banks in the simulations (Chart V-2-8). Looking at credit costs, which incorporate the contribution of corporate financing support measures, by type of banks, the ratio for internationally active banks is higher than for other types of banks. This reflects the fact that internationally active banks benefit less from the corporate financing support measures than the other types of banks amid the relatively high proportion of loans to domestic large firms and overseas firms. A limited proportion of the loans to domestic large firms qualify for the corporate financing support measures. Moreover, the stress testing of this *Report* does not consider the effect of the corporate financing support measures by overseas governments. Meanwhile, the credit cost ratio for domestic regional banks in fiscal 2020 is compressed by more than 1 percentage point, indicating that the impact of support measures is larger for domestic regional banks than for other types of banks.[47]

Chart V-2-8: Credit cost ratios (baseline scenario)



[47] This reflects the fact that the scope for the suppression of credit costs through policy measures is larger for domestic regional banks than other types of banks, since the decline in sales outlook faced by their borrowers is larger than that of internationally active banks' borrowers, and the fact that their credit costs are more sensitive to the business cycle than those of *shinkin* banks.

Chart V-2-9: Credit cost ratios (3-year cumulative totals)

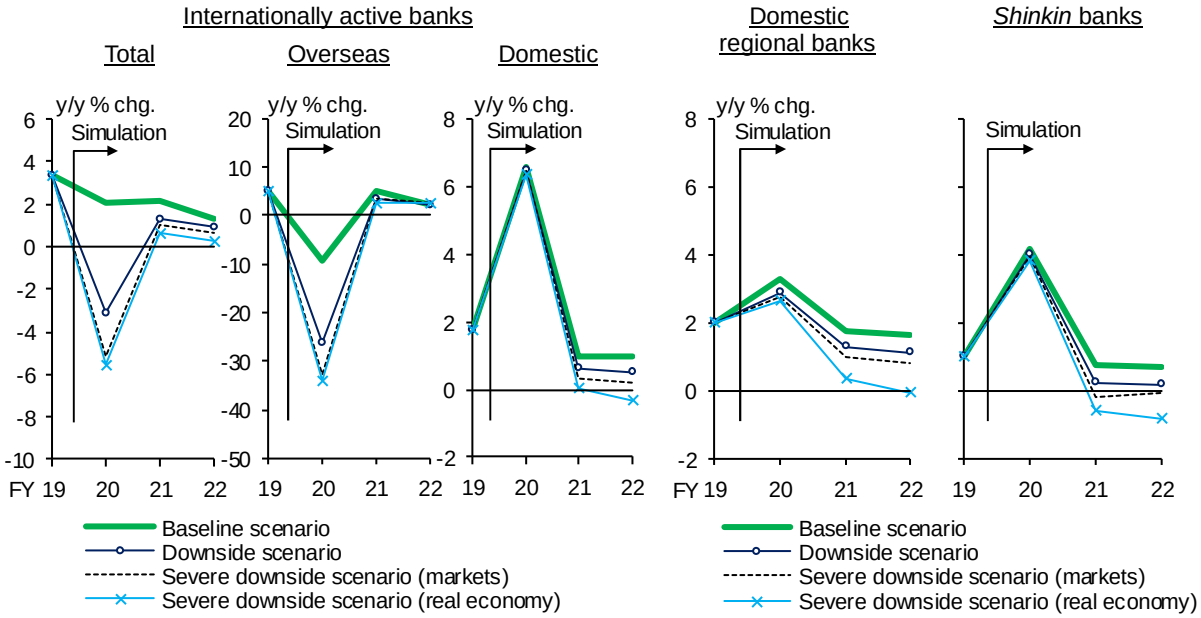


Note: Credit cost ratios are cumulative totals of FY 2020-2022.

Loans outstanding continue to show positive growth throughout the simulation period for all types of banks (Chart V-2-10). Since the beginning of fiscal 2020, loans to domestic firms have increased substantially among all types of banks, mainly due to the increase in loans based on government programs in response to the spread of COVID-19 (Chart III-1-8). In the simulation in this *Report*, loans outstanding to domestic firms in excess of the amount predicted by the stress testing model as of the end of June 2020 are regarded as COVID-19-realted lending. The loans are added on to financial institutions' loans outstanding throughout the simulation period (Chart V-2-11). [48] Consequently, the loans outstanding of domestic regional banks and *shinkin* banks and the domestic loans of internationally active banks increase sharply in fiscal 2020 and continue to exhibit moderate growth thereafter (Chart V-2-10).

[48] In this simulation, this "excess" increase in loans is treated as follows. In the case of loans to large firms, the increase in leverage in the corporate sector will lead to a rise in future default rates, and this impact is incorporated into the simulation. On the other hand, in the case of loans to SMEs, it is assumed that effectively interest-free loans make up the majority, so that such negative impact does not arise and therefore is not incorporated. As for COVID-19-related lending to large firms, while loans based on precautionary demand for liquidity may gradually decrease over time, for simplicity, the simulation assumes that outstanding balances do not change, meaning that the assumptions regarding risk-weighted assets are on the conservative side.

Chart V-2-10: Loans outstanding



However, at internationally active banks, overseas lending decreases significantly from the second half of 2020 mainly due to the decline in the demand for funds amid the substantial slowdown in overseas economies. As this offsets the increase in domestic loans, the overall growth of their loans outstanding is only about 2 percent in fiscal 2020.[49] Lending margins continue to shrink moderately for all types of banks amid the continued slack in the domestic loan market (Chart V-2-12). Under these developments in loans outstanding and lending margins, in fiscal 2020, net interest income at domestic regional banks and *shinkin* banks slightly expands from its actual level for fiscal 2019, but it subsequently declines moderately at all types of banks through fiscal 2022, the final year of the simulation (Chart V-2-13). Taken together, the cumulative net income during the simulation period remains positive for all types of banks (Chart V-2-14).[50] Consequently, the capital adequacy ratio in fiscal 2022, the final fiscal year of the simulation, remains at levels that exceed regulatory requirements for all types of banks (Chart V-2-15). Regarding the changes in capital adequacy ratios from the end of fiscal 2019, the CET1 ratio declines for internationally active banks (Chart V-2-16). The rise in credit cost contributes largely to such decline and the increase in risk-weighted assets due to the current increase also makes a contribution. In contrast to internationally active banks, the capital adequacy ratios for domestic regional banks and *shinkin* banks remain almost unchanged. This reflects the slightly smaller negative contribution of the credit cost and the limited increase in risk-weighted assets due to the increase in lending guaranteed by public institutions.[51]

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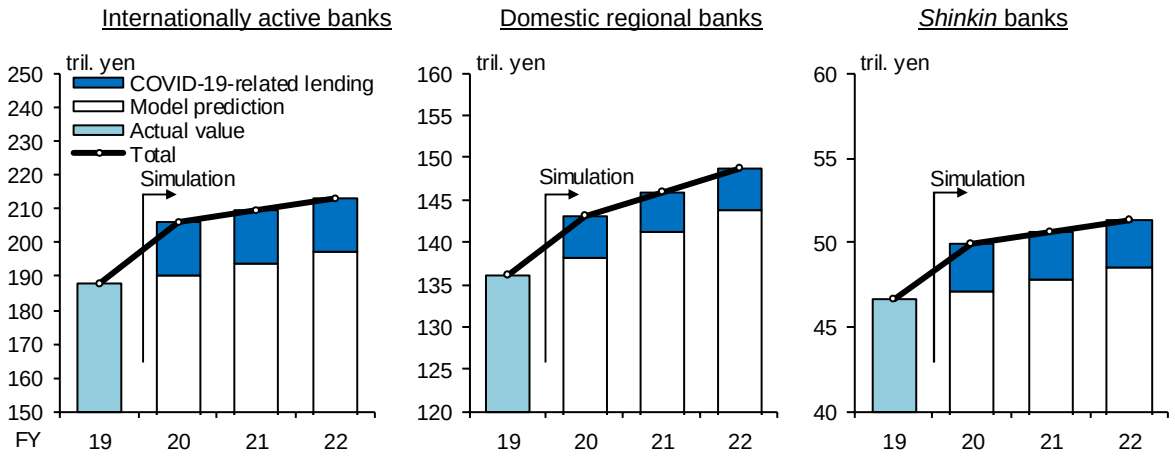
[49] One of the reasons for the large decrease in overseas loans is that in the FMM, large banks' overseas loans are highly sensitive to the business cycle overseas. While this captures the average trend during recessionary periods in the past, including the GFC, when overseas lending fell substantially, it may not fully capture changes resulting from the growing importance of Japanese banks' overseas business in recent years. In addition, it should be noted that the impact on loans of corporate financing support measures currently taken by governments abroad is not incorporated.

[50] As in the previous *Report*, regarding financial institutions' dividend payments, the average payout ratio of the past 3 years is used if a financial institution's net income is positive, while it is assumed that a financial institution pays no dividends if its net income is negative. For details, see "The Financial Macro-econometric Model (FMM, March-2020 Version): Overview and Recent Developments," *Financial System Report Annex Series*, August 2020.

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

Chart V-2-11: Loans outstanding for domestic firms (baseline scenario)



Note: The figures are as at the end of each fiscal year. "COVID-19-related lending" is defined as the actual value minus the model prediction at end-June 2020.
Source: BOJ.

Chart V-2-12: Lending margin

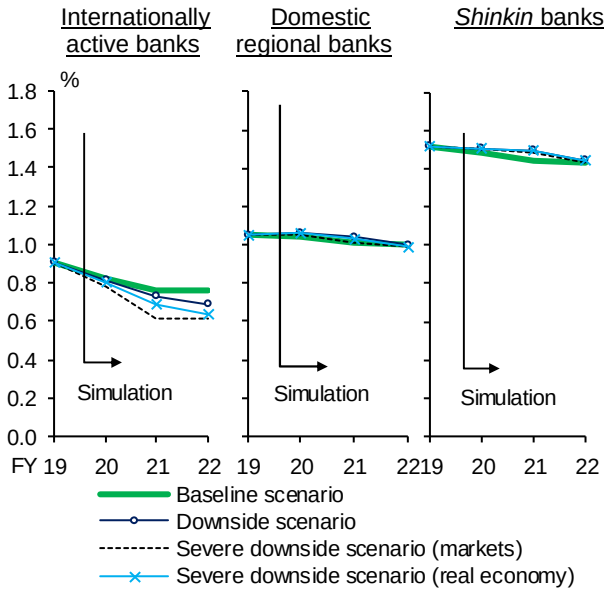
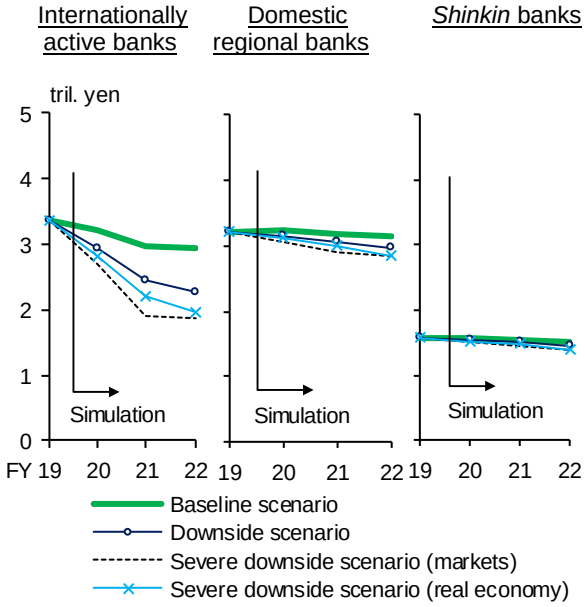
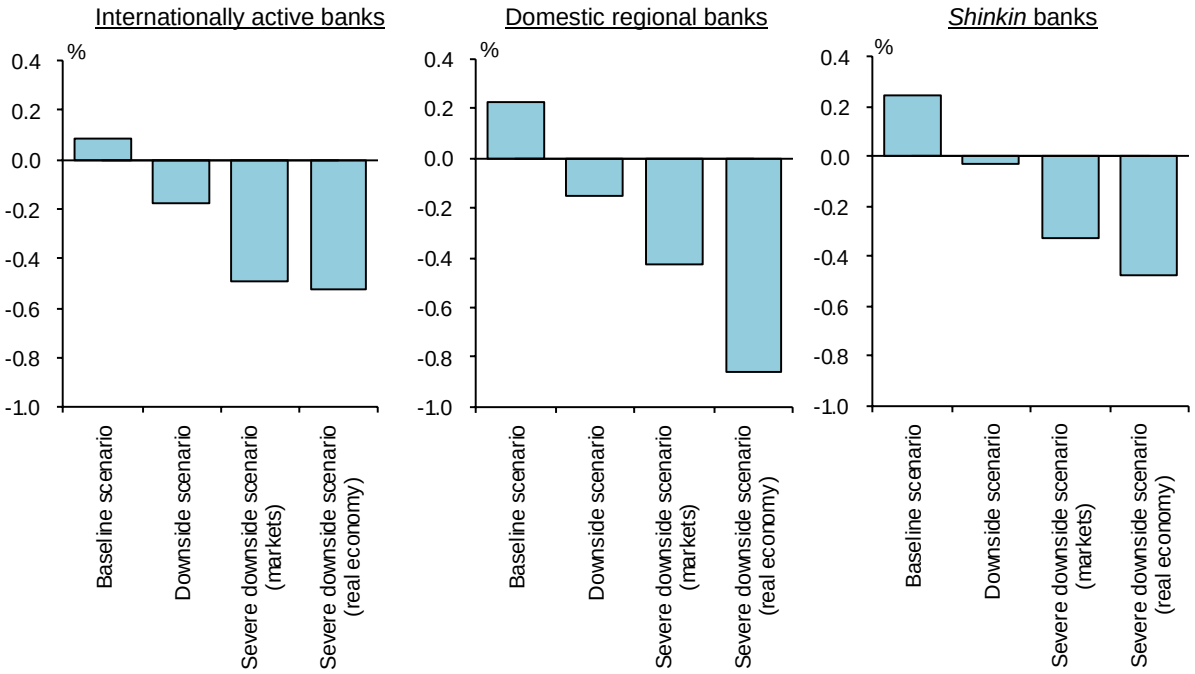


Chart V-2-13: Net interest income



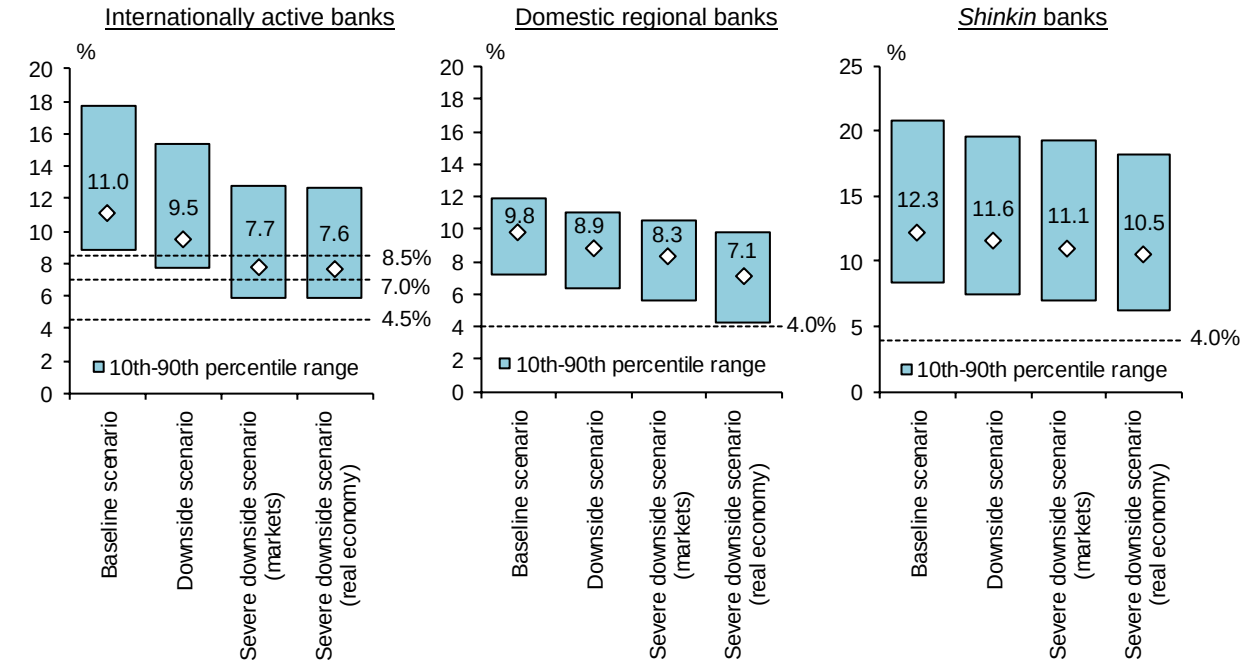
institutions that have exhausted all unrealized gains.

Chart V-2-14: Net income (3-year cumulative totals)



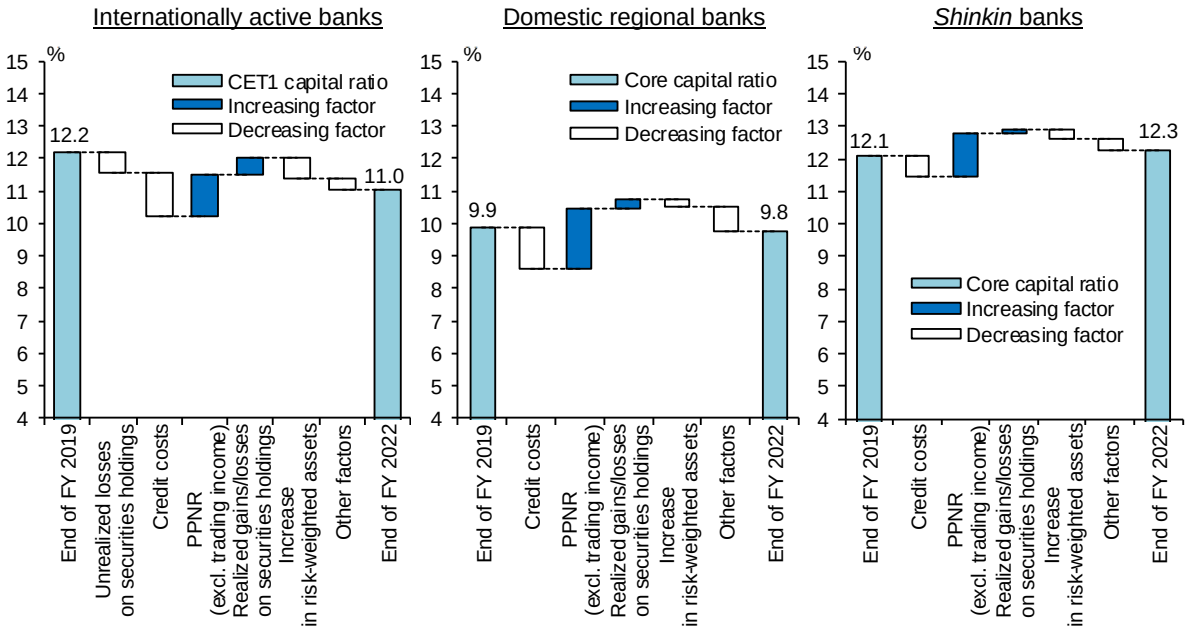
Note: The charts indicate the ratio of net income to total assets. The net incomes are cumulative totals of FY 2020-2022.

Chart V-2-15: CET1 capital ratios and core capital ratios (fiscal 2022)



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

Chart V-2-16: Decomposition of CET1 capital ratio and core capital ratio (baseline scenario)



Note: 1. The charts indicate the contribution of each factor to the difference between the capital adequacy ratios at end-March 2020 and the end of the simulation period (as at end-March 2023) under the baseline scenario.
2. "Unrealized losses on securities holdings" takes tax effects into account (the same applies to Charts V-2-17, V-2-18, and V-2-19).
3. The left-hand chart shows the CET1 capital ratio of internationally active banks. The other charts show the core capital ratio (the same applies to Charts V-2-17, V-2-18, and V-2-19).
The transitional arrangements are taken into consideration (the same applies to Charts V-2-17, V-2-18, and V-2-19).
4. "Other factors" includes taxes, dividends, and CET1 regulatory adjustments (the same applies to Charts V-2-17, V-2-18, and V-2-19).

Downside scenario and two severe downside scenarios

The results of the simulations based on the downside scenario and the two additional severe downside scenarios are as follows.

a. Credit cost ratios

In the downside scenario, credit cost ratios increase more than the baseline scenario for all types of banks (Chart V-2-9).[52] By type of banks, credit cost ratios for internationally active and domestic regional banks are roughly at the same level, and at a slightly lower level for *shinkin* banks. The main reason for this contrast is that although SMEs in general are more susceptible to the impact of the spread of COVID-19, the credit cost ratios of loans to SMEs held by *shinkin* banks tend to be less sensitive to macroeconomic changes than those held by other types of banks. Under the severe downside scenario (real economy), the credit cost ratio of domestic regional banks is the highest among all types of banks for the following reasons.[53] First, domestic regional banks' borrowers, in terms of their size and industry, are more likely to be affected by the spread of the disease, assuming that the scale of measures to support

[52] Since the assumption on the real economy for the severe downside scenario (markets) employs the same one as the downside scenario, the result of the simulation is more or less identical.

[53] The reason why the credit cost ratio of domestic regional banks is projected to become significantly higher than that of shinkin banks is that regional banks' share of loans to low-return borrowers is higher than that of shinkin banks, as well as the fact that the credit costs of regional banks during past recessions, including during the GFC, were more sensitive to business conditions than those of shinkin banks, which is reflected in different parameter values in the credit cost models.

corporate financing remains unchanged during the simulation period. Second, the credit costs of domestic regional banks are more sensitive to economic conditions than those of *shinkin* banks. At internationally active banks, while their overseas loans outstanding account for about 20 percent of their loans outstanding overall, the relatively large credit cost of overseas loans accounts for about 30 percent of their overall credit cost.

b. Loans outstanding and net income

The growth in loans outstanding in the downside scenario falls below the baseline scenario (Chart V-2-10). Moreover, in the severe downside scenario (real economy), the overall domestic loans outstanding decline in fiscal 2022 on a year-on-year basis, due mainly to a decline in demand for funds amid the downturn in the domestic and overseas economies and to a deterioration in lending capacity amid lower capital adequacy ratios. Meanwhile, in all the downside scenarios, overseas lending by internationally active banks declines significantly in fiscal 2020. This reflects weaker demand for funds amid a larger downturn in the overseas real economies than in the domestic economy and a decline in the yen-denominated value of overseas loans due to the yen appreciation. Against this background, net interest income declines relative to the baseline scenario due to the decrease in loans outstanding both at home and abroad and to the shrinking lending margins owing to the increase in funding costs (Charts V-2-12 and V-2-13). In particular, the decline in the net interest income of internationally active banks is larger than that of other types of banks. This is due to a contraction in overseas net interest margins driven by a plunge in overseas economies and an increase in foreign currency funding costs, and to the yen-denominated value reduction in overseas lending-related revenue under the yen appreciation. Taken together, for all types of banks, the cumulative net income over the simulation period is unlikely to remain in the black (Chart V-2-14).

c. Capital adequacy ratios

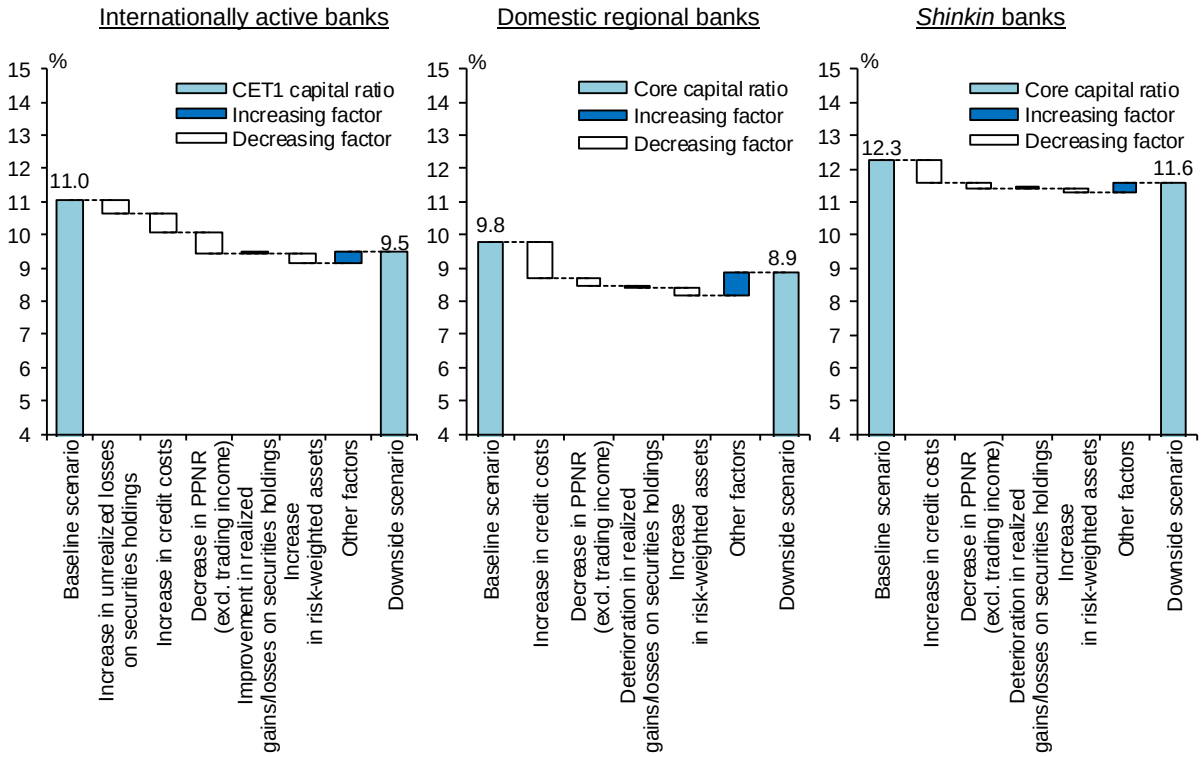
In the downside scenario, capital adequacy ratios decline through fiscal 2022, the final fiscal year of the simulation (Chart V-2-15). The ratios on average, nevertheless, remain above regulatory levels for all types of banks. However, some internationally active banks need to draw down their regulatory capital buffers. Decomposition of the decline in the ratios relative to that of the baseline scenario shows that the rise in credit cost is the main contributor to the decline for all types of banks. For internationally active banks, the deterioration in unrealized gains/losses on securities, due to the decline in stock prices and higher credit spreads, also contributes to the decline in their ratios (Chart V-2-17).

In the severe downside scenario (markets), financial markets react with stronger sensitivity to an additional negative shock to the real economy than they do in the downside scenario. Under this scenario, the average CET1 ratio of internationally active banks falls below 8 percent (Chart V-2-15). More of these banks have to draw down their regulatory capital buffers. The average capital adequacy ratio of domestic regional banks also falls to the range of 8.0-8.5 percent. The deterioration in realized gains/losses on securities holdings, as well as unrealized gains/losses in the case of internationally active banks, contributes to a further decline in capital adequacy ratios relative to the baseline scenario (Chart V-2-18).

In the severe downside scenario (real economy), capital adequacy ratios fall even further for all types of banks compared to the downside scenario. By type of banks, the average CET1 ratio of internationally active banks falls below 8 percent and the average capital adequacy ratio of domestic regional banks declines to only slightly above 7 percent (Chart V-2-15).

Decomposing the decline in capital adequacy ratios relative to the baseline scenario, the increase in credit costs due to the downturn in the real economy further pushes down the capital adequacy ratios for all types of banks (Chart V-2-19).

Chart V-2-17: Decomposition of CET1 capital ratio and core capital ratio (downside scenario)



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 2023) under the baseline and downside scenarios (the same applies to Charts V-2-18 and V-2-19).

Chart V-2-18: Decomposition of CET1 capital ratio and core capital ratio (severe downside scenario <markets>)

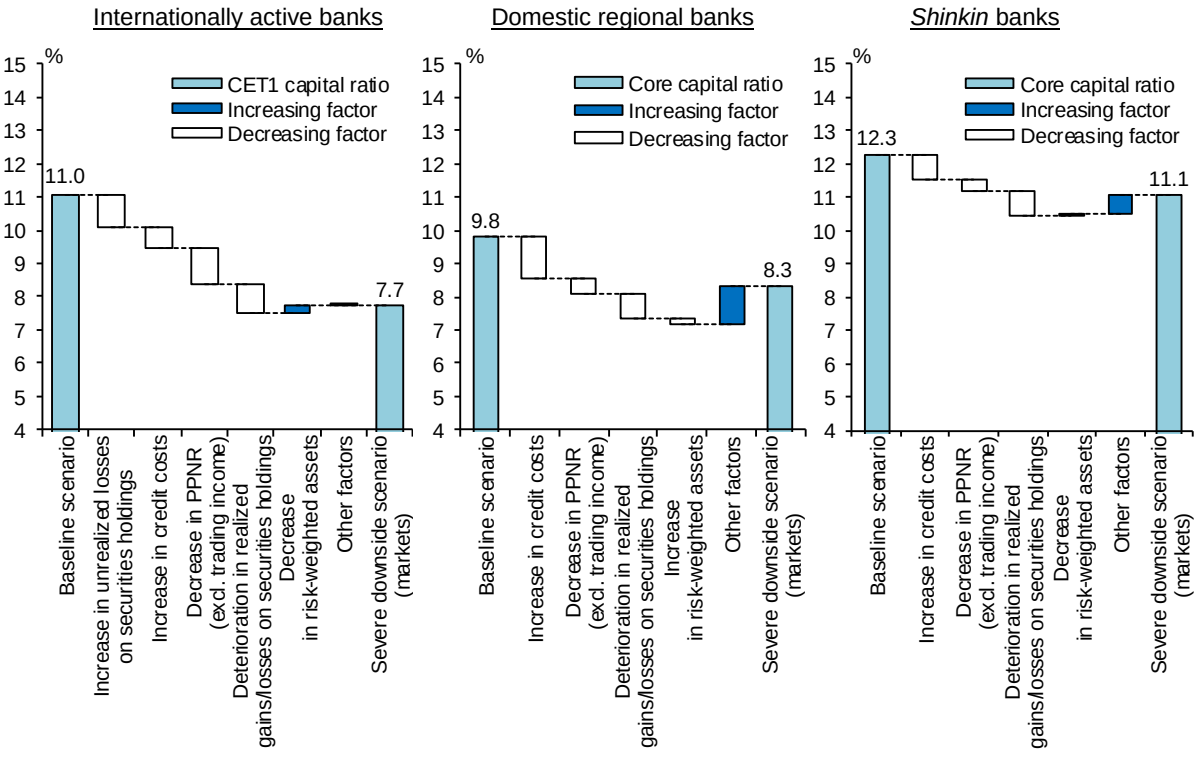
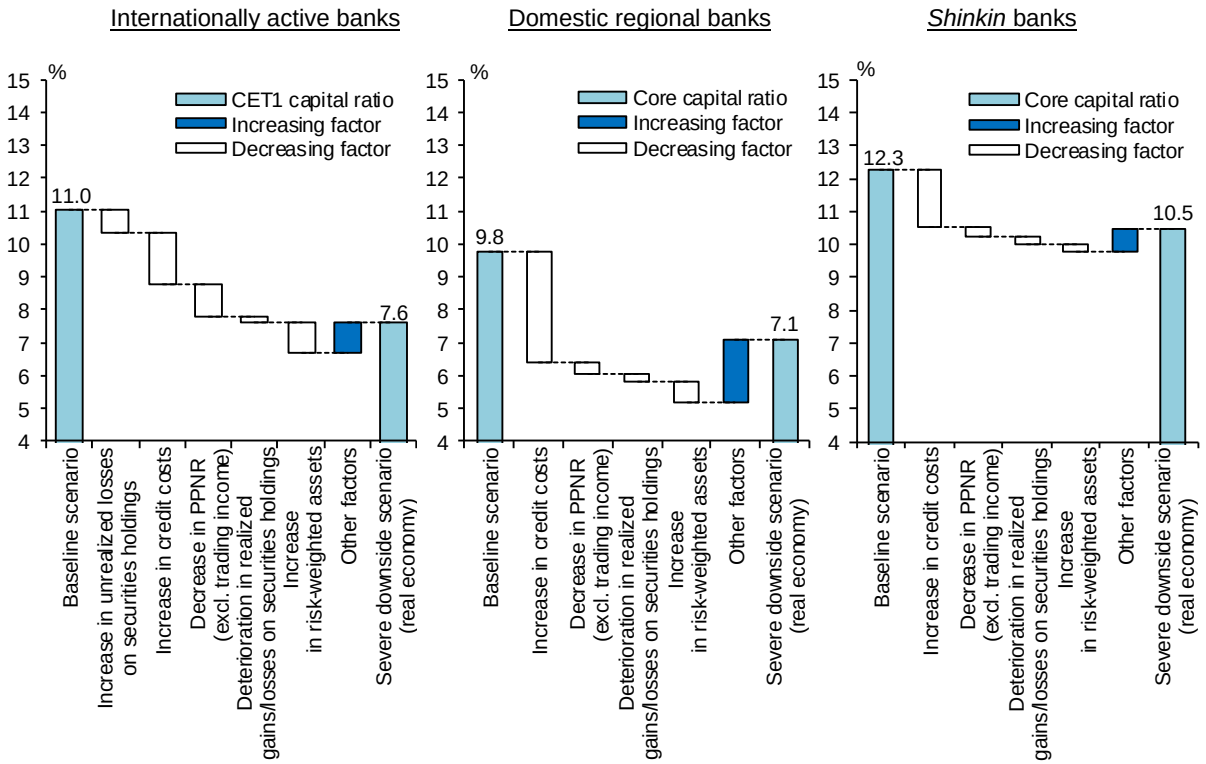


Chart V-2-19: Decomposition of CET1 capital ratio and core capital ratio (severe downside scenario <real economy>)



In summary, the stability of Japan's financial system will be maintained if the economy recovered in line with the average of the current forecasts. Since the GFC, financial institutions have become more robust by building up their capital and non-financial firms have also maintained their sound financial positions on the whole. Against this backdrop, measures to support corporate financing have been highly effective, which is the fundamental background of this result.[54] Even in the case where the economic recovery remains very moderate, Japan's financial system is likely to remain robust and the smooth functioning of financial intermediation will be maintained. Nevertheless, the result also suggests the possibility that a negative influence on financial intermediation activities could surface if a strong negative shock stagnated the pace of the recovery of the domestic and overseas economies and the shock was viewed as a negative surprise by financial markets. Under such severe stress event, the growth in domestic loans would become negative at the end of the simulation period due both to sluggish demand for funds amid the downturn in the domestic and overseas economies and to the capital constraints of financial institutions.

[54] However, the impact of policy responses on credit costs, etc., in the banking sector should be regarded as subject to a considerable margin of error. For example, in the long run, the policy responses may lead to an increase in credit costs and a decrease in financial institutions' profits such as through an increase in lending to low-return borrowers. This *Report* does not consider these negative effects regarding the allocation of loans across firms.

VI. Impact of COVID-19 and challenges for financial institutions

Impact of the disease and challenges for financial institutions

The major challenge for financial institutions is to smoothly fulfill their financial intermediation function and support the economy by balancing their financial soundness and risk taking, in a situation where the impact of COVID-19 continues to be observed.

Financial institutions' loans outstanding to domestic firms have increased significantly as financial institutions have been making positive efforts toward providing funding support to firms, and as the government and the Bank of Japan have been supporting such efforts. The implication of the increase in loans outstanding for financial stability depends on whether the downward pressure on GDP and corporate earnings will be a temporary one or a considerably persistent one that requires a long recovery period. The future outcome is subject to great uncertainty regarding the developments in the spread of the disease and their impact on the domestic and overseas economies.

Many firms have increased their debt as their sales have declined and their profits have deteriorated. Further, some of these firms have recorded losses with their net assets declining. The debt servicing capacity of firms would decline if the pace of the economic recovery stagnates going forward. The stress testing in this *Report* examines the impact of such risks on Japan's financial stability. The results show that, (1) even in the case where the economic recovery remains very moderate, Japan's financial system is likely to remain highly robust, and (2) under the severe stress event of the persistently stagnated pace of economic recovery and significant adjustments in financial markets, a deterioration in financial institutions' financial soundness and the resultant impairment of the smooth functioning of financial intermediation could pose a risk of further downward pressure on the real economy.

Against this background, careful assessment of the sustainability of the borrowers' businesses based on future changes in economic conditions will become increasingly important for financial institutions. Specifically, it is necessary to assess whether borrowers are capable of making up the loss of sales and profits due to COVID-19, and whether they are able to adapt to the future changes in the economy and society from a longer-term perspective. On this basis, providing effective support tailored to the needs of borrowers will become essential. The sustainability of borrowers' businesses may be influenced by the quality and quantity of the broad-ranging financial services that financial institutions provide. These services include (1) assisting firms' core business, such as business matching, (2) facilitating business revitalization and succession, and (3) providing funds to restructure debt and strengthen capital bases. In some cases, in order for society to more efficiently utilize the human resources, knowledge and experience, and production facilities of firms, it may be an option for financial institutions to support firms in business take-overs and reorganization, including M&A. These initiatives will promote more efficient allocation of resources in the overall economy, thereby contributing to an improvement in the productivity and vitality of industries both at the national and local levels. At the same time, this will lead to an improvement in financial institutions' core profitability.

Maintaining financial soundness is one of the primary foundations for financial institutions to play these roles. There are three key points to maintaining their financial soundness. The first is strengthened risk management capabilities in areas where they actively take risks. This requires

accurate identification and measurement of risks in investing and lending as well as foreign currency funding for areas where there was concern over the accumulation of vulnerabilities before the COVID-19 outbreak and areas that have been significantly affected by the spread of the disease. The capabilities should be functioning even in times of stress. The second is adequate loan-loss provisioning based on accurate identification and measurement of risks as well as the assessment of the sustainability of borrowers' businesses. This element is important when providing proactive financial support to firms. The fact that financial institutions have started working on implementing loan-loss provisioning that is compatible with their business strategies and focuses on borrowers' future repayment capacity in a forward-looking manner marks an important change. This change was in line with the repeal of the FSA's inspection manual. The third is sound capital planning under considerable uncertainty. In fiscal 2019, financial institutions substantially reduced their share buybacks. Recently, some institutions have been planning to increase their capital. In major economies, financial authorities are increasingly instructing and requesting financial institutions to restrict the outflow of funds in order to secure their lending capacity. In Japan, financial institutions, especially systemically important large ones, need to conduct stress testing in order to examine the balance between financial soundness and risk taking, assuming an additional strong negative shock to the economy at home and abroad. Financial institutions then need to reflect their findings from the stress testing in their capital planning.

The environment surrounding Japanese society is undergoing major changes, including population declines and aging, digital transformation and working-style reforms, as well as heightened interest in climate change. In the medium to long run, financial institutions are expected to contribute to achieving a sustainable society in the post-COVID-19 era by offering higher value-added financial services. Meanwhile, amid the prolonged low interest rate environment, financial institutions' profit margins and net interest income will continue to be depressed. In addition, the digital transformation can affect financial institutions' profits from their conventional business areas, through new entry of firms from different businesses and lower pricing.

Considering the foregoing, financial institutions need to work on two fronts. The first is improving their capability to contribute to vitalizing the national and local economies. Together with the aforementioned efforts to support firms and contribute to solving a variety of issues -- by supporting households' wealth building and inheritance, by vitalizing local economies and renovating communities, and by implementing disaster prevention measures -- financial institutions need to establish business models to profit from such efforts. The second is enhancing operating efficiency and business bases. Financial institutions need to further accelerate their efforts since the current environment, in which profit-making is difficult, will continue. Against this background, financial institutions need to continue making proactive investments to enhance their capacity to deliver better financial services. Making use of digital technologies is an important factor for both the first and second front.

Actions by the Bank of Japan

The Bank of Japan, in close cooperation with the Japanese government and overseas financial authorities, will make efforts to ensure the stability of the financial system and the smooth functioning of financial intermediation. From a medium- to long-term perspective, the Bank will

actively support financial institutions' initiatives by preparing institutional frameworks for the financial system and taking measures to facilitate the digital transformation.[55]

In conducting on-site examinations and off-site monitoring, the Bank will accurately identify and measure the impact of COVID-19 on financial institutions' future profitability and financial soundness as well as foreign currency funding, based on their risk profile. It will also share its views with these institutions. The Bank will place greater emphasis on examining financial institutions' resilience to downside risks to their profitability and financial soundness by using, for example, supervisory simultaneous stress testing that is based on common scenarios and is conducted jointly with the FSA. The Bank will actively engage in dialogue with financial institutions whose future profitability and financial soundness concern the bank. Such dialogue will cover the capital levels necessary for these institutions to perform their financial intermediation functions in a stable manner into the future as well as management policies, including capital policies that can secure such capital levels. In terms of foreign currency funding, the Bank will accurately grasp Japanese banks' management framework and will closely exchange views with the banks about managing stable foreign currency funding, while taking account of the fact that the amount of Japanese banks' foreign currency funding has been on an upward trend.

In fiscal 2020, the Bank has tentatively replaced its on-site examinations with intensive interviews with examinee institutions conducted mainly through web and teleconferences. This action was taken in order to prevent the spread of COVID-19 and to reduce the operational burdens on examinee institutions, which are striving to provide financing support to corporates and households. In conducting these interviews, the Bank, based on the risk profiles of examinee institutions, focuses on examining how COVID-19 affects their business, such as in terms of providing financing support to corporates and households and the management of credit and market risk. Through these intensive interviews, the Bank has been accumulating experience in the application of digital technology to on-site examinations. With this experience as well as increasing social acknowledgement of and experience with the digital transformation amid the spread of COVID-19, the Bank intends to utilize digital technologies as necessary in on-site examinations going forward, such as web conferences and other means.

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

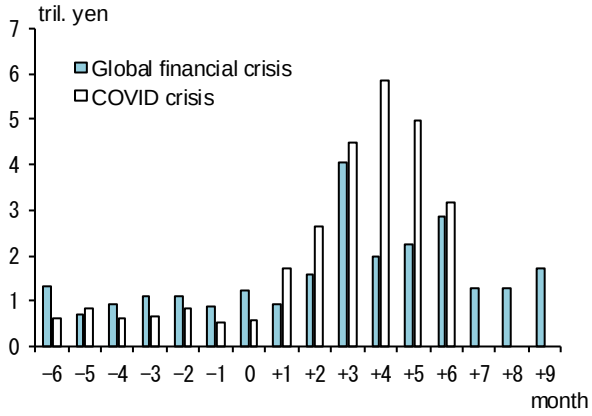
[55] For more details on the basic approach applied in conducting on-site examinations in fiscal 2020, see "On-Site Examination Policy for Fiscal 2020," March 2020 and "Guideline for Conducting On-Site Examinations in Response to COVID-19," June 2020.

Box 1: Easing of financing conditions through effectively interest-free loans

Amid the spreading impact of COVID-19, government loan programs have been expanded to further enhance financial support for small businesses and small business owners. As part of these programs, private financial institutions have been providing effectively interest-free loans since May 2020. Under this program, small businesses that have been facing a sales decline are able to receive loans of up to 40 million yen with a duration of up to 10 years and the option to defer principal repayments by up to 5 years. The program also offers borrowers a reduction of, or exemption from, loan guarantee fees for the entire loan period and interest subsidies for the initial 3 years. The way that interest is subsidised differs across local governments and can be classified into the following three methods: (1) the *cash back method*, where borrowers are required to pay interest to financial institutions and the local government subsequently reimburses borrowers; (2) the *real time method*, where the local government directly pays interest to financial institutions without going through borrowers; and (3) the *alternative method*, where financial institutions can choose either the *cash back method* or the *real time method*.

Since its inception, the loan program is considered to have helped ensure stable funding of small businesses both in terms of volume and costs. With regard to volume, loans outstanding extended by regional financial institutions under this particular program have shown a sharper increase than the amounts outstanding of their regular loans (Chart III-1-14). The amount of loan guarantees approved by credit guarantee corporations, including loans extended under other similar programs of local governments, has far exceeded that during the GFC (Chart B1-1). Borrowers' funding costs

Chart B1-1: Amount of loan guarantees approved by credit guarantee corporations



Note: 1. The approved amount of loan guarantees before and after the event.
2. The event date (represented as zero) is September 2008 for the "Global financial crisis" and February 2020 for the "COVID crisis."
Source: Japan Federation of Credit Guarantee Corporations.

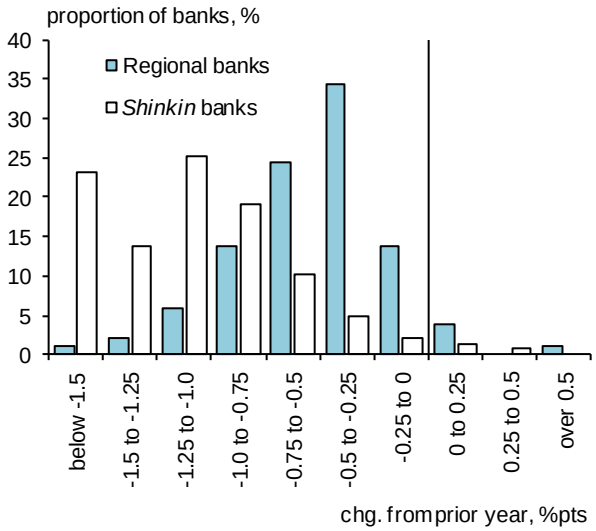
on new loans, estimated by assuming that interest rates under the loan program are set at zero percent regardless of interest subsidy methods, have declined substantially for both regional bank lenders and *shinkin* bank lenders (Chart B1-2).[56]

It should also be noted that quite a few regional financial institutions have seen a decline in lending rates on new loans, estimated by assuming that interest rates under the loan program are set at the subsidy levels of each local government's program (Chart B1-3). In particular, more than half of *shinkin* banks, whose borrowers are small firms and whose lending rates during normal times are relatively high, have seen a decline in lending rates from the previous year since the start of the

[56] In general, regional financial institutions extend loans under the loan programs of several different local governments. The figures in Chart B1-2, however, are estimated based on the assumption that the total amount of effectively interest-free loans of an individual regional financial institution is extended at the interest rate (5-year rate for fully guaranteed loans) set by the local government where the institution's head office is located. The same applies to Chart B1-3.

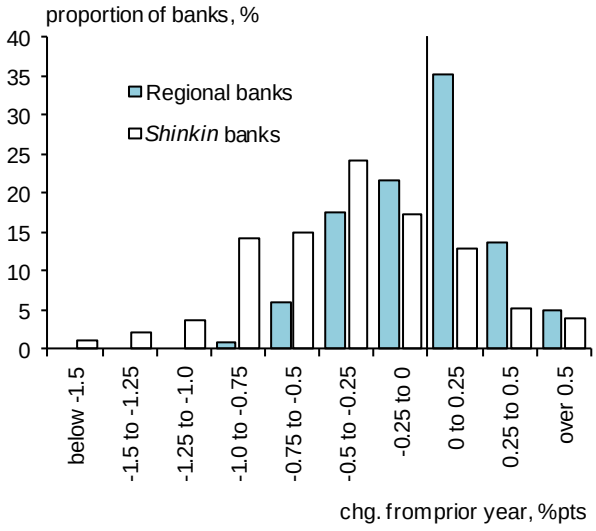
program. However, at most of the regional financial institutions, the negative impact that a decline in lending rates has had on profits from deposit-taking and lending activities has been offset by the positive impact of an increase in loans outstanding, so that their break-even credit cost ratios have marginally improved this fiscal year (Chart B1-4).

Chart B1-2: Changes in borrowing interest rates on new loans from a borrower's perspective



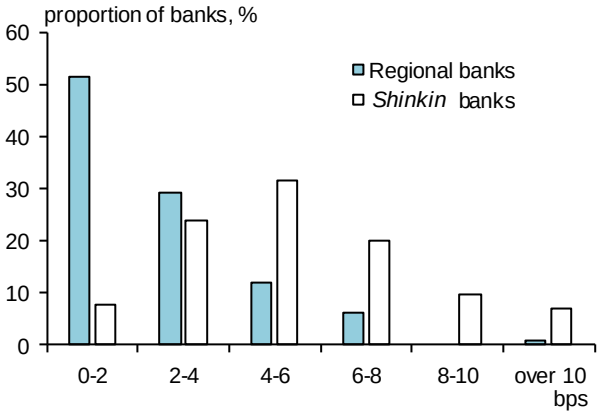
Note: 1. Borrowing interest rates on new loans are calculated by assuming that effectively interest-free loans are set at an interest rate of zero.
2. The horizontal axis indicates the year-on-year difference in borrowing interest rates, and the vertical axis indicates the proportion of financial institutions. Data as at July 2020.
Source: BOJ.

Chart B1-3: Changes in lending rates on new loans from a financial institution's perspective



Note: 1. Lending rates on new loans are calculated by assuming that effectively interest-free loans are set at an interest rate of each local government's program.
2. The horizontal axis indicates the year-on-year difference in lending interest rates, and the vertical axis indicates the proportion of financial institutions. Data as at July 2020.
Source: BOJ.

Chart B1-4: Changes in break-even credit cost ratios



Note: 1. The horizontal axis indicates the change in the break-even credit cost ratios under effectively interest-free loans, and the vertical axis indicates the proportion of financial institutions.
2. The increase in each financial institution's break-even credit cost ratio is estimated by using the approved amount of loan guarantees for effectively interest-free loans up to end-July 2020 and the data based on each institution's lending policy for fiscal 2020.
Source: BOJ.

Box 2: Impact of COVID-19 on firms' operating liquidity: Comparison with the GFC

This box provides a comparison of the impact on firms' operating liquidity of the outbreak of COVID-19 and the GFC. Specifically, a set of simulations are conducted for comparison with the result shown in Section A of Chapter IV. The set includes simulations that consider the shock of a decline in sales in each industry that is equivalent to the rate of change in sales observed during the GFC. It also includes simulations that assume that firms' cash reserves are equivalent to those before the GFC.

The rate of change in sales during the GFC (GFC-style shock) is computed from the rate of change in sales for the one-year period from October 2008 to September 2009, which saw the largest drop in sales. The data source is the actual sales of listed firms for large firms and the industry-level values of the *Tankan* (Short-Term Economic Survey of Enterprises in Japan) for SMEs (Chart B2-1). Compared to the expected rate of decline in firms' sales amid the current outbreak (COVID-style shock), by firm size, the GFC-style shock was greater for large firms than SMEs, since it was a shock that was triggered by a sharp fall in exports due to external factors. Meanwhile, by industry, while manufacturing saw a large drop in sales, the decline in food, accommodation, and consumer services was relatively small under the GFC-style shock, indicating that the nature of the shock was quite different from the COVID-style shock.

Chart B2-1: Assumed sales changes (COVID-style shock and GFC-style shock)

year-on-year change, %

	COVID-style shock		GFC-style shock (Oct. 2008-Sep. 2009)	
	Large firms	SMEs	Large firms	SMEs
All industries	-8.8	-22.0	-19.7	-11.9
Basic materials manufacturing	-11.2	-21.3	-23.2	-18.3
Processing and assembly manufacturing	-11.3	-22.2	-23.8	-15.9
Construction	-6.4	-21.1	-6.5	-5.9
Real estate	-2.8	-21.6	1.1	-11.1
Wholesale	-6.6	-21.1	-27.0	-13.2
Retail	-3.6	-13.1	-3.4	-10.9
Transportation and communications	-6.2	-15.7	-8.0	-12.1
Food, accommodation, and consumer services	-16.5	-47.0	1.3	-6.2
Other nonmanufacturing	-6.4	-23.1	-8.0	-10.2
All firms	-14.4		-16.2	

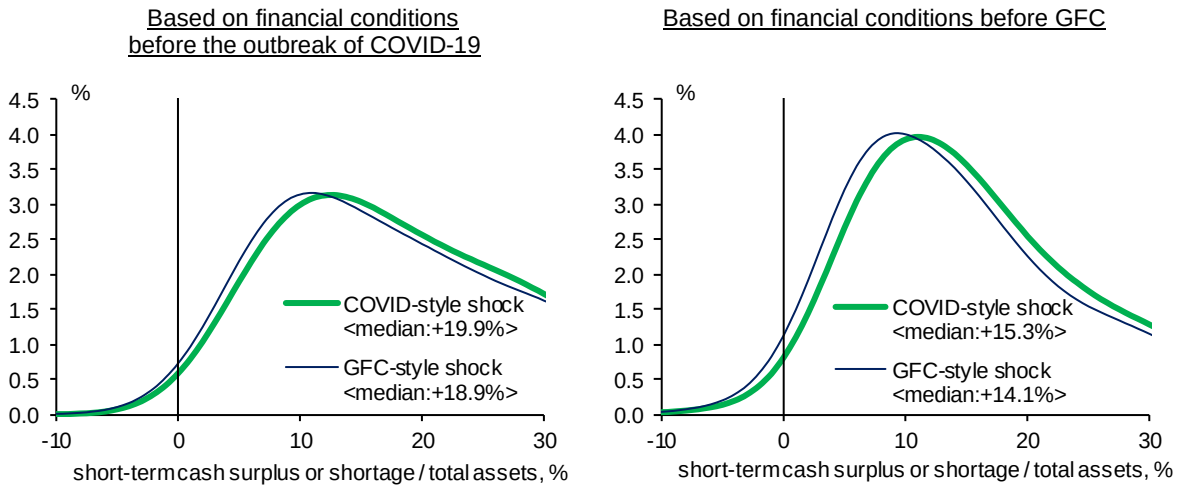
Source: Development Bank of Japan; Nikkei Inc., "NEEDS-Financial QUEST"; S&P Global Market Intelligence; Published accounts of each firm; BOJ.

In the analysis below, first, differences in the impact of the GFC-style shock and the COVID-style shock on firms' short-term cash surpluses/shortages are studied. Next, differences in the impact of the two shocks at different points in time are studied using counterfactual simulations, each of which employs two different assumptions regarding individual firms' financial conditions such as their cash reserves: in assumption 1, firms' financial conditions are assumed to be the same as those before the COVID-19 outbreak, and in assumption 2, they are assumed to be the same as those before the GFC.

The simulation results by firm size show that for large firms, the GFC-style shock had a greater impact on sales than the COVID-style shock. Under either of the two assumptions, the distribution of short-term cash surpluses/shortages shifts to the left more in response to the GFC-style shock than to the COVID-style shock (Chart B2-2). Given that many firms have been increasing their cash reserves since the GFC, the median of the distribution following the COVID-style shock remains higher based on assumption 1, i.e., firms' financial conditions are set to those before the outbreak,

than based on assumption 2, i.e., firms' financial conditions are set to those before the GFC. This observation confirms that the resilience of large firms to cash flow stress has increased over time.

Chart B2-2: Distribution of simulated short-term cash surplus/shortage (large firms)



Note: "Based on financial conditions before the outbreak of COVID-19" shows the two simulations on the financial conditions as at fiscal 2018. "Based on financial conditions before GFC" shows the two simulations on the financial conditions as at fiscal 2007. The same applies to subsequent charts.

In contrast to large firms, for SMEs, the COVID-style shock has had a larger impact on their sales than the GFC-style shock. Under both assumptions 1 and 2, the distribution of short-term cash surpluses/shortages for the case of the COVID-style shock shifts to the left more than that for the GFC-style shock (Chart B2-3). Given that an increasing number of SMEs have built up a buffer of cash reserves since the GFC, however, the median of the distribution following the COVID-style shock remains higher based on assumption 1 than based on assumption 2.

Looking at the increase in the share of SMEs facing cash shortages in each combination of shocks and assumptions, in all industries, the share of SMEs facing cash shortages is the highest in the case of the COVID-style shock under assumption 2 (Chart B2-4). This is because, in all industries, firms' cash reserves before the GFC were lower than before the outbreak.

Chart B2-3: Distribution of simulated short-term cash surplus/shortage (SMEs)

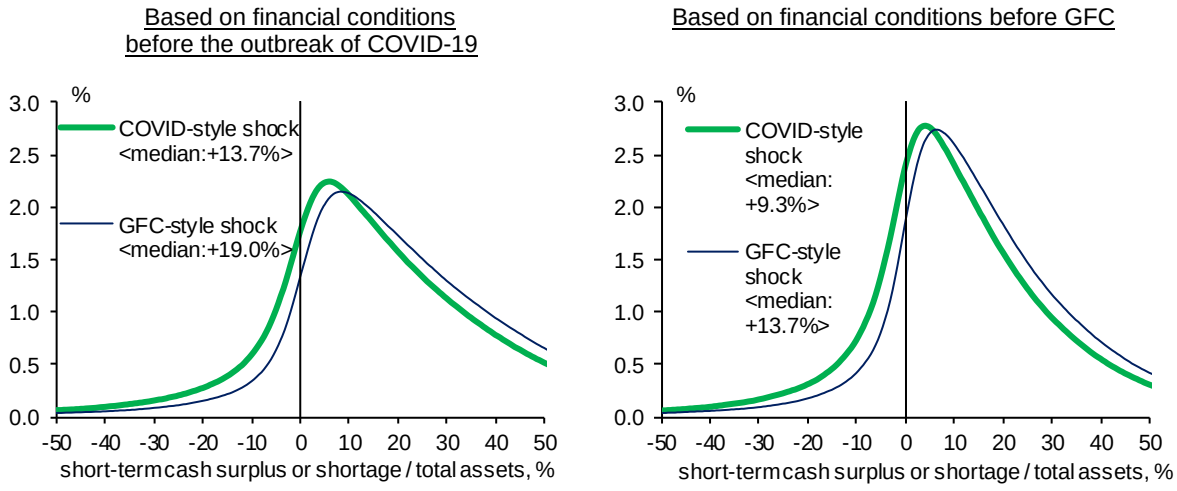


Chart B2-4: Share of firms facing cash shortages by industry (SMEs)

%

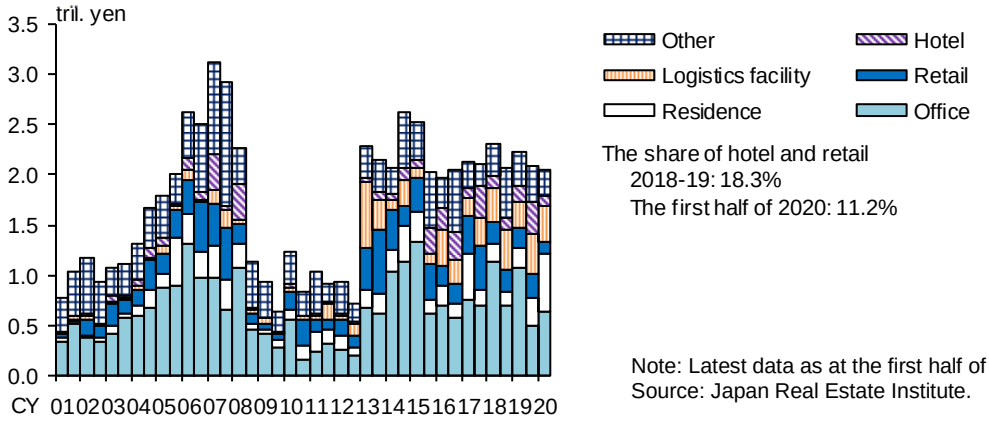
	Based on financial conditions before the outbreak of COVID-19		Based on financial conditions before GFC	
	COVID-style shock	GFC-style shock	COVID-style shock	GFC-style shock
All industries	20.5	12.2	24.3	14.4
Basic materials manufacturing	22.1	15.0	26.8	18.2
Processing and assembly manufacturing	16.4	12.2	20.3	14.9
Construction	15.3	8.8	21.5	11.9
Real estate	8.2	5.9	12.8	8.1
Wholesale	16.3	12.7	16.7	11.9
Retail	19.5	17.8	21.7	19.7
Transportation and communications	12.7	10.8	16.3	13.4
Food, accommodation, and consumer services	53.6	16.2	60.5	15.1
Other nonmanufacturing	23.5	13.5	32.3	17.7

Box 3: Overview of issues for the management of risk related to loans to rental real estate businesses

The spread of COVID-19 has exerted more severe pressure on corporate financing than the GFC, especially for nonmanufacturing SMEs. Its impact on the rental real estate business is also different from that of the GFC, as seen in the plunge in rents, including those for retail stores and hotels (Charts IV-1-17 and IV-1-18). Against this background, this box provides an overview of issues regarding the management of risk associated with loans to rental real estate businesses.

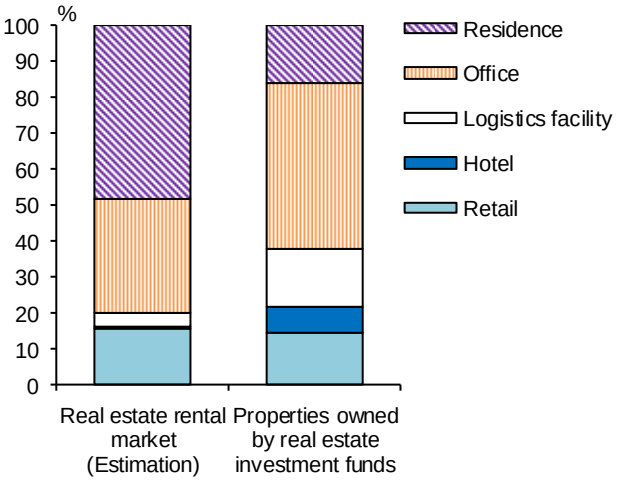
Starting with transactions in the real estate market in the first half of 2020, transaction volumes for retail stores and hotels plummeted due to the spread of the disease (Chart B3-1). Rental income from retail stores and hotels seems to account for a large share -- nearly 20 percent -- of the total rental income in the real estate market (Chart B3-2).

Chart B3-1: Value of real estate transactions by type of property



Note: Latest data as at the first half of 2020.
Source: Japan Real Estate Institute.

Chart B3-2: Composition of real estate rental market by type of property

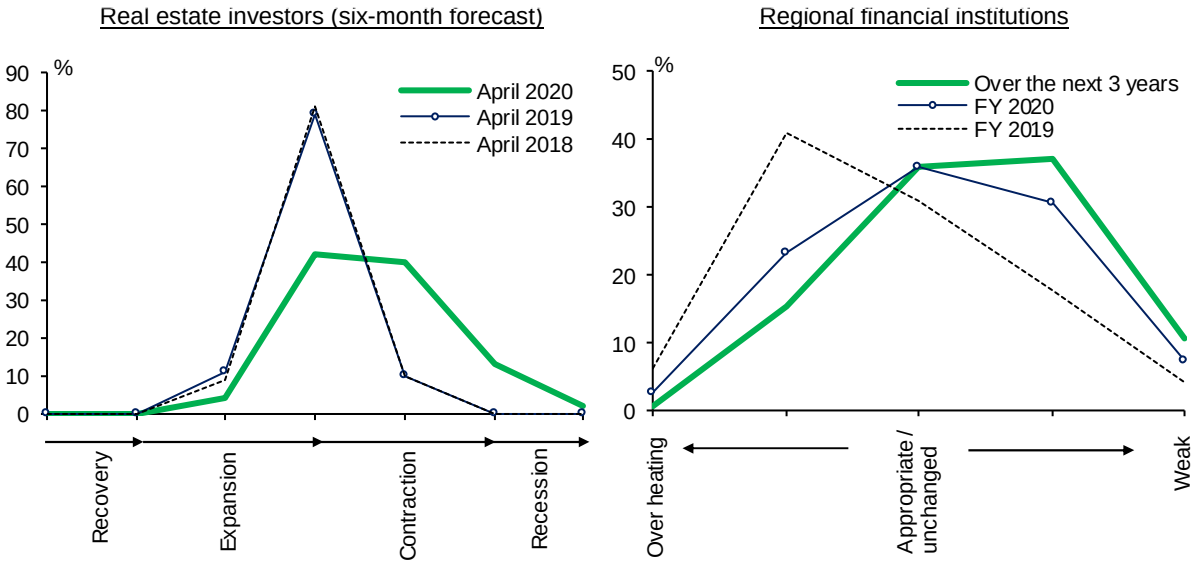


Note: 1. The composition of the real estate rental market is estimated by proportionally dividing movable property rent and real estate rent stated in the 2016 Economic Census for Business Activity, using the 2015 Input-Output Tables for Japan. "Retail" represents retail and food and consumer services, "Hotel" represents accommodations, "Logistics facility" represents transportation and communications and "Office" represents other industries. "Residence" represents housing rent estimated in the 2015 Input-Output Tables for Japan.
2. The composition of properties owned by real estate investment funds is as at end-December 2019.
Source: Ministry of Economy, Trade and Industry; Ministry of Internal Affairs and Communications; The Association for Real Estate Securitization.

However, the current transaction volume in the real estate market overall has remained almost unchanged, exhibiting no drastic shrinkage of market transactions, while investors and financial institutions have seemingly become more cautious about future developments in the real estate market due to the COVID-19 outbreak (Charts B3-1 and B3-3). The following reasons can be pointed out for this phenomenon. First, because financial institutions have not taken as conservative of an attitude toward lending as they did during the GFC, investors have been able to avoid fire sales of assets. Second, the asset allocations of domestic and foreign institutional investors with a medium-

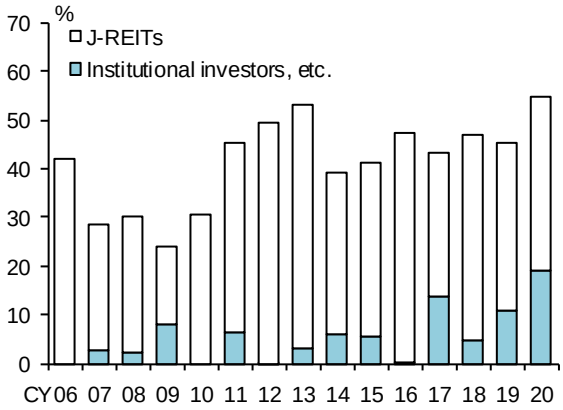
to long-term investment horizon seem to remain tilted toward investments in real estate in Japan. And third, foreign investment funds, which held back on investing during the GFC, are not facing any major financing constraints and their investment appetite has not weakened (Chart B3-4).

Chart B3-3: Outlook for real estate market



Note: 1. The left-hand chart indicates the proportion of real estate investors (including asset managers, banks, and developers) who select each given choice as the six-month forecast of the Tokyo (Marunouchi and Otemachi) office market. The April 2020 survey covers 108 respondents.
2. The right-hand chart shows the results of the survey on credit costs conducted in fiscal 2019 and 2020. The chart indicates the proportion of regional financial institutions who select each given choice as the evaluation for the real estate rental market of the main business base.
Source: Japan Real Estate Institute, "The Japanese real estate investor survey"; BOJ.

Chart B3-4: Share of real estate transactions by medium- to long-term players

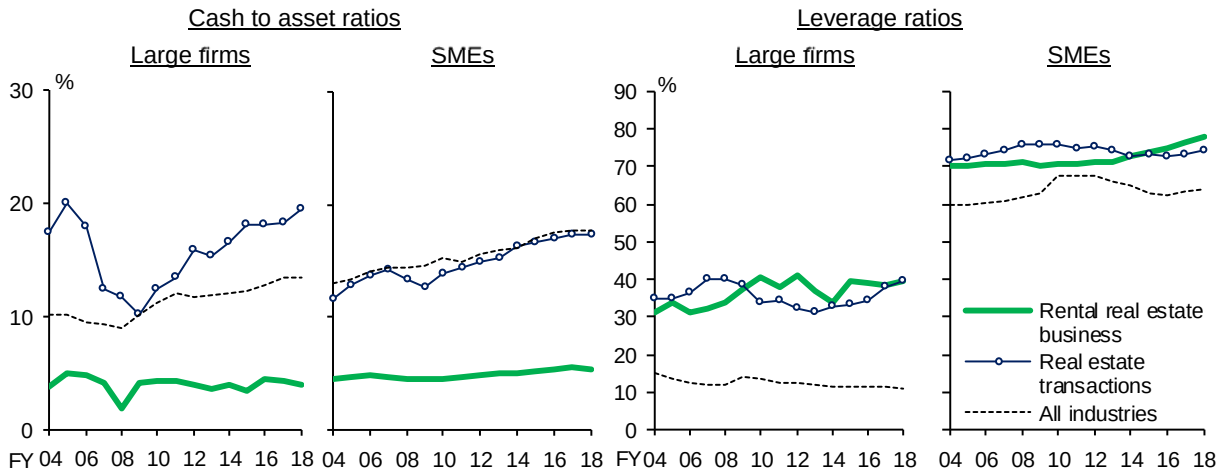


Note: "Medium- to long-term players" is defined here as J-REITs and institutional investors, etc. whose main purpose of property acquisition is rental income. Latest data as at the first half of 2020.
Source: Japan Real Estate Institute.

Next, developments in the indicators of the financial soundness of firms in two subsectors of the real estate industry are shown. Firms engaged in real estate transactions, which experienced a massive adverse shock during the GFC, have been increasing their cash reserves, similar to firms in other industries. On the other hand, for firms engaged in the rental real estate business, an increase in cash reserves has hardly been seen. In particular, for SMEs in the real estate industry, since the GFC, the financial leverage ratio has been almost flat or on a declining trend for firms engaged in real estate transactions, while it has been on an uptrend for firms engaged in the rental real estate business (Chart B3-5). As pointed out in previous issues of the *Report*, firms engaged in the rental real estate business face the long-term risk of a rise in vacancy rates due to declines in the population and the number of households. Unlike Japanese firms in general, they have not seen a secular

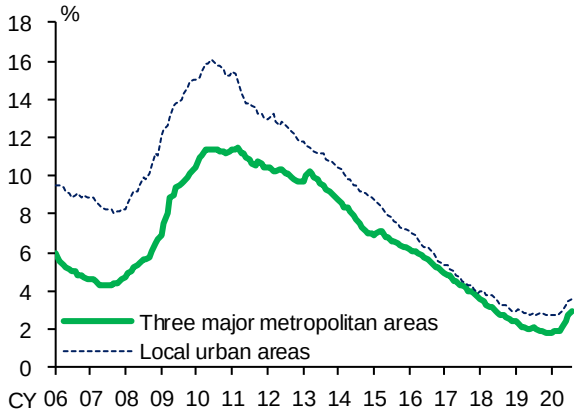
improvement in their financial soundness. It is therefore necessary to carefully monitor future developments, including how the spread of COVID-19 will affect vacancy rates (Chart B3-6).

Chart B3-5: Financial conditions in real estate industry



Note: Medians by industry. Leverage ratio is the ratio of interest-bearing debt to total assets.
Source: CRD Association; Development Bank of Japan.

Chart B3-6: Vacancy rates for office buildings

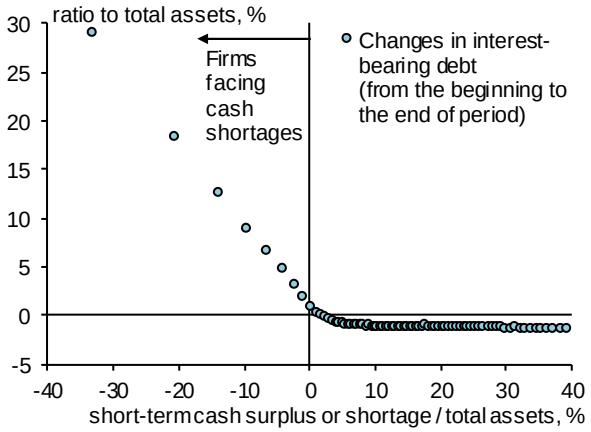


Note: 1. Vacancy rates for "Three major metropolitan areas" are the average among Tokyo, Osaka and Nagoya, and those for "Local urban areas" are the average among Sapporo, Sendai and Fukuoka.
2. Latest data as at August 2020.
Source: Miki Shoji Co., Ltd.

Box 4: Probability of default model explicitly taking firms' operating liquidity into account

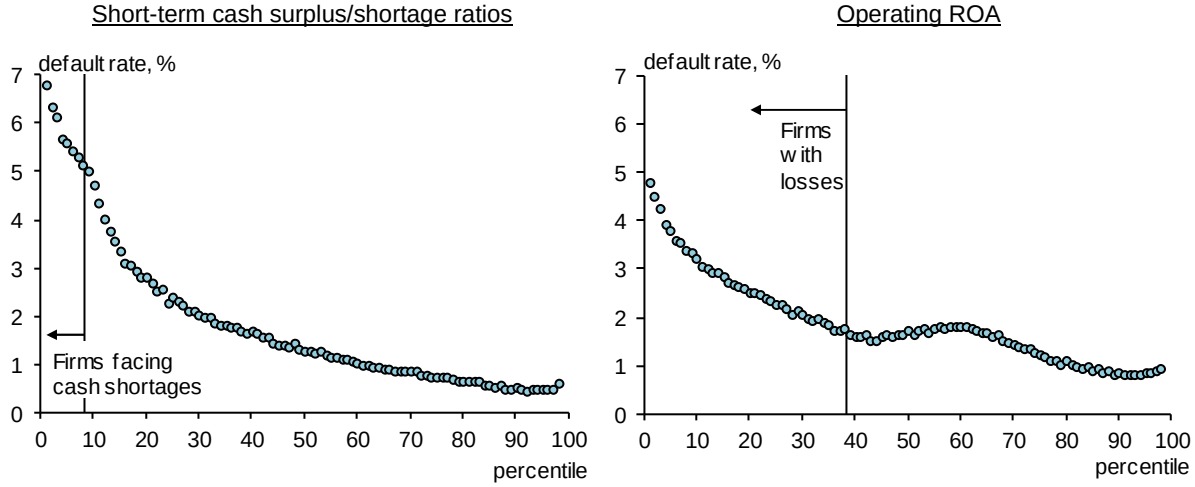
This box explains a novel probability of default (PD) model that utilizes data of about 2.5 million SMEs from the Credit Risk Database (CRD) so as to quantitatively assess the impact of a deterioration in firms' operating liquidity on the PD.

Chart B4-1: Short-term cash surplus/shortage and firms' funding activities



Note: 1. Covers SMEs. The reference period is from fiscal 2002 to 2019.
2. Firms are grouped into 1-percentile bins based on their short-term cash surplus/shortage to total assets ratio. The dots represent the median values for each group.
Source: CRD Association.

Chart B4-2: Relationship between short-term cash surplus/shortage and default rate



Note: 1. Covers SMEs. The reference period is from fiscal 2002 to 2018.
2. "Short-term cash surplus/shortage ratios" are the ratio of short-term cash surpluses/shortages to total assets. "Operating ROA" = (operating profits + interest and dividends received) / total assets. Firm defaults are defined as being, for the first time, (1) downgraded to the borrower classification "special attention" or below, (2) overdue by more than 3 months, and/or (3) subrogated by credit guarantee corporations.
3. Firms are grouped into 1-percentile bins based on each ratio. The vertical axes show the default rate for each bin. The vertical lines indicate the percentile bin where each ratio is zero.
Source: CRD Association.

In this model, "short-term cash surplus/shortage," which is used as an indicator of firms' operating liquidity in the simulation in Section A of Chapter IV, is employed as a key explanatory variable. "Short-term cash surplus/shortage" is calculated as the sum of cash reserves at the beginning of the fiscal year and operating cash flow during the fiscal year. Net operating cash outflow puts downward pressure on cash reserves. If net operating cash outflow is so large that the cash reserves dwindle and such pressure cannot be compensated for by borrowing (cash flow from financing activities) or the disposal of assets (cash flow from investing activities), the firm goes bankrupt due to funding

difficulties (Chart B4-1). "Short-term cash surplus/shortage" intends to capture the impact on the PD of such downward pressure on operating liquidity. In fact, the relationship between "short-term cash surplus/shortage" (as a ratio of total assets) and the PD indicates clearly that, as short-term cash shortages become more severe, the PD increases (Chart B4-2).

In addition to "short-term cash surplus/shortage," the model includes the interest coverage ratio (ICR),[57] which represents firms' interest payment capacity, the leverage ratio, and the borrowing interest rate -- indicators representing firms' debt servicing capacity that were also used in the past issues of the *Report* -- as explanatory variables. Note that the ICR here is calculated with the 3-year moving average of operating income as the numerator, in order to average out short-term fluctuations in profits that also affect firms' cash flow.

Estimates by industry -- where industries are classified into the following nine categories: basic materials manufacturing; processing and assembly manufacturing; construction; real estate; wholesale; retail; transportation and communications; food, accommodation, and consumer services; and other nonmanufacturing industries -- show that "short-term cash surplus/shortage," which represents the tightness of operating liquidity, has the expected sign and is statistically significant at the 1 percent level in all industries. The parameter estimates for the other variables also have the expected sign and are statistically significant in most of the industries (Chart B4-3).

Chart B4-3: Estimation results for PD

		Dependent variables: whether a firm defaults (within 1 year)								
		Basic materials manufacturing	Processing and assembly manufacturing	Construction	Real estate	Wholesale	Retail	Transportation and communications	Food, accommodation, and consumer services	Other nonmanufacturing
Explanatory variables	Short-term cash surplus/shortage ratio	-5.14 ***	-4.64 ***	-3.69 ***	-3.98 ***	-3.99 ***	-3.84 ***	-4.02 ***	-3.39 ***	-3.08 ***
	Interest coverage ratio	-0.16 ***	-0.26 ***	-0.13 ***	-0.50 ***	-0.25 ***	-0.06 ***	-0.14 ***	0.01	-0.16 ***
	Leverage ratio	0.97 ***	1.07 ***	0.94 ***	1.76 ***	1.28 ***	0.96 ***	1.23 ***	1.04 ***	1.08 ***
	Borrowing interest rate	36.5 ***	29.2 ***	25.8 ***	29.7 ***	30.4 ***	41.1 ***	24.4 ***	33.2 ***	25.8 ***
Sample size		458,940	1,444,505	2,168,756	538,706	1,348,957	1,204,341	652,777	797,373	1,130,963
Pseudo R^2		0.100	0.101	0.092	0.063	0.088	0.081	0.097	0.070	0.087

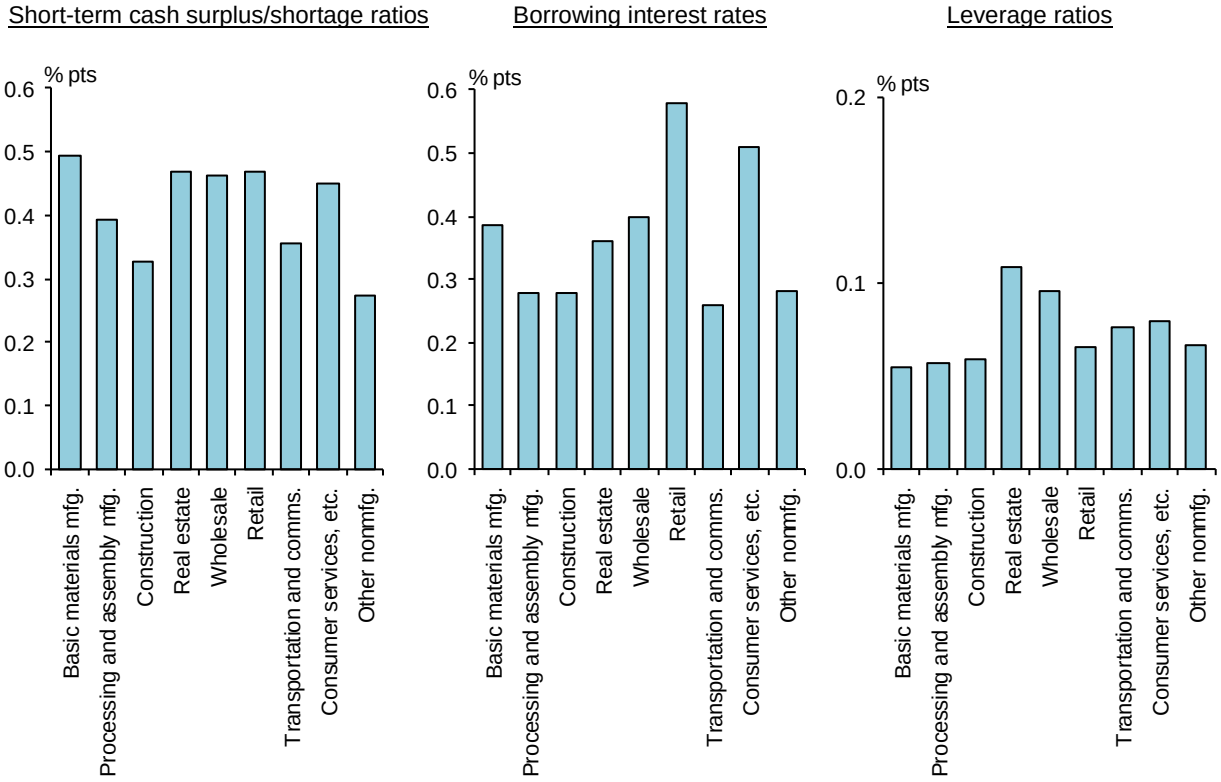
Note: 1. ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively. The estimation covers SMEs. The estimation period is from fiscal 2002 to 2018.
2. "Short-term cash surplus/shortage ratio" is the ratio of short-term cash surplus/shortage to total assets. "Interest coverage ratio" is the kinked interest coverage ratio (KICR). "Leverage ratio" is the ratio of interest-bearing debt to total assets. The explanatory variables are the neglog transformed values.

From these estimation results, the sensitivity of the PD of firms in each industry to the shock of a "short-term cash surplus/shortage" decline by 10 percentage points is simulated (Chart B4-4). In industries such as basic materials manufacturing; wholesale; retail; and food, accommodation, and consumer services, the sensitivity to changes in "short-term cash surplus/shortage" is higher than the average for firms in all industries. This indicates that when the cash flow of firms in these industries deteriorates, their PD is more likely to increase. The simulation in Chart IV-1-23 presented above is

[57] The ICR is usually defined as "(operating profits + interest and dividends received) / interest payments." However, this has a technical drawback that emerges when operating profits in the numerator are negative. In this case, an increase in interest payments in the denominator results in an improvement in the ICR (i.e., a smaller negative value). Therefore, in the model here, the Kinked ICR (KICR), which overcomes this drawback, is used. For details of the KICR, see "A Forecast Model for the Probability of Default Based on Granular Firm-Level Data and Its Application to Stress Testing," *Financial System Report Annex Series*, May 2019.

based on the estimation results presented here.

Chart B4-4: Stress sensitivity of PD by industry



Note: 1. The charts show the increase in a hypothetical firm's PD in each industry to deterioration in one of the explanatory variables of the model in Chart B4-3; a 10 percentage point fall in the short-term cash surplus/shortage ratio, a 1 percentage point increase in the borrowing interest rate, and a 10 percentage point increase in the leverage ratio. The hypothetical firm in a specific industry takes the industry's median values in fiscal 2018 for all the explanatory variables used in the model.
2. "Consumer services, etc.," indicates food, accommodation and consumer services.

Box 5: Financial soundness and profitability of Japanese banks' large overseas borrowers

As discussed above, the impact of the spread of COVID-19 on Japanese banks' overseas loan portfolios is considered to be limited. This partly reflects the fact that they had a small amount of loans to industries that have seen a sharp rise in default rates on corporate bonds due to the spread of the disease. However, even if the impact is limited at the industry level, looking at firm-specific characteristics, there may be borrowers that are more susceptible than other firms in the same industry. From the perspective of managing the credit risk of large borrowers at the firm-specific level, therefore, it is considered important to examine the financial soundness and profitability of a specific borrower relative to other firms within the same industry. This box documents the characteristics of Japanese banks' large overseas borrowers compared to those of others in the same industry in terms of their financial soundness and profitability before the outbreak, and how these characteristics had developed for several years before the outbreak and how they have changed after the outbreak.

To start with, the interest coverage ratio (ICR), an indicator of firms' debt servicing capacity, as of 2019, i.e., before the COVID-19 outbreak, is examined (top left panel of Chart IV-2-13). The horizontal axis of the chart shows the deviation of a large borrower's ICR from the representative value, which is the median of other firms in the same industry in the analysis, while the vertical axis shows the share of loans outstanding[58] to the borrower over the total amount of loans outstanding to large overseas borrowers of Japanese banks. When the deviation is zero, the borrower's ICR coincides with that of the representative firm in the same industry. As for the ICR of Japanese banks' large borrowers as of 2019, the negative mode of the distribution indicates that the amount of loans to large borrowers with a lower ICR relative to other firms in the same industry is sizable. The slightly negative median implies that the ICR of Japanese banks' large borrowers overall was lower than that of others in the same industry.

The decomposition of ICR into return on assets (ROA), a profitability indicator, and leverage ratio (interest-bearing debt / total assets), a financial leverage indicator, shows that Japanese banks' large borrowers are characterized as having a high value for both indicators (bottom panels of Chart IV-2-13).

Next, in terms of the current ratio (current assets / current debt), an indicator of firms' resilience to a short-term liquidity shock, compared to other firms in the same industry, the ratio of Japanese banks' large borrowers is low, indicating that they are more susceptible to short-term funding shocks (top right panel of Chart IV-2-13).

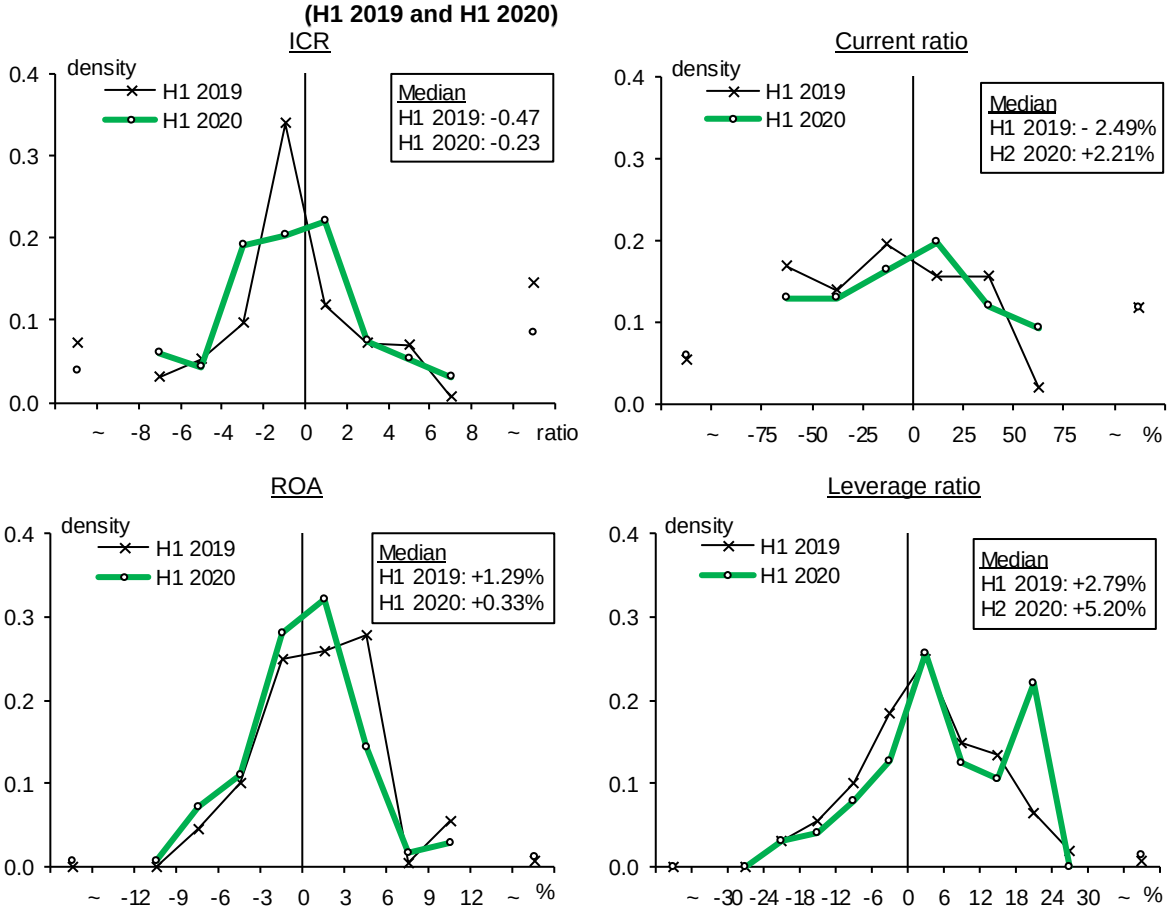
Comparing the distribution of the indicators as of 2015 and 2019 to see how they have changed over the last few years, it is observed that the share of loans to firms with a higher ICR and ROA relative to other firms in the same industry has declined and the share of loans to firms with a low leverage ratio has decreased. These observations seem to indicate that in 2015, the ICR of Japanese banks' large borrowers was much higher than others in the same industry and a large number of them had a relatively high debt servicing capacity, but such relative advantages seem to have waned in 2019. The current ratio of Japanese banks' large borrowers improved compared to others in the same industry from 2015 to 2019, though the ratio overall has remained at a low level.

In the periods immediately before and after the COVID-19 outbreak, the pattern of development leading up to such periods continued for the ICR and its constituent elements. A comparison of the distribution of indicators between the first half of 2019 and 2020 shows that for the ICR, the mode

[58] Loans outstanding here indicate the total amount of "loans and bills discounted" and "acceptances and guarantees."

has shifted slightly to the right, but the median has remained negative, indicating that the ICR of Japanese banks' large borrowers overall has remained lower than that of others in the same industry (top left panel of Chart B5-1). In addition, the share of loans to borrowers with a relatively high ROA has decreased and the median of the distribution has decreased, while Japanese banks' large borrowers still have high profitability compared to others (bottom left panel of Chart B5-1). The share of loans to borrowers with a very high leverage ratio has increased, and thus the leverage of Japanese banks' large borrowers has remained high (bottom right panel of Chart B5-1). By contrast, the share of loans to borrowers with a very high current ratio has increased and the median of the distribution has turned positive, implying that Japanese banks' large borrowers are more resilient to short-term funding shocks than other firms in the same industry (top right panel of Chart B5-1).

Chart B5-1: Distributions of financial indicators of Japanese banks' large borrowers (H1 2019 and H1 2020)



Note: 1. Covers the three major banks. Japanese banks' large borrowers are as at end-March 2020.
2. Each value represents the deviation from the median for the companies in the same industry.
3. Borrowers are limited to companies for which financial data for both the first half of 2019 and the first half of 2020 are available.
Source: S&P Global Market Intelligence; BOJ.

Finally, from an analysis of market participants' views regarding the relative advantage of the profitability of Japanese banks' large borrowers by the same method, it is observed that their ROA is considered as being worse off than that of other firms in the same industry (Chart IV-2-14). If Japanese banks' large borrowers are unable to maintain their relatively high level of profitability, their relative debt servicing capacity may further decline, reflecting their high level of leverage. It is considered beneficial for financial institutions to incorporate these viewpoints into their risk management of large borrowers going forward.

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 unrealized gains/losses on stockholdings

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

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

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

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

Credit cost ratio = credit costs / total loans outstanding

Capital adequacy ratios of internationally active banks

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

CET1 capital includes common equities and retained earnings.

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

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

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

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

Capital adequacy ratios of domestic banks

Core capital ratio = core capital / risk-weighted assets

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