BOJ Reports & Research Papers

Financial System Report

BANK OF JAPAN

APRIL 2017

The total of major banks, regional banks, and *shinkin* banks covered in this *Report* is as follows (as at March 31, 2017).

Major banks comprise the following 10 banks: Mizuho Bank; The Bank of Tokyo-Mitsubishi UFJ; 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 41 member banks of the Second Association of Regional Banks (Regional banks II). *Shinkin* banks are the 255 *shinkin* banks that hold current accounts at the Bank of Japan.

This *Report* basically uses data available as at March 31, 2017.

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Objective of the *Financial System Report*

The Bank of Japan publishes the *Financial System Report* semiannually, with the objective of assessing the stability of Japan's financial system and facilitating communication with concerned parties on relevant tasks and challenges in order to ensure such stability.

The *Report* provides a regular and comprehensive assessment of Japan's financial system with a large emphasis on the macroprudential perspective. The macroprudential framework means devising institutional designs and policy measures 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, to ensure the stability of the overall financial system.

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

In this April 2017 issue of the *Report*, two topics regarding the potential vulnerabilities of the financial system are analyzed with particular focus, in addition to a regular assessment of financial institutions' risk profile and financial bases: (1) the effects of competition among financial institutions and (2) financial institutions' resilience against stresses in real estate markets. Furthermore, financial institutions' profitability is assessed, with emphasis on areas such as the relationship between realized gains from the sale of securities and risk taking as well as an international comparison of the structures of overhead costs.

Contents

I. Executive summary: comprehensive assessment of the financial system

Developments in financial markets

In global financial markets, rises in stock prices and interest rates became increasingly evident worldwide after the U.S. presidential election in November 2016. In Japan, a rise in stock prices and depreciation of the yen were observed, and highly accommodative financial conditions have been maintained under the Bank of Japan's "Quantitative and Qualitative Monetary Easing (QQE) with Yield Curve Control." Meanwhile, with regard to the U.S. dollar funding environment among Japanese financial institutions, funding costs have remained high on the whole, although dollar funding premiums, particularly in short-term FX swap markets, have declined somewhat as dollar funding demand decreased due to a temporary restraint on foreign bond investment.

Examination of financial intermediation

Financial institutions' domestic loans outstanding have been increasing at a year-on-year growth rate of around 3 percent, amid accommodative lending stances among financial institutions and demand for funds from a wide range of industries. Overseas loans have maintained relatively high growth, even with dollar funding costs remaining at a high level. As for securities investment, financial institutions have maintained their stance of increasing their risk taking particularly by accumulating investment trusts further, although there have been some moves to temporarily hold back on foreign bond investment in response to the rise in U.S. interest rates since the fall of 2016. Institutional investors -- such as insurance companies and pension funds -- have continued to accumulate risky assets, particularly foreign bonds, in an environment characterized by prolonged low interest rates. Meanwhile, in financial markets, the issuance rates in the CP and corporate bond market have hovered at extremely low levels, and firms' debt financing has increased.

Signs of overheating in a large part of financial and economic activities have not been observed on the whole, although the funding environment for the non-financial private sector has been highly accommodative. Nevertheless, amid the continued low interest rate environment, banks have adopted the most accommodative lending stance since the bubble period. In addition, although the real estate market does not appear to show signs of overheating on the whole, acquisition of properties by J-REITs, etc. has spread from metropolitan areas to provincial areas and financial institutions have been increasing their real estate loans and investments in real estate funds. It is therefore necessary to carefully examine whether there will be an excessive decline in risk premiums or overly bullish

expectations for rents.

Stability of the financial system

Japan's financial system has been maintaining stability. Indeed, financial institutions' capital adequacy ratios are sufficiently above regulatory requirements, and their capital levels are generally adequate relative to the amount of risk undertaken. The results of macro stress testing indicate that financial institutions as a whole are considered to have generally strong resilience against stresses. Developments in profits and capital after applying stresses, however, vary from one financial institution to another, suggesting heterogeneity with regard to their degree of resilience against stresses. Meanwhile, with regard to financial institutions' funding liquidity, while foreign currency-denominated lending and investment activity has continued to increase, they have a liquidity buffer that can cover funding shortages, even if market funding conditions for securing foreign currency become difficult for a certain period. Major banks in particular have made efforts to bolster their stable funding bases, mainly through increasing client-related deposits.

Potential vulnerabilities due to the decline in financial institutions' profitability

At present, financial institutions have sufficient capital bases, which will allow them to continue risk taking even if profitability remains subject to downward pressure for the time being. Going forward, if their portfolio rebalancing leads to an improvement in economic and price developments, this is in turn likely to bring about a recovery in profitability.

However, when focusing on the structural aspects of the financial system, financial intermediation services provided by Japanese financial institutions are relatively homogeneous and easily substituted by one another, and there are a large number of competing financial institutions. Competition among them is therefore considered prone to intensify, when demand for conventional financial intermediation services declines due to factors including population decrease. Excessive competition among financial institutions can reduce their profitability, thereby undermining their business stability. Put differently, there is a possibility that financial imbalances will build up and financial system stability will be impaired, if financial institutions shift toward excessive risk taking in order to maintain profitability as deposit and lending margins continue to decline as a trend. On the other hand, if the number of financial institutions whose loss-absorbing capacity declines due to a continued weakening of its profitability increases, the financial intermediation function of financial institutions as a whole could

weaken, adversely affecting the real economy.

As such, regarding potential vulnerabilities due to the declining profitability of financial institutions, it is necessary to examine both the risk of overheating -- excessive accumulation of macro risks and exuberant asset prices -- and the risk of a gradual pullback in financial intermediation due to a persistent decline in profits.

Challenges for financial institutions and actions by the Bank of Japan

Three challenges to be tackled by financial institutions, in order for Japan's financial system to ensure stability in the future, are outlined below. First, individual financial institutions need to work to improve their profitability by proceeding with efforts to develop and implement business strategies that utilize their core competence, for example, in the strengthening of their support for the regional economies and local firms, utilization of FinTech, and operational reforms for improving their management efficiency. Second, financial institutions need to strengthen their ability to respond to risks in areas where they are proactively stepping up their risk taking, such as overseas business and market investment. Third, large financial institutions need to be sufficiently aware of the increasing influence they may have on the financial system, and take further action including efforts to establish a solid financial base and strengthen business management frameworks to respond to the accumulation of risks, and make preparations to respond in an orderly manner in times of stress.

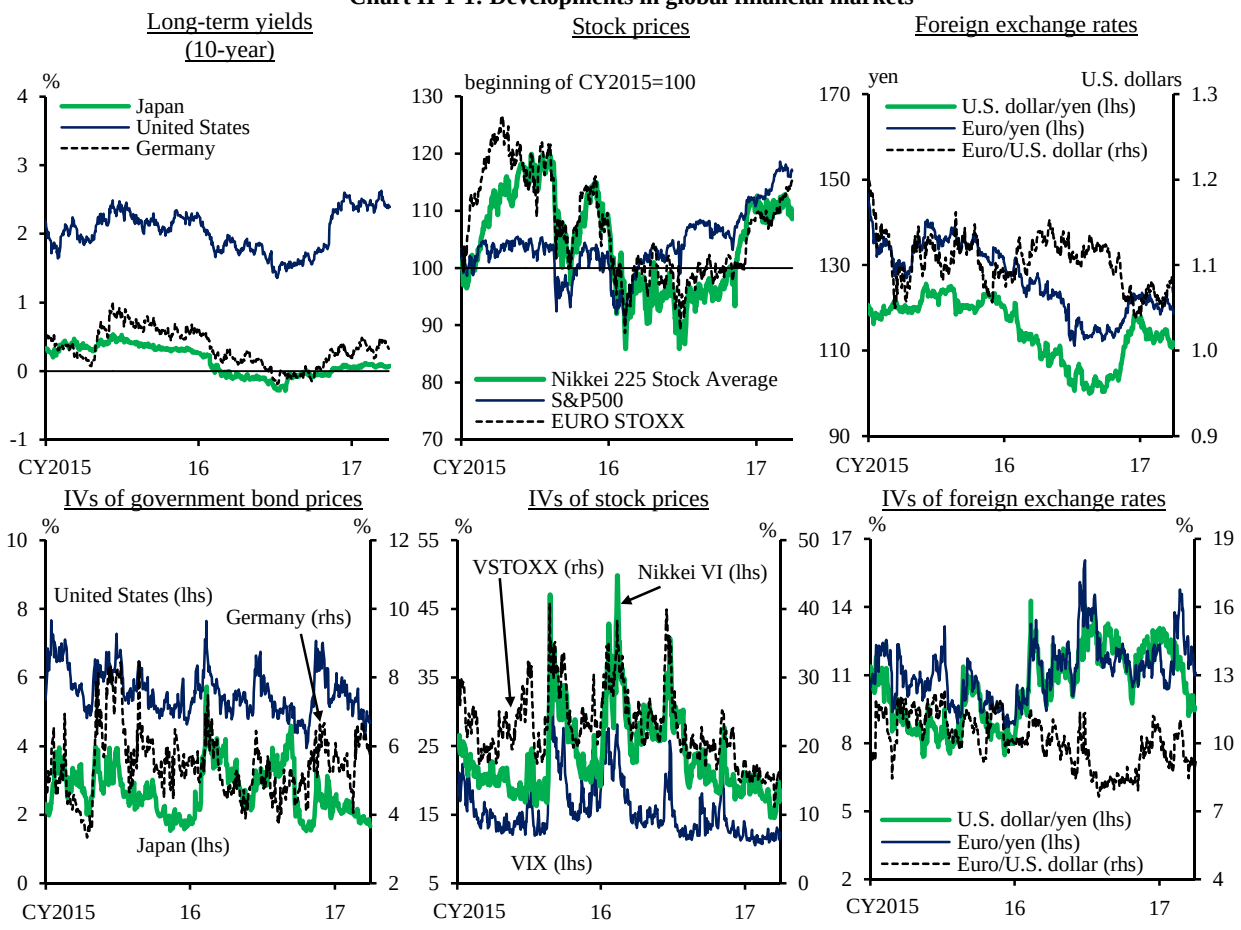
The Bank will continue to deal with these challenges on its part toward ensuring financial system stability, through its off-site monitoring and on-site examinations, among other efforts. In particular, as improving profitability is an issue of high importance and urgent priority, it will continue to strengthen its dialogue with relevant institutions, utilizing its off-site monitoring in tandem with its on-site examinations including new targeted on-site examinations focusing on profitability. With regard to the further advancement and utilization of stress testing, the Bank will also make progress in its dialogue with financial institutions and collaborative research.

II. Risks observed in financial markets

This chapter summarizes developments in financial markets at home and abroad mainly during the second half of fiscal 2016 and examines risks observed.[1]

A. Global financial markets

Chart II-1-1: Developments in global financial markets[1,2]



Notes: *1*. Implied volatilities (IVs) of government bond prices are based on the following data: S&P JPX JGB VIX for Japan; CBOE CBOT 10-year U.S. Treasury Note Volatility Index for the United States; IV of the options on Euro-Bund futures traded on Eurex for Germany, calculated by Bloomberg. IVs of foreign exchange rates are calculated by Bloomberg.
2. Data to March 31, 2017.
Source: Bloomberg.

With regard to developments in global financial markets, long-term interest rates rose significantly and stock prices have moved at around historically high levels in the United States, reflecting the following: increased expectations for the new U.S. administration's economic policy conduct since the presidential election in November 2016; solid economic indicators; and the policy rate hikes by the Federal

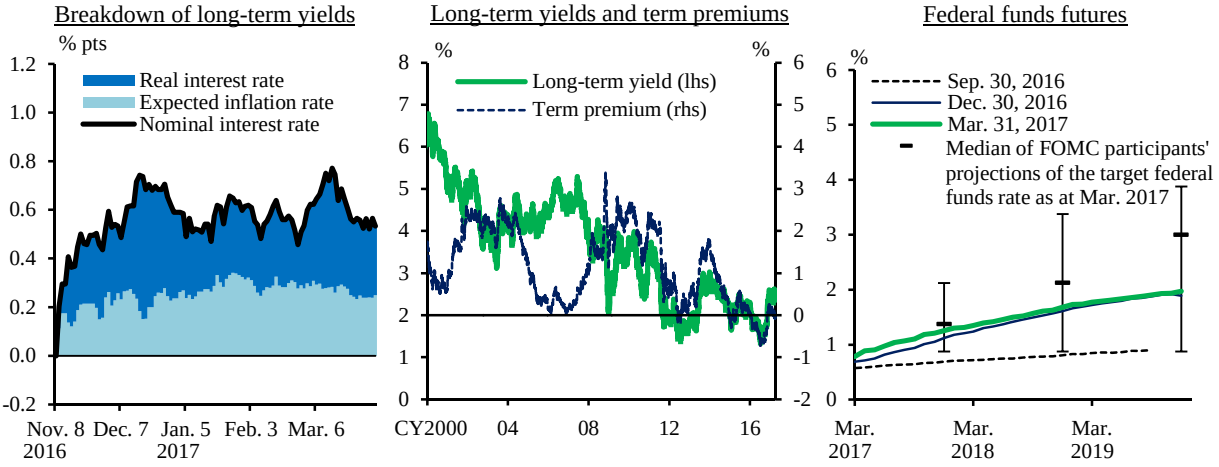
[1] In Japan, the fiscal year starts in April and ends in March of the following year.

Reserve (Chart II-1-1). **In foreign exchange markets, the U.S. dollar has appreciated against major currencies on the whole. As for the outlook, careful attention should continue to be paid to whether drastic changes would occur in global financial markets, including in global fund flows, with downside risks to overseas economies and uncertainties over politics and economic policies in the United States and Europe remaining.**

Rise in U.S. interest rates and low volatilities

Reflecting on developments in U.S. long-term interest rates since the beginning of the second half of 2016, they fell below historical lows to 1.3-1.4 percent in early July after the U.K. referendum. Thereafter, long-term interest rates rose moderately through early November, mainly reflecting the release of solid U.S. economic indicators (Chart II-1-1). Following the U.S. presidential election, long-term interest rates rose at a faster pace, as expectations for the new administration's economic policy conduct increased, and reached a level of around 2.5 percent through the end of 2016. Since the beginning of 2017, they have generally stayed within a relatively narrow range.

Chart II-1-2: U.S. interest rates[1,2,3]

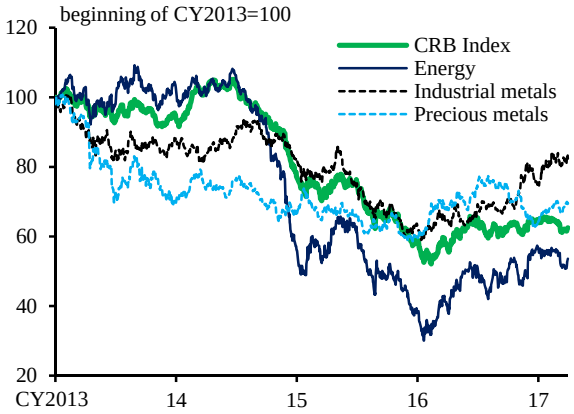


Notes: *1*. In the left-hand chart, figures are those for 10 years. Cumulative changes from November 8, 2016. "Expected inflation rate" is the break-even inflation rate. Data to March 31, 2017.
2. In the middle chart, figures are those for 10 years. Data to March 31, 2017.
3. In the right-hand chart, the vertical bars indicate the range between the minimum and maximum of the FOMC participants' projections.
Sources: Bloomberg; FRB.

A breakdown of changes in U.S. nominal long-term interest rates into real interest rates and expected inflation rates indicates that the former has fluctuated largely after rising through mid-December 2016, while the latter has increased continuously (Chart II-1-2). As background to these developments, the recovery in the global economy and the resulting rise in commodity prices have contributed to the rise in expected inflation rates (Chart II-1-3). There is also a possibility that market participants have factored in the effects of the new administration's fiscal policy on future inflation rates. Meanwhile, a

breakdown of changes in U.S. nominal long-term interest rates into the expected future path of nominal short-term interest rates (federal funds futures) and term premiums shows that the former as projected by market participants has shifted upward, reflecting the rise in expected inflation rates, and that the latter has also risen (Chart II-1-2). However, the rise in term premiums has been small compared to that observed during the period of the so-called taper tantrum through the summer of 2013.

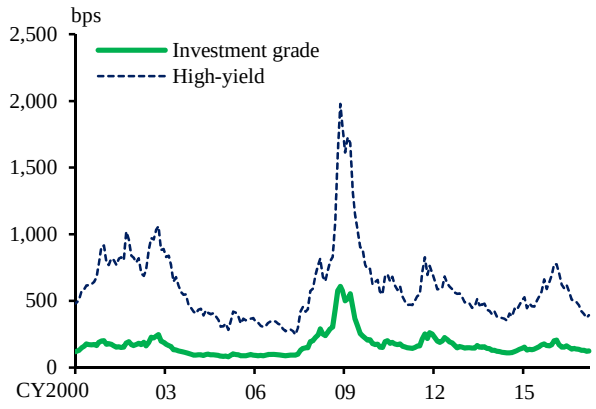
Chart II-1-3: Commodity prices[1]



Note: *1*. Energy, industrial metals, and precious metals are sub-indices of the S&P GSCI. Data to March 31, 2017.
Source: Bloomberg.

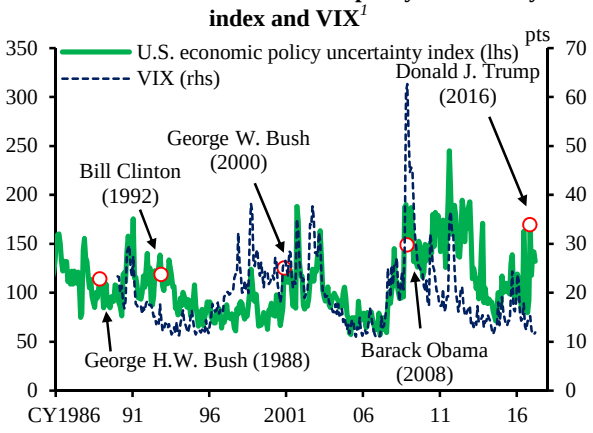
Although uncertainty regarding U.S. policy conduct continues to be high, stock price volatilities and credit spreads on corporate bonds have remained at low levels in financial markets (Charts II-1-4 and II-1-5). Under these circumstances, future risks may not be sufficiently factored in to asset prices, and thus it is necessary to carefully monitor market developments.

Chart II-1-4: Credit spreads on U.S. corporate bonds[1]



Note: *1*. Calculated by Bank of America Merrill Lynch. Latest data as at March 2017.
Source: Bloomberg.

Chart II-1-5: U.S. economic policy uncertainty index and VIX[1]

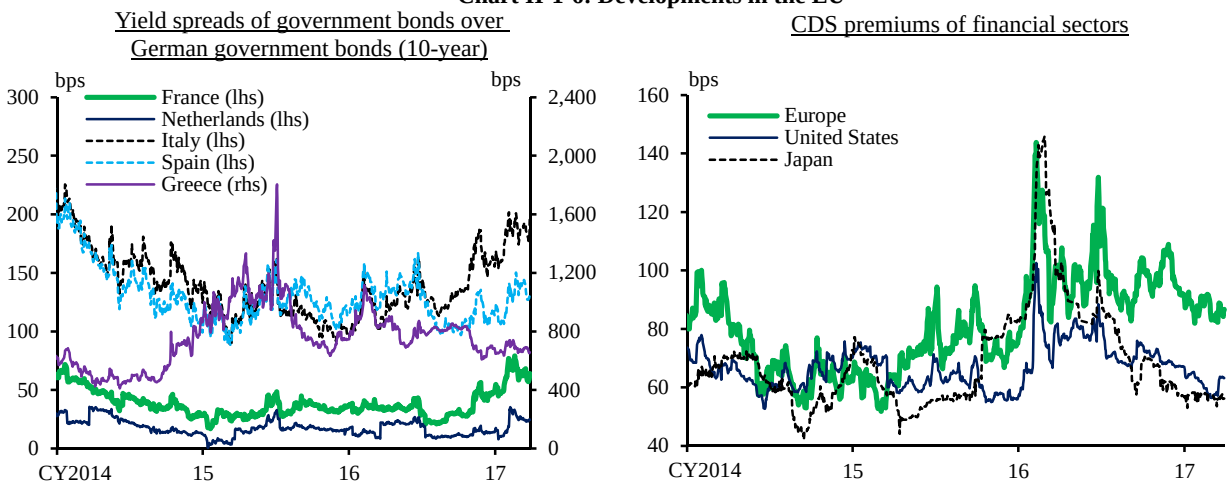


Note: *1*. Markers in the chart indicate the months of the voting dates of the presidential elections. Latest data as at March 2017.
Sources: Bloomberg; Thomson Reuters.

In European financial markets, stock prices have been firm on the whole (Chart II-1-1). Volatilities of stock prices rose temporarily after the U.K. referendum, but have remained

at low levels thereafter. On the other hand, yield spreads between German government bonds and government bonds of some European countries -- with scheduled national elections that may affect their future policy conduct -- have recently widened. In addition, credit default swap (CDS) premiums of the European financial sector have remained elevated compared with those in Japan and the United States, exhibiting market concerns about matters such as non-performing loan problems (Chart II-1-6).

Chart II-1-6: Developments in the EU[1]

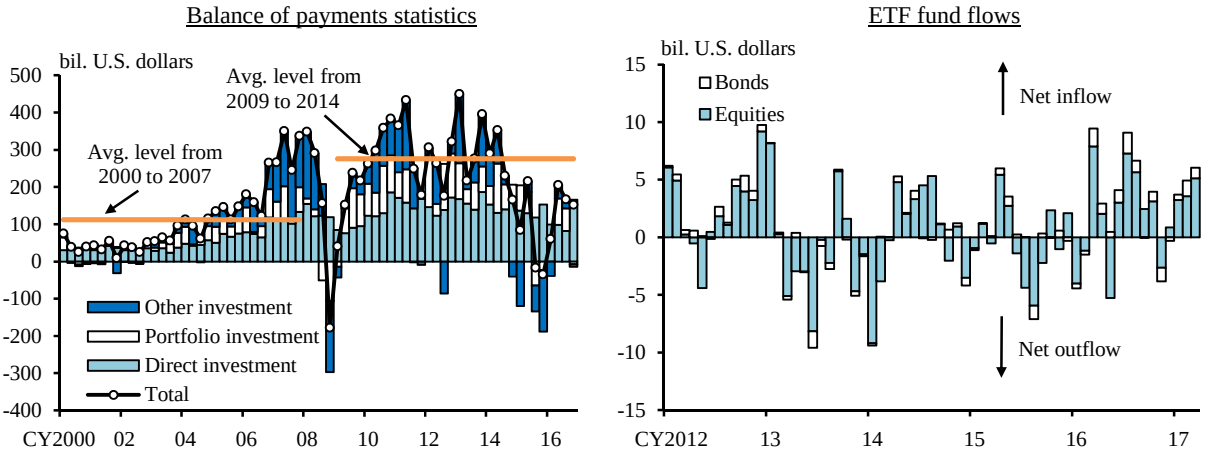


Note: *1*. In the right-hand chart, figures are sub-indices of the CDX.NA.IG for the United States; sub-indices of iTraxx Europe for Europe; averages of CDSs in the three major banks for Japan. Data to March 31, 2017.
Sources: Bloomberg; IHS Markit.

Developments in emerging markets

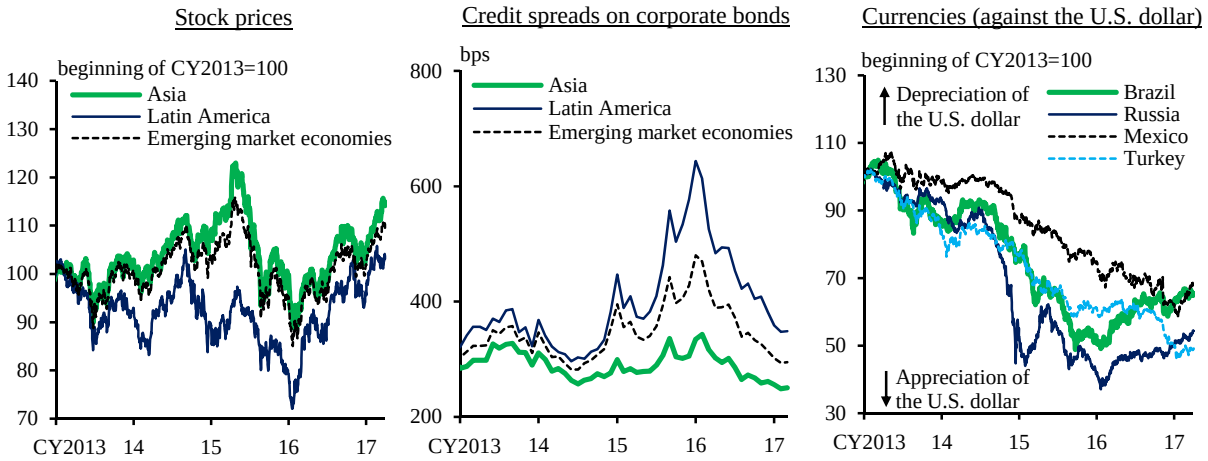
Emerging markets faced capital outflows through the end of 2016, reflecting the effects of the rise in U.S. long-term interest rates. Since the beginning of 2017, this situation has come to vary among emerging market economies; currencies of countries such as those highly susceptible to U.S. trade policy depreciated further, whereas capital flows to countries, particularly those that benefit from a rise in commodity prices, have turned to net inflows (Charts II-1-7 and II-1-8). Stock prices, despite an increase in downward pressure through the end of 2016, have been firm on the whole since the beginning of 2017. Credit spreads on corporate bonds have also been narrowing (Chart II-1-8).

Chart II-1-7: Capital flows to emerging markets[1,2]



Notes: *1*. In the left-hand chart, figures are the sum of 19 major emerging market economies. Latest data as at the October-December quarter of 2016.
2. In the right-hand chart, figures are fund flows of ETFs listed on the U.S. stock exchange. Latest data as at March 2017.
Sources: Bloomberg; Haver Analytics.

Chart II-1-8: Emerging markets[1,2]



Notes: *1*. Stock prices are sub-indices of the MSCI Emerging Index, denominated in local currencies. Credit spreads on corporate bonds are sub-indices of the J.P. Morgan CEMBI Broad Diversified, compiled from U.S. dollar-denominated bonds.
2. Data for stock prices and currencies to March 31, 2017. Latest data for credit spreads on corporate bonds as at March 2017.
Sources: Bloomberg; J.P. Morgan.

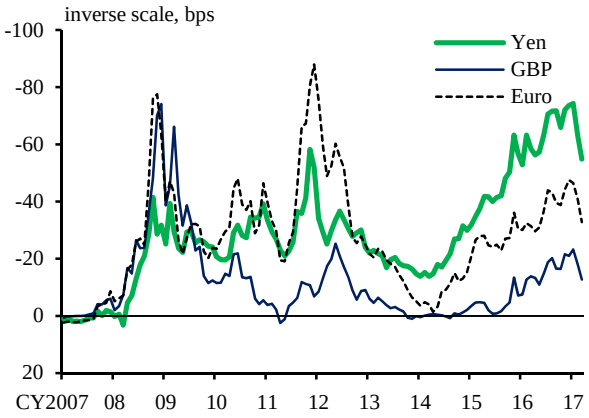
Nevertheless, in emerging market economies, a certain number of firms are likely to be confronted with an increase in refinancing costs due to a rise in interest rates when their U.S. dollar-denominated debt, funded at low interest rates, reaches maturity. Uncertainty regarding future developments in emerging market and commodity-exporting economies remains high, and if downside risks materialize, this could lead to sudden capital outflows and adjustments to asset prices.

U.S. dollar funding markets

Looking at developments in the U.S. dollar funding markets, dollar funding premiums in

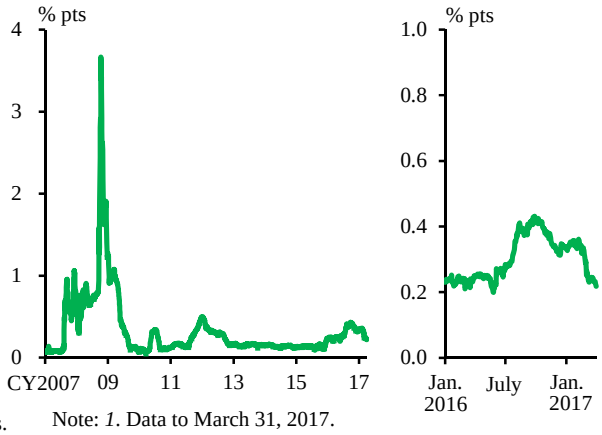
the FX swap and cross-currency basis swap markets have continued to be at high levels, although they narrowed somewhat after the beginning of 2017 (Chart II-1-9). LIBOR-OIS spreads -- which had widened through October 2016, partly reflecting the effects of the U.S. money market fund (MMF) reform -- have remained at somewhat high levels (Chart II-1-10). In the FX swap markets, while U.S. and European financial institutions have refrained from engaging in arbitrage trading due in part to the effects of financial regulations, non-banks -- such as sovereign wealth funds (SWFs) and emerging markets' foreign reserve managers -- have relatively increased their presence as suppliers of U.S. dollars. It is necessary to continue to pay close attention to the risk that the slowdown in emerging market economies and the decline in commodity prices could induce these entities to take a cautious stance toward supplying U.S. dollars, thereby leading to a rise in U.S. dollar funding costs.[2]

Chart II-1-9: U.S. dollar funding premiums[1,2]



Notes: *1*. Monthly averages of 1-year cross-currency basis swaps.
2. Latest data as at March 2017.
Source: Bloomberg.

Chart II-1-10: LIBOR-OIS spreads (U.S. dollar, 3-month)[1]



Note: *1*. Data to March 31, 2017.
Source: Bloomberg.

B. Japanese financial markets

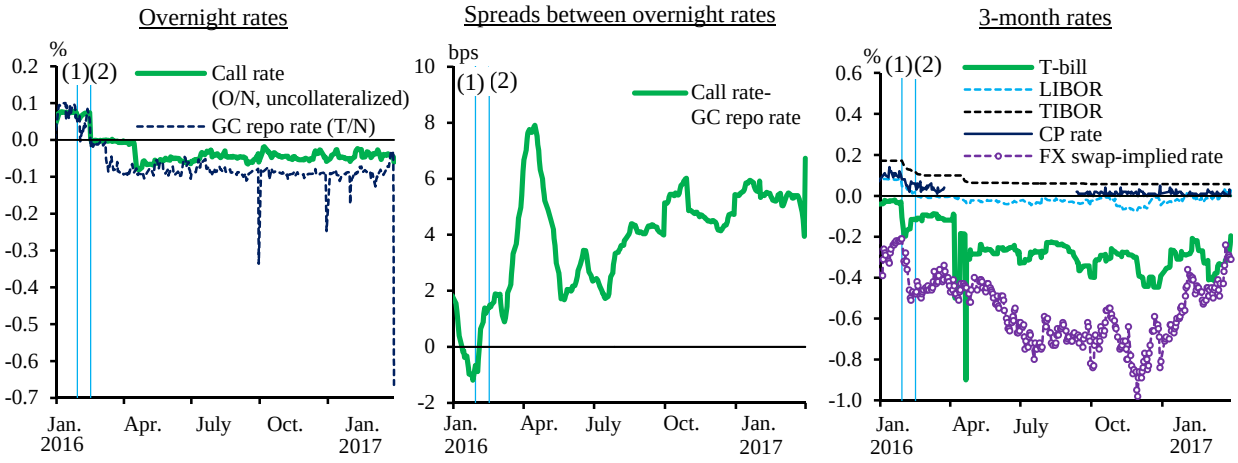
In Japanese financial markets, both short-term and long-term interest rates have generally been stable under QQE with Yield Curve Control. Credit spreads on corporate bonds have continued to be at low levels on the whole. Stock prices rose through the end of 2016, and have been more or less unchanged thereafter.

[2] For details, see Hiroshi Nakaso, Deputy Governor of the Bank of Japan, "Monetary Policy Divergence and Global Financial Stability: From the Perspective of Demand and Supply of Safe Assets," Speech at a Meeting Hosted by the International Bankers Association of Japan, January 20, 2017.

1. Money markets

Short-term interest rates have been around 0 percent or in negative territory. The uncollateralized call rate (O/N) and the GC repo rate (T/N) have more or less hovered in negative territory above minus 0.5 percent. Rates on term instruments have generally remained around 0 percent or in negative territory (Chart II-2-1).[3] A closer look indicates that yields on T-bills have occasionally fallen deeper into negative territory, linked with developments in FX swap-implied yen rates. As background to these developments, foreign investors who have supplied foreign currencies in markets such as the FX swap markets have increased their yen holdings and have strengthened their investment stance in the T-bill market (Chart II-2-2). The repo market has also experienced capital inflows from foreign investors in search of safe-haven assets. Consequently, the spread between the repo rate and the uncollateralized call rate has widened moderately (Charts II-2-1 and II-2-3).

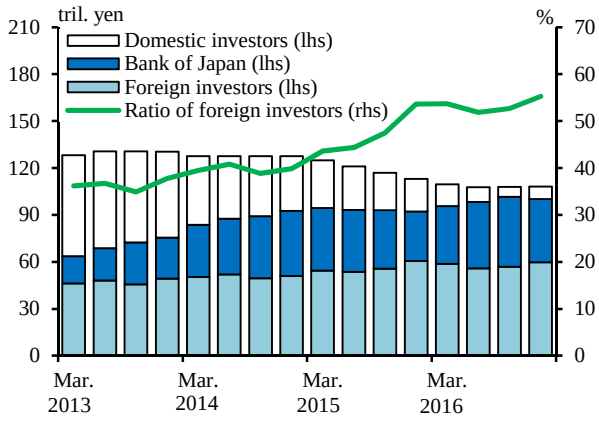
Chart II-2-1: Short-term rates[1,2,3,4]



Notes: *1*. In the left-hand and middle charts, the horizontal axis indicates the start dates of transactions.
2. (1) indicates the announcement of the introduction of QQE with a Negative Interest Rate; (2) indicates the effective start date of the negative interest rate.
3. In the middle chart, figures are 20-day backward moving averages.
4. Data to March 31, 2017 (data for the CP rate are not available from March 25 to September 9, 2016).
Sources: Bloomberg; Japan Bond Trading; JASDEC; JSDA; BOJ.

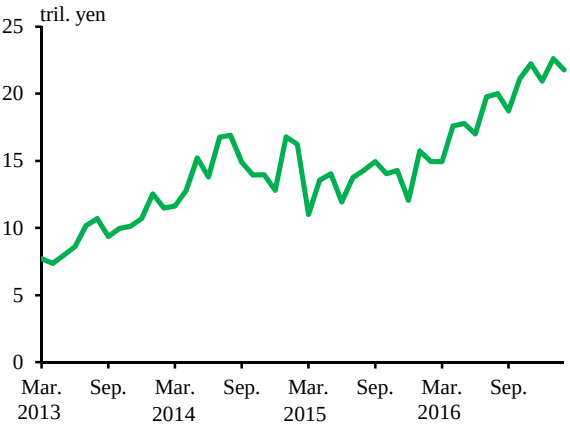
[3] The release of CP (issuance rates) was suspended from March 25, 2016. The Bank of Japan then resumed the release of the data on January 5, 2017, starting with figures for September 12, 2016 onward (Japan Securities Depository Center <JASDEC> is entrusted to calculate and release the data).

Chart II-2-2: Amount outstanding of T-bill holdings by sector[1]



Note: *1*. Latest data as at December 2016.
Sources: Ministry of Finance; BOJ.

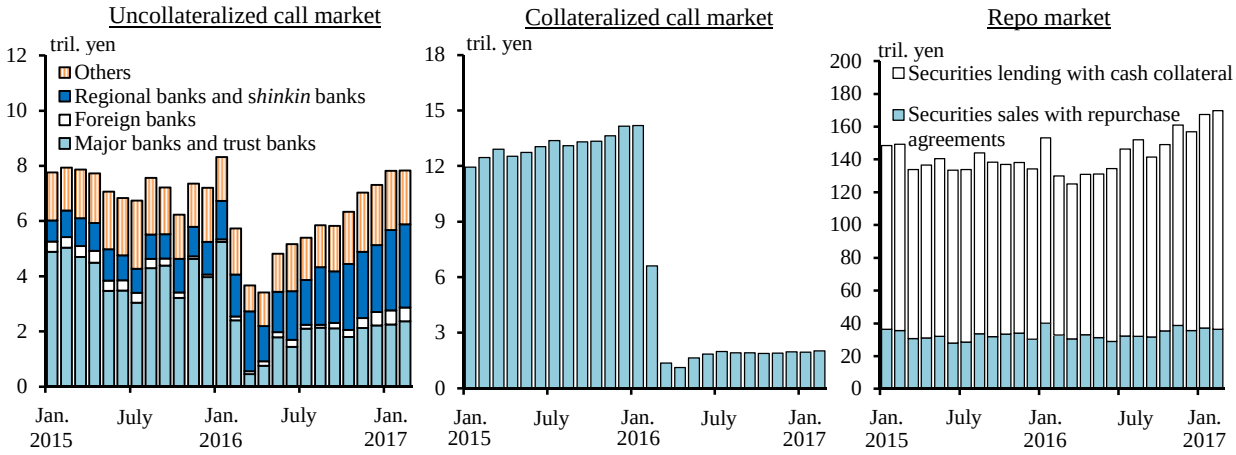
Chart II-2-3: Non-residents' fund positions (Repo market)[1]



Note: *1*. Figures are differences between the amount of investments and funding. Latest data as at February 2017.
Source: JSDA.

In money markets, the amount outstanding of the collateralized call market has remained at a low level. On the other hand, in the uncollateralized call market, the amount outstanding, including that of term instruments, has recovered to the level before the introduction of the negative interest rate policy, owing to the diversification of borrowers. The amount outstanding of the repo market has also been on a moderate increasing trend (Chart II-2-4).

Chart II-2-4: Amount outstanding in money markets[1,2]



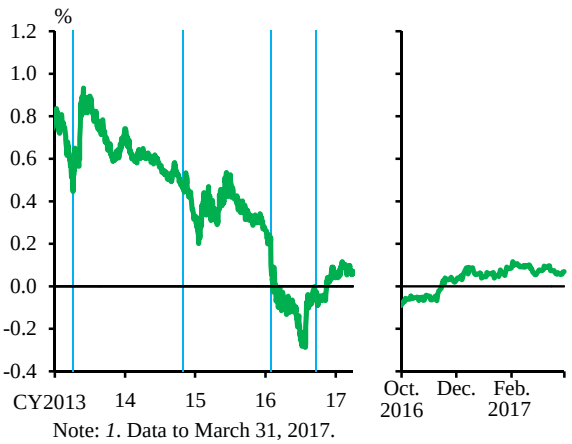
Notes: *1*. In the left-hand chart, figures are broken down by borrower.
2. In the left-hand and middle charts, figures are the average amount outstanding. In the right-hand chart, figures are the amount outstanding at month-end. Latest data as at February 2017.
Sources: JSDA; BOJ.

2. JGB markets

Under QQE with Yield Curve Control, the shape of the yield curve for JGBs has been in line with the current guideline for market operations, in which the short-term policy interest rate is set at minus 0.1 percent and the target level of

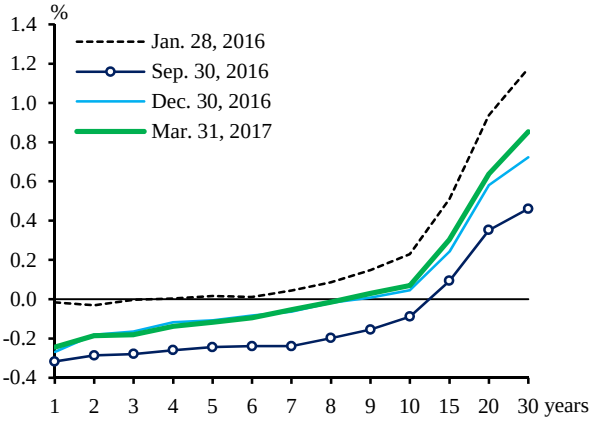
10-year JGB yields is around 0 percent. Yields for relatively short maturities have moved in negative territory above minus 0.5 percent, while 10-year JGB yields rose somewhat and have been stable in slightly positive territory. Meanwhile, the rise in yields for super-long maturities of 20 years or longer has been somewhat larger (Charts II-2-5 and II-2-6).[4] Looking at JGB trading activity by investor type, foreign investors have been the main net purchasers, given that they have continued to raise yen mainly in the FX swap markets at relatively deep negative interest rates and to invest in JGBs (Chart II-2-7).

Chart II-2-5: Long-term JGB yields (10-year)[1]



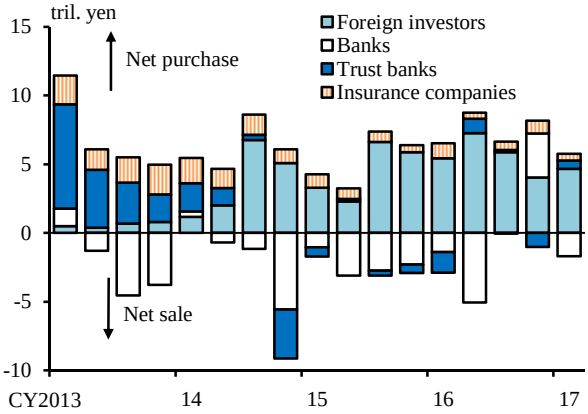
Note: *1*. Data to March 31, 2017.
Source: Bloomberg.

Chart II-2-6: JGB yield curve



Source: Bloomberg.

Chart II-2-7: JGB trading activity by investor type[1]



Note: *1*. The latest data are as of January-February 2017 (converted into quarterly amount).
Source: JSDA.

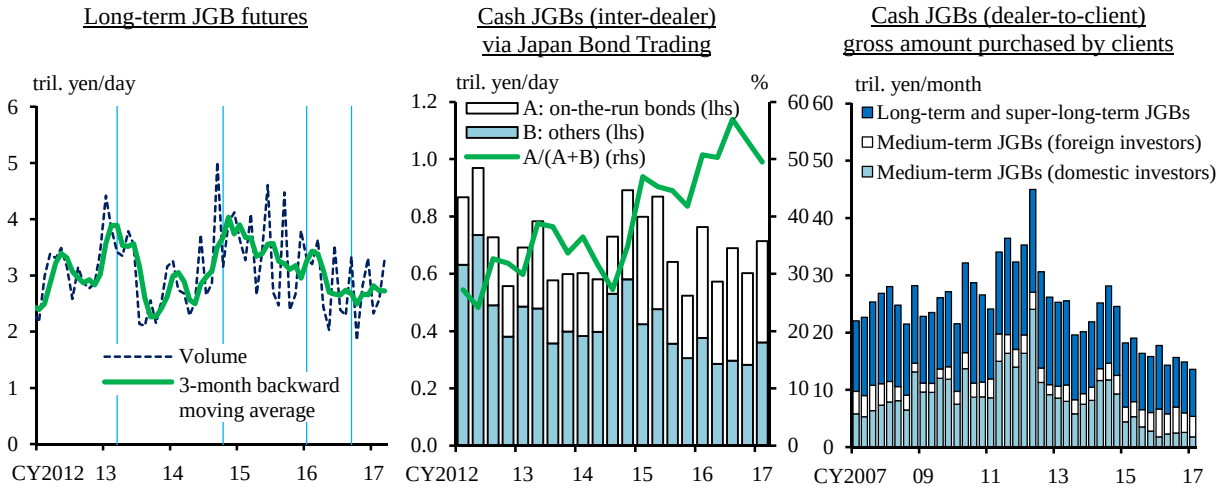
Liquidity and functioning of the JGB markets

Many liquidity indicators of the JGB markets suggest that market liquidity remains

[4] In the following section, the vertical lines in the charts indicate the introduction of QQE (April 4, 2013), the expansion of QQE (October 31, 2014), the introduction of QQE with a Negative Interest Rate (January 29, 2016), and the introduction of QQE with Yield Curve Control (September 21, 2016).

deteriorated on the whole.[5] Transaction volume for long-term JGB futures has recently shown signs of bottoming out, but from a longer-term perspective it has continued to decrease moderately as a trend. As for cash JGBs, both inter-dealer transaction volume and dealer-to-client transaction volume have also been at low levels on the whole (Chart II-2-8).

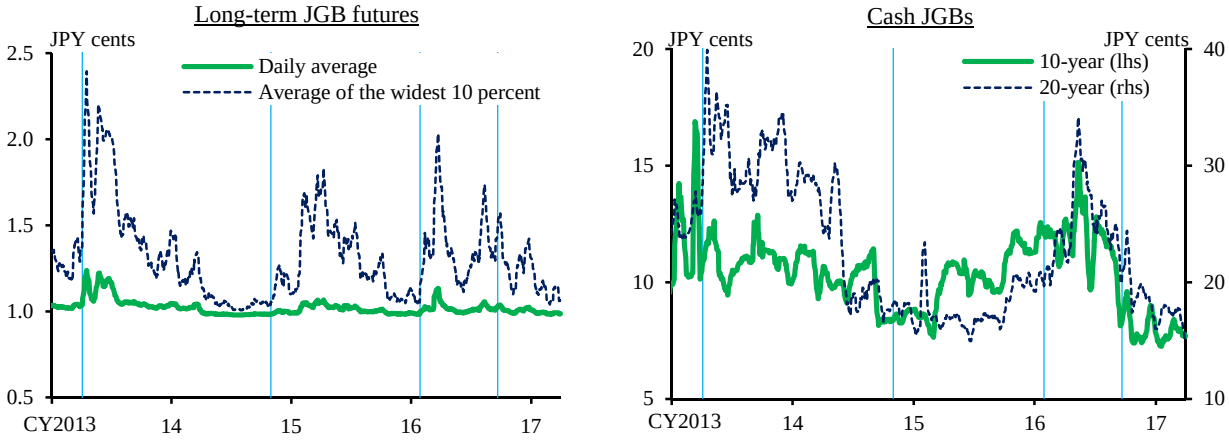
Chart II-2-8: Transaction volume in the JGB markets[1,2]



Notes: *1*. In the right-hand chart, "clients" excludes government, BOJ, etc. Latest data as at January-February 2017.
2. Latest data for JGB futures as at March 2017. Cash JGB (inter-dealer) data as at the January-March quarter of 2017.
Sources: JSDA; Osaka Exchange; QUICK.

Bid-ask spreads have been narrowing somewhat, as price ranges have become narrower (Chart II-2-9). On the other hand, indicators of both market depth and resiliency suggest low market liquidity (Chart II-2-10).

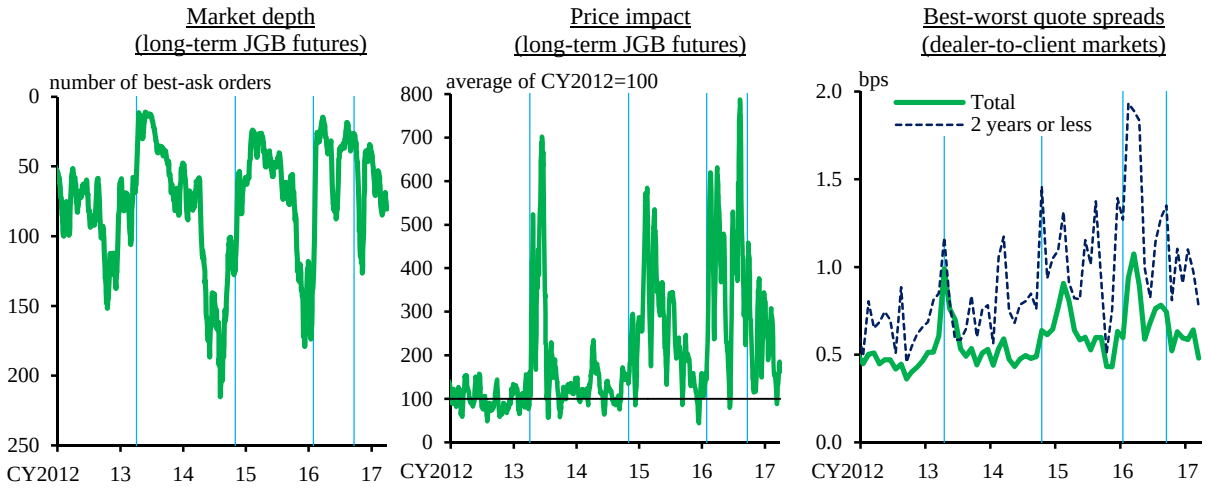
Chart II-2-9: Bid-ask spreads in the JGB markets[1]



Note: *1*. In the left-hand chart, figures are calculated by using the bid-ask spread data with a 1-minute frequency. "Average of the widest 10 percent" is calculated by extracting the widest 10 percent of data (with a 1-minute frequency) for each business day and taking the average of them. 10-day backward moving averages. Data to March 31, 2017.
Sources: Nikkei Inc., "NEEDS"; Thomson Reuters Markets; BOJ.

[5] The Financial Markets Department of the Bank of Japan updates and releases liquidity indicators of the JGB markets, generally on a quarterly basis (https://www.boj.or.jp/en/paym/bond/index.htm/#p02). For the definition of each indicator, see Tetsuo Kurosaki, Yusuke Kumano, Kota Okabe, and Teppei Nagano, "Liquidity in JGB Markets: An Evaluation from Transaction Data," Bank of Japan Working Paper, No. 15-E-2, May 2015.

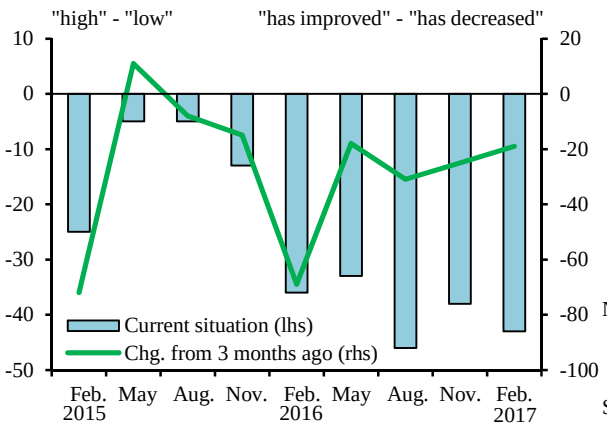
Chart II-2-10: Market depth and resiliency in the JGB markets[1,2,3]



Notes: *1*. In the left-hand chart, figures are calculated by taking the median of the number of orders at the best-ask price with a 1-minute frequency. 10-day backward moving averages. Data to March 31, 2017.
2. In the middle chart, figures are estimated by the BOJ. Price impact is a measurement of how much impact a unit volume of transaction gives to changes in the price. See the reference in Note 5 for details. 10-day backward moving averages. Data to March 31, 2017.
3. In the right-hand chart, a small portion of transactions with spreads of more than 10bps is excluded from the calculation. Latest data as at March 2017.
Sources: Nikkei Inc., "NEEDS"; Yensai.com; BOJ.

Although further deterioration in the functioning and liquidity of the bond markets has not been observed since the introduction of QQE with Yield Curve Control, the results of the *Bond Market Survey* (February 2017) indicate that many market participants continue to cite low functioning (Chart II-2-11). It is necessary to continue to closely monitor the liquidity indicators.

Chart II-2-11: Bond market survey[1,2]



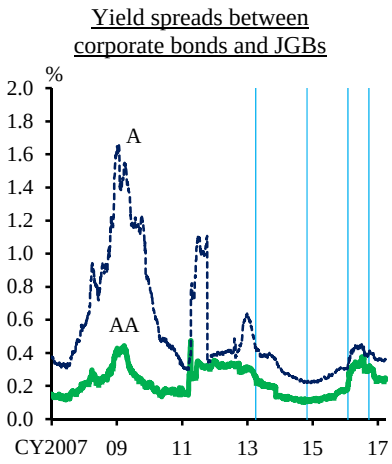
Notes: *1*. The degree of bond market functioning from the surveyed institutions' viewpoint.
2. The latest survey was conducted from February 8-15, 2017.
Source: BOJ, "Bond Market Survey."

3. Credit and stock markets

Credit spreads on corporate bonds have continued to be at low levels on the whole (Chart II-2-12). CDS premiums have also been unchanged at low levels. Although CDS premiums and stock prices show a negative correlation on the whole, the sensitivity of

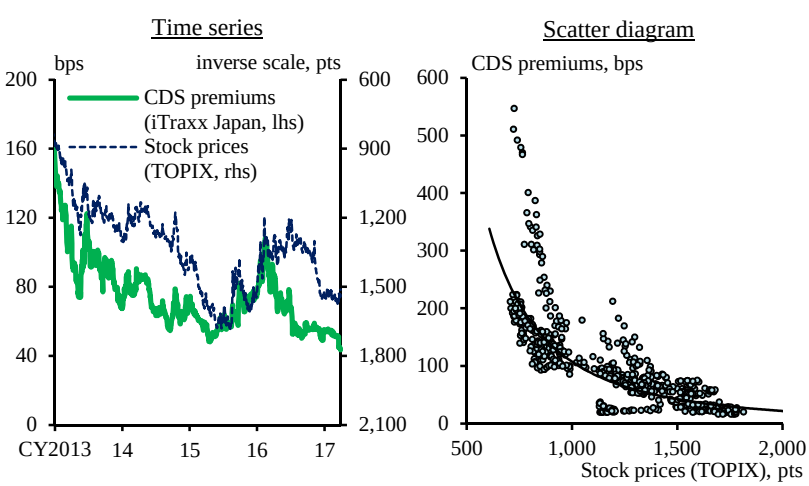
CDS premiums to a rise in stock prices seems to have weakened recently (Chart II-2-13). With corporate profits at high levels and financial institutions' lending attitudes being highly accommodative, it is considered that CDS premiums, linked with firms' probability of default, have declined to a level at which they are unlikely to react to positive news that boosts stock prices.

Chart II-2-12: Corporate bond yields[1,2]



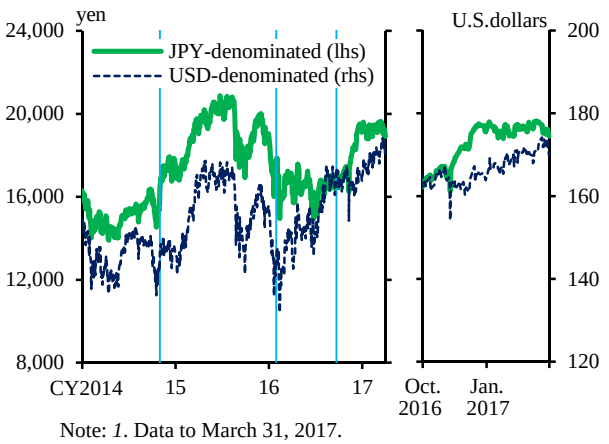
Notes: *1*. Average yield spreads of bonds with a residual maturity of 3 years or more and less than 7 years. Rated by R&I.
2. Data to March 31, 2017.
Source: JSDA.

Chart II-2-13: CDS premiums and stock prices[1,2]



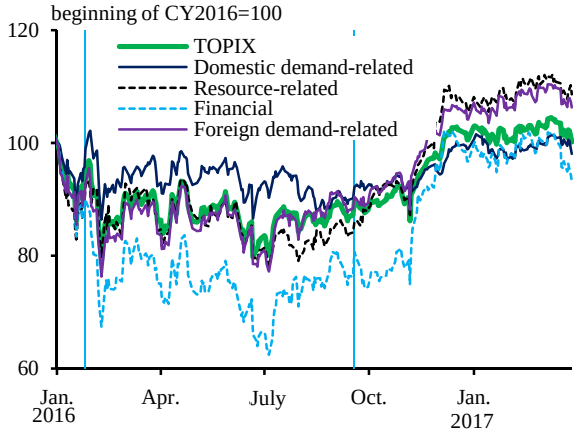
Notes: *1*. In the left-hand chart, data for iTraxx Japan and TOPIX to March 31, 2017.
2. In the right-hand chart, figures are weekly data from January 14, 2005 to March 31, 2017.
Source: Bloomberg.

Chart II-2-14: Stock prices (Nikkei 225) [1]



Note: *1*. Data to March 31, 2017.
Source: Bloomberg.

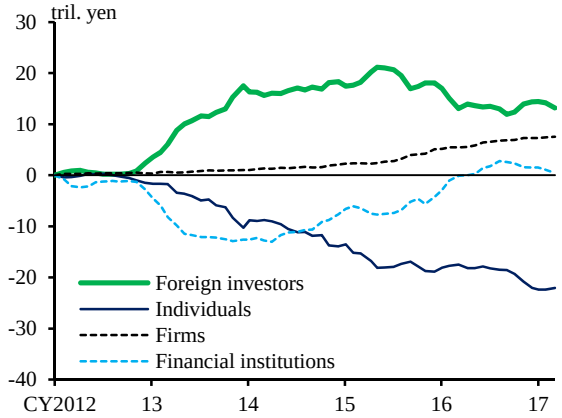
Chart II-2-15: Stock prices by sector[1]



Note: *1*. Figures are averages of the following sub-indices by sector: six indices (IT & services, others, transportation & logistics, pharmaceutical, construction & materials, retail trade, foods) for domestic demand-related; five indices (electric appliances & precision instruments, automobiles & transportation equipment, raw materials & chemicals, machinery, steel & nonferrous metals) for foreign demand-related; two indices (banks, financial institutions excluding banks) for financial; two indices (commercial & wholesale trade, energy resources) for resource-related. Data to March 31, 2017.
Source: Bloomberg.

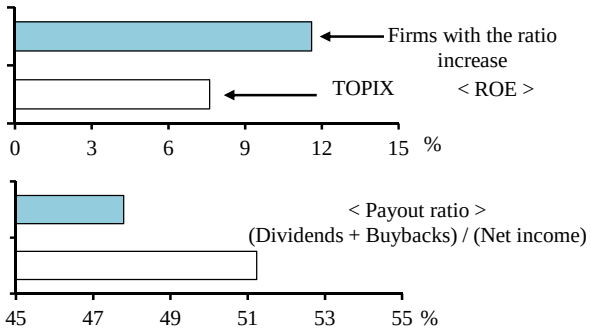
Japanese stock prices rose significantly through the end of 2016, reflecting developments in U.S. and European stock prices and in foreign exchange rates, and have been more or less unchanged thereafter (Chart II-2-14). By sector, stock prices rose through the end of 2016 in a wide range of sectors, such as domestic demand-related, foreign demand-related, financial, and resource-related ones (Chart II-2-15). Stock prices denominated in U.S. dollars have also been firm. Looking at stock trading activity by investor type, foreign investors have been the main net purchasers when stock prices have risen, and the main net sellers when stock prices have declined (Chart II-2-16). Nevertheless, according to data on individual firms' shareholders, foreign investors have consistently increased their share in shareholders of firms whose indicators of profitability or ability to generate cash flow, i.e., return on equity (ROE) or earnings per share (EPS), are high (Chart II-2-17). It seems that foreign investors, rather than focusing on firms' current payout ratios, prefer firms with ample room for enhancing them (i.e., firms previously reluctant to return profits to shareholders) through their active engagement as shareholders.

Chart II-2-16: Stock trading activity by investor type[1]



Note: *1*.Cumulative changes from January 2012. Latest data as at March 2017.
Source: Tokyo Stock Exchange.

Chart II-2-17: Characteristics of firms for which the ratio of stockholdings by foreign investors has increased[1]

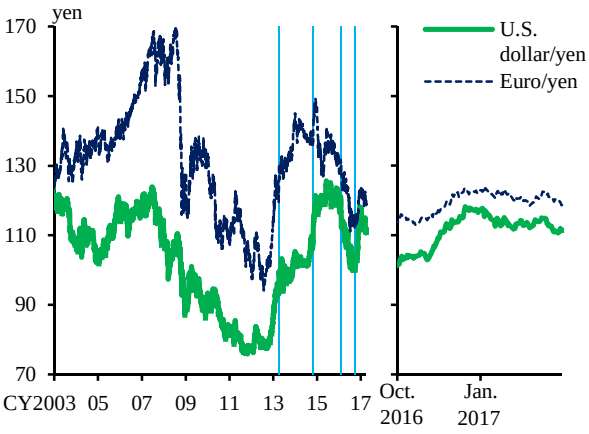


Note: *1*. Data for firms included in TOPIX 500 whose fiscal year ends in February or March. "Firms with the ratio increase" indicates firms with a 3 percent or more increase in the ratio of stockholdings by foreign investors during fiscal 2012 to 2014 and fiscal 2014 to 2015 (excluding some outlier samples).
Source: Bloomberg.

4. Foreign exchange markets

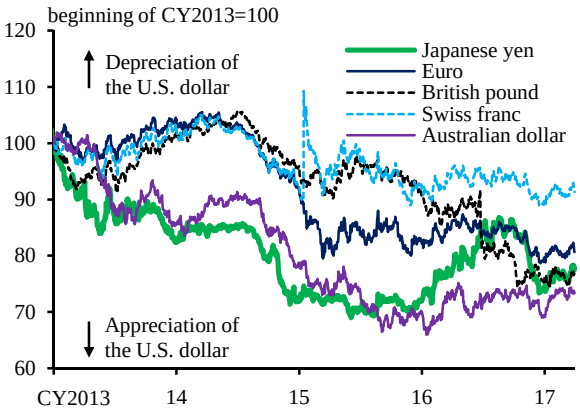
The yen has depreciated against the U.S. dollar (Chart II-2-18). Currencies of major advanced economies have generally depreciated against the U.S. dollar following the U.S. presidential election (Chart II-2-19). In this situation, risk reversals show that market participants' vigilance over the yen's appreciation against the U.S. dollar has mitigated (Chart II-2-20).

Chart II-2-18: FX rates[1]



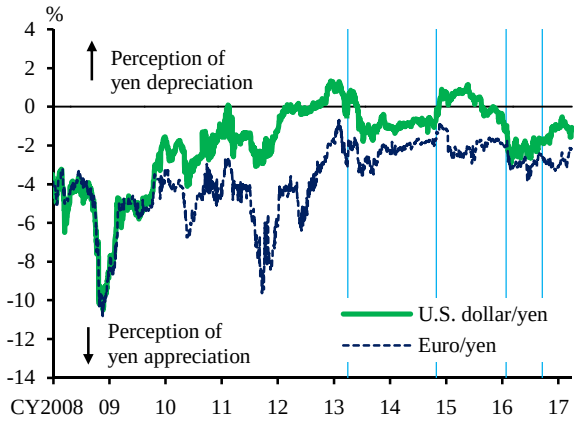
Note: *1*. Data to March 31, 2017.
Source: Bloomberg.

Chart II-2-19: FX rates of advanced economies' currencies against the U.S. dollar[1]



Note: *1*. Data to March 31, 2017.
Source: Bloomberg.

Chart II-2-20: Risk reversals[1]



Note: *1*. 1-year risk reversals. Data to March 31, 2017.
Source: Bloomberg.

III. Examination of financial intermediation

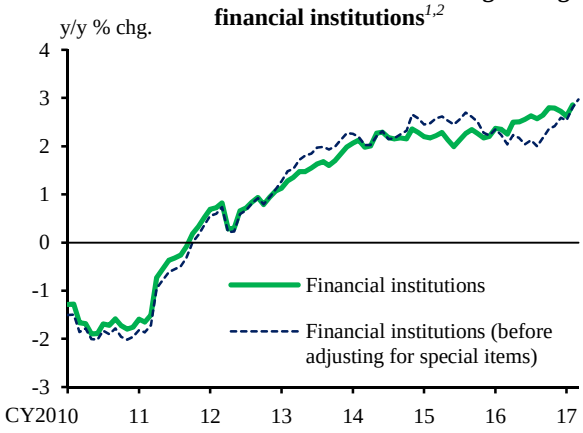
This chapter examines developments in financial intermediation, based mainly on financial information in the second half of fiscal 2016. First, we outline developments in financial intermediation by financial institutions, such as banks and *shinkin* banks, investment activities by institutional investors, and households' investment in financial assets. Then, we assess the state of financial intermediation through financial markets. In the last part of this chapter, we examine whether these activities show signs of overheating.

A. Financial intermediation by financial institutions

1. Domestic loans

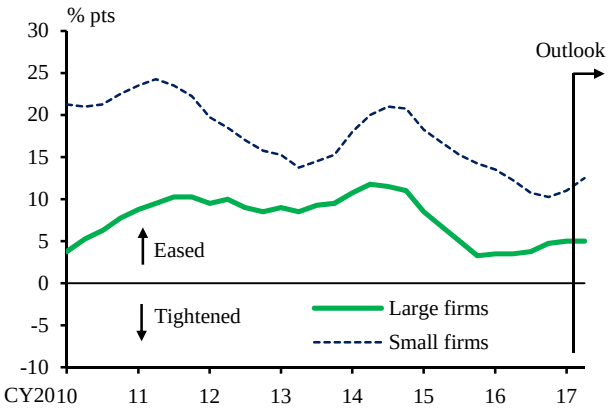
Financial institutions' domestic loans outstanding have been growing at a moderately faster pace on a year-on-year basis, recently at around 3 percent (Chart III-1-1). Financial institutions' lending stances have remained accommodative, and demand for funds has increased on the whole (Charts III-1-2 and III-1-3).

Chart III-1-1: Domestic loans outstanding among financial institutions[1,2]



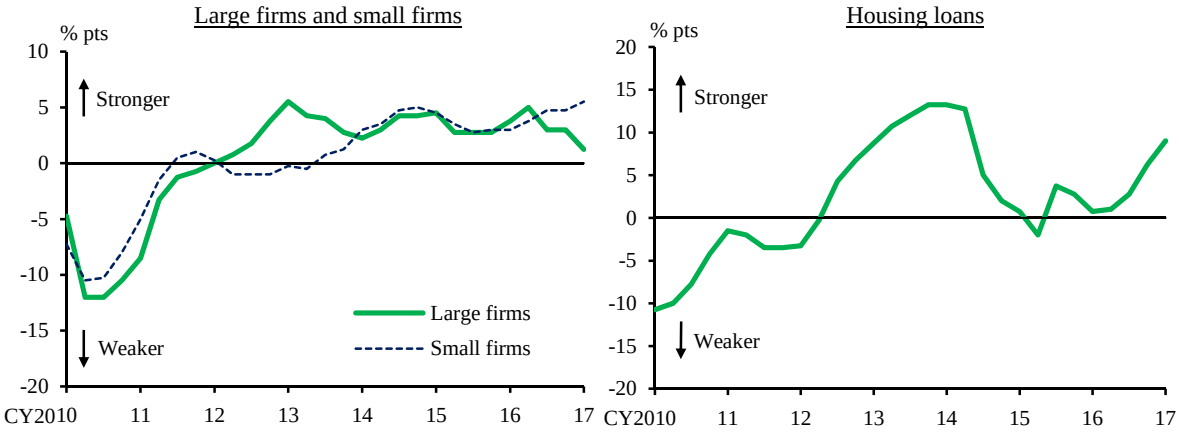
Notes: *1*. Latest data for loans outstanding among financial institutions as at February 2017. Latest data for those before adjusting for special items as at March 2017.
2. "Financial institutions" indicates average amounts outstanding after adjusting bank loans for special items, which are composed of adjustment for exchange rate changes, adjustment for loan write-offs and related items, and adjustment for securitization of loans.
Source: BOJ, "Principal figures of financial institutions."

Chart III-1-2: DI of credit standards[1,2,3]



Notes: *1*. Latest data as at January 2017.
2. Based on the proportion of responding financial institutions selecting each given choice, the DI of credit standards is calculated as follows:
DI = "eased considerably" + 0.5 * "eased somewhat" - 0.5 * "tightened somewhat" - "tightened considerably."
3. 4-quarter backward moving averages.
Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

Chart III-1-3: DI of demand for loans as perceived by financial institutions[1,2,3]



Notes: *1*. Latest data as at January 2017.
2. Based on the proportion of responding financial institutions selecting each given choice, the DI of demand for loans is calculated as follows:
DI = "substantially stronger" + 0.5 * "moderately stronger" - 0.5 * "moderately weaker" - "substantially weaker."
3. 4-quarter backward moving averages.
Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

Developments in loans by type of borrower

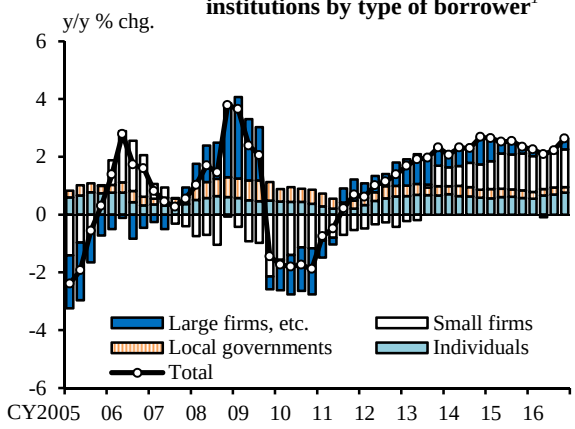
Financial institutions' loans to firms, individuals, and local governments have all continued to grow (Chart III-1-4).

In terms of loans to firms by firm size, loans to large firms were pushed down due to the effects of yen appreciation on foreign currency-denominated loans (foreign currency-denominated impact loans) in the middle of 2016, so that the growth rate temporarily became negative; however, the growth rate has recently turned positive again and, on average, loans to large firms have remained on an uptrend (Chart III-1-4). While large firms hold ample internal reserves, demand for funds related to merger and acquisition (M&A) deals and hybrid financing (such as subordinated loans) has remained high (Chart III-1-3).[6] M&A activity by Japanese firms has continued to be brisk, across both cross-border mergers and acquisitions -- targeting foreign companies (IN-OUT) -- and domestic mergers and acquisitions (IN-IN) (Chart III-1-5). Banks, especially major banks -- partly with a view to improving their non-interest income (fees and commissions related to domestic and foreign transactions and syndicated loans, etc.) -- have been proactive in conducting lending businesses, which may become a source of non-interest income. In particular, banks have been responding proactively to meet demand for funds

[6] Hybrid financing is a financing instrument with characteristics of both debt and equity and, to a certain extent, can be approved as capital by rating agencies. For example, in the case of subordinated loans, corporate firms are able to secure capital funds without issuing stocks that may result in a short-term decline in ROE. While normal hybrid products have super-long maturities (e.g., 60 years), it is often the case that incentives (e.g., an interest rate step-up) for corporate firms to carry out early redemption after 5 to 10 years are embedded.

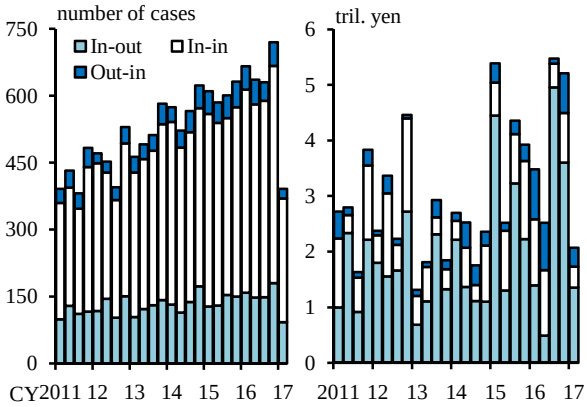
especially for M&As and business expansion at home and abroad, and have been focusing on products with relatively wider profit margins, such as subordinated loans.

Chart III-1-4: Loans outstanding among financial institutions by type of borrower[1]



Note: *1*. Latest data as at end-December 2016. Overseas yen loans and domestic loans transferred overseas are excluded.
Source: BOJ.

Chart III-1-5: M&A related to Japanese companies[1,2]



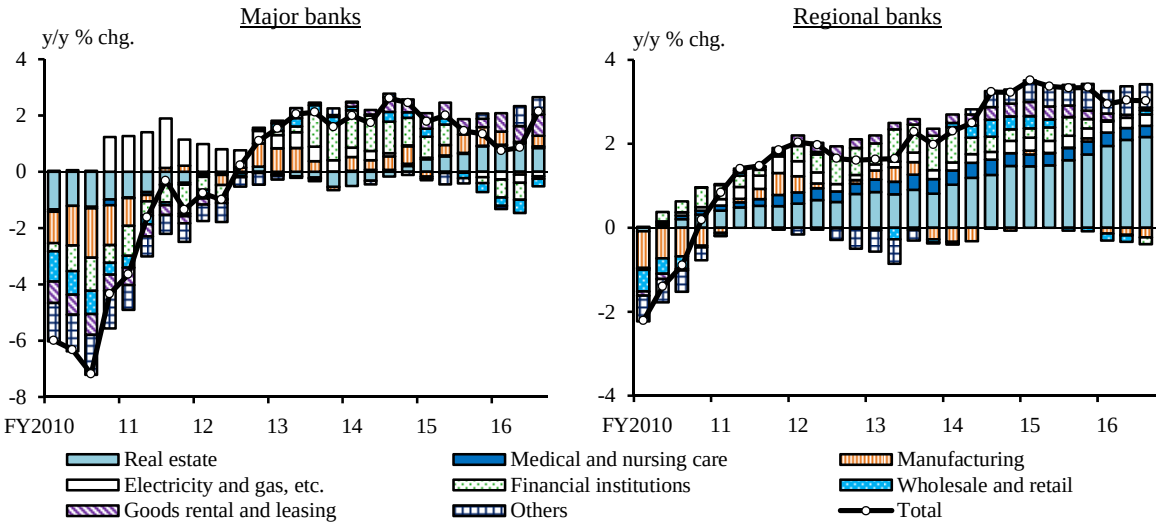
Notes: *1*. Latest data as at January-February 2017.
2. "In-out" means the acquirer is a Japanese company and the target company is a foreign company. "In-in" means the acquirer is a Japanese company and the target company is a Japanese company. "Out-in" means the acquirer is a foreign company and the target company is a Japanese company.
Source: RECOF.

Loans to small and medium-sized firms -- both for business fixed investment and working capital -- have continued to increase, with the growth rate accelerating slightly compared to half a year earlier (Chart III-1-4). With the increase in small and medium-sized firms' demand for funds continuing, financial institutions have been working proactively to extend loans to local firms, including borrowers with lower credit ratings (Chart III-1-3). Financial institutions have been continuing to work together with local governments and other entities toward the revitalization of local economies and to support, for example, start-up firms, business revitalization, succession of businesses, and firms' business matching. Regional financial institutions in particular have continued to focus on efforts to revitalize local economies and firms with a view to maintaining and buttressing their own business bases.

In terms of loans to firms by industry, loans to a large number of industries, including real estate, medical & nursing care, goods rental & leasing, and information & communications, have been increasing (Chart III-1-6). Loans to the wholesale and retail industry have continued to decrease, mainly due to the decline in demand for funds related to resource development investment especially among trading companies and working capital particularly among importing firms, but with commodity prices having risen, the extent of the decline has moderated. On the other hand, loans to financial

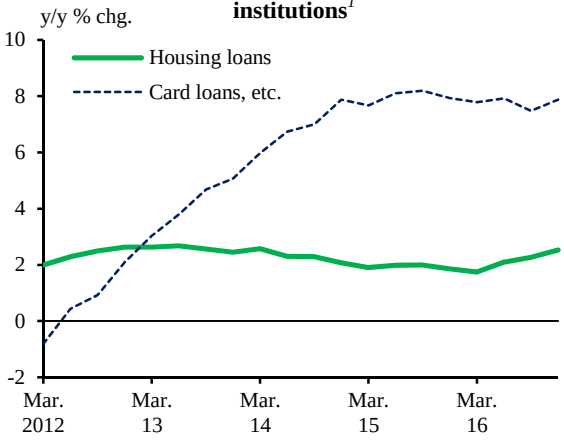
services providers have continued to decrease, as stock transactions conducted on margins in the securities industry have been sluggish.

Chart III-1-6: Banks' corporate loans outstanding by industry[1]



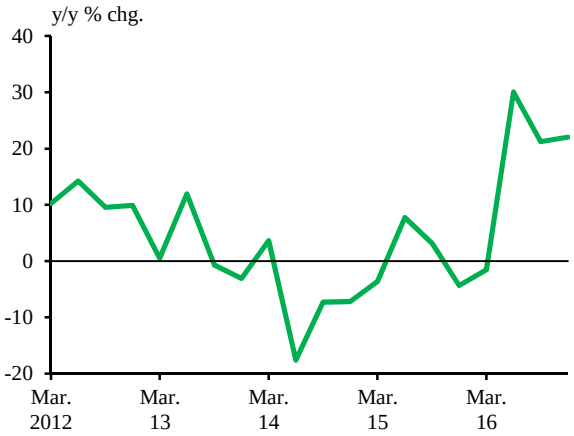
Note: *1*. Latest data as at end-December 2016. Overseas yen loans and domestic loans transferred overseas are excluded.
Source: BOJ.

Chart III-1-7: Outstanding amount of loans to individuals among financial institutions[1]



Note: *1*. Latest data as at end-December 2016.
Source: BOJ.

Chart III-1-8: Newly extended housing loans among financial institutions[1]



Note: *1*. Latest data as at end-December 2016.
Source: BOJ.

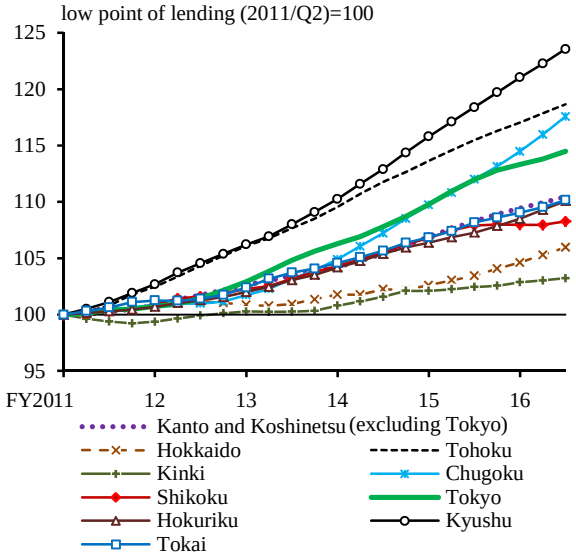
Next, in terms of loans to individuals, the year-on-year growth rate in the outstanding amount of housing loans has increased somewhat, reflecting the slight year-on-year increase in the number of construction starts for owner-occupied houses and housing for sale as well as the rise in housing prices (Chart III-1-7). After the introduction of QQE with a Negative Interest Rate in January 2016, newly extended housing loans have increased sharply, mainly due to a spike in refinancing (Charts III-1-3 and III-1-8).[7]

[7] Loan refinancing by another bank is treated as a new loan.

Meanwhile, outstanding card loans have continued increasing fairly briskly, mainly against the background that many financial institutions are proactive in extending card loans with relatively wide profit margins (Chart III-1-7).

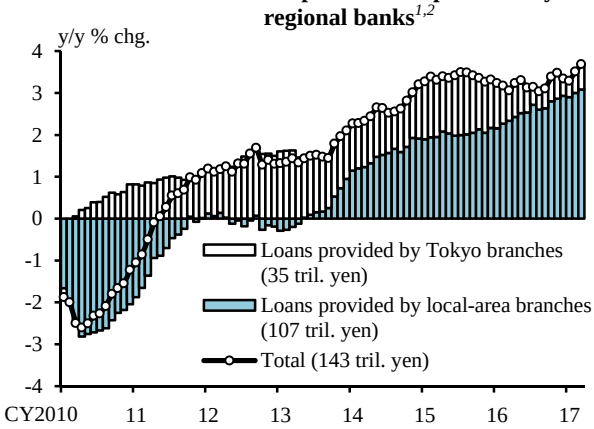
By region, bank loans have been growing in a large number of regions, including Kyushu, Tohoku, and Chugoku (Chart III-1-9). At regional banks, growth in loans extended by their branches in Tokyo, including syndicated loans to large firms with thin margins, has been slowing, while growth in loans to local firms has accelerated (Chart III-1-10).

Chart III-1-9: Bank loans by region[1]



Note: *1*. Latest data as at end-December 2016. 4-quarter backward moving averages.
Source: BOJ.

Chart III-1-10: Corporate loans provided by regional banks[1,2]

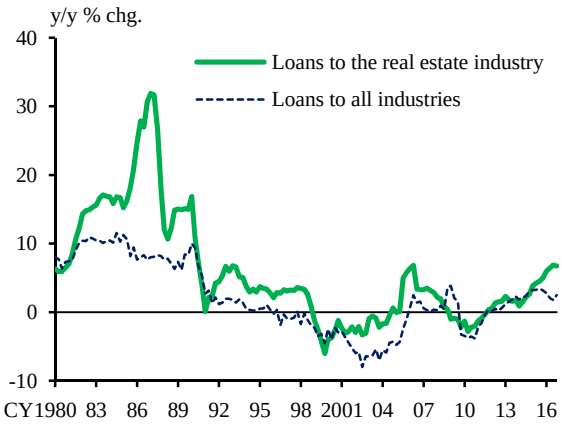


Notes: *1*. Latest data as at March 2017.
2. Figures in parentheses indicate the amounts outstanding as at March 2017.
Source: BOJ.

Developments in real estate loans

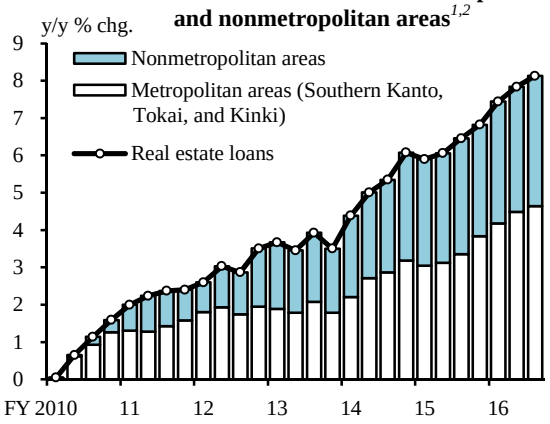
Real estate loans have been growing at an even faster pace, and continue to exceed the growth rate of loans to firms in all industries (Chart III-1-11). Although the growth rate is still low compared to the bubble period during the 1980s, the amount outstanding of real estate loans extended by domestic banks and *shinkin* banks as at end-December 2016 reached about 85 trillion yen, marking a new record high. Moreover, by region, regional financial institutions' real estate loans in nonmetropolitan areas, in addition to the three major metropolitan areas (Southern Kanto, Tokai, and Kinki regions), have been growing at a faster pace (Chart III-1-12). Financial institutions' lending stance continues to be proactive overall, although some financial institutions are more aware of the risks such as a drop in the real estate market and the risk associated with credit concentration in the real estate industry, and are becoming more prudent in their lending.

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



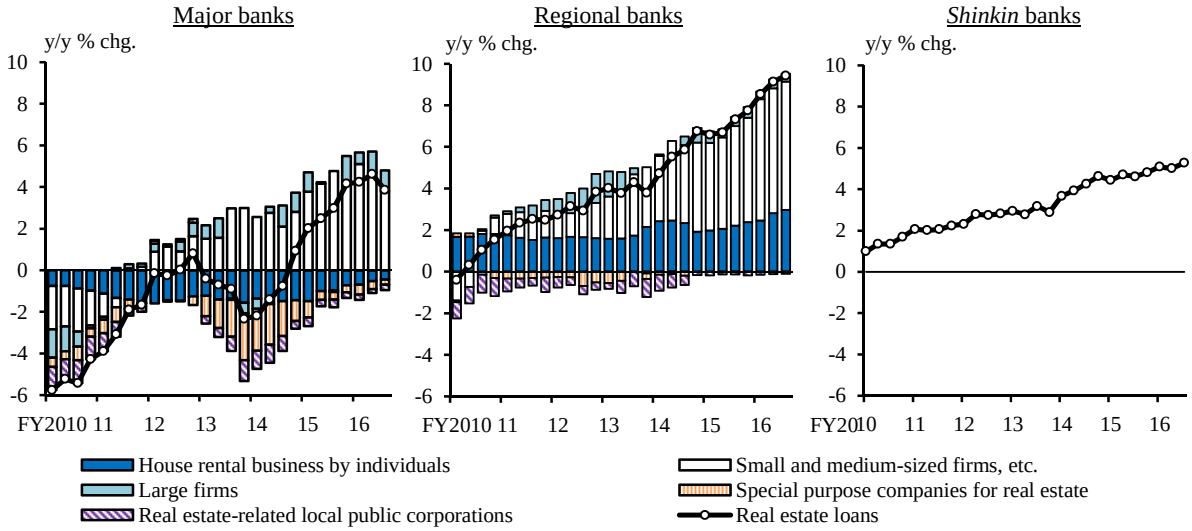
Note: *1*. Latest data as at end-December 2016.
Source: BOJ.

Chart III-1-12: Real estate loans among regional financial institutions in metropolitan and nonmetropolitan areas[1,2]



Notes: *1*. Latest data as at end-December 2016.
2. For metropolitan areas, banks with head offices located in the Southern Kanto region, the Tokai region, and the Kinki region are included. For nonmetropolitan areas, banks with head offices located in other areas are included.
Source: BOJ.

Chart III-1-13: Breakdown of real estate loans[1]



Note: *1*. Latest data as at end-December 2016.
Source: BOJ.

By type of financial institution, the year-on-year growth rate of major banks' real estate loans, after accelerating in fiscal 2015, has remained at around 4 percent since the start of fiscal 2016 (Chart III-1-13). A breakdown shows that real estate investment trusts (REITs) and large real estate developers account for a large share.[8] While some regional financial institutions are concerned about a loosening in the supply and demand conditions of the rental housing market and are taking a more cautious stance, the growth rate of real estate loans by regional financial institutions has accelerated on the whole:

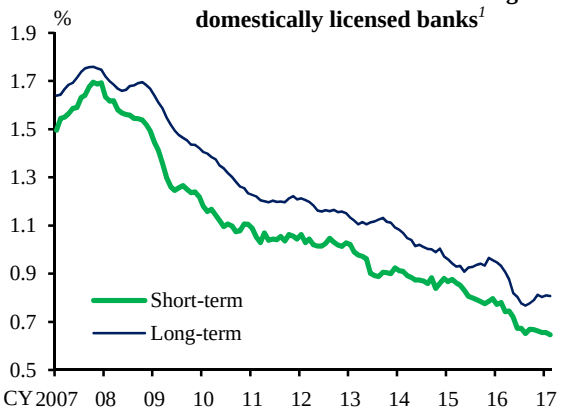
[8] In Chart III-1-13, REITs are included within small and medium-sized firms, etc.

the year-on-year growth rate of regional banks' lending has reached around 9 percent. A breakdown shows that loans to the housing rental business by individuals, and to small and medium-sized firms including asset management companies founded by individuals, are driving the high growth.

Developments in loan and deposit interest rates

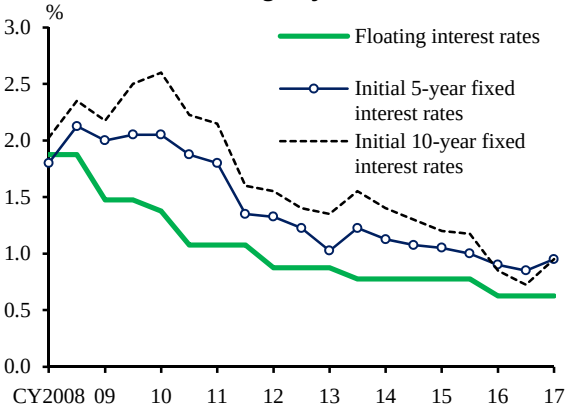
Financial institutions' average contracted interest rates on new loans and discounts are hovering around historically low levels (Chart III-1-14). Interest rates on loans to firms continue to be pushed down by interest rate competition among financial institutions and the improvement in firms' financial conditions. Interest rates on housing loans are also hovering at low levels (Chart III-1-15). Meanwhile, the average contracted interest rate on new long-term loans declined significantly at the start of 2016 and since then has remained more or less unchanged (Chart III-1-14). While factors such as competition among financial institutions exert downward pressure on interest rates, those supporting a rise in the rates include the following: (1) an increase in loans with wider margins such as subordinated loans, particularly by major banks; (2) a shift toward fixed-rate loans over longer lending periods; and (3) the moderate rise in medium- to long-term market interest rates that serve as reference rates, since the summer of 2016 (Chart III-1-16).

Chart III-1-14: Average contract interest rates on new loans and discounts among domestically licensed banks[1]



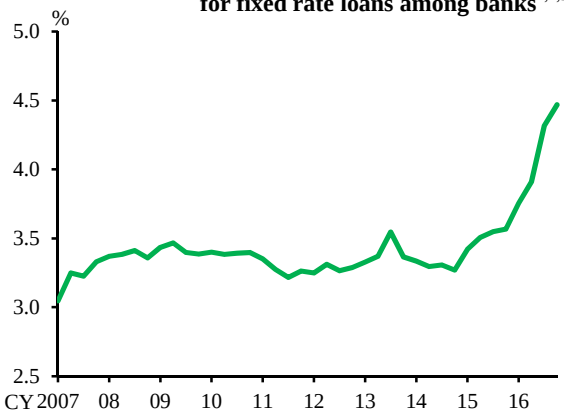
Note: *1*. Latest data as at February 2017. 6-month backward moving averages.
Source: BOJ, "Average contract interest rates on loans and discounts."

Chart III-1-15: Interest rates on housing loans among major banks[1,2,3]



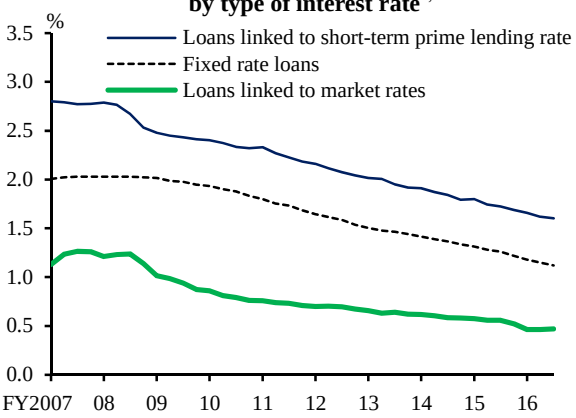
Notes: *1*. Includes Mizuho Bank, The Bank of Tokyo-Mitsubishi UFJ, Sumitomo Mitsui Banking Corporation, Resona Bank, Saitama Resona Bank, Sumitomo Mitsui Trust Bank. The data are based on April and October figures for each year.
2. Interest rates are the median of preferential rates.
3. Latest data as at April 2017.
Sources: "Nikkin report"; Published accounts of each bank.

Chart III-1-16: Super-long-term fixed rate loans ratio for fixed rate loans among banks[1,2,3]



Notes: *1*. Latest data as at end-December 2016.
2. "Super-long-term" indicates terms longer than 10 years.
3. The data are based on the amount outstanding at month-end.
Source: BOJ.

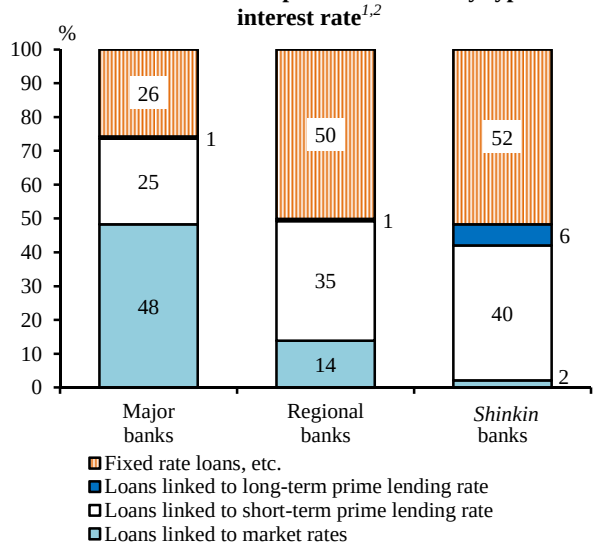
Chart III-1-17: Lending rates among regional banks by type of interest rate[1,2]



Notes: *1*. Last data as at end-December 2016.
2. The lending rates are the median of the interest rates on outstanding loans among regional banks.
Source: BOJ.

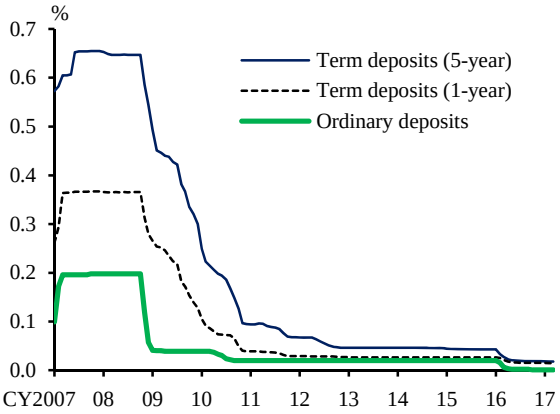
Looking at loan interest rates by type, interest rates on loans linked to market rates and subject to interest rate renewal every few months are hovering at low levels, with reference rates such as TIBOR having been flat recently after declining following the introduction of the negative interest rate policy (Chart III-1-17). Interest rates for fixed-rate loans, which make up a relatively large share of regional financial institutions' loan portfolios, have continued to decline as a trend. They will remain affected by the decline in interest rates at the time of rollover, as their average remaining lending term tends to be several years (Chart III-1-18).

Chart III-1-18: Composition of loans by type of interest rate[1,2]



Notes: *1*. Data as at end-December 2016.
2. Loans linked to market rates are loans that are linked to rates such as TIBOR.
Source: BOJ.

Chart III-1-19: Interest rates on deposits[1]



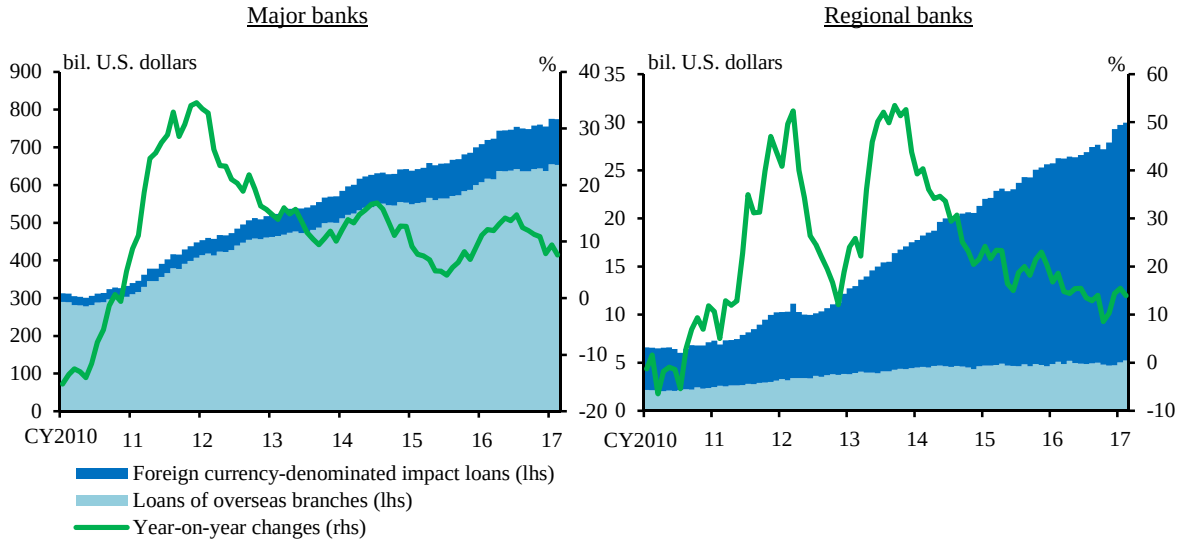
Note: *1*. Interest rates on term deposits are averages posted at financial institutions. Data to March 27, 2017.
Source: BOJ.

Meanwhile, **interest rates on deposits (term deposits and ordinary deposits) have remained at extremely low levels** (Chart III-1-19). At both major banks and regional banks, interest rates on ordinary deposits have dropped to close to 0 percent.

2. Overseas loans

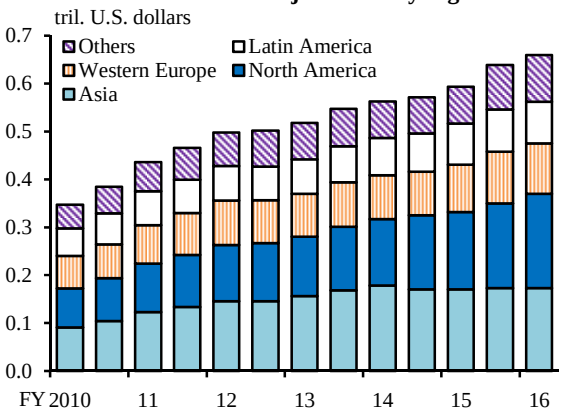
Banks' overseas loans, particularly to North America, have continued to show relatively high growth (Charts III-1-20 and III-1-21). In U.S. dollar terms, loans extended by major banks and regional banks have both increased by approximately 10 percent on a year-on-year basis. In terms of major banks' loans by region, loans to North America have continued to increase steadily and supported overall loan growth, while loans to other regions, partly reflecting competition with local and other foreign financial institutions, have remained more or less unchanged. Under these circumstances, Japanese banks' share in overall foreign claims, particularly in the United States, has continued to increase (Chart III-1-22).

Chart III-1-20: Banks' foreign currency-denominated loans and loans by overseas branches[1,2,3,4]



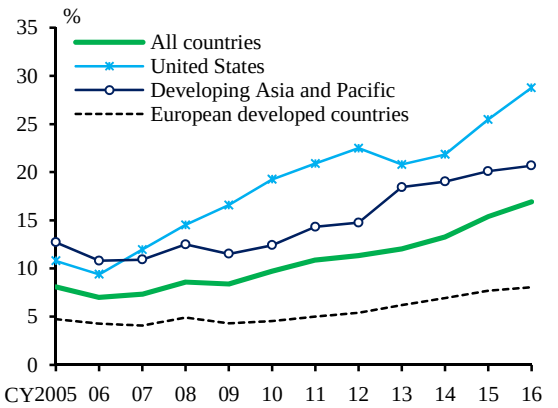
Notes: *1*. Latest data as at February 2017.
2. Loans by overseas branches include foreign currency-denominated impact loans in accounts held overseas.
3. Foreign currency-denominated impact loans indicate banks' foreign currency-denominated loans for residents.
4. Year-on-year changes represent the growth rate of loans extended by overseas branches and foreign currency-denominated impact loans.
Source: BOJ.

Chart III-1-21: Overseas loans outstanding of the three major banks by region[1]



Note: *1*. Latest data as at end-September 2016.
Sources: Published accounts of each bank.

Chart III-1-22: Foreign claims share among Japanese banks by region[1,2]

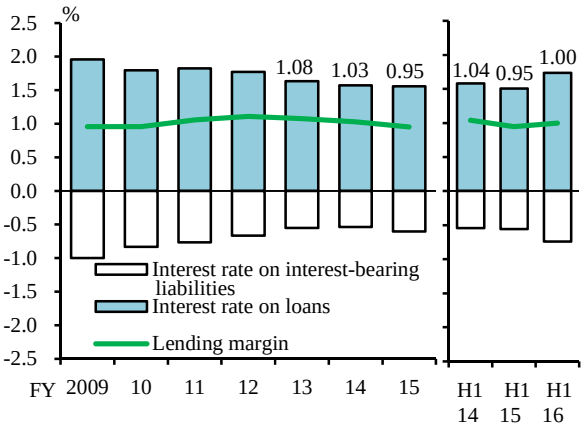


Notes: *1*. The data are based on end-December figures for each year. Latest data as at end-September 2016.
2. This chart is based on foreign claims in the non-bank private sector (ultimate risk basis).
Sources: BIS, "Consolidated banking statistics"; BOJ, "The results of BIS international consolidated banking statistics in Japan."

While maintaining a proactive stance with regard to overseas business on the whole, banks have recently taken a cautious stance in their initial assessment of loans in terms of their profitability and borrowers' creditworthiness and have been strengthening efforts to focus on non-interest income.

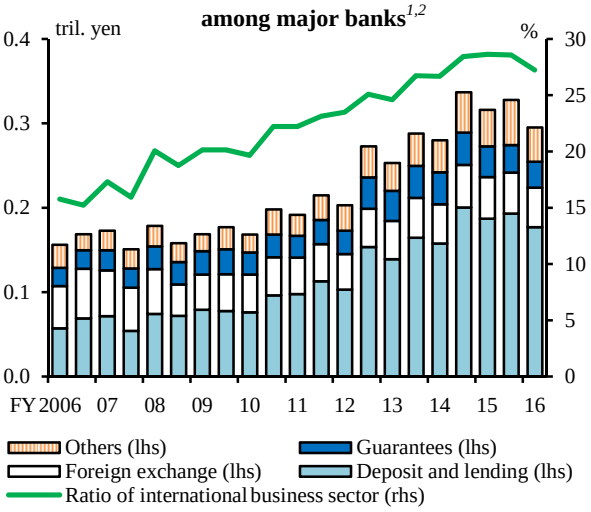
Banks have endeavored to exploit new lending opportunities and deepen relationships with prime borrowers, with a view toward supporting the global expansion of Japanese firms and establishing a global business base through satisfying the financial needs of countries with high long-term growth potential. Nevertheless, with the effects of the slowdown in emerging market economies and low commodity prices lingering in particular, banks have become more cautious in their initial and interim assessment of borrowers' creditworthiness. Meanwhile, mainly due to the rise in foreign currency funding costs and intensifying competition for prime borrowers, lending margins have continued shrinking as a trend (Chart III-1-23). Partly owing to this, banks are making their assessment of loan profitability more rigorous. Under these circumstances, while restraining the pace of increase in loans, in order to improve their overall profitability including in non-lending businesses, major banks are placing even more emphasis on deepening their relationships with existing clients and increasing their fee and commission-based income by, for example, engaging in closer cooperation with securities companies as well as with other firms belonging to the same group (Chart III-1-24).

Chart III-1-23: Lending margin in the international business sector among major banks[1,2]



Notes: *1*. Latest data as at the first half of fiscal 2016.
2. Cost of interest rate swaps is subtracted when calculating the funding costs and the lending margin.
Source: BOJ.

Chart III-1-24: Fee and commission income in the international business sector among major banks[1,2]



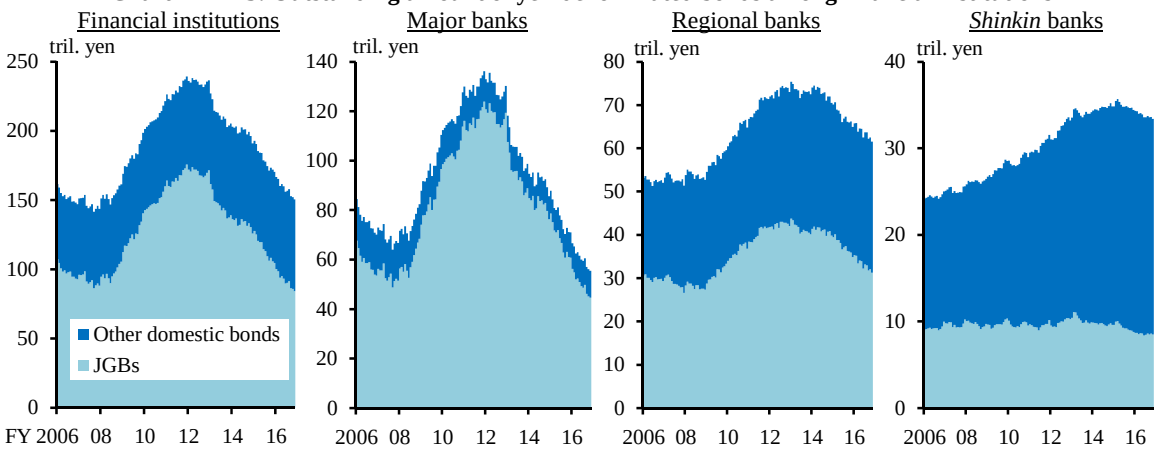
Notes: *1*. Latest data as at the first half of fiscal 2016.
2. "Ratio of international business sector" is the ratio of fee and commission income of the international business sector to total fee and commission income.
Source: BOJ.

3. Securities investment

The amount outstanding of financial institutions' yen-denominated bond investment has been on a declining trend against the background of the continued large-scale JGB purchases by the Bank of Japan. Meanwhile, investment in foreign bonds has recently decreased, although it had continued to follow an increasing trend. Financial institutions have generally maintained their stance of increasing their risk taking in securities investment, as seen in the continued growth in the amount outstanding of financial institutions' investment trusts.

With regard to the outstanding holdings of yen-denominated bonds -- including JGBs, municipal bonds, and corporate bonds -- by type of financial institution, holdings of *shinkin* banks have remained at a high level, while those of major banks have continued to decrease, and those of regional banks have also been decreasing moderately (Chart III-1-25). Especially, in the course of the rise in U.S. interest rates following the presidential election in the United States, some financial institutions sold yen bonds with unrealized gains along with foreign bonds, etc. with unrealized losses. By contrast, in order to secure interest income, retain unrealized gains, and keep their current account deposit balances at the Bank of Japan from increasing, others have refrained from selling JGBs, or purchased JGBs, with long-term JGB yields having turned positive since the summer of 2016.

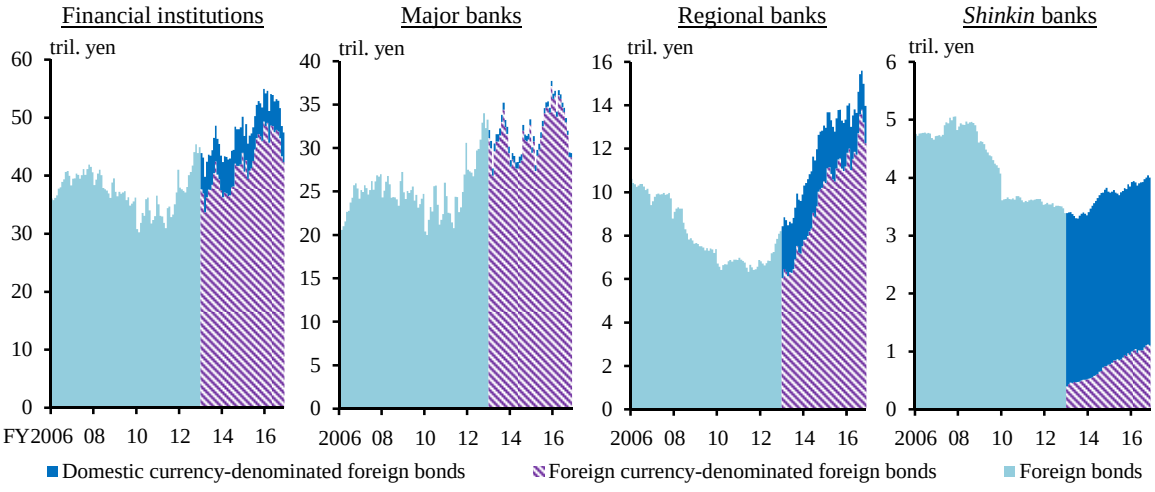
Chart III-1-25: Outstanding amount of yen-denominated bonds among financial institutions[1,2]



Notes: *1*. Latest data as at end-February 2017.
2. The data are the sums of figures for domestic and overseas branches. The data are based on the amount outstanding at month-end.
Source: BOJ.

Turning to recent developments in the outstanding holdings of foreign bonds (in yen terms), by type of financial institution, whereas major banks' holdings have decreased, regional financial institutions' holdings have been more or less unchanged overall (Chart III-1-26). In response to the rise in U.S. interest rates since the fall of 2016, some financial institutions have purchased foreign bonds with the aim of increasing their income gain. On the whole, however, many have held back from investing in foreign bonds and have been selling bonds that have experienced relatively large price declines. Moreover, the widening of dollar funding premiums toward the end of 2016 has also restrained investment. Although the dollar funding premiums have tightened since the start of 2017, current moves among financial institutions to increase foreign bond investment once again are still limited, with caution against a further rise in U.S. interest rates.

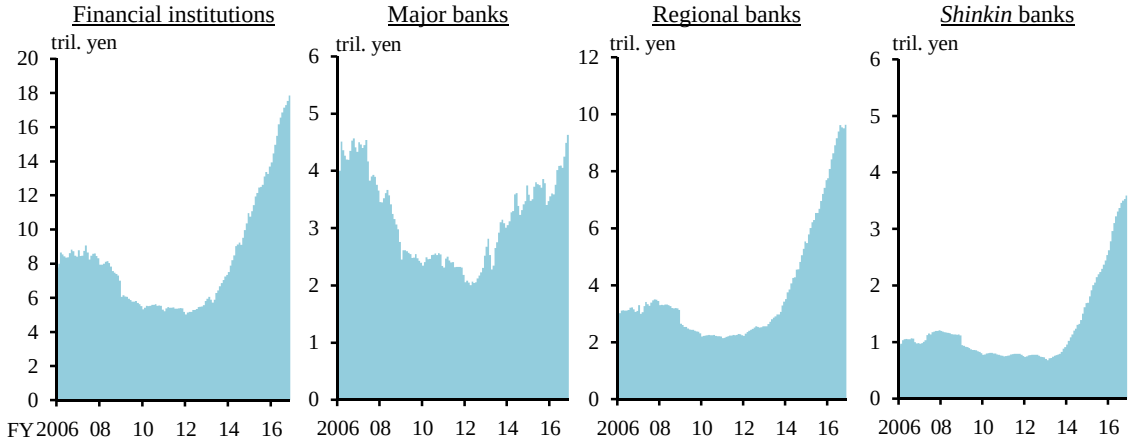
Chart III-1-26: Outstanding amount of foreign bonds among financial institutions[1,2,3]



Notes: *1*. Latest data as at end-February 2017.
2. The data are the sums of figures for foreign currency-denominated and domestic currency-denominated foreign bonds. The data up to March 2010 are figures for foreign securities.
3. The data are the sums of figures for domestic and overseas branches. The data are based on the amount outstanding at month-end.
Source: BOJ.

The outstanding holdings of investment trusts and other assets by financial institutions have continued to increase. By type, major banks have increased their outstanding amount of stock investment trusts as stock prices have been firm, and regional financial institutions have further increased their holdings of investment trusts and other assets that carry various risk factors, such as stock investment trusts, REITs, and bond ladder funds both at home and abroad (Chart III-1-27).

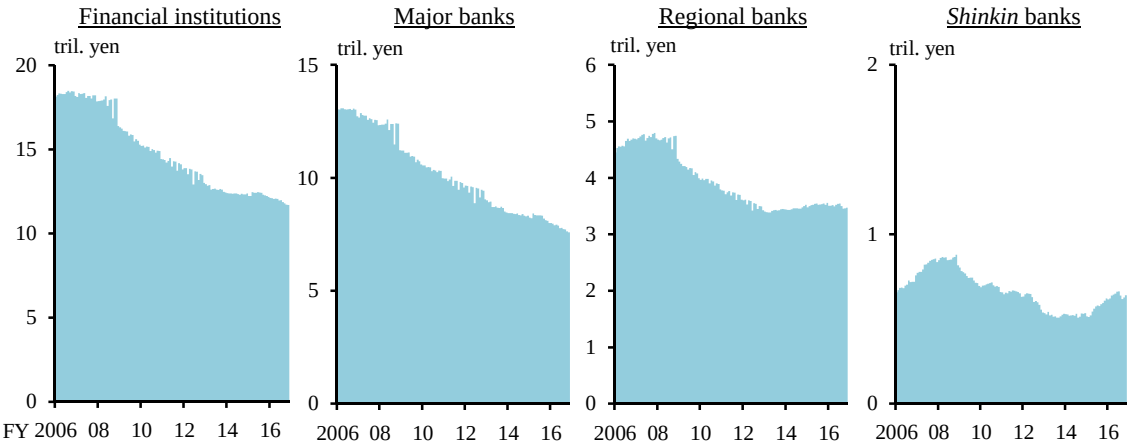
Chart III-1-27: Outstanding amount of investment trusts, etc. among financial institutions[1,2]



Notes: *1*. Latest data as at end-February 2017.
2. The data are the sums of figures for domestic and overseas branches. The data for domestic branches are based on the average amount outstanding. The data for overseas branches are based on the amount outstanding at month-end.
Source: BOJ.

Meanwhile, financial institutions' outstanding amount of stockholdings has been on a gradual downtrend, as they continue to reduce their stockholdings aimed at maintaining business ties with firms (i.e., strategic stockholdings) (Chart III-1-28).

Chart III-1-28: Outstanding amount of stockholdings among financial institutions[1,2,3,4]



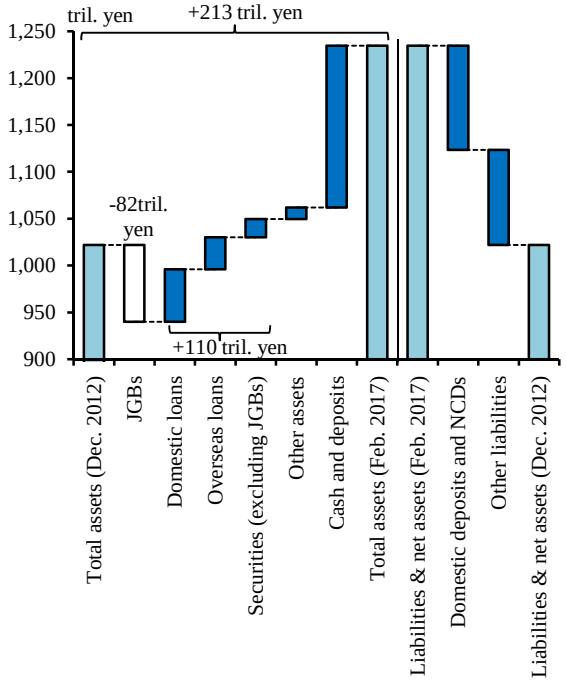
Notes: *1*. Latest data as at end-February 2017.
2. These charts are based on book value.
3. The data are the sums of figures for domestic and overseas branches. The data for major banks are the sums of figures for domestic branches. The data are based on the amount outstanding at month-end.
4. The data exclude foreign stockholdings.
Source: BOJ.

4. Financial institutions' balance sheet changes

Based on the developments in loans and securities investment examined above, financial institutions have continued to expand their balance sheets and rebalance their portfolios through the increase in risky assets.

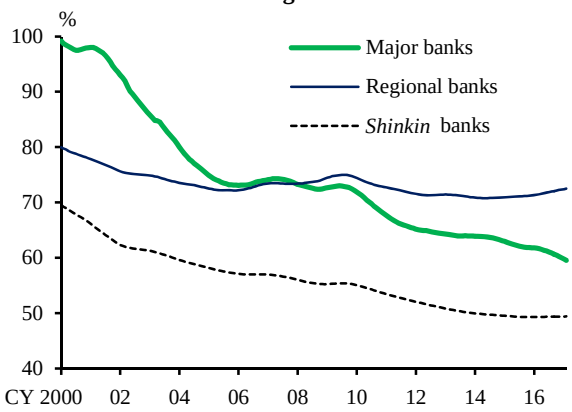
The total assets and liabilities of financial institutions increased by 213 trillion yen in the period from December 2012, prior to the introduction of QQE, through February 2017 (Chart III-1-29). A breakdown shows that on the asset side, cash and deposits (mainly current account deposits at the Bank of Japan) witnessed the most significant rise. In terms of other asset classes, the total amount of domestic loans, overseas loans, and securities investment excluding JGBs increased by 110 trillion yen, while JGB holdings decreased by 82 trillion yen. The data suggest that portfolio rebalancing from JGBs (entailing yen interest rate risk) to other risky assets (entailing credit, equity-related, and overseas interest rate risks, etc.) has continued to take place.

Chart III-1-29: Changes in assets and liabilities among financial institutions[1]



Note: *1*. The data are the sums of figures for domestic and overseas branches. The data for domestic branches are based on the average amount outstanding. The data for overseas branches are based on the amount outstanding at month-end.
Source: BOJ.

Chart III-1-30: Domestic loan-to-deposit ratio among financial institutions[1,2,3,4]



Notes: *1*. Latest data as at February 2017.
2. Loan-to-deposit ratio = loans / deposits and NCDs
3. The data are for domestic branches and based on the average amount outstanding.
4. 12-month backward moving averages.
Source: BOJ.

In terms of domestic loan-to-deposit ratios, those of major banks have continued to follow a downward trend, mainly due to an increase in corporate deposits of large firms with strong earnings (Chart III-1-30). On the other hand, the loan-to-deposit ratios among

regional financial institutions -- which tend to transact with small and medium-sized firms -- have stopped declining due to the steady increase in lending, with corporate deposits having grown at a slower rate than those at major banks.

B. Developments in investment by institutional investors

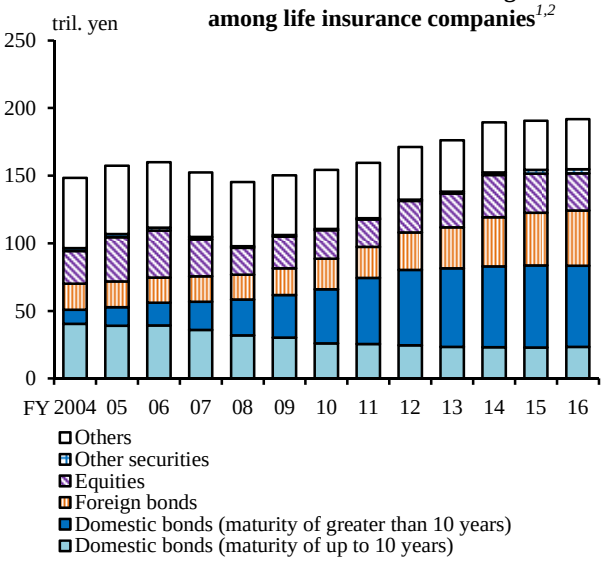
Institutional investors, such as life insurance companies, and depository institutions with a focus on market investment, such as Japan Post Bank and central organizations of financial cooperatives, have continued to accumulate risky assets, in particular foreign bonds.

Although increased risk taking by life insurance companies under the low interest rate environment can be observed across advanced economies, the composition of investment assets varies widely due to differences in financial market structures and the composition of insurance products offered (see Box 1). Japan's life insurance companies have continued to accumulate assets including foreign bonds and funds that are expected to generate high yields (Chart III-2-1). Specifically, foreign bonds make up a large share of around 20 percent of investment assets. A high ratio of foreign currency-denominated bond investment is a feature that cannot be observed at insurance companies in other advanced economies (Chart III-2-2). In addition to the yield differential vis-à-vis domestic bonds, the increase in the ratio of foreign bond investment partly reflects that the risk coefficients for foreign currency-denominated bonds were lowered in the solvency margin regulations amended in fiscal 2010 (Chart III-2-3). While about 70 percent of the foreign bondholdings are currency hedged, some life insurance companies have recently been accumulating U.S. corporate bonds and mortgage-backed securities (MBSs), which offer higher yields than U.S. Treasury bonds, in response to the rise in hedging costs (Chart III-2-4).

Meanwhile, life insurance companies' investment in super-long-term JGBs has slowed over the past few years. This is attributable to the fact that the low interest rate environment has rendered it difficult for these companies to improve their profits and to extend the asset duration at the same time. Although super-long-term interest rates have risen since the introduction of QQE with Yield Curve Control, insurance companies are still cautious about increasing their holdings of super-long-term JGBs. Moreover, the fact that premium income -- the source of insurance companies' funds for investment -- has decreased, due to the partial suspension of the sale of single-premium whole life insurance products (which extend the duration of insurers' liabilities), is also a possible factor slowing the pace of increase in super-long-term government bondholdings. Since April

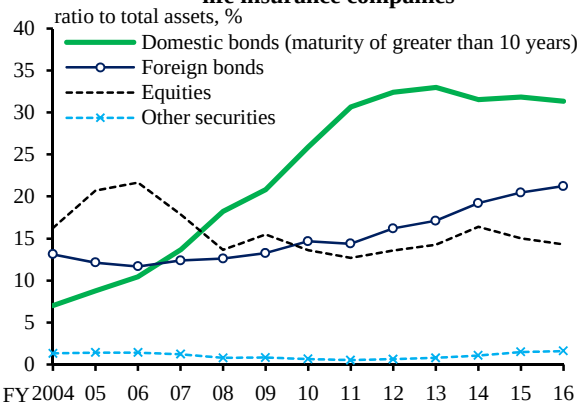
2017, moves to limit the sale through premium hikes have spread to level-premium insurance products, which may further restrain investment sources in the future.

Chart III-2-1: Investment assets outstanding among life insurance companies [1,2]



Notes: *1*. Includes nine major life insurance companies. Latest data as at end-September 2016. Based on general account.
2. "Other securities" includes investment trusts. "Others" includes cash and deposits, loans, and real estate.
Sources: Published accounts of each company.

Chart III-2-2: Investment asset portfolios among life insurance companies [1,2]



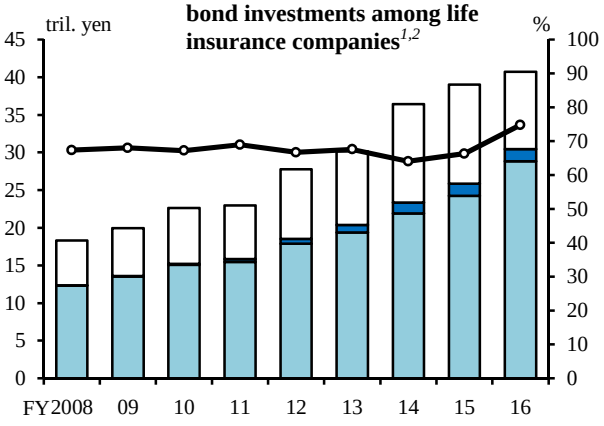
Notes: *1*. Includes nine major life insurance companies. Latest data as at end-September 2016. Based on general account.
2. "Other securities" includes investment trusts.
Sources: Published accounts of each company.

Chart III-2-3: Risk coefficients in the regulation on solvency margin ratios [1,2]

Risky assets	Pre-amendment	Post-amendment
Domestic equities	10%	20%
Foreign equities	10%	10%
Yen-denominated bonds	1%	2%
Foreign currency-denominated bonds, loans, etc.	5%	1%
Real estate (domestic properties)	5%	10%
Assets involving foreign exchange risks	-	10%

Notes: *1*. The risk coefficients associated with asset price fluctuations.
2. The post-amendment risk coefficient of policy-reserve-matching bonds (a component of Yen-denominated bonds) is 1 percent.
Source: Financial Services Agency.

Chart III-2-4: Currency hedge ratios for foreign bond investments among life insurance companies [1,2]



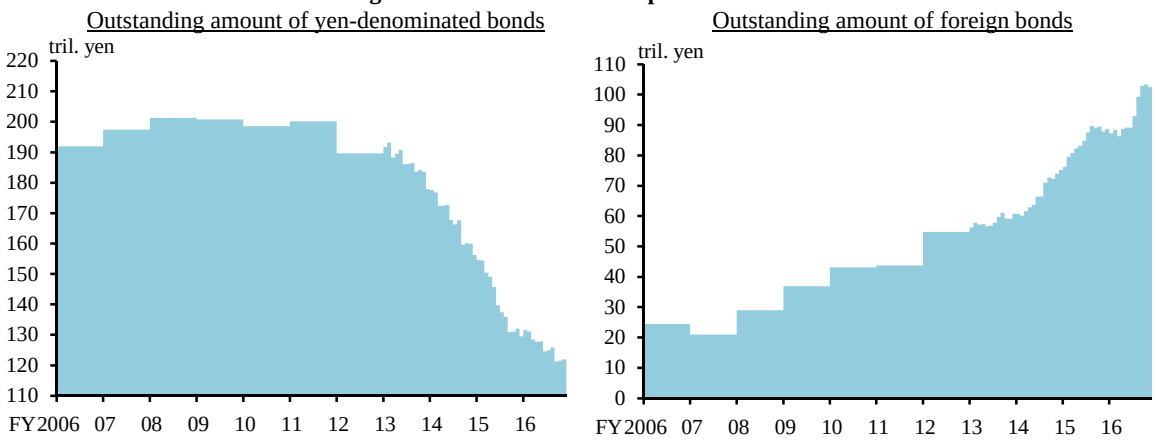
Notes: *1*. Estimated by the BOJ.
2. Includes nine major life insurance companies. Latest data as at end-September 2016. Based on general account.
Sources: Published accounts of each company.

Depository institutions investing a large proportion of their funds in market investment, such as Japan Post Bank and the central organizations of financial cooperatives, on the whole have also continued to reallocate investments away from domestic bonds toward foreign bonds and other risky assets (Chart III-2-5). While purchasing JGBs when yields

on JGBs with long and super-long maturities rose, they proactively increased their foreign bondholdings when U.S. interest rates rose following the U.S. presidential election, with the aim of securing interest income.

In terms of developments in pension funds, the Government Pension Investment Fund (GPIF) has continued to manage its assets in line with the basic portfolio allocation, which contains an increased share of stocks. Other public pension funds have also continued to reduce their share of domestic bonds and gradually increase the share of stocks at home and abroad to achieve the basic portfolio allocation. Corporate pension funds so far have maintained their established cautious investment stance.

Chart III-2-5: Outstanding amount of yen-denominated bonds and foreign bonds of Japan Post Bank and central organizations of financial cooperatives[1,2]



Notes: *1*. The data are based on the amount outstanding at month-end. Latest data as at end-February 2017. The data for fiscal 2012 and before are as at the end of each fiscal year.
2. The data are the sums of figures for Japan Post Bank, Shinkin Central Bank, the Shinkumi Federation Bank, the Rokinren Bank, and the Norinchukin Bank.
Source: BOJ.

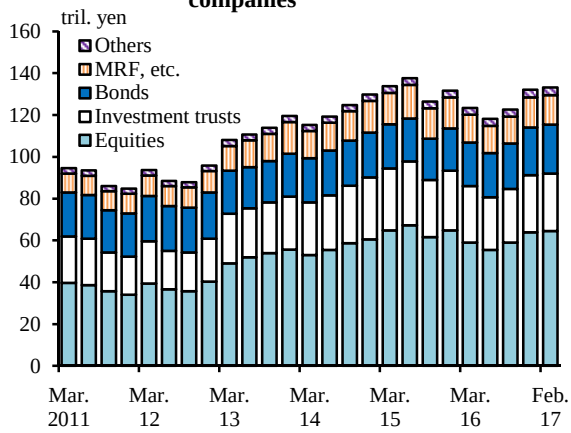
C. Developments in households' investment activities

Households have remained cautious in increasing their holdings of risky assets. Although outstanding client assets held at securities companies have started to increase again since the fall of 2016, this is due to the rise in market values reflecting the rise in stock prices and the depreciation of the yen. The inflow of funds into stocks and stock investment trusts has continued to be slow (Chart III-3-1). In fact, excluding the effects of changes in stock prices and foreign exchange movements on the market values of financial assets, funds have continued to flow into safe assets such as JGBs for retail investors and low-risk structured bonds (Chart III-3-2). By contrast, with regard to risky assets, contrarian activities of retail investors have been remarkable, in that they have been selling such assets amid the rise in stock prices and depreciation of the yen since the fall of 2016. Specifically, toward the end of 2016, there were large outflows of funds

from stocks, largely reflecting sales to lock in gains, while net flows into stock investment trusts turned slightly negative, partly due to increased sales in response to the reduction in dividends.

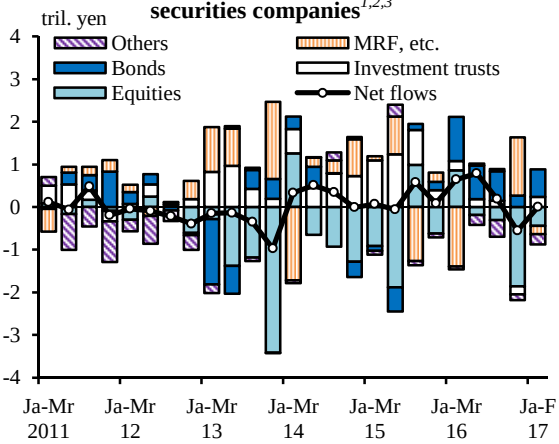
Meanwhile, financial institutions have continued to make efforts to increase their client assets through expanding their lineup of products such as investment trusts suitable for medium- to long-term asset formation for households, and through expanding their services such as wrap accounts. The number of tax-free accounts for small investments, Nippon Individual Savings Accounts (NISAs) and Junior NISAs, is steadily increasing. Moreover, the membership criteria for defined contribution plans targeted for individuals were relaxed in January 2017. Furthermore, as part of the planned expansion of the system beyond the current NISA and Junior NISA, the specifics of a monthly investment-type NISA to be introduced in January 2018 are being studied. These wide-ranging initiatives are expected to help households with a variety of asset formation.

Chart III-3-1: Client assets held by major securities companies[1,2,3]



Notes: *1*. Latest data as at end-February 2017.
2. Includes 18 major securities companies that hold current accounts at the BOJ.
3. "Investment trusts" indicates the sum of stock investment trusts and wrap products. "MRF, etc." includes public and corporate bond investment trusts.
Source: BOJ.

Chart III-3-2: Capital flows by product among major securities companies[1,2,3]



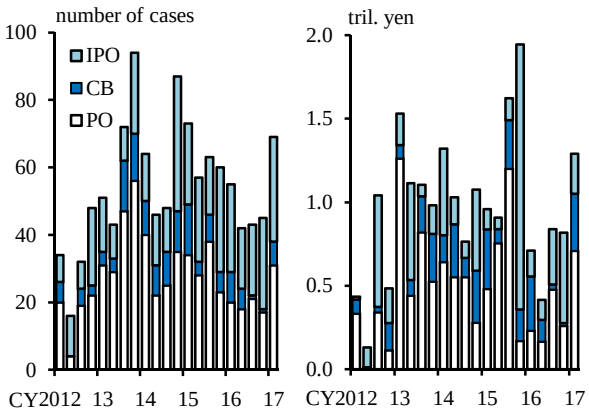
Notes: *1*. Latest data as at January-February 2017.
2. Includes 18 major securities companies that hold current accounts at the BOJ.
3. "Investment trusts" indicates the sum of stock investment trusts and wrap products. "MRF, etc." includes public and corporate bond investment trusts.
Source: BOJ.

D. Financial intermediation through financial markets

In terms of equity financing through the stock market, transactions have remained lackluster amid a growing awareness among firms with regard to capital efficiency. Although firms continue to have an appetite for funding with increased momentum toward overseas expansion and industry reorganization, public offering (PO) activity has been sluggish despite the rise in stock prices since the fall of 2016 (Chart III-4-1). One reason for the sluggishness of equity financing is the impact of the corporate governance

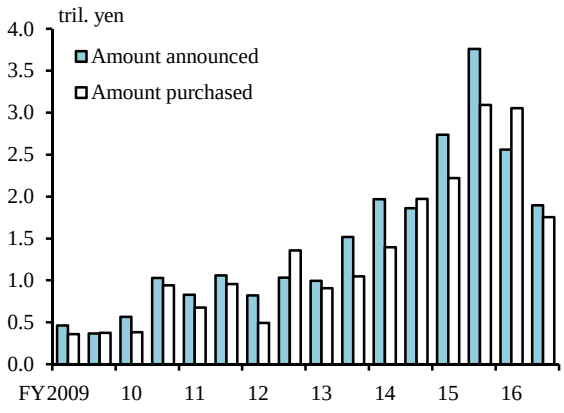
code that took effect in June 2015 in addition to the increase in debt financing due to the proactive lending stance of banks. Amid a growing consciousness among firms with regard to capital efficiency and shareholder returns, firms are becoming more cautious about raising capital through POs. Going forward, it is likely that firms actively considering POs will continue to be limited to small and medium-sized firms that need a strengthening of their capital bases and firms that want to sell off cross-shareholdings. Meanwhile, reflecting a strong awareness regarding shareholder returns, announced and executed stock buybacks by firms have remained at a high level (Chart III-4-2).

Chart III-4-1: Equity financing[1]



Note: *1*. Latest data as at the January-March quarter of 2017.
Source: I-N Information Systems.

Chart III-4-2: Amount of stock buybacks[1,2]

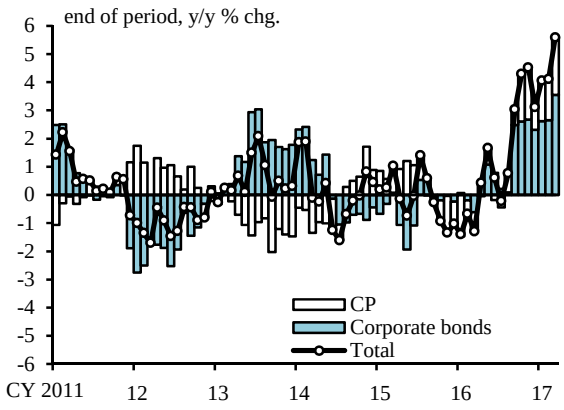


Notes: *1*. Latest data as at the second half of fiscal 2016.
2. Stocks listed on the First Section of the Tokyo Stock Exchange. Based on the announcement date.
Source: I-N Information Systems.

On the other hand, **firms' funding has increased as the issuance rate hovered at extremely low levels in the CP and corporate bond market** (Chart III-4-3). Since the introduction of QQE with Yield Curve Control, investors' moves to purchase corporate bonds with the aim of securing investment yields have become moderate amid a rise in yields on super-long-term JGBs. That said, from a longer-term perspective, investors have still been proactive in terms of investing in credit products.

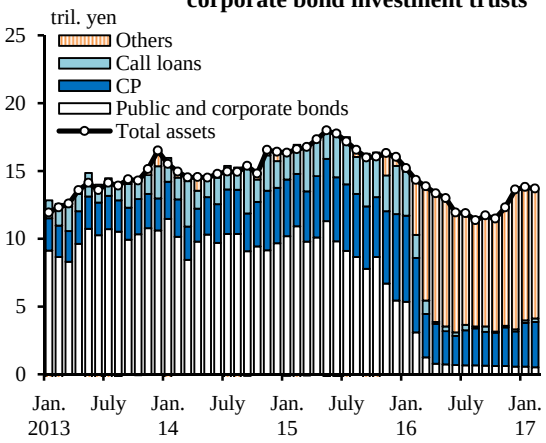
Meanwhile, the flow of funds through public and corporate bond investment trusts has continued to be partly stagnant (Chart III-4-4). With regard to money reserve funds (MRFs), which invest primarily in short-term money markets, more than 90 percent of their assets under management have now been transferred to trust banks in the form of money trusts, as it has become impossible to earn positive yields through market investment in anything other than CP.

Chart III-4-3: Outstanding amount of CP and corporate bonds[1,2]



Notes: *1*. Includes ordinary industrial corporates.
2. Latest data as at end-March 2017.
Sources: I-N Information Systems; JASDEC.

Chart III-4-4: Investment portfolio of public and corporate bond investment trusts[1]



Note: *1*. Latest data as at February 2017.
Source: The Investment Trusts Association, Japan.

E. Financial Activity Indexes

Partly as a result of financial institutions' proactive lending stance, **the funding environment among firms and households has been highly accommodative.** This section examines whether there are any signs of overheating in the financial system.

The heat map of Financial Activity Indexes (FAIXs) shows, using colors, the deviation of 14 indicators from their trends in order to assess whether there are any imbalances in various financial and economic activities (Chart III-5-1).[9] At present, none of the indicators are "red," which would signal overheating, showing that **many financial and economic activities exhibit no significant deviation from their trends.**[10] For example, looking at the "total credit-to-GDP ratio," credit volumes relative to the size of the economy have remained more or less unchanged (Chart III-5-2).[11] However, the "DI of

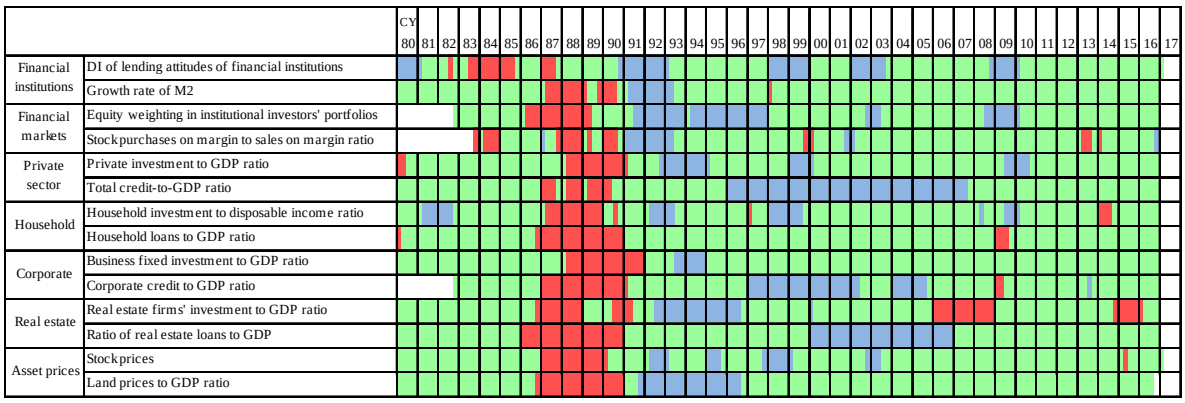
[9] Whether financial and economic activities are overheating or contracting excessively is assessed based on how far individual indicators deviate from their historical trends. Shaded areas in Chart III-5-1 represent the following: (1) areas shaded in red (the darkest shaded areas) show that an indicator has risen above the upper threshold, that is, it is overheating; (2) areas shaded in blue (the second darkest shaded areas) show that an indicator has declined below the lower threshold, that is, it is contracting excessively; (3) areas shaded in green (the most lightly shaded areas) show a limited tendency toward either extreme; and (4) areas shaded in white show the periods without data. For details on the FAIXs, see Yuichiro Ito, Tomiyuki Kitamura, Koji Nakamura, and Takashi Nakazawa, "New Financial Activity Indexes: Early Warning System for Financial Imbalances in Japan," Bank of Japan Working Paper, No. 14-E-7, April 2014.

[10] While the "stock purchases on margin to sales on margin ratio" has deviated downward from its trend due to a drop in stock prices through mid-2016 and has been "blue," it is unlikely that the stock market is cooling excessively given the rebound and rise in stock prices since the fall of 2016.

[11] In addition to loans extended by financial intermediaries, total credit also includes debt securities funding from capital markets such as corporate bonds. Borrowers of funds include households and firms.

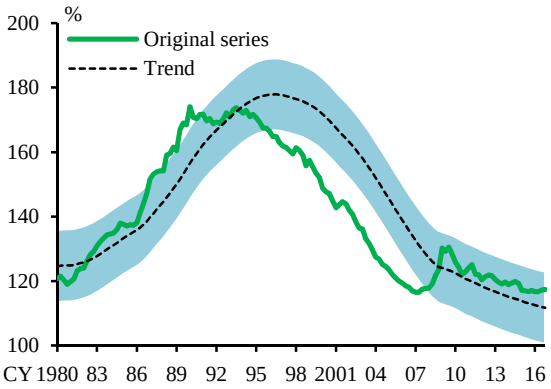
lending attitudes of financial institutions" and the "real estate firms' investment to GDP ratio," while remaining "green," are approaching "red," so that careful monitoring is required (Charts III-5-3 and III-5-4).[12]

Chart III-5-1: Financial Activity Indexes[1]



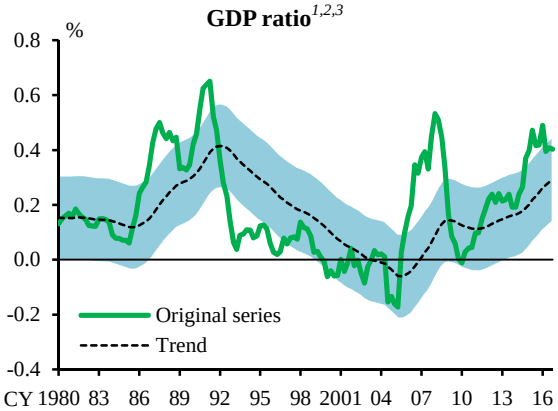
Note: *1*. Estimated by the BOJ. Latest data for the DI of lending attitudes of financial institutions and stock prices as at the January-March quarter of 2017. Latest data for the land prices to GDP ratio as at the July-September quarter of 2016. Latest data for the other indicators as at the October-December quarter of 2016.
Sources: 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*."

Chart III-5-2: Total credit-to-GDP ratio[1,2]



Notes: *1*. Latest data as at the October-December quarter of 2016; 4-quarter backward moving averages.
2. The trend is calculated using the one-sided HP filter. Shaded areas indicate the root mean square of the deviation from trend.
Sources: Cabinet Office, "National accounts"; BOJ, "Flow of funds accounts."

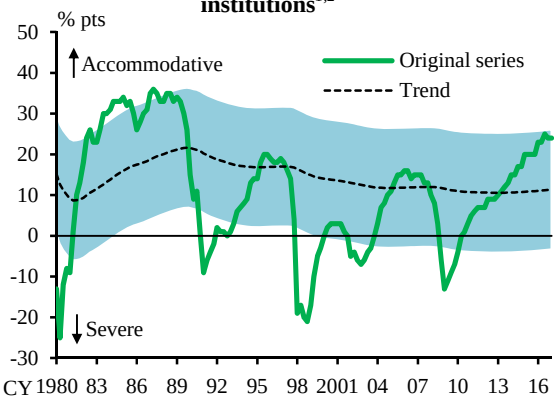
Chart III-5-3: Real estate firms' investment to GDP ratio[1,2,3]



Notes: *1*. Includes large firms in the real estate industry. Latest data as at the October-December quarter of 2016; 4-quarter backward moving averages.
2. Original series = (business fixed investment [including land investment] + inventory investment) / nominal GDP.
3. The trend is calculated using the one-sided HP filter. Shaded areas indicate the root mean square of the deviation from trend.
Sources: Cabinet Office, "National accounts"; Ministry of Finance, "Financial statements statistics of corporations by industry."

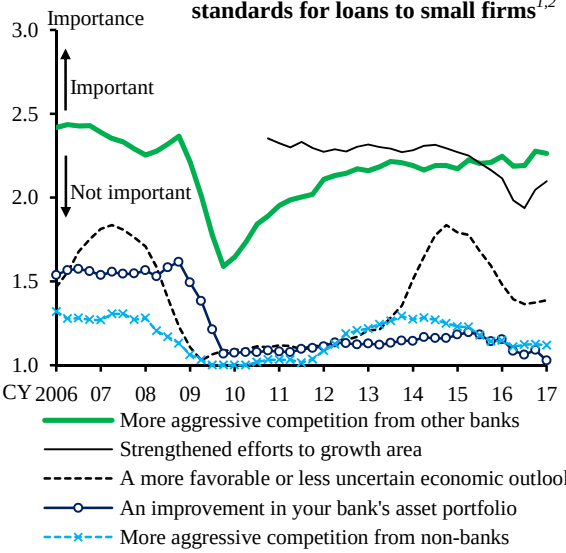
[12] In the "Financial Statement Statistics of Corporations by Industry" published by the Ministry of Finance, which provide the source data for the "real estate firms' investment to GDP ratio," large real estate firms' business fixed investment declined substantially in April-June 2016. The reason is a large increase in sales, losses, and transfers of other tangible fixed assets. However, because part of this increase is due to technical reasons and does not reflect changes in the economic situation, the impact of this factor was adjusted for in the calculation of the FAIXs.

Chart III-5-4: DI of lending attitudes of financial institutions[1,2]



Notes: *1*. Includes all firm sizes and all industries. Latest data as at the January-March quarter of 2017.
2. The trend is calculated from the historical average. Shaded areas indicate the root mean square of the deviation from trend.
Source: BOJ, "*Tankan*."

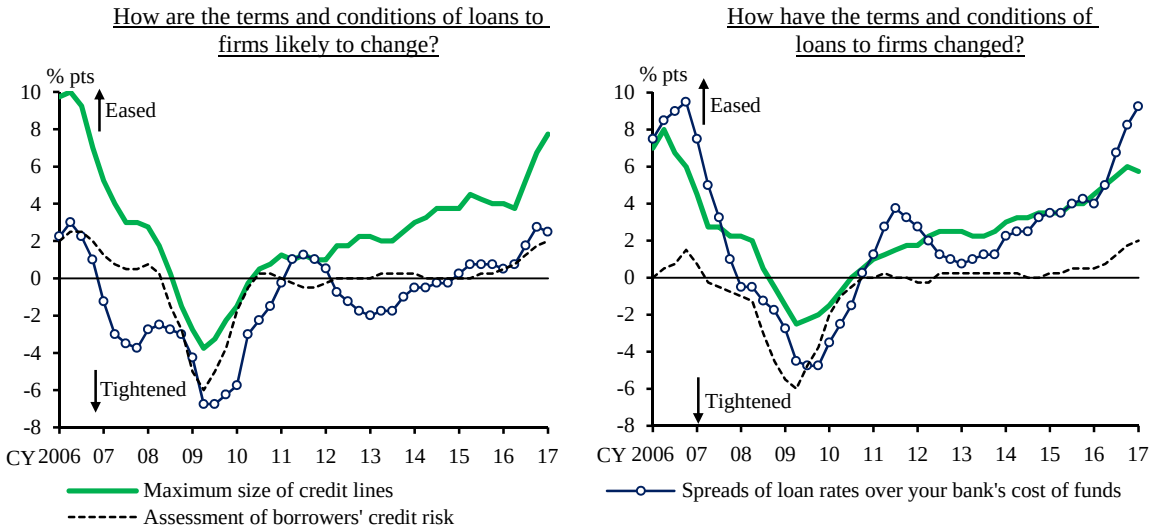
Chart III-5-5: Factors behind easing credit standards for loans to small firms[1,2]



Notes: *1*. Latest data as at January 2017; 4-quarter backward moving averages.
2. Importance is calculated by asking banks how important each factor is in explaining their accommodative stance, weighted by the following metric ("3: important," "2: somewhat important," "1: not important,") and summing up the weighted shares of responses.
Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

The "DI of lending attitudes of financial institutions" shows that the difference between the number of firms who perceive that financial institutions have "accommodative" lending attitudes and the number of those who perceive their lending attitudes as "severe" has continued to widen as a trend, and the indicator has reached the highest level since the previous bubble period (Chart III-5-4). Banks' increasingly proactive lending stance serves as an important transmission channel of monetary easing and helps to improve business sentiment, especially among small firms (see Box 2). The increasingly proactive lending stance reflects fiercer competition among banks, which is the result not only of monetary easing but also of the change in demographics (Chart III-5-5, see Box 3). That is, while population decline has exerted downward pressure on aggregate demand for traditional financial intermediation services, banks have been competing more strongly to retain customers in order to maintain profitability. If this competition among banks becomes excessive, it can lead to excessive risk taking, such as in the form of an easing of loan standards or increase in loan amounts, or can result in a further deterioration in profitability on loans. Thus, these points warrant continued vigilance (Chart III-5-6).

Chart III-5-6: DI for terms and conditions of loans (small firms) [1,2]



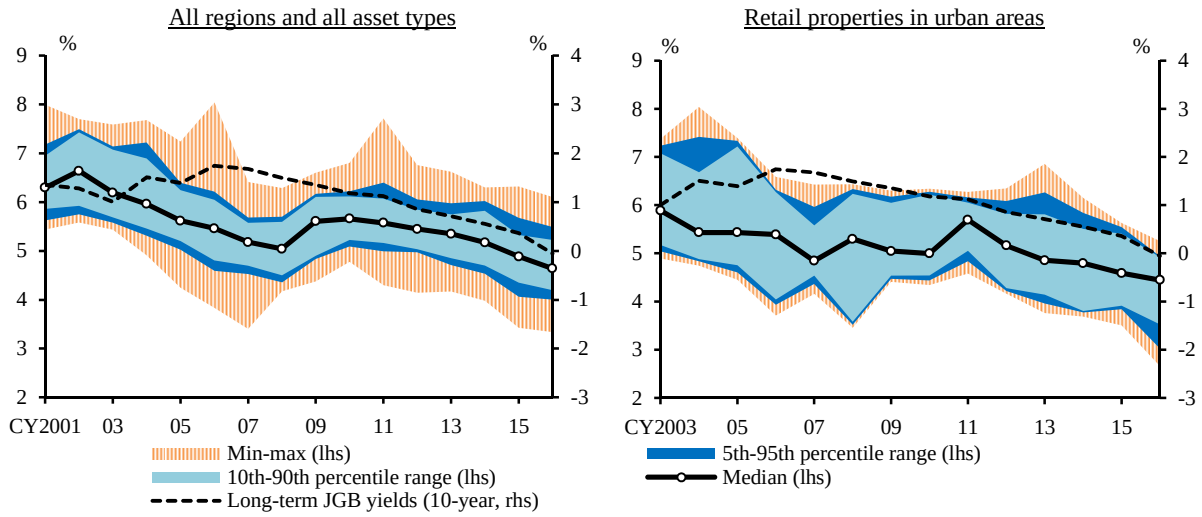
Notes: *1*. Latest data as at January 2017; 4-quarter backward moving averages.
2. Based on the proportion of responding financial institutions selecting each given choice, the DI for terms and conditions of loans is calculated as follows:
DI = "eased considerably" + 0.5 * "eased somewhat" – 0.5 * "tightened somewhat" – "tightened considerably."
Source: BOJ, "Senior loan officer opinion survey on bank lending practices at large Japanese banks."

The "real estate firms' investment to GDP ratio" remains at a high level, but the leverage of the real estate sector has not increased, so that the real estate market does not appear to show signs of overheating on the whole (Chart III-5-3).[13] Moreover, with regard to J-REITs, the major buyers in the real estate market, looking at capitalization rates at the time of property acquisition, the overall decline in the rates is generally in line with the decline in long-term interest rates, and on the whole there are no signs of an excessive decline in risk premiums or of overly bullish expectations for rents (Chart III-5-7).[14] However, there are some developments that warrant attention. Among the properties acquired, such as retail properties in urban areas, there are instances in which the decline in J-REITs' capitalization rates is greater than the decline in long-term interest rates. Moreover, against the background of a decline in the number of properties for sale in metropolitan areas, J-REITs, etc. continue to acquire properties in provincial areas (Chart III-5-8). Meanwhile, regional financial institutions are further increasing their equity investment in real estate funds such as J-REITs and private REITs (Chart III-5-9). Thus, developments in real estate markets continue to warrant careful vigilance.

[13] The leverage for listed firms (excluding J-REITs) had declined since 2008 and has recently remained stable, at around 2. The leverage for J-REITs has been stable, at around 1.

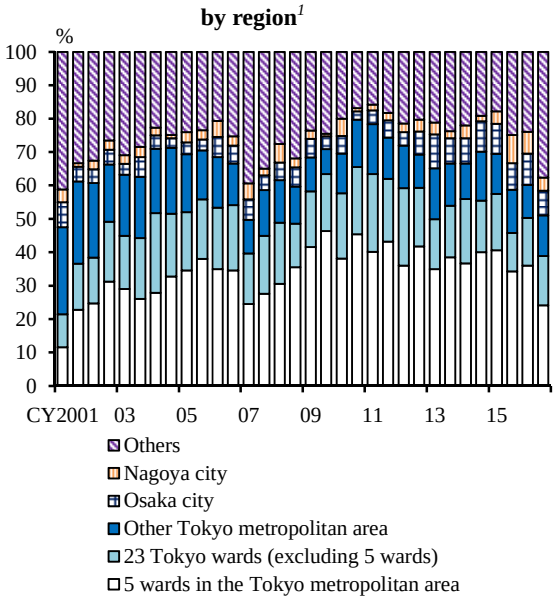
[14] Since J-REITs' capitalization rates at the time of property acquisition reflect differences in the characteristics of properties (such as their age and location) in addition to macroeconomic factors such as land price and interest rate fluctuations, it is necessary to adjust for such factors when comparing capitalization rates across different properties. The distribution of capitalization rates shown in Chart III-5-7 is obtained after hedonic adjustment using panel estimation.

Chart III-5-7: Capitalization rates of properties acquired by J-REITs[1,2]



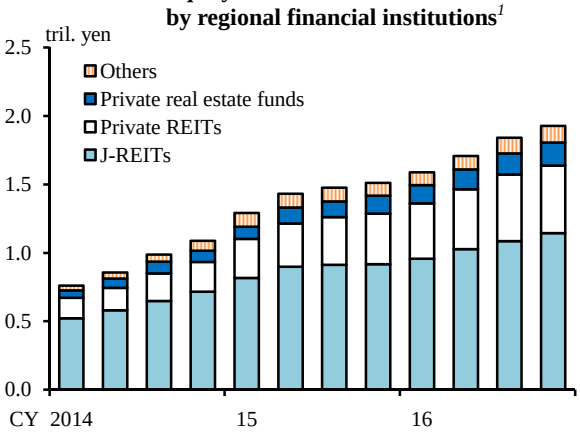
Notes: *1*. Estimated by the BOJ. Latest data as at 2016.
2. Urban areas include Tokyo metropolitan area, Osaka city, and Nagoya city.
Sources: Bloomberg; Nikkei real estate market information; Published accounts of each J-REIT.

Chart III-5-8: Number of real estate transactions by region[1]



Note: *1*. Latest data as at the second half of 2016.
Source: Japan Real Estate Institute.

Chart III-5-9: Equity investments in real estate funds by regional financial institutions[1]



Note: *1*. Latest data as at end-December 2016.
Source: BOJ.

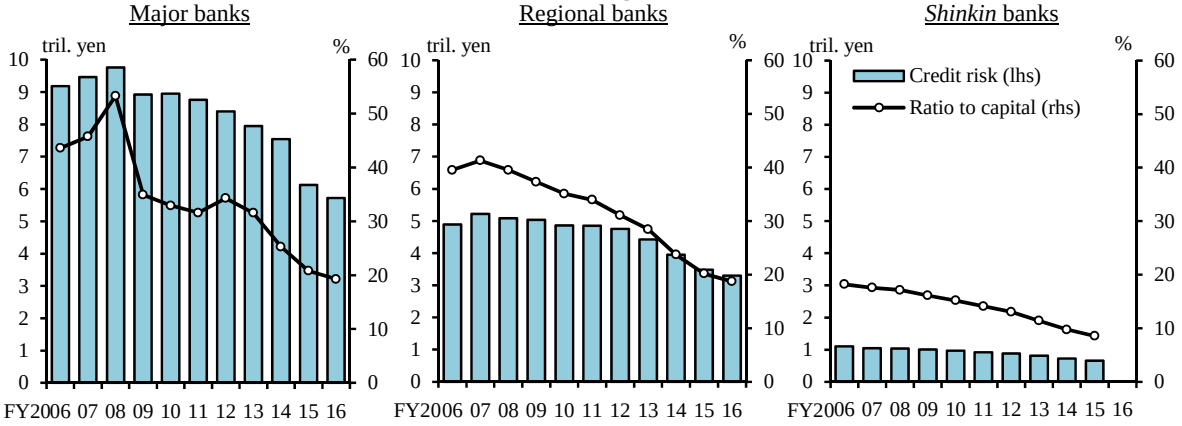
IV. Financial institutions' risk profile and financial bases

In this chapter, we first examine financial institutions' risk profile as a whole (comprising the size of risks accumulated, the speed of accumulation, and the distribution of risks as well as its skewness within the system) by collecting and analyzing financial institutions' financial data, among other information sources, and then assess the adequacy of their financial bases (financial institutions' capital and funding liquidity) relative to risks at the current juncture. Furthermore, we examine the profitability of financial institutions, as this has an impact on their financial bases and their risk-taking capabilities.[15]

A. Credit risk

The amount of financial institutions' credit risk has continued to follow a downward trend (Chart IV-1-1).[16] The reason for the decrease, despite the increase in financial institutions' domestic and overseas loans outstanding, is the improvement in the quality of their assets reflecting improved financial conditions among firms as the economy has continued its moderate recovery trend. By type of financial institution, the ratio of the amount of credit risk to that of capital declined to slightly below 20 percent at major banks and regional banks, and slightly below 10 percent at *shinkin* banks.

Chart IV-1-1: Credit risk among financial institutions[1,2,3,4]



Notes: *1*. Latest data for banks as at the first half of fiscal 2016 (annualized), and data for *shinkin* banks as at fiscal 2015.
2. Credit risk is unexpected losses with a 99 percent confidence level.
3. Includes credit that is subject to self-assessment.
4. Capital for internationally active banks from fiscal 2012 is CET1. Capital for domestic banks from fiscal 2013 is core capital. The data do not take the phase-in arrangements into consideration. Capital preceding the respective periods is Tier 1.
Source: BOJ.

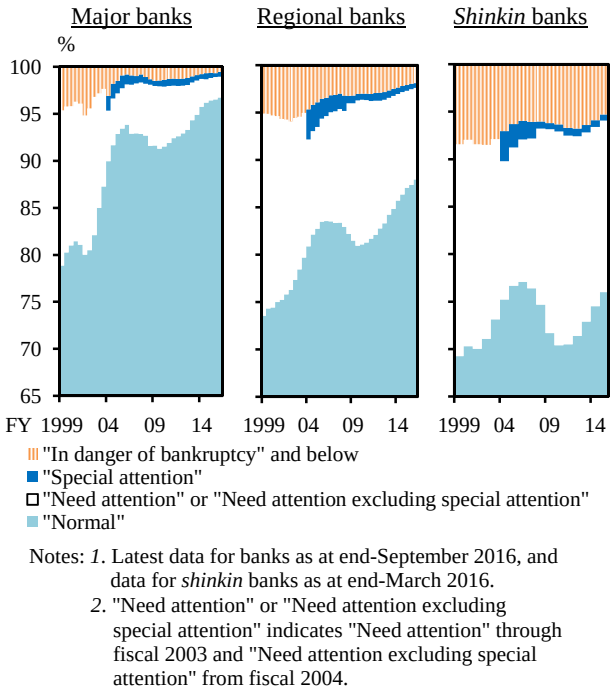
[15] It should be noted that most of the data used in the analysis here, particularly in the sections on credit risk and bank capital, were current as at the end of September 2016. In the sections on market risk and liquidity risk, the latest available data are used.

[16] Credit risk as defined here refers to unexpected losses. Unexpected losses are estimated by deducting the average amount of losses arising in 1 year (expected losses) from the maximum amount of losses envisaged within 99 percent of possible outcomes in 1 year.

Quality of loans and credit costs

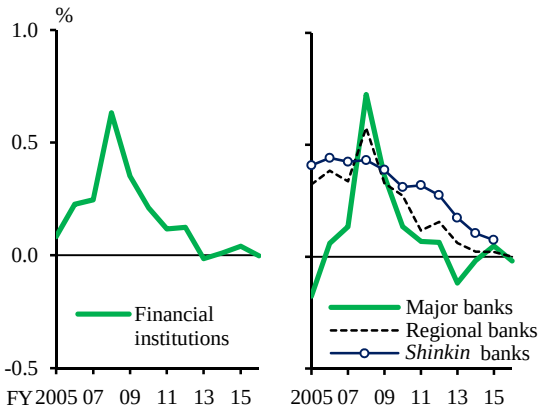
The quality of loans held by financial institutions has continued to improve. The amount of loans outstanding by borrower classification shows that the ratio of normal loans to total loans has risen for every type of bank (Chart IV-1-2). **Financial institutions' credit cost ratios have been at extremely low levels on the whole** (Chart IV-1-3). Credit cost ratios at major banks and regional banks have been hovering around zero, while credit cost ratios at *shinkin* banks have continued declining at a moderate pace. Meanwhile, although the nonperforming loan ratio on major banks' overseas loans has risen somewhat mainly against the backdrop of the previous decline in commodity prices, it is still at a low level (Charts IV-1-4 and IV-1-5).

Chart IV-1-2: Composition of claims by borrower classification[1,2]



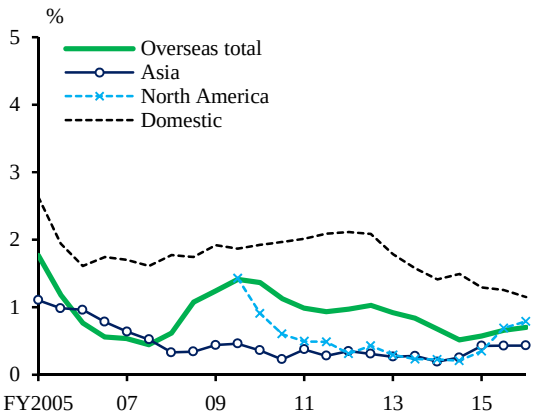
Notes: *1*. Latest data for banks as at end-September 2016, and data for *shinkin* banks as at end-March 2016.
2. "Need attention" or "Need attention excluding special attention" indicates "Need attention" through fiscal 2003 and "Need attention excluding special attention" from fiscal 2004.
Source: BOJ.

Chart IV-1-3: Credit cost ratios among financial institutions[1,2]



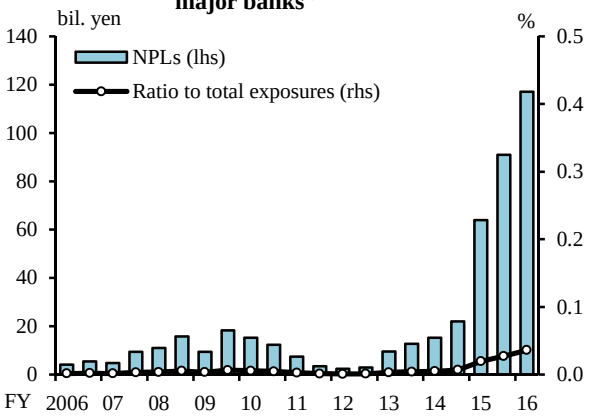
Notes: *1*. Latest data for banks as at the first half of fiscal 2016 (annualized), and data for *shinkin* banks as at fiscal 2015.
2. For the left-hand chart, latest data for *shinkin* banks are assumed to be unchanged from end-March 2016.
Source: BOJ.

Chart IV-1-4: Nonperforming loan ratios for overseas lending[1]



Note: *1*. Data for the three major financial groups are shown (on a non-consolidated basis). Latest data as at end-September 2016.
Sources: Published accounts of each group.

Chart IV-1-5: Nonperforming loans in resource-related industries among major banks[1,2]



Notes: *1*. Latest data as at end-September 2016.
2. Includes exposures that are subject to self-assessment.
Source: BOJ.

Tasks and challenges regarding credit risk management

The three key tasks and challenges for financial institutions regarding credit risk management are detailed below.

(1) **It is necessary for financial institutions to improve their credit management capabilities in areas where they take an active stance in credit extension and in sectors with large amounts of loans outstanding.**

With regard to overseas-related loans, including resource- and M&A-related loans, financial institutions need to assess the creditworthiness of borrowers in a timely manner and to manage credit risk as appropriate, as uncertainty with respect to economic developments abroad is expected to remain high.[17]

With regard to domestic loans, financial institutions need to enhance their credit management of real estate loans and loans related to medical and nursing care, which have undergone rapid growth, taking into account factors including the future business environment. In particular, real estate loans by some banks have increased far beyond levels that can be justified by demand factors such as the number of households (see Box 4). Given that vacancy rates have been rising in some regional rental housing markets, it is important to carry out more meticulously initial screening for such loans and interim management, including

[17] For more details on the risk management of resource-related exposures, see Box 2 in the April 2016 issue of the *Report*, and for more details on the risk management of overseas M&A-related exposures, see Box 1 in the October 2015 issue of the *Report*.

monitoring supply and demand developments in rental housing markets (Charts IV-1-6 to IV-1-8).[18,19] In addition, with regard to hybrid loans -- which will be super-long if early redemption is not exercised -- as well as consumer loans -- which have recently increased -- financial institutions need to implement credit management taking the risk characteristics of such loans into account.

(2) **It is necessary to conduct reviews of the estimated amount of credit risk and loan-loss provisions on a regular basis, taking into account changes in the portfolio characteristics and anticipated future developments.**

In calculating loan-loss provisions, from a through-the-cycle point of view, financial institutions should appropriately factor in possible changes that may not have been reflected in past figures, bearing in mind that credit cost ratios and loan-loss provision ratios are at historically low levels.[20]

Moreover, the share of large exposures in credit portfolios has been rising, especially at major banks (Chart IV-1-9). When conducting credit risk management, taking this changing feature of credit portfolios into account, it is necessary to improve the effectiveness of management, such as measuring large exposure concentration risk as well as conducting stress testing based on expected future environmental changes, in order to gauge the amount of credit risk.

(3) **It is necessary to make appropriate assessments of risk and return when originating loans.**

With lending margins tightening further against the backdrop of monetary easing and intensified competition among banks, some loans to top-rated firms and local governments, which are likely to result in net losses in terms of the lending business alone, have continued to be extended. Financial institutions need to make appropriate risk and return assessments when extending loans, including

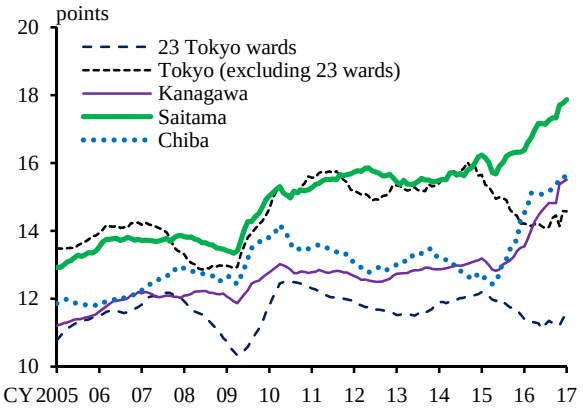
[18] The denominator used to calculate the vacancy index used in Chart IV-1-6 includes the total number of units looking for tenants but does not include the total number of units in fully occupied buildings. Thus, the occurrence of a small number of vacancies in hitherto fully occupied buildings depresses the index because those buildings are now included in the computation. Likewise, when vacancies are filled and the building becomes fully occupied, the index is pushed up, because the fully occupied buildings are no longer included in the computation. Caution should therefore be taken when interpreting short-term changes in the index.

[19] For details, see "Tasks and Challenges regarding Regional Financial Institutions' Loans for the Housing Rental Business and Credit Management: Findings of Survey Results," *Financial System Report Annex Series*, March 2016 (available in Japanese only).

[20] On this issue, see "Revisions to Loan-Loss Provision Calculation Methods by Regional Financial Institutions," *Financial System Report Annex Series*, April 2017 (available in Japanese only).

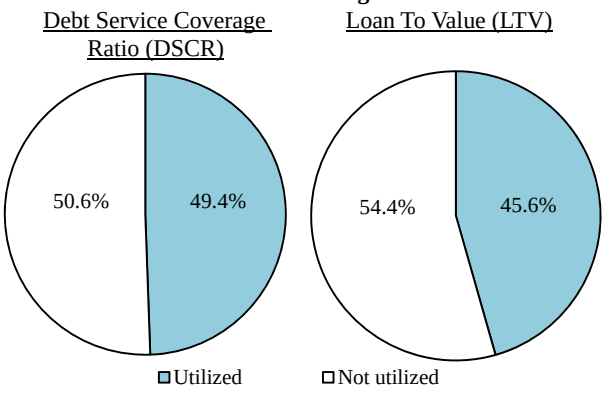
examining the profitability of transactions that are expected to be associated with lending. Moreover, in the negative interest rate environment, financial institutions need to continue to appropriately review their profitability management frameworks, which had assumed positive market interest rates.

Chart IV-1-6: Vacancy indices of rental housing[1,2]



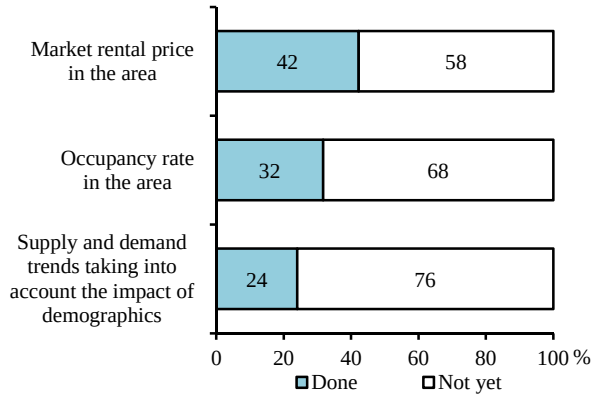
Notes: *1*. Latest data as at January 2017.
2. Vacancy index is the number of unoccupied rental units divided by the number of all rental units. The denominator excludes fully occupied housing and is estimated by TAS.
Source: TAS, "Residential Market Report."

Chart IV-1-7: Utilization of quantitative criteria at the initial screening[1,2,3]



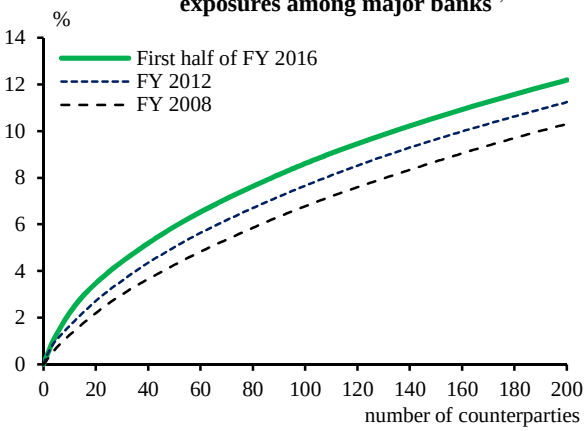
Notes: *1*. Includes regional banks, etc. and *shinkin* banks.
2. Survey results about the risk management for loans for the housing rental business. Responded from the middle of September to the middle of October 2016.
3. DSCR is the ratio of net income from real estate to principal and interest repayments. LTV is the ratio of credit amount to the market value of real estate.
Source: BOJ.

Chart IV-1-8: Implementation of research on rental housing markets[1,2]



Notes: *1*. Includes regional banks, etc. and *shinkin* banks.
2. Survey results about the risk management for loans for the housing rental business. Responded from the middle of September to the middle of October 2016.
Source: BOJ.

Chart IV-1-9: Cumulative share of largest exposures among major banks[1,2]



Notes: *1*. Cumulative share of largest exposures to total exposures.
2. Includes exposures that are subject to self-assessment.
Source: BOJ.

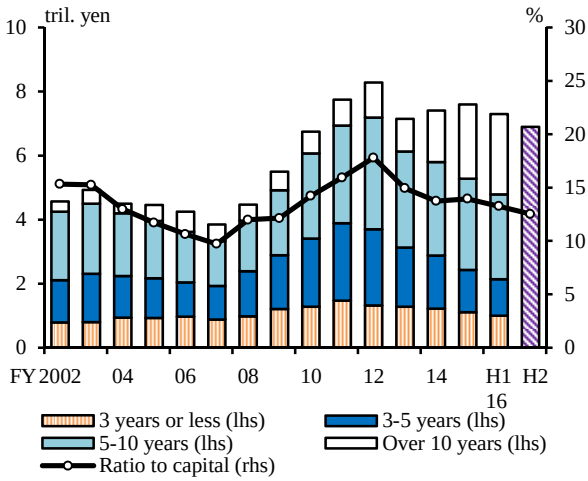
B. Market risk

The following section assesses three aspects of market risk, namely, yen interest rate risk, foreign currency interest rate risk, and market risk associated with stockholdings.

Yen interest rate risk

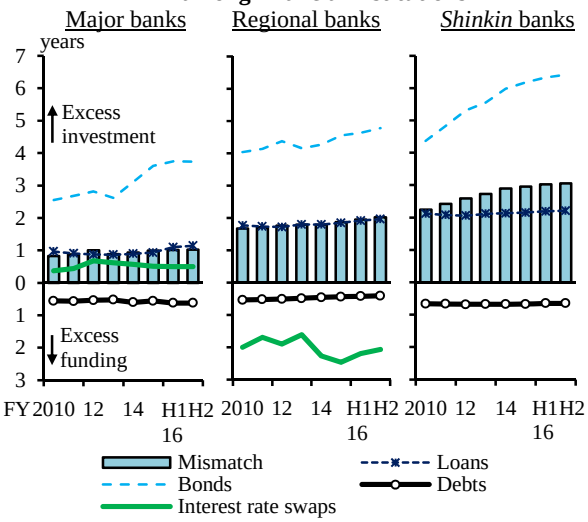
The amount of interest rate risk associated with financial institutions' yen-denominated bond investments remains at a high level from a historical perspective (Chart IV-2-1).[21] While a decrease in the outstanding amount of yen-denominated bonds reduces the amount of interest rate risk, financial institutions' extension of the duration of bonds increases it (Chart IV-2-2).

Chart IV-2-1: Interest rate risk associated with yen-denominated bondholdings among financial institutions[1,2,3]



Notes: *1*. Latest data as at end-February 2017. Data for end-February 2017 are estimated.
2. Interest rate risk: 100 basis point value in the banking book.
3. Convexity and higher order terms are taken into account.
Source: BOJ.

Chart IV-2-2: Average remaining maturity of yen-denominated assets and liabilities among financial institutions[1,2]



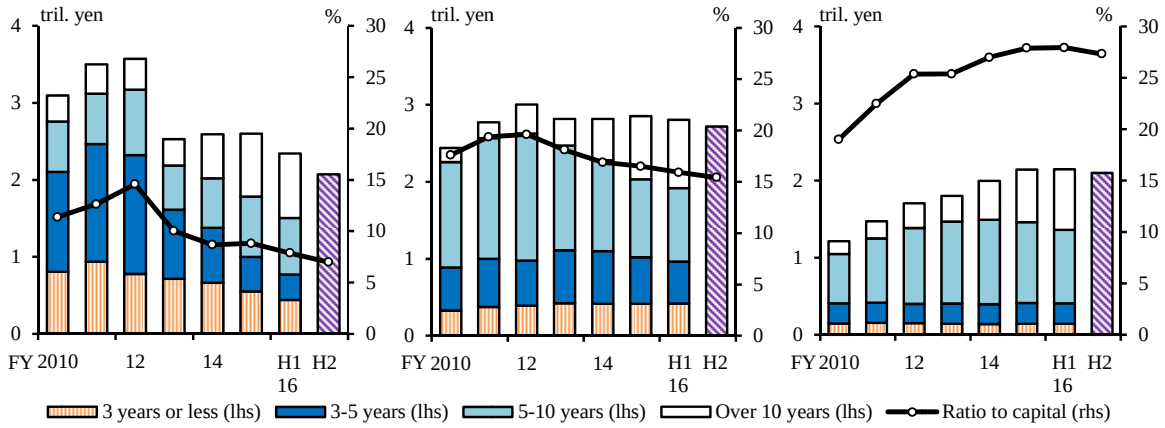
Notes: *1*. Latest data as at end-December 2016.
2. The mismatch is the difference between the average remaining maturity of assets and that of liabilities. The average remaining maturity of assets is the weighted average of loans, bonds, and interest rate swaps with interest receipts. The average remaining maturity of liabilities is the weighted average of debts and interest rate swaps with interest payments. The average remaining maturity of interest rate swaps is the difference between interest rate swaps with interest receipts and those with interest payments.
Source: BOJ.

By type of bank, the ratio of the amount of interest rate risk associated with yen-denominated bond investements to the amount of capital at major banks has been low, below 10 percent, but relatively high, at 15 to 20 percent, at regional banks and 25

[21] The analysis here estimates changes in the market value of bondholdings in the case of a "parallel shift" where interest rates for all maturities rise by 1 percentage point.

to 30 percent at *shinkin* banks (Charts IV-2-3 and IV-2-4). The amount of yen interest rate risk on financial institutions' balance sheets as a whole, including components such as loans and deposits in addition to bond investments, indicates similar trends when looking at developments by type of bank (Charts IV-2-5 and IV-2-6).[22]

Chart IV-2-3: Interest rate risk associated with yen-denominated bondholdings by type of bank[1,2,3]



Notes: *1*. Latest data as at end-February 2017. Data for end-February 2017 are estimated.
2. Interest rate risk: 100 basis point value in the banking book.
3. Convexity and higher order terms are taken into account.
Source: BOJ.

Chart IV-2-4: Effects of a rise in interest rates on the market value of yen-denominated bondholdings[1]

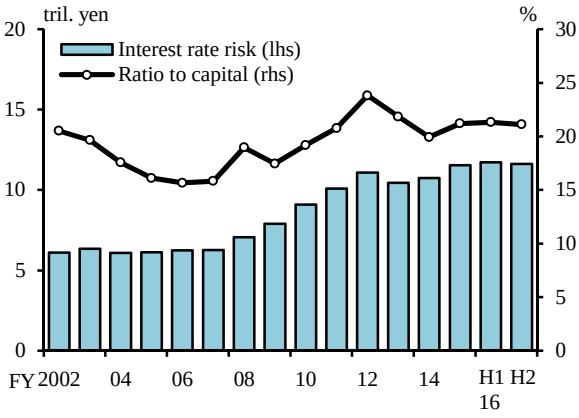
tril. yen

	Upward shift by 1 percentage point		Upward shift by 2 percentage points		Upward shift by 3 percentage points	
	End-June 2016	End-Dec. 2016	End-June 2016	End-Dec. 2016	End-June 2016	End-Dec. 2016
Financial institutions	-7.5	-7.1	-14.3	-13.5	-20.4	-19.2
Banks	-5.4	-5.0	-10.2	-9.5	-14.5	-13.5
Major banks	-2.5	-2.2	-4.7	-4.1	-6.7	-5.9
Regional banks	-2.9	-2.8	-5.5	-5.3	-7.8	-7.6
Shinkin banks	-2.2	-2.1	-4.1	-4.0	-5.8	-5.7

Note: *1*. Assuming a parallel shift. Convexity and higher order terms are taken into account.
Source: BOJ.

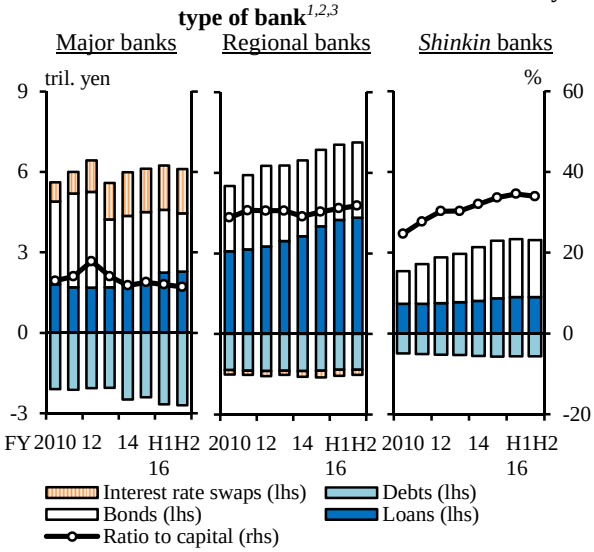
[22] The 100 basis point value (bpv) is used to estimate changes in economic value associated with all assets and liabilities given a parallel shift in the yield curve, in which interest rates for all maturities increase by 1 percentage point. When the average duration of assets is longer than that of liabilities, a widening maturity mismatch (the difference between the duration of assets and liabilities) will amplify interest rate risk. In this estimation of changes in value, the 100 bpv only includes the interest rate risk associated with yen-denominated assets (loans and bonds), yen-denominated liabilities, and yen interest rate swaps (only banks are taken into account). It does not reflect the risk associated with foreign currency-denominated assets and liabilities or off-balance-sheet transactions, other than yen interest rate swaps. We assume that the duration of demand deposits is 3 months or less when the effect of the 100 bpv on liabilities is calculated, meaning that so-called "core deposits" are not taken into account.

Chart IV-2-5: Yen-denominated interest rate risk among financial institutions[1,2,3]



Notes: *1*. Latest data as at end-December 2016.
2. Interest rate risk: 100 basis point value in the banking book. For banks, off-balance-sheet transactions (interest rate swaps) are included.
3. Convexity and higher order terms are taken into account.
Source: BOJ.

Chart IV-2-6: Yen-denominated interest rate risk by type of bank[1,2,3]

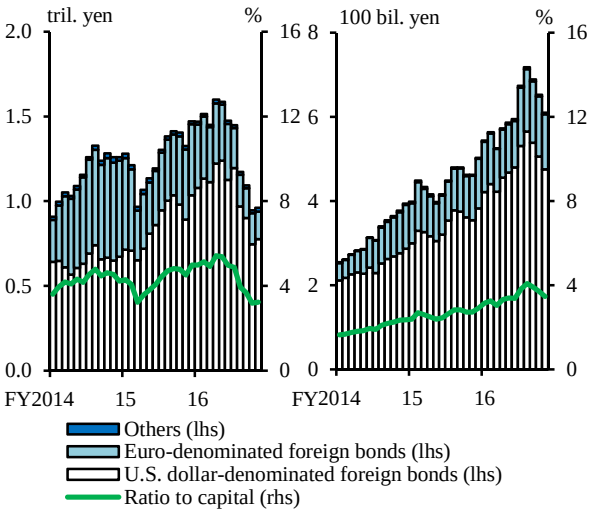


Notes: *1*. Latest data as at end-December 2016.
2. Interest rate risk: 100 basis point value in the banking book. For banks, off-balance-sheet transactions (interest rate swaps) are included.
3. Convexity and higher order terms are taken into account.
Source: BOJ.

Foreign currency interest rate risk

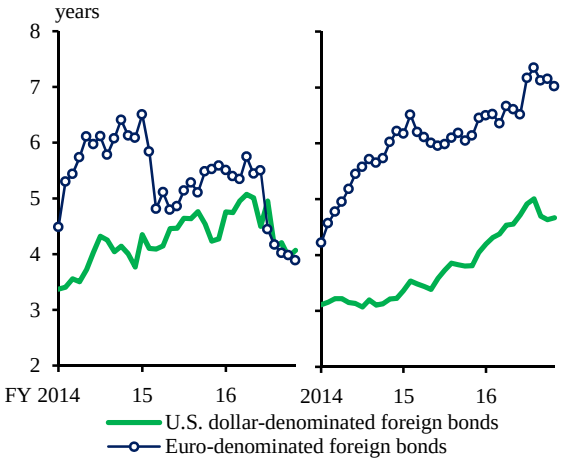
The amount of interest rate risk associated with foreign currency-denominated bond investments by financial institutions has decreased recently (Chart IV-2-7). Specifically, major banks reduced their outstanding bondholdings and shortened the duration of bonds in response to the rise in overseas long-term interest rates from the fall of 2016, so that the amount of foreign currency interest rate risk decreased substantially toward the end of 2016 (Chart IV-2-8). On the other hand, regional banks have extended the duration of bonds, but the amount of risk regional banks hold has decreased somewhat on the whole as some regional banks have restrained their accumulation of bondholdings. The ratio of the amount of interest rate risk associated with foreign currency-denominated bonds to capital at both major banks and regional banks has been between 3 and 4 percent.

Chart IV-2-7: Interest rate risk of foreign currency-denominated bonds among banks[1,2]



Notes: *1*. Latest data as at end-February 2017.
2. Interest rate risk: 100 basis point value in the banking book. Off-balance-sheet transactions of major banks are included. Off-balance-sheet transactions of regional banks are not included.
Source: BOJ.

Chart IV-2-8: Average remaining maturity of foreign currency-denominated bonds among banks[1,2]



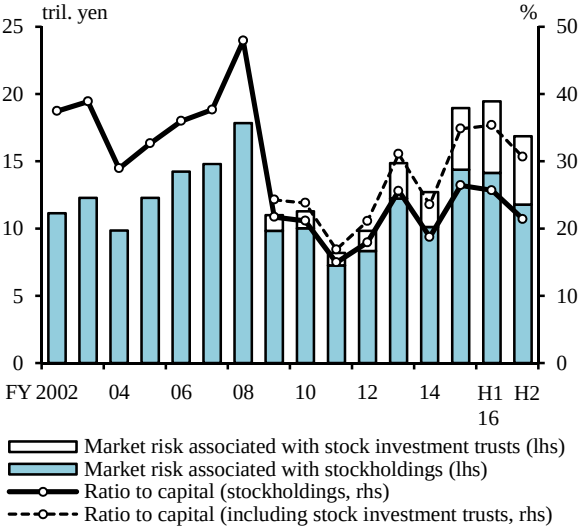
Notes: *1*. Latest data as at end-February 2017.
2. Average remaining maturity is estimated by the interest rate risk.
Source: BOJ.

Market risk associated with stockholdings

The amount of market risk associated with stockholdings at financial institutions has continued to be on an upward trend for the past few years, mainly against the backdrop of the accumulation of stock investment trusts, but has recently decreased somewhat due to the decline in market volatility (Charts IV-2-9 and IV-2-10).[23] Whereas at major banks the amount of the risk has decreased, partly reflecting the decline in the amount of strategic stockholdings, regional financial institutions have increased their holdings of stock investment trusts as part of their portfolio diversification strategy, so that the amount of market risk has been more or less unchanged. The ratio of the amount of market risk associated with stockholdings to the amount of capital has been around 40 percent at major banks and regional banks, and nearly 20 percent at *shinkin* banks (Chart IV-2-11).

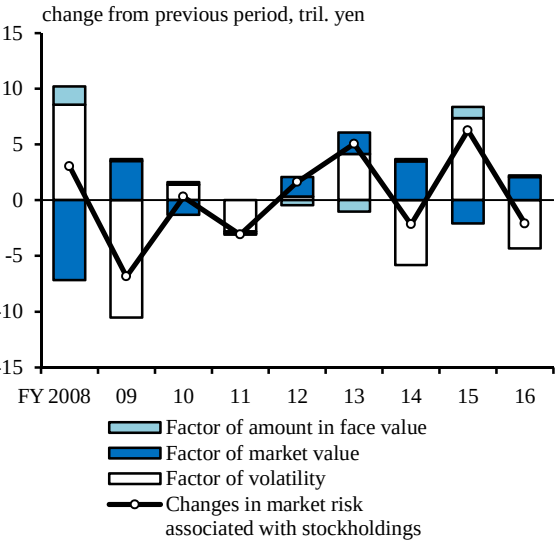
[23] The market risk associated with stockholdings (including stock investment trusts) computed here is estimated using a VaR with a 99 percent confidence level and a 1-year holding period.

Chart IV-2-9: Market risk associated with stockholdings among financial institutions[1,2,3,4]



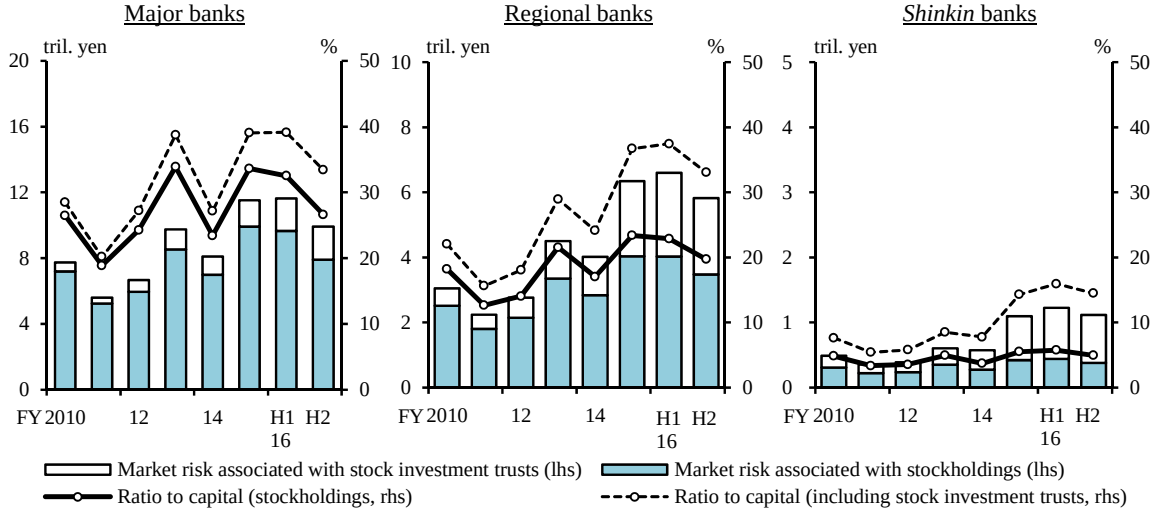
Notes: *1*. Latest data as at end-March 2017.
2. Market risk associated with stockholdings and stock investment trusts: value-at-risk with a 99 percent confidence level and a 1-year holding period.
3. Market risk associated with stockholdings and stock investment trusts excludes risk associated with foreign currency-denominated stockholdings and stock investment trusts. Pre-fiscal 2009 data do not include stock investment trusts.
4. Latest data are estimated using outstanding amount of stockholdings and stock investment trusts as at end-February 2017 and stock prices as at end-March 2017.
Source: BOJ.

Chart IV-2-10: Decompositions of changes in market risk associated with stockholdings among financial institutions[1,2,3]



Notes: *1*. Market risk associated with stockholdings and stock investment trusts: value-at-risk with a 99 percent confidence level and a 1-year holding period.
2. Market risk associated with stockholdings and stock investment trusts excludes risk associated with foreign currency-denominated stockholdings and stock investment trusts. Fiscal 2008 data do not include stock investment trusts.
3. Figures for fiscal 2016 are estimated values.
Source: BOJ.

Chart IV-2-11: Market risk associated with stockholdings by type of bank[1,2,3,4]



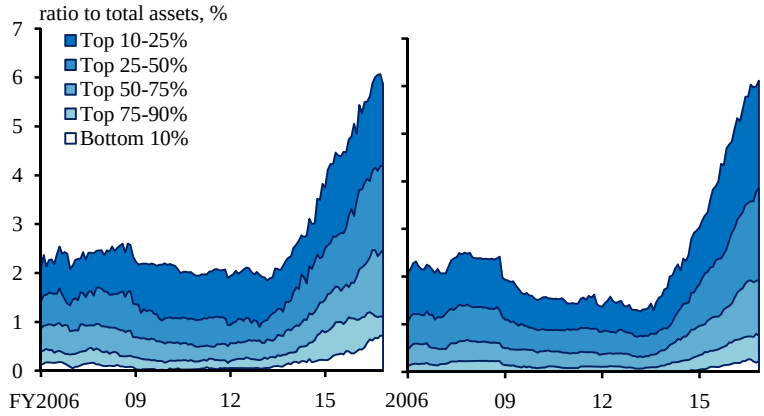
Notes: *1*. Latest data as at end-March 2017.
2. Market risk associated with stockholdings and stock investment trusts: value-at-risk with a 99 percent confidence level and a 1-year holding period.
3. Market risk associated with stockholdings and stock investment trusts excludes risk associated with foreign currency-denominated stockholdings and stock investment trusts.
4. Latest data are estimated using outstanding amount of stockholdings and stock investment trusts as at end-February 2017 and stock prices as at end-March 2017.
Source: BOJ.

Tasks and challenges regarding market risk management

The two key tasks and challenges in market risk management for financial institutions are detailed below.

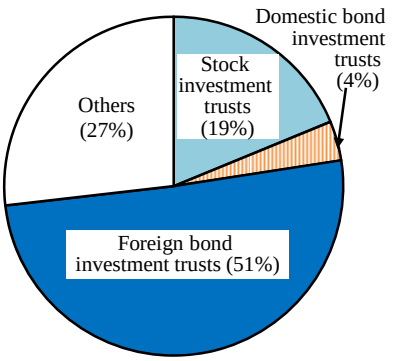
(1) **Financial institutions need to develop a clear securities investment and asset-liability management (ALM) strategy, and manage their positions in an appropriate manner after figuring out the impact of changes in the profile of various risk factors from a cross-sectional perspective.**

Chart IV-2-12: Distribution of outstanding amount of investment trusts among regional financial institutions[1,2,3]



Notes: *1*. Latest data as at end-February 2017.
2. The data are each financial institution's ratios of outstanding amounts of investment trusts to total assets.
3. Outstanding amounts of investment trusts are based on book values.
Source: BOJ.

Chart IV-2-13: Breakdown of investment trusts among regional financial institutions[1,2]



Notes: *1*. Data as at end-December 2016.
2. Based on book values.
Source: BOJ.

Many financial institutions, in particular regional ones, are actively investing in risky assets such as investment trusts and foreign bonds, so that they hold various market risks such as foreign interest rate risk, stock market risk, foreign exchange risk, and real estate risk in addition to a high level of yen interest rate risk (Charts IV-2-12 and IV-2-13). In fact, many financial institutions suffered losses as a result of the rise in U.S. interest rates toward the end of 2016, and their profitability declined due to the increase in foreign currency funding premiums. Going forward, regional financial institutions will likely continue to experience downward pressure on the profitability of domestic deposit-taking and lending activities against the backdrop of the structural problem of a shrinking business base mainly due to the population decline. Under these circumstances, accumulating a variety of risky market products is one option, in which case it is essential for such financial institutions to gain a cross-sectional understanding of the impact of fluctuating risk factors on their portfolios, and to adopt a management and operational framework that takes the size of risks and profitability into account.

(2) **Financial institutions need to properly re-evaluate the purpose and costs of strategic stockholdings, thereby continuing their efforts to reduce them.**

Although strategic stockholdings have been on a moderate declining trend, the amount of market risk associated with stockholdings remains large enough to have considerable effects on financial institutions' financial strength and profits. Strategic stockholdings have been accumulated over a long period, along with the development of transactional relationships between financial institutions and corporate firms. Moves to reduce such stockholdings are thought to be premised on gaining the understanding of their counterparties, and it is thus important for financial institutions to work to raise their objectivity in assessing the purpose and costs of their strategic stockholdings. Taking these points into account, they are expected to steadily proceed with efforts to reduce their stockholdings.

C. Funding liquidity risk

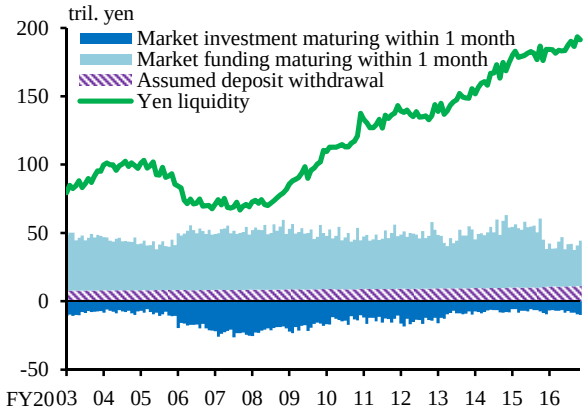
In this section, we assess funding liquidity risk, first in yen and then foreign currencies.

Yen funding liquidity risk

Financial institutions have sufficient yen funding liquidity. The stability of the investment and funding structure of yen is high, mainly because: the majority of funding is sourced from stable retail deposits; the outstanding amount of deposits is far larger than total loans outstanding; and a large part of the excess of deposits over loans is invested in highly liquid securities, such as JGBs, or current account deposits at the Bank of Japan. Even under stress situations, it is assessed that financial institutions have a sufficiently high degree of resilience to short-term stress, as they hold liquid assets worth far more than the expected fund outflows (Chart IV-3-1).[24]

[24] In accordance with the concept of the Liquidity Coverage Ratio (LCR), here we assume an outflow of market funding with a maturity of 1 month or less and an outflow amounting to 3 percent of total deposits. In the computation of the LCR, more complex stress situations than the one featured here are assumed, such as the withdrawal of committed facilities and the downgrading of credit ratings. Thus, it should be noted that the assumption for fund outflows under stress does not fully conform to the definition of the LCR.

Chart IV-3-1: Resilience to yen liquidity stress among major banks[1,2,3]



Notes: *1*. Latest data as at end-February 2017.
2. It is assumed that 3 percent of deposits are withdrawn.
3. Yen liquidity = cash + deposits + JGBs.
Source: BOJ.

Funding liquidity risk for foreign currencies

Market funding accounts for a large share of foreign currency funding. However, financial institutions have a liquidity buffer that can cover funding shortages, even if market funding conditions become difficult for a certain period. With respect to the foreign currency investment and funding structure of major banks, a large proportion of foreign currency investments consists of loans and foreign bonds with relatively long maturities, whereas a large share of foreign currency funding consists of market funding, such as repos, FX and currency swaps, and interbank borrowings (Chart IV-3-2). Meanwhile, looking at the impact of the money market fund (MMF) reform in the United States in October 2016, the amount of CD and CP issuance has decreased substantially, given that in the U.S. markets Prime MMFs have held a large share of CDs and CPs issued by global banks, including Japanese banks.[25] However, major Japanese banks have been responding to the rise in loan demand by making up for the decrease in funding through CDs and CPs with an increase in other funding means, such as client-related deposits and corporate bonds. Meanwhile, the outstanding amount of foreign currency-denominated securities at major banks has shrunk due to the rise in overseas interest rates toward the end of 2016, so that the amount of repo borrowings has decreased.

[25] U.S. MMFs can be classified into Government MMFs, which invest more than 99.5 percent of their portfolios in cash, treasury bonds or repos secured by treasury bonds, and other MMFs (i.e., Prime MMFs). On October 14, 2016, the U.S. Securities and Exchange Commission (SEC) implemented final rules that call for the introduction of floating Net Asset Value (NAV) and a framework in which fees or restrictions may be imposed on the cancellation of Prime MMFs when there is a decline in the liquidity of assets held. As a result, there were withdrawals from Prime MMFs by investors and a shift of assets from Prime MMFs to Government MMFs by fund managers, which sharply reduced the outstanding amount of Prime MMFs.

In assessing the stability of the investment and funding structure of foreign currencies, the "stability gap" -- the gap between the amount of illiquid loans and stable funding through, for example, client-related deposits, medium- to long-term FX and currency swaps, and corporate bonds -- serves as a useful indicator. **For major banks, this stability gap has continued to narrow as a trend. While loans have continued to increase, this narrowing is partly attributable to banks' continued progress in bolstering funding bases, particularly through increasing client-related deposits** (Chart IV-3-3). Nevertheless, to some extent, a gap still remains, and given other risks such as uncertainties regarding the stability of client-related deposits, uncertainties surrounding the liquidation of foreign currency-denominated assets, and the risk of a rapid withdrawal of unused committed facilities, it is important for banks to continue with their efforts to shore up the stability of their foreign currency funding sources (Chart IV-3-4). **In terms of the stability gap among regional banks, there is large variation, and those that have been actively accumulating foreign currency-denominated assets or have increased their dependence on short-term funding have a correspondingly large gap** (Chart IV-3-5). These banks need to continue to make efforts to reduce the stability gap, for example by bolstering stable funding bases.

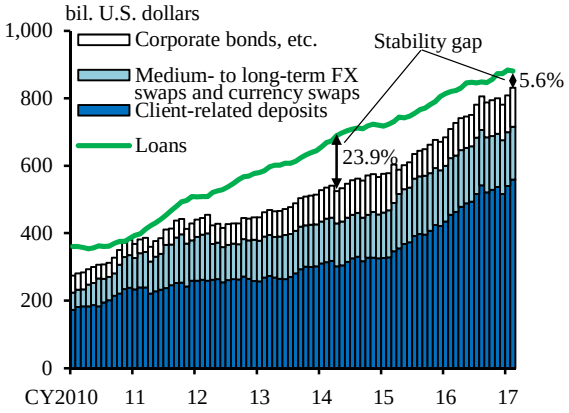
Chart IV-3-2: Major banks' foreign currency-denominated balance sheet[1,2]

bil. U.S. dollars

Assets		Liabilities	
Loans	881 (+33)	Client-related deposits	559 (+66)
		Corporate bonds, etc.	116 (+23)
Interbank investments	289 (+47)	Medium- to long-term FX and currency swaps	156 (-8)
		Short-term FX and currency swaps	67 (+6)
Securities	308 (-75)	Repos	189 (-50)
		Interbank funding	450 (-5)
Others	79 (+10)	of which: CD, CP	230 (-30)
		Others	22 (-16)
Total	1,557 (+16)	Total	1,560 (+15)

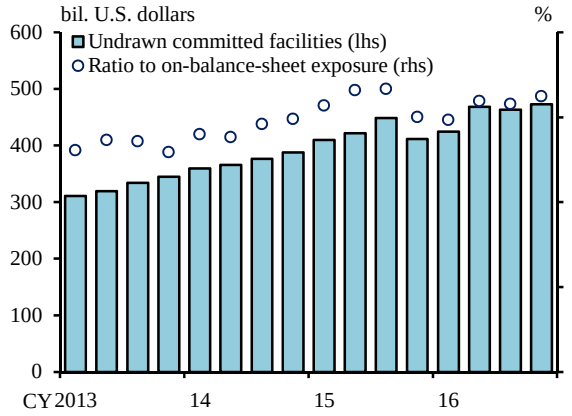
Notes: *1*. Data as at end-February 2017. Figures in parentheses indicate the change from end-June 2016 to end-February 2017.
2. Includes major banks classified as internationally active banks.
Source: BOJ.

Chart IV-3-3: Stability gap among major banks[1,2,3,4]



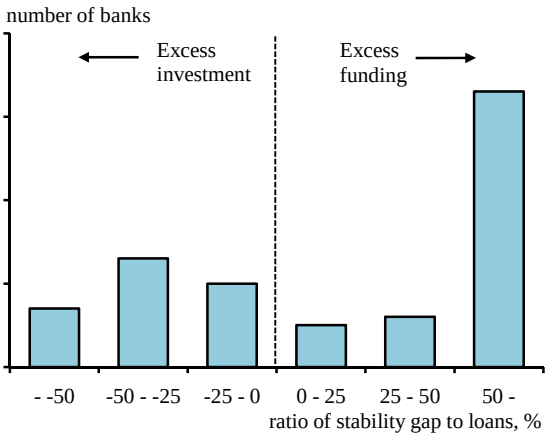
Notes: *1*. Includes major banks classified as internationally active banks.
2. Latest data as at end-February 2017.
3. "Corporate bonds, etc." and "Medium- to long-term FX swaps and currency swaps" indicate funding maturing in over 3 months until March 2012 and funding maturing in over 1 year from April 2012.
4. The figures in the chart indicate the ratios of the gaps to the loans (April 2014 and February 2017).
Source: BOJ.

Chart IV-3-4: Undrawn committed facilities among the three major financial groups[1,2]



Notes: *1*. Latest data as at end-December 2016.
2. The data are based on international claims including cross-border claims and local claims of foreign offices (ultimate risk basis).
Source: BOJ.

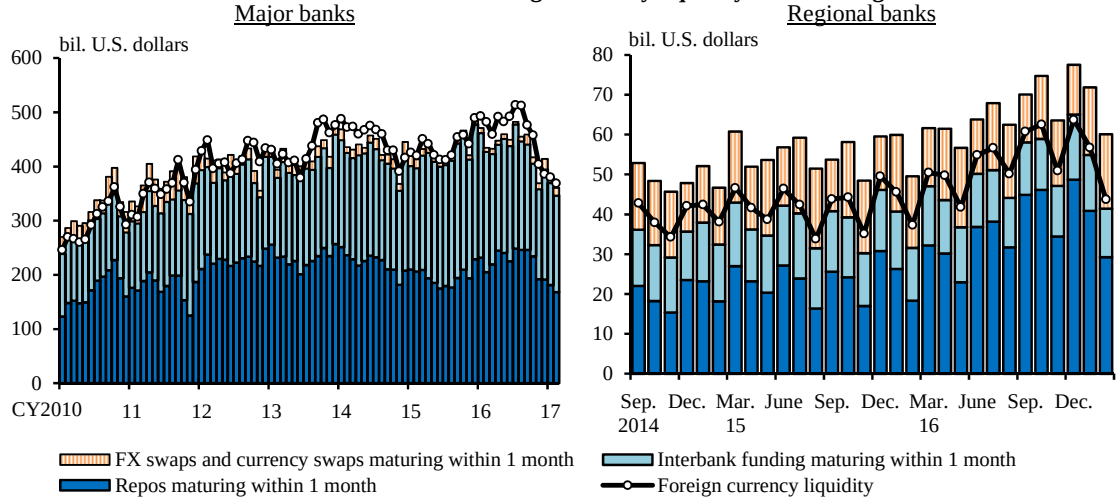
Chart IV-3-5: Stability gap among regional banks[1,2,3]



Notes: *1*. Data as at end-February 2017.
2. Includes 74 regional banks that have foreign currency-denominated loans.
3. Stability gap = (client-related deposits + medium- to long-term FX swaps and currency swaps + corporate bonds, etc.) – loans. Includes "medium- to long-term FX swaps and currency swaps" and "corporate bonds, etc." maturing in over 1 year.
Source: BOJ.

As for the resilience of foreign currency funding to short-term stress, both major banks and regional banks generally hold sufficient liquid assets to cover the outflow of funds expected under a stress situation (Chart IV-3-6).[26]

Chart IV-3-6: Resilience to foreign currency liquidity stress among banks[1,2]



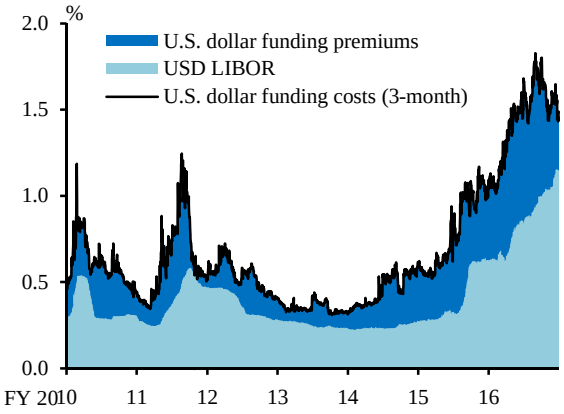
Notes: *1*. Latest data as at end-February 2017.
2. Foreign currency liquidity = cash + deposits + unencumbered U.S. treasuries + repos maturing within 1 month.
Source: BOJ.

[26] We classify repo borrowings with remaining maturities of 1 month or less as liquid assets, based on the assumption that the collateral used is of high quality and that the total amount of funding with a maturity of 1 month or less can be rolled over using the same collateral. At the same time, this exercise does not account for withdrawals from unused committed facilities and/or outflows from client-related deposits, so that it is necessary to pay attention to the possibility that this is not an assessment based on sufficiently conservative assumptions.

Foreign currency funding environment

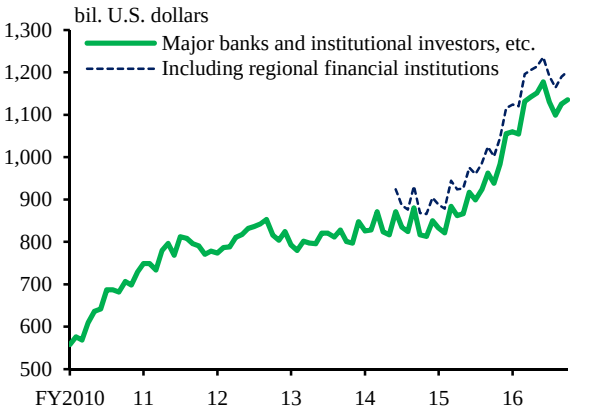
U.S. dollar funding costs in FX and currency swap markets have been on an upward trend since around 2015 due to the increase in dollar funding premiums as well as the rise in the U.S. policy rate (Chart IV-3-7). Since the start of 2017, dollar funding premiums, particularly in short-term FX swap markets, have declined. This largely reflects (1) the fact that dollar funding demand decreased somewhat as investment in overseas assets by Japanese financial institutions temporarily decelerated, and (2) the supplying of dollar funds by foreign investors is increasing, mainly against the backdrop of the increase in dollar funding premiums toward the end of 2016 (Chart IV-3-8).

Chart IV-3-7: Breakdown of U.S. dollar funding costs through short-term FX swaps[1,2]



Notes: *1*. Data to March 31, 2017.
2. U.S. dollar funding premiums indicate the additional costs on USD LIBOR.
Source: Bloomberg.

Chart IV-3-8: Amount of foreign currency funding via FX swaps and currency swaps by Japanese financial entities[1,2,3,4]



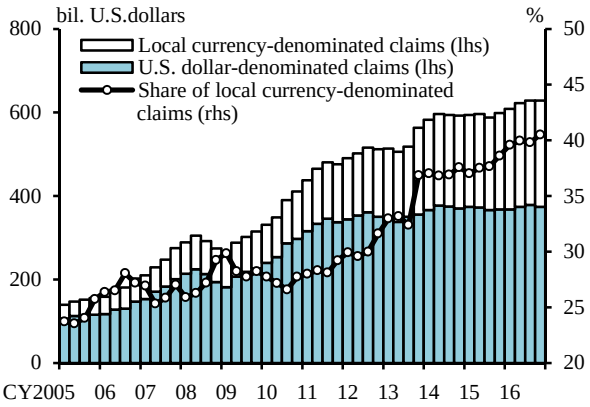
Notes: *1*. Estimated by the BOJ. Latest data as at end-January 2017.
2. "Major banks and institutional investors, etc." includes major banks, Japan Post Bank, The Norinchukin Bank, Shinkin Central Bank (from end-September 2014), and life insurance companies.
3. Life insurance companies are members of the Life Insurance Association of Japan (latest data on members show 41 companies).
4. Regional financial institutions are included from end-September 2014.
Sources: Bloomberg; The Life Insurance Association of Japan; Published accounts of each company.

However, given the difference in growth rates and yields between the Japanese and overseas economies, the appetite of Japanese financial institutions and institutional investors to invest in overseas assets is bound to remain strong. It is therefore likely that dollar funding premiums through FX and currency swaps will continue to be under upward pressure. Major banks, which have a wider range of dollar funding means, currently tend to avoid securing dollar funds through comparatively expensive FX and currency swaps, partly because they have accumulated client-related deposits, etc. in view of ensuring stability. However, the amount of dollar funding through FX and currency swaps by Japanese financial institutions overall has continued to trend upward

(Chart IV-3-8). The reason is the increase in funding demand by other banks and insurance companies, which have a more limited range of options to secure dollar funding compared to major banks.

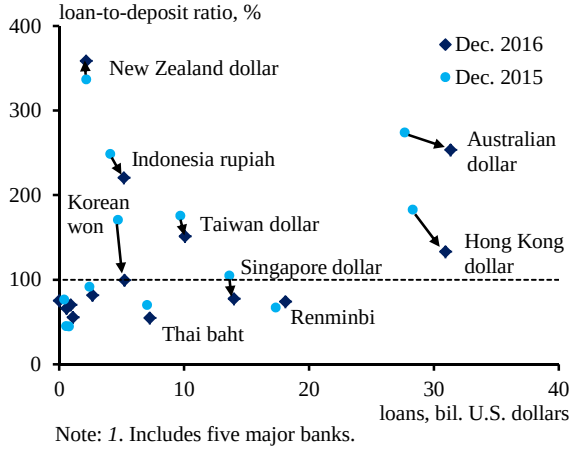
Meanwhile, the proportion of loans denominated in local currencies continues to increase especially in the Asian region (Chart IV-3-9). Looking at major banks' balance of investment and funding by local currency, loan-to-deposit ratios have generally declined, reflecting the fact that deposits have increased at a faster pace than loans (Chart IV-3-10). However, market liquidity in local currencies is relatively low, and there are some currencies in which loan-to-deposit ratios are still high. Financial institutions need to continue to make efforts to bolster stable funding bases through, for example, making committed facilities with local banks and utilizing medium- and long-term funding means (swaps, capital, etc.).

Chart IV-3-9: Japanese banks' claims on Asia by currency[1,2]



Notes: *1*. Latest data as at end-December 2016.
2. "U.S. dollar currency-denominated claims" includes not only local currency-denominated cross-border claims but also foreign currency except for U.S. dollar-denominated claims.
Sources: BIS, "Consolidated banking statistics"; BOJ, "BIS international consolidated banking statistics in Japan."

Chart IV-3-10: Major banks' loans outstanding and loan-to-deposit ratios by currency[1]



Note: *1*. Includes five major banks.
Source: BOJ.

Tasks and challenges regarding foreign currency liquidity risk management

The three key tasks and challenges for financial institutions in terms of foreign currency liquidity risk management are as follows:

(1) **Financial institutions need to persevere with efforts to secure stable funding bases in major foreign currencies, especially the U.S. dollar.**

(2) **Financial institutions should work toward responding more effectively to market stresses through, for example, detailed management of liquidity risk taking into account the attributes of their assets and liabilities, including**

client-related deposits and committed facilities.

(3) **Financial institutions need to enhance liquidity risk management by bolstering stable funding bases in foreign currencies other than major currencies, including Asian currencies.**

D. Financial institutions' capital adequacy

This section examines whether financial institutions' capital adequacy ratios fulfill regulatory requirements, and further, whether they maintain a sufficient capital base against the various risks they undertake.

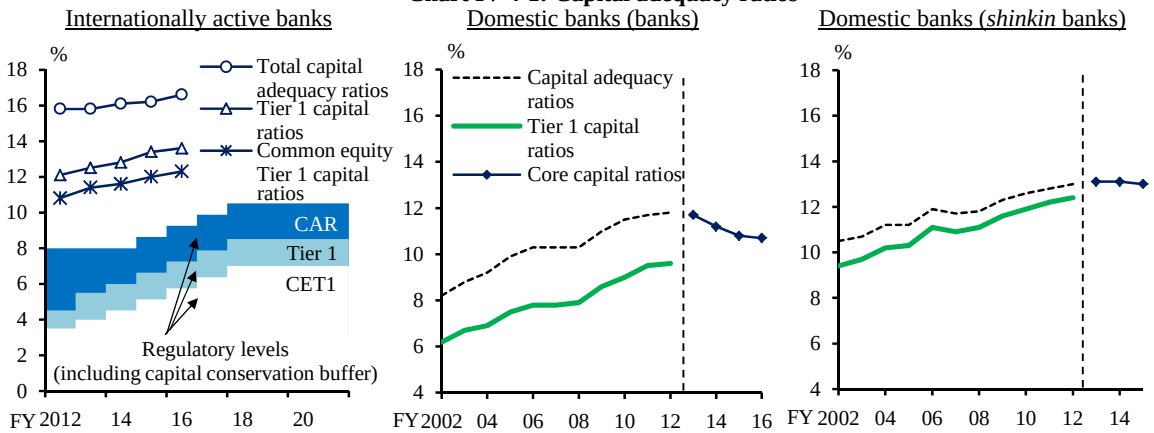
Capital adequacy ratios

Financial institutions' capital adequacy ratios are sufficiently above regulatory requirements. As at the end of the first half of fiscal 2016, total capital adequacy ratios, Tier 1 capital ratios, common equity Tier 1 capital ratios (CET1 capital ratios) at internationally active banks, and core capital ratios at domestic banks significantly exceeded regulatory requirements (Chart IV-4-1).[27] However, it should be borne in mind that international financial regulations, such as the Basel III framework, will gradually be implemented in full, and some issues, such as the methodology for the calculation of risk-weighted assets, involve new content on regulations that is yet to be finalized.[28]

[27] The moderate decline in core capital ratios of domestic banks is due to the gradual phasing out of the effects of transitory arrangements for the calculation of their capital adequacy ratios adopted during the transition to new regulatory requirements.

[28] Under the Basel III requirements, (1) the capital conservation buffer (2.5 percent), (2) the countercyclical capital buffer (upper limit of 2.5 percent), and (3) the surcharge on global systemically important banks (G-SIBs) of 1-2.5 percent (determined according to their size and other characteristics) were introduced at the end of March 2016 (all of these requirements will be implemented in stages, with full implementation by 2019). As for domestic banks, they are currently allowed to consider all or a portion of certain instruments, such as non-convertible preferred stocks and subordinated bonds, as part of new core capital under the phase-in arrangements, but the proportion of these instruments that can be included will be reduced gradually in the future. In addition, they will be required to exclude certain assets -- such as goodwill -- from core capital gradually under phase-in arrangements, with these assets subject to full deduction by the end of March 2019.

Chart IV-4-1: Capital adequacy ratios[1,2]



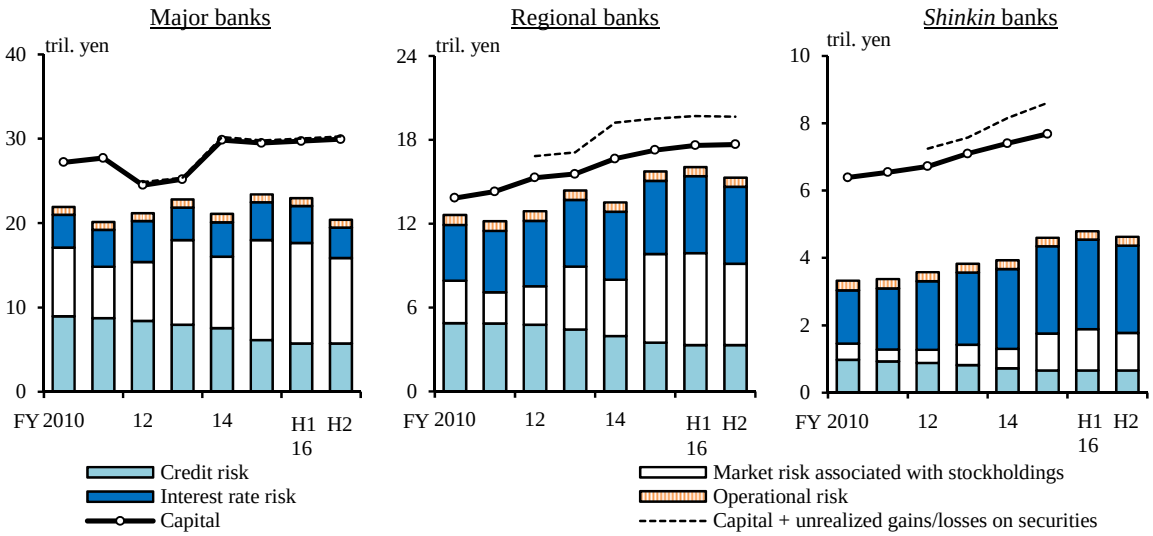
Notes: *1*. CAR indicates total capital adequacy ratios. Latest data for banks are as at end-September 2016, and those for *shinkin* banks are as at end-March 2016.
2. Classifications of internationally active banks and domestic banks are as at each time point for Basel III's regulatory ratios, and are as at end-fiscal 2013 for regulatory ratios before Basel III. Data take the phase-in arrangements into consideration. Data for banks are calculated on a consolidated basis.
Source: BOJ.

Capital adequacy relative to the amount of risk borne by financial institutions

Financial institutions' capital levels are generally adequate relative to the amount of risk they undertake (Chart IV-4-2).[29] The amount of risk borne by major banks has decreased from a year earlier (end of March 2016), mainly reflecting the decline in market risk associated with stockholdings and interest rate risk, while the amount of risk borne by regional financial institutions has been more or less unchanged. On the other hand, capital levels at both major banks and regional banks have increased somewhat through the accumulation of retained earnings. **It can be judged that financial institutions currently have sufficient capacity to absorb losses and ability to take on risks.**

[29] Common methods and parameters (such as the confidence level and the holding period) are used to calculate the amount of risk borne by all financial institutions. Thus, the amount of risk presented here does not necessarily match the internal calculations by financial institutions as part of their risk management process/framework. For the calculation methods used for each type of risk, see the Notes in Charts IV-1-1, IV-2-6, IV-2-7, and IV-2-11. The amount of operational risk corresponds to 15 percent of gross profits. Capital for internationally active banks from fiscal 2012 refers to CET1 capital. Capital for domestic banks from fiscal 2013 refers to core capital. The data do not take the phase-in arrangements into consideration. Capital preceding the respective periods refers to Tier 1 capital.

Chart IV-4-2: Risks borne by financial institutions and amount of capital[1,2,3]



Notes: *1*. Latest data for *shinkin* banks' capital are as at end-fiscal 2015, and those for others are as at end-fiscal 2016. For the following items, figures are assumed to be unchanged from the date indicated below to the latest date: interest rate risk associated with bondholdings and banks' unrealized gains/losses on securities (excluding on stockholdings), end-February 2017; other interest rate risk (yen-denominated), end-December 2016; banks' credit risk, other interest rate risk (foreign currency-denominated), operational risk, and capital, end-September 2016; *shinkin* banks' credit risk and operational risk, end-March 2016.

2. Data for market risk associated with stockholdings include stock investment trusts. Credit risk includes risks of foreign currency-denominated assets. Market risk associated with stockholdings and interest rate risk (off-balance-sheet transactions are partly included) at major banks include foreign currency-denominated risk.

3. "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.

Source: BOJ.

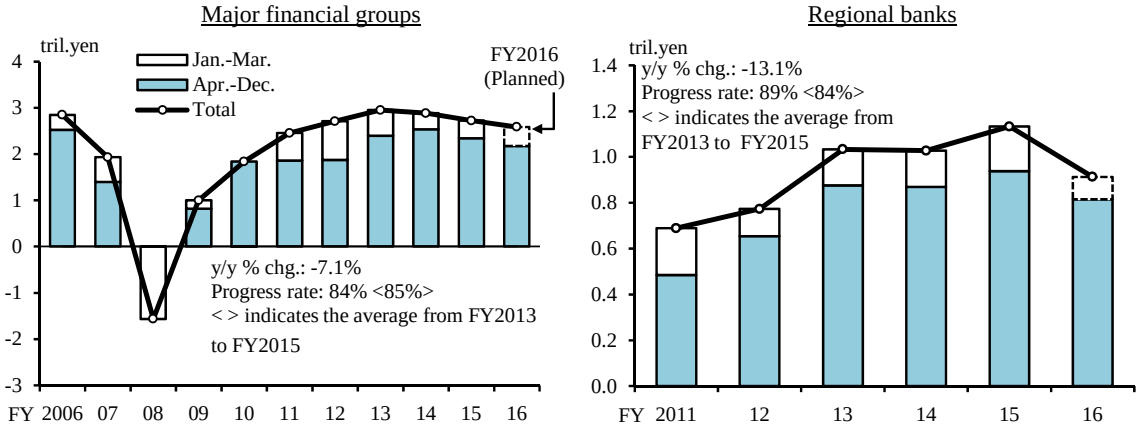
E. Financial institutions' profitability and its effects on financial system functioning and stability

Until this juncture, the analysis has examined the balance between risks currently undertaken by financial institutions as a whole and their financial bases. This section summarizes developments in financial institutions' profitability, which will affect their financial bases in the future, and examines how developments in their profitability could impact their financial intermediation.

Starting with financial institutions' financial results for fiscal 2016 up to the third quarter (i.e., April to December), **financial institutions' profits are at a high level from a long-term perspective, but both major and regional banks have seen a net income decline, mainly due to a decrease in net interest income through the tightening of domestic deposit and lending margins, etc. and a decrease in profits from fees and commissions** (Charts IV-5-1 and IV-5-2). Turning to the effect of negative interest rates on loan interest rates, while the downward pressure on interest rates materialized at an early point in the case of market interest rate-linked loans that are subject to interest rate renewal every few months, the effects of the decline in interest rates at the time of

rollover will continue to materialize for the time being in the case of fixed-rate loans with a remaining lending term of several years. Following the substantial tightening in major banks' deposit and lending margins in the first half of fiscal 2016 in the wake of the introduction of negative interest rates, the decline in the margins moderated somewhat in the October-December quarter, reflecting the fact that market interest rate-linked loans make up a relatively large share of loans at major banks (Chart III-1-18). On the other hand, fixed-rate loans make up a large share of loans at regional financial institutions, so that the downward pressure on deposit and lending margins is expected to continue going forward (Chart IV-5-3).

Chart IV-5-1: Net income[1]

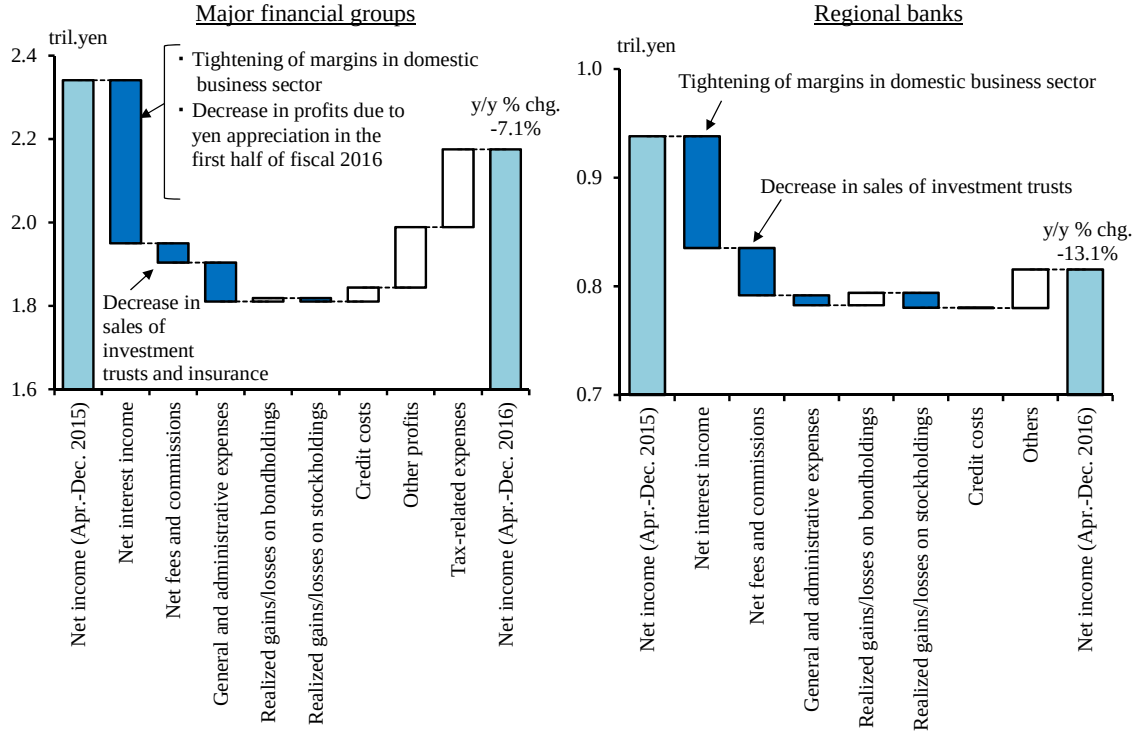


Note: *1.* "Major financial groups" includes Mizuho Financial Group, Mitsubishi UFJ Financial Group, Sumitomo Mitsui Financial Group, Resona Holdings, Sumitomo Mitsui Trust Holdings, Shinsei Bank, and Aozora Bank.
Sources: Published accounts of each bank; BOJ.

As discussed above, at present **financial institutions have sufficient capital bases, which will allow them to continue risk taking even if profitability remains subject to downward pressure for the time being. Going forward, if financial institutions' portfolio rebalancing leads to an improvement in economic and price developments, this is in turn likely to bring about a recovery in their profitability. However, if the downward pressure on profits persists, a decline in their loss-absorbing capacity could lead to a weakening in the financial intermediation function.** In fact, the number of financial institutions -- in particular regional financial institutions -- that are unable to cover their expenses with income from deposit-taking and lending activities as well as fees and commissions has been increasing, and should a shock materialize, causing credit costs to increase, these institutions could more easily record losses, being unable to absorb the credit costs with pre-provision net revenue (excluding trading income) (Chart IV-5-4). Under these circumstances, there are not a few regional financial institutions whose profitability is sustained by realizing gains through the sales of securities. While structural problems, such as regional population decline, are likely to put long-term downward pressure on the profitability of deposit-taking and lending

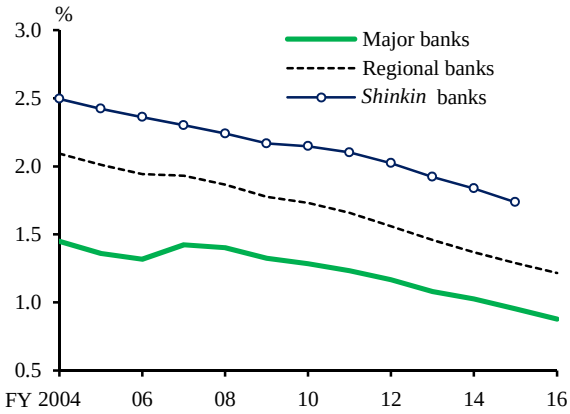
activities of regional financial institutions, there is a limit to which they can make up for the decline in their profit by realizing gains through the sales of securities, and it is possible that their risk-taking capabilities may decline at some point (see Box 5).

Chart IV-5-2: Decomposition of change in net income from the previous year[1]



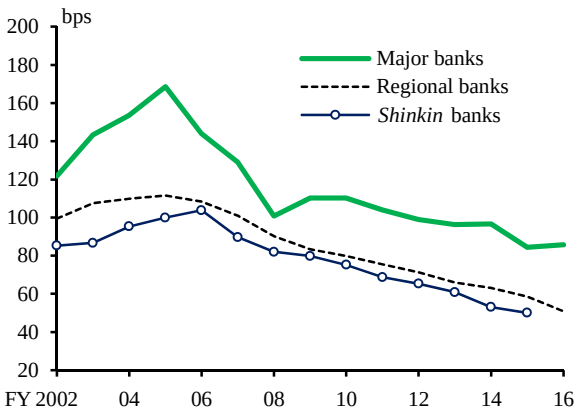
Note: *1*. "Major financial groups" includes Mizuho Financial Group, Mitsubishi UFJ Financial Group, Sumitomo Mitsui Financial Group, Resona Holdings, Sumitomo Mitsui Trust Holdings, Shinsei Bank, and Aozora Bank.
Sources: Published accounts of each bank.

Chart IV-5-3: Lending margins among financial institutions[1,2,3]



Notes: *1*. Latest data for banks as at the first half of fiscal 2016, and those for *shinkin* banks as at fiscal 2015.
2. Data for banks are for the domestic business sector. Data for *shinkin* banks are for all branches.
3. Interest rate swaps are subtracted from funding costs.
Source: BOJ.

Chart IV-5-4: Break-even credit cost ratios among financial institutions[1,2,3]



Notes: *1*. Latest data for banks as at the first half of fiscal 2016, and those for *shinkin* banks as at fiscal 2015.
2. Break-even credit cost ratios are the ratios above which credit costs exceed pre-provision net revenue (excluding trading income). Averages for each type of bank.
3. Pre-provision net revenue (excluding trading income) for fiscal 2012 onward is calculated without profits due to cancellations of investment trusts.
Source: BOJ.

At the same time, it is necessary to pay attention to the possibility that financial system stability will be impaired, if financial institutions shift toward excessive risk taking in order to maintain profitability as deposit and lending margins continue to decline as a trend. If competition among financial institutions becomes excessive, this could give rise to excessive risk taking, such as through the easing of loan conditions and expansion of loan amounts, and there is a risk that their businesses might become unstable mainly through deterioration in the profitability of loans (see Box 6).

Regarding potential vulnerabilities due to the declining profitability of financial institutions, it is necessary to examine both the risk of overheating -- excessive accumulation of macro risks and exuberant asset prices -- and the risk of a gradual pullback in financial intermediation due to a persistent decline in profits.

V. Macro stress testing

This chapter assesses the stability of the financial system through macro stress testing. Macro stress testing involves examining financial institutions' capital adequacy and the resilience of the financial system dynamically by estimating the extent of capital loss under specific stress events. The results of macro stress testing in this round indicate that **the financial system is considered to have generally strong resilience against economic and financial shocks originating from home and abroad.**

The two stress scenarios under consideration are the "tail event scenario" and the "tailored event scenario." The former is designed to assess the stability of the financial system through fixed-point observations, by applying an approximately equal degree of severe stress in every semiannual report. In particular, the assumed economic and financial conditions are comparable to those observed at home and abroad during the Lehman shock. The latter is designed to be a multi-dimensional analysis of the vulnerabilities inherent in the financial system under different scenarios. Against the backdrop of strong growth in exposures related to real estate among financial institutions, as observed in Chapter III, the scenario in this *Report* assumes a decline in real estate prices in order to analyze its impact on the financial system. Scenarios presented in this stress testing exercise are hypothetical, developed for the purpose of effectively conducting the above-mentioned examination and analysis. It should be noted that the scenarios presented are not an indication of the likelihood of outcomes for the economy, asset prices, or other factors, nor should they be interpreted as the Bank of Japan's outlook.

The subjects of the stress test are 115 banks and 256 *shinkin* banks (accounting for approximately 80 to 90 percent of total credit outstanding), and the duration of stress is assumed to be 3 years, from April-June 2017 through January-March 2020. The simulation utilizes the Financial Macro-econometric Model (FMM) developed by the Financial System and Bank Examination Department of the Bank.[30]

In the following sections, we discuss the procedure and results of the stress testing exercise.[31]

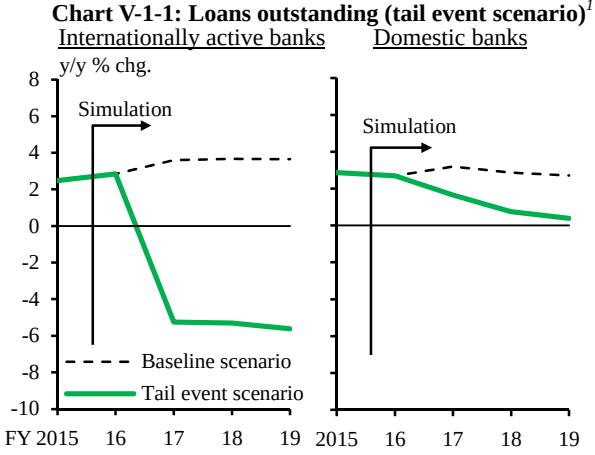
[30] For more details, see Tomiyuki Kitamura, Satoko Kojima, Koji Nakamura, Kojiro Takahashi, and Ikuo Takei, "Macro Stress Testing at the Bank of Japan," BOJ Reports & Research Papers, October 2014.

[31] For more details on the stress test, see "Macro Stress Testing in the *Financial System Report* (April 2017)," *Financial System Report Annex Series* (forthcoming).

1. Baseline scenario

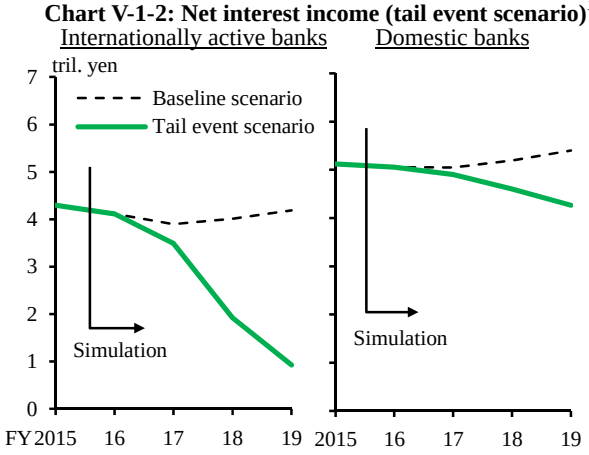
The baseline scenario is designed to serve as a benchmark for the assessment of the simulation results under the two stress scenarios. Based on baseline forecasts by the market and various organizations, the scenario assumes that "the growth rate of overseas economies increases moderately, as the steady growth in advanced economies spreads to emerging and developing economies, resulting in a continued moderate recovery for Japan's economy." In addition, JGB yields evolve, more or less in line with the yield curve as at late January 2017.

Chart V-1-1: Loans outstanding (tail event scenario)[1]



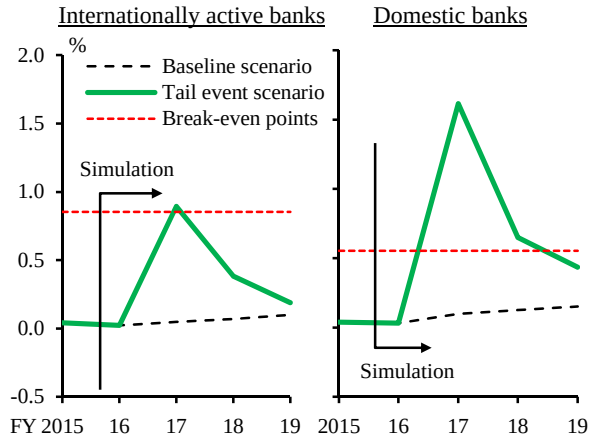
Note: *1*. Estimated by the BOJ.

Chart V-1-2: Net interest income (tail event scenario)[1]



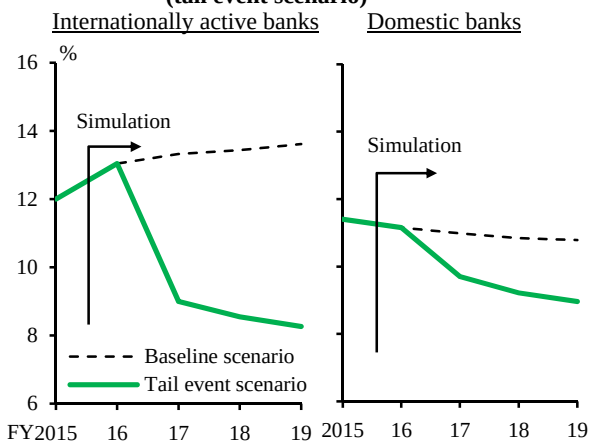
Note: *1*. Estimated by the BOJ.

Chart V-1-3: Credit cost ratio (tail event scenario)[1,2]



Notes: *1*. Estimated by the BOJ.
2. Break-even points as at the first half of fiscal 2016. For *shinkin* banks, they are assumed to be unchanged from fiscal 2015.

Chart V-1-4: CET1 capital ratio and core capital ratio (tail event scenario)[1,2]



Notes: *1*. Estimated by the BOJ.
2. The left-hand chart shows the CET1 capital ratio of internationally active banks. The right-hand chart shows the core capital ratio of domestic banks. These take the phase-in arrangements into consideration.

The baseline simulation results are as follows. The loans outstanding among financial institutions continue to increase, and net interest income remains more or less unchanged, as Japan's and overseas economies recover moderately (Charts V-1-1 and V-1-2). Credit costs remain at low levels, against the backdrop of the favorable financial conditions of

firms (Chart V-1-3). As a result, capital adequacy ratios at both internationally active banks and domestic banks remain well above regulatory requirements throughout the simulation period (Chart V-1-4).[32]

2. Tail event scenario

The tail event scenario envisages a situation whereby "Japan's output gap deteriorates to a level comparable to that seen during the Lehman shock." A significant economic slowdown occurs abroad, and financial markets are buffeted by a substantial decline in stock prices (TOPIX), an appreciation of the yen against the U.S. dollar, and a decline in JGB yields.

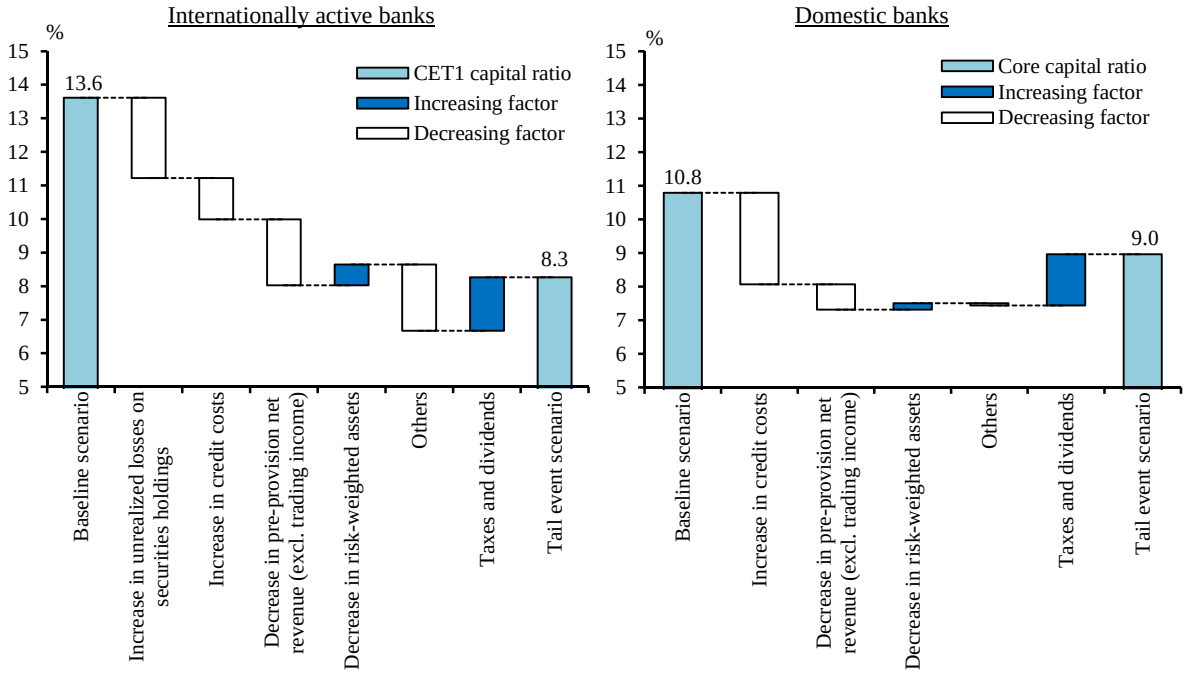
The simulation results based on this scenario are as follows. The year-on-year growth rate of loans outstanding falls, partly because of a tighter lending stance reflecting the decline in the profitability and the capital adequacy ratio, in addition to subdued demand for funds due to an economic downturn (Chart V-1-1). In particular, the total amount of loans decreases sharply at internationally active banks, as their overseas loans decrease substantially partly due to the translation effects of yen appreciation. Net interest income decreases substantially at internationally active banks, mainly due to the significant decline in overseas loans, and net interest income also decreases moderately at domestic banks, where overseas loans account for a smaller proportion of total loans (Chart V-1-2). In the corporate sector, financial conditions deteriorate due to a significant downturn in economic conditions both at home and abroad. As a result, credit cost ratios at internationally active banks increase to levels around their break-even points, while credit cost ratios at domestic banks rise to levels well above their break-even points (Chart V-1-3). In addition, banks incur unrealized losses on securities holdings in response to declines in stock prices at home and abroad.

At internationally active banks, the capital adequacy ratio falls by around 5 percentage points compared to the baseline scenario, due to a decrease in pre-provision net revenue (excluding trading income) and an increase in unrealized losses on securities holdings. However, on average, the capital adequacy ratio still remains above regulatory requirements (Charts V-1-4 and V-1-5). The capital adequacy ratio for domestic banks declines by around 2 percentage points, mainly due to an increase in credit costs, but remains well above regulatory requirements on average. However, those results present

[32] The moderate decline in core capital ratios of domestic banks is due to the gradual phasing out of the effects of transitory arrangements for the calculation of their capital adequacy ratios adopted during the transition to new regulatory requirements.

averages of financial institutions, and it should be noted that there is some heterogeneity among financial institutions with regard to the profitability and capital adequacy ratios in the stress situation. The simulation results show that more than 80 percent of financial institutions could temporarily record net losses. Even if financial institutions' capital adequacy ratios are above regulatory requirements, financial institutions' stance toward risk taking could retreat, for instance when net losses in their financial statements or unrealized losses on securities holdings are incurred. This could in turn adversely affect the financial intermediation function. Financial institutions that record net losses could display a tendency to tighten their lending stance to a greater extent if their capital adequacy ratios are comparatively low.[33]

Chart V-1-5: Decompositions of the CET1 capital ratio and the core capital ratio (tail event scenario)[1,2,3]



Notes: *1*. Estimated by the BOJ.
2. "Increase in unrealized losses on securities holdings" takes tax effects into account. Data for end-March 2020.
3. The left-hand chart shows the CET1 capital ratio of internationally active banks. The right-hand chart shows the core capital ratio of domestic banks. These take the phase-in arrangements into consideration.

3. Tailored event scenario

As was observed in Chapter III, Japan's real estate market does not appear to show signs of overheating on the whole. However, given the high growth of financial institutions' exposures related to real estate (real estate loans and investments in real estate funds), the tailored event scenario in this round examines the impact of stresses in the real estate sector on the financial system.[34] Specifically, the stress test examines the degree to

[33] See the macro stress testing part of the October 2016 issue of the *Report*.

[34] In the tailored event scenario, shocks are not directly applied to other sectors of the Japanese

which a decline in real estate-related markets and a widening of the real estate firms' credit spreads increase the credit costs of financial institutions through deterioration in the firms' financial conditions.[35] Another focus of the stress test is the degree to which unrealized losses on investments in real estate funds that arise from a drop in J-REIT prices affect the financial positions of financial institutions.

In the simulation, loans to the real estate sector are categorized into the following: (1) loans to firms engaging in real estate transactions and (2) loans to firms engaging in real estate rental and management (including housing rental businesses). An adverse shock on real estate prices is applied to the former category, while an adverse shock on office rents is applied to the latter category. The sizes of the shocks are calibrated by area, given the regional heterogeneity of real estate price behavior and office rent behavior.[36] The shocks applied to commercial real estate prices and office rents in each area have been calibrated so that the ratio of the rate of decline in the simulation to the rate of increase from 2012 and 2016 matches the ratio of the rate of decline to the rate of increase after and before the Lehman shock. Likewise, a shock calibrated in the same way based on the developments in J-REIT prices observed during the Lehman shock is applied to real estate funds. In addition, this simulation assumes that real estate firms experience a rise in funding costs due to deterioration in their creditworthiness caused by a decline in real estate related-markets, given that the probability of default for the real estate sector is susceptible to a rise in the borrowing interest rate.[37] Specifically, the funding costs of real estate firms are assumed to rise to a level comparable to the level observed during the Lehman shock.

The simulation results are as follows. At internationally active banks, the credit cost ratio remains at a relatively low level (Chart V-1-6). In addition, the impact of a decline in the market value of real estate funds is also not large because their investments are relatively small (Chart V-1-7). As a result, the capital adequacy ratio for internationally active banks declines only slightly (Chart V-1-8). On the other hand, at domestic banks, the

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economy or overseas economies, in order to focus on the impact of the shocks in the domestic real estate sector.

[35] A decline in real estate prices could also raise credit costs of financial institutions by lowering collateral values, thereby pushing up the loss given default (LGD) of exposure to non-real estate industries. However, this scenario does not incorporate such channel because loans backed by real estate collaterals account for only about 15 percent of the overall loans and the proportion of the loans that are expected to incur the credit costs is even smaller.

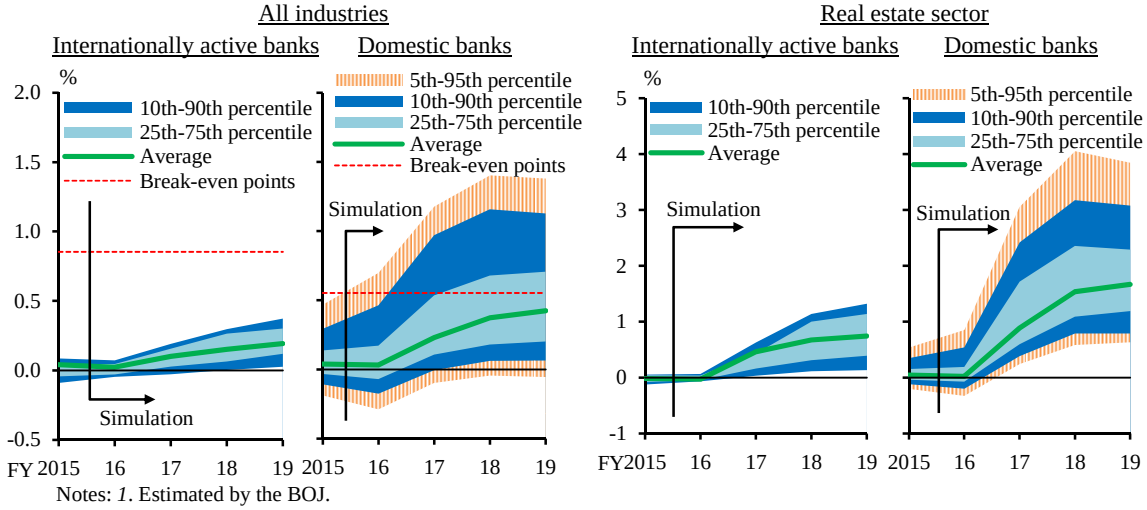
[36] Japan is divided into the following four areas: the Tokyo area, the Osaka area, the Nagoya area, and others.

[37] For details, see Box 3 in "Macro Stress Testing in the Financial System Report (October 2016)," *Financial System Report Annex Series*, October 2016.

credit cost ratio of real estate firms rises to around 160 basis points on average. Moreover, unrealized losses in real estate funds are larger because the amount of their investments is larger than that by major banks. However, the impact on the capital adequacy ratio for domestic banks is limited because unrealized losses on securities are not reflected in their regulatory capital.

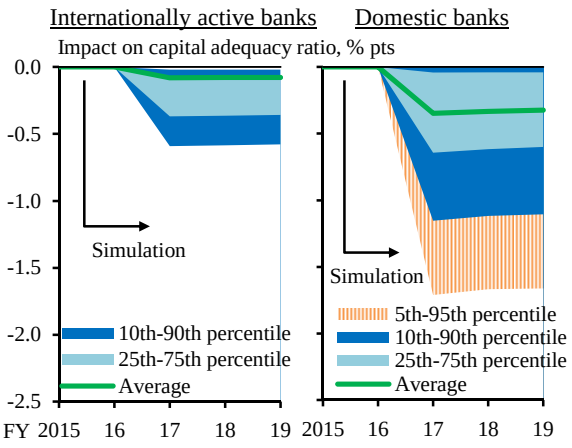
To sum up, the adverse shocks in the real estate markets exert only a limited impact on the financial system from a macroprudential perspective, partly because real estate-related markets have not risen as much as they did during the real estate boom from 2006 through 2007. However, it should be noted that some heterogeneity is observed among financial institutions with regard to the simulation results of the tailored event scenario. The distribution of credit cost ratios indicates that around 40 percent of domestic banks' credit cost ratios are higher than their break-even points (Chart V-1-6). Furthermore, more than 10 percent of domestic banks incur unrealized losses on investments in real estate funds comparable to more than 1 percentage point of the capital adequacy ratio (Chart V-1-7). Although unrealized gains/losses on securities are not reflected in the capital adequacy ratio for domestic banks on a regulatory basis, they are considered to effectively serve as a buffer of profits or capital. Taking into account these factors, financial institutions with significant exposures related to real estate could experience adverse effects, which are non-negligible from a microprudential perspective. Therefore, it is necessary to strengthen risk management in case of an occurrence of a tail event in the real estate markets.

Chart V-1-6: Credit cost ratio (tailored event scenario)[1,2]



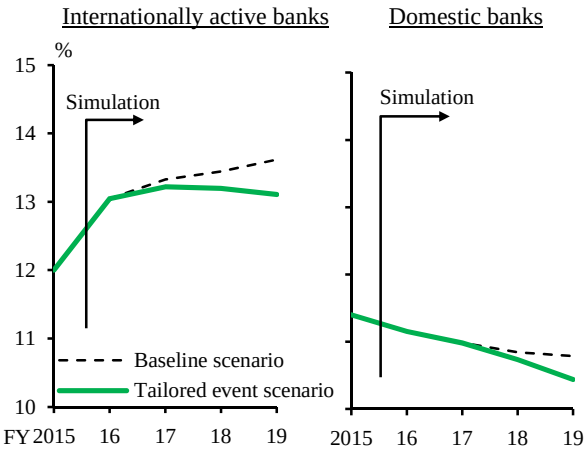
Notes: *1*. Estimated by the BOJ.
2. Break-even points as at the first half of fiscal 2016. For *shinkin* banks, they are assumed to be unchanged from fiscal 2015.

Chart V-1-7: Impact on capital adequacy ratio by unrealized losses on investment in real estate funds (tailored event scenario)[1,2,3]



Notes: *1*. Estimated by the BOJ.
2. The left-hand chart shows the CET1 capital ratio of internationally active banks. The right-hand chart shows the core capital ratio of domestic banks. The unrealized losses on securities holdings take tax effects into account.
3. For domestic banks, realization of unrealized losses on securities holdings is assumed.

Chart V-1-8: CET1 capital ratio and core capital ratio (tailored event scenario)[1,2]



Notes: *1*. Estimated by the BOJ.
2. The left-hand chart shows the CET1 capital ratio of internationally active banks. The right-hand chart shows the core capital ratio of domestic banks. These take the phase-in arrangements into consideration.

VI. Toward ensuring financial stability in the future

Japan's financial system has been maintaining stability on the whole. In order to ensure financial stability in the future, it is essential for financial institutions to work to maintain and improve profitability while steadily responding to the accumulation of risks as well as their greater variation and complexity.

Challenges for financial institutions

Three challenges to be tackled by individual financial institutions that constitute the financial system, in order to ensure the stability of the financial system as a whole, are outlined below.

First, individual financial institutions need to develop and implement business strategies that utilize their core competence by formulating business plans toward raising their profitability, while taking into account the medium- and long-term outlook for the regional economies and their own business bases.

The profitability of domestic deposit-taking and lending activities has been on a declining trend, against the backdrop of factors such as the domestic economy's falling growth potential and the continuation of the low interest rate environment. Particularly for regional finance, the problem of low profitability is expected to be exacerbated, with structural changes to the business environment, such as the shrinking regional population and business base. Temporary measures for securing profits, such as realization of gains through sales of securities, in themselves are not fundamental solutions to the problem of low profitability, even though they may improve financial institutions' profits in the short term. Japanese financial institutions' overhead cost ratios (OHRs) are higher than those of their U.S. and European counterparts, and the root cause can be attributed to the low labor productivity (gross operating profit per employee) at Japanese financial institutions (see Box 7). Moreover, the variation in their labor productivity is small compared to their U.S. and European counterparts, which suggests that Japanese financial institutions' business models are more similar to one another. When financial institutions provide homogenous and substitutable financial intermediation services, this is prone to bring about an even fiercer competitive environment for them. In Japan, intensified competition among financial institutions is considered a factor that undermines their business stability on the whole (see Boxes 3 and 6). Therefore, it is necessary for individual regional financial institutions to develop and implement business strategies that utilize their core competence. This includes differentiating the financial intermediation services they offer from those by others through, for example, the

following: the diversification of their profit sources as well as the strengthening of their support for the regional economies and local firms by enhancing financial intermediation capabilities; and the utilization of IT in financial businesses, including FinTech. At the same time, it is important for financial institutions to make efficient use of human resources through means such as operational reforms and to strengthen their sales capacity as well as improve their management efficiency.

Second, financial institutions need to strengthen their ability to respond to risks in areas where they are proactively stepping up their risk taking.

As core profitability has declined, financial institutions have increased their real estate loans and overseas loans with regard to lending, and their risky assets such as investment trusts and foreign bonds with regard to securities investment. Currently, the risks that financial institutions are undertaking remain contained relative to their financial bases. When looking at individual financial institutions, however, some indicate room for improvement in their profitability and risk management frameworks. Many have suffered losses from foreign bond investment as a result of the rise in U.S. interest rates and the increase in dollar funding premiums after the fall of 2016. Moreover, a distinct pattern is evident in the investment behavior of regional financial institutions, in that they accumulate risky assets more actively following an increase in unrealized gains on securities holdings (see Box 5). Thus, caution should be paid in that such procyclical investment behavior dependent on unrealized gains is likely to make financial institutions' profit bases vulnerable to a reversal in market conditions. Appropriate profitability and risk management frameworks are essential for sustainable improvement in profitability through risk taking. In addition, cyber security protection amid the proliferation of IT utilization in financial businesses is another important challenge to be met.

Third, large financial institutions need to respond to their increasing systemic importance.

As part of their medium- to long-term strategy, large financial institutions have been promoting integrated business strategies by group companies, namely, those related to the supply of a wide range of financial services, including active international business expansion such as overseas merger and acquisition activities. These institutions have therefore grown in size as their risk exposures as well as sources of return have become more varied and complex, and have been increasing their influence on macro financial stability and economic activity. Under these circumstances, further action by large financial institutions is more strongly called for. This includes efforts to establish a solid

financial base sufficiently resilient against the accumulation of risks, to strengthen business management frameworks including the utilization of stress testing, to make preparations to respond in an orderly manner in times of stress, and to develop management information systems to deal with increasingly complex risks.

Actions by the Bank of Japan

The Bank of Japan will make the following efforts toward ensuring the stability of the financial system, while providing support to financial institutions in their efforts to meet their challenges.

Through its off-site monitoring and on-site examinations, the Bank will ensure individual financial institutions' soundness and encourage them to deal with the above-mentioned challenges, securing a sound understanding of their business conditions and the accumulation of macro risks. In particular, with regard to the structural decline in profitability among regional financial institutions, the Bank will continue to strengthen its dialogue with relevant institutions, utilizing its off-site monitoring in tandem with its on-site examinations, with the recognition that making efforts to improve profitability is an issue of high importance and urgent priority. This includes implementing not only regular on-site examinations but also new targeted ones, focusing on profitability, and following up on financial institutions' efforts -- to develop and implement their business strategies and conduct operational reforms -- in its off-site monitoring. At seminars for financial institutions, the Bank will also engage in themes that will lead to the strengthening of the financial intermediation function, such as enhancement of their assessments of firms, and themes that will contribute to improvement in financial institutions' profits through enhancing productivity by such means as operational reforms.[38] Through its financial system research, the Bank will make progress in its dialogue with financial institutions, including collaborative research, for further advancement and utilization of stress testing. In addition, the Bank will strengthen its analysis from a macroprudential perspective, bearing in mind developments including the increased interconnectedness of financial institutions (see Box 8).

As part of its efforts to respond to financial globalization, the Bank will strengthen its coordination with overseas central banks and other organizations further, while enhancing its understanding of developments in the overseas financial system. With

[38] The Bank has held various seminars and workshops, with a view to reinforcing financial institutions' support for regions' and industries' drive to enhance their vitality and backing up financial institutions' business management practices. Those held during fiscal 2016 pertained to: (1) support for start-up firms and renewed efforts of firms (support for business revitalization and discontinuance); (2) the advancement of financial technology and management through the utilization of IT; (3) agri-finance; (4) private finance initiatives (PFIs) and public–private partnerships (PPPs).

regard to international financial regulations, the Bank will contribute proactively to international discussions on topics including the implementation of regulations and the assessment of their effects, with a view to striking a fine balance between the financial system's resilience and its smooth functioning. As for measures related to transaction activities, the Bank will act to ensure financial system stability, including by demonstrating its lender-of-last-resort function when deemed appropriate.[39] In the context of the above measures, the Bank will continue with appropriate efforts to engage in coordination with relevant authorities, particularly the Financial Services Agency.[40]

The following are areas that the Bank will give priority to in carrying out its off-site monitoring and on-site examinations, in securing a sound understanding of the actual situation and exchanging views with financial institutions.

(1) Regional financial institutions' profitability: awareness of issues taking into account the medium-term outlook for the regional economies and their own business bases; measures aimed toward strengthening profitability (sales strategies, and management-enhancing measures including operational reforms; the development of financial tools and risk management frameworks to support their efforts to enhance the vitality of regions and firms (efforts to support start-up firms, investment and lending to growth areas, business revitalization, succession of businesses, financing of PPPs, and support for firms' core business, such as business matching).

(2) Financial institutions' ALM and investment in markets: investment policies for securities investment under the low interest rate environment; understanding risk profiles, for example a multidimensional understanding of risks related to each individual risk factor, in a timely and appropriate manner; scenario analysis; formulating practical responses to possible changes in market conditions; pricing and volume strategies of domestic deposits and loans.

(3) Financial institutions' credit management: management framework for areas of credit extension posting high growth (in particular, real estate-related lending and

[39] The Bank has a lender-of-last-resort function with regard to both collateralized and uncollateralized yen funds. Moreover, it stands ready to extend loans in U.S. dollars in case of an emergency, by utilizing its foreign currency-denominated assets. Following the bilateral local currency swap arrangement signed with the Reserve Bank of Australia in March 2016, in November 2016 the Bank signed a bilateral local currency swap arrangement with the Monetary Authority of Singapore, additionally establishing provisions that allow for the extension of loans in Singaporean dollars in an emergency situation. These provisions contribute to financial system stability by serving as a liquidity backstop in case of a critical situation.

[40] As an example of coordination, the guideline for supervision by the Financial Services Agency, which was revised in March 2017, states that any future change in the level of the countercyclical capital buffer will be decided upon consultation with the Bank.

investment, including loans to firms in the housing rental business and fund investment, as well as M&A-related loans); management framework for areas of credit extension whose risk characteristics differ from those of regular loans (e.g., hybrid loans and consumer loans).

(4) Financial institutions' international operations: business and hub strategies by country and region as well as currency; the investment and funding structure, as well as the situation regarding customer and business bases; credit risk management, including large exposure concentration and country risk; management framework for foreign currency liquidity, including local currencies; efforts toward buttressing the stable foreign currency funding base; effectiveness of contingency plans regarding foreign currency liquidity; profitability management framework for foreign currency-denominated assets that takes developments in foreign currency funding costs into account, etc.

(5) Systemic-risk characteristics of large financial institutions: governance and business management structure of group companies as a whole (including risk appetite frameworks) and developments in as well as utilization of management information systems; implementation of stress testing associated with financial institutions' capital levels, profits, and liquidity and its application to business; effectiveness of recovery plans and contingency plans; capital policy and plans for securing liquidity; responses to international financial regulations; understanding the actual situation regarding overseas branches, subsidiaries, and related firms, etc. With regard to stress testing, the Bank will make comparisons between financial institutions' results with the test results based on its own model, as well as conduct further analyses. It will also deepen discussions on practical handling, for example, the development of stress test scenarios, the enhancement of the required database, and models used for stress testing, focusing on the specific topics.

(6) Financial institutions' utilization of IT: strategies utilizing FinTech as well as developments in its implementation and utilization; management framework for cyber security; system development plans and process management; IT governance of the above, etc.

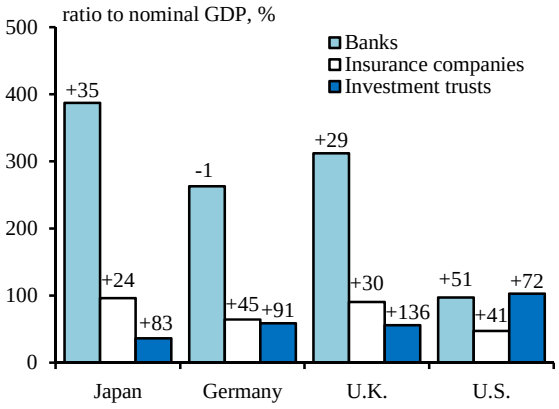
(7) Other areas: (i) business plans for "households' moves to diversify their asset portfolios" among financial institutions and securities firms as well as developments in their sales of financial products; (ii) market-related businesses conducted by financial institutions and securities firms (market making, management of related risks, etc.); (iii) study of the governance structure of foreign G-SIFIs' Japanese

branches within their group (effects of an assumed stress situation of the group as a whole particularly on the Japanese branches as well as responses taken, management of yen liquidity of the group as a whole, and the role of Japanese branches in their groups' reconstruction plans); (iv) developments in asset management and product supply among nonbanks including life insurance companies under the low interest rate environment, etc.

Box 1: International comparison of life insurance companies' balance sheets

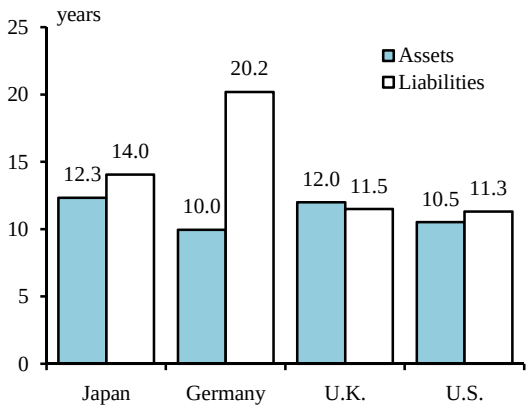
The amount of assets held in the insurance sector is relatively small compared to the banking sector. Nevertheless, insurance sector assets have expanded in recent years, as have assets held by investment trusts, and the presence of the insurance sector in financial markets has increased (Chart B1-1). Life insurance companies invest in long-term assets in order to fulfill long-term insurance contracts. While this feature is common, the composition of the insurance products they provide and the financial instruments they hold vary across countries, leading to differences in the duration of assets and liabilities (Chart B1-2).[41]

Chart B1-1: Financial assets among financial intermediaries[1,2]



Notes: *1*. Latest data as at end-December 2016 for Japan and the U.S., end-September 2016 for Germany, and end-December 2015 for the U.K.
2. Figures in the chart show changes in outstanding financial assets for the past 10 years (%).
Sources: BOE; Bundesbank; FRB; IMF; ONS; BOJ.

Chart B1-2: Duration of assets and liabilities among life insurance companies[1]

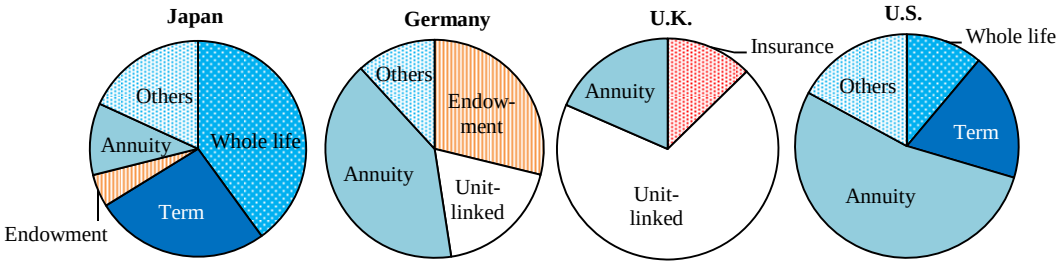


Note: *1*. Data as at end-March 2016 for Japan, end-December 2015 for the U.S., and end-December 2013 for Germany and the U.K. Data for Japan include four major life insurance companies. The duration of liabilities for Japan is estimated by the BOJ.
Sources: ACLI; EIOPA; Moody's; Published accounts of each company.

First, with regard to liabilities, in Germany and Japan, insurance policies with long contract periods, such as endowment insurance and whole life insurance products, make up a large proportion, lengthening the duration of liabilities (Chart B1-3). In Germany, against the background of low and stable inflation since World War II as well as prolonged tax incentives and subsidies, long-term endowment insurance products and individual pension products with guaranteed yields have become widely accepted as a means of asset formation. In Japan, reflecting the fact that many products are provided on the premise of one-breadwinner households, death-benefit insurance products such as whole life insurance for the household head account for a substantial share.

[41] For details, see Kazuaki Washimi, Hiroki Inaba, and Kei Imakubo, "International Comparison of Life Insurers -- Balance-Sheet Differences and Their Financial Stability Implications --," Bank of Japan Review, No. 17-E-2, April 2017.

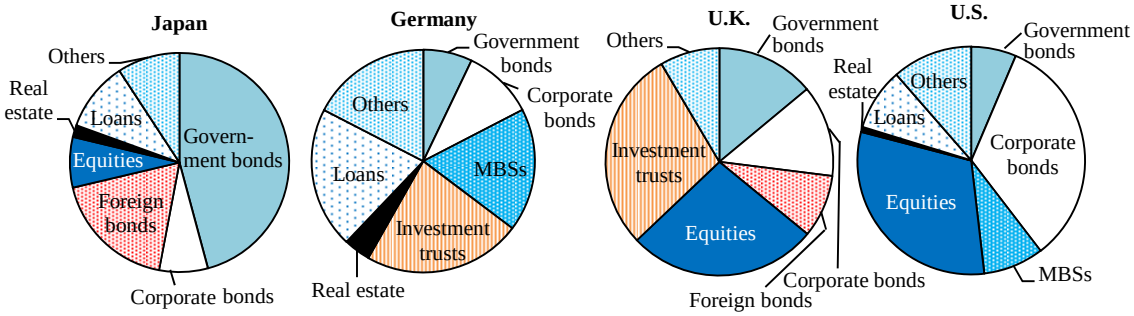
Chart B1-3: Breakdown of insurance products among life insurance companies[1]



Note: *1*. Data as at end-March 2016 for Japan, end-December 2015 for Germany and the U.S., and end-December 2012 for the U.K. Excludes group insurance and group annuity. Data for Japan are based on amount of policies in force, while others are based on insurance premium.
Sources: ABI; ACLI; GDV; LIMRA; The Life Insurance Association of Japan.

In contrast, in the United States and the United Kingdom, death-benefit insurance products with long contract periods are rare and, instead, variable insurance policies are common, such as variable annuities in the United States and unit-linked policies in the United Kingdom. Unit-linked policies with a low guaranteed interest rate are similar to investment trusts, and in recent years have been spreading rapidly throughout Germany as well. Variable insurance products differ from fixed-amount insurance products -- where the insurance company is responsible for managing the investment risk -- in that insurance payouts and surrender refunds fluctuate depending on investment performance and it is therefore the policyholders that assume the investment risk.

Chart B1-4: Breakdown of investment portfolio among life insurance companies[1]



Note: *1*. Data as at end-March 2016 for Japan, end-December 2015 for Germany and the U.S., and end-December 2014 for the U.K. Data for Japan and the U.S. are the sum of general account and separate account, while those for Germany and the U.K. are total account including unit-linked.
Sources: ACLI; GDV; ONS; The Life Insurance Association of Japan.

The asset portfolios in which insurance premiums are invested also differ across countries reflecting the composition of insurance products provided and the structure of financial markets in the different countries (Chart B1-4). Japanese life insurance companies used to invest mainly in super-long-term government bonds in order to achieve targeted investment yields and match the duration of assets and liabilities, but the share of investment in foreign bonds has increased sharply in recent years (Chart III-2-2). Another feature of Japanese life insurance companies is that the share of investment trusts and

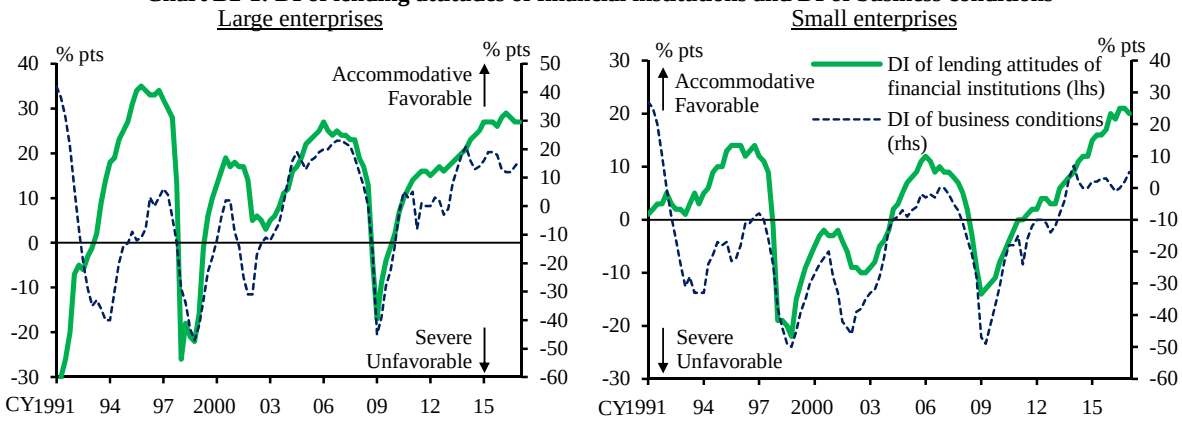
corporate bonds in their asset portfolios is relatively small. In the United States, life insurance companies invest mainly in domestic corporate bonds, in which there is a thick market. Meanwhile, a feature of German and U.K. life insurance companies is that the share of investment trusts in their asset portfolios is relatively high compared to their Japanese and U.S. counterparts.

Amid the prolonged low interest rate environment worldwide, life insurance companies in all countries are stepping up their search for yield, but the degree of the resulting potential vulnerabilities of the financial system differs depending on the insurance products provided by life insurance companies and the composition of investment assets. In Germany and the United Kingdom, links between the insurance market and investment trusts are strengthening as a result of the increased exposure of life insurance companies to investment trusts through the increase in unit-linked insurance products. This carries the risk that market turmoil will be amplified due to asset sales by insurance companies and asset managers of investment trusts if, for instance, a concentrated cancellation of insurance contracts and investment trusts is triggered by the heightening of a risk that a loss of principal of investment trusts, including an increase in losses due to an interest rate hike, will occur. Similarly, in the United States, links between insurance companies and investment trusts have been strengthening through the corporate bond market, which could affect the investment behavior of insurance companies if a concentration of cancellations in open-ended investment trusts leads to a fire sale of corporate bonds. Meanwhile, because in Japan the share of currency-hedged foreign bonds in asset portfolios has been increasing, life insurance companies could easily be affected by turmoil in global financial markets through the foreign exchange swap market (Chart III-2-4). In recent years, overseas nonbanks -- such as sovereign wealth funds (SWFs), foreign exchange reserves in emerging economies, and investment trusts -- have increased their presence as suppliers of U.S. dollars in the foreign exchange swap market. If these nonbanks restrict the supply of dollars at a time of market stress, this will lead to an increase in hedging costs, thereby affecting the profits of life insurance companies and their investment behavior.

Box 2: The link between financial institutions' lending attitudes and firms' business conditions

Firms' diffusion index (DI) of business conditions and firms' DI of the lending attitudes of financial institutions in the Bank of Japan's *Tankan* (Short-Term Economic Survey of Enterprises in Japan) reveal a positive correlation in the long run (Chart B2-1).

Chart B2-1: DI of lending attitudes of financial institutions and DI of business conditions[1]



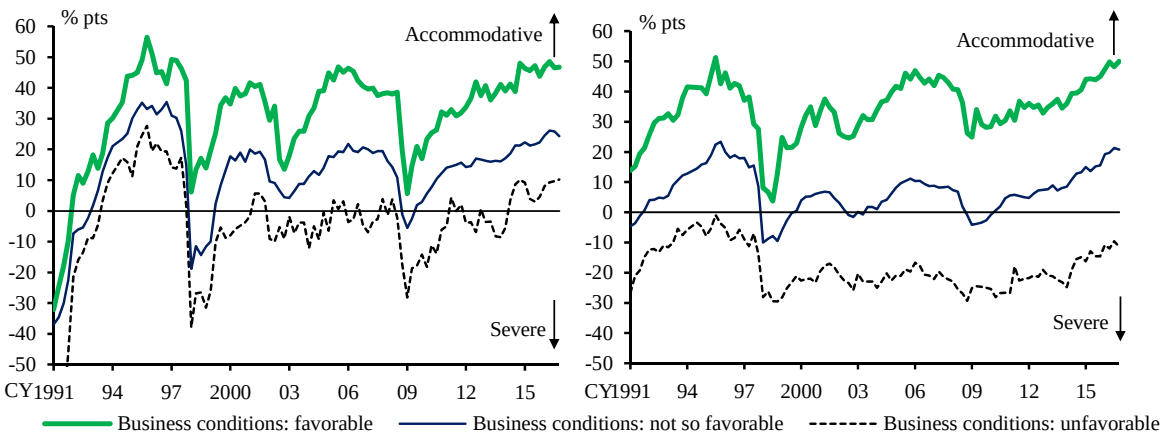
Note: *1*. Includes all industries. Latest data as at March 2017.
Source: BOJ, "*Tankan*."

This positive correlation reflects the reciprocal causal link between the two: (1) if firms' business conditions improve, financial institutions' lending attitude "passively" becomes more accommodative in response, and (2) the financial institutions' "active" change to a more accommodative lending attitude in turn helps to improve firms' business conditions. As will be seen below, financial institutions take a relatively severe lending attitude toward firms whose business conditions are unfavorable, while they take an accommodative attitude toward firms whose business conditions are favorable. Therefore, if the proportion of firms with favorable business conditions increases due to an improvement in the external environment such as economic recovery, the DI of the lending attitudes of financial institutions in the *Tankan* will improve, even if financial institutions have not changed their lending attitude "actively." Consequently, in order to correctly assess financial institutions' "active" changes in lending attitudes, it is necessary to adjust for changes in the proportion of firms with each business condition. To this end, using microdata from the *Tankan*, we classify firms into three categories in terms of their business conditions (favorable, not so favorable, and unfavorable) and calculate the DI of financial institutions' lending attitudes for each category (Chart B2-2).

The results indicate that financial institutions' lending attitudes differ depending on firms' business conditions. In addition, with regard to firm size, the following two characteristics can be observed:

- Taking the average for the sample period, financial institutions' lending attitude toward firms with favorable business conditions does not differ substantially depending on firm size: the average for large firms is plus 32, while that for small firms is plus 34. On the other hand, the lending attitude toward firms with unfavorable business conditions is more severe for small firms than for large firms: the average for large firms is minus 4, while that for small firms is minus 18. The likely reason is that even if the assessment of business conditions of large firms and small firms is the same, i.e., unfavorable, the level of uncertainty with regard to firms' financial conditions and earnings outlook differs between the two groups, and thus the evaluation of their creditworthiness also differs.

Chart B2-2: DI of lending attitudes of financial institutions by business condition[1,2]



Notes: *1*. Includes all industries. Latest data as at December 2016.
2. The DIs are calculated by subtracting the share of firms whose response to the question related to lending attitudes is "1: accommodative" from those that choose "3: severe." The shares are calculated relative to the total number of enterprises reporting the same business conditions.
Source: BOJ.

- At times of financial stress (i.e., the bursting of the bubble in the early 1990s, the financial crisis in 1997-1999, and the Lehman shock in 2008), financial institutions' lending attitude toward large firms tends to quickly become severe regardless of their business conditions.[42] On the other hand, the extent to which their lending attitude toward small firms deteriorates at times of financial stress is smaller than that for large firms. Small firms usually cannot raise funds in financial markets and do not tend to have ample internal funds; therefore, if financial institutions were to squeeze

[42] There may be a gap in perception between banks and firms regarding this point. Results of the *Senior Loan Officer Opinion Survey on Bank Lending Practices at Large Japanese Banks* -- which reflects banks' self-perceived lending attitude -- suggest that banks' lending attitude toward large firms during the Lehman shock did not tighten as much as is indicated in the *Tankan*, a survey that reflects firms' perception of banks' lending attitude. During the Lehman shock, banks may have sought to provide liquidity to their maximum capacity, as seen in the increase in loans extended to large firms. Nevertheless, large firms that feared liquidity shortages and were unable to secure a sufficient amount of funds at the time may have perceived banks' lending attitude to be more severe.

lending to them at times of stress, the probability of default for many small firms would increase, which would lead to an increase in financial institutions' credit costs. For this reason, financial institutions with sufficient financial strength will not drastically squeeze lending to small firms at times of stress.[43]

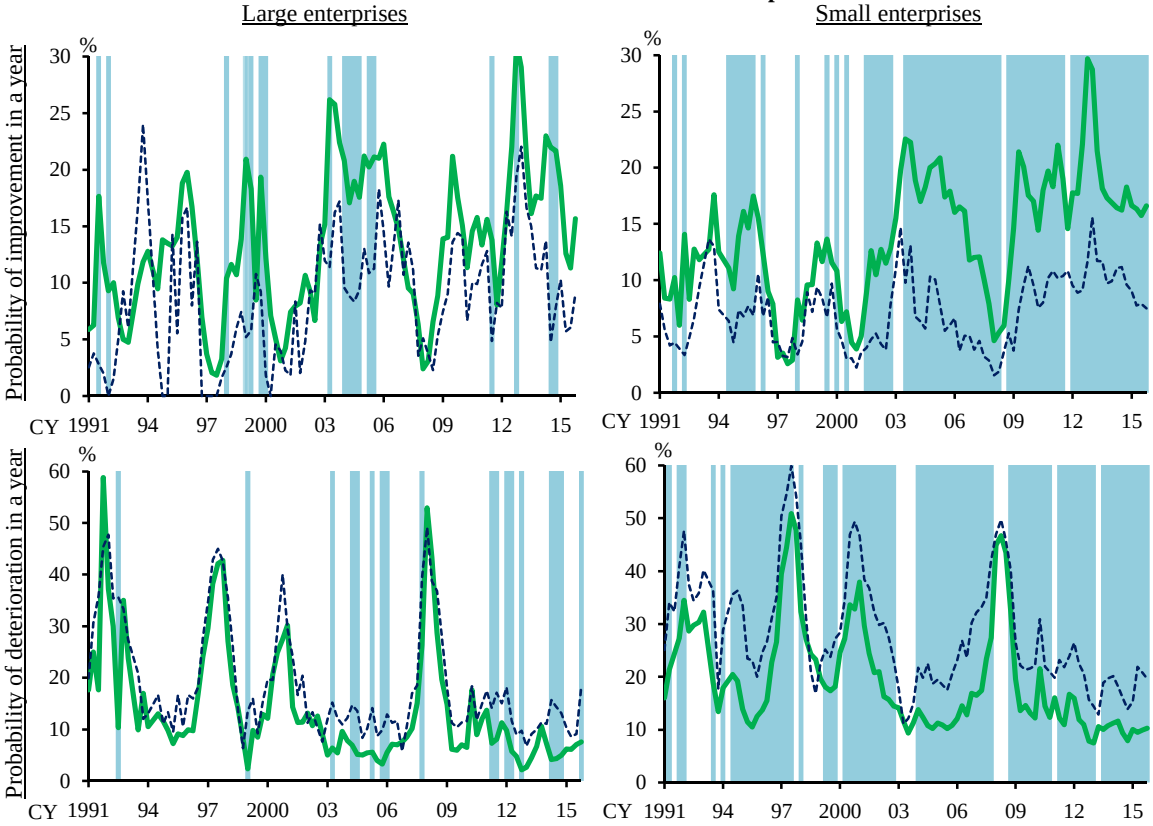
The next issue is how financial institutions' "active" changes in lending attitudes affect firms' business conditions. Specifically, focusing on firms whose current business conditions are "not so favorable," we examine whether the transition probabilities with regard to firms' business conditions a year later differ significantly depending on whether financial institutions' lending attitude is "accommodative" or "severe" (Chart B2-3).[44]

The results indicate that, when financial institutions' lending attitude in the current period is "accommodative" rather than "severe," the probability that firms' business conditions will improve a year later tends to be higher and the probability that they will deteriorate tends to be lower. However, whereas for large firms there are few periods in which the difference in transition probabilities is statistically significant, for small firms it is statistically significant in almost all periods. That is, financial institutions' lending attitude does not have a significant effect on business conditions of large firms, which have ample internal funds and have alternative means of funding such as directly accessing capital markets. On the other hand, for small firms, which do not have ample internal funds and lack means of funding other than loans, financial institutions' lending attitude does have a significant effect. Moreover, the results may be also driven partly by the possibility that financial institutions have expertise in identifying the small firms that have the potential to improve their business conditions and proactively extend loans to them. Thus, the shift of financial institutions toward a more accommodative lending attitude can be expected to support the business sentiment of firms, small firms in particular, going forward.

[43] In addition, during the Lehman shock, government support measures, such as the Emergency Guarantee Program and the Act Concerning Temporary Measures to Facilitate Financing for Small and Medium-Sized Enterprises, may have alleviated the tightening of financial institutions' lending attitude toward small firms.

[44] Given that individual firms are given three options to choose from with regard to their business conditions -- "1: favorable," "2: not so favorable," and "3: unfavorable" -- transition patterns can be represented as follows. Improvement in business conditions would follow the pattern of either "2→1" or "3→2 or 1." Similarly, deterioration would follow the pattern of either "2→3" or "1→2 or 3." The transition probabilities displayed in this box focus on cases where firms' current business conditions fall under "2." That said, the results remain unchanged even when other transition probabilities are used.

Chart B2-3: Business conditions' transition probabilities[1,2,3]



Notes: *1*. Includes all industries. Latest data as at December 2015.
2. Indicates probabilities of improvement and deterioration in business conditions, which are calculated relative to the total number of firms whose response to the question related to business conditions are "2: not so favorable." The top charts indicate the probabilities of transition to "1: favorable," while the bottom charts indicate probabilities of transition to "3: unfavorable."
3. Shaded areas indicate periods in which probabilities of improvement (deterioration) for enterprises judging financial institutions' lending attitude as "accommodative" are significantly higher (lower) than probabilities for those who choose "severe" (one-sided test, statistical significance at 5 percent levels).
Source: BOJ.

Box 3: Intensified competition among regional financial institutions and its background

One of the major factors underlying the increasingly active bank lending in recent years is the intensification of competition among banks (Chart III-5-5). This box provides a quantitative analysis of competition among Japanese banks from a long-term perspective and examines the reasons for the change in the competitive environment.

According to microeconomic theory, the market power of a firm can be defined in terms of the price elasticity of demand for the goods the firm provides. If the price elasticity of demand is low -- in other words, demand does not decrease much when a firm raises the price -- the firm has strong market power. On the other hand, if the price elasticity of demand is very high as in perfect competition -- meaning that if a firm raises the price, demand will decrease significantly as customers immediately shift to other firms -- the firm has no market power. The market power of a firm, which depends on the price elasticity of demand, is generally defined as the markup ($P - MC$) a firm can charge, that is, the difference between the marginal cost (MC) and the price (P) of the product.[45] Firms that have market power and maintain a competitive advantage can charge large markups, while firms that have no market power and are exposed to severe competition can only charge small markups.

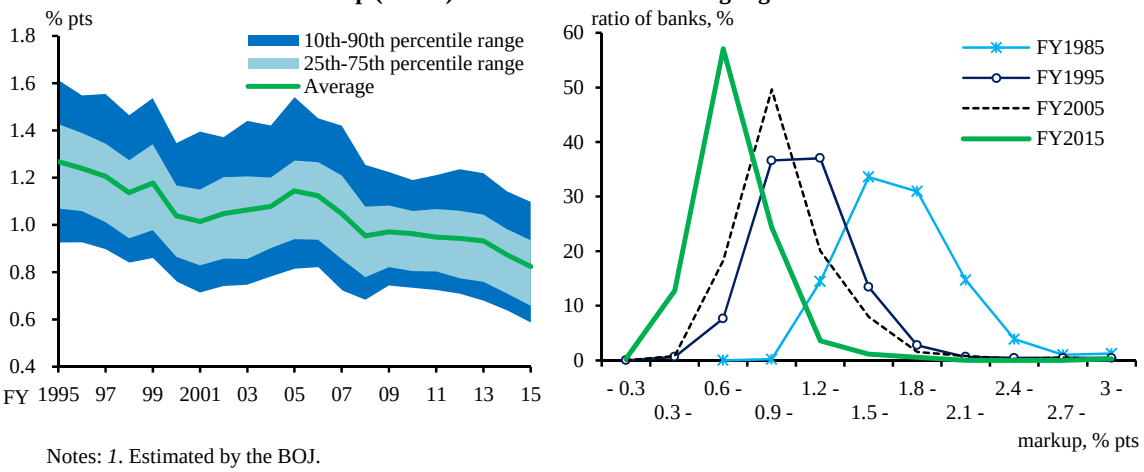
This box presents the estimation results of markups ($P - MC$) charged by regional financial institutions, which are likely to be affected by such structural factors as population decline. For the estimation, the ratio of operating income to total assets is used to represent the price (P) of financial intermediation services provided by banks. Marginal costs (MC) are calculated based on panel estimates of individual banks' cost function.[46] The estimation results show that measured markups have been declining over the long

[45] One indicator used to measure market power is the Lerner index (Abraham P. Lerner, "The Concept of Monopoly and the Measurement of Monopoly Power," The Review of Economic Studies, Vol. 1, No. 3, June 1934). The Lerner index is typically defined as $(P - MC)/P$, but in a low interest rate environment the indicator will tend to rise as the denominator P declines, even if there is no change in banks' market power. Therefore, in this box, to correct this bias, $P - MC$ is used as the competition index instead. It should be noted that $P - MC$ is the elasticity-adjusted Lerner index assuming a semi-log-linear demand function for financial intermediation services. For details, see: David Genesove and Wallace P. Mullin, "Testing Static Oligopoly Models: Conduct and Cost in the Sugar Industry, 1890-1914," The RAND Journal of Economics, Vol. 29, No. 2, 1998.

[46] Specifically, a translog cost function with three factors of production (labor, funds, and fixed capital) is estimated with panel data (including fixed effects and time dummies). The estimation period is fiscal 1982 to fiscal 2015. Merged financial institutions are treated in the estimation by regarding the entities before and after the merger as separate financial institutions. There are 633 financial institutions in the estimation.

term, confirming that competition among financial institutions is intensifying (Chart B3-1).

Chart B3-1: Markup (P-MC) and its distribution among regional financial institutions[1,2]



Notes: *1*. Estimated by the BOJ.
2. Includes regional banks and *shinkin* banks.

Potential factors underlying the intensified competition, for example, are the following:

- *The rate of population change in a financial institution's business area*: If demand for financial intermediation services declines as a result of population decline, competition will increase as financial institutions seek to retain customers by lowering prices in order to maintain profits. It is likely that this effect will be larger for financial institutions operating in provincial areas, where populations are declining at a faster rate.

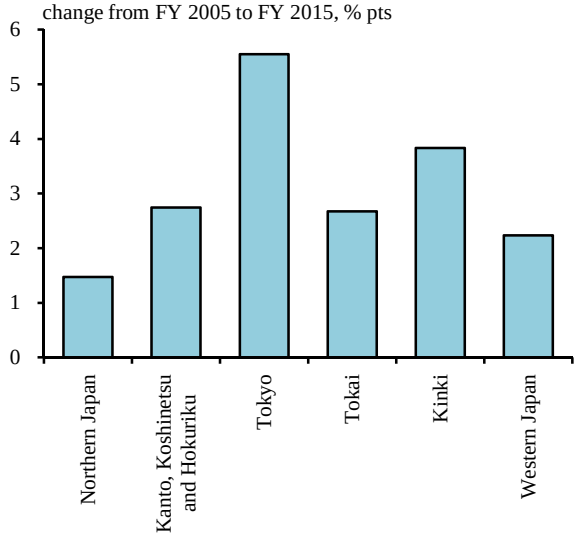
- *The number of competing branches of financial institutions*: The more competing branches providing similar financial intermediation services there are, the more financial institutions need to worry about customers leaving for competing financial institutions and the more cautious they will be about raising prices. Looking at the rate of increase in the number of competing branches per capita in each financial institution's business area, this is higher in metropolitan areas than in provincial areas (Chart B3-2). The reason is that, faced with a declining population, financial institutions in provincial areas have been opening new branches in metropolitan areas with larger populations.

- *Financial institutions' ratio of securities to deposits*: The cost to produce information about the credit risk of investment in securities, mainly composed of government bonds as safe assets, is lower than in the case of loans, which require more information production on credit risk, so that returns on investment in securities are lower than returns on loans. For this reason, financial institutions with a high ratio of securities to deposits will aim to increase loans, which have a comparatively high profit margin, by lowering interest rates, thus increasing competition. In general, in

regions with a large share of the elderly population, it is relatively easy to attract deposits, while demand for housing loans is small, so that the ratio of securities to deposits of financial institutions in such regions tends to be large.

- *Term spreads*: When term spreads tighten mainly as a result of monetary easing, the attractiveness of investing in JGBs declines, so that financial institutions will lower interest rates in order to further increase their lending, thereby increasing competition.

Chart B3-2: Changes in the number of competitors' branches by region[1,2,3]



Notes: *1*. Estimated by the BOJ.
2. Includes regional banks and *shinkin* banks. The figure shows the change over the past 10 years in the ratio between the number of competitors' branches and the population of each respective financial institution's operating area.
3. "Kanto, Koshinetsu and Hokuriku" excludes Tokyo. "Western Japan" excludes Kinki.

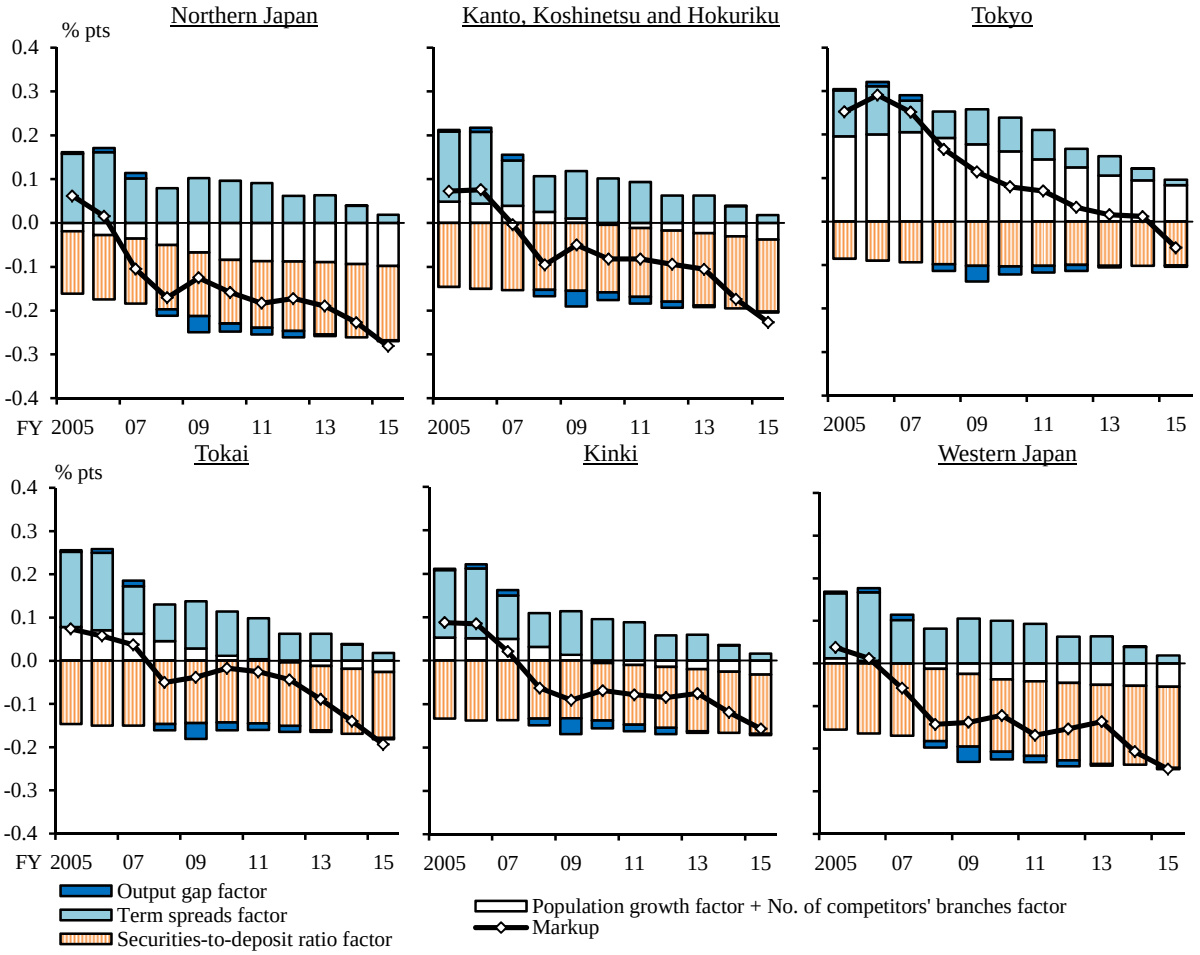
The extent to which these factors affect regional financial institutions' markups is examined using panel estimation focusing on regional banks and *shinkin* banks.[47] In order to take the cyclicality of markups into account in the estimation, the output gap is included in the explanatory variables.[48] While not shown here due to space constraints, the estimation results indicate that all explanatory variables have the expected signs and are statistically significant. Decomposition of changes in regional financial institutions' markups based on the estimation results shows that in both metropolitan and provincial

[47] The panel estimation includes fixed effects. The estimation period is fiscal 2005 to fiscal 2015. Merged financial institutions are treated in the estimation by regarding the entities before and after the merger as separate financial institutions. There are 407 financial institutions in the estimation. With regard to explanatory variables, a term spread is adjusted to the interaction term of the term spread and each financial institution's ratio of securities to deposits.

[48] Markups will be countercyclical if, during recessionary phases, financial institutions increase interest margins on loans to firms facing cash flow issues. Conversely, markups will be procyclical if, in recessionary phases, financial institutions facing a decline in borrowing demand proactively lower loan interest rates in order to maintain their loan outstanding. The estimation results here indicate that financial institutions' markups are procyclical.

areas, population decline and the increase in the number of competing branches, as well as the tightening of term spreads, contributed to pushing down markups (Chart B3-3).

Chart B3-3: Factor decomposition of markup (P-MC) among financial institutions by region[1,2,3,4]



Notes: *1*. Estimated by the BOJ.
2. Includes regional banks and *shinkin* banks that have not been involved in any mergers from fiscal 2000 onward.
3. Markup (P-MC) excluding fixed effects is the average for financial institutions in each region.
4. "Kanto, Koshinetsu and Hokuriku" excludes Tokyo. "Western Japan" excludes Kinki.

While monetary policy has recently depressed regional financial institutions' markups, it helps to improve business sentiment by encouraging proactive lending, and the downward pressure it exerts on margins will diminish once interest rates start to be normalized in the future (see Box 2). However, since population decline is expected to continue, the competitive environment that financial institutions will face could be even fiercer if there is no change in the number of competing financial institutions. It should be noted that because the services that Japanese financial institutions provide can easily be substituted by one another, competition is prone to intensify. In fact, looking at the distribution of regional financial institutions' markups, the median has declined and the variance has been shrinking, suggesting that financial intermediation services provided by financial institutions are becoming more homogeneous (Chart B3-1). In order for financial

institutions to improve their profitability, mergers and consolidations are one option, but what is important is for individual financial institutions to develop and implement business strategies that utilize their core competence, such as differentiation of their financial intermediation services.

Box 4: Regional banks' real estate loans

In recent years, regional banks have increased their real estate loans, especially to the housing rental business. Employing panel estimation, this box examines whether this increase in regional banks' real estate loans is consistent with economic conditions. Specifically, regional banks' real estate loans outstanding are used as the dependent variable, while the following explanatory variables are employed to represent economic conditions that affect loan demand:

- *Number of households in each region (number of households in the prefecture where a regional bank is headquartered)*: Demand for rental apartments varies depending on the number of households in each region.
- *Business conditions in each region (the active job openings-to-applicants ratio in the prefecture where a regional bank is headquartered)*: Improvement in business conditions strengthens construction demand particularly for office buildings, retail and logistics facilities, hotels, and apartments, and leads to an increase in demand for real estate investment as households' income situation improves.
- *Land prices in each region (land prices in the prefecture where a regional bank is headquartered)*: In addition to spurring a rise in demand for real estate investment, an increase in land prices also leads to an increase in the amount of funds needed to acquire land.
- *Long-term interest rates*: If the funding environment improves through a decline in interest rates, real estate investment activity picks up.

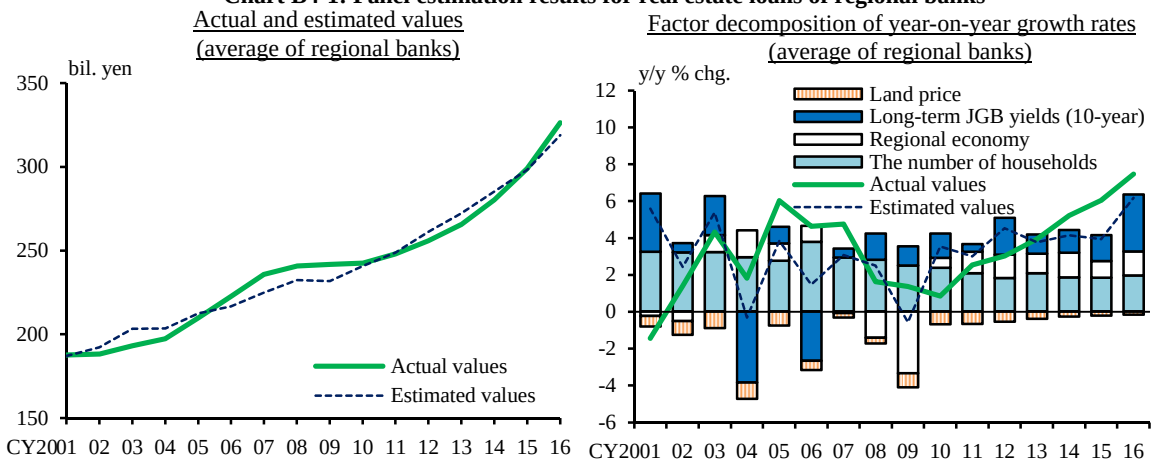
The estimation results (not shown to conserve space) indicate that all explanatory variables are statistically significant and have the expected signs.[49] Decomposing the developments in regional banks' real estate loans based on the results of the panel estimation shows that in recent years, while growth in the number of households has slowed, the improvement in regional business conditions and the decline in interest rates have made the largest contribution to the increase in lending (Chart B4-1). However, in recent years, the amount outstanding of real estate loans has been deviating upward from the level that can be explained by the economic conditions.[50] The distribution of regional banks in terms of the deviation rate indicates that the average has been higher than the median in recent years, suggesting that some regional banks have increased their real

[49] The sample period is from 1999 to 2016. The sample includes 104 regional banks for which data for the entire observation period are available. The panel estimation includes fixed effects.

[50] Such deviation is partly attributable to the growing need for tax reduction following the inheritance tax reform in January 2015.

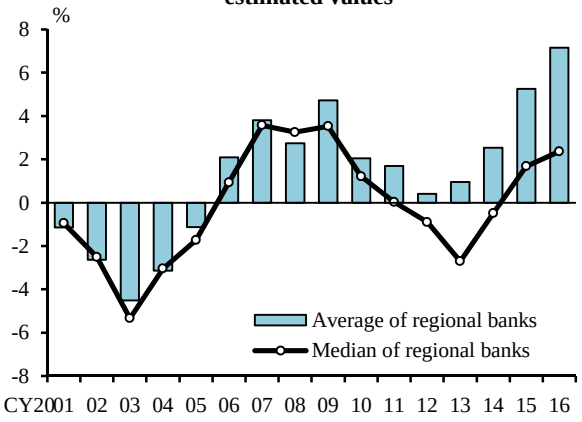
estate loans by considerably more than the economic conditions would warrant (Charts B4-2 and B4-3). Aggregating the deviation at the prefectural level based on where regional banks are headquartered, the deviation rates for Kyushu and some other regions indicate a large upward deviation (Chart B4-4).

Chart B4-1: Panel estimation results for real estate loans of regional banks[1]



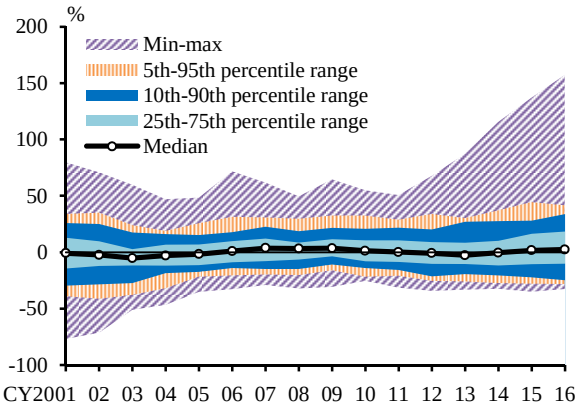
Note: *1*. Estimated by the BOJ.

Chart B4-2: Deviation between actual and estimated values[1]



Note: *1*. Estimated by the BOJ.

Chart B4-3: Distribution of deviation from estimated values by bank[1]

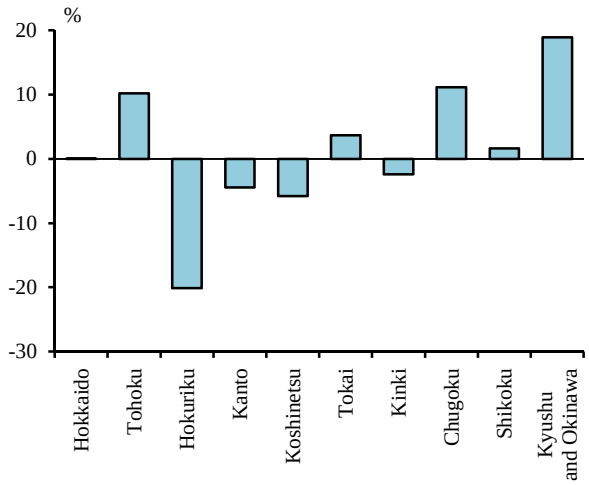


Note: *1*. Estimated by the BOJ.

At regional banks with significant growth in real estate loans, a large share of that growth is accounted for by lending to the housing rental business, and some concerns over a slackening of the rental housing market have begun to be expressed.[51] Given this, regional financial institutions need to improve their credit management through, for example, the examination of income and expenditure plans at the initial screening and the appropriate interim management of loans including the close monitoring of supply and demand developments in regional rental housing markets.

[51] On this point, see Bank of Japan, "Regional Economic Report," January 2017 (full report available in Japanese only).

Chart B4-4: Deviation from estimated values by region (as at end-September 2016)[1]

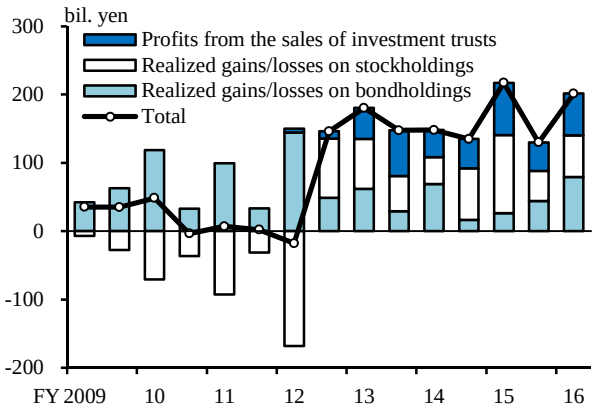


Note: *1*. Estimated by the BOJ.

Box 5: Regional banks' unrealized gains/losses on securities holdings and realization of gains from the sale of securities

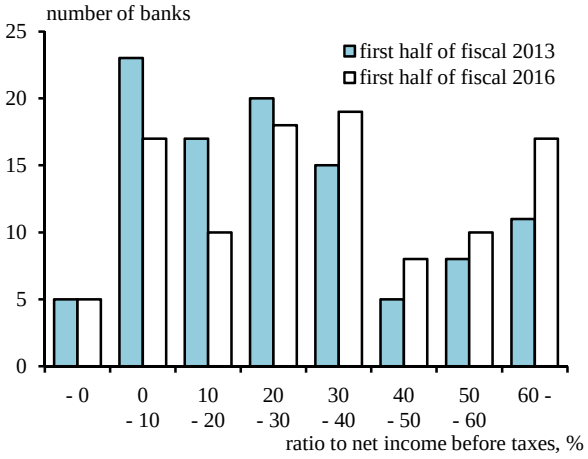
In recent years, regional banks have posted substantial profits on the sale of securities, and with the profitability of domestic deposit-taking and lending activities -- their core business -- declining, the share of realized gains from the sale of securities in their net income has increased (Charts B5-1 and B5-2).

Chart B5-1: Realized gains/losses on securities holdings, etc. among regional banks[1,2]



Notes: *1*. Latest data as at the first half of fiscal 2016.
2. Pre-fiscal 2012 data do not include profits from the sales of investment trusts.
Source: BOJ.

Chart B5-2: Distribution of ratio of realized gains/losses on securities holdings, etc. to net income among regional banks[1,2]



Notes: *1*. Includes 104 regional banks whose net income before taxes is not negative.
2. Realized gains/losses on securities holdings, etc. include profits from the sales of investment trusts which are booked as interest and dividends on securities.
Source: BOJ.

In order to examine regional banks' motives for selling securities, the following panel estimation is conducted.

$$(\text{Ratio of realized gains/losses on securities holdings to total assets})_{i,t}$$
$$= \lambda \cdot (\text{Deviation of profits before realization of gains from profit target})_{i,t} + \text{Constant},$$

where *i* denotes each regional bank and *t* represents each fiscal year.[52] The dependent variable is the ratio of the aggregate of realized gains/losses on bondholdings and profits from the sale of investment trusts (hereafter, "gains/losses on bondholdings and investment trusts") to total assets, and represents the size of realized gains.[53] The

[52] The sample period is from fiscal 2012 to fiscal 2015, and the sample includes 105 regional banks. The estimation includes time effects.

[53] A breakdown of realized gains/losses on securities holdings shows that a fairly large proportion of those gains/losses is accounted for by gains/losses on stockholdings, but because the majority of the stocks held by banks are strategic holdings with some constraint on their sale, transactions in stocks

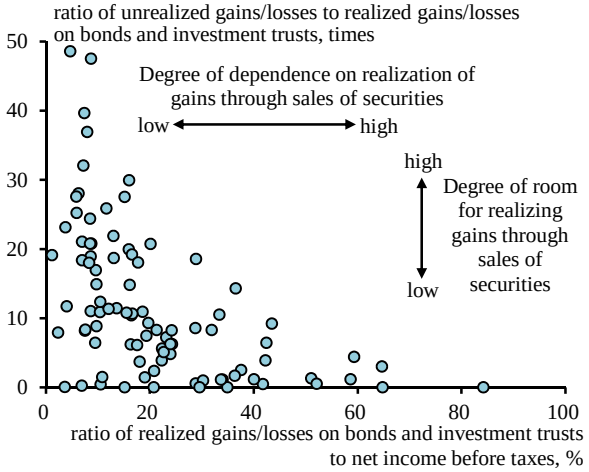
explanatory variable is the deviation between return on assets (ROA) based on pre-tax net income excluding gains/losses on bondholdings and investment trusts and the profit target (the average of pre-tax net income ROA over the past 3 years). The parameter λ shows the extent to which a bank relies on realization of gains relative to the deviation from the profit target, and we postulate that λ depends on (1) the sign (±) of the result of a profit calculation (profits before realization of gains minus profit target) and (2) room for realizing gains through sales of securities (i.e., the amount of unrealized gains on securities holdings).[54]

Chart B5-3: Estimation results (estimated value of λ)[1,2]

		Profits before realization of gains - profit target	
		Negative	Positive
Room for realizing gains through sales of securities	High	-0.45 ***	-0.29 ***
	Low	-0.25 ***	-0.09 **

Notes: *1*. Estimated by the BOJ.
2. *** and ** indicate statistical significance at 1 percent and 5 percent levels, respectively.

Chart B5-4: Dependence on realization of gains and room for realizing gains[1,2]



Notes: *1*. Includes regional banks except for those whose ratio of unrealized gains/losses to realized gains/losses on bonds and investment trusts is more than 50 times.
2. Unrealized gains/losses on bonds and investment trusts (net basis) are as at the end of the first half of fiscal 2016, and the value is treated as zero if it is negative. Figures for realized gains/losses on bonds and investment trusts, and net income before taxes are averages for the period from fiscal 2013 through the first half of fiscal 2016.
Source: BOJ.

---

are not included in the dependent variable. However, the conclusion remains unchanged when including stocks.

[54] Specifically, λ is represented by the following equation:

$$\lambda = \alpha + \beta DUM^1_{i,t} + \gamma DUM^2_{i,t},$$

where $DUM^1_{i,t}$ is a dummy variable for the sign of the result of the profit calculation (profits before realization of gains minus profit target), which takes a value of 0 if the sign is positive and 1 if the sign is negative. $DUM^2_{i,t}$ is a dummy variable for room for realizing gains, which takes a value of 0 if the outstanding amount of unrealized gains/losses on bondholdings and investment trusts (relative to total assets) at the start of the period is larger than the median of the sample and 1 if it is smaller than the median.

The estimation results show the following (Chart B5-3). First, when the sign of the result of the profit calculation (profits before realization of gains minus profit target) is negative, λ takes a large negative value; that is, banks that do not reach their profit target without realization of gains actively realize gains through sales of securities. Second, for banks with little room for realizing gains, λ takes a small negative value; that is, such banks are reluctant to realize gains even if they have not reached their profit target.

Looking at regional banks' room for realizing gains individually, the higher a bank's dependence on realization of gains relative to net income, the less room it has for continuing to realize gains (Chart B5-4).

Based on the regulations on capital adequacy ratios, unrealized gains/losses on securities holdings are not included in capital with regard to domestic banks, but in a sense function as a capital buffer on an economic value basis. Since the amount of financial institutions' capital affects their risk-taking stance, the size of unrealized gains/losses on securities may also affect banks' risk taking.[55] The following panel estimation is conducted to examine this point.[56]

$$\Delta(\text{Ratio of risky assets to total assets}_{i,t}) = \mu \cdot \Delta(\text{Lending margin}_{i,t}) + \text{Constant, etc.}$$

In the specification above, the outstanding amount of investment trust holdings (as a ratio to total assets), which represents risky assets, is used as the dependent variable. Banks' lending margin is used as one of the explanatory variables. The parameter μ represents the extent to which banks increase risk taking when their lending margin, their core source of profits, declines, and is assumed to change depending on the amount of unrealized gains/losses on securities holdings.[57]

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[55] Box 2 in the October 2016 issue of the *Report* raised the possibility that the number of regional financial institutions unable to increase their amount of investment in risky assets may rise if their financial strength (capital adequacy ratio) declines.

[56] The sample period is from fiscal 2005 to fiscal 2015 and the sample includes the 112 regional banks that existed during the period. The estimation includes fixed effects. In order to control possible effects of the ratio of securities investment on the estimation results, the ratio of securities to deposits is included in the explanatory variables.

[57] Specifically, two thresholds (the upper 25th percentile and the lower 10th percentile) of the distribution of regional banks' unrealized gains/losses on securities (relative to total assets) are set and the following equation is employed:

$$\mu = \delta + \sigma D_{i,t}^{1} + \varphi D_{i,t}^{2},$$

where the dummy variable $D_{i,t}^{1}$ takes the value of 1 if a bank's unrealized gains/losses are in the upper 25th percentile. The dummy variable $D_{i,t}^{2}$ takes the value of 1 if they are in the lower 10th percentile.

The estimation results indicate that (1) banks with large unrealized gains on securities holdings proactively increase investment in risky assets when their lending margin has declined, i.e., the parameter μ takes a large negative value; and (2) banks with small unrealized gains on securities holdings are cautious with regard to investing in risky assets even when their lending margin has declined, i.e., the parameter μ takes a small negative value and is statistically insignificant (Chart B5-5).

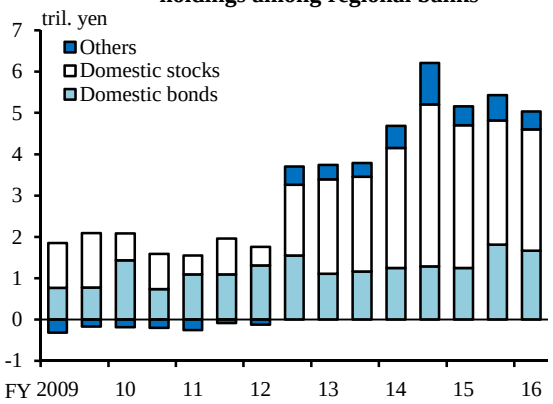
Although regional banks' unrealized gains on securities holdings have recently been maintained at a high level on the whole, those for some banks have become small (Charts B5-4 and B5-6). Looking ahead, structural downward pressure on regional banks' profitability can be expected due to the shrinking of their business bases through population decline and other factors. There is a limit to compensating for the decline in profitability with the realization of gains through sales of securities, however, and it is possible that their risk-taking ability will eventually decline.

Chart B5-5: Estimation results (estimated value of μ)[1,2]

Level of unrealized gains/losses on securities holdings		
High	Middle	Low
-5.08 ***	-3.31 ***	-0.83

Notes: *1*. Estimated by the BOJ.
2. *** indicates statistical significance at 1 percent levels.

Chart B5-6: Unrealized gains/losses on securities holdings among regional banks[1,2]



Notes: *1*. Latest data as at the first half of fiscal 2016.
2. Includes available-for-sale securities.
Source: BOJ.

Box 6: Intensified competition among regional financial institutions and their business stability

There are two opposing views with regard to the impact of competition among banks on their business stability. The first view is the "competition-stability view," which holds that competition among banks increases their business stability. This view argues that as banks compete with each other and loan interest rates fall, borrowing firms' probability of default declines, raising banks' business stability. Conversely, the second view is the "competition-fragility view," which holds that competition among banks lowers their business stability. This view argues that as competition intensifies and banks' profit margins continue to tighten, their capacity to absorb losses due to external shocks, such as an increase in credit costs, decreases and/or they take more risks, so that banks' business becomes unstable. This box tries to examine which of the two views applies to Japan's financial system by focusing on regional financial institutions (regional banks and *shinkin* banks).

To do so, the Z-score for each financial institution is calculated as an indicator of business stability (Chart B6-1). The Z-score is defined as the ratio of a financial institution's loss-absorbing capacity to the volatility of profits, and the lower the score, the less stable the financial institution's business is.[58] Although the measured Z-score has improved in recent years, mainly reflecting the decline in credit costs due to economic recovery and the realization of gains through sales of securities, the number of regional financial institutions whose score has fallen has been increasing over the long term.

Chart B6-1: Z-score

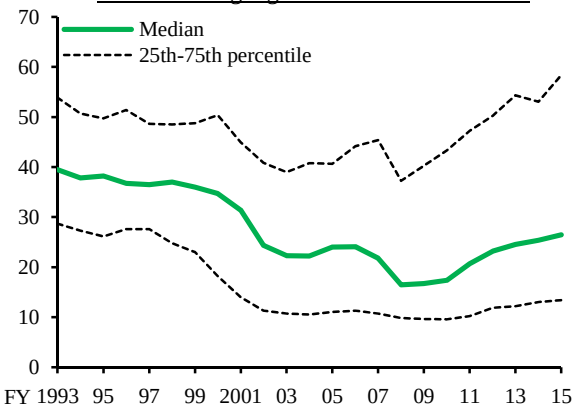
Definition of Z-score

$$\text{Z-score} = \frac{\text{Loss-absorbing capacity}}{\text{Volatility of profits}} = \frac{\text{ROA} + \text{Capital adequacy ratio}}{\text{Standard deviation of ROA}}$$

Factors contributing to a lower Z-score

- Declining profits (ROA) depress loss-absorbing capacity (numerator).
- Declining core profitability increases the impact of shocks such as increasing credit costs on the volatility of profits (denominator).
- A shift towards high risk and high return investment increases the volatility of profits (denominator).

Z-score among regional financial institutions[1]



Note: *1*. Estimated by the BOJ.

Next, to quantitatively examine the impact of competition among financial institutions on their business stability (i.e., on their Z-scores), panel estimation is conducted. The

[58] The standard deviation of ROA, which is the denominator for the Z-score, is calculated by using the historical volatility over a ten-year rolling window.

markup ($P - MC$) presented in Box 3 is used as the explanatory variable to gauge the competitive environment facing financial institutions. To take into account that the markup may have a nonlinear effect on the Z-score, the square of the markup is also included as the explanatory variable. As dependent variables, in addition to the Z-score, the constituents of the Z-score, namely the loss-absorbing capacity (i.e., the numerator of the Z-score) and the standard deviation of the ROA (the denominator), are employed.

The estimation results show that the markup, which represents financial institutions' competitive environment, has statistically significant explanatory power with regard to the Z-score (as well as its denominator and numerator) (Chart B6-2). Moreover, the estimated parameters indicate that (1) the relationship between the markup and the Z-score forms an inverted U-shape, and (2) the markup level maximizing the Z-score is around 1.3 ($= 30.18/(2 \times 11.52)$) (Chart B6-3). As at fiscal 1990, the median of regional financial institutions' markup ($P - MC$) was in the neighborhood of 1.3, which maximized the Z-score, but since then it has trended downward. In other words, financial institutions' business stability has declined as a result of intensified competition, meaning that of the two views mentioned above the "competition-fragility view" is considered to hold true for recent years.

Chart B6-2: Dynamic panel estimation results[1,2,3]

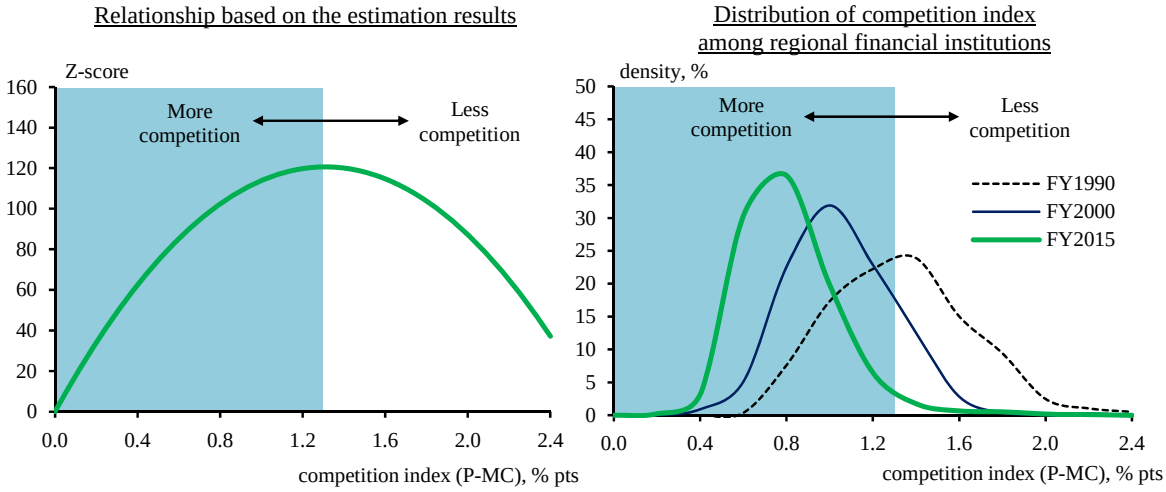
Dependent variable / Explanatory variable		Z-score	Loss-absorbing capacity (numerator)	Standard deviation of ROA (denominator)
One-term lag of dependent variable		0.84 ***	0.90 ***	0.80 ***
Competition index among financial institutions (markup)	P-MC	30.18 ***	0.78 ***	-0.88 ***
	$(P\text{-}MC)^2$	-11.52 ***	-0.11 ***	0.28 ***

Notes: *1*. Estimated by the BOJ. *** indicates statistical significance at 1 percent levels.
2. The models were estimated using the GMM estimator suggested by Arellano and Bond (1991). The instruments used are the full set of lags of the dependent variables. The test results show that we cannot reject the null hypothesis of no second-order serial correlation and validity of the instruments (over-identifying restrictions are satisfied).
3. Explanatory variables used other than those noted above are total assets and balance sheet composition (loan-to-asset ratio), representing specific characteristics of a financial institution. Estimation includes fixed effects and time dummies. The estimation period is from fiscal 1993 to fiscal 2015.

For individual financial institutions facing a decline in demand for financial intermediation services, it is rational to attempt to reduce the impact of decreasing demand by lowering interest rates, and to increase risk taking, in order to secure profits. However, when the demand decline is caused by population decline, which represents a shock that is persistent and common to all financial institutions, there is a risk that, instead, this response will lead to excessive competition that undermines financial institutions' business stability as a whole. At present, this risk has not materialized, as

seen in the stable Z-score, which reflects the decline in credit costs due to economic recovery and the realization of gains through sales of securities. However, since negative externalities could work on the intensification of competition, it is necessary to recognize this as a potential vulnerability from a macroprudential perspective.

Chart B6-3: Competition index among financial institutions and their business stability[1,2,3,4]



Notes: *1*. Estimated by the BOJ.
2. The left-hand chart shows the cumulative effects of markup (P-MC) changes on the Z-score, calculated by plugging the estimated parameters (Chart B6-2) into the following formula:
$(30.18\times(\text{P-MC})-11.52\times(\text{P-MC})^2)/(1-0.84)$
3. The shaded area indicates the range over which a decline in the competition index (P-MC), suggesting more intense competition among financial institutions, leads to a decline in the Z-score, suggesting undermined the business stability.
4. Density in the right-hand chart is estimated by using the Gaussian kernel function.

Box 7: International comparison of financial institutions' overhead cost ratios

Cost reduction is a way to improve the profitability of financial institutions. This box examines, by way of an international comparison, (1) how high (or low) Japanese financial institutions' overhead costs are; (2) for what reasons they are high (or low); and (3) what needs to be done to improve them.

Since the structures of overhead costs differ substantially depending on the financial institutions' size, by region (Japan, the United States, and Europe), financial institutions are divided into four groups based on their size of gross operating profits. Then, the three regions are compared within each group (Chart B7-1).[57]

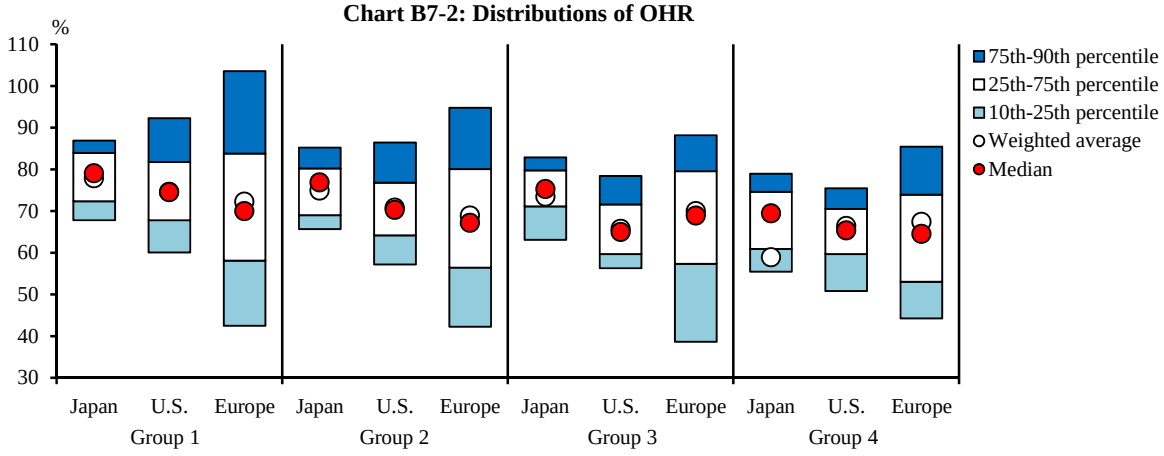
Chart B7-1: Classification of financial institutions in Japan, the United States, and Europe[1]

Group name	Gross operating profits	Number of financial institutions		
		Japan	U.S.	Europe
Group 1	Minimum-25th percentile (0.7-3.1 billion yen)	93	329	193
Group 2	25th-50th percentile (3.1-7.6 billion yen)	92	149	148
Group 3	50th-75th percentile (7.6-23.9 billion yen)	93	100	167
Group 4	75th percentile- (23.9 billion yen-)	93	102	212

Note: *1*. Classification is based on quartiles of gross operating profits of Japanese financial institutions.
Sources: OECD; S&P Global Market Intelligence; BOJ.

With regard to the distribution of overhead cost ratios (OHR = overhead costs/gross operating profits), Japanese financial institutions are characterized in that their OHRs are less widely dispersed and the median is higher than those of their U.S. and European counterparts (Chart B7-2).

Chart B7-2: Distributions of OHR

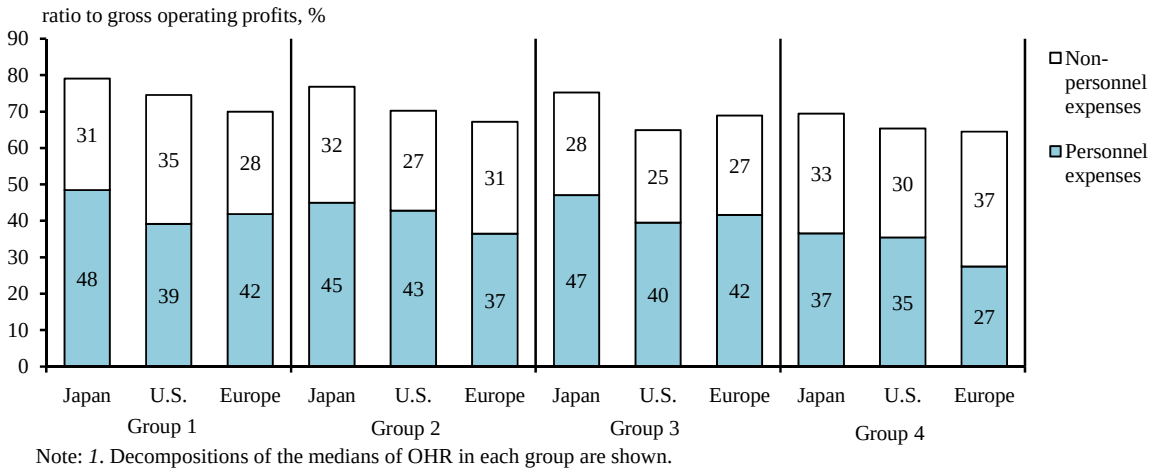


Sources: OECD; S&P Global Market Intelligence; BOJ.

[57] The analysis includes 371 Japanese financial institutions (consisting of major banks, regional banks, and *shinkin* banks), 680 U.S. financial institutions, and 720 European financial institutions from the euro area, the United Kingdom, and Switzerland. Figures used for the analysis are the averages for the period from fiscal 2013 to fiscal 2015. Figures for U.S. and European financial institutions were converted into yen using purchasing power parity exchange rates (obtained from the OECD) for the period.

Decomposing the OHRs into personnel expenses and non-personnel expenses (e.g., equipment costs) shows that Japanese financial institutions' high OHRs are attributed mainly to their high personnel expenses ratio (Chart B7-3).

Chart B7-3: Decompositions of OHR[1]



Note: *1*. Decompositions of the medians of OHR in each group are shown.
Sources: OECD; S&P Global Market Intelligence; BOJ.

Next, decomposing personnel expenses into personnel expenses per employee and the number of employees per financial institution shows that while personnel expenses per employee are low, the number of employees per financial institution is high in Japan (Charts B7-4 and B7-5). As a result, gross operating profits per employee (i.e., labor productivity) are lower in Japan than in the United States and Europe (Chart B7-6).

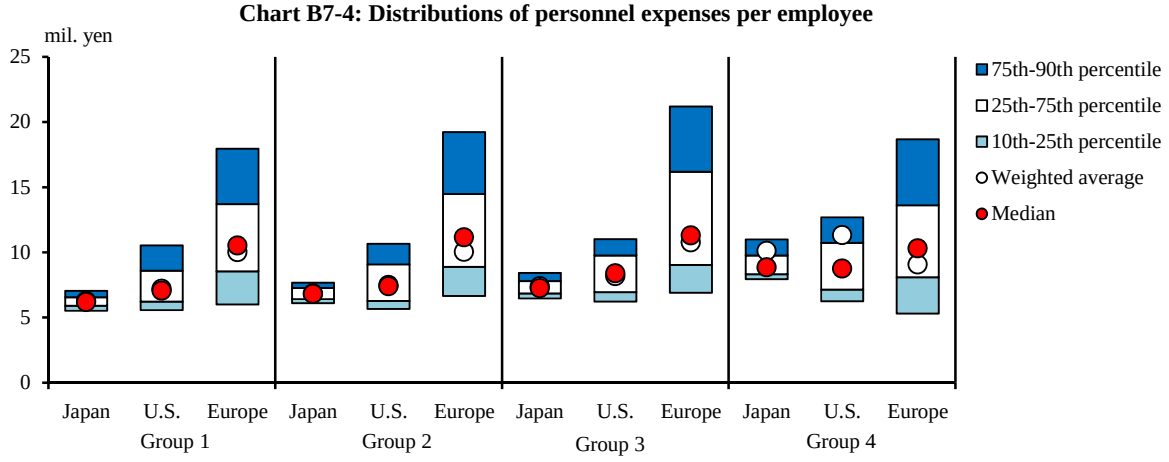
Summing up, the high OHRs of Japanese financial institutions are attributable to the fact that labor productivity is low relative to costs per employee:

$$\text{OHR} = \frac{\text{Overhead costs}}{\text{Gross operating profits}} = \frac{\text{Overhead costs/No. of employees}}{\text{Gross operating profits/No. of employees}}$$

$$= \frac{\text{Overhead costs per employee}}{\text{Labor productivity}}.$$

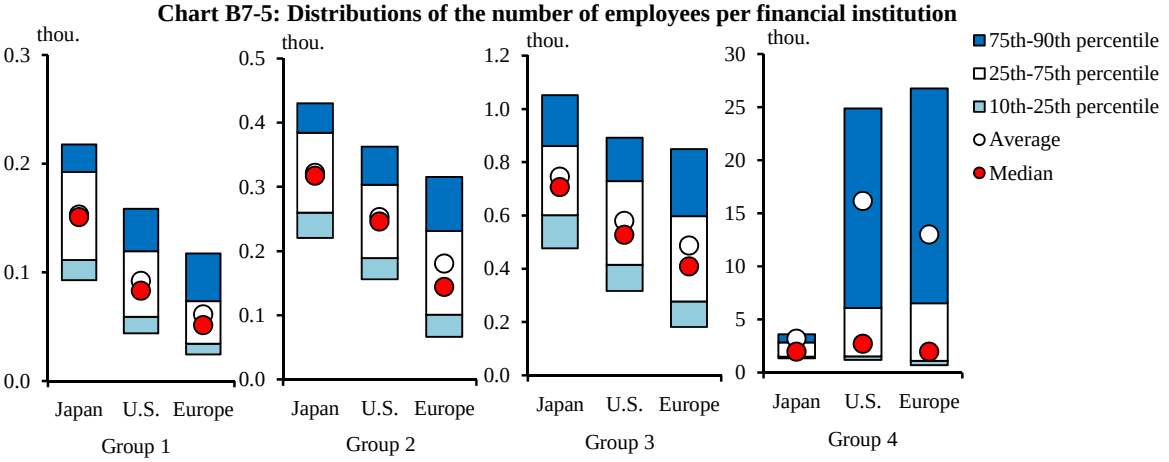
In order to improve OHRs, Japanese financial institutions could reduce personnel expenses per employee to bring them in line with the low labor productivity. However, a better option is probably to raise the financial institutions' labor productivity, given that salaries at Japanese financial institutions are already lower than those at their U.S. and European counterparts.

Chart B7-4: Distributions of personnel expenses per employee



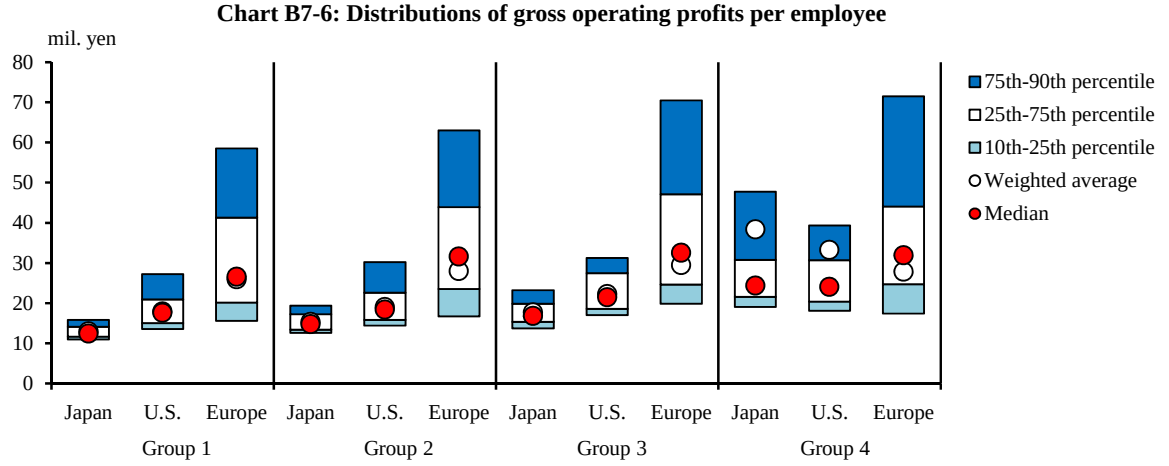
Sources: OECD; S&P Global Market Intelligence; BOJ.

Chart B7-5: Distributions of the number of employees per financial institution



Sources: OECD; S&P Global Market Intelligence; BOJ.

Chart B7-6: Distributions of gross operating profits per employee



Sources: OECD; S&P Global Market Intelligence; BOJ.

While the prolonged low interest rate environment has reduced gross operating profits, what is notable is that, in addition to Japanese financial institutions' low gross operating profits per employee, the variation is small compared to their U.S. and European

counterparts. On the other hand, there seem to be more types of revenue sources and business models in the United States and Europe, as non-interest income accounts for a larger portion of gross operating profits on average and the variation in the share of non-interest income is also high among financial institutions. Given the sluggish demand for financial intermediation services due to the population decline, if financial institutions compete against one another by supplying homogeneous and substitutable services, it will be difficult to improve their profitability (see Box 3). Therefore, in order for Japanese financial institutions to fundamentally improve their gross operating profits and labor productivity, it is essential for them to develop and implement business strategies that utilize their core competence, such as differentiation of their services.

Box 8: The increasing similarity of large financial institutions' large credit exposures

If a bank's loan portfolio is concentrated in specific firms and/or industries, there is a risk that its business stability will be undermined when the business conditions of those firms or industries deteriorate. Therefore, it is important for banks to diversify their credit portfolios as part of their credit risk management. If individual banks limit the amount of exposure to a single firm in their efforts to diversify portfolios, firms with large funding needs will borrow from multiple banks. Syndicated loans provide a means of credit intermediation that simultaneously satisfies firms' large funding needs and banks' need for portfolio diversification. However, if it is always the same banks participating in syndicated loans, the banks' portfolios will become more similar to each other, even though individual banks may achieve diversification in terms of who they lend to. If such diversification in terms of borrowers occurs at multiple banks (i.e., uniform diversification), this will increase the interconnectedness among these banks through common exposures. In this case, it is possible that exposure to the common risks raises the likelihood that multiple banks will come under stress simultaneously.

From the perspective of the financial system as a whole, the greater the number of banks that simultaneously become unstable through such interconnectedness, the greater the damage to the economy could be in a nonlinear fashion. Thus, credit portfolio diversification, which is rational from the perspective of individual banks to ensure their own business stability, can lead to a "fallacy of composition" in that instead it undermines the stability of the entire financial system.[60] For the stability of the financial system as a whole it is desirable that there is diversity to some extent in the way that banks pursue credit portfolio diversification (i.e., diverse diversification).

In order to investigate the degree of similarity of banks' credit portfolios, we calculate a measure called "cosine similarity" using data on large borrowers of the three major banks.[61]

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[60] On this issue, see, for example, Nicholas Beale, David G. Rand, Heather Battey, Karen Croxson, Robert M. May, and Martin A. Nowak, "Individual versus Systemic Risk and the Regulator's Dilemma," Proceedings of the National Academy of Sciences, Vol. 108, No. 31, August 2011.

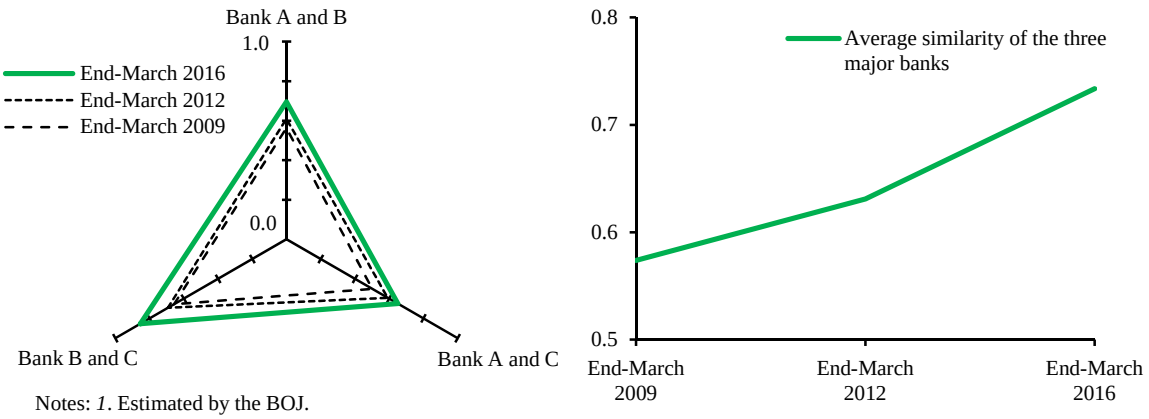
[61] For the calculation, large borrowers are defined as firms that have outstanding loans from at least one of the three major banks exceeding 100 billion yen and the top 50 large borrowers in terms of the total sum of loans from the three major banks are chosen. For each pair of banks, the cosine similarity of their large-exposure portfolios is calculated as follows:

$$\text{Cosine similarity}\ (i,j) = \frac{\sum_{a=1}^{50} x_{i,a} x_{j,a}}{\left(\sum_{a=1}^{50} x_{i,a}^2 \sum_{a=1}^{50} x_{j,a}^2\right)^{1/2}},$$

The cosine similarity measure shows the extent to which the credit portfolios of two banks, when represented as two vectors, have the same direction. The measure takes a value of 1 when the two vectors have the same direction -- that is, when the weights of borrowers in the two banks' credit portfolios are identical. Conversely, it takes a value of 0 when they have a completely different direction -- that is, when the borrowers of two banks' credit portfolios differ completely. This means that cosine similarity is close to 1 when the degree of banks' interconnectedness is high and close to 0 when the degree of interconnectedness is low.

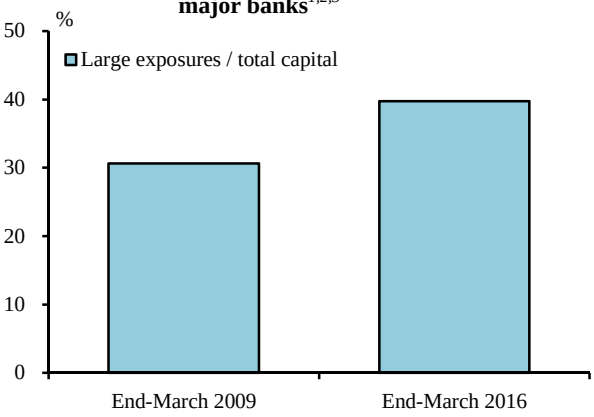
The estimation results show that the cosine similarity of large exposures of the three major banks increased from the 0.5-0.6 range at the end of March 2009 to more than 0.7 at the end of March 2016 (Chart B8-1). This suggests that the similarity of the three major banks' credit portfolios has increased in recent years and their interconnectedness has been rising.

Chart B8-1: Similarity of large credit exposures among the three major banks[1,2]



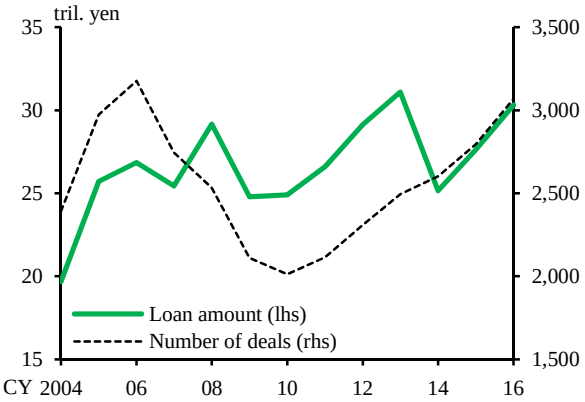
Notes: *1*. Estimated by the BOJ.
2. The closer to 1 the similarity measure, the higher the similarity between two banks.

Chart B8-2: Large exposures ratio among the three major banks[1,2,3]



Notes: *1*. Estimated by the BOJ.
2. Large exposures are the sum of loans that exceed 3 percent of each bank's capital.
3. Total capital is based on Basel II and Basel III, respectively (non-consolidated basis).

Chart B8-3: Primary market for domestic syndicated loans



Source: Japanese Bankers Association.

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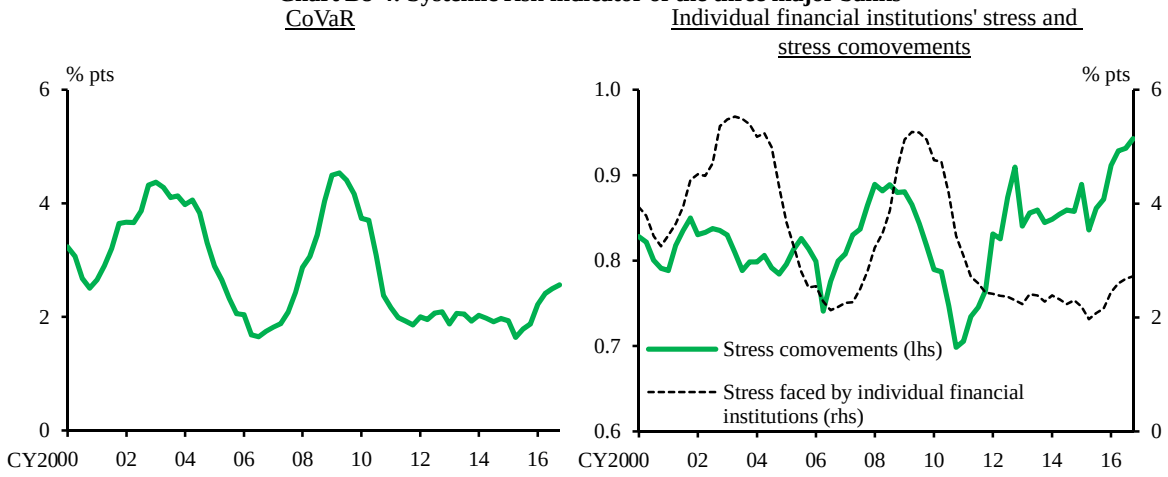
where $x_{i,a}$ stands for the amount of bank i 's exposure to borrower a.

At the three major banks, the increase in large exposures in banks' credit portfolios continues, with, for instance, the total of large exposures that exceed 3 percent of their capital now having reached around 40 percent of their capital (Charts IV-1-9 and B8-2). Given the increasing demand for large-scale funding such as for large-scale M&As, banks are proceeding with portfolio diversification through syndicated loans, among other measures, but it seems that such behavior is one of the factors that increases the similarity of banks' credit portfolios (Chart B8-3).

If the major banks' credit portfolios become too similar, this will be an issue that may lead to systemic risk. Looking at a measure of the degree of systemic risk (CoVaR) among the three major banks, no major change has been observed recently (Chart B8-4).[62] However, looking at developments of CoVaR separately in terms of (1) the stress that individual banks come under and (2) the comovement of stress among the three major banks shows that while the former is on a declining trend, the latter is on a rising trend. This suggests that, while the diversification of banks' credit portfolios leads to a reduction of credit concentration that individual banks face, the increase in the similarity of their credit portfolios increases the comovement of credit risks they are exposed to. These results indicate that it is necessary to continue to carefully monitor the similarity of banks' credit portfolios from a macroprudential perspective.

Chart B8-4: Systemic risk indicator of the three major banks[1,2,3,4]



Notes: *1*. Estimated by the BOJ. Latest data as at end-December 2016.
2. The left-hand chart indicates the average of CoVaR among the three major banks.
3. The right-hand chart indicates the components of CoVaR (stress faced by individual financial institutions and stress comovements between financial institutions).
4. CoVaR is estimated using rolling samples of the last 2 years on a daily basis.
Source: Bloomberg.

[62] For details about CoVaR, see Tobias Adrian and Markus K. Brunnermeier, "CoVaR," American Economic Review, Vol. 106, No. 7, July 2016.

Glossary

Financial statements of financial institutions

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

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

Net interest income = interest income – interest expenses

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

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

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

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

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

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

Credit cost ratio = credit costs / total loans outstanding

Capital adequacy ratios of internationally active banks

Common equity Tier 1 (CET1) capital ratio = CET1 capital / risky assets

CET1 capital comprises common equities and retained earnings.

Risky assets are financial institutions' risk-weighted assets.

Tier 1 capital ratio = Tier 1 capital / risky assets

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

Total capital adequacy ratio = Total capital / risky 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 / risky assets

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

Risky assets are financial institutions' risk-weighted assets.