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Financial Stability Report

2022. 6

BANK OF KOREA

Bank of Korea Mid- and Long-term Strategic Plan (BOK 2030)

- **Vision** — **Bank of Korea**
  : Taking the lead in stabilizing and developing the national economy

- **Strategic Directions**

Agility	Pursue Innovation in a Flexible and Swift Manner
Collaboration	Bolster Synergy Through Collaboration
Expertise	Reinforce Policy and Research Capability

BANK OF KOREA

Financial Stability Report

2022. 6

This Financial Stability Report is published in accordance with the provisions of Article 96 of the Bank of Korea Act, and upon the resolution of the Monetary Policy Board.

June 2022

Rhee, Chang Yong
Governor
Bank of Korea

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Financial stability refers to a condition in which the financial system works smoothly with all of its key components satisfactorily performing their roles: financial institutions carrying out their financial intermediary functions, market participants maintaining a high level of confidence in their financial market, and the financial infrastructure being well developed.

Financial stability is regarded as one of the policy goals that must be achieved, together with price stability and economic growth, for the realization of sustainable economic development. Policy authorities around the world thus devote great efforts to achieving financial stability.

As part of its conduct of macroprudential policies, the Bank of Korea has been publishing the Financial Stability Report on a biannual basis since 2003, analyzing and assessing the potential risks inherent in the Korean financial system and suggesting related policy challenges.

Notably, under the revised Bank of Korea Act of 2011 (Article 96), the Bank of Korea is obliged to draw up a Financial Stability Report and submit and report it to the Korean National Assembly at least two times each year.

The Bank of Korea is devoting its best efforts to qualitative improvement of the Financial Stability Report. This report takes the potential risks to financial stability highlighted until May 2022 as the objects of its analysis.

It is hoped that this Financial Stability Report will help financial market participants, regulators and policymakers to recognize the risk factors inherent in the financial system at an early stage, and deal with them appropriately.

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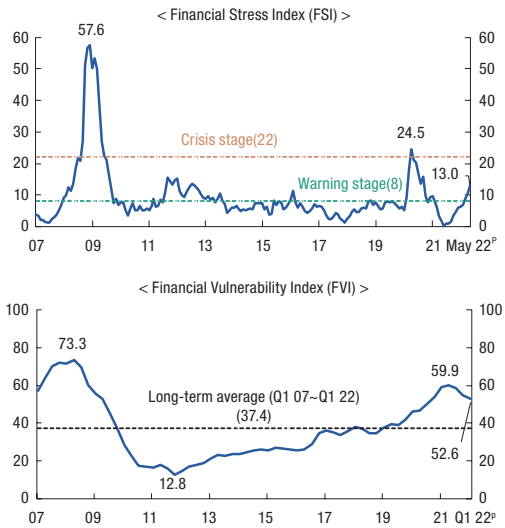
Executive Summary

Overview

Since the second half of last year, financial market volatility appears to have expanded as external risks have increased significantly. Due to elevated global inflationary pressures, the accelerated pace of policy rate hikes by the Federal Reserve, and persistent geopolitical risks associated with the war in Ukraine, stock and bond prices fell substantially and the Financial Stress Index (FSI), which reflects the level of instability in the financial system, entered into the warning stage (threshold 8). However, Korea's financial system generally remained stable as a while, supported by solid financial soundness and resilience of its financial institutions, with the financial intermediation function working well.

In the meantime, the potential vulnerability within the financial system from a medium- to long-term perspective is assessed to have remained high. The accumulated household debt and elevated housing prices are some of the key potential risks to the economy. The Financial Vulnerability Index (FVI), which shows overall vulnerabilities in the financial system from a medium- to long-term perspective, reversed to a decrease as asset prices partly underwent an adjustment since the second half of last year, but was still above the historical long-term average.

Financial Stress Index (FSI)[1] and Financial Vulnerability Index (FVI)[2]



Notes: 1) A composite index (0-100) calculated by standardizing 20 monthly real and financial sector indicators related to financial instability. The warning and crisis stage thresholds are set at 8 and 22 respectively, using the "noise-to-signal" ratio method.
2) A composite index (0-100) calculated by standardizing 39 quarterly indicators concerning three criteria for assessment (asset prices, credit accumulation and financial system resilience).

Source: Bank of Korea.

In the credit market, the rate of private credit growth slowed modestly, particularly in household credit, while the private credit-to-nominal GDP ratio remained high. The household and corporate debt servicing capacity in general appeared favorable, boosted by economic recovery and government's financial support measures. However, insolvency risks could materialize, particularly among marginal companies, vulnerable households and self-employed business owners, depending on market rate hikes and uneven recovery pattern by sector.

In the asset markets, financial market volatility expanded with a substantial fall in stock and bond prices, caused by an increase in global inflationary pressures and changes in expecta-

tions for monetary policy in major countries. The pace of housing price growth slowed significantly, but the level of housing price remained at a high level compared to underlying economic fundamentals. Vigilance will be needed toward the possibility of a further escalation of asset price volatility, in the event that risk appetite in the markets changes rapidly in response to changes in financial and economic conditions at home and abroad.

With regard to financial institutions, profitability improved and asset quality remained solid, due to an increase in lending and extension of financial support measures. Nevertheless, bad loans could increase, particularly associated with non-bank financial institutions, in the process of the winding down of government's financial support measures and hiking of market rates.

As for capital flows, foreigners' stock investment continued a net outflow, while the inflow of foreigners' domestic bond investment narrowed. Attention should be paid to the possibility of increasing volitality of capital inflows and outflows, depending on the pace of interest rate hikes in major economies and changes in global financial market conditions.

The financial system's resilience, which means the capacity to withstand domestic and external shocks, has remained favorable, with the capital ratios of both banks and non-bank financial institutions significantly exceeding the regulatory standards. In addition, Korea's external payment capacity has remained stable overall.

As discussed above, the Korean financial system has been stable, albeit with vulnerability factors such as an accumulation of private debt, elevated housing prices, and the possibility of an increase in insolvency of corporate sector due to the uneven recovery by industry. Recently, risk factors including a rise in global inflationary pressures, the accelerated pace of policy rate hikes in major economies, persistent global geopolitical risks, and possible instability in emerging market economies such as China could have adverse effects on Korea's financial system stability. Accordingly, this report examines in depth key financial stability issues in consideration of Korea's financial system vulnerabilities and risk factors.

First of all, Korea's financial system is expected to maintain stable resilience, even if market rates rise and financial market volatility expands due to an acceleration of the Federal Reserve's monetary policy normalization, while some non-bank financial institutions could face a rise in credit and liquidity risks. In addition, the analysis on the linkage between Korea's household debt and asset markets suggests a possible contraction in household consumption with a possible increase in the insolvency risk of household debt, depending on the degree of adjustment in the asset market in the future. Moreover, corporate and self-employed business owner lending also acted as a factor that deepened the financial imbalance. The proportion of loans to the real estate industry is steadily increasing, and the potential insolvency of some self-employed business owner's loans is deferred and accumulated due to the government's financial supports.

Given that domestic and foreign risks are rising gradually with pockets of vulnerability remaining in the financial system, efforts are needed toward easing financial imbalances and enhancing financial resilience. In order to suppress the accumulation of debt, it will be necessary to devise policies that seek to adjust appropriately the

level of lending regulations and COVID-19 related financial support measures, operate financial support measures that focus on solvency support rather than liquidity support and facilitate a countercyclical capital buffer (CCyB). In addition, it is necessary to prepare for a potential outbreak of external and internal shocks by improving credit risk assessment and loan loss provisioning standards, as well as strengthening monitoring of FX liquidity of non-bank financial institutions. Lastly, vigilance is needed toward a possible decline of asset value in carbon-intensive industries caused by a surge in prices of emission allowances in the process of achieving carbon neutrality, while the regulatory framework for investor and user protection should be improved in response to the growing influence of crypto assets and Big Tech payment services.

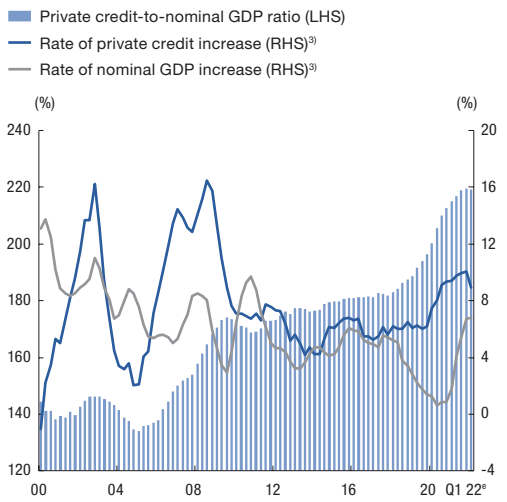
Financial Stability Situation by Sector

Ⅰ. Credit Markets

The increase in private credit has slowed somewhat, led by household credit, but the private credit-to-nominal GDP ratio is still at a high level.

1 The private credit-to-nominal GDP ratio, an indicator of the level of private sector leverage, stood at 219.4% (estimated) at the end of the first quarter of 2022, declining slightly from the previous quarter (219.5%). The high growth trend so far has slowed, due to expanded growth in nominal GDP and a slowdown in household credit growth.

Private credit[1]-to-nominal GDP[2] ratio



Notes: 1) Flow of funds statistics basis (estimated figures for Q1 2022).
2) Sum of nominal GDPs in quarter concerned and immediately preceding three quarters.
3) Year-on-year basis.

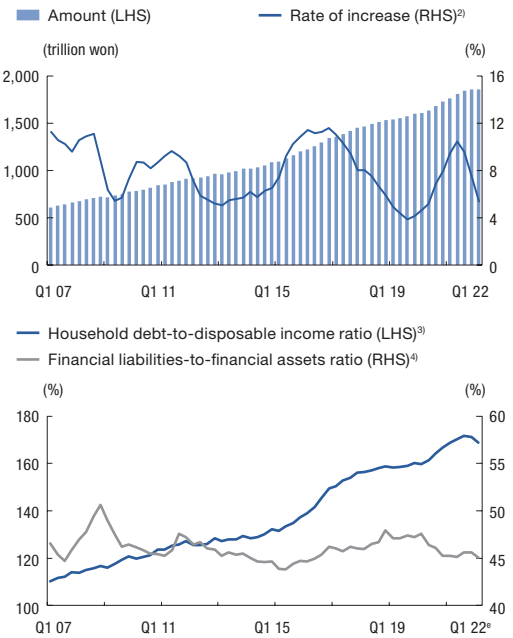
Source: Bank of Korea.

2 Household debt (household credit statistics basis) increased by 5.4% year on year to record 1,859.4 trillion won at the end of the first quarter of 2022, showing a slowdown in growth.

The household debt-to-disposable income ratio stood at 168.9% (estimated) at the end of the first quarter of 2022, a decline of 2.2%p from the end of last year. The financial liabilities-to-financial assets ratio (flow of funds statistics basis) declined to 45.0% from 45.6% at the end of last year.

The delinquency rate of household loans remains low, but attention should be given to the possibility of increasing delinquency of vulnerable borrowers due to an increase in lending rates.

Household credit[1]



Notes: 1) Household credit statistics basis.
2) Year-on-year basis.
3) Disposable income for Q1 2022 is estimated using the average of the household disposable income-to-gross national income ratios for the immediately preceding three years.
4) Based on flow of funds statistics (estimated figure for Q1 2022).

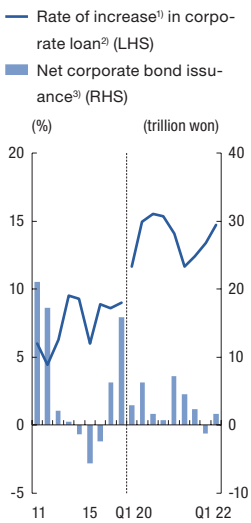
Source: Bank of Korea.

3 Corporate credit has maintained high growth due to the extension of financial support measures related to COVID-19, growing demand for facilities loans, and banks' efforts to increase corporate loans. Corporate bonds and CP recorded net issuance as well. Corporate loans rose 14.8% year-on-year to 1,609.0 trillion won at the end of the first quarter 2022. By company size, the growth rate of loans to large enterprises rose by 7.8% year-on-year due to growing demand for facility investment funds in line with economic recovery, and loans to small and medium-sized enterprises (SMEs) showed a strong growth rate of 16.0% as demand for facilities loans continued amid the extension of financial support measures related to COVID-19.

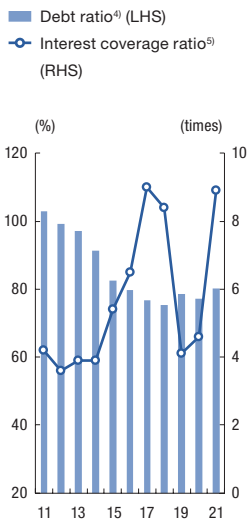
Corporate financial soundness has improved rapidly due to recovery in performance and growing profitability. The overall corporate debt ratio (debt/equity) rose to 80.1% at the end of 2021, from 77.2% at the end of 2020. However, the share of companies with a debt ratio exceeding 200% (heavily indebted companies) fell to 14.6%, from 15.3% at the end of 2020. The interest coverage ratio (operating income/ total interest expenses) increased substantially to 8.9 from 4.6 in 2020.

However, potential insolvencies could materialize, led by marginal companies and the vulnerable self-employed business owners, as upward pressures on lending rates increase amid growing uncertainties surrounding business management conditions due to rising raw material prices and increasing exchange rate volatility.

Corporate credit



Corporate financial soundness



Notes: 1) Year-on-year basis.
2) Based on excluding financial and insurance companies, but the data of some NBFIs include loans to financial and insurance companies.
3) Quarterly basis.
4) Debt/ Equity; end-period basis.
5) Operating income/Total interest expenses.

Sources: Bank of Korea, Korea Securities Depository, KIS-Value, Financial institutions' business reports.

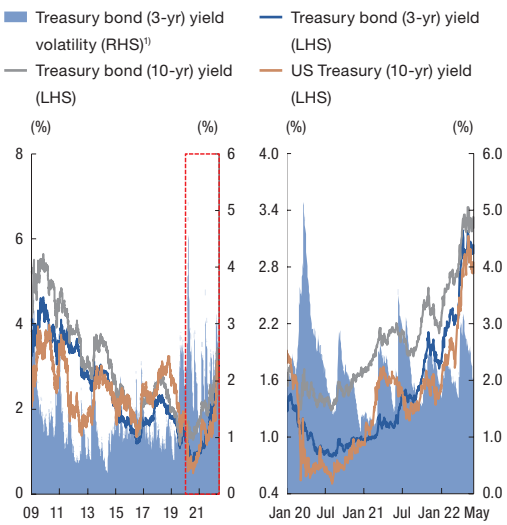
II. Asset Markets

Stock and bond prices declined and their volatilities increased greatly, due to accelerated moves to raise policy rates at home and abroad and growing geopolitical risks. The rise in housing prices has slowed significantly after the second half of last year, but are still at a high level relative to economic fundamentals.

1 Treasury bond yields rose significantly, affected mainly by accelerated policy rate hikes at home and abroad.

Corporate bond credit spreads showed a gradual expansion as investor sentiment shrank due to increased treasury bond rate volatility and increased geopolitical risks.

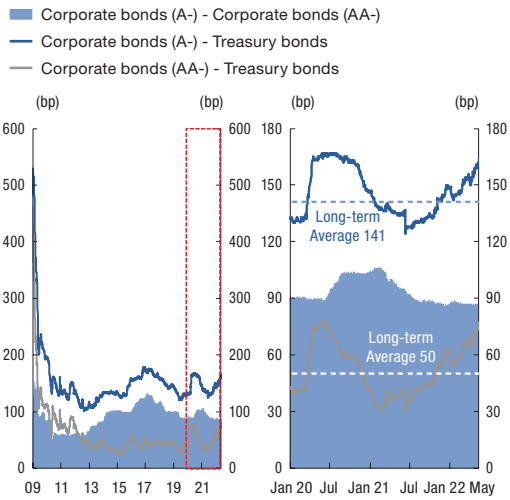
Korean and US Treasury bond yields



Note: 1) Daily volatility calculated using exponential weighted moving average (EWMA) method.

Sources: Korea Financial Investment Association, Bloomberg.

Corporate bond credit spreads[1)2)] and spread across credit ratings

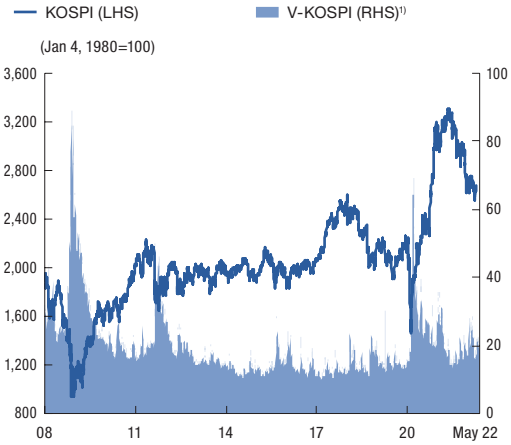


Notes: 1) 3-yr maturity basis.
2) The long-term average is for the period between January 2010 and May 2022.

Source: Korea Financial Investment Association.

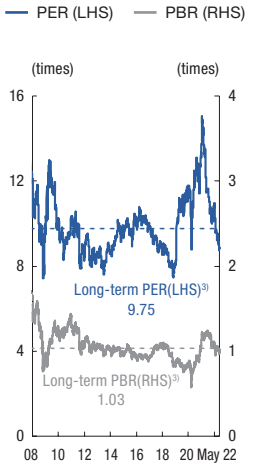
2 Stock prices declined considerably, affected mainly by external factors, such as accelerated policy rate hikes in major countries, geopolitical risks related to Ukraine and the resurgence of COVID-19 in China. The stock price volatility index (V-KOSPI) also rose compared to the second half of last year, as external uncertainty increased.

Stock price and stock price volatility indices

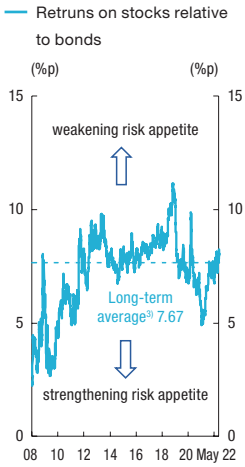


Note: 1) Volatility index calculated based on prices for options on the KOSPI200 index.
Source: KOSCOM.

PER[1] and PBR[2]



Stock risk premium[4]



Notes: 1) MSCI basis (12-month forward PER).
2) KOSPI basis.
3) Long-term average for the period between January 2010 and May 2022.
4) Earnings-price ratio (the inverse of 12-month-forward PER based on the MSCI)-Treasury bond yield (10-yr).
Sources: Bloomberg, Refinitiv.

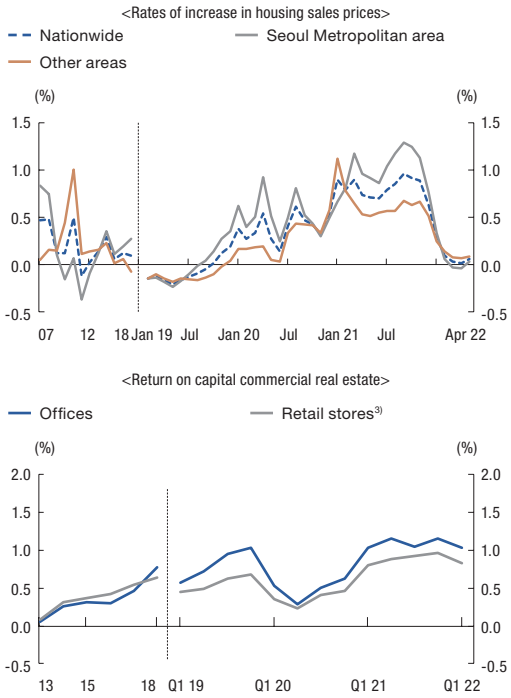
Major indicators representing the overvaluation of the stock market declined substantially, as stock prices plunged. The price-earnings ratio (PER), showing the level of a firm's stock price relative to its profit, stood at 8.86 as of end-May, running below its long-term average (9.75 since 2010). Meanwhile, the equity risk premium (a higher equity risk premium is associated with weakening of risk-taking behavior by investors) stood at 7.96%p on May 31, remaining above its long-term average (7.67%p).

3 The rates of increase in housing sales prices have slowed significantly since the second half of last year. In rental markets, the rates of increase in leasehold deposit (*jeonse*) prices slowed considerably while the rental market transction volumes increased, led by monthly rental contracts.

In the commercial real estate market, return on capital declined as price growth slowed due to the reduction of investment demand. Transaction activity also fell.

Exposure to real estate financing continued to increase, led by corporate credit, despite a slowdown in the upward trend of housing prices. It is necessary to preemptively strengthen risk management in preparation for the possibility of related loans becoming insolvent due to rising loan interest rates and possible real estate market adjustments in the future.

Rates of increase in housing sales prices[1] and return on capital in commercial real estate[2]



Notes: 1) For 2018 and earlier, annual average of monthly growth; for 2019 onward, month-on-month increase.
2) Quarter-on-quarter rate of increase in asset value reflecting changes in land and building prices. For 2018 and earlier, annual average.
3) Medium- and large-sized property basis.

Source: Korea Real Estate Board.

Ⅲ. Financial Institutions

While the asset soundness of financial institutions remained solid, the profitability of banks improved in particular.

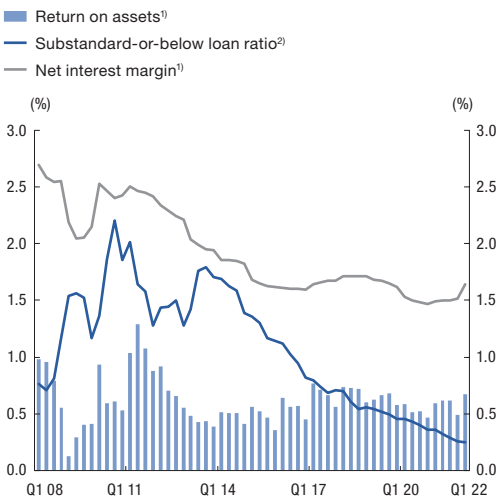
1 The financial soundness of commercial banks remained solid, with asset quality and profitability both improving. Commercial banks' total assets grew by 10.7% year on year to 2,202 trillion won at the end of the first quarter of 2022, sustaining a rapid expansion trend since the third quarter of 2021 (11.0%).

Their asset soundness remained solid with the substandard-or-below loan (none performing loan) ratio falling to 0.25% at the end of the first quarter of 2022, thanks to economic recovery and the extension of the government's financial support measures.

Their return on assets (ROA) stood at 0.67% (annualized) in the first quarter of 2022, up 0.08%p from the same period of last year (0.59%), bolstered by their increased net profit.

However, since there are high uncertainties surrounding economic conditions at home and abroad and upward pressures on market interest rates are increasing, financial institutions should prepare for a possible materialization of potential insolvency risks of vulnerable borrowers, depending on the rollbacks in government financial support.

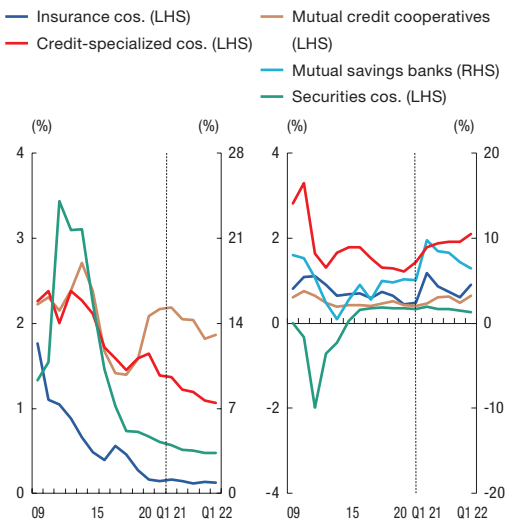
Commercial bank asset soundness and profitability



Notes: 1) Accumulated quarterly incomes annualized.
2) End-period basis.
Sources: Commercial banks' business reports.

NBFI substandard-or-below loan ratios[1)2)]

NBFI returns on assets (ROAs)[2)3)]



Notes: 1) End-period basis, excluding securities cos.
2) For 2019 and earlier, annual basis; for 2020 onward, quarterly basis.
3) Accumulated quarterly income annualized.
Sources: Financial institutions' business reports.

2 A look at the financial soundness of NBFIs shows that asset quality improved from a year earlier across all NBFI sectors, while profitability varied from sector to sector.

NBFIs' assets recorded 3,391 trillion won at the end of the first quarter of 2022, up by 7.0% year on year. However, growth in assets slowed particularly among insurance companies and securities companies.

The asset soundness of NBFIs remained solid, with the substandard-or-below loan ratios falling across most NBFI sectors.

In terms of profitability, the ROAs of mutual credit cooperatives and credit-specialized financial companies rose from a year earlier, while those of insurance companies, securities companies and mutual savings banks fell.

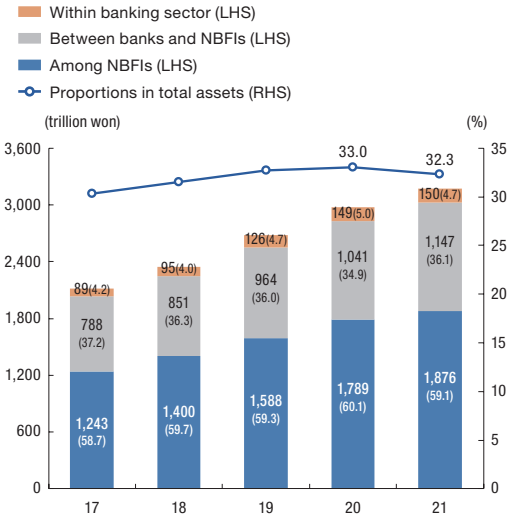
3 The growth in financial institutions' interconnectedness through their funding and operations has slowed to record 3,173 trillion won at the end of 2021 (rising by 6.5% from the end of the previous year). Mutual transactions accounted for 32.3% of the total assets in the overall financial sector, down by 0.7%p from the end of the previous year.

By sector, mutual transactions between banks and NBFIs and those among NBFIs expanded by 10.2% and 4.8% respectively, while those among banks increased only by 1.2%. As a result, the proportions of mutual transactions between banks and NBFIs went up by 1.2%p from the end of the preceding year to 36.1% at the end of 2021.

Analysis of default contagion and concentration risks based on the structure of mutual transac-

tions across financial sectors shows that both remained at similar levels to those of the preceding year.

Mutual transactions among financial institutions and across sectors[1)2)]



Notes: 1) Mutual transactions amounts are on an end-period basis (flow of funds statistics).
2) ( ) indicates proportions in total amount of mutual transactions.

Source: Bank of Korea.

Ⅳ. Capital Flows

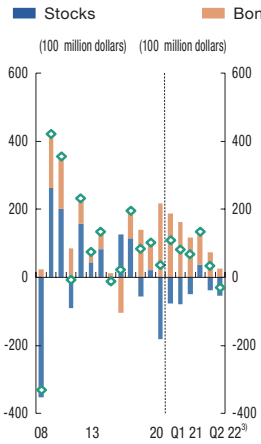
Since the beginning of this year, the net inflow in foreigners' domestic portfolio investment has dropped significantly due to heightened uncertainties in the global financial market, and the rise in residents' overseas portfolio investment has also slowed owing to worsened investment sentiment.

1 From January to May 2022, foreigners' domestic portfolio investment recorded a net inflow of 200 million dollars (with stock investment recording a net outflow of 9.5 billion dollars and bond investment a net inflow of 9.7 billion dollars). Foreigners' funds for stock investment showed a net outflow due to heightened geopolitical risks related to Ukraine, and the prospect of an early tightening by the US Federal Reserve. Foreigners' funds for bond investment continued to record net inflows, but the volume of inflow declined from a year earlier.

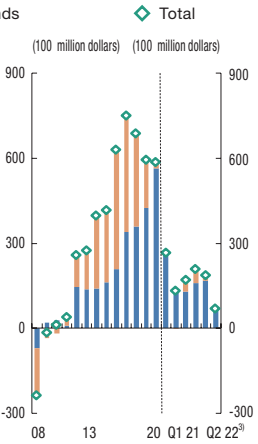
Going forward, inflows in foreigners' funds for domestic bond investment are expected to slow, affected mainly by the narrowing spread between domestic and foreign rates and heightened global risks. And the volatility in foreigners' funds flows for domestic stock investment is expected to be high, owing primarily to the prolongation of the crisis in Ukraine, stronger tightening by the US Fed, and concerns about a Chinese economic slowdown.

2 Residents' overseas portfolio investment continued to increase mainly in stocks, but the amount of investment (26.1 billion) in the January-April period this year decreased from a year earlier (31.7 billion) due to weak investor sentiment caused by falling stock prices.

Changes[1)3)] in foreigners' domestic portfolio investment



Changes[2)3)] in residents' overseas portfolio investment



Notes: 1) A "+" means net inflow, and a "-" net outflow.
2) A "+" means net investment, and a "-" net withdrawal.
3) Foreigners' domestic portfolio investment changes are based on April-May, residents' overseas portfolio investment changes are based on April.

Source: Bank of Korea.

Resilience of Financial System

Ⅰ. Financial Institutions

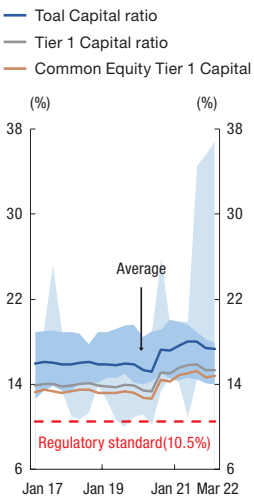
The resilience of commercial banks and NBFIs generally remained solid.

1 Commercial banks' resilience remained generally solid, with their capital adequacy and liquidity ratios exceeding the regulatory standards.

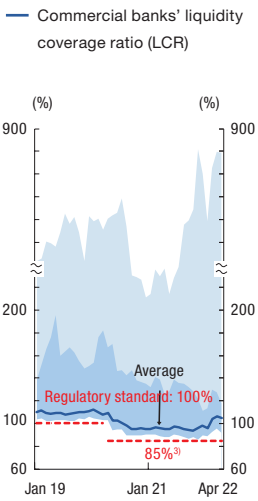
The total capital ratio of commercial banks under Basel III, indicative of their loss absorption capacities, stood at 17.35% at the end of the first quarter of this year, down by 0.06%p from the end of 2021, but still remained considerably above the regulatory standard. Common Equity Tier 1 Capital ratio climbed to 14.78%, up by 0.11%p relative to the end of last year.

The liquidity coverage ratio, which measures the ability to respond to sudden net outflows of funds, reached 104.6% at the end of April 2022, up by 6.7%p relative to the end of 2021.

Commercial bank total capital ratios[1)]



Commercial bank liquidity coverage ratios (LCRs)[1)2)]



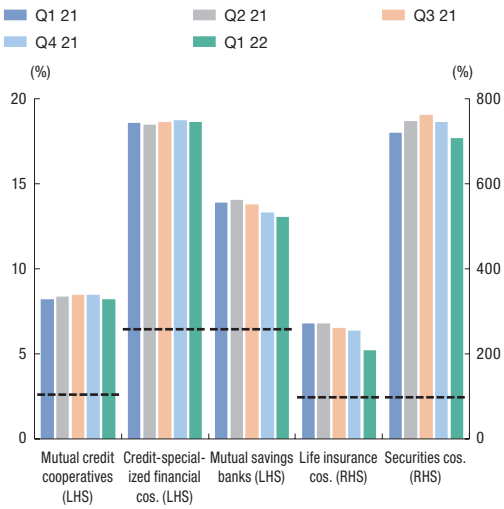
Notes:1) The shaded area indicates the distribution of individual banks, while the deep shaded area indicates distribution with Internet-only banks excluded.
2) High-quality liquid assets/Total net cash outflows over next 30 calendar days.
3) 85% for a limited period from April 2020 to June 2022.
Source: Commercial banks' business reports.

2 The resilience of NBFIs remained generally favorable, with their capital adequacy ratio exceeding regulatory standards across all sectors, but deteriorating slightly relative to the end of 2021.

The net capital ratio of securities companies declined by 37.9%p from the end of 2021 to reach 707.9% at the end of the first quarter of this year. The risk-based capital ratio (RBC ratio) of life insurance companies stood at 208.8%, down by 45.6%p from the end of 2021. Mutual savings banks' BIS capital ratio dropped 0.2%p from the end of last year to 13.1%. Credit-specialized financial companies' adjusted capital ratio and the net capital ratio of mutual credit cooperatives remained at a similar level as the end of last year, at 18.6% and 8.2% respectively.

Although the resilience of NBFIs is currently solid, some financial institutions whose loss absorption capacities have weakened should make preemptive recapitalization efforts in preparation against future changes in domestic and overseas conditions and external shocks.

NBFI capital adequacy ratios[1)2)]



Notes: 1) Mutual credit cooperatives' net capital ratio (supervisory standard 2%; 4% for MG community credit cooperatives and 5% for NongHyup), credit-specialized financial companies' adjusted capital ratio (7%; 8% for credit card companies), mutual savings banks' BIS capital ratio (7%; 8% for banks with total assets of 1 trillion won or more), insurance companies' risk-based capital ratio (100%), securities companies' net capital ratio (100%).
2) The doted lines show the supervisory standards.
Sources: Financial institutions' business reports.

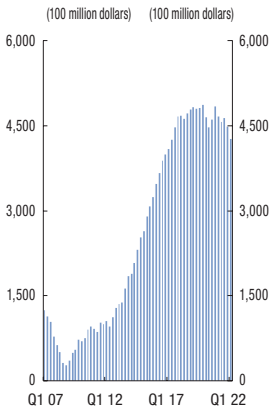
II. External Payment Capacity

Korea's external payment capacity remained solid but slightly weakened compared to last year.

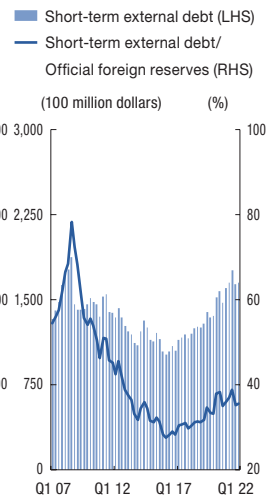
1 Net external assets amounted to 425.75 billion dollars at the end of the first quarter of 2022, down by 22.2 billion dollars from the end of 2021. The share of short-term debt in the overall external debt stood at 26.7%, slightly up from the end of last year (26.0%).

2 Official foreign reserves recorded 447.71 billion dollars at the end of May 2022, down by 15.41 billion dollars compared to the end of 2021. The decline was driven mainly by the drop in US dollar-denominated value of assets denominated in other currencies, resulting from strenthening US dollar, and by measures to reduce FX market volatility. The ratio of short-term external debt relative to official foreign reserves increased slightly from the end of 2021 (35.6%) to 38.2% at the end of the first quarter of 2022.

Net external assets[1)]



Short-term external debt-to-official foreign reserves ratio[1)]



Note: 1) End-quarter basis.
Source: Bank of Korea.

Ⅲ. Financial Market Infrastructures

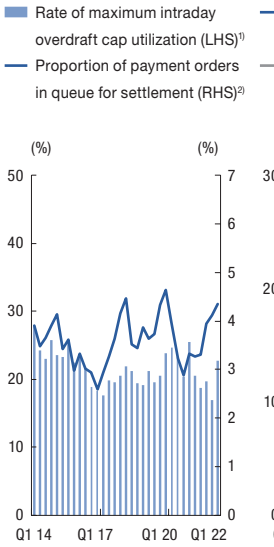
Payment and settlement systems have operated smoothly, with settlement risks managed stably amid a continued increase in the amount of settlement, driven mainly by securities settlements by financial institutions and electronic funds transfers by individuals and companies.

1 The rate of maximum intraday overdraft cap utilization and the proportion of payment orders in queue for settlement, both of which are monitored as indicators of the settlement liquidity of BOK-Wire+ participants in the nation's large-value settlement system, remained generally stable at 22.8% and 4.4% respectively, during the first quarter of 2022.

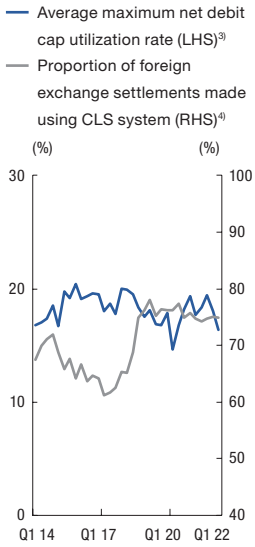
2 The net debit cap utilization rate, which reflects the settlement risks related to the retail payment systems operated by Korea Financial Telecommunications & Clearing Institute, was also solid at 16.3%.

The share of settlements handled by the CLS payment-versus-payment system, which effectively reduces settlement risk by settling foreign exchange transactions without any time lag, maintained a high level of 75.0% in the first quarter of 2022.

Large-value payment system



Retail payment and foreign exchange settlement systems



Notes: 1) Average of daily maximum amounts of intraday overdraft utilized divided by intraday overdraft cap.
2) Average ratio of the amount of payment orders in queue for settlement / Total settlement amount of participants (excluding multilateral settlements for liquidity savings).
3) Average of daily maximum net debit cap utilization rates of participants during the quarter.
4) Proportions in total CLS eligible FX transactions of those settled through the CLS system, transactions made by domestic banks and foreign bank branches. This proportion rose sharply as five more financial institutions including foreign bank branches joined the CLS in 2018.

Source: Bank of Korea.

Financial Stability Situation by Sector

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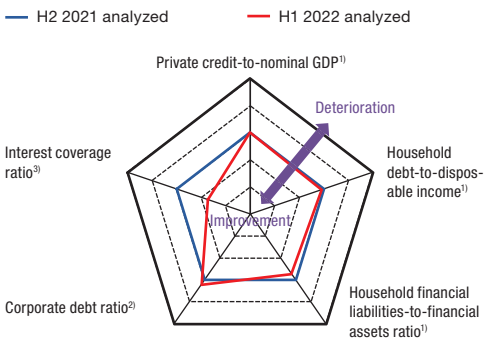
Ⅰ. Credit Markets

The pace of increase in the private credit-to-nominal GDP ratio[1] slowed as the private sector credit growth rate declined, while GDP growth increased.

As household credit growth, which had been high, falls below income growth, households' debt repayment burden is easing somewhat.

In the case of corporate credit, loans continued to increase amid banks' efforts to expand corporate loans in line with the growing corporate demand for facility funds, and corporate bonds and commercial paper (CP) recorded net issuance. Corporate soundness, including the interest coverage ratio, improved thanks to the economic recovery (Figure I-1).

Figure Ⅰ-1. Map of changes in credit market conditions



Notes: 1) Extents of change as of end-Q1 2022 compared to end-Q3 2021 indexed.
2) Extents of change as of end 2021 compared to end-June 2021 indexed.
3) Extents of change as of 2021 compared to H1 2021 indexed.

Source: Bank of Korea.

1. Credit Leverage

Slowing pace of increase in credit-to-nominal GDP ratio

At the end of the first quarter of 2022, the private credit[2]-to-nominal GDP ratio reached 219.4% (estimated),[3] showing a slight decrease from the previous quarter (219.5%) (year-on-year growth of 4.2%p). As the growth of private credit has slowed and nominal GDP growth increased, the upward trend appears to have slowed. At the end of the first quar-

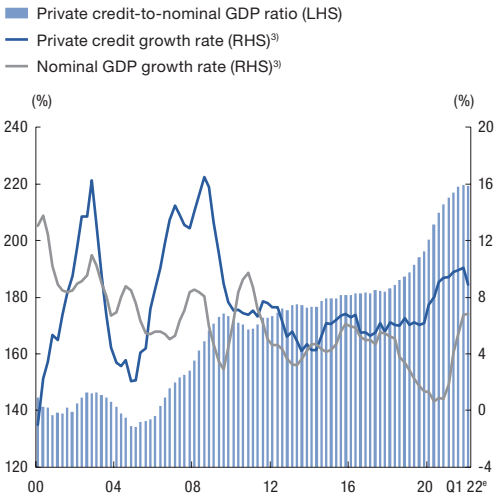
1) The level of private sector leverage can be assessed using a variety of financial and real economic indicators, such as the private credit growth rate by sector, debt repayment burdens of households and corporations, housing price levels, and bank leverage. In this report, the level of private sector leverage is discussed based primarily on the private credit-to-nominal GDP ratio, which is the global common reference guide recommended by the Basel Committee on Banking Supervision (hereafter "BCBS", 2010) under the Bank for International Settlements (BIS).

2) The BCBS (2010) broadly defines private credit as "all types of debt funds provided to households and non-financial corporations." In accordance with this definition, we used the sum of household debt (borrowing from financial institutions and government) and corporate debt (borrowing from financial institutions and government and issuance of securities other than shares) as reported in the flow of funds statistics.

3) This is based on household and corporate debt in the flow of funds statistics for the first quarter of 2022 and was estimated using the growth rate of household credit (based on household credit statistics) and the growth rate of corporate debt by deposit-taking institutions, respectively.

ter of 2022, the year-on-year growth rate of private credit fell to 8.9%, while the nominal GDP growth rate increased to 6.8% (Figure I-2).

Figure Ⅰ-2. Private credit[1]-to-nominal GDP[2] ratio



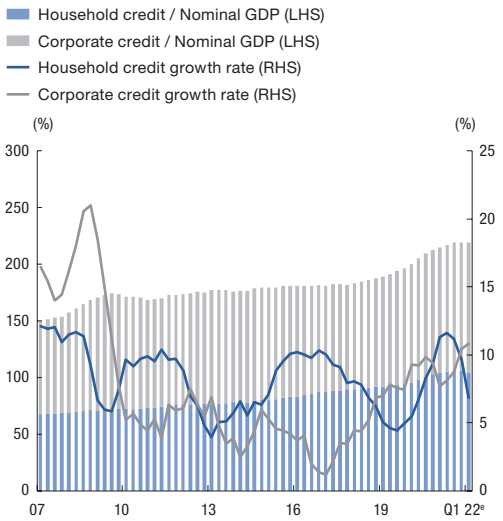
Notes: 1) Based on flow of funds statistics; estimated figure for Q1 2022.
2) Sum of nominal GDPs in quarter concerned and immediately preceding three quarters.
3) Year-on-year basis.
Source: Bank of Korea.

Decline in household leverage and rise in corporate leverage

By sector, household leverage decreased, while corporate leverage increased slightly. At the end of the first quarter of 2022, the household credit-to-nominal GDP ratio fell to 104.5%, having declined for two consecutive quarters, but the corporate credit-to-nominal GDP ratio rose to 114.9%.

Household credit growth slowed due to a decrease in housing transactions, while corporate credit showed high growth thanks to the increased demand for facilities investment and extended financial support measures (Figure I-3).

Figure Ⅰ-3. Credit leverage and credit growth rates,[1][2] by sector



Notes: 1) Estimated figure for Q1 2022.
2) Year-on-year basis.
Source: Bank of Korea.

Narrowing of household credit-to-nominal GDP gap

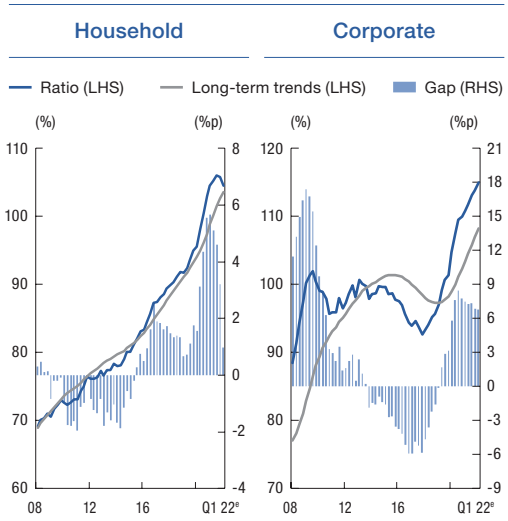
The private credit-to-nominal GDP gap[4] (gap between the credit leverage ratio and its long-term trend) is gradually narrowing, particularly in terms of household credit. The household credit-to-nominal GDP gap stood at +1.0%p in the first quarter of 2022, shrink-

4) As the household or corporate credit-to-nominal GDP ratio tends to rise over the long run as a result of financial deepening, the gap between this ratio and its long-term trends, i.e. its deviation from long-term trends, is used as a common indicator to measure systemic risk in time series. Although the BCBS (2010) recommends a smoothing parameter of 400,000 when calculating long-term trend values using an HP filter (one-sided), in this report, we opted for a significantly smaller smoothing parameter (25,000), given that the financial cycle in Korea is much shorter than in other OECD economies.

ing significantly compared to the previous quarter.

The corporate credit-to-nominal GDP gap narrowed slightly compared to the previous quarter to +6.7%p in the first quarter of 2022, but still remained high (Figure I-4).

Figure Ⅰ-4. Private credit-to-nominal GDP ratios and gaps,[1] by sector



Note: 1) Differences between credit-to-nominal GDP ratio and long-term trend value based on one-sided HP filter, by sector.

Source: Bank of Korea.

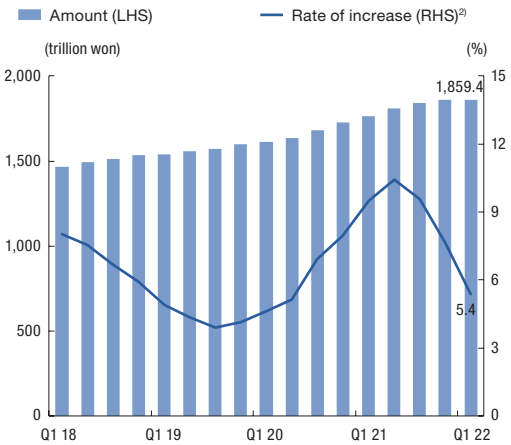
2. Household Credit

Slowdown in household credit growth

Household debt (based on household credit statistics) reached KRW 1,859.4 trillion at the end of the first quarter of 2022, recording an increase of 5.4% compared to the same period of the previous year (Figure I-5). This slowdown in growth was mainly influenced by the supervisory authorities' strengthening of household debt management[5] and rising interest rates on loans.[6] However, it is worth noting the possibility that household loan growth will expand again in line with the loosening of loan regulations.[7]

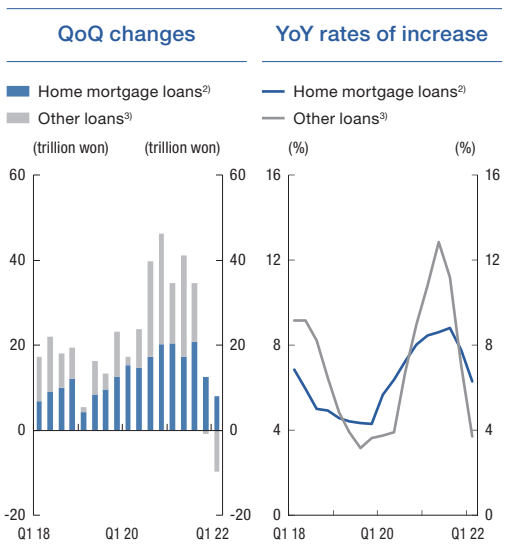
Among loan types, the slowdown in the growth of other loans including unsecured-loans stood out. Home mortgage loans reached KRW 989.8 trillion at the end of the first quarter of 2022, recording an increase of 6.3% compared to the same period of the previous year. Loan growth has slowed since the fourth quarter of last year due to a decrease in housing transactions. Meanwhile, other loans stood at KRW 762.9 trillion, up only 3.7% from the previous year (Figure I-6).

Figure I-5. Household credit[1]



Notes: 1) Based on household credit statistics.
2) Year-on-year basis.
Source: Bank of Korea.

Figure I-6. Household loans,[1] by loan type



Notes: 1) Based on household credit statistics.
2) Home mortgage loans, leasehold deposit fund loans, etc.
3) Secured loans not collateralized by housing, unsecured loans, guaranteed loans, etc.
Source: Bank of Korea.

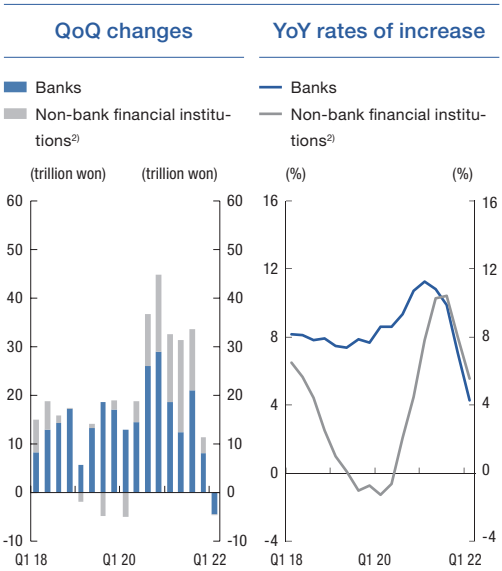
5) Under the Financial Services Commission's "Additional Measures to Strengthen Household Debt Management" (October 2021), the second phase of DSR rules on individual borrowers was implemented early from January 2022 (under the original plan, it was to be implemented from July 2022). As a result, the DSR rule on individual borrowers is applied if the total loan amount exceeds KRW 200 million.

6) The weighted average interest rate on household loans of deposit-taking banks (based on newly-taken/extended amounts) rose from 2.8% in December 2020 to 3.2% in September 2021, 3.7% in December 2021, 4.0% in March 2022, and 4.1% in April 2022. Meanwhile, the annual increase in the household interest burden due to a 25bp increase in the loan interest rate is estimated to be about KRW 3.3 trillion (based on the household loan balance at the end of the first quarter of 2022).

7) For more information, refer to Box 1, "Impact of Easing Loan Restrictions on Household Debt Growth and Soundness".

By type of financial institution, banks' household loans increased by 4.3% year-on-year to KRW 905.6 trillion at the end of the first quarter of 2022. Household loans by non-bank financial institutions (NBFIs) rose by 5.6% to KRW 652.3 trillion, showing a significant decline in the growth rate (Figure I-7).

Figure I-7. Household loans,[1] by financial sector



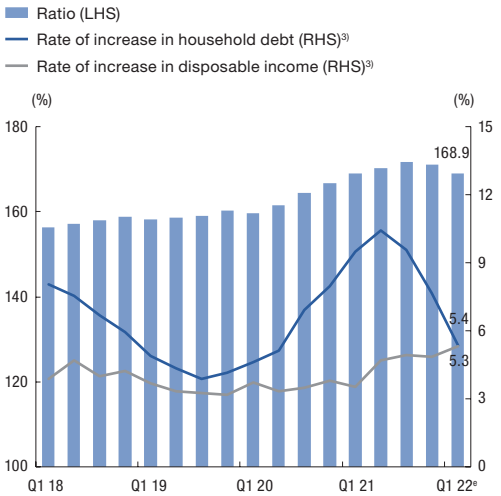
Notes: 1) Based on household credit statistics.
2) Non-bank deposit-taking institutions and others (excluding Korea Housing Finance Corporation, etc.).
Source: Bank of Korea.

Household debt service burden eased slightly

At the end of the first quarter of 2022, the household debt-to-disposable income ratio (based on household credit statistics) decreased 2.2%p from the end of the previous year to 168.9% (estimated). As the rate of increase in household debt decreased, after having remained high, households' debt service burden was somewhat alleviated (Figure I-8). Meanwhile, the financial liabilities-to-financial assets ratio (based on flow of funds statistics) was 45.0% (estimated) at the end of the first quarter of 2022, showing a slight decrease compared to the end of last year (45.6%)[8] (Figure I-9).

However, due to the high level of household debt and strong linkage with the asset market, it is necessary to be aware that the insolvency risk of household debt could increase in the event of a change in conditions, such as a fluctuation in asset prices.[9]

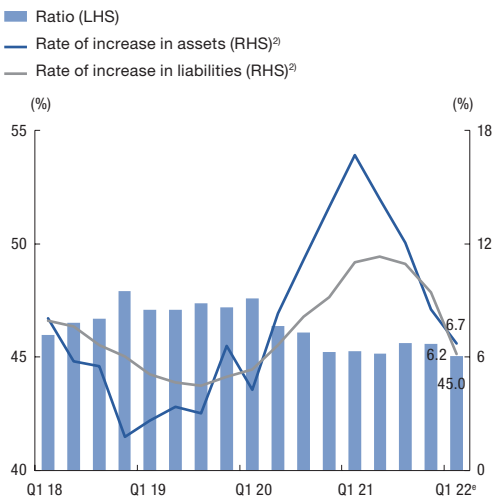
Figure I-8. Household debt[1]-to-disposable income[2] ratio



Notes: 1) Based on household credit statistics.
2) Disposable incomes for Q1 2022 are estimated using the average of the household disposable income-to-gross national income ratios for the immediately preceding three years.
3) Year-on-year basis.
Source: Bank of Korea.

8) This is attributable to a decrease in financial liabilities during the first quarter of this year, while the growth of financial assets slowed due to a decrease in the valuation of stocks.
9) For more information on this, please refer to "II. Assessment of the Impact of Accumulated Household Debt Related to Asset Markets on the Consumption and Defaults of Household Borrowers."

Figure Ⅰ-9. Financial liabilities-to-financial assets ratio[1)]

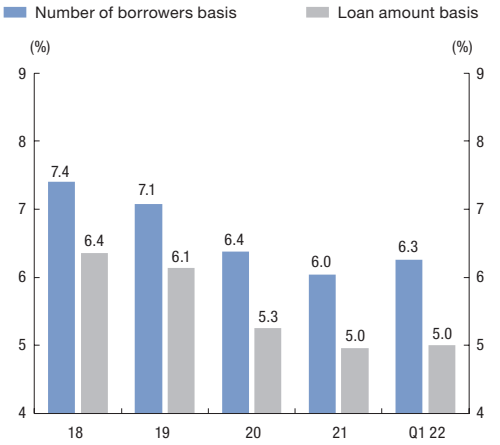


Notes: 1) Based on flow of funds statistics.
2) Year-on-year basis.
Source: Bank of Korea.

Increase in share of vulnerable borrowers

The share of borrowers with comparatively low debt repayment capacities among total household borrowers rose slightly. At the end of the first quarter of 2022, borrowers with low income (bottom 30%) or low credit ratings (credit score of 664 or below),[10)]who also hold multiple household loans, accounted for 6.3% of all borrowers, showing an increase of 0.3%p from the end of the previous year. In terms of loan value, the share of vulnerable borrowers of total household loans was 5.0%, showing no change from the end of the previous year (Figure I-10).

Figure Ⅰ-10. Proportions of vulnerable borrowers

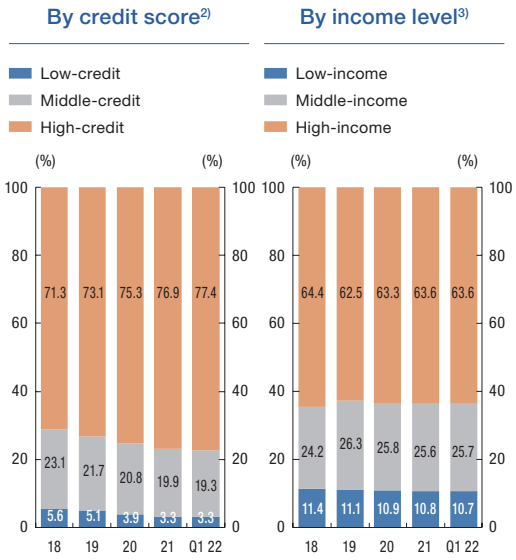


Source: Bank of Korea (Consumer Credit Panel).

By borrower profile (based on loan amount), the proportion of borrowers with high credit ratings increased steadily, and the proportion of high-income borrowers remained unchanged from the end of the previous year. At the end of the first quarter of 2022, the proportion of borrowers with high credit ratings stood at 77.4%, marking an increase of 0.5%p from the end of the previous year, while the proportion of high-income borrowers reached 63.6%, showing no change from the end of the previous year (Figure I-11).

10) In 2021, the rating system for consumer credit worthiness was changed from a grade-based system to a score-based one. In this report, scores of 840 and above (based on credit scores by NICE Credit Information Service) are considered high; scores between 665 and 839, average; and scores below 664, low.

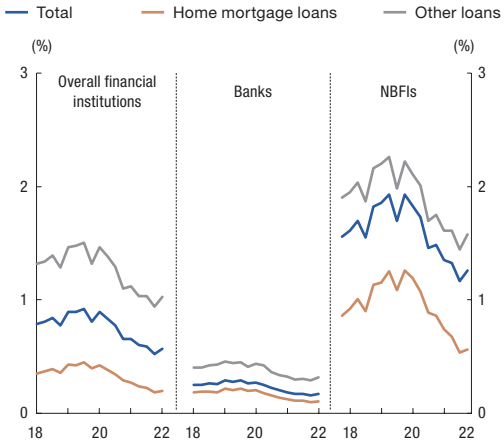
Figure I-11. Shares[1] in household loans, by borrower credit score and income level



Notes: 1) Loan amount basis.
2) High-credit (scores greater than or equal to 840), middle-credit (scores 665-839), low-credit (scores less than or equal to 664).
3) High-income (top 30%), middle-income (30-70%), low-income (bottom 30%).

Source: Bank of Korea (Consumer Credit Panel).

Figure I-12. Delinquency rates[1] of household loans extended by banks and NBFIs[2][3]



Notes: 1) Based on delinquencies of one month and longer (for mutual credit cooperatives and mutual savings banks, principal delinquencies of one day and longer or interest delinquencies of one month and longer).
2) Mutual savings banks, mutual credit cooperatives, insurance companies, credit-specialized financial companies, etc.
3) Excluding insurance contract loans for insurance companies.

Sources: Financial institutions' business reports.

The household loan delinquency rate has remained low for both banks and non-bank financial institutions. At the end of the first quarter of 2022, the household loan delinquency rates for banks and non-bank financial institutions were 0.17% and 1.26%, respectively, up 0.01%p and 0.10%p from the end of the previous year. However, these rates are lower than those of previous years[11] (Figure I-12).

11) However, it is worth noting the possibility that the delinquency of vulnerable borrowers may increase due to an rise in loan interest rates. Looking at a past period of rising interest rates (from the fourth quarter of 2016 to the first quarter of 2019), the delinquency rate of normal borrowers hardly changed, while the delinquency rate of vulnerable borrowers rose by 1.9%p.

3. Corporate Credit

Increase in Growth of Corporate Credit

Corporate loans from financial institutions stood at KRW 1,609.0 trillion as of the end of the first quarter of 2022, recording an increase of 14.8% compared to the same period of the previous year. The growth rate of corporate loans rose further compared to the previous quarter due to the extension of financial support measures for COVID-19,[12] increased demand for facility funds, and banks' efforts to expand the handling of corporate loans.

In particular, as corporate loans continue to increase rapidly in some industries such as construction and real estate which are highly connected to asset markets, it is necessary to check whether funds generated from corporate loans are efficiently flowing into productive sectors.[13] In addition, there is a need to examine the possibility of loans defaults byself-employed business owners,[14] which have been on the rise due to the government's recent financial support measures.

In the financial sector, both banks and non-bank financial institutions showed high growth. Corporate loans of deposit-taking banks reached KRW 1,104.8 trillion at the end of the first quarter of 2022 (commercial banks: KRW 641.2 trillion, special banks: KRW 441.1 trillion), showing an increase of 9.7% (commercial banks: 10.1%, special banks: 8.3%) compared to the same period of the previous year. Those of non-bank financial institutions[15] amounted to KRW 504.2 trillion,[16] an increase of 27.5% compared to the same period of the previous year, led by savings banks (45.8%) (Figure I-13).

12) In March 2022, the government extended the maturity extension and repayment deferral of loans to SMEs and small business owners for an additional six months until September 2022.

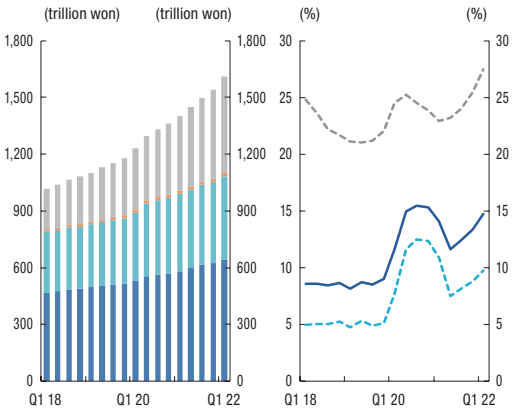
13) For details, please refer to "II. Recent Developments of Corporate Credit Allocation and its Relationship with Corporate Financial Indicators."

14) For details, please refer to "IV. Growth of Loans issued to Self-employed Business Owners After COVID-19 and Assessment of Debt Repayment Risks."

15) The data for non-bank financial institutions are based on mutual savings banks, mutual credit cooperatives (Nonghyup, Suhyup, Forestry Cooperatives, Sinhyup and MG Community Credit Cooperatives), insurance companies (life insurance companies and general insurance companies), and credit-specialized financial companies. However, due to limited data availability, some sectors' data include loans to financial and insurance companies.

16) In the business sector, mutual credit cooperatives accounted for KRW 285.5 trillion (56.6% of corporate loans offered by non-bank financial institutions), insurance companies for KRW 98.9 trillion (19.6%), credit-specialized financial companies for KRW 65.3 trillion (12.9%), and savings banks for KRW 54.6 trillion (10.8%).

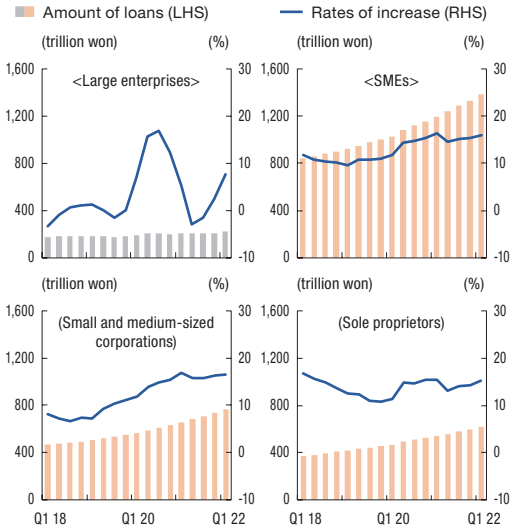
Figure Ⅰ-13. Corporate loans of financial institutions[1)]



Notes: 1) Deposit-taking banks include commercial banks, specialized banks and foreign bank branches; NBFIs include mutual savings banks, mutual credit cooperatives, insurance companies, and credit-specialized financial companies.
2) End-period basis; excluding financial and insurance companies.
3) Year-on-year basis.
Sources: Financial institutions' business reports.

By company size,[17)] loans to large companies and small- and medium-sized enterprises (SMEs) both increased. Loans to large enterprises (KRW 221.8 trillion, 7.8% YoY) increased due to worsening conditions for the issuance of corporate bonds and increased demand for facility funds. SME loans (KRW 1,384.6 trillion, 16.0%) continued their high growth trend as the demand for facility funds remained strong amid the extension of COVID-19 financial support measures (SMEs: KRW 763.7 trillion, 16.6%; sole proprietors: KRW 620.9 trillion, 15.3%) (Figure Ⅰ-14).

Figure Ⅰ-14. Corporate loans,[1)2)3)] by company size

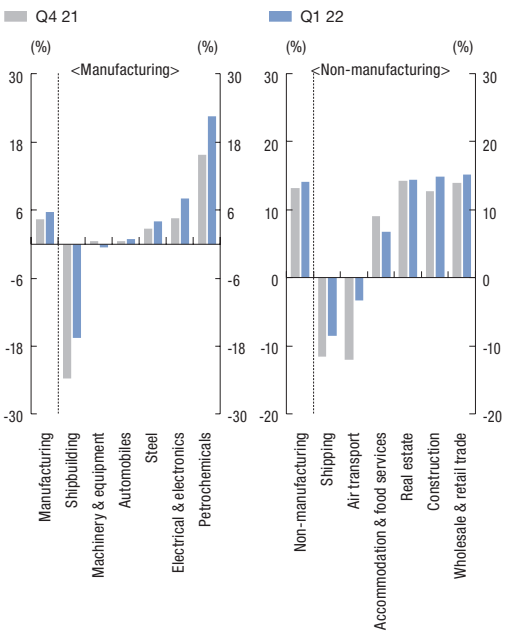


Notes: 1) Based on sum of banks and NBFIs (due to the limited availability of data, some NBFIs include loans of financial and insurance companies in some businesses and periods).
2) End-period basis, rates of increase are year-on-year basis.
3) "Small and medium-sized corporations" refers to SMEs other than sole proprietors.
Sources: Financial institutions' business reports.

By industry,[18)] manufacturing showed a high rate of increase in loans, centered on petrochemicals, while for the non-manufacturing sector, the increase was concentrated in wholesale and retail, construction, and real estate[19)] (Figure Ⅰ-15).

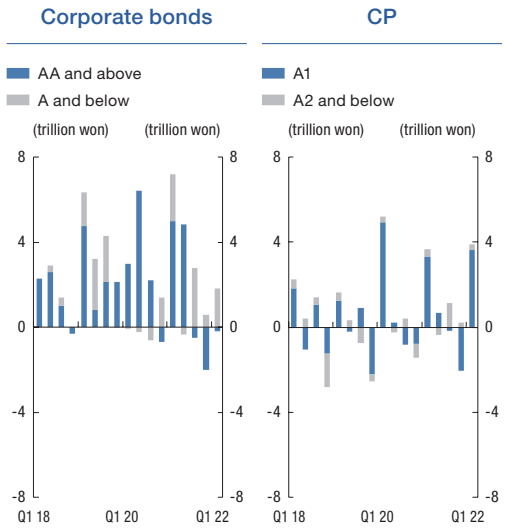
17) In the analysis of loans by company size, some loans from non-bank financial institutions that do not differentiate by company size were excluded due to data limitations.
18) Corporate loans from some non-bank financial institutions (savings banks, credit-specialized financial companies, and the Korean Federation of Community Credit Cooperatives) were excluded from the analysis because they were not classified by industry.
19) In the petrochemical and construction industries, raw material prices continued rising, and in the wholesale and retail industry, the demand for working capital increased due to the re-emergence of COVID-19, resulting in a significant increase in loans. Meanwhile, in the real estate industry, high loan growth continued due to investment in commercial real estate.

Figure Ⅰ-15. Growth rates[1] of financial institutions' corporate loans,[2] by industry



Notes: 1) Year on year basis.
2) Based on summing up banks and NBFIs that can be classified by industry.
Sources: Financial institutions' business reports.

Figure Ⅰ-16. Corporate bond and commercial paper (CP) issuance[1]



Note: 1) Excluding issuance by financial holding companies and special purpose companies (SPCs); net-issuance basis.
Sources: Bank of Korea, Korea Securities Depository, Infomax.

In the direct financial market, net issuance was centered mainly on prime bonds for CP and subprime bonds for corporate bonds during the first quarter of 2022 (Figure I-16). However, financing through corporate bonds contracted compared to the same period of the previous year as demand for issuance and investment slowed because of the expansion of credit spreads.

Increase in Debt Ratio

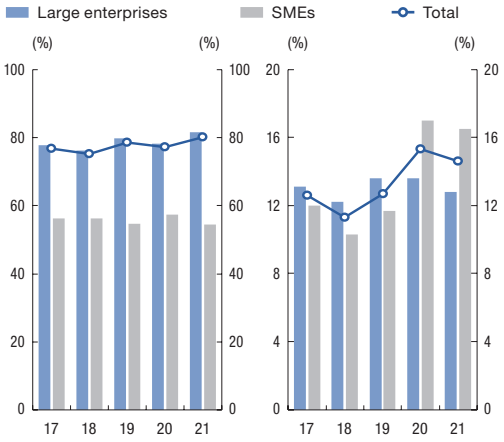
The corporate debt ratio (debt/equity)[20] was 80.1% at the end of 2021, showing a slight increase compared to the end of 2020 (77.2%), led by large companies.[21] However, the proportion of companies with a debt ratio exceeding 200% (excessively-indebted firms) fell from 15.3% at the end of 2020 to 14.6% at the end of 2021[22] (Figure I-17).

20) Hereafter based on 2,610 firms (1,300 large enterprises, 1,310 SMEs), including listed companies required to file a business report pursuant to the Financial Investment Services and Capital Markets Act and some unlisted companies (excluding financial and insurance industries). It is necessary to note that there is a difference in the level of financial soundness indicators, such as the debt ratio, because the sample companies analyzed differed from those of the 「Financial Statement Analysis」, which is annually conducted by Bank of Korea.

21) By company size, large enterprises (78.2% at the end of 2020 → 81.5% at the end of 2021) showed an increase, while SMEs (57.4% → 54.6%) showed a decline.

22) When looking at the proportion of excessively-indebted firms by company size, both large enterprises (13.6% at the end of 2020 → 12.4% at the end of June 2021 → 12.8% at the end of 2021) and SMEs (17.0% → 12.2% → 16.5%, over the same periods) showed an increase compared to the end of June, but remained at a lower level compared to the end of 2020.

Figure I-17. Corporate debt ratios,[1] by company size



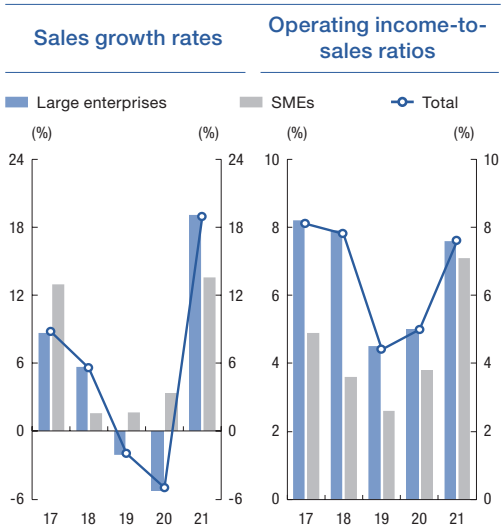
Notes: 1) Debt / Equity; end-period basis.
2) Including corporations with capital erosion.
Source: KIS-Value.

Significant Improvements in Growth Potential and Profitability

The sales growth rate of companies (compared to the same period of the previous year) was 18.9% in 2021, which transitioned from a decline (-5.0%) in 2020 to a large increase, with the growth rate further increasing in the second half (13.2% in the first half, 25.7% in the second half). Sales in most industries recovered significantly compared to the previous year, with relatively large increases in shipping, real estate, steel, and petrochemicals. By company size, both large enterprises (-5.2% in 2020 → 19.1% in 2021) and SMEs (3.3% in 2020 → 13.6% in 2021) showed significant increases in their sales growth rates.

The operating income-to-sales ratio (operating income/sales), which indicates the profitability of a company, also increased significantly (5.0% in 2020 → 7.6% in 2021) due to an increase in operating income following the recovery of sales in 2021. By company size, both large enterprises (5.0% in 2020 → 7.6% in 2021) and SMEs (3.8% in 2020 → 7.1% in 2021) recorded an increase from the previous year (Figure I-18).

Figure I-18. Sales growth rates[1] and operating income-to-sales ratios,[2] by company size



Notes: 1) Year on year basis.
2) Operating income / Sales.
Source: KIS-Value.

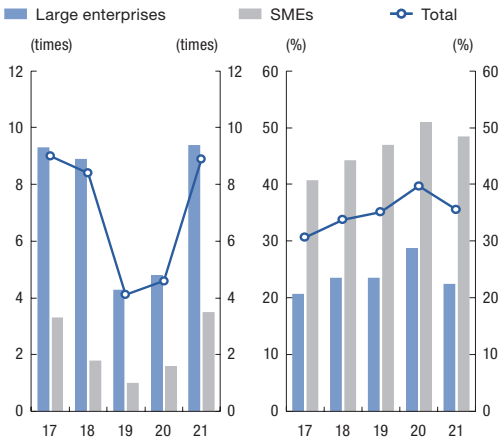
Significant Improvement in Interest Coverage Ratio

The interest coverage ratio (operating income/total interest expenses), which indicates a company's ability to make interest payments,[23] was 8.9 in 2021 (7.9 in the first half, 10.3 in the second half), showing a significant

23) When calculating the interest coverage ratio, the numerator is operating income, and the denominator is total interest expenses, including interest on bonds.

increase compared to the ratio of 4.6 recorded in 2020, as operating income increased significantly.[24] By company size, both large enterprises (4.8 in 2020 → 9.4 in 2021) and SMEs (1.6 in 2020 → 3.5 in 2021) showed a significant increase from the previous year. Accordingly, the proportion of companies with an interest coverage ratio of less than 1 fell from 39.7% in 2020 to 35.5% in 2021. By company size, both large enterprises (28.8% in 2020 → 22.5% in 2021) and SMEs (50.9% in 2020 → 48.4% in 2021) showed a decrease from the previous year (Figure I-19).

Figure I-19. Corporate interest coverage ratios,[1] by company size



Notes: 1) Operating income / Total interest expenses.
2) Including corporations recording operating losses.
Source: KIS-Value.

Corporate earnings recovered and profitability improved significantly in 2021, but there are still some differences in the speed of recovery by industry.[25] In addition, uncertainty surrounding future business conditions is increasing due to the rise in raw material prices and expansion of exchange rate volatility this year. Worse yet, as the pressure to increase loan interest rates is rising, the risk of potential insolvency will become a reality, particularly among marginal companies and the vulnerable self-employed business owners.

24) The interest coverage ratio increased significantly, centering on the information service (41.5), electrical and electronic device (38.1), and steel (17.4) industries, which have strong operating performances.

Box 1.

Impact of Easing Lending Regulations on Household Debt Growth and Soundness

To facilitate access to mortgages for home buyers with actual demands, the new administrationis weighing the possibility ofeasing lending regulations. For first-time home buyers, the government is looking to increase the maximum LTV (loan-to-value) ratio to 80%.The government is also considering raising the maximum LTVratio for other home buyers to 70%[1] in due course, by taking into consideration conditions in the housing market and the progress in the implementation of the DSR (debt service ratio) rules.[2][3]

Cap on loan-to-value (LTV) ratio for home mortgages[1]

	Speculation and over-speculation zones		Adjustment target areas		Other areas
For ordinary buyers with actual demand[2]	Properties valued KRW 600mil. or less	60%	Properties valued KRW 500mil. or less	70%	70%
	KRW 600 - 900mil.	50%	KRW 500 - 800mil.	60%	
For tenants with no house or single homeowners	Properties valued KRW 900mil. or less	40%	Properties valued KRW 900mil. or less	50%	Tenants with no house Single homeowners
	KRW 900m - 1.5bn	20%	KRW 900m - 1.5bn	30%	
	Over KRW 1.5bn	0%	Over KRW 1.5bn	0%	
For homeowners with more than one house	0%		0%		60%

Notes: 1) As of May 2022.
2) Cases where ① the annual income of households is below KRW 90mil. (100mil. for first home buyers), ② the price is below KRW 900mil. for properties in speculation or over-speculation zones, and KRW 800mil. for properties in adjustment target areas, ③ buyers are tenants without houses.

Source: Financial Services Commission.

1) The government is discussinga blanket increase of the LTV limit on home mortgages, which currently varies from 0% to 70% depending on the location and price of a home, to 70% (80% for first-time homebuyers). The current LTV limit is 0% for homes exceeding 1.5 billion won in value that are located in regulated zones and for buyers who own more than one house.
2) The individual borrower-level DSR ruleson bank loans and non-bank loans meeting certain criteria to 40% and 50%, respectively, have been in place since January 2022.
3) The Financial Services Commission announced the details of this plan through a press release, titled “Directions of Household Loan Management and Regulatory Normalization by the New Administration” (Jun. 16, 2022).

Strengthened DSR rules for household loans

	Before Jul 2021	1st phase (Jul 2021)	2nd phase (Jan 2022)	3rd phase (Jul 2022)
Home mortgages	Properties valued over KRW 900mil. in speculation or over-speculation zones	ⓐ Properties valued over KRW 600mil. in all regulated areas	Total borrowed amount over KRW 200mil. (maintain ⓐ, ⓑ)	Total borrowed amount over 100mil. (discontinue ⓐ, ⓑ)
Credit loans	Annual income over KRW 80mil. and loans over KRW 100mil.	ⓑ Loans over KRW 100mil.		

Source: Financial Services Commission.

Although the easing of lending regulations can have a positive effect of increasing the availability of loans for home buyers, an excessive easing can cause household debt growth to spiral. In what follows, the impact of easing the lending regulations on home buyers' maximum loan limits for home mortgages and the total household debt growth is assessed to derive implications for future directions in the regulation of loans.

Effect of Easing Loan Regulations on Credit Availability for Home Buyers

The effect of easing loan regulations on credit availability for home buyers is estimated based on changes in the maximum borrowing limit by home price range and by the borrower's income and age.[4)]

Change in the Maximum Loan Limit by Home Price Range

Under the phase-3 DSR rules (scheduled to enter into effect in July 2022), relaxing the LTV rules (to 70%-80%) appeared to cause a larger increase in the maximum loan limit for high-priced homes. For low-priced homes in unregulated zones, the easing of the LTV rules is expected to result only in a negligible increase in the maximum loan limit, sincea higher LTV cap is already in effect in these zones.On the other hand, for homes priced over 1.5 billion won located in the speculation zones where home mortgages are currently disallowed for such homes, the relaxation of the LTV rules appeared to lead to a sharp increase in the maximum loan limit. If a young borrower with an average annual income (31.2 million won for people in their 20s and 30s[KHTC1] in 2021) purchases a home in an unregulated zone for 300 million won, the slight increase in the maximum LTV ratio(70% ~ 80%)will only add 30 million won to the maximum loan limit (210 million won → 240 million won).[5)] However, if a high-income earner in the top income quintile (84 million won on average) purchases a home in the speculation zone for 1.6 billion won, the sharp increase in the LTV limit (0% → 70%) will addas much as 650 million won to the maximum loan limit.

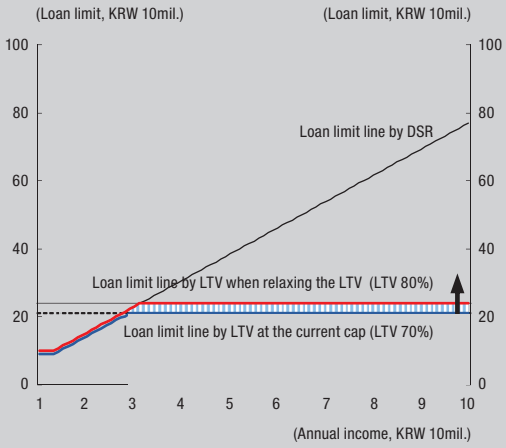
4) Changes in the average maximum loan limit resulting from the easing of loan regulations were calculated using the data of home mortgage borrowers who purchased a home in the past three years (2019-2021), obtained from the Household Debt Database.

5) If the same borrower buys a home priced at 900 million won in the speculation zone, in spite of the increase of the maximum LTV ratio, the allowable amount of the loan will still be capped at 240 million won because of the DSR restrictions.

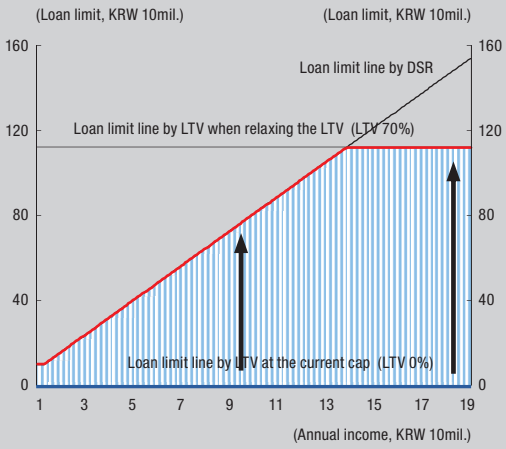
Changes in mortgage loan limits in response to the easing of the LTV rules (by house price)[1)2)]

Changes in loan limit
Loan limit before easing the LTV rules
Loan limit after easing the LTV rules

① Cases when buying one's first house at KRW 300mil. in other areas



② Cases when buying a house at KRW 1.6bn in the speculation zones

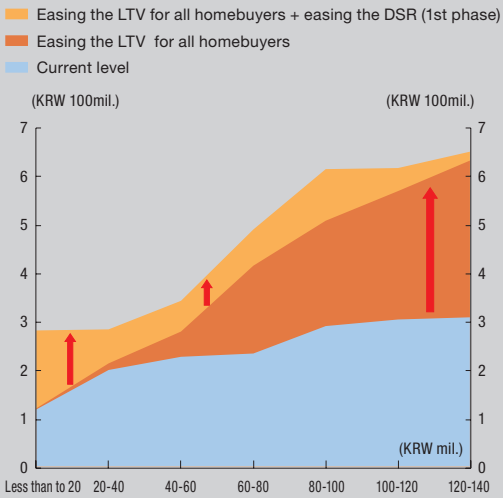


Notes: 1) Calculation of loan limit by DSR (40%) assumes 30-year maturity of mortgage loans, 3.85% interest rate, and equal amortization of principal (with no existing loans) under the 3rd phase of DSR rules.
2) The minimum value between loan limits by DSR and LTV.
3) Assuming that the LTV cap is increased to 70% for all borrowers.
Sources: Bank of Korea staff calculation.

Change in the Maximum Loan Limit by Income of Borrower

For high-income earners with a high propensity to buy high-priced homes in the speculation-zones, easing the LTV rules increases the maximum loan limit more significantly than easing the DSR rules. On the other hand, for middle- to low-income earners, easing the DSR rules has a greater effect of increasing the maximum loan limit than easing the LTV rules. This is because for higher-income earners with a high debt servicing capacity, the allowable loan amount is bound more to the LTV ratio than the DSR. However, in the case of middle- to low-income earners with a relatively lower debt servicing capacity, even when they benefit from more favorable LTV rules as first-time home buyers, it has a minimal effect on the maximum allowable amount of the loan compared to the DSR.

Changes in average loan limits in response to the easing of household loan regulation (by income level)

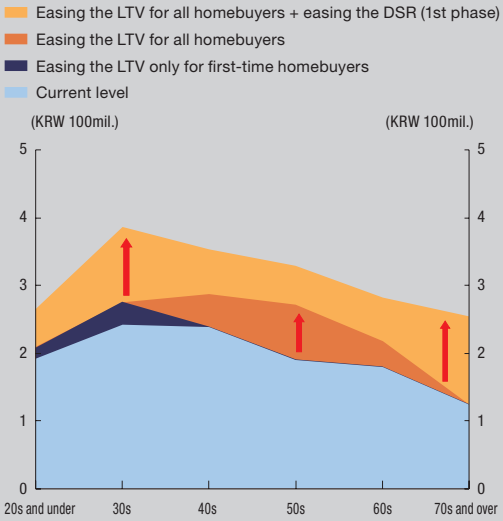


Note: 1) Mortgage loan limit by regulatory level is calculated for each income range by using information about areas where housing was purchased and prices for the borrowers who purchased a house in the last 3 years.
Sources: Bank of Korea staff calculation (Consumer Credit Panel).

Change in the Maximum Loan Limit by Age of Borrower

Easing the LTV rules is expected to substantially increase the maximum loan limit for borrowers in their 40's and 50's as this age group tends to be in higher income brackets and purchase comparatively high-priced homes. On the other hand, raising the LTV limit will likely have a more modest effect on the maximum loan limit of those in their 20s and 30s, who are often first-time home buyers. Nonetheless, since home buyers in their 30s[6] are increasingly purchasing homes in the Seoul metropolitan area and other speculation(over-speculation) zones despite their comparatively low income levels, if the easing of the LTV rules is coupled with the easing of the DSR rules, this could result in a sizeable increase in their maximum loan limit.[7]

Changes in average loan limits in response to the easing of household loan regulation (by age)



Note: 1) Mortgage loan limit by regulatory level is calculated for each income range by using information about areas where housing was purchased and prices for the borrowers who purchased a house in the last 3 years.

Source: Bank of Korea staff calculation (Consumer Credit Panel).

The effect of regulatory easing on the maximum loan limit, therefore, increases commensurately with the price range of homes purchased and the income level of borrowers. For younger borrowers in their 20s-30s, easing the DSR rules appeared to be more effective for increasing the maximum loan limit than easing the LTV rules.

Effect on Household Debt Growth

As easing loan regulations raises the maximum allowable amount of money home buyers can borrow, it can lead to rapid growth in total

6) According the Household Debt Database, while home mortgage borrowers in their 30s who bought a home in the past three years had a lower average annual income than older borrowers(46.1 million won for the age group 40-49; 45.6 million won for the age group 50-59) of 39.8 million won, home purchases by this age group in the speculation (over-speculation) zones accounted for more than 40% of total property purchases in the zones, far exceeding the corresponding figure for the age groupsof 40s and 50s (26% and 18%, respectively).

7) A less stringent DSR limit appears to have a similarly large effect on borrowers in their 70s and older, as this age group also has a lower income and a tendency to buy homes in the speculation (over-speculation) zones. However, as borrowers in this age group represent only a small share of total borrowers, an increase in the maximum loan limit for this group is unlikely to have a measurable effect on household debt growth.

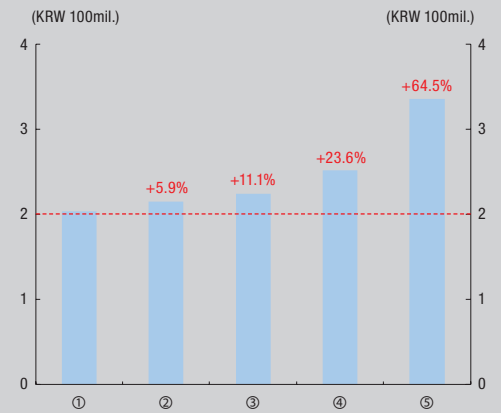
household debt. Changes in aggregate household debt were, therefore, estimated for different regulatory options(different mixes of LTV and DSR rules).

If the LTV cap is raised only for first-time home buyers (option②), the average maximum household loan limit is estimated to increase 5.9%[8] from the level in the current regulatory level (①). If the easing of the LTV cap is combined with the easing of the DSR cap by extending the maximum loan maturity (30 years → 40 years)(option③), this is expected to result in an estimated 11.1% increase in the maximum household loan limit. Meanwhile, if the LTV cap is raised to 70-80% for all borrowers, while keeping the current phase-3 DSR rules unchanged(option④), the maximum household loan limit is estimated to jump 23.6% from the level in the current level(①). Finally, if the LTV cap is raised for all borrowers at the same time as a reversion back to the phase-1 DSR rules(option⑤), this is expected to lead to a whopping 64.5% increase in the maximum household loan limit.

The calculation of changes in aggregate household debt[9] using the above estimates suggested that a partial easing of the LTV rules would only lead to a negligible increase in debt growth as long as the DSR rules are implemented as planned. If the LTV cap is raised only for first-time homebuyers (②, ③), this appeared to result in an estimated 0.6-1.2%p increase in household debt growth. On the other hand, raising the LTV cap for all homebuyers (④) and raising the LTV cap for all homebuyers at the same time as reverting to the phase-1 DSR rules (⑤) are expected to result in an estimated 2.6%p increase and 7.0%p increase in household debt growth, respectively.

Changes in average loan limits[1] by regulatory option

	Option ①	Option ②	Option ③	Option ④	Option ⑤
LTV	Current level	Easing for first-time homebuyers (80%)	Easing for first-time homebuyers (80%)	Easing for all homebuyers	Easing for all homebuyers
DSR	Current level	Current Regulation	Eeasing with extension of maturity	Current level	Eeasing to the 1st phase



Note: 1) Weighted average of home mortgage loan limits for individual borrowers who have purchased a house in the last 3 years.
Source: Bank of Korea staff calculation (Consumer Credit Panel).

Estimation of increases in household loan growth rate by regulatory option[1]

Option ②	Option ③	Option ④	Option ⑤
+0.6%p	+1.2%p	+2.6%p	+7.0%p

Notes: 1) Additional increases in household loan growth rate in 2021 on the assumption that new household mortgage loans increase further in line with the higher loan limit due to the easing of regulations.
Sources: Bank of Korea staff calculation.

Effect on Household Debt Soundness

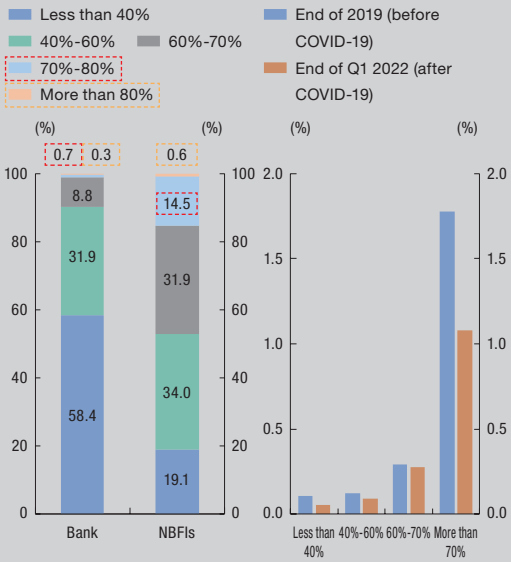
Despite accelerated household debt growth, the quality of financial institutions' loans has

8) The calculation was based on home mortgage borrowers in their 20s-30s, many of whom are first-time homebuyers.
9) Changes in household loans were calculated for different regulatory options, based on new home mortgage loans issued during 2021. Given a higher than usual demand for home mortgage loans during 2021,the actual increase in household loans could be smaller if mortgage demand slows going forward.

remained sound thanks to more stringent LTV rules. At the end of the 1st quarter of 2022, the average LTV ratio of bank home mortgages stood at alow level of 38.7% (about 61% for non-bank loans),[10] with the LTV ratio exceeding 70% for only 1.0% of all loans (about 15% for non-bank loans). However, if the LTV rules are eased across all borrower types, in the event of a housing market shock, this could increase loan defaults, centered on high LTV non-bank loans,[11] potentially creating situations where financial institutions are unable to recover the loan principal by foreclosing and liquidating the homes.

Share[1] and delinquency rate of home mortgage loans by LTV level

<The share of loans by LTV level>



<Delinquency[2] rate of home mortgage loans>

Notes: 1) End-Q1 2022 basis.
2) Domestic bank basis.
3) Mutual credit cooperatives basis.
Sources: Bank of Korea, Financial institutions' business reports.

LTV and DSR Regulations in Other Jurisdictions

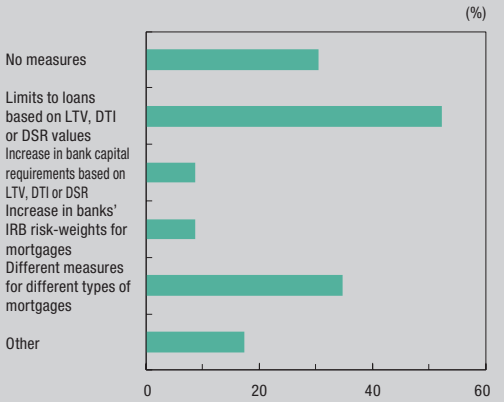
Currently, in most jurisdictions that have implemented lending regulations, are applying appropriate policy mixes that combine LTV and DSR restrictions and capital requirements to improve credit availability while ensuring the soundness of loans. In jurisdictions where both the LTV ratio and DSR are in place, the LTV cap is generally set quite high at 70-100% and, instead, the DSR cap is set lower (Canada) for high LTV loans (80%

10) However, the tightening of the LTV rules caused unsecured loans to increase sharply. If the LTV ratio is recalculated for the overall financial sector (as of the end of 2021) by including the amount of unsecured loans issued to borrowers who are already carrying a home mortgage, this figure is estimated to rise by over 7%p, which may indicate that the effectiveness of the LTV restrictions has weakened considerably in recent times.

11) The delinquency rate tends to be higher on high LTV mortgage loans. During the period (end of 2019) before the introduction of COVID-19-related relief measures, the delinquency rate on high LTV loans was significantly more elevated than in the recent period (end of Q1 2022).

or more)or the DSR limit is waived for low LTV loans (Singapore).[12] Some jurisdictions raised bank capital requirements for loans with high LTV values (Mexico, Russia). High LTV loans are also assigned higher IRB risk-weights when calculating risk-weighted assets (Netherlands) or are subject to a higher loan loss provision (Mexico).

Share of jurisdictions[1] applying macroprudential mortgage measures



Note: 1) 16 jurisdictions responding to the BIS CGFS' survey.
Source: BIS.

Policy Implications

The policy authority needs to determine the appropriate extent of an easing of lending regulations in consideration of potential qualitive and quantitative negative impacts on household debt. This is because an excessive easing of LTV and DSR rules can lead to a renewed increase in household debt by rekindling expectations of housing price appreciation and ultimately to the build-up of financial imbalances. It will therefore be more prudent to gradually ease LTV and other loan regulations based on a careful assessment of housing market, household debt, and macroeconomic conditions, while putting lending practices based on borrowers' debtservicing capacity in place with a consistent implementation of DSR rules. However, liquidity restrictions need to be relaxed for home buyers with actual demand by raising the LTV cap for first-time home buyers. For the effectiveness of easing LTV rules,it may also be necessary to more flexibly calculate the DSR for young homebuyers, for example, by recognizing their future income.

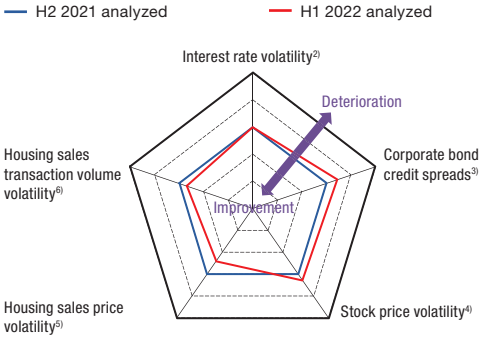
12) In the U.S., although the LTV ratio and the DSR are not among the macroprudential measures considered by its financial authorities, they are two of the key management indicators used by banks during credit checks.

Ⅱ. Asset Markets

In the asset markets, the volatility of price variables in the financial markets has increased significantly due to the acceleration of policy rate hikes at home and abroad and the increase in geopolitical risk related to Ukraine. Korea Treasury Bond (KTB) yields rose sharply while stock prices fell significantly, mainly affected by external factors.[1)]

Although the increase in housing prices has slowed remarkably since the second half of last year, prices are still at a high level relative to underlying economic conditions (Figure II-1).

Figure Ⅱ-1. Map of changes in asset market conditions[1)]



Notes: 1) Extents of change in December 2021-May 2022 period compared to June 2021-November 2021 period (December 2021-April 2022 period for housing sales price and housing sales volume) indexed.
2) Daily volatility of Treasury bond yield (3-yr) calculated using exponential weighted moving average (EWMA) method.
3) Corporate bond yield (A-) - Treasury bond yield (3-yr), with its extent of change as of end-May 2022 compared to end-November 2021 indexed.
4) V-KOSPI basis.
5) Standardized monthly housing sales price index (housing sale price index for the month/standard deviation of housing sale price index for overall period).
6) The same as the method of calculating indexed monthly volatility of housing salesprice.

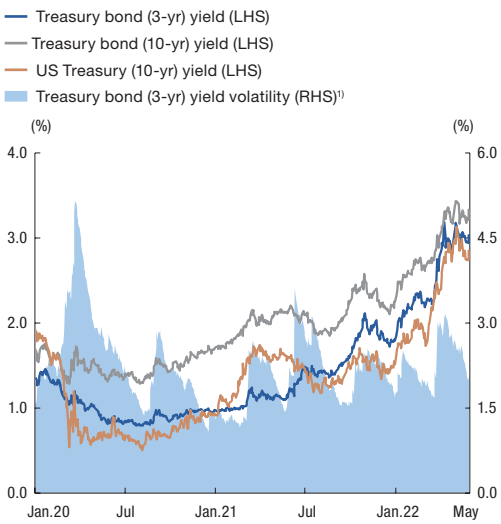
Source: Bank of Korea.

1. Bond Markets

Sharp Rise in Long-term Market Interest Rates

KTB yields were largely affected by the acceleration of policy rate hikes at home and abroad, and rose sharply along with interest rates in the US and other major countries. As concerns about global inflation intensified due to the Ukraine crisis this year,[2)] the US Federal Reserve raised policy rates rapidly, followed by other major countries such as the UK and Australia,[3)] greatly increasing upward pressure on interest rates. Internally, the effects of the Bank of Korea's rate hikes (25bp each in January, April, and May), concerns over the supply of and demand for government bonds related to the supplementary budget,[4)] and increasing domestic inflation rates[5)] have all contributed to the interest rate rise (Figure II-2).

Figure Ⅱ-2. Korean and US Treasury bond yields



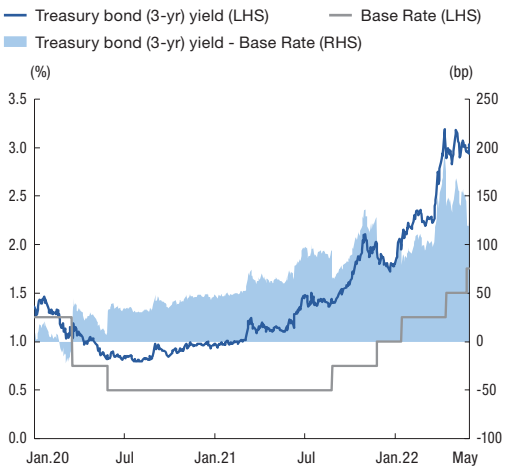
Note: 1) Daily volatility calculated using exponential weighted moving average (EWMA) method.

Sources: Korea Financial Investment Association, Bloomberg.

1) Recently, the risk to global financial stability has been increasing. In this regard, please refer to Box 2. “Recent Global Financial Stability Risk Assessment of International Financial Institutions and Response.”

During the first half of the year, the difference between short-term and long-term interest rates (3-year government bond yield - base interest rate) widened due to a sharp rise in the interest rate on government bonds despite the three Base Rate hikes (Figure II-3).

Figure II-3. Base Rate and Treasury bond yield

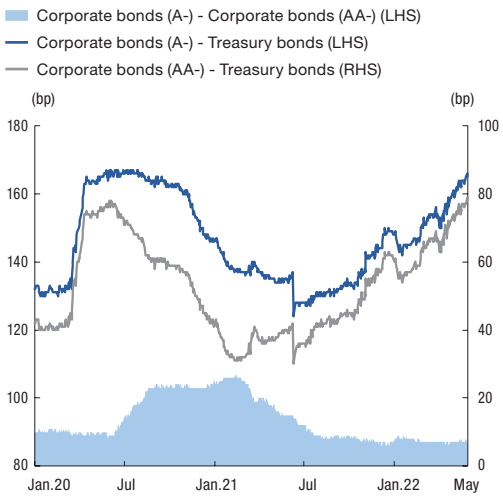


Sources: Bank of Korea, Korea Financial Investment Association.

Expansion in Credit Spreads of Corporate Bonds

Credit spreads of corporate bonds widened this year as investor sentiment toward credit securities contracted due to increased volatility in KTB interest rates and intensified geopolitical risk. Since the end of February, geopolitical risk has increased (increasing risk aversion) due to the Ukraine crisis, along with the volatility in KTB interest rates due to the acceleration of interest rate hikes at home and abroad. As a result, the spread on both prime and subprime bonds expanded considerably. However, the spread between credit ratings (AA- and A-based) did not change significantly as the credit spread between prime bonds and subprime bonds moved relatively evenly (Figure II-4).

Figure II-4. Corporate bond credit spreads,[1] and spread across credit ratings



Note: 1) 3-year maturity basis.
Source: Korea Financial Investment Association.

2) Downward pressure was exerted on interest rates at the beginning of the Ukraine crisis due to the attractiveness of safe-haven assets, but rising prices for oil and other commodities and consequent inflation concerns have served as upward pressure on interest rates. This is in contrast to downward pressure from concerns over the global economic slowdown caused by the prolonged crisis.

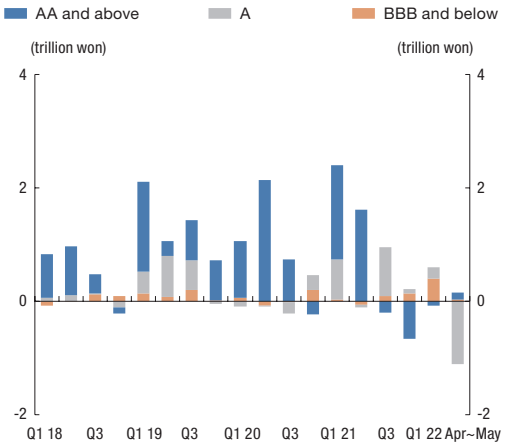
3) The US Federal Reserve raised its policy rate three times (March, May and June) this year, the Bank of England (BOE) raised its policy rate four times (February, March, May and June) and the Reserve Bank of Australia (RBA) raised interest rates in May for the first time since the COVID-19 pandemic began.

4) The government stated on May 11 that there would be no additional government bonds issued in relation to the second supplementary budget financing plan. This greatly eased the burden on bond supply and demand related to the supplementary budget.

5) The domestic consumer price index (CPI, YoY) has risen sharply this year (3.6% in January → 3.7% in February → 4.1% in March → 4.8% in April → 5.4% in May).

Looking at corporate bond issuance in the first half of the year, net issuance was recorded during January and February due to the demand for advance issuance arising from the prospect of rising market interest rates. From March, however, the position turned to net redemption, since the issuance conditions of corporate bonds deteriorated somewhat due to credit spread widening, etc. (Figure II-5).

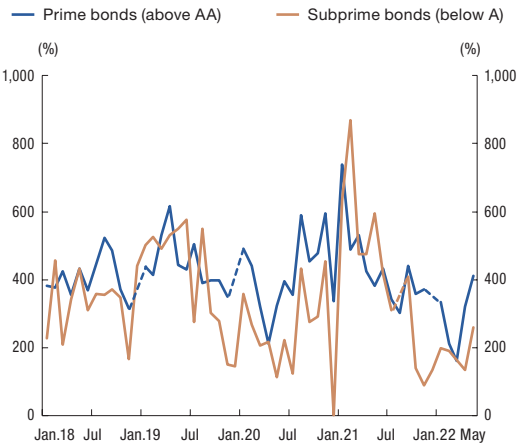
Figure II-5. Net corporate bond[1] issuances[2]



Notes: 1) Public offer basis; excluding issuance by financial companies.
2) Monthly average basis.
Sources: Bank of Korea, Korea Securities Depository.

Participation in book building for corporate bonds remains at a low level, particularly among subprime bonds (A rating or lower) (Figure II-6).

Figure II-6. The rate of participation[1] in book-building for prime bonds[2]



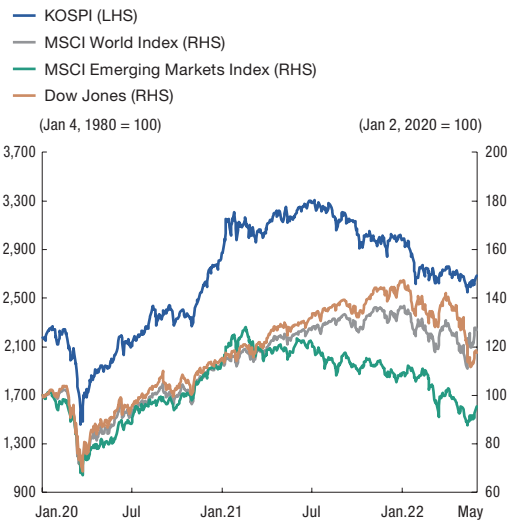
Notes: 1) Participation in book-building for prime bonds amount/expected issuance amount.
2) Public offer basis; excluding issuance by financial companies.
Sources: Bank of Korea, Korea Securities Depository.

2. Stock Markets

Sharp Fall in Stock Prices

Share prices fell sharply this year mainly due to external factors such as concerns over accelerated rate hikes by the US Federal Reserve at the beginning of the year, continued geopolitical risk in Ukraine, and supply-demand adjustments following the listing of large public offerings.[6] Afterward, as concerns grew overrising global inflation and deepening economic slowdown due to COVID-19-related lockdown measures in China, stock prices fell to their lowest level of the year (2,550 on May 12) before rebounding slightly (Figure II-7).

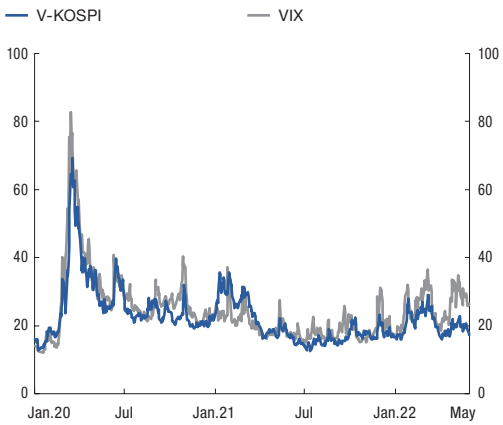
Figure II-7. KOSPI and global stock prices[1]



Note: 1) US is based on S&P 500 index; developed and emerging market countries are based on MSCI.
Sources: KOSCOM, Bloomberg.

The KOSPI200 Volatility Index (V-KOSPI) rose sharply at the end of January over concerns about the US Federal Reserve's monetary policy tightening and geopolitical risk but declined from mid-March due to expectations for improved corporate earnings. It rose temporarily after April(due to economic slowdown concerns) before declining (Figure II-8).

Figure II-8. Stock price volatility indices[1]



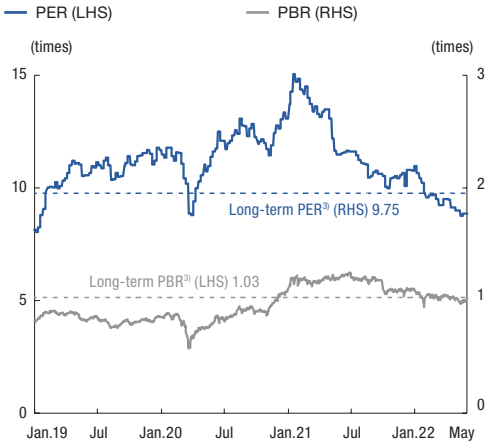
Note: 1) Volatility indices calculated using prices for options on KOSPI 200 and S&P 500 indices.
Sources: KOSCOM, Bloomberg.

Declining PER and PBR

The Price Earnings Ratio (PER)[7] dropped to 8.86x as of the end of May, significantly below the long-term average (9.75, since 2010) as stock prices fell sharply while expected company earnings remained high. The Price Book Value ratio (PBR) was 1.01 as of the end of May, slightly below the long-term average of 1.03 (Figure II-9).

6) Around the listing date of LG Energy Solution (January 27), KOSPI-tracking financial instruments sold many of their existing stocks to make room in their portfolios for LG Energy Solution stocks.
7) Based on the 12-month forward MSCI PER, calculated by dividing the sum of stock market capitalizations of companies tracked by the MSCI index by the sum of their expected net profits (values forecast by Korean and foreign securities companies) during the next one year period.

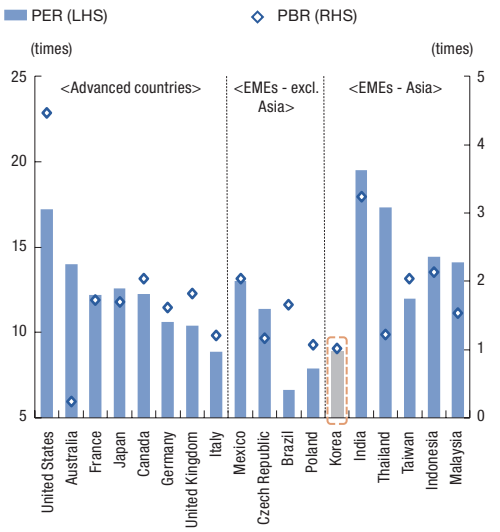
Figure II-9. PER[1] and PBR[2]



Notes: 1) MSCI basis (12-month forward).
2) KOSPI basis.
3) Average of Jan 2010 ~ May 2022.
Sources: Bloomberg, Refinitiv.

The domestic market PER and PBR remained lower than those of advanced countries and major emerging markets (Figure II-10).

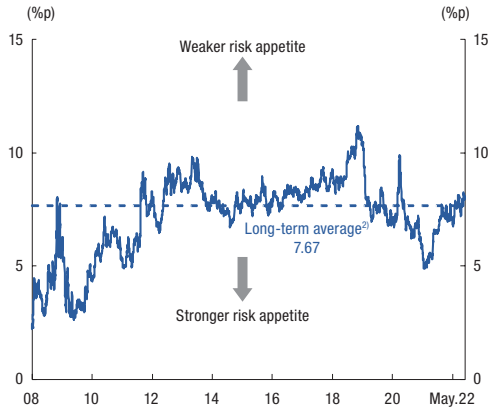
Figure II-10. PERs[1][2] and PBRs[1] of major countries



Notes: 1) End-May 2022 basis.
2) MSCI basis (12-month forward).
Sources: Bloomberg, Refinitiv.

Meanwhile, the stock risk premium[8] exceeded the long-term average (7.67 percentage points, since 2010) in May (7.96 percentage points as of May 31) as investor risk appetite weakened (Figure II-11).

Figure II-11. Stock risk premium[1]



Note: 1) Treasury bond (10-year) yield subtracted from the earnings-to-price ratio (reciprocal of the 12-month forward MSCI PER).
2) Average of Jan 2010 ~ May 2022.
Sources: Bloomberg, Refinitiv.

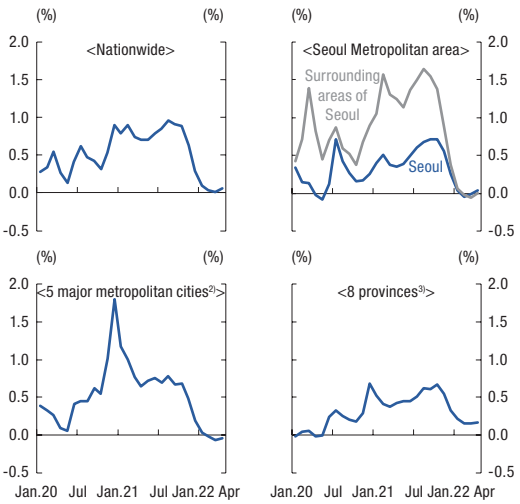
8) The equity risk premium is calculated by subtracting the Treasury (10-year) yield from the earnings-to-price ratio(reciprocal of MSCI-based 12-month leading PER). The fact that investors hold stocks even when the excess return relative to the risk-free rate is lower than in the past means a higher risk appetite.

3. Real Estate Markets

Sharp Slowdown in Housing Price Growth

The increase in housing purchase prices has slowed significantly since September of last year due to widening views that the market is overvalued, the rise in the Base Rate and consequent increase in loan interest rates,[9] and stronger loan regulations. In the Seoul metropolitan area and the nation's five other major metropolitan cities, price increases slowed significantly, with a temporary decline in February and March, but a slight upward trend remained in the eight provinces (Figure II-12).

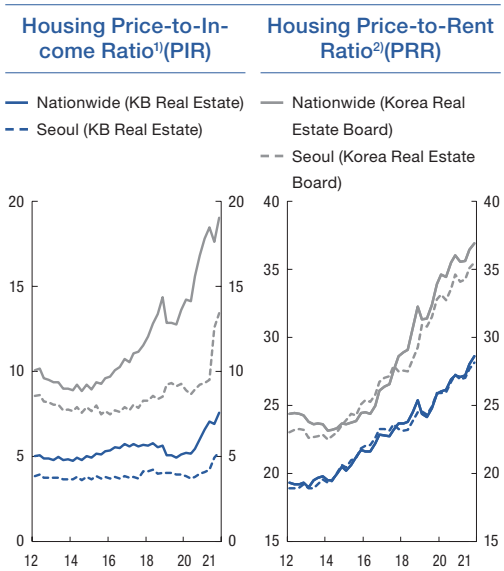
Figure II-12. Rates of increase[1] in housing sales prices



Notes: 1) Compared to previous months.
2) Busan, Daegu, Daejeon, Gwangju and Ulsan.
3) Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam and Jeju.
Source: Korea Real Estate Board.

The Price-to-Income Ratio (PIR) rose as the rise in housing prices outpaced the growth in household income. The Price-to-Rent Ratio (PRR) also continued to rise as housing prices rose higher than rents (Figure II-13).

Figure II-13. Price-to-Income ratio and Price-to-Rent ratio



Notes: 1) Housing price / Annual household income.
2) Housing price / Annual rent.
Sources: Bank of Korea staff calculations, KB Real Estate, Korea Real Estate Board.

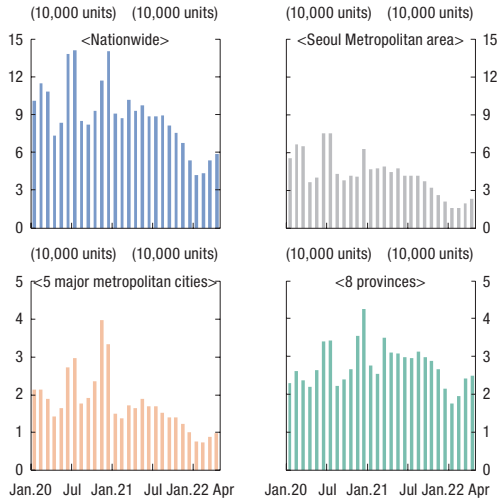
The volume of housing sales transactions from January to April 2022 was 197,000 units, representing a decrease of 47.2% year on year (373,000 units). Especially during January and February, transactions contracted significantly due to the wait-and-see attitude surrounding policy uncertainty. However, as purchase sentiment recovered in March,[10] an upward trend has reappeared (Figure II-14).[11]

9) The weighted average interest rate for mortgage loans at deposit-taking banks (based on new transactions amount) rose from 2.88% in August 2021 to 3.51% in November and 3.90% in April 2022.

10) The Buyer Superiority Index (KB Kookmin Bank) has continued to decline since September last year, dropping to 50.1 in February 2022, then rebounding to 50.4 in March and 51.5 in April.

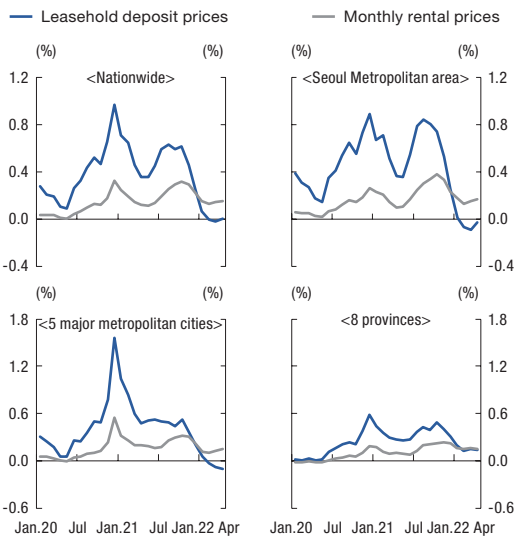
11) The volume of housing sales transactions continued to decrease from September 2021, dropping to about 42,000units in January 2022, and increasing from March (89,000 units in August 2021 → 82,000 units in September 2021 → 42,000 units in January 2022 → 43,000 units in Feb 2022 → 53,000 units in March 2022 → 58,000 units in April 2022).

Figure Ⅱ-14. Housing sales transaction volumes



Source: Ministry of Land, Infrastructure and Transport.

Figure Ⅱ-15. Rates of increase[1] in leasehold deposit and monthly rental prices



Note: 1) Compared to previous months.
Source: Korea Real Estate Board.

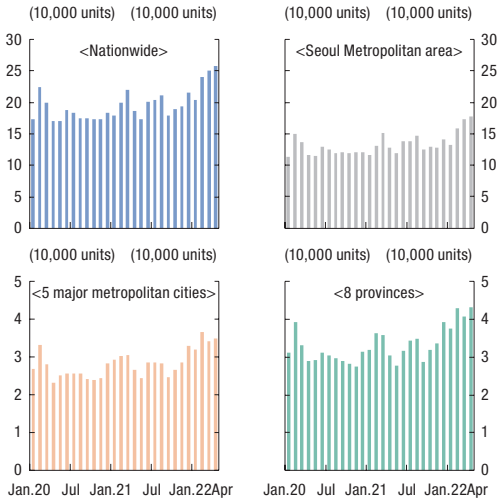
Significant Slowing of Increases in Leasehold Deposit and Monthly Rental Prices

In the housing rental market, increases in leasehold deposit (*jeonse*) and monthly rental prices slowed sharply last year. Leasehold deposit prices in the Seoul metropolitan region and five other major metropolitan cities have turned downward since February this year. However, the rise in monthly rental prices continued to increase as the demand for leasehold deposits has transferred to demand for monthly rent due to the interest rate hike for leasehold deposit fund loans and the burden of higher leasehold deposit prices (Figure II-15)

The volume of leasehold deposit and monthly rent transactions was 954,000 units between January and April 2022, up 21.5% year on year (785,000 units).[12] Leasehold deposit transactions increased slightly (8.0%) over the same period to 490,000 units, while monthly rent transactions increased significantly (40.1%) to 464,000 units. As a result, the proportion held by monthly rent of total leasehold deposit and monthly rent transactions was 48.7% from January to April 2022, recording an increase of 6.4 percentage points year on year (Figure II-16).

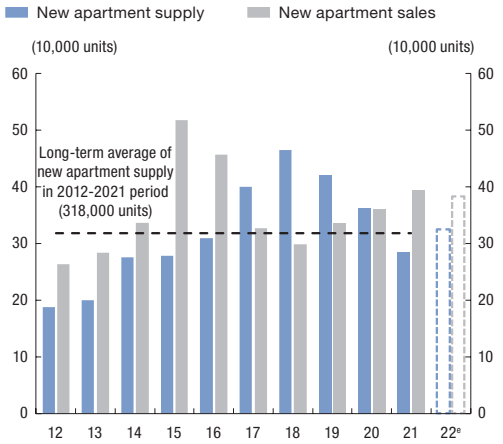
12) With implementation of the housing rental report system from June 2021, the scope of leasehold deposit and monthly rental transaction aggregation has expanded. When the scope of aggregation is limited to the data reported on the fixed date, the volume of leasehold deposit and monthly rent transactions increased by 19.6% year on year.

Figure II-16. House leasehold deposit and monthly rental transaction volumes[1)]



Note: 1) Since June 2021, the scope of calculation has been expanded from registered fixed date data to housing rental transaction report data.
Source: Ministry of Land, Infrastructure and Transport.

Figure II-17. New apartment supply and new apartment sales[1)]



Note: 1) June 2, 2022 basis; based on sum of monthly planned amount for 2022.
Source: Real Estate 114.

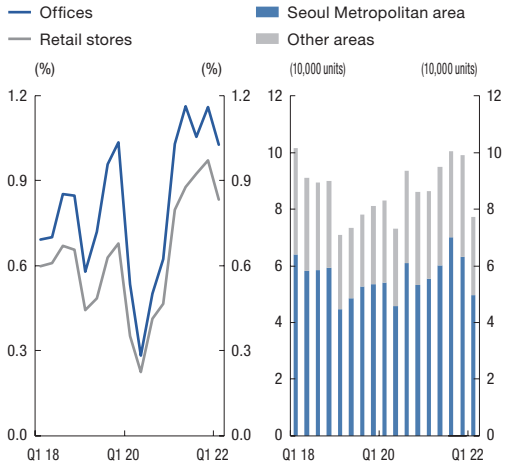
The supply of new apartments in 2022[13)] is expected to increase to 325,000 units, up from 285,000 units the previous year and exceeding the annual average of previous years (318,000 units from 2012 to 2021). However, The volume of new apartment sales is projected to decrease slightly from the previous year (395,000 units) to 383,000 units (Figure II-17). Meanwhile, The inventory of unsold housing units stood at 27,000[14)] (3,000 units in the Seoul metropolitan area and 24,000 units in non-metropolitan areas) as of the end of April 2022?a 53.5% increase compared to the end of the previous year (18,000 units).

Declining Return on Capital for Commercial Real Estate

The return on capital for commercial real estate declined as price increases slowed due to a contraction in investment demand. During Q1 2022, the return on capital for offices and retail stores stood at 1.03% and 0.83%, respectively down 0.13 percentage points and 0.14 percentage points from the previous quarter. The volume of commercial real estate transactions recorded 77,000 in Q1 2022, showing a decrease of 10.4% from Q1 2021 (86,000) (Figure II-18).

13) In 2022, new apartment supply is expected to increase over the previous year both in metropolitan areas (163,000 units → 174,000 units) and non-metropolitan areas (122,000 units → 150,000 units).
14) The inventory of unsold housing units was the lowest (16,000 units) since statistics began to be compiled at the end of September last year, then returned to an increasing trend from October, and is rapidly increasing, mainly in non-metropolitan areas such as Daegu and Gyeongbuk province.

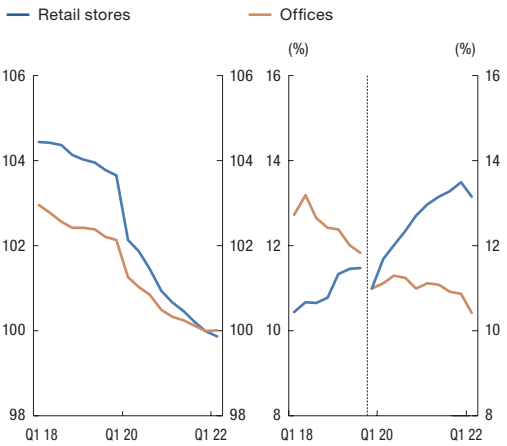
Figure Ⅱ-18. Rates of increases in commercial real estate price and volume of commercial real estate transactions



Notes: 1) Quarter-on-quarter rate of increase in asset value reflecting changes in land and building prices. Retail stores are based on medium-sized to large retail stores.
2) Based on buildings used for commercial including officetels (dual-purpose buildings used for commercial and residential purposes). Including transactions other than sales, such as allotment of new apartments, gifts, and exchanges.
Sources: Korea Real Estate Board, Ministry of Land, Infrastructure and Transport.

due to an increase in rental demand (Figure II-19).

Figure Ⅱ-19. Commercial real estate rental price indices and vacancy rates



Notes: 1) Q4 2021 = 100, Based on medium-sized to large retail stores.
2) Interrupted due to redesign of the samples of the commercial real estate market rent survey in Q1 2020.
Source: Korea Real Estate Board.

Rise in Rent for Office Space, Decrease in Rent for Retail Stores

The rent for office space rose by 0.01% as of the end of Q1 2022 compared to Q4 2021 as demand for shared offices increased amid limited new supply. On the other hand, the rent for retail stores fell 0.13% during the same period as commercial districts continued to stagnate. The vacancy rates for office space and retail storeswere 10.4% and 13.2%, respectively, as of the end of Q1 2022, down 0.5 percentage points and 0.3 percentage points, respectively, compared to the end of Q4 2021

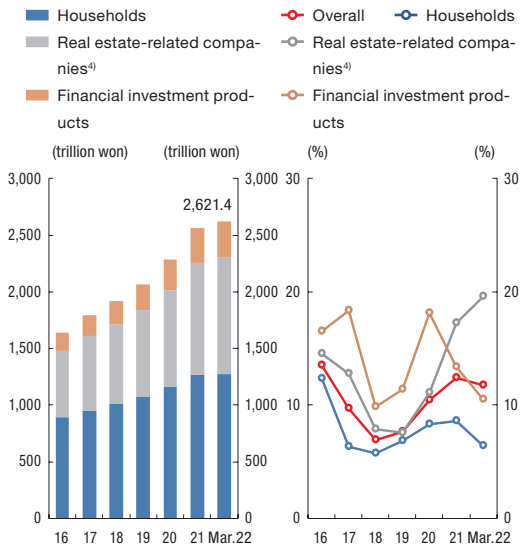
Increased Real Estate Finance Exposure

As of the end of March 2022, real estate finance exposure[15] stood at KRW 2,621.4 trillion, representing a year-on-year increase of 11.7% due to the favorable real estate market trends. By type, household loans amounted to KRW 1,275.4 trillion (48.7% of total exposure), representing an increase of 6.4% from the same period the previous year, led by guarantees related to leasehold deposits and policy mortgage loans. Real estate-related corporate loans stood at KRW 1,034 trillion (39.4%),

15) Real estate finance exposures are defined as the sum of real estate-related loans to households and corporations by financial institutions and credit guarantee institutions, and real estate-related financial investment products. For more information about real estate exposures, refer to the June 2017 Financial Stability Report, Box 3 “Current Status of Real Finance Estate Exposures.”

up19.6% year on year as loans from financial institutions continued to increase along with business guarantees and PF loans. Meanwhile, financial investment products amounted to 312.0 trillion won (11.9%), an increase of 10.5% year on year as the issuance of MBS continued and the size of real estate funds expanded (Figure II-20).

Figure II-20. Amount[1] and rates of increase[2] of real estate finance exposures[3]



Notes: 1) End-period basis.
2) Year-on-year basis.
3) The sum of real estate-related household loans, corporate loans issued by financial institutions and credit guarantee institutions, and real estate-related financial investment products.
4) Defined as companies directly related to real estate market conditions (such as real estate rental and supply businesses and related service businesses) and construction firms.

Source: Bank of Korea.

Box 2.

Financial Stability Risk Assessment and Response by International Financial Institutions

The recent crisis in Ukraine has heightened uncertainty over the conditions of the world economy by clouding the prospects for global recovery and growth and further increasing inflationary pressure. International financial institutions including the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) have recently begun to evaluate new threats to the stability of the global financial system that have emerged since the COVID-19 crisis, and to explore solutions to mitigate them. More recently, they have also started monitoring the impact of the ongoing conflict in Ukraine on global financial stability. The following is an examination of key vulnerabilities in the global financial system based on the assessment of international financial institutions and measures to strengthen its resilience that are currently being discussed in the international community.

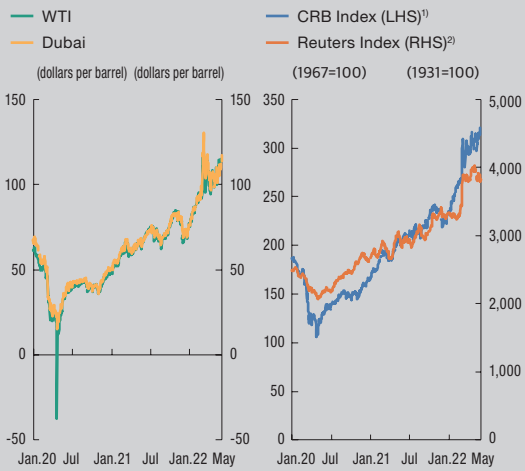
Vulnerabilities in the Global Financial System

In spite of the recent high level of volatility in the global financial markets, the FSB and the BCBS believe that financial institutions in major countries are currently facing no funding constraints. Meanwhile, the FSB and the BCBS have singled out the following as key vulnerabilities that could undermine global financial stability in the future: market volatility, reduced global liquidity, change in risk appetite, and volatility in global fund flows.

Increase in Market Volatility

The volatility of commodity prices has increased sharply in recent months. After soaring to record highs, the prices of commodities have fallen slightly off their peak, but are still well above the levels before the Russian invasion of Ukraine. The price of international crude oil, which surged past USD 125 for the first time since the global financial crisis of 2008, is currently moving sideways around the USD 120 level. The prices of other commodities are also slightly down from their peak levels, showing signs of a slowdown in their upward momentum.

Trends in price indexes of international crude oil and major commodities

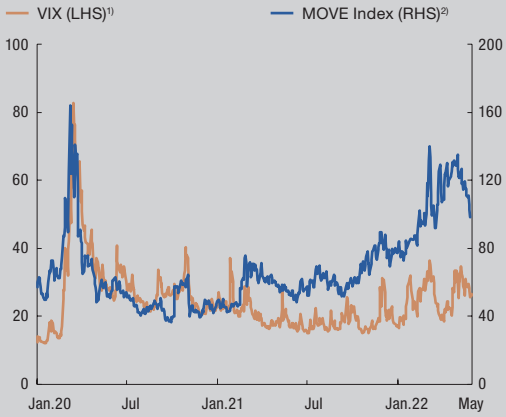


Notes: 1) The index released by commodity Research Bureau in the US is calculated based on the prices of 19 products, including agricultural and livestock products, energy, and nonferrous metals.
2) The index released by Reuters in the UK is calculated based on the prices of 17 products, including agricultural and livestock products and nonferrous metals.
Sources: Bloomberg, Reuters

In the international financial markets, the rapid spike of uncertainty at the start of the conflict in Ukraine was followed by a moderate easing.

However, the recent acceleration in the pace of benchmark interest rate hikes by the U.S. Federal Reserve has caused uncertainty to surge. In the stock market, volatility returned to a normal level after a roller-coaster ride at the beginning of the Ukrainian crisis, only to resume its increase in April. Volatility is also running high in the international bond markets. The MOVE Index,[1] although having steadily declined after reaching 140 in March 2022, still remains elevated.

Trends in stock and sovereign bond volatility index



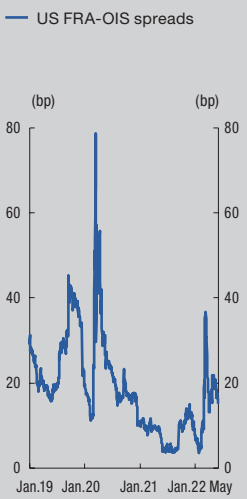
Notes: 1) Chicago Board Options Exchange S&P500 Volatility Index.
2) Merrill Lynch Option Volatility Estimate Index.
Source: Bloomberg.

Going forward, broader markets may face a risk of contagion from the commodities sector, should there be massive margin calls or losses on speculative positions in this market. Moreover, an exacerbation of geopolitical uncertainties, due to developments such as the conflict in Ukraine turning into a long-running crisis or an increase in the international community's sanctions against Russia, could drive up market volatility, posing a serious threat to global financial stability.

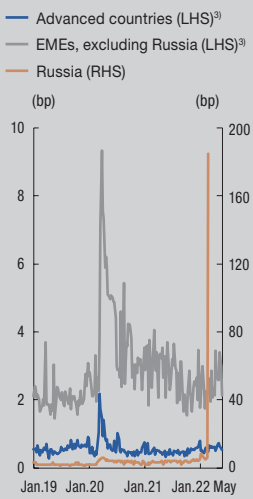
Reduced Level of Global Liquidity

The FRA-OIS spread, a key indicator of short-term US dollar liquidity, has been fluctuating sharply. In developed markets, the bid-ask spread on long-term sovereign bonds widened slightly at the beginning of the Ukrainian crisis, but soon returned to normal levels. The price action has been more volatile in emerging bond markets (excluding Russia) where the bid-ask spread grew significantly wider. In Russia, the spread started to widen dramatically from late February at the start of the conflict in Ukraine, making it increasingly difficult to issues overeignbonds.

FRA-OIS spreads[1]



Sovereign bond bid-ask spreads[2]



Notes: 1) The difference between the Forward Rate Agreement rate (3M Libor formed in the forward market) and the Over night Index Swap rate
2) 10-year basis.
3) Average of major countries.
Sources: BOK calculation, Bloomberg.

1) The MOVE (Merrill Lynch Option Volatility Estimate) Index, developed by Merrill Lynch, tracks volatility in the U.S. Treasury market based on the prices of Treasury options. A rise in the MOVE score means higher expectations of volatility in the U.S. Treasury market.

An analysis of liquidity transformation[2] in FSB member countries found that short-term debt securities and redeemable equity instruments, such as MMFs (money market funds), fixed income funds, and mixed funds, started to exceed current assets (cash and cash equivalent assets) in some of them. This condition makes the financial system vulnerable to shocks if a spike in uncertainty triggers large redemptions from funds investing in less liquid assets, as it will create massive sell-off pressure in asset markets, causing a sharp price drop.

Change in the Risk Appetite

Global investors' risk appetite appears to have decreased significantly in recent times. In the stock market, a major risk asset market, valuation indicators have been on an overall downward trend in all major countries. The Cyclically Adjusted Price-Earnings (CAPE) ratio, which excludes the influence of inflation and short-term cyclical factors, has mostly been on a downward trajectory since the third quarter of 2021.

CAPE ratios[1] for some of the largest economies in the world

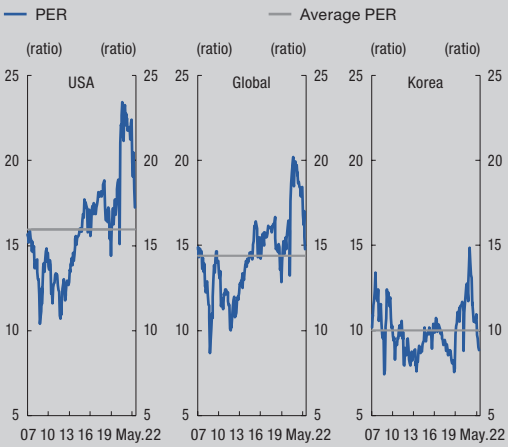
Note: 1) CAPE ratio (Cyclically Adjusted Price-Earnings ratio) is calculated by dividing a company's stock price by the average company's earnings from the previous ten years, adjusted for inflation. The above country-level data are based on the country-specific MSCI indices, rather than individual stock market indices.

Source: Barclays.

The global price-earnings ratio (PER) has also steadily declined in recent months, moving closer to the long-term average (average for the period between Jan. 2007 and May 2022), suggesting that a correction is underway in the prices of risk assets.

2) If the liquidity ratio, calculated as (total financial assets - current assets + short-term debt + redeemable equity)/(total financial assets), is greater than 1, this means short-term debt and redeemable equity exceed current assets (cash and cash equivalents) (FSB, Global Monitoring Report on NBFI, Dec. 2021).

Level of price-earnings ratios (PER)[1] compared to long-term average[2]



Notes: 1) MSCI 12-month forward PER.
2) Average of PER from January 2007 to May 2022.
Sources: BOK calculations, Refinitiv.

High-yield corporate bond spreads[1]

Note: 1) ICE BofAML High Yield Indices (option-adjusted spreads).
Sources: ICE BofAML indices, FRED.

Meanwhile, starting early this year, the credit spread on high-yield bonds has widened considerably. This appears to be due both to the withdrawal of extra liquidity, injected during the pandemic, from the market, which began with the global shift to a contractionary monetary policy, and the weakening of risk appetite amid persisting uncertainty over the Ukrainian crisis.

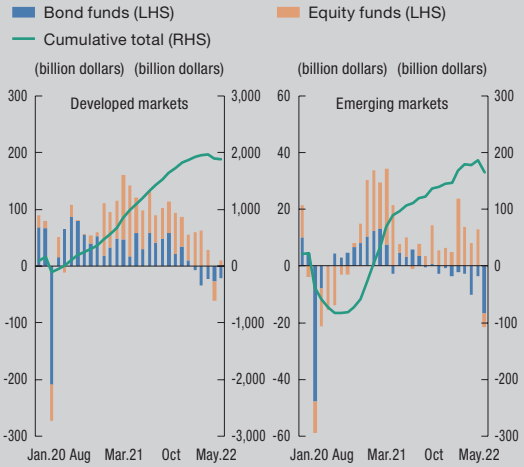
Asset prices, which had steadily risen since early in the pandemic due to an accommodative financial environment, recently underwent a correction as inflation worries weigh on the global markets and policy interest rate hikes gain momentum in major countries amid growing uncertainty over the war in Ukraine. However, the prices of assets still remain high by historical standards. Therefore, a more drastic price correction could be on the horizon, particularly in risk assets, should risk appetite suddenly deteriorate.

Increased Volatility in Global Fund Flows

At the onset of the COVID-19 crisis, there were massive outflows of money from global funds, especially from bond funds,[3] in both developed and emerging markets. Although global fund flows mostly shifted to inflows later on, volatility recently crept higher with the Russian invasion of Ukraine and policy rate hikes in major countries, with outflows resuming from bond funds.

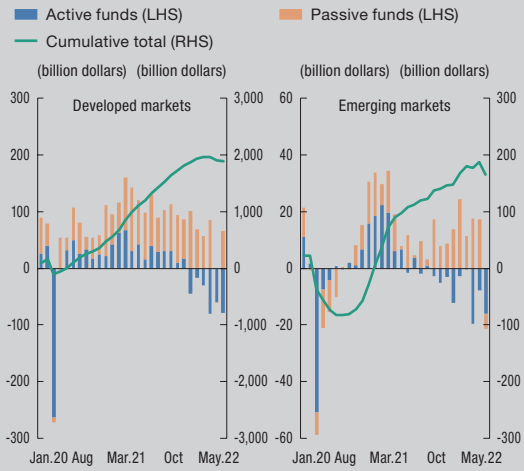
3) They are named based on what global funds invest in. For example, EM bond funds refer to funds that are investing in emerging market bonds.

Inflow and outflow of global funds



Source: EPFR.

Inflow and outflow of global funds, by investment strategy



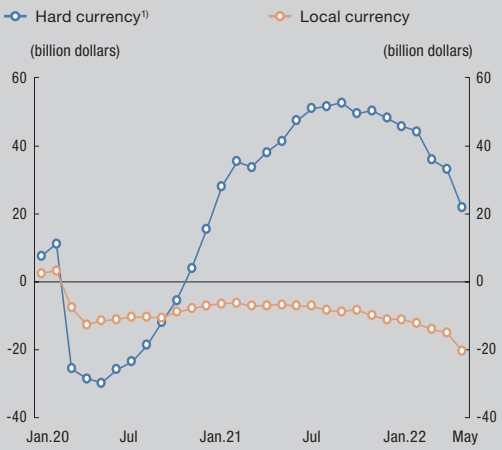
Source: EPFR.

Since early in the pandemic, global funds have experienced a steady inflow, centered particularly on passive funds.[4] Due to their procyclical nature, in times of crisis, passive funds tend to exacerbate the volatility of capital flows. Therefore, emerging market countries, into which a continuous stream of passive fund investment has flowed in recent years, need to be particularly wary of new bouts of instability in the global financial markets, as they could spark sudden capital flight.

During the first half of 2020, when the global spread of COVID-19 caused an upsurge of uncertainty in the financial markets, there were sudden outflows from emerging market bond funds, and more particularly from funds investing in major currency-denominated bonds. However, fund flows later shifted to large inflows during the second half of 2020. In the case of emerging market funds investing in major currency-denominated bonds, despite the recent resumption of outflows, there is still a considerable amount of foreign investment remaining, which could cause volatility in fund flows should there be a new episode of financial instability triggering capital flight.

4) Funds that passively track certain indices, such as index funds and exchange-traded funds (ETFs).

Flows to emerging market bond funds, by currency



Note: 1) USD, GBP, EUR, CHF, JPY.
Source: EPFR.

International Financial Institutions' Response

International financial institutions including the FSB and the BCBS are paying close attention to market volatility in response to the Ukrainian crisis, reduced global liquidity, change in the risk appetite, and volatility in global fund flows, which they consider to be the key vulnerabilities in the global financial system.

Meanwhile, a recent BOK survey of Korean and international financial experts ("System Risk Survey")[5] found that inflationary pressure from rising prices of commodities and supply chain disruptions, policy rate hikes in major countries, and the escalation of geopolitical risks from the conflict in Ukraine were the most significant external risk factors.

Discussions are currently ongoing at leading international financial institutions on measures to enhance the resilience of the global financial system to key vulnerabilities.

The FSB is developing measures to address vulnerabilities associated with non-bank financial intermediation, which surfaced during the COVID-19 crisis, by strengthening the resilience of NBFIs (non-bank financial institutions). As part of this effort, the FSB issued a report containing its policy proposals to improve the resilience of MMFs[6] by reducing the first mover advantage for investors wishing to withdraw funds (Oct.2021). Moreover, regarding vulnerabilities associated with the liquidity crisis experienced by certain market participants in March 2020 due to a sharp rise in margin calls from central clearing counterparties (CCPs) amid the market turmoil,[7] the FSB plans to continue the discussions on the analysis of financial resources available to a CCP for the recovery and resolutions of losses and the evaluation of the margin call system. In tandem, to respond to climate change

5) According to the results of the "System Risk Survey," a survey of 80 domestic and international financial and economic experts conducted during the first half of 2022, inflationary pressure from rising prices of commodities and global supply chain disruptions (79.9%), the normalization of monetary policy in major countries (55.4%), high levels of household debt (43.8%), the escalation of geopolitical risks caused by the Ukrainian crisis (41.2%), a sudden increase in market interest rates (33.5%), and heightened volatility in the financial markets (21.9%) were top six risk factors based on the frequency of responses. For detailed results of this survey, see "Results of 「System Risk Survey」1st Half, 2022" (BOK press release, May 30, 2022).

6) As a way of reducing threshold effects, the FSB proposed to remove ties between regulatory thresholds and imposition of fees/gates and remove the stable net asset value. Meanwhile, to impose on redeeming investors the cost of their redemptions and potential losses, the FSB also proposed swing pricing (FSB, Policy proposals to enhance money market fund resilience: Final report, Oct. 2021).

7) During the market turmoil in March 2020, the initial margin and the variation margin in centrally cleared markets increased twenty-fold and five- to six-fold, respectively, from previous levels, and demand for cash and highly liquid assets rapidly surged (FSB, Enhancing the resilience of non-bank financial intermediation: Progress report, Nov. 2021).

and financial digitalization, which may become potential vulnerability factors for the financial system in the long term, the FSB is exploring new supervisory and regulatory approaches for climate-related risks and closely examining the impact of crypto assets and fintech on financial stability.

The BCBS assessed that the Basel III reforms were crucial in maintaining the resilience of banks during the COVID-19 crisis, which has enabled them to provide an uninterrupted supply of credit to households and businesses, unlike during the global financial crisis. However, keeping in mind the possibility that financial relief measures in response to the COVID-19 crisis may have resulted in an underestimation of credit risk, the BCBS plans to continuously monitor banks' credit risk management practices, asset soundness, and the debt repayment capacity indicators of borrowers benefiting from a loan deferment or forbearance program. Concerning measurement methods for credit, market, and operational risks that are yet to be implemented, the BCBS reaffirmed its intention to ensure their full, timely, and consistent global implementation. Finally, the BCBS plans to continue to examine how to reflect climate change-related financial risks and crypto asset exposures in the Basel III.

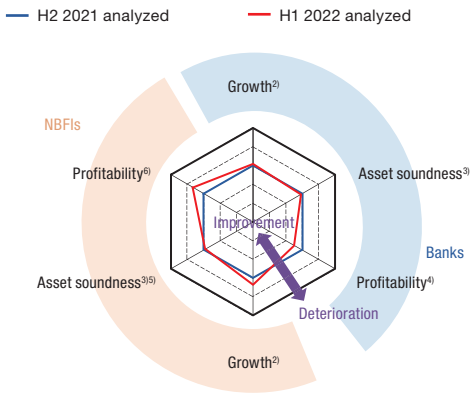
Ⅲ. Financial Institutions

Commercial bank[1] asset soundness remained sound thanks to financial support measures and profitability improved significantly.

Non-bank financial institution asset soundness remained favorable, but profitability varied by industry and deteriorated somewhat (Figure III-1).

The increase in transactions among financial institutions slowed year on year, with the ratio of mutual transactions to total assets in the financial sector also decreasing. The risk of default contagion in the financial sector remained generally at a similar level year on year.

Figure Ⅲ-1. Map of changes in financial soundness conditions of financial institutions[1]



Notes: 1) Extents of change of growth and asset soundness as of end-Q1 2022 compared to end-Q3 2021 indexed.
Extents of change of profitability as of end-Q1 2022 compared to end-Q1 2021 indexed.
2) Rate of increase in total assets.
3) Substandard-or-below loan ratio.
4) Return on Assets (ROA).
5) Excluding securities companies.
6) Average of each NBFI sector's ROA weighted by the amounts of their total assets.
Sources: Bank of Korea, Financial institutions' business reports.

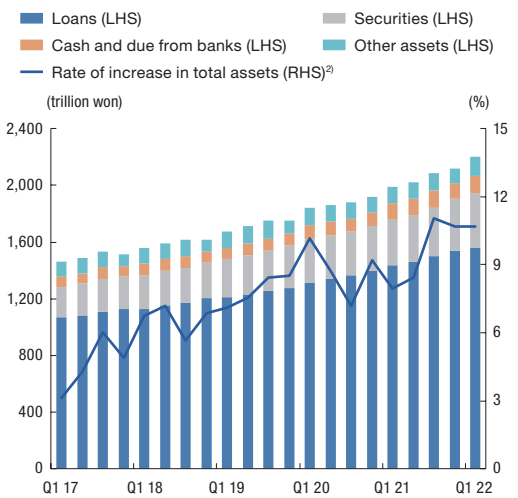
1. Banks

Continued Asset Growth

The total assets of commercial banks(based on bank accounts) reached KRW 2,201.7 trillion by the end of Q1 2022, representing an increase of 10.7% year on year and marking a continued expansionfrom Q3 2021 (11.0%).

Looking at each asset category, loans increased 8.1% year on year, showing a slight slowdown, while securities increased by 21.2%, the largest increase since the end of Q3 2009 (21.9%). The increase in securities was mainly attributable to increased holdings of government bonds[2] in preparation for the phased normalization of financial easing measures such as the liquidity coverage ratio (LCR).[3] Meanwhile, cash and deposits increased by 10.3% year on year (Figure III-2).

Figure Ⅲ-2. Commercial bank total assets[1]

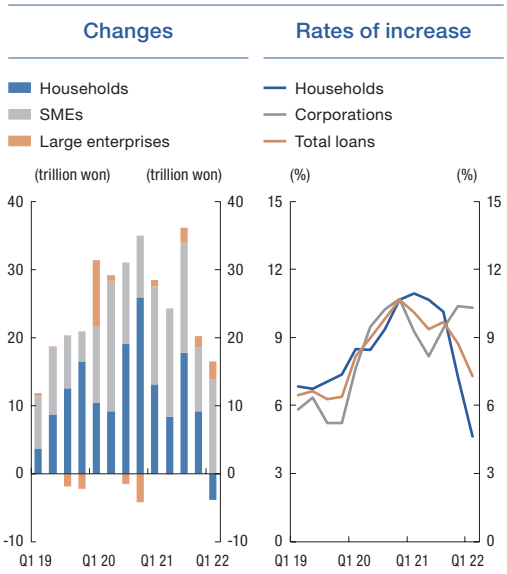


Notes: 1) End-period banking account balance basis.
2) Year-on-year basis.
Sources: Commercial banks' business reports.

1) Commercial banks (nationwide and regional banks) are analyzed in the Financial Stability Report, while specializedbanks (KDB, IBK, EXIM bank, Nonghyup Bank and Suhyup Bank) with different business models are not. Internet-only banks such as K-Bank, KakaoBank, and Toss Bank are included in the nationwide bank category.

Loans (Korean won-denominated loan basis) to large enterprises increased by KRW 2.6 trillion during Q1 2022 due to worsening conditions for corporate bond issuance and efforts by banks to expand corporate loans. Loans to small- and medium-sized enterprises (SMEs) increased by KRW 13.9 trillion due to extension of the government's COVID-19 financial support measures and continued demand for facility investments. Meanwhile, household loans decreased by KRW 3.9 trillion for the first time since Q1 2017 (KRW -0.5 trillion) due to strengthening of credit loan management by banks and increasing loan interest rates (Figure III-3).

Figure Ⅲ-3. Changes[1] and rates of increase[2] in commercial bank loans[3]

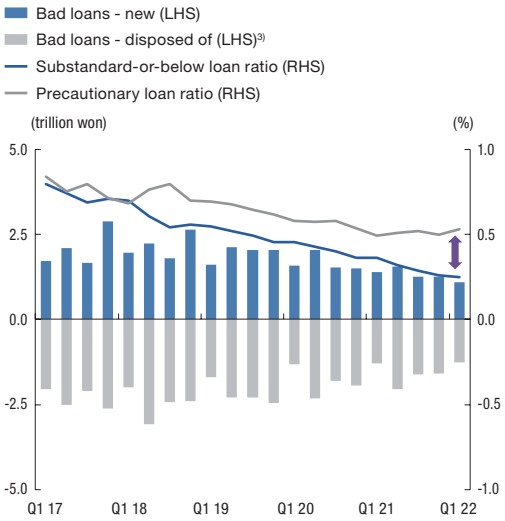


Notes: 1) Compared to previous quarters.
2) Year-on-year basis.
3) Banking account won-denominated loan basis.
Sources: Commercial banks' business reports.

Satisfactory Asset Soundness

The substandard-or-below loan ratio, which is an indicator of commercial banks' asset-soundness, continued to show downward stability, falling 0.01 percentage points from the previous quarter to 0.25% at the end of Q1 2022. The precautionary loan ratio was 0.53%, up 0.03 percentage points from the previous quarter, due mainly to large corporations[4] (Figure III-4).

Figure Ⅲ-4. Commercial bank occurrence and disposal of loans[1] classified as sub-standard-or-below (SBLs) and asset soundness indicators[2]

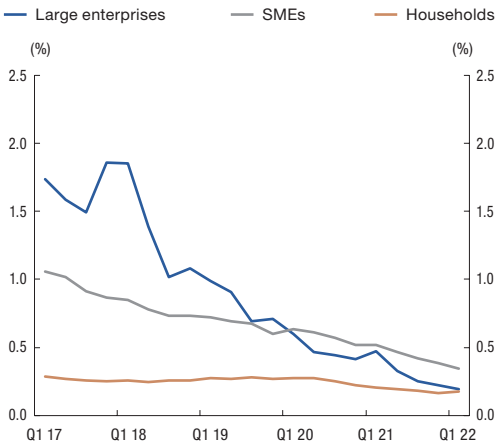


Notes: 1) During the period basis.
2) End-period basis.
3) Including those disposed of through loan withdrawals, loan loss write-offs, loan sales, soundness reclassifications, debt restructurings, etc.
Sources: Commercial banks' business reports.

2) The value of Treasurybonds held by commercial banks stood at KRW 137.3 trillion at the end of March 2022, up 86.4% year on year (KRW 73.7 trillion).
3) The government announced that most measures to ease financial regulations, such as a looser loan-to-deposit ratio and liquidity coverage ratio, would be delayed until the end of June 2022 and then normalized in stages.
4) At the end of Q1 2022, the precautionary loan ratio increased by 0.26 percentage points (1.20% → 1.46%) from the previous quarter for loans to large enterprises, decreased 0.04 percentage points (0.59% → 0.55%) for SMEs loans and increased 0.01 percentage points (0.25% → 0.26%) for household loans.

For each borrower, the substandard-or-below loan ratio declined for SMEs and large enterprises, but remained at a level similar to the previous quarter for households (Figure III-5).

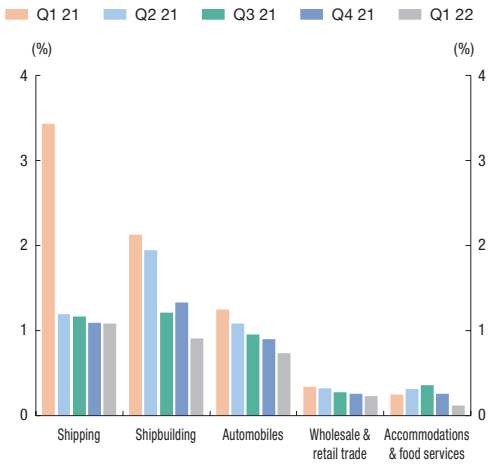
Figure III-5. Commercial bank substandard-or-below loan ratios by borrower type



Sources: Commercial banks' business reports.

Looking at the substandard-or-below loan ratio by industry, the major industries showed an overall decline, including shipping (1.09% at the end of Q4 2021 → 1.08% at the end of Q1 2022), shipbuilding (1.33% → 0.91%), automotive (0.90% → 0.74%), wholesale and retail (0.26) % → 0.23%) and accommodation and food services (0.26% → 0.12%) (Figure III-6).

Figure III-6. Commercial bank substandard-or-below loan ratios in major industries



Sources: Commercial banks' business reports.

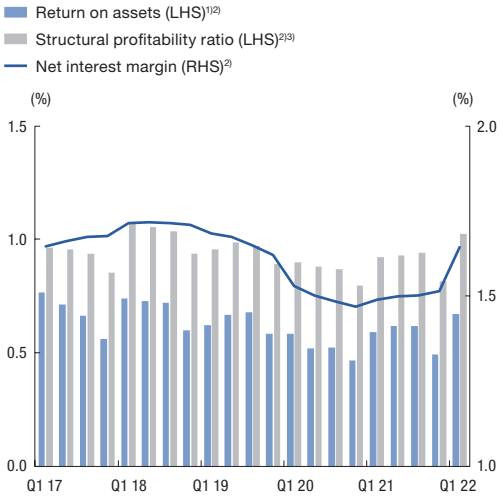
The substandard-or-below loan ratio remained at a stable level thanks to an increase in new loans, economic recovery, and extension of financial support measures by the policy authorities. However, it is very likely that deferment has increased the risk of loan defaults.[5] It is particularly necessary to prepare against insolvency risk for marginal companies and others if financial easing and support measures end while loan interest rates rise.

Significant Improvement in Profitability

Commercial banks' profitability improved significantly year on year. Banks' return on assets (ROA) was 0.67% in Q1 2022 (annualized basis)-up 0.08 percentage points year on year. The structural profitability ratio, which shows banks' capacity to generate profits in a sustained manner, was 1.02% (annualized basis), up 0.1 percentage points year on year (Figure III-7).

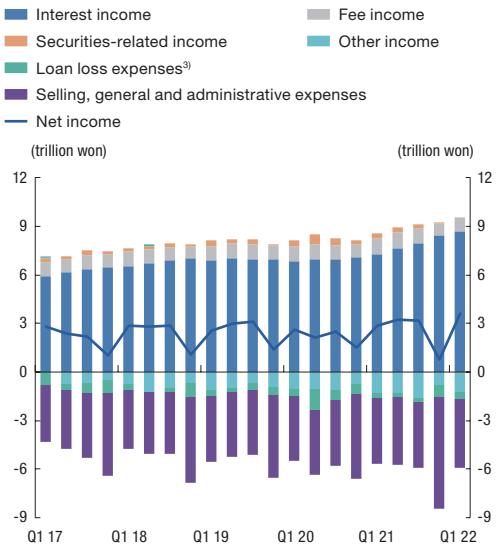
5) For more information on this, refer to Box 3. "Estimation of Potential Corporate Credit Losses at the Expiration of COVID-19 Loan Forbearance and Assessment."

Figure Ⅲ-7. Commercial bank profitability



Notes: 1) Loan loss reserves excluded.
2) Accumulated quarterly incomes annualized.
3) (Interest income + Fee income + Trust account income - Operating expenses) / Total assets.
Sources: Commercial banks' business reports.

Figure Ⅲ-8. Commercial bank net income composition[1)2)]



Notes: 1) Loan loss reserves excluded.
2) During the period basis.
3) Including bad debt expenses, net provisions transferred.
Sources: Commercial banks' business reports.

The net income of commercial banks was KRW 3.6 trillion in Q1 2022, up KRW 0.7 trillion year on year (KRW 2.9 trillion). This is mainly attributable to an increase in interest income (+KRW 1.4 trillion) year on year due to an increase in corporate loans and the net interest margin[6)] with the rise in market interest rates (Figure III-8).

Meanwhile, with the recent rise in market interest rates, upward pressure on the loan interest rate was also increasing. Although this may be positive in terms of banks' profitability, it can also increase the pressure on borrowers and lead to deterioration in the soundness of loan assets. As the proportion of commercial banks' variable rate loans has reached 70.8% (as of the end of Q1 2022), continuous monitoring and preemptive management of the debt repayment capacity of borrowers is necessary in preparation for changes in the business environment, such as further increases in market interest rates.

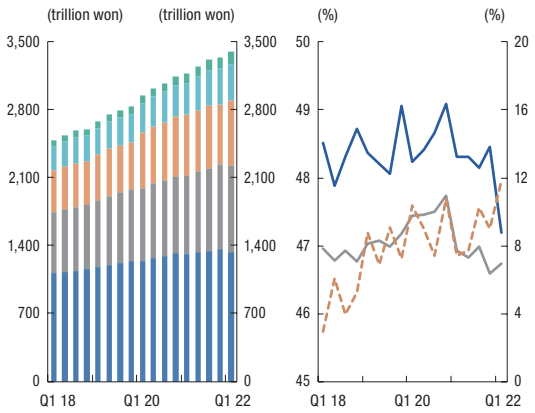
6) The net interest margin (NIM) of commercial banks was 1.64% (annualized rate) in Q1 2022, representing an increase of 0.15 percentage points YoY (1.49%).

2. Non-Bank Financial Institutions

Slowing Asset Growth

The total assets of non-bank financial institutions stood at KRW 3,391.3 trillion at the end of Q1 2022, representing an increase of only 7.0% YoY. As a result, the proportion of total assets in the entire financial sector held by non-bank financial institutions[7] (KRW 7,184.5 trillion) continued to decline, falling to 47.2% at the end of Q1 2022 (Figure III-9).

Figure III-9. NBFI total assets and asset growth rate

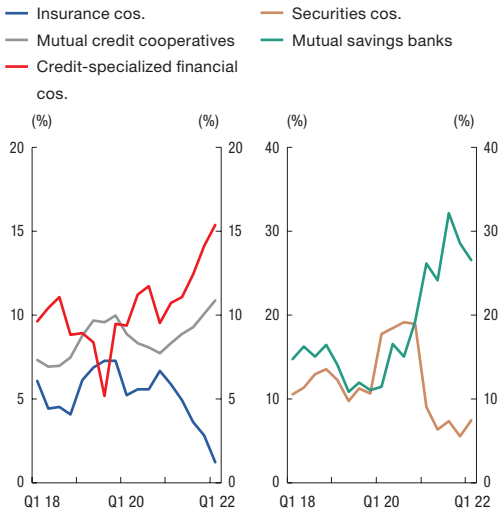


Notes: 1) Total assets of NBFIs / (Total assets of banks + Total assets of NBFIs).
2) Year-on-year basis.
3) Including commercial banks, specialized banks and foreign bank branches.
Sources: Financial institutions' business reports.

By business sector, the total assets of savings banks and mutual credit cooperatives continued to grow, with real estate-related corporate loans increasing by 26.6% and 10.9% year on year, respectively.[8] Credit-specialized financial companies also showed a high growth rate of 15.4% year on year thanks to an increase in credit card receivables from credit card companies and loans from capital companies.

On the other hand, securities company assets increased only 7.4% year on year due to the sluggish stock market and falling bond prices. Insurance company growth slowed rapidly, with total assets increasing only 1.2% year on year due to increased losses from security valuation[9] (Figure III-10).

Figure III-10. NBFI rates of total asset growth by sector1)2)



Notes: 1) Year-on-year basis.
2) Excluding accounts receivable for securities companies.
Sources: Financial institutions' business reports.

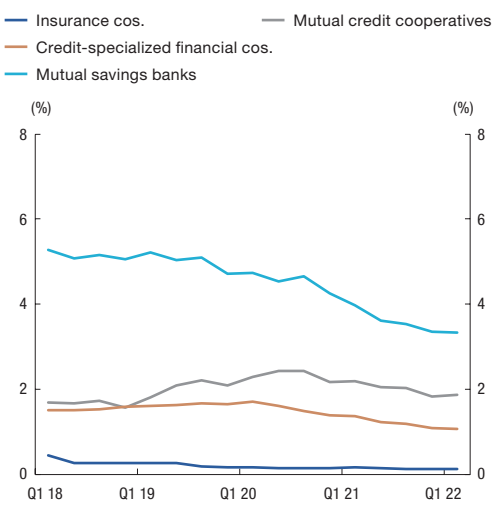
7) Includes banks and non-bank financial institutions, with banks including special banks and foreign bank branches as well as commercial banks.
8) As of the end of Q1 2022, corporate loans from savings banks and mutual credit cooperatives had increased by 45.8% and 32.5% year on year, respectively, thanks to increased demand for real estate purchases and development and the government's tightening of household loan regulations.

Satisfactory Level of Asset Soundness

Non-bank financial institution asset soundness was generally good, with substandard-or-below loan ratios falling in most sectors.

The substandard-or-below loan ratio of savings banks continued to decline, reaching 3.32% at the end of Q1 2022. However, this is mainly attributable to a significant increase in new loans.[10] It is worth noting that the proportion of loans classified as precautionary is high[11] while the total value of loans classified as precautionary is increasing.[12] The substandard-or-below loan ratio of mutual credit cooperatives recorded 1.87% at the end of Q1 2022, continuing a downward trend.[13] The substandard-or-below loan ratio of credit-specialized financial companies continued to decline, reaching 1.07% at the end of Q1 2022. Insurance company substandard-or-below loans remained at a low 0.13% (Figure III-11).

Figure Ⅲ-11. NBFI substandard-or-below loan ratios



Sources: Financial institutions' business reports.

Non-bank financial institution asset soundness has been good, which is largely attributable to the government's extension of financial support measures related to COVID-19. Accordingly, if interest rates rise in the future and the government's financial support ends, asset soundness may deteriorate.[14]

9) In Q1 2022, the loss on valuation of securities by insurance companies (KRW 20.8 trillion) increased 3.9 times year on year, while as of the end of March 2022, the balance of securities holdings (including securities held to maturity) had decreased by 0.3% year on year.

10) As of the end of Q1 2022, the total value of loans given by savings banks increased 32.4% year on year, significantly exceeding the growth rate of the substandard-or-below loan balance (10.5%).

11) As of the end of Q1 2022, the ratio of savings bank loans classified as precautionary was 14.18%, which is significantly higher than for mutual credit cooperatives (1.92%), insurance companies (0.34%) and credit-specialized financial companies (2.40%).

12) The value of savings bank loans classified as precautionary increased from KRW 11.7 trillion at the end of Q4 2020 to KRW 15.4 trillion at the end of Q1 2022.

13) As of the end of Q1 2022, the balance of delinquent loans owed to mutual credit cooperatives increased 1.5% YoY, while the balance of substandard-or-below loans decreased by 1.2% and the total value of loans increased by 15.9%.

14) The proportion of deferred interest payments for non-bank financial institutions of total COVID-19 financial support from the government was 47.2% as of December 2021, which is significantly higher than for banks (1.9%). This means the insolvency risk for these borrowers may increase significantly once financial support ends and the looming burden of rising interest rates becomes reality.

Varied Profitability Among Industries

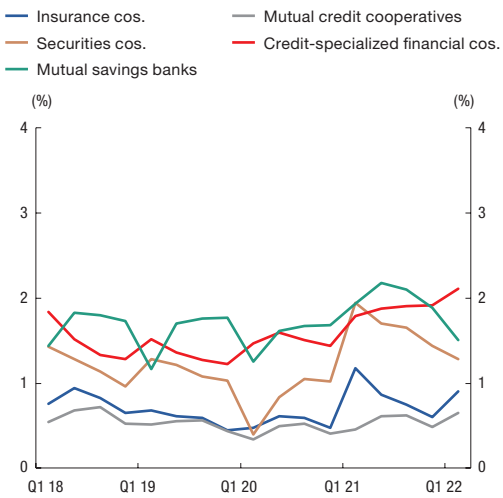
The profitability of mutual credit cooperatives and credit-specialized financial companies improved significantly, but the profitability of savings banks, securities companies and insurance companies deteriorated.

The ROA of mutual credit cooperatives was 0.65% in Q1 2022, up 0.19 percentage points year on year due to rising interest income with the increase in loans. For credit-specialized finance companies, the ROA recorded 2.11%, up 0.32% points year on year, thanks to an increase in credit card-related profits and capital company interest income.[15)]

Savings bank ROA continued to decline after peaking at 2.17% in Q2 2021, falling to 1.51% as of Q1 2022. This is mainly attributable to a narrowing of the loan-to-deposit interest rate gap[16)] as deposit interest rates have risen, while the increase in loan interest rates has been constrained by intensifying competition for medium-rate loans and restrictions on the legal maximum interest rate. After peaking (1.95%) in Q1 2021, the ROA of securities companies fell sharply due to a decrease in securities investment transactions from weakened investor sentiment and a loss in valuation of securities with the rise in interest rates. It recorded 1.29%, a decrease of 0.66 percentage points year on year.

Insurance company ROA was 0.91% in Q1 2022, down 0.27 percentage points year on year. Non-life insurer earnings improved due to a drop in the automobile insurance loss ratio,[17)] while life insurer profits declined due to a decrease in operating profits and disappearance of the special dividend effect of the previous year[18)] (Figure III-12, Figure III-13).

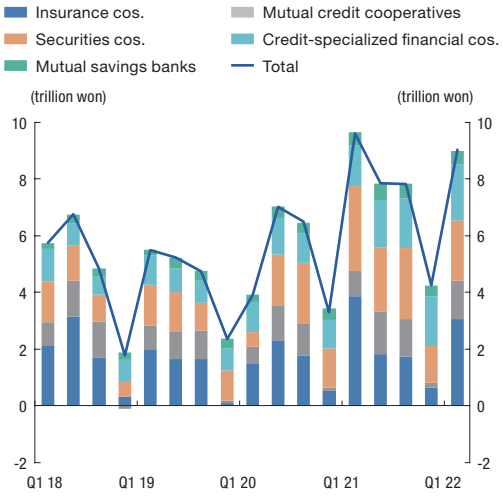
Figure III-12. NBFI ROAs[1)]



Note: 1) Accumulated quarterly incomes annualized.
Sources: Financial institutions' business reports.

15) During the same period, card company ROA was 1.94%, up 0.48 percentage points year on year (1.46%), while capital company ROA stood at 2.24%, up 0.21 percentage points year on year (2.03%).
16) From Q1 2021 to Q1 2022, the deposit interest rate rose 0.75 percentage points (1.75% → 2.50%), while the loan interest rate fell 0.46 percentage points (9.70% → 9.24%).
17) The automobile insurance loss ratio fell from 80.5% in Q1 2021 to 76.5% in Q1 2022.
18) During Q1 2021, the dividend income of life insurance companies temporarily increased sharply due to a special dividend by Samsung Electronics (+KRW 1.0 trillion).

Figure Ⅲ-13. NBFI net incomes[1)]



Note: 1) During the quarter basis.

Sources: Financial institutions' business reports.

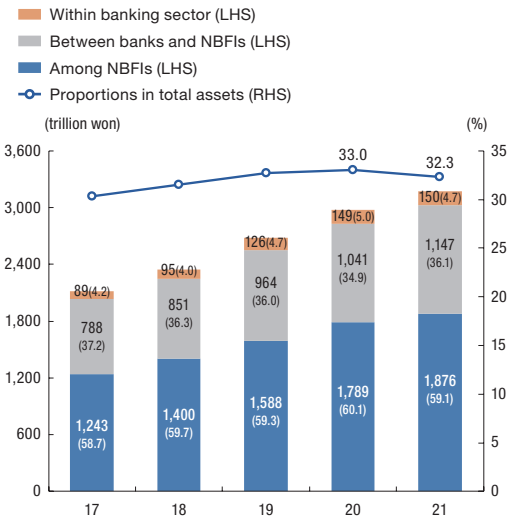
3. Interconnectedness

Slowing Growth in Mutual Transactions

Transactions between financial institutions[19] reached KRW 3,173 trillion at the end of 2021, representing a 6.5% increase year on year-a growth rate that is gradually slowing.[20] This is mainly due to an increase in the supply of funds to non-financial sectors such as households and corporations rather than money transactions within the financial sector.[21] Accordingly, the share of mutual transactions of total financial sector assets (KRW 9,812 trillion, based on the flow of funds statistics) fell 0.7 percentage points from 33.0% at the end of 2020 to 32.3% at the end of 2021.

Looking at transactions between financial institutions in each sector, those between banks[22] and non-banks increased 10.2% compared to the end of the previous year due to the expansion of time deposits in non-banks, while transactions as a proportion of all mutual transactions also rose by 1.2 percentage points to 36.1% during the same period. Mutual transactions within the non-banking sector increased 4.8%, but the rate of increase was lower than those between the banking and non-banking sectors, while the proportion of total mutual transactions was 59.1%-a decrease of 1.0 percentage point compared to the end of the previous year. Transactions within the banking sector also increased 1.2% during the same period, but their share of total mutual transactions decreased 0.2 percentage points from the end of the previous year to 4.7%(Figure III-14).

Figure III-14. Mutual transactions among financial institutions and across sectors[1)2)]



Notes: 1) Mutual transaction amounts are on an end-period basis (flow of funds statistics).
2) Figures within parentheses are the proportion of the total amount of mutual transactions.

Source: Bank of Korea.

19) Refers to the total value of assets each financial institution has managed in other financial institutions, and is estimated by dividing it into 48 financial products, 34 financial industries, and 9 other sectors based on the flow of funds statistics. For details, please see Issue 3. "Analysis of Banking System Interconnectedness, and Measurement of Cross-sectional Systemic Risk" in the 「Financial Stability Report」 released in December 2016.

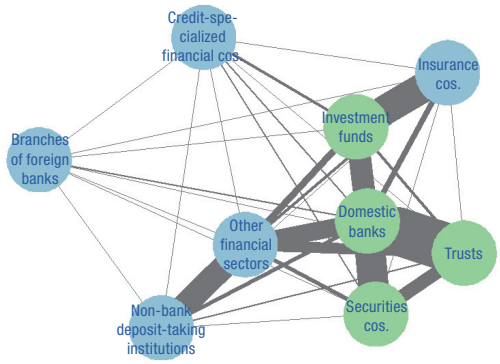
20) The rate of increase in the volume of transactions between financial institutions is falling gradually, from 14.2% at the end of 2019 to 11.2% at the end of 2020 and to 6.5% at the end of 2021.

21) While the growth rate of total assets in the financial sector slowed from 10.2% at the end of 2020 to 8.7% at the end of 2021, the growth rate of financial institution fund management to households and corporations had increased 9.9% and 11.4%, respectively, by the end of 2021-an increase over the end of 2020 (9.6% and 10.3%, respectively). The proportion of fund management to households and corporations increased 0.7%p and 0.2 percentage points, to 21.8% and 28.4%, respectively, during the same period.

22) Based on domestic banks, which include commercial and special banks. Foreign bank branches were included in the non-bank category for this analysis.

Banks, securities companies, trusts, and investment funds play a central role in transactions between financial institutions. The volume of mutual transactions between banks and trusts stood at KRW 284.3 trillion, those between banks and securities companies at KRW 225.8 trillion, those between insurance and investment funds at KRW 223.8 trillion, and those between banks and investment funds at KRW 193.1 trillion (Fig. III-15).

Figure Ⅲ-15. Financial sector interconnectedness map[1)2)3)4)]



Notes: 1) ● indicate the four highest-ranked financial sectors in terms of their mutual transaction volumes.
2) Using network visualization analysis, with centrality, concentrations and line thicknesses all proportional to the mutual transaction volumes.
3) "Trusts" refers to trust accounts of banks, securities and insurance companies; "Non-bank deposit-taking institutions" to MG community credit cooperatives, credit unions, mutual savings banks, etc.; and "Other financial sectors" to public financial institutions, holding companies, the national federations of each non-bank deposit-taking institution, etc.
4) End of 2021 basis.
Source: Bank of Korea.

Looking at the mutual transactions by product, the majority were made through deposits and bonds, which made up 24.5% and 22.6%, respectively, of total mutual transactions by the end of 2021, or up 0.4 percentage points and 0.2 percentage points, respectively, from the end of the previous year. The share of mutual transactions involving stocks increased 0.9 percentage points compared to the end of the previous year due to increased investment in beneficiary certificates[23)] by banks and insurance companies, while derivatives decreased 1.8 percentage points due to a decline in foreign exchange swap transactions[24)] by foreign bank branches and banks (Table III-1).

Table Ⅲ-1. Volumes of mutual transactions among financial sectors, by product

(trillion won, %, %p)

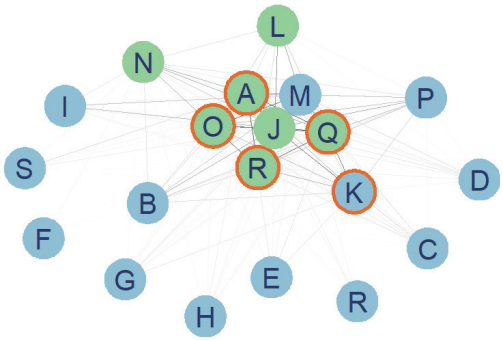
Product	End of 2020		End of 2021		B-A
	Amount	Share (A)	Amount	Share (B)	
Deposits	719.2	24.1	778.1	24.5	0.4
Bonds	667.2	22.4	716.3	22.6	0.2
Stocks[1)]	590.8	19.8	657.1	20.7	0.9
Loans	144.1	4.8	153.6	4.8	0.0
Repos	157.5	5.3	172.8	5.4	0.2
Derivatives	108.6	3.6	60.1	1.9	-1.8

Note: 1) Including investment fund shares, equity-linked securities (ELS), etc.
Source: Bank of Korea.

Meanwhile, bank interconnectedness is concentrated in certain commercial and special banks(Fig. III-16), and the proportion of mutual transactions involving specific products is as follows: bonds (68.3%, the highest proportion), loans (14.2%), derivatives (3.8%).

23) Securities investment trusts excluding MMF in the flow of fund statistics, such as ETFs and mutual funds.
24) The value of derivative-related mutual transactions decreased by KRW 48.5 trillion in 2021, of which the transactions between banks and foreign bank branches decreased by KRW 16.6 trillion while the transactions between foreign bank branches decreased by KRW 11.0 trillion. This was largely because the supply of swap funds at foreign bank branches and banks expanded with foreign currency liquidity regulations easing due to market instability during and after the COVID-19 crisis. Stabilization in foreign currency funds market related transactions has decreased to pre-COVID-19 levels (the share of total foreign bank branch assets involving derivative assets increased from 17.8% at the end of 2019 to 24.5% at the end of 2020 and then decreased to 17.5% by the end of 2021).

Figure Ⅲ-16. Domestic banking sector interconnectedness map[1)2)3)]



Notes: 1) Using network visualization analysis, with centrality, concentrations and line thicknesses all proportional to the mutual transaction volumes.
2) ○ indicate D-SIBs, and ● the seven highest-ranked banks in terms of their mutual transaction volumes.
3) End of 2021 basis.
Source: Bank of Korea.

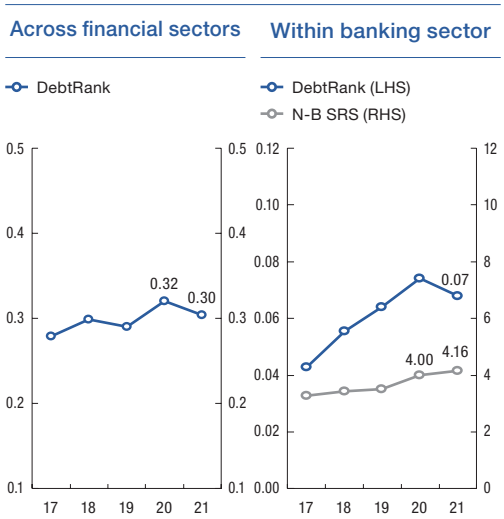
Default contagion risk remaining at a similar level to last year

The analysis of default contagion risk and concentration risk based on the structure of interconnectedness between financial institutions found that the risk of default contagion has increased, while the concentration risk has remained roughly the same.

DebtRank, an indicator of default contagion risk,[25)] decreased slightly compared to the end of the previous year both between financial sectors and within the banking sector. The default contagion risk and the concentration risk analyzed through the mutual transaction structure across financial institutions were generally at the same level as the previous year.

The N-B SRS in the banking sector, an indicator of the total quantity of default contagion risks,[26)] increased slightly compared to the end of the previous year (Figure III-17).

Figure Ⅲ-17. Default contagion risks[1)]



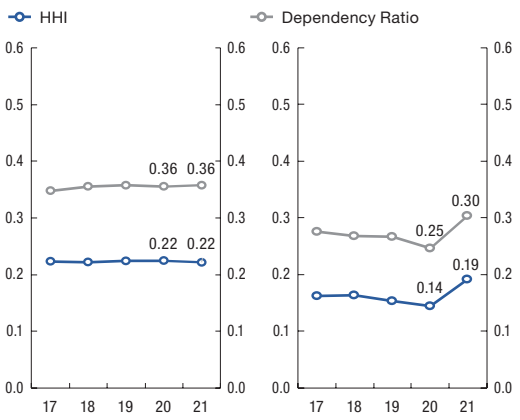
Note: 1) End-period basis.
Source: Bank of Korea.

25) As the simple average of the ratio of aggregate losses appearing when a shock from the insolvency of an individual sector (bank) spreads to its transaction counterparties through their mutual exposure, relative to total financial (banking) sector assets under management, a DebtRank of 0.05 means that losses following the insolvency of an individual sector (bank) will on average give rise to a loss of 5% of total financial (banking) sector assets under management (Battiston, Stefano, et al. “DebtRank: Too Central to Fail? Financial Networks, the Fed and Systemic Risk,” 2012).

26) Network-Based Systemic Risk Scoring is the aggregate amount of banking sector risk, appearing when the probability of default of a specific bank expands through its exposure to mutual transactions with other banks, is defined as the square root of the bank’s probability (%) of default multiplied by the amount (KRW trillion) of its mutual transactions with its transaction counterparties (Das, Sanjiv Ranjan. "Matrix Metrics: Network-Based Systemic Risk Scoring,” 2015).

The Herfindahl-Hirschman Index (HHI), which indicates concentration risk,[27] and the Dependency Ratio of a single counterparty[28] were generally similar to those of the previous year in the transactions between financial sectors, but increased slightly in intra-banking transactions due to the entry of new Internet banks[29] (Figure III-18).

Figure Ⅲ-18. Concentration risks[1]



Note: 1) End-period basis.
Source: Bank of Korea.

27) HHI is the weighted average value of the summed squares of the proportions of individual sector (bank) transactions with other sectors (banks) and indicates the level of dependence on a small number of transaction counterparties. The shares of transactions and the weight were based on fund management transactions.

28) The Dependency Ratio is the weighted average value of the proportions of individual sector (bank) transactions with the single sector (bank) with which they have the largest transaction values and signifies the level of dependence on a single transaction counterparty. The shares of transactions and the weight were based on fund management transactions.

29) Online-only banks tend to depend highly on a single counterparty, as their small sizes make it difficult to diversify transactions.

Box 3.

Estimation of Potential Corporate Credit Losses at the Expiration of COVID-19 Loan Forbearance and Assessment

Financial relief measures implemented by the policy authorities since early in the COVID-19 pandemic[1] have led to a sharp increase in corporate loan growth. However, in spite of the pandemic's impact on the real economy, loan soundness indicators appear to be unaffected or even improving, in a clear divergence from the behavior during past periods of macroeconomic weakness. It has been suggested that the COVID-19 relief measures' effect of delaying corporate delinquencies and defaults means that actual credit risk is not accurately reflected in soundness indicators. The BIS[2] also has also drawn attention to this phenomenon called the "bankruptcy gap," which is the decoupling between the soundness of banks' corporate loans and the real economy, and stressed that credit losses could increase sharply when relief measures end.

In what follows, the likelihood of hidden corporate credit risk coming to the surface at the expiration of COVID-19 relief measures is examined and the potential credit losses of the domestic banking sector are estimated to derive policy implications.

Likelihood of a Deterioration of Domestic Banks' Corporate Loans at the Expiration of COVID-19 Relief Measures

Bankruptcy Gap during the COVID-19 Crisis and Causes

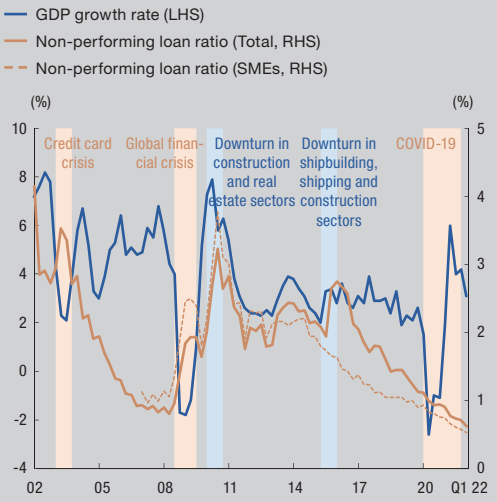
In spite of the economic impact of the pandemic, resulting in a sharp slowdown in growth, the incidence of defaults on domestic banks' corporate loans has paradoxically decreased in the so-called bankruptcy gap phenomenon. This is in a stark contrast to the behavior of credit risk during the global financial crisis or the Korean credit card crisis in which the nonperforming loan ratio and the rate of economic growth showed a negative correlation and moved in opposite directions.[3]

1) Financial relief measures implemented in response to the COVID-19 crisis include ① the deferment of loan principal and interest payments and the extension of loan maturity for SMEs and sole proprietors impacted by the pandemic (about 177 trillion won worth of loans deferred or modified between April 2020 and December 2021, expiration in September 2022), ② the easing of loan restrictions: ⓐ the early implementation of the final Basel III reforms (Jun. 2020 instead of 2023), and ⓑ the upward adjustment of the maximum loan-deposit ratio (from 100% to 105%, expiration in Jun. 2022), and ⓒ the application of regular asset soundness categories to loans deferred or modified under the COVID-19 impact forbearance program.

2) In BIS Bulletin No.40 (2021, "Liquidity to solvency: transition cancelled or postponed?") and BIS Bulletin No.46 (2021, "Could corporate credit losses turn out higher than expected?"), the current situation, in which despite the real economic shock from COVID-19 the rate of corporate bankruptcy remains surprisingly low due to the financial easing and relief measures, was designated as the "COVID-19 bankruptcy gap."

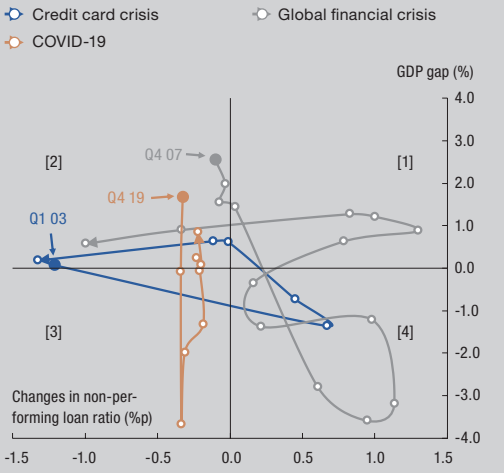
3) However, the correlation between economic growth and the nonperforming loan ratio has slightly weakened in recent years due to the modest level of cyclical changes during the period from the global financial crisis to the COVID-19 crisis and tighter regulation of asset soundness.

GDP growth[1] and non-performing loan ratio of corporate loans[2]



Notes: 1) Year-on-year basis.
2) Non-performing loans / Total loans (domestic banks, end of quarter basis).
Sources: Bank of Korea, financial institutions' business reports.

Cyclical pattern between economic conditions[1] and non-performing loan ratio[2]



Notes: 1) Based on the quarterly real GDP gap calculated by dividing the cyclical components by the trend components, using the HP filter.
2) Year-on-year basis.
Sources: Bank of Korea, financial institutions' business reports.

The non-performing loan(npl) ratio, which remained low during the unfolding of the COVID-19 crisis, embarked directly on a downward trend upon economic recovery, with no increase during the transition (quadrant 2 of the graph). In the past crises, the NPL ratio showed a cyclical pattern in which it rose upon an economic shock (quadrant 4) and dropped with the recovery (quadrant 2).

The bankruptcy gap appears to be due both to the financial relief measures implemented in response to COVID-19 and the conditions in the credit market which have been mostly favorable in recent years.

The COVID-19 impact relief measures for SMEs in April 2020 and other measures to ease financial regulations and capital adequacy requirements[4] helped limit nonperforming loans. Of these, the deferment of payments and the extension of maturity on SME loans contributed particularly significantly to reducing new precautionary or substandard and below loans. As a result, newly delinquent SME loans sharply fell from 3.4 trillion won (average for Q1 2018-Q1 2020) before the pandemic to 2.5 trillion won (Q2 2020-Q4 2021) after the pandemic.

4) A low capital adequacy ratio prevents banks from expanding corporate loans with high risk weights. However, in the case of domestic banks, whose total capital ratio has continuously increased in recent years (end of 2015: 13.9% → end of 2019: 15.3% → end of 2021: 16.5%), in part thanks to the early adoption of the final Basel III reforms, they likely had space to take on additional risk-weighted assets during the COVID-19 crisis.

Newly delinquent amounts[1] of SME loans

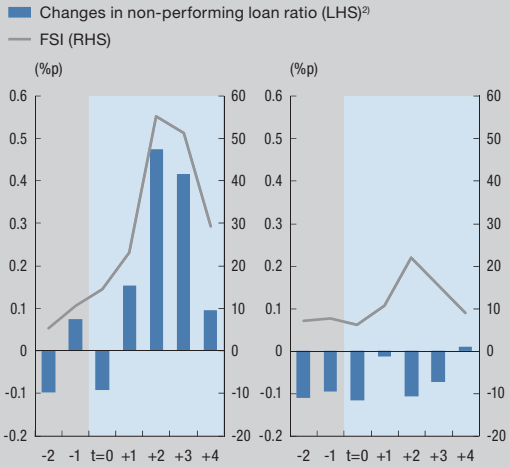
(trillion won)

	2018	2019	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
New delinquencies	3.5	3.4	3.4	2.9	2.7	2.6	2.4	2.3	2.1	2.1

Notes: 1) Figures for 2018 and 2019 are average of each quarterly data of the year.
Sources: Financial institutions' business reports.

Moreover, even amid the pandemic, the Financial Stability Index (FSI) only briefly surged past the critical threshold (22) to 24.4[5] and the widening of the credit spread on corporate bonds was also less extensive than during the global financial crisis.[6] This suggests that corporate funding conditions[7] were generally more favorable compared to during the global financial crisis.

Financial stability index (FSI) and non-performing loan ratio



Notes: 1) Base times (t=0) are Q2 2008 and Q4 2019.
2) Quarter-on-quarter basis.
Sources: Bank of Korea, Financial institutions' business reports.

Finally, banks' accommodative lending attitude[8] and the drop in loan interest rates, which improved credit supply conditions,[9] also appeared to have helped to limit new corporate delinquencies caused by temporary liquidity stress.

Assessment of the Likelihood of Corporate Credit Losses at the Expiration of Relief Measures

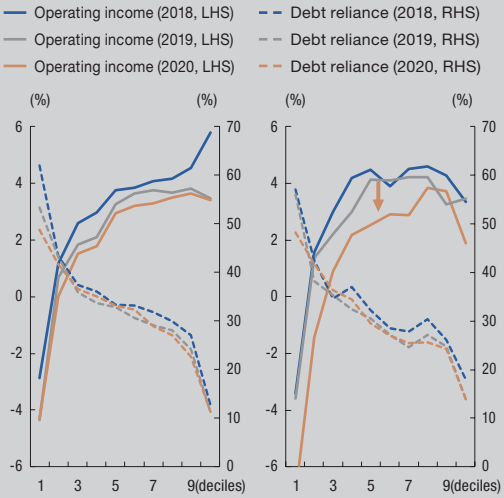
The recent soundness indicators for domestic banks' corporate loans appear to underestimate

5) While during the COVID-19 crisis, the Financial Stability Index (FSI) climbed to 24.4 in April 2020 (above the critical threshold for a month) from 9.1 in February 2020, before dropping to 9.6 in October 2020, during the global financial crisis, it stayed above the critical threshold for six straight months between September 2008 and June 2009, hitting a high of 57.5 in December 2008.
6) The corporate credit spread, which widened by 365bp (average for Q4 2008) during the global financial crisis, only increased by 74bp during the COVID-19 crisis (Q2 2020).
7) BIS Quarterly Review (September 2021, "Covid-19 policy measures to support bank lending") singled out ample credit supply as the chief cause of the bankruptcy gap.
8) In 2020, banks' lending attitude toward SMEs (based on the results of a lending behavior survey of domestic banks) had a positive average score of 11.3.
9) The NFC (non-financial corporation) loans to nominal GDP ratio increased sharply from 101.3% at the end of 2019 to 110.3% at the end of 2020 and 114.7% at the end of 2021. The rate of increase in domestic banks' loans also accelerated from 3.3% in 2017-2019 (average of quarterly figures during the period) to 9.6% in 2020 and 7.8% of 2021.

credit risk caused by the effect of policy measures in response to COVID-19. Future changes in financial conditions, including the expiration of the government's relief measures, could bring to the surface hidden credit risk built up during the pandemic years, particularly among companies in sectors where recovery is slow that have moreover been benefiting from the loan forbearance program.

Meanwhile, the increase in loan reliance (loans/total assets) amid the pandemic-caused downturn among smaller companies that are in mid to low deciles in asset size[10] and consumer-facing firms[11] is also a source of credit risk concern.

Operating income[1] and debt reliance[2] of firms, by company size[3]



Notes: 1) Operating profits (losses) relative to total assets.
2) Borrowings relative to total assets (excluding corporate bonds).
3) External audit firms are divided into 10 deciles based on their total asset size.
4) Accomodation & food services, wholesale & retail trade, leisure services, personal services, education, business support services and transportation & storage.

Source: KIS-Value.

The past experience from the global financial crisis period also suggests a strong likelihood of a rise in credit losses at the expiration of relief measures. In the immediate aftermath of the global financial crisis (2010), when the tapering of financial support for SMEs[12] began, along with corporate debt restructuring, this caused a surge in nonperforming loans.[13] Moreover, if the normalization of monetary policy in major coun-

10) Corporations that are subject to external audit requirements (22,542 on average in 2018-2020, including 5,268 firms in COVID-19-related service sectors) were divided into 10 quantiles according to the size of total assets.

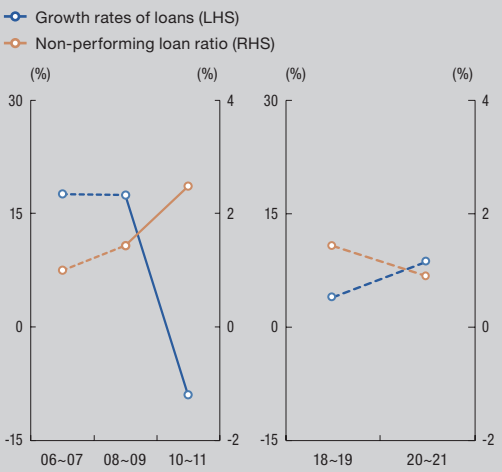
11) Including accommodation and food services, wholesale and retail, recreation and leisure services, personal services, educational services, business support, and transportation and warehousing. BIS Bulletin No.40 (2021) reported that the shock of COVID-19 was particularly severe for consumer-facing firms.

12) According to the Financial Services Commission (Dec. 24, 2013, 「Extension and Improvement of the SMEs Fast Track Program」), the government provided support for SMEs undergoing temporary liquidity constraints (24.1 trillion won in 2009) starting in October 2008, through a fast track program, which also extended the length of maturity on existing loans.

13) After the global financial crisis, there was a steep decline in loan growth (based on SME loans), compared to the previous period (from 7.3% YOY in 2008-2009 to -6.7% in 2010-2011), with a measurable rise in the nonperforming loan ratio (1.3% → 2.5%).

tries leads to a tightening of financial conditions and causes the global recovery to slow, this could reduce the bankruptcy gap and increase credit losses.[14]

Corporate loans growth rate[1)2)] and non-performing loan ratio[2)]



Notes: 1) Year-on-year basis.
2) Average of each period.
Sources: Financial institutions' business reports.

Potential Credit Loss Estimation: Methodology and Results

Methodology

Potential credit losses that are masked by COVID-19 relief schemes were estimated by dividing them into expected losses[15] and unexpected losses.[16] All changes that occurred (Q1 2020-Q4 2021) in major macroeconomic variables (interest rates, credit supply, housing prices, stock prices, etc.) as a result of financial relief measures were considered policy effects. Potential credit losses corresponding to the bankruptcy gap were calculated by subtracting credit losses that reflect policy effects[17] (②) from credit losses not reflecting policy effects[18] (①) (① - ②).

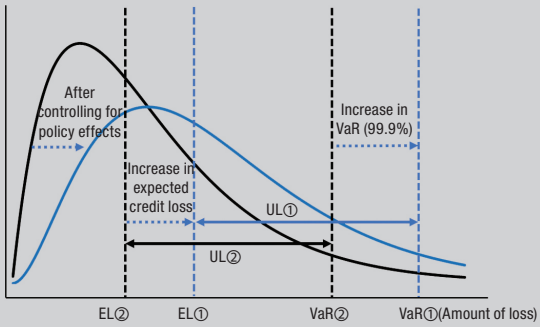
14) An impulse-response analysis was conducted using a four-variable structural VAR model (2), under the assumption that there were no COVID-19-related financial relief measures. The four variables for the structural VAR model were economic growth during the period between Q1 2003 and Q4 2019 (YOY, the same hereafter), change in corporate loan interest rates, change in the precautionary loan ratio, and change in substandard and below loan ratio. The results showed that a 1.0%p drop in GDP growth would cause an increase in the substandard and below loan ratio of 4.2%p, 3.8%p, and 2.3%p and an increase in the precautionary loan ratio of 3.2%p, 4.6%p, and 4.3%p in the quarter during which the shock occurred and the two subsequent quarters, respectively.

15) Expected losses, which are losses that can be reasonably expected based on past experiences, are calculated by multiplying the probability of default by the exposure at default and the loss given default. In the probability of default model, macroeconomic explanatory variables including GDP growth, interest rates, stock prices, and housing prices were used for the estimation of the bankruptcy gap. Meanwhile, in order to reflect the probability of a change in the status of a loan, a matrix (3x3) of probabilities of transition from one status to another (normal, precautionary, substandard-and-below, etc.) between a given point in time (t) and the next period(t+1) was used. The transition matrix was estimated using the probability of default model and z-scores (statistical values expressing the information contained in the transition matrix as a single value for each point in time). The exposure was assumed to be a function of credit supply and was calculated by credit rating and company size. The loss ratio was estimated as a linear function of the probability of default. For other detailed methods for the estimation of expected losses, the IMF's methodology (IMF WP 2021, "Expected credit loss modeling from a top-down stress testing perspective") was consulted.

16) Unexpected losses are losses with a low probability of occurrence that are in excess of expected losses, corresponding to losses (VaR) with a 99.9% confidence level minus expected losses. In this study, they were estimated using the K function, an internal rating method under Basel III, consisting of coefficients of correlation between the probability of default, exposure, and loss ratio.

17) Credit losses were calculated by reflecting the original time series data of macroeconomic variables since early in the COVID-19 pandemic.

Counterfactual credit loss[1] distribution[2] without policy effects[3]



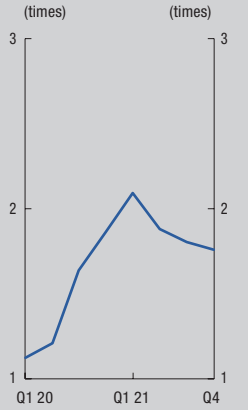
Notes: 1) EL means expected credit loss, and UL (VaR-EL) means unexpected credit loss.
2) Blue line graph indicates credit loss distribution without the policy effects, and black line graph indicates credit loss distribution with the policy effects.
3) Changes in interest rates and credit supply during the COVID-19 period are regarded as policy effects to estimate the policy-effect-controlled(counterfactual) loss distribution.
Source: Bank of Korea staff calculation.

Estimation Results

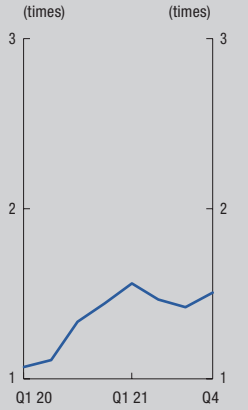
When credit losses were estimated while controlling for COVID-19 policy effects, expected and unexpected losses of domestic banks were 1.6-fold (average for 2020-2021) and 1.3-fold the corresponding figures when the policy effects were not excluded. Moreover, if such losses materialize, it is estimated that this would cause domestic banks' capital adequacy ratio to drop by up to 1.4%p. As credit risk, which was kept artificially low by policy effects, increased sharply on the rising probability of default,[19] the right tail of the credit loss distribution became fatter and the size of losses grew.

Changes in credit loss when controlling for COVID-related policy effects

<Expected credit loss[1)2)]>

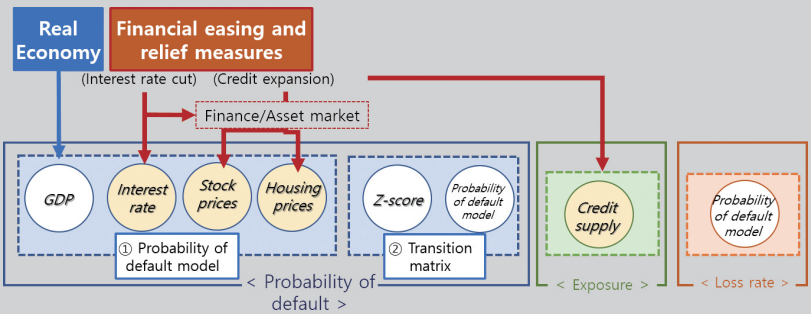


<Unexpected credit loss[1)3)]>



Notes: 1) Based on losses over the next one year at each time point.
2) Counterfactual expected loss (policy effect controlled) / Expected loss.
3) Counterfactual unexpected loss (policy effect controlled) / Unexpected loss.
Source: Bank of Korea staff calculation.

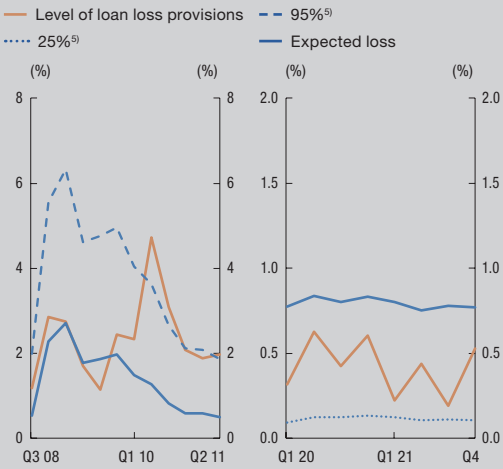
18) It was assumed that interest rates and credit supply growth would remain at pre-pandemic levels (average of 2019) with no financial relief measures, and all the changes were considered to be policy effects. For stock and housing prices, policy effects during the pandemic period were measured by historically decomposing them through structural vector autoregression (SVAR) and wiping out their contribution parts.



19) When controlling for policy effects, the probability of default for Q4 2020 increased to up to 1.5%, 0.5%p higher than when policy effects were reflected (1.0%), with the probability of the transition of precautionary-rated loans with a high level of credit risk to default also rising sharply (4.7% → 9.9%).

Meanwhile, the comparison of the credit loss distribution with loss reserves[20] shows that during the COVID-19 period, loan loss reserves were in the 25-45 percentile range of the loss distribution, which is below the amount of expected losses (mean value of the credit loss distribution). On the other hand, during the global financial crisis, loss reserves were in the 75-95 percentile range of the credit loss distribution.

Level of loan loss provisions[1)2)] and expected loss[1)3)]



Notes: 1) Ratio to corporate exposures.
2) Sum of net loan loss provisions, regulatory loan loss reserves, and etc.
3) Expected credit losses over the next one year at each time point.
4) Expected loss without the policy effects.
5) 95% and 25% quantiles of the credit loss distribution.

Source: Bank of Korea staff calculation.

Assessment and Implications

Given the bankruptcy gap caused by financial relief measures during the COVID-19 period, the current soundness indicators for corporate loans appear to misrepresent the actual level of credit risk.

When potential credit losses were estimated by controlling for COVID-19 policy effects, the rising probability of default caused the right tail of the loss distribution to become fatter, and both the expected and unexpected losses increased. This also implies that the current level of loss reserves and provisions is far too insufficient to absorb future credit losses.[21]

Going forward, when the relief measures and the temporary relaxation of financial regulations come to an end, potential credit risk could rise to the surface and materialize into losses, increasing loss costs for banks and lowering their capital adequacy ratio.

In order to anticipate the possibility of potential credit losses materializing, it is important for domestic banks to set aside more provisions and reserves by improving their credit risk evaluation and loss reserve standards, while at the same time strengthening their overall loss absorption capacity.

When estimating credit losses, banks need to establish best practice guidelines to avoid underestimating credit risk and setting aside insufficient loss reserves by not appropriately reflecting the future economic outlook, crisis conditions, or policy effects.

20) Defined as the sum of the net amount of loss reserves and the amount transferred to loan loss provisions to cover future expected losses.

21) Banks set aside a loss reserve (accounting standard), in an amount corresponding to their expected losses according to the credit loss distribution. If this amount is less than the amount of expected losses, calculated according to asset sound classification categories (supervisory standard), the difference is set aside as a loss provision.

In addition, during periods in which expected losses can be underestimated due to policy effects or other causes, minimum loss reserve requirements (supervisory reserve requirements) need to be adjusted upward.[22)]

22) In 2006, minimum loss reserve requirements were adjusted upward on normal and precautionary-rated corporate and household loans. In 2007, the minimum loss reserve ratio was increased again on normal-rated corporate loans, but by a variable amount depending on the industry.

Ⅳ. Capital Flows

From January to May 2022, domestic stock investment by foreigners recorded a net outflow, and the inflow of bond investment by foreigners decreased.

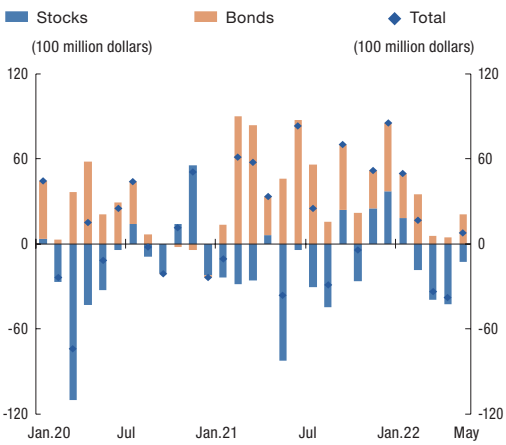
Overseas portfolio investment by residents continued to increase as overseas stock investment rose, but as investment sentiment cooled, the size of net investment decreased. Going forward, amid the narrowing difference between domestic and overseas interest rates and the possibility of elevated global risk,[1] the volatility of domestic portfolio investment by foreigners and overseas portfolio investment by Korean residents is likely to increase.

Net Inflow of Foreign Portfolio Investment into Domestic Securities

From January to May 2022, portfolio investment in domestic securities by foreigners[2] recorded a net inflow of USD 0.2 billion (-USD9.5 billion in stocks, +USD9.7 billion in bonds). Stock investment by foreigners had registered a net inflow due to massive IPOs earlier this year[3] but, after February, shifted to a net outflow as investment sentiment soured amid surging geopolitical risks related to Ukraine, the prospect for earlier monetary policy tightening by the US Federal Reserve, and concern over an economic downturn in China.

The inflow of bond investment by foreigners fell significantly,[4] driven by public investment, on the back of narrowing of the domestic and international interest rate spread since March (Figure Ⅳ-1).

Figure Ⅳ-1. Changes in foreigners' domestic portfolio investment[1]

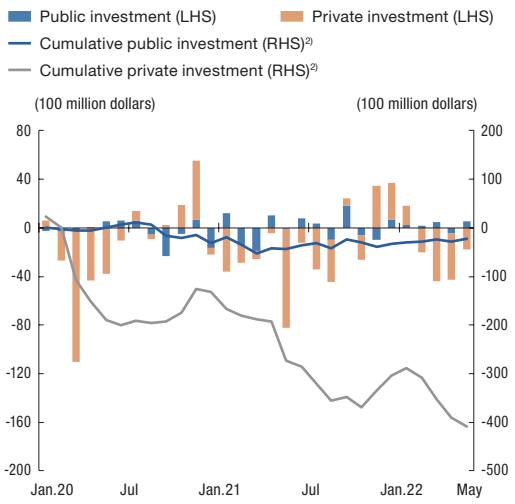


Note: 1) A "+" means net inflow, and a "-" net outflow.
Source: Bank of Korea.

By investor type, stock investment recorded a net outflow, led by private investors, and bond investment saw a net inflow, also led by private investors (Figures Ⅳ-2 and Ⅳ-3).

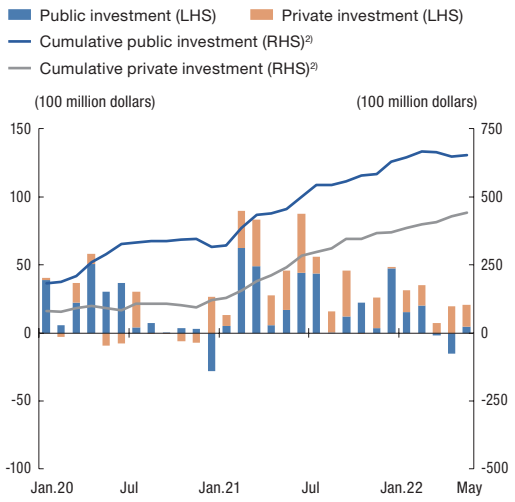
1) For details, refer to Box 4. "Impact of Increasing Global Risks on Major Emerging Market Economies and Assessment."
2) In this section, stock investment includes exchange and OTC transactions of KOSPI- and KOSDAQ-listed stocks as well as initial public offerings (IPOs) (but excludes ETFs, ELWs, ETNs, etc.), while bond investment is based on exchange and OTC transactions of listed bonds (with repo transactions and amounts reaching maturity also taken into consideration).
3) In January 2022, funds that flowed to IPOs amounted to USD 3.23 billion, the largest-ever monthly inflow.
4) This was also attributed to special factors such as the transfer of assets of some public institutions and portfolio adjustment in the beginning of the fiscal year.

Figure Ⅳ-2. Net foreigners' stock investment inflows,[1] by investor type



Notes: 1) A "+" means net inflow, and a "-" net outflow.
2) Cumulative sums of monthly net inflows since January 2020.
Source: Bank of Korea.

Figure Ⅳ-3. Net foreigners' bond investment inflows,[1] by investor type



Notes: 1) A "+" means net inflow, and a "-" net outflow.
2) Cumulative sums of monthly net inflows since January 2020.
Source: Bank of Korea.

As of the end of May 2022, the balance of stock investment by foreigners stood at KRW 691 trillion, accounting for 27.7%[5] of stock market capitalization,[6] down from the end of last year (29.7%). Meanwhile, the balance of bond investment by foreigners amounted to KRW 226 trillion, representing 9.7% of the total listed bond value, edging up from the end of last year (9.6%).

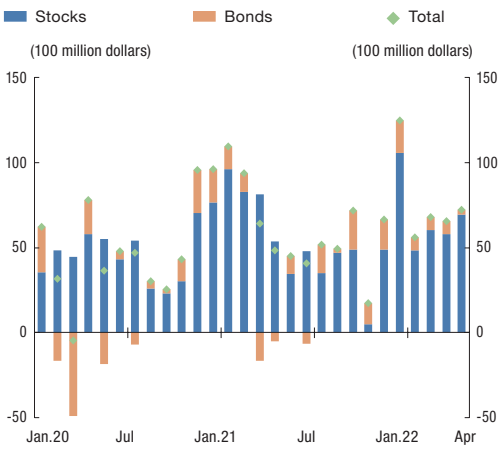
Domestic bond investment by foreigners is expected to be slower than last year, due to the narrowing of the domestic and international interest rate spread, and stock investment is likely to be more volatile owing to the protracted war in Ukraine, stronger monetary policy tightening by the US Federal Reserve, and worries over an economic downturn in China.

Slowing Growth in Overseas Portfolio Investment by Residents

From January to April 2022, overseas portfolio investment by Korean residents rose by USD 26.1 billion (USD 23.6 billion in stocks, USD 2.5 billion in bonds), showing slower growth compared tothe same period of last year (total of USD 31.7 billion, withUSD 31.3 billion in stocks andUSD 0.3 billion in bonds) (Figure IV-4). This is primarily explained by a contraction of net stock investment, which had soared significantly a year earlier, as investment sentiment cooled with stock prices falling in major countries this year.

5) Based on the balance of stocks listed on the KOSPI and KOSDAQ, excluding ETFs, out of the balance of stock investment by foreigners.
6) Sum of the total market capitalizations of the KOSPI and KOSDAQ markets.

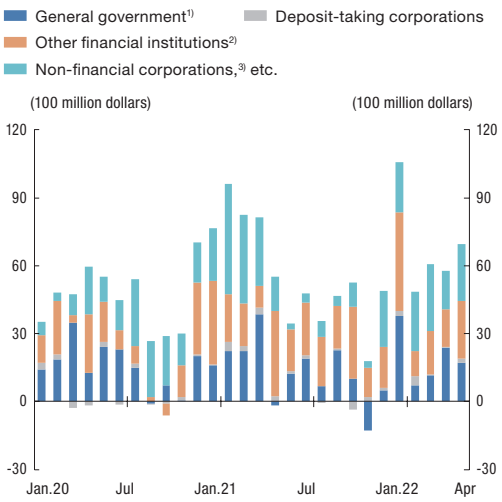
Figure Ⅳ-4. Changes[1] in residents' overseas portfolio investment



Note: 1) A "+" means net investment, and a "-" net withdrawal.
Source: Bank of Korea.

By investor type, amid the inflow of stock investment into overseas investment funds and continued overseas investment in stocks by individual investors, investment remained steady, driven mainly by other financial corporations and non-financial corporations(including individual investors) (Figure Ⅳ-5).

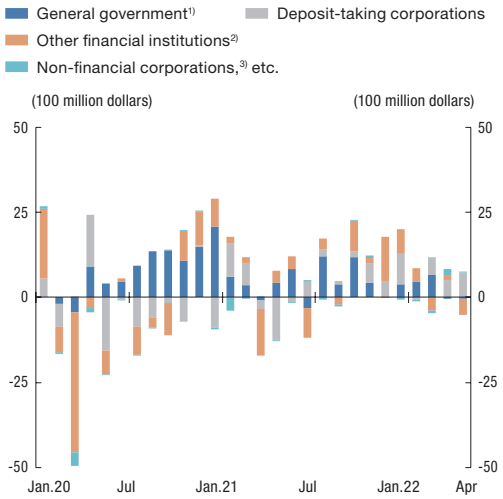
Figure Ⅳ-5. Net residents' overseas stock investment outflows, by investor type



Notes: 1) National Pension Service (NPS), Korea Investment Corporation (KIC), etc.
2) Insurance companies, asset management companies, etc.
3) Including individual investors.
Source: Bank of Korea.

Thanks to the purchase of highly-liquid bonds by deposit-taking corporations for the purpose of observing the regulatory ratio, a moderate net investment in bonds was made, but overall investment in bonds slowed (Figure Ⅳ-6).

Figure Ⅳ-6. Net residents' overseas bond investment outflows, by investor type



Notes: 1) National Pension Service (NPS), Korea Investment Corporation (KIC), etc.
2) Insurance companies, asset management companies, etc.
3) Including individual investors.
Source: Bank of Korea.

Overseas portfolio investment by Korean residents is expected to maintain a continuous net outflow as pension funds intend to raise their share of overseas investment in portfolios, and individual investors favor direct investment in overseas stocks.

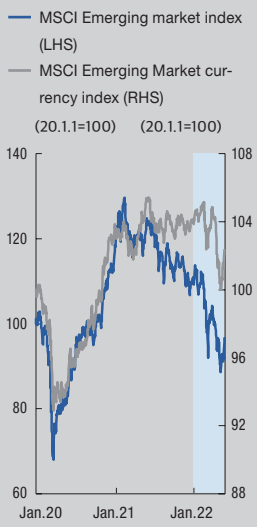
However, amid the prospect of tighter monetary policy by the US Federal Reserve and development of geopolitical risks surrounding the Russia-Ukraine war and concern over slow growth in China, the surging volatility of international financial markets is likely to act as a constraint.

Box 4.

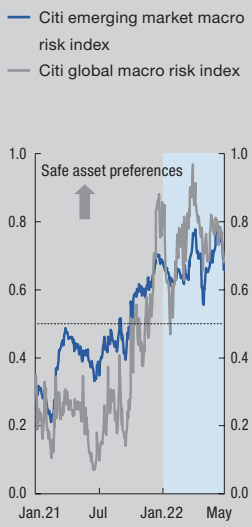
Impact of Increasing Global Risks on Major Emerging Market Economies and Assessment

Amid the accelerating pace of benchmark interest rate hikes by the U.S. Federal Reserve and signs of economic slowdown in China, the war in Ukraine has compounded economic slowdown by introducing additional geopolitical uncertainty. This environment has heightened concerns about the impact of global risks on emerging market economies. Stock prices in emerging market economies have recently plummeted, and their currencies have also sharply fallen, causing investor wariness on risks to remain high.

Stock prices and currencies of major emerging markets



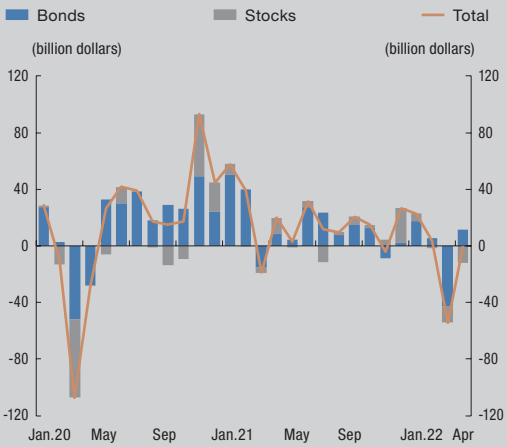
Risk appetite of major emerging markets



Source: Bloomberg.

Foreign portfolio investment in emerging market economies recorded massive net outflows in March 2022,[1] with net outflows continuing into April.

Foreign portfolio investment in emerging market economies[1]



Note: 1) Based on 20 countries including China, Taiwan, Korea, India and Brazil (excluding Brazil bond funds and Mexico stock funds).

Sources: Bank of Korea, IIF, Bloomberg.

The following is an examination of the impact of global risk factors on emerging market economies.

Increase in Monetary Tightening by the US Federal Reserve

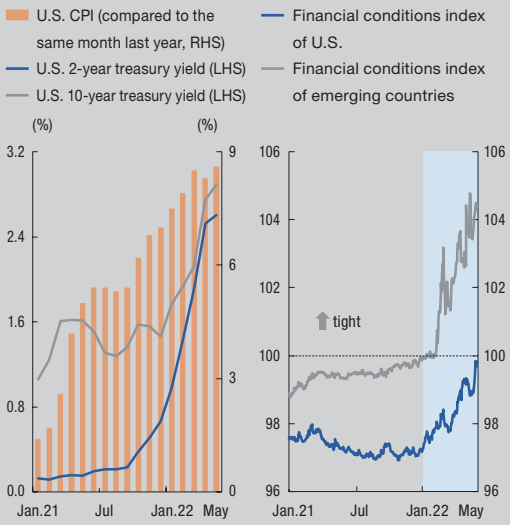
Early this year, a more hawkish monetary policy by the U.S. Federal Reserve[2] and a big jump in U.S. market interests[3] caused financial conditions in emerging market economies to deteriorate sharply. The impact on emerging market economies appears to have been severer due to the fact that the U.S. rate hikes were prompted primarily by inflation worries.[4]

1) According to the Institute of International Finance (IIF), net outflows in March 2022 amounted to USD 54.4 billion, the highest monthly net outflows recorded since March 2020 when the global spread of COVID-19 sent this figure to a record high of USD 107.1 billion.

2) Based on the Federal Reserve's dot plot, the projection of the federal funds rate (based on the median value) at the end of 2022 was adjusted sharply upward from 1.9% (Mar. 2022) to 3.4% (Jun. 2022 FOMC meeting).

U.S. bonds rates[1] and inflation

Financial situation index[2] of emerging countries



Notes: 1) Average of months basis.
2) Goldman Sachs FCI basis. If above 100, the financial situation is considered tight.
Source: Bloomberg.

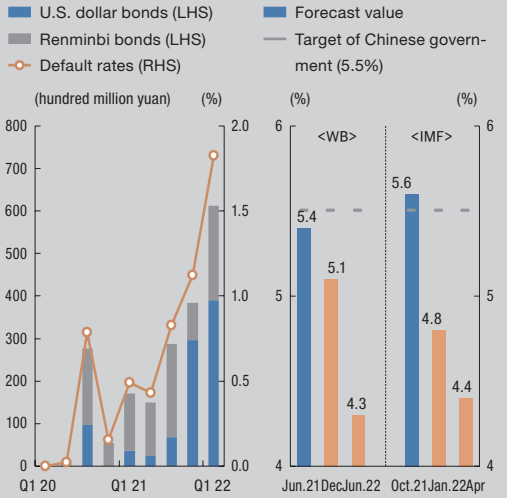
Worsening financial conditions in emerging market economies can lead to heightened pressure for outflows of foreign portfolio investment and an increased redemption burden on foreign currency-denominated bonds. Under a lower-for-longer interest rate environment of recent years, there has been a sharp rise in the issue of foreign currency-denominated bonds by emerging market economies. A considerable amount of U.S. dollar-denominated bonds is expected to reach maturity during 2022.[5]

Growing Concerns about Economic Slowdown in China

Amid a prolonged downturn in China's real estate sector, the lockdown in strict major cities under the recent zero COVID-19 policy has sparked worries about a slowdown in production and consumption, resulting in lower growth projections for the country.[6] As the tighter regulation of the real estate sector by the Chinese government has worsened borrowing conditions and slowed housing sales, the default rate for Chinese developers has surged sharply this year.[7] Meanwhile, the lockdown of major cities under the zero COVID-19 policy[8] is expected to cause a sizeable drop in China's GDP growth.

3) In January 2022, the yield on 10-year U.S. Treasury notes (intra-month average) rose from 1.76% to 2.89%.
4) According to an analysis by the U.S. Federal Reserve, when U.S. interest rates rise due to expectations of an economic recovery rather than inflation concerns, this tends to lead to a strengthening of the value of emerging market currencies, and the resulting increase in interest rates in these countries and CDS premia remains moderate (International Finance Discussion paper, Jan. 2020).
5) USD 399.3 billion as of the end of April 2022.
6) The IMF adjusted its forecast for Chinese economic growth for 2022 downward from 4.8% to 4.4% (Apr. 2022).
7) In January to April 2022, defaults on onshore and offshore corporate bonds reached RMB 134.4 billion, exceeding last year's total (RMB 109.6 billion).
8) As of May 10, 2022, 41 cities including Shanghai, Suzhou, and Beijing were fully or partially locked down or were designated as control zones.

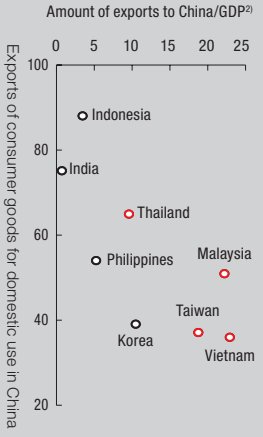
Default size and default rate[1] of Chinese property developers



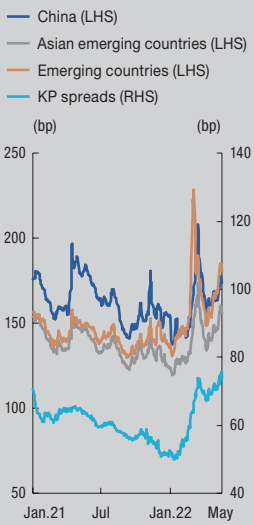
2022 growth forecast[2] for Chinese economy

Notes: 1) Default size during the quarter compared to the balance of corporate bonds issued in the same sector at the end of the previous quarter.
2) The horizontal axis is the forecast period.
Sources: Bloomberg, WIND, World Bank, IMF.

Asian emerging countries' trade with China



Bond[3] spreads[4] in emerging countries



Notes: 1) Exports of consumer goods for domestic use in China total exports of 2021 basis.
2) 2020 basis.
3) US dollar corporate bonds and quasi-treasury bonds of investment grade.
4) Compared to U.S treasury bond basis.
Sources: UN Comtrade, Goldman Sachs, Bloomberg.

A slowing Chinese economy is likely to have a negative impact on the real sector of its trade partners, particularly emerging countries in Asia actively trading with China. Moreover, given China's importance in emerging financial markets,[9] insolvencies among Chinese property developers could trigger credit fears and cause global investors' sentiment about emerging market economies as a whole to sour.

Prolonged Conflict in Ukraine

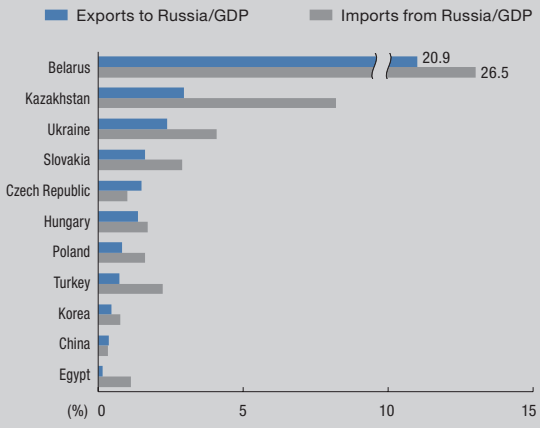
The Russian invasion of Ukraine caused the prices of crude oil, raw materials, and grains to skyrocket, putting strain on economic growth for emerging market economies and causing runaway inflation. Should the conflict in Ukraine turn into a prolonged crisis, this is likely to impact Europe more than the rest of the world, due to its geographical proximity to and trade relationships with the region.[10] Meanwhile, the spiraling prices of grains could also increase inflationary pressure in emerging market economies outside Europe that rely heavily on Russian and Ukrainian

9) As of the end of April 2022, China accounted for 36.7% of the total outstanding balance of U.S. dollar-denominated corporate bonds issued by emerging market economies (USD 2.6 trillion).
10) According to an OECD analysis, if the impact of the Ukrainian crisis on the commodities and financial markets continues for the next 12 months at the level during the first two weeks following the Russian invasion of Ukraine, this will lead to a 1.4%p decline in European GDP growth and a 2.0%p increase in inflation. For details, refer to "Economic and Social Impacts and Policy Implications of the War in Ukraine" (OECD, Mar. 2022).

crops.[11] However, the picture is quite different for emerging market economies that are exporters of raw materials and grains. These countries are currently experiencing export booms and the resulting economic improvement has, in turn, set off stock market rallies.

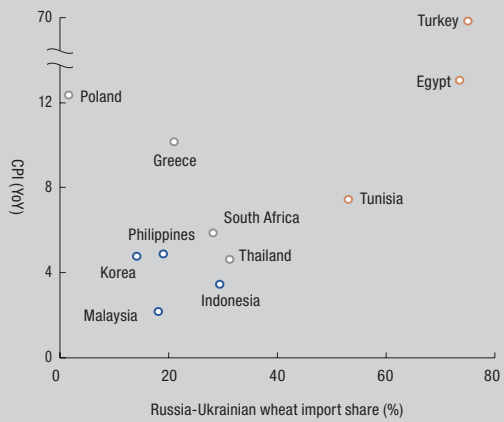
In addition, there are also persistent worries about a Russian default on its foreign currency-denominated bonds,[12] due to the ongoing Western economic sanctions. Attention must be therefore paid to the possible contagion of risk to the emerging financial markets.

Trade[1] with Russia by country



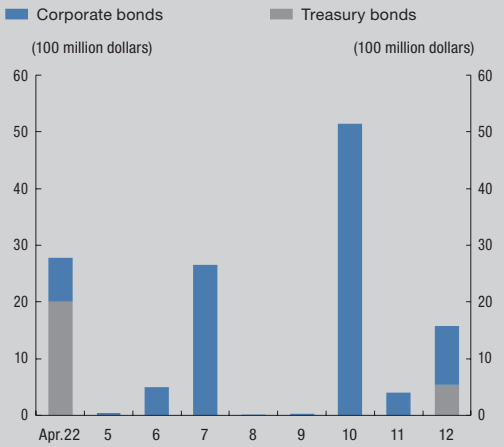
Note: 1) 2020 basis.
Sources: IMF, UN Comtrade.

Percentage[1] of CPI[2] and smuggling in emerging market economies



Notes: 1) Proportion of the amount of wheat imports accounted for Russia and Ukraine.
2) April 2022 basis.
Sources: Bloomberg, OECD.

Maturity schedule[1] of Russian foreign currency[2] bonds this year



Notes: 1) Apr 2022 basis.
2) U.S. dollar denominated bond standard.
Source: Bloomberg.

Assessment

The compounding of global risk factors, including the pick-up in the pace of monetary tightening by the U.S. Federal Reserve, the deceleration of the Chinese economy, and a prolonged war in Ukraine, is causing financial conditions to deteriorate and increasing concerns about slowing growth in emerging market economies. The rapid rise in U.S. interest rates has triggered capital outflows from countries with weak levels of external soundness and magnified the redemption burden on their foreign currency-denominated

11) A representative example is Egypt, which relied on imports from Ukraine for nearly 74% of its wheat consumption as of 2019. Amid the prolonged pandemic, Egypt saw its tourism revenue plummet. On March 24, 2022, its government official requested support from the IMF, as its economic woes were worsened by the recent inflation spiral.
12) Between April and December 2022, close to USD 13.1 billion worth of U.S. dollar-denominated bonds are set to mature.

bonds. The economic slowdown in China and the war in Ukraine are likely to have a substantial negative impact on the real sectors of countries with significant trade reliance on these countries as well as their regional neighbors located in close proximity to them.

As the Korean economy is strongly correlated with the Chinese economy and is heavily influenced by rising prices of raw materials and grains, it is important to closely monitor future developments in global risk factors and carefully analyze economic and financial conditions in emerging market economies. Given the current high level of risk sensitivity in the market, attention must be paid to the possibility of an increase in global risks causing a sharp rise in volatility in emerging markets, as this could also have an adverse impact on investors' sentiment about Korea.

Resilience of Financial System

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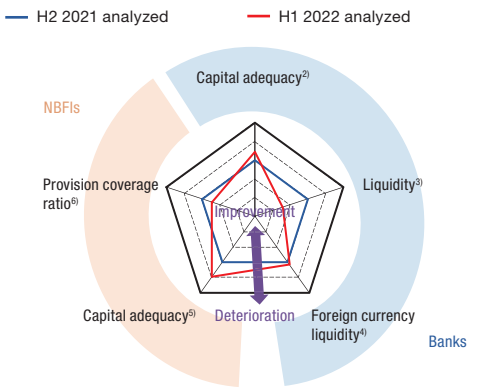
I. Financial Institutions

Commercial banks' resilience has remained strong. The capital adequacy ratio, measuring banks' loss-absorbing capacity, was way above the minimum regulatory standard, while their liquidity ratio, gauging their ability to withstand capital outflows, showed a small improvement.

The resilience of non-bank financial institutions (NBFIs) weakened slightly, although it remained mostly solid, with the capital adequacy ratio remaining above the minimum regulatory standard.

Financial institutions must continue efforts to strengthen their loss-absorbing capacity in anticipation of a potential rise in credit risk centered particularly in more vulnerable sectors due to the expiration of pandemic-related financial relief measures, hikes of the U.S. Federal Reserve policy rate, and the ongoing conflict in Ukraine (Figure I-1).

Figure I-1. Map of changes in financial institution resilience[1)]



Notes: 1) Extent of change as of end-Q1 2022 (end-April 2022 for banks' liquidity and foreign currency liquidity) compared to end-Q3 2021 indexed.
2) Total capital ratio under Basel Ⅲ.
3) Liquidity coverage ratio (LCR).
4) Foreign currency LCR.
5) Weighted average of NBFI sectors' capital adequacy ratios by their total assets.
6) Excluding securities companies.
Sources: Bank of Korea, Financial institutions' business reports.

1. Banks

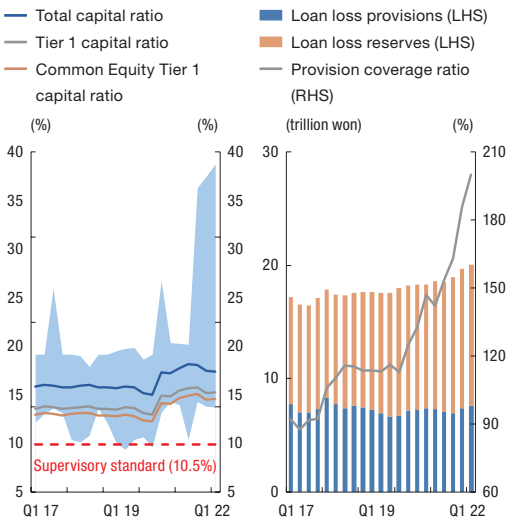
Satisfactory loss-absorbing capacity

At the end of the first quarter of 2022, commercial banks' capital adequacy ratio (BIS total capital ratio) was 17.35%, having dropped 0.06%p from the end of last year (17.41%) because of the increase in risk-weighted assets resulting from growth in loans, and the deduction from the capital base of the non-qualifying portion of capital instruments.[1)] However, the Common Equity Tier-1 capital ratio was 14.78%, having risen by 0.11%p from the end of the prior year. The capital adequacy ratio was significantly above the minimum

1) Of the capital instruments issued under the Basel II framework, 10% of those that no longer qualify as capital securities under the Basel III framework have been annually deducted from the additional Tier 1 capital and Tier 2 capital, starting in 2013 (Detailed Enforcement Regulations for Supervision of Banking Institutions).

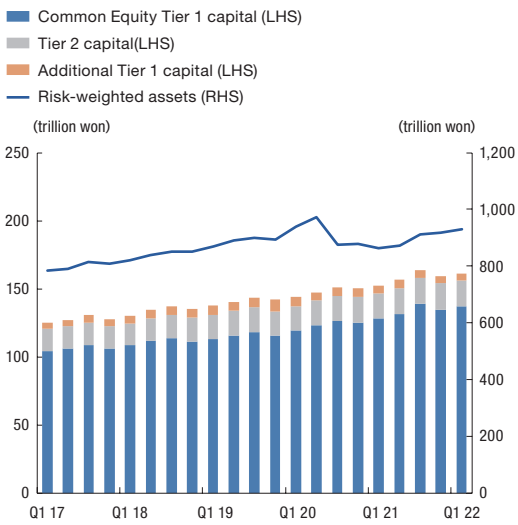
regulatory requirements(10.5%, 11.5%, for D-SIB[2] 9.875% for internet-only banks) for all banks. The provision coverage ratio, measuring banks' capacity to absorb expected losses, was 199.7% at the end of the first quarter of 2022,having risen by 14.29%p from the end of 2021 (185.5%). This increase is mainly explained by the continuous decline in nonperforming loans (NPLs) due to the extension of loan forbearance and other pandemic-related financial relief measures (Figure I-2, Figure I-3).

Figure Ⅰ-2. Commercial bank Basel Ⅲ-basis capital ratios[1)2)3)4)] and provision coverage ratio[1)2)]



Notes: 1) End-period basis.
2) Provision coverage ratio = Loan loss provisions / Substandard-or-below loans. Loan loss reserves were included in loan loss provisions until Q3 2016, and loan loss reserves have been included in common equity Tier 1 capital since then.
3) Supervisory standards: Common Equity Tier 1 capital ratio 7%, Tier 1 capital ratio 8.5%, and total capital ratio 10.5% (8%, 9.5% and 11.5% for D-SIBs, respectively).
4) Shaded area indicates distribution of individual banks' total capital ratios and and deep shaded area indicates distribution with Internet-only banks excluded.
Sources: Commercial banks' business reports.

Figure Ⅰ-3. Commercial bank capital ratio decomposition[1)]

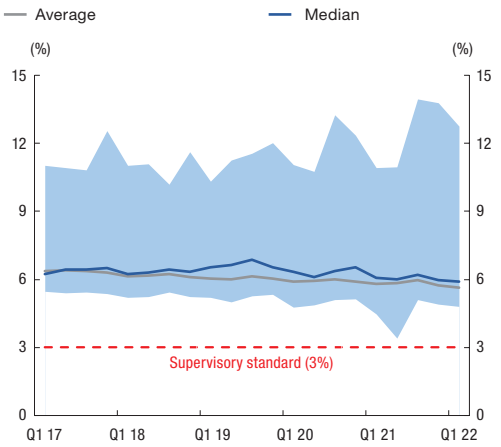


Notes: 1) End-period basis.
Sources: Commercial banks' business reports.

Commercial banks' leverage ratio[3] was 5.63% at the end of the first quarter of 2022, having dropped by 0.11%p from the end of last year (5.75%) as an increase in loans led to arise in their total exposures. Nevertheless, the leverage ratio has remained above the minimum supervisory standard (3%) for all banks (Figure I-4).

2) Domestic systemically important banks (D-SIB) and bank holding companies include Shinhan Bank (Shinhan Financial Group), Hana Bank (Hana Financial Group), KB Kookmin Bank (KB Financial Group), Nonghyup Bank (NH Financial Group), and Woori Bank (Woori Financial Group).

Figure Ⅰ-4. Commercial bank leverage ratios[1)2)]



Notes: 1) Tier 1 capital (Common Equity Tier 1 capital + Additional Tier 1 capital) / Total exposure; end-period basis.
2) Shaded area indicates distribution of individual banks' leverage ratios.

Sources: Commercial banks' business reports.

Generally satisfactory liquidity response capacity

At the end of April 2022, the liquidity coverage ratio (LCR)[4)] was 104.6%, having risen 6.7%p from the end of the previous year (97.9%). This increase is mainly due to the recognition of the unused portion of collateral securities being accepted for the performance of different settlement, as high-quality liquid assets for the calculation of the LCR.[5)] The LCR was above the minimum supervisory standard (100%, temporarily lowered to 85% for Apr. 2022-Jun. 2022) for all banks. The LCR of some banks has fallen below the regular minimum standard (100%), suggesting that the compliance burden will likely grow for these institutions when the standard is restored to the prior level. However, the minimum regulatory standard is scheduled to increase gradually,[6)] which could lessen banks' compliance burden (Figure Ⅰ-5).

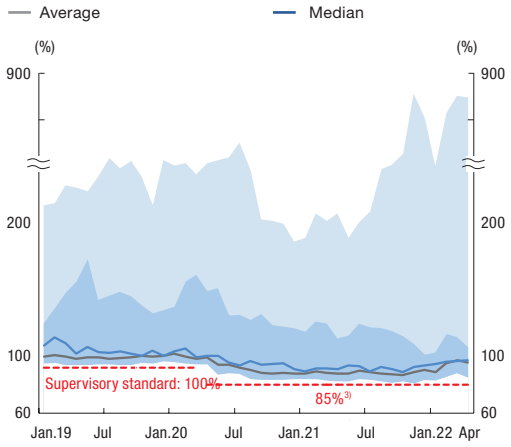
3) The leverage ratio in the article means the simple Tier 1 capital ratio under the Regulation on Supervision of Banking Business. This ratio was introduced to limit excessive leverage in the banking sector to prevent abrupt deleveraging in times of crisis and the resulting amplification of shocks to the financial system. Calculated based on total exposures, the leverage ratio plays a supplementary role to minimum capital adequacy requirements. In Korea, it was selected as a supplementary indicator from the first quarter of 2015 and then officially adopted as a regulatory measure in 2018. The leverage ratio also started to be applied to internet-only banks in January 2020.

4) The leverage coverage ratio (LCR) is measured as high-quality liquid assets relative to total expected net cash outflows over the next 30 calendar days.

5) To alleviate the regulatory compliance burden for banks and expand the supply of money to the real sector, starting in February 2022, when calculating the LCR, banks are allowed to include the unused portion of collateral securities-pledged with BOK for the performance of difference settlement in high-quality liquid assets.

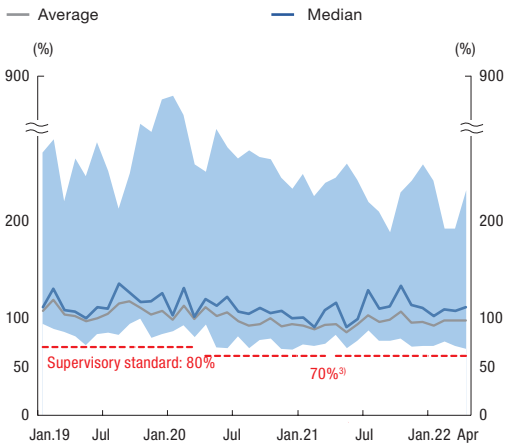
6) To prevent a shock to the banking sector and the bond market from a sudden restoration of the minimum regulatory LCR to the previous level (85% → 100%), the financial authority adopted for a gradual quarterly increase (90% for Jul.-Sep. 2022, 92.5% for Oct-Dec., 2022, 95% for Jan.-Mar., 2023, 97.5% for Apr.-Jun., 2023, and 100% for Jul. 2023), starting at the end of the three-month phase-in period (85%, ~Jun. 2022).

Figure Ⅰ-5. Commercial bank LCRs[1)2)]



Notes: 1) High-quality liquid assets/Total net cash outflows over next 30 calendar days; monthly average balance basis.
2) Shaded area indicates distribution of individual banks' LCRs, and deep shaded area indicates distribution with Internet-only banks excluded.
3) Temporary adjustment in place from April 2020 through June 2022.
Sources: Commercial banks' business reports.

Figure Ⅰ-6. Commercial bank foreign currency LCRs[1)2)]



Notes: 1) High-quality liquid foreign currency assets/Total net cash outflows in foreign currency over next 30 calendar days; monthly average balance basis.
2) Shaded area indicates distribution of individual banks' foreign currency LCRs.
3) Temporary adjustment in place from April 2020 through June 2022.
Sources: Commercial banks' business reports.

Banks' foreign currency LCR[7)] was 111.8% at the end of April 2022, increasing 1.6%p from the end of 2021 (110.2%). The foreign currency LCR was in excess of the minimum supervisory standard (80%, temporarily lowered to 70% for Apr. 2020-Jun. 2022) for all banks (Figure I-6).

The net stable funding ratio (NSFR),[8)] measuring the long-term stability of banks' funding profiles, stood at 110.2% at the end of the first quarter of 2022, with all banks satisfying the minimum regulatory standard (100%)(Table I-1).

7) Although the foreign currency LCR is not a part of the Basel III requirements, it became an official requirement in Korea, effective as of January 2017, to ensure the steady supply of foreign currencies to the real sector even under a stress situation. The foreign currency LCR is a requirement for most domestic banks with the exception of Korea Eximbank, internet-only banks and some region-based banks with only small amounts of foreign currency liabilities (Kwangju and Jeju Banks). The regulatory minimum was raised incrementally starting in 2017 until 2019 when the fully phased-in level (80% for commercial banks) became effective. Meanwhile, in order to allow banks to make sufficient use of their high-quality liquid assets to mitigate the economic fallout of COVID-19, the supervisory authorities temporarily lowered the minimum foreign currency LCR standard by 10%p.

8) The NSFR limits banks' overreliance on short-term wholesale funding by requiring them to fund some of their long-term assets under management with stable debt and capital. The NSFR was introduced for domestic banks in January 2018 (2020 for internet-only banks).

Table Ⅰ-1. Commercial bank net stable funding ratios (NSFRs)[1)2)]

(%)

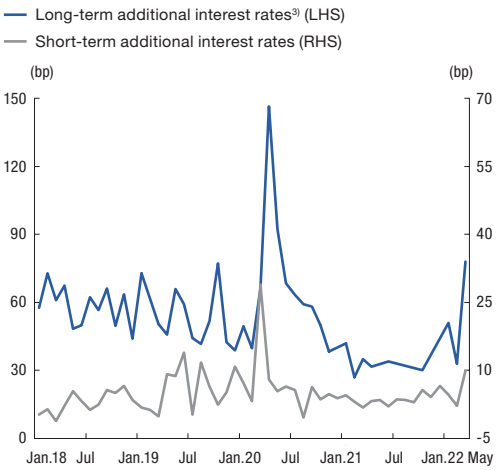
	2020				2021				2022
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Average	111.7	111.6	111.1	112.2	111.2	111.7	110.1	111.9	110.2
Median	111.9	110.1	109.4	110.3	108.2	109.6	106.9	108.2	106.9

Notes: 1) Available stable funding / Required stable funding; end-period basis.
2) Supervisory standard is 100%.
Source: Commercial banks' business reports.

Slight deterioration of overseas foreign currency funding conditions

Conditions for banks' overseas foreign currency funding have taken a slightly unfavorable turn. In March 2022, long-term foreign currency borrowing spreads widened significantly on the declining investment demand for intermediate and long-term bonds amid the war in Ukraine. Short-term foreign currency borrowing spreads appeared generally stable despite a minor increase (Figure I-7).

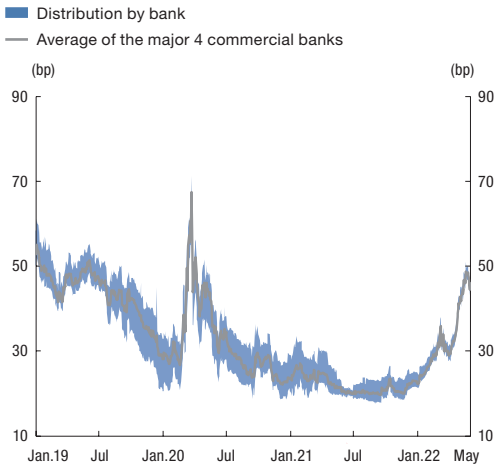
Figure Ⅰ-7. Foreign currency borrowing short and long term additional interest rates[1)2)]



Notes: 1) Additional interest rates based on LIBOR.
2) Borrowing between domestic financial institutions and borrowing from headquarters, O/N is excluded from the aggregation target.
3) Among the long-term additional interest rates, the absence of the borrowing performance in Feb 2019, Dec 20, May 21, Jul~Sep and Nov~Dec.
Source: Bank of Korea.

Commercial banks' CDS premia also increased substantially, similarly to long-term foreign currency borrowing spreads (Figure I-8).

Figure Ⅰ-8. Commercial bank[1)] CDS premium[2)]



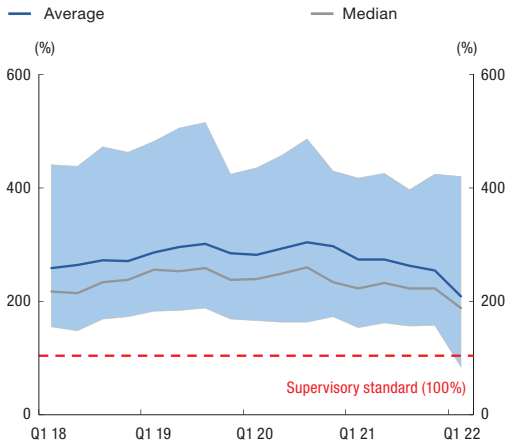
Notes: 1) Kookmin, Shinhan, Woori and KEB basis.
2) 5-maturity basis.
Source: Markit.

2. Non-Bank Financial Institutions

Varying levels of resilience according to the type of institution

At the end of the first quarter of 2022, life insurance companies' risk-based capital (RBC) ratio,[9] measuring their loss-absorbing capacity, fell by 45.6%p from the end of last year (254.4%) to 208.8%, as the rise in market interest rates resulted in large losses on valuation of marketable securities.[10] The RBC ratio of some insurance companies sank below the minimum regulatory standard of 100% during this period (Figure I-9).

Figure Ⅰ-9. Life insurance company risk-based capital (RBC) ratio[1]

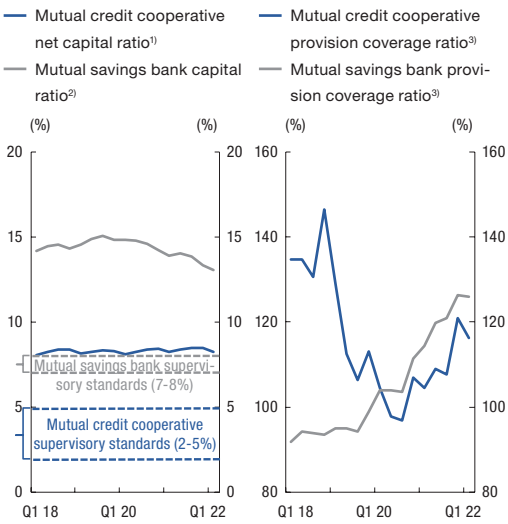


Note: 1) Amount of available capital / Amount of required capital; shaded area indicates highest and lowest value of RBC ratios among companies with assets of 1 trillion won or more.
Sources: Financial institutions' business reports.

At the end of the first quarter of 2022, the net capital ratio of mutual credit cooperatives stood at 8.2%, little changed from the end of the prior year. Their provision coverage ratio continued the steep upward trend begun in the fourth quarter of 2020 to reach 116.2% at the end of the first quarter of 2022.

The BIS capital ratio of mutual savings banks fell 0.2%p from the end of previous year to 13.1% at the end of the first quarter of 2022, on an increase in loans. The provision coverage ratio, which recently embarked on an upward trend, hit 126.0% at the end of the first quarter of 2022 (Figure I-10).

Figure Ⅰ-10. Mutual credit cooperative and mutual savings bank resilience indicators



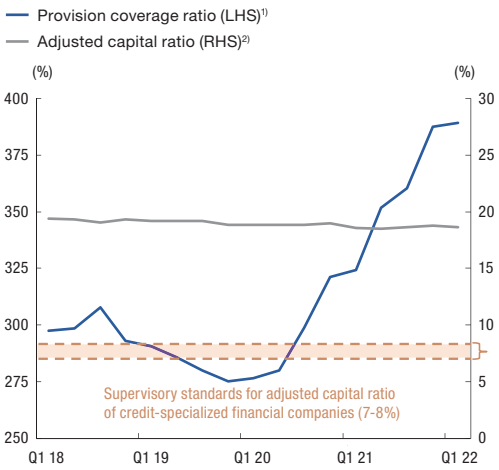
Notes: 1) Supervisory standard 2% (4% for MG community credit cooperatives, 5% for Nonghyup).
2) Capital / Risk-weighted assets; supervisory standard 7% (8% for institutions with assets of 1 trillion won or more).
3) Loan loss provisions / Substandard-or-below loans.
Sources: Financial institutions' business reports.

9) The RBC ratio is the amount of available capital (actual reserves for liabilities) divided by the amount of required capital (required reserves for liabilities). Required capital is calculated by measuring amounts at risk for insurance risk, interest rate risk, credit risk, market risk, and operational risk.

10) With the introduction of the new insurance capital standard (K-ICS), scheduled for 2023, insurance companies' liabilities will also be recorded on a mark-to-market basis. As liabilities tend to decline with rising interest rates under this new accounting method, this is expected to reduce the sensitivity of insurance companies' capital ratio to interest rates.

At the end of the first quarter of 2022, the adjusted capital ratio of credit-specialized financial companies stood at 18.6%, continuing the stable trend from prior periods. Their provision coverage ratio jumped to 389.1% during this period, lifted by an increase in loss provisions and a drop in substandard-and-below loans (Figure I-11).

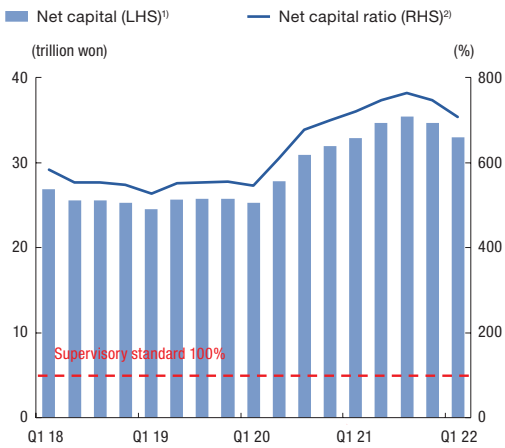
Figure I-11. Credit-specialized financial company resilience indicators



Notes: 1) Loan loss provisions / Substandard-or-below loans.
2) Adjusted capital / Adjusted total assets; supervisory standard 7% (credit card companies 8%).
Sources: Financial institutions' business reports.

At the end of the first quarter of 2022, the net capital ratio of securities companies fell to 707.9%. Securities companies' net capital ratio has been on a downward trajectory since the first quarter of 2021 as falling prices of bonds and stocks magnified losses on valuation of marketable securities (Figure I-12).

Figure I-12. Securities company resilience indicators



Notes: 1) Net operating capital minus total risk.
2) (Net operating capital - total risk) / Required maintenance equity.
Sources: Financial institutions' business reports.

Although most NBFIs' capital ratios remain largely in excess of the minimum regulatory standard, suggesting a good level of resilience, insurance companies and securities companies are two exceptions that buck this trend. The current downswing in the capital ratio of insurance and securities companies could worsen should bond and stock prices decline further, as this will increase losses on valuation for these institutions with large holdings of mark-to-market securities. Attention must also be paid to mutual savings banks and credit-specialized financial companies with high shares of loans to vulnerable borrowers and real estate-related companies. Such a loan portfolio could expose them to credit risk and adversely affect their capital adequacy if rising interest rates and economic slowdown cause financial conditions to deteriorate.[11)]

11) For details, refer to Issue 1, "Impact of the Accelerated Monetary Policy Normalization of the US Federal Reserve on the Soundness of NBFIs."

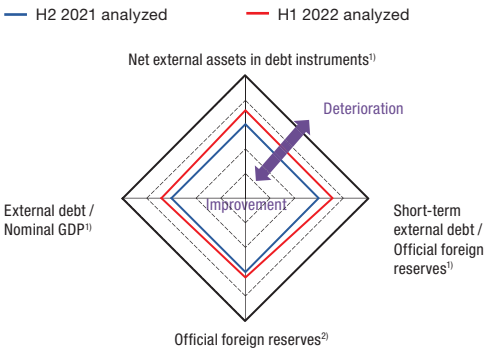
Ⅱ. External Payment Capacity

Korea's external payment capacity has weakened somewhat from last year, although it remains robust.

Net external assets decreased from the end of the previous year, while the share of short-term debt in net external debt increased slightly.

At the end of May 2022, the official foreign reserves stood at USD 447.71 billion, representing a decrease of USD 15.41 billion from the end of 2021. The ratio of short-term external debt relative to official foreign reserves increased from the end of the prior year (35.6%) to 38.2% at the end of the first quarter of 2022 (Figure Ⅱ-1).

Figure Ⅱ-1. Map of changes in external payment capacity indicators

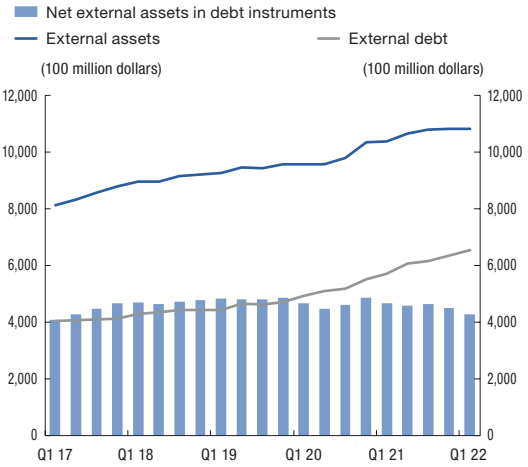


Notes: 1) Extent of change as of end-Q1 2022 compared to end-Q3 2021 indexed.
2) Extent of change as of end-May 2022 compared to end-November 2021 indexed.
Source: Bank of Korea.

Drop in net external assets

At the end of the first quarter of 2022, Korea's net external assets (external assets - external debt) dropped by USD 22.2 billion from the end of the previous year to USD 425.75 billion (Figure Ⅱ-2).

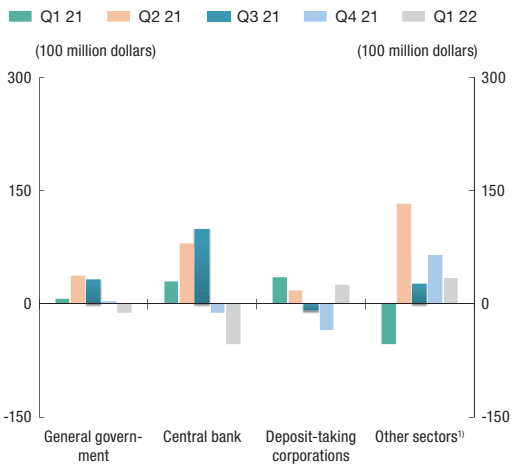
Figure Ⅱ-2. Net external assets in debt instruments1)



Note: 1) End-quarter balance basis.
Source: Bank of Korea.

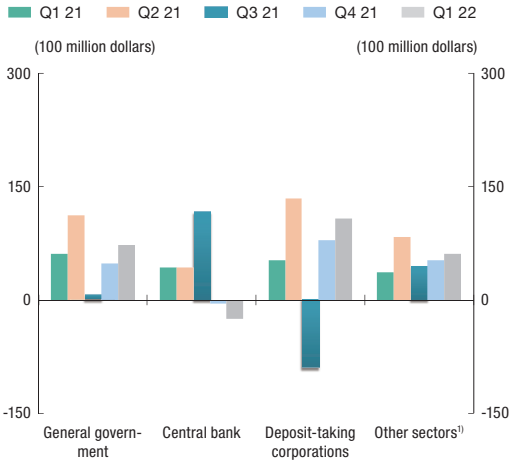
External assets fell by USD 500 million to USD 1,079.8 billion at the end of the first quarter of 2022. By sector, while the central bank's external assets decreased by USD 5.3 billion as a result of a decline in its foreign reserves, other sectors' assets increased by USD 3.5 billion on private institutions' investment in debt instruments. The assets of deposit-taking corporations rose by USD 2.5 billion and those of general government dropped by USD 1.2 billion(Figure Ⅱ-3).

Figure Ⅱ-3. Changes in external assets in debt instruments, by sector



Note: 1) Including other financial corporations (securities companies, asset management companies, insurance companies, etc.) and non-financial corporations.
Source: Bank of Korea.

Figure Ⅱ-4. Changes in external debt, by sector



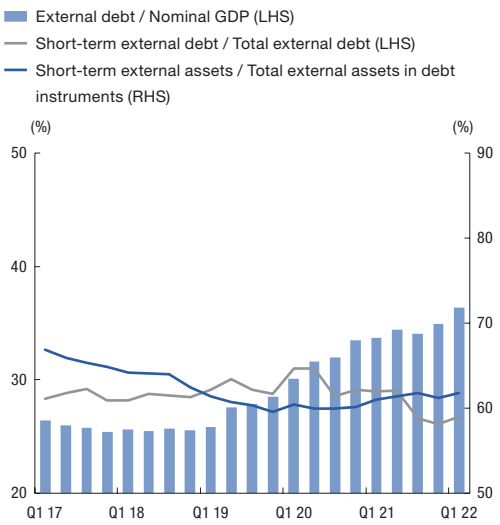
Note: 1) Including other financial corporations (securities companies, asset management companies, insurance companies, etc.) and non-financial corporations.
Source: Bank of Korea.

At the end of the first quarter of 2022, external debt increased by USD 21.7 billion from the end of 2021 to USD 654.1 billion. By sector, deposit-taking corporations added USD 10.7 billion worth of debt by issuing foreign currency-denominated securities. The general government sector saw its external debt rise by USD 7.2 billion due to the investment in won-denominated securities by nonresidents, while the central bank's debt decreased by USD 2.4 billion. Other sectors' debt climbed by USD 6.1 billion due mainly to the issuance of foreign currency-denominated securities (Figure Ⅱ-4).

At the end of the first quarter of 2022, the ratio of external debt to nominal GDP edged higher from the end of the previous year (34.9%) to 36.4%.

The share of short-term debt in total external debt also recorded a minor increase from the end of 2021 (26.0%)to 26.7%. The share of short-term assets in external assets showed a slight uptick from the end of the prior year (61.1%) to 61.7% (Figure Ⅱ-5).

Figure Ⅱ-5. Proportions[1] of short-term external debt and assets in debt instruments

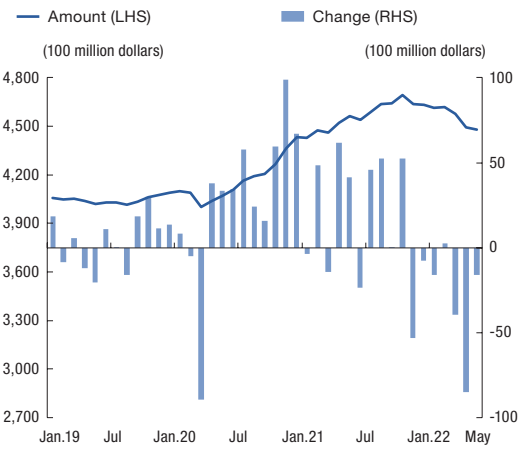


Note: 1) End-quarter basis.
Source: Bank of Korea.

Continuous downward trend in official foreign reserves since October 2021

At the end of May 2022, the official foreign reserves stood at USD 447.71 billion, representing a decrease of USD 15.41 billion from the end of 2021(USD 463.12 billion). This decline was mainly caused by the stronger U.S. dollar, which reduced the conversion value of assets denominated in other foreign currencies, and market stabilization efforts to contain volatility in the foreign exchange market (Figure Ⅱ-6).

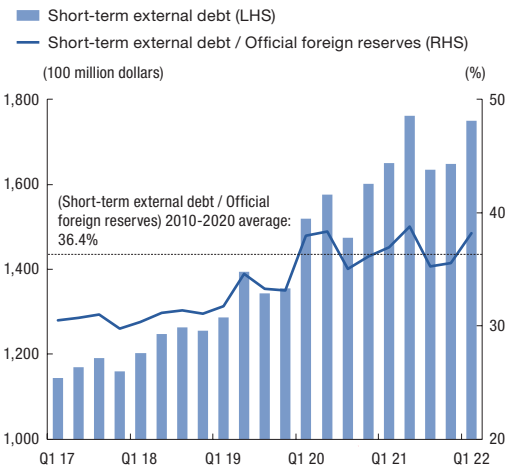
Figure Ⅱ-6. Balance of and changes in official foreign reserves[1]



Note: 1) Amounts at the month-ends, changes during the months.
Source: Bank of Korea.

Meanwhile, the ratio of short-term external debt relative to official foreign reserves edged up slightly from the end of the prior year (35.6%) to 38.2% at the end of the first quarter of 2022 (Figure Ⅱ-7).

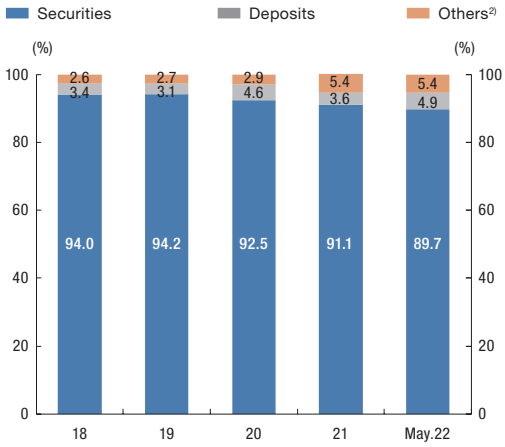
Figure Ⅱ-7. Short-term external debt-to-official foreign reserves ratio[1]



Note: 1) End-quarter basis.
Source: Bank of Korea.

As of the end of May 2022, securities (89.7%) and deposits (4.9%) accounted for the majority of the official foreign reserves. Securities making up the foreign reserves portfolio are mostly safe and liquid assets, such as government bonds and government agency bonds (Figure Ⅱ-8).

Figure Ⅱ-8. Composition[1] of official foreign reserves



Notes: 1) End-period basis.
2) Gold, SDRs, etc.
Source: Bank of Korea.

Ⅲ. Financial Market Infrastructures

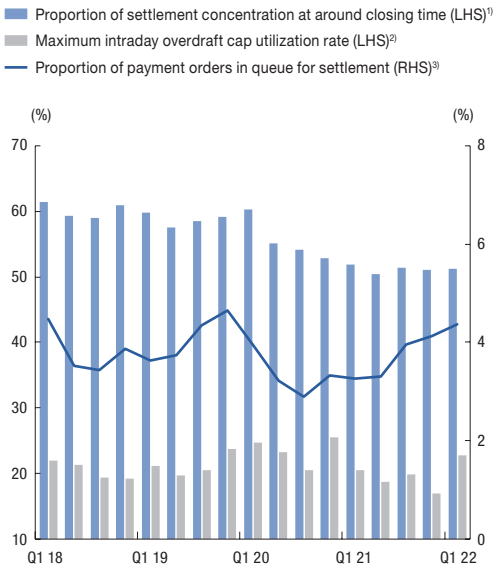
The value of settlement in BOK-Wire+ and other major payment and settlement systems increased steadily, driven by securities settlements by financial institutions and electronic funds transfers by individuals and companies. Settlement risk was managed appropriately, remaining at a stable level.

BOK-Wire+

In the first quarter of 2022, the daily average value of settlement in BOK-Wire+, providing final settlement of obligations between financial institutions, reached 524.4 trillion won, continuing on the upward trend from the prior year (488.5 trillion won). Settlement risk was managed at a stable level.

The maximum intraday overdraft cap utilization rate and proportion of payment orders in queue for settlement, which are two indicators of the level of liquidity among BOK-Wire+ participants, remained generally stable at 22.8% and 4.4%, respectively. Of the total settlement value, the portion that was settled near the closing time (16:00-17:30) decreased from the same period of 2021 (51.9%) to 51.2% (Figure Ⅲ-1).

Figure Ⅲ-1. Risk indicators related to BOK-Wire+

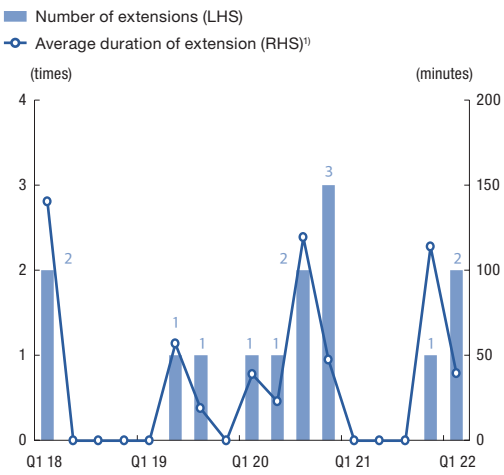


Notes: 1) Amount of settlement processed after 16:00 / Total settlement amount during the period.
2) Average of daily maximum amounts of participating institutions' intraday net overdraft / intraday overdraft cap.
3) Total payment orders in queue for settlement / Total settlement amount during the period(excluding multilateral settlements for liquidity savings).

Source: Bank of Korea.

In the first quarter of 2022, the closing time of BOK-Wire+ was extended twice, once for the settlement of purchases from a repo auction by BOK and once due to a system issue at a participating institution (Figure Ⅲ-2).

Figure Ⅲ-2. Extension of BOK-Wire+ operating hours



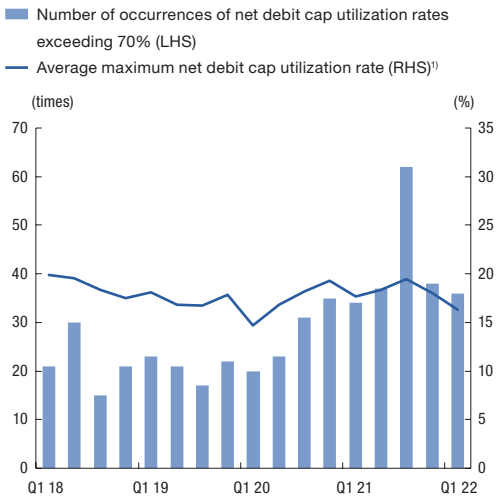
Note: 1) Total duration of extension / Number of extensions during the quarter.
Source: Bank of Korea.

Retail payment systems

In the first quarter of 2022, the daily average value of settlement in the retail payment systems, operated by the Korea Financial Telecommunications and Clearings Institute, was lifted by the increase in electronic funds transfers by individuals and companies[1] to 101.5 trillion won, sharply higher than in 2021 (94.3 trillion won). In spite of this increase, settlement risk in the retail payment systems was managed smoothly overall.

Among retail payment system-related risk indicators, the net debit cap[2] utilization rate of net settlement participants surged past the cautionary level (70%) 36 times during the first quarter, twice more than during the same period of the prior year (34 times). During this period, the average net debit cap utilization rate fell slightly from the same period of 2021 (17.7%) to 16.3%, suggesting an overall satisfactory level of risk management (Figure Ⅲ-3).

Figure Ⅲ-3. Net debit cap utilization rate



Note: 1) Average of daily maximum net debit cap utilization rates of participants during the period.
Source: Bank of Korea.

Securities settlement systems

Settlement risk was kept at a stable level in the securities settlement systems operated by the Korea Exchange and Korea Securities Depository amid a continuous increase in the value of settlement. In the first quarter of 2022, the daily average value of settlement continued

1) For a detailed discussion on this topic, refer to Box 5, "Trends and Risks in the Provision of Payment Services by Non-financial Institutions."
2) In the retail payment systems, including the CD Network System, Interbank Remittance System, and Electronic Banking System, a transaction payee is paid immediately, but the credits and debits between financial institutions arising from this payment are settled on the following business day at a designated time (11:00) through BOK Wire+. As this results in the provision of credit between financial institutions, Bank of Korea requires participants to independently establish ceilings (net debit caps) on their own unsettled net debit positions.

the upswing from the prior year (221.7 trillion won) to reach 226.8 trillion won, driven by inter-institutional repo transactions and transactions in stocks and bonds.

In the first quarter of 2022, settlements on transactions in exchange-traded stocks and exchange-traded government bonds, as well as OTC stock transactions by institutional investors, were completed by their respective deadlines (16:00, 17:00, and 16:50, respectively) (Table Ⅲ-1).

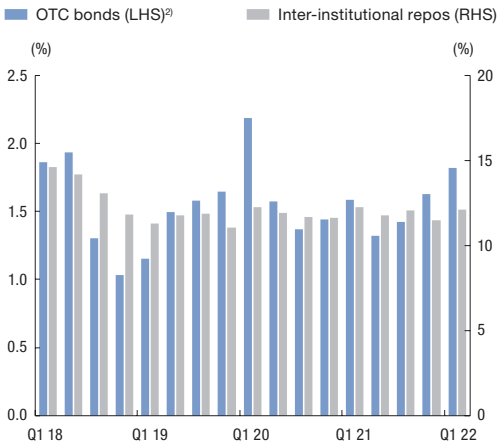
Table Ⅲ-1. Proportions[1] of securities settlement completed after the deadline

	Penalty deadline[2]	Proportions (%)				
		2021				2022
		Q1	Q2	Q3	Q4	Q1
Exchange-traded stocks	16:00	-	-	-	-	-
Exchange-traded government bonds	17:00	-	0.014	-	-	-
Institutional investors for OTC stocks	16:50	0.0001	-	-	-	-

Notes: 1) Amount of settlement processed after deadlines / Total settlement amount during the period.
2) Deadlines after which settlement delay penalties are imposed.
Source: Bank of Korea.

Of the OTC bond transactions and inter-institutional repo transactions, the proportions settled on a free-of-payment (FoP) basis, rather than through the delivery-versus-payment (DvP) system, remained at the stable levels of 1.8% and 6.0%, respectively, during the first quarter of 2022 (Figure Ⅲ-4).

Figure Ⅲ-4. Shares[1] of FOP settlement



Notes: 1) Proportion in total settlement amount (of OTC bonds and inter-institutional repos) of settlements not processed through DvP (delivery-versus-payment) system.
2) OTC bonds include bonds, CDs, and electronic short-term bonds (based on final settlement after deduction of linked settlements).
Source: Korea Securities Depository.

Foreign exchange settlement systems[3]

In the first quarter of 2022, the daily average value of settlement in the foreign exchange payment-versus-payment (PvP) settlement system operated by CLS Bank (CLS system)[4] increased from the previous year (USD 65.85 billion) to USD 72.53 billion.

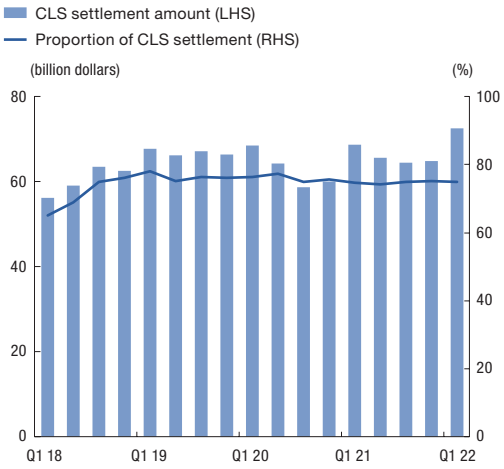
PvP settlement via the CLS system accounted

3) Foreign exchange settlements are conducted through the interbank correspondent network, the PvP system operated by CLS Bank, and domestic foreign currency funds transfer systems. In this report, we focus on foreign exchange PvP settlements routed through the CLS System in which the settlement amounts can be accurately determined.

4) To address time differences between countries, which are a fundamental cause of foreign exchange settlement risk, CLS (Continuous Linked Settlement) Bank settles most transactions during a designated settlement period (07:00-12:00 CET). In continuous linked settlement, actual funds transfers (payments) are linked and processed within this settlement period, between the accounts of settlement member banks and CLS Bank held with the central banks issuing the currencies concerned. At present, the CLS PvP system is connected to large-value payment systems (including BOK-Wire+) run by central banks issuing the 18 CLS settlement currencies.

for a continuously high share of 75.0% in total foreign exchange transactions, and related settlement risk appears to have remained stable (Figure Ⅲ-5).

Figure Ⅲ-5. Settlement amount[1] and proportion[2] made through the CLS system



Notes: 1) Daily average amount of transactions made by domestic banks and foreign bank branches during the quarter.
2) Proportion in total CLS eligible FX transactions (of domestic banks and foreign bank branches) of those settled through the CLS system.

Source: Bank of Korea.

Box 5.

Trends and Risks in the Provision of Payment Services by Non-financial Institutions

The volume and value of easy payment and transfer services,[1] provided by big techs and other non-financial institutions,[2] have rapidly risen in recent years, driven by prepaid deposits. We have examined the recent growth of payment services by non-financial institutions and associated risks.

Trends in the Provision of Payment Services by Non-financial Institutions

Entities that are neither banks nor card companies are currently providing payment services to consumers, as authorized by the Electronic Financial Transaction Act.[3] Of these entities, those issuing and managing prepaid electronic payment instruments (hereafter "prepaid service providers") and payment gateway providers provide "easy payment" and "easy transfer" services using simplified authentication methods.[4] The value of payments processed via easy payment services provided by non-financial institutions has risen sharply since December 2019, following the removal of restrictions on big techs' access to the Open Banking System[5] and the spread of COVID-19 pandemic, to reach a daily average of 341.25 billion won during the fourth quarter of 2021. Funds transferred via easytransfer services also steadily increased to a daily average value of 513.01 billion won in the fourth quarter of 2021.

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1) Easypayment (KakaoPay, Naver Pay, etc.) is a service where a customer is able to pay for goods or services after a simple authorization (password, biometric data such as fingerprints) of the payment means, the information of which the customer has registered beforehand at payment service providers. Easytransfer (Toss, etc.) is a service that allows a customer to transfer funds from the customer's prepaid deposit account after a simple authorization to the beneficiary's prepaid deposit account along with a notification to the beneficiary.

2) Electronic financial service providers pursuant to the Electronic Financial Transaction Act.

3) Under the Electronic Financial Transaction Act, electronic financial services are classified into the issuance of electronic currencies, electronic funds transfer services, the issuance and management of prepaid payment instruments, the issuance and management of electronic debit payment instruments, payment gateway services, escrow services, and electronic bill presentment and payment services.

4) With the repeal of the requirement to use public key certificates (Mar. 2015) following the amendment of the Detailed Regulations of Supervision of Electronic Finance, users of electronic financial services are required to verify their identity (ARS, bank account verification, public key certificate, etc.) only once when the account is created, after which they can log into their accounts using simple verification methods (simple passwords, fingerprints, etc.).

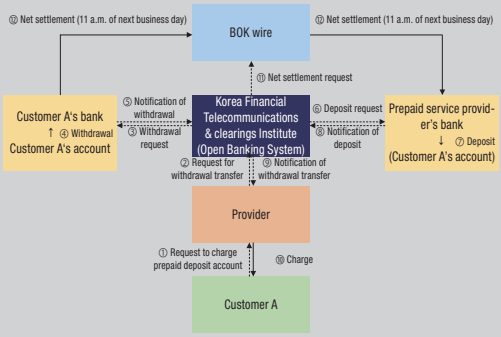
5) Open banking is a system which, given the customer's explicit consent, enables fintech firms and other entities to use open APIs(an open API is a publicly available application programming interface that facilitates third parties' access to information such as data and programs stored in separate locations) to access customer information owned by banks, based on which they provide payment services and integrated financial information services. In Korea open banking was introduced in August 2016 as a payment and settlement system available for use by fintech firms. The system, established by the Korea Financial Telecommunications & Clearings Institute(KFTC), acts as a hub at which information sharing among banks and fintech firms is coordinated and as a point of system access, while also processing funds transfer requests from fintech firms.

Value[1] of payments via easy payment services provided by electronic financial institutions

Note: 1) Daily average basis.
Source: Bank of Korea.

Fund deposits into a prepaid deposit account and customer refunds that entail easy payment and easy transfer services are processed through the Open Banking System. The volume and value of payments processed through the Opening Banking System has increased rapidly since the removal of restrictions on big techs' access to the system in December 2019, to a daily average of 4.69 million transactions and 1.1 trillion won, respectively, in December 2021.As a result, the Open Banking System has become the second largest of the 12 retail payment systems operated by the KFTC (Korea Financial Telecommunications and Clearings Institute) in terms of volume after the Electronic Banking System, and the fourth largest after the Electronic Banking System, the Check Clearing System, and the Interbank Funds Transfer System in terms of value.

Process of charging prepaid deposit accounts



Source: Bank of Korea.

Growth of Prepaid Payment Services and Drivers

Prepaid deposits play an important role in easypayment and transfer services. By payment instrument,[6] while the share of credit and check cards in easy services has recently declined, that of prepaid deposits have been on a steady rise. The share of credit and check cards fell from 79.9% in the first quarter of 2018 to 65.0% in the fourth quarter of 2021, whereas that of prepaid deposits rose from 11.6% to 29.1% during the same period. As for easy transfer services provided by electronic financial service providers, all transfers are made with prepaid deposits.

6) Accepted payment instruments for easy payment services include credit and check cards, prepaid deposits, and account transfers.

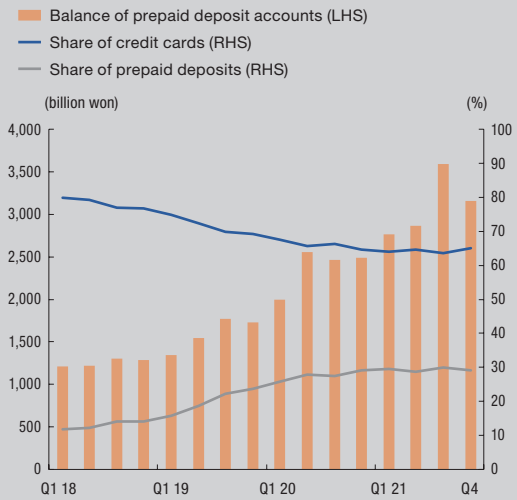
Use of payment instrument in easy payment

Payment instrument	Use in easy payment
Credit·debit cards	■ Credit·debit card information is saved in advance and the payment is made through simple authentication.
Prepaid deposits	■ Payment is made with funds in the prepaid deposit account ■ Even though charged funds are insufficient, payment can be made as additional funds can be charged immediately from the connected account.
Account transfers	■ Bank account information is saved in advance and money is withdrawn through simple authentication.

Source: Bank of Korea.

The increasing use of easy payment and transfer services by electronic financial service providers has also led to a continuous rise in the balance of prepaid deposits, from 1.7 trillion won at the end of 2019 to 2.5 trillion won at the end of 2020 and 3.2 trillion won at the end of 2021.

Balance of prepaid deposit accounts and share[1] of credit cards and prepaid deposit accounts in easy payments



Note: 1) Daily average basis.
Source: Bank of Korea.

The growing use of prepaid payment services is mainly explained by the advantages they offer to service providers and users. The use of prepaid services often results in a positive prepaid deposit account balance, creating a lock-in effect. A customer who has a positive prepaid deposit account balance at a prepaid payment service provider would find it more convenient to continue using the provider's services rather than switching to another service provider. Prepaid services are also more profitable for service providers. Unlike with payments using credit or check cards, in which a certain percentage of transaction value is paid to card companies as affiliate member fees, electronic financial service providers do not have to share the fee revenues from prepaid services with other providers. Additionally, bonus points offered occasionally by prepaid service providers when a customer deposits funds into prepaid deposit accounts is an advantage prepaid services have over other payment options.

Meanwhile, the easing of restrictions on prepaid service providers has also contributed to the increased use of easy transfer services based on prepaid deposits. There are two main ways in which electronic financial service providers transfer funds to the recipient: one is the direct transfer of prepaid deposits from the sender's prepaid account to the recipient's prepaid account; the other is the "refund" method in which funds are transferred to the recipient's bank account. In the latter method, the funds are automatically debited from the sender's bank accountand credited to the sender's prepaid deposit account, which in turn is refunded and deposited into the recipient's bank account. It has been pointed out that a prepaid easytransfer service using the "refund" method should be considered an electronic funds transfer

service and accordingly become subject to a higher minimum capital requirement.[7] However, the Financial Services Commission issued an authoritative interpretation (Jan. 2015) that the "refund" easy transfer should not be considered an electronic funds transfer service. As a result, prepaid service providers, which are subject to lower capital requirements than electronic funds transfer service providers, have been able to provide simple transfer services.

Risks Associated with the Increasing Use of Prepaid Payment Services

The provision of payment services by big techsand other non-financial institutions has promoted competition and technological innovation in the payment services market, thereby enhancing users' accessibility and service quality. However, despite the similarities with financial institutions in services that non-financial institutions provide, they are not subject to consumer deposit protection requirements such as the Depositor Protection Act. As a complementary measure, guidelines have been put in place requiring prepaid service providers to place funds corresponding to 100% of customer funds if they provide easy transfer services, and 50% of customer funds if they do not at an external institutions. Major countries have implemented various effective regulations for "Electronic Money Institutions," entities providing services similar to those provided by prepaid service providers in Korea.

Consumer fund protection schemes for electronic money institutions in major jurisdictions

Jurisdiction	Consumer fund protection schemes
EU	■ Users' funds must be safeguarded by private insurance, or funds equivalent to users' funds must be deposited at a separate institution.
United Kingdom	■ Fintech firms must report liquidity and capital adequacy stress test results at least once a year. ■ Fintech companies must prepare a business resolution plan in case of bankruptcy and other situations.
Japan	■ Funds equivalent to 100% (funds transfer services) or 50% (prepaid services) of users' funds are deposited at an official deposit office, transferred to a trustee, or safeguarded via indemnity agreements with financial institutions.
China	■ Deposit funds equivalent to 100% of user funds at the central bank

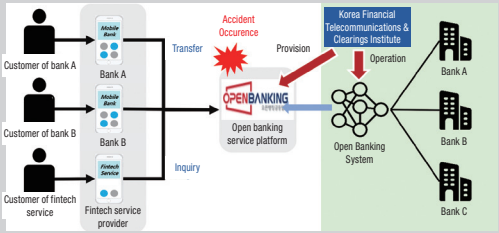
Source: Laws of each jurisdiction.

Meanwhile, there are risks that may arise from the use of the Open Banking System and should be prepared for. Contrary to other countries' openbanking systems in which fintech firms provide payment services based on individual access to banks, Korea's openbanking system is designed as a shared platform operated by the KFTC, which fintech firms have to access to provide payment services. Because of this design, there is a significant level of single-point-of-failure (SPOF) risk[8] in Korea's Open Banking System. This means that a security incident in the KFTC platform could lead to a disruption of services provided by every connected institution. In order to ensure a prompt resumption of business in the event of single point of failure, the KFTC has recently improved its disaster recovery exercise scenario, in accordance with BOK's recommendation.

7) Electronic funds transfer service providers are required to use security cards and OTPs (one-time passwords) and are, therefore, not allowed to use simplified authentication methods. They are also subject to a higher minimum capital requirement (electronic funds transfer service providers: 3 billion won, prepaid service providers: 2 billion won). Because of the stringency of regulation, there is no company registered as an electronic funds transfer service provider (73 prepaid service providers) as of May 2022.

8) A type of risk associated with a centralized network overly dependent on a single point, the failure of which could stop the entire system from working.

Structure of the Open Banking System



Source: Bank of Korea.

In addition to SPOF risk, the lack of clearly defined eligibility requirements for access to the Open Banking System is another source of risk. Currently, the only eligibility requirement is being engaged in a related business.[9] As fintech firms, unlike banks, do not use a dedicated line to connect to the Open Banking System, they are exposed to security risks such as data privacy breach and fraudulent transactions. In particular, a cyber attack via fintech firms as intermediaries could negatively affect the safety of the KFTC's payment network. Accordingly, in line with the principle of "same business, same risks, same rule," eligibility criteria for access to the Open Banking System must be revised so that only fintech firms that are properly authorized to provide payment services are able to access the system.

Currently, a project to amend the Electronic Financial Transaction Act is underway to increase the maximum cap on prepaid deposits[10] and introduce "comprehensive payment and settlement services.[11]" When easing regulations, the balance between innovation and regulation should be considered, along with its impact on the financial system and payment and settlement system. Therefore it will be necessary to ensure consumers' trust in the financial system and payment and settlement system by licensing entities that satisfy the eligibility criteria to provide payment services, mandating consumer protection, and reducing risks stemming from the payment and settlement processes.

9) In addition to electronic financial service providers, businesses engaged in auxiliary electronic financial transaction services and other financial support services, data processing services, and fintech businesses including database operators and online information providers are also allowed to access and use the Open Banking System.

10) The Financial Services Commission will seek the amendment of the Electronic Financial Transaction Act to raise the current cap of 2 million won, established in July 2008, to 5 million won.

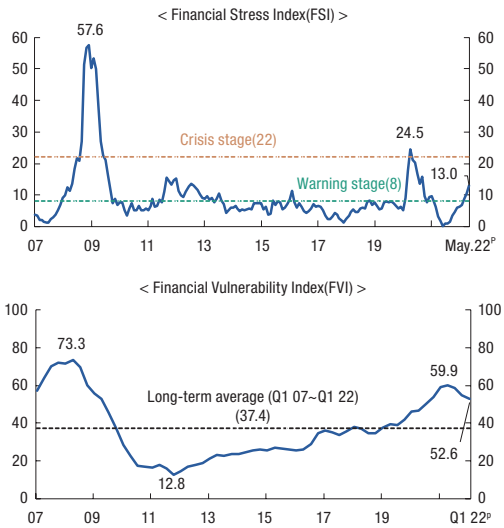
11) A new type of financial service the government will be introducing through the amendment of the Electronic Financial Transaction Act, enabling service providers to provide every electronic financial service with a single license and also authorizing them to provide account services, which have been reserved for financial companies so far.

Overall Assessment

Since the second half of last year, external risk has risen dramatically, and the volatility of financial markets has also escalated. Due to growing global inflationary pressure, the accelerated pace of policy rate hikes by the US Federal Reserve, and persistent geopolitical risk related to the war in Ukraine, the Financial Stress Index (FSI),[1] which indicates the level of instability of the financial system, has entered into the warning stage (threshold 8). The FSI fell to its lowest value (0) in June last year, and has since risen steadily amid the expansion of volatility in the financial market and deterioration of external sector indices, reaching 13.0 in May 2022. However, Korea's financial system remained stable overall with favorable financial soundness and resilience of its financial institutions and smooth functioning of financial intermediation.

Meanwhile, the medium- and long-term vulnerability of the financial system remains high. The household debt that has accumulated so far and high housing prices are potential factors causing the Korean economy's vulnerability. The financial vulnerability index (FVI),[2] an indicator of medium- and long-term financial system vulnerability, has moved downwards as bond and stock prices have adjusted and the pace of growth in both real estate prices and household credit has slowed since the second half of last year, but the index was 52.6 in the first quarter of this year, still above its long-term average of 37.4.

Financial Stress Index (FSI)[1] and Financial Vulnerability Index (FVI)[2]



Notes: 1) A composite index (0-100) calculated by standardizing 20 monthly real and financial sector indicators related to financial instability. The warning and crisis stage thresholds are set at 8 and 22 respectively, using the "noise-to-signal" ratio method.
2) A composite index (0-100) calculated by standardizing 39 quarterly indicators concerning three criteria for assessment (asset prices, credit accumulation and financial system resilience).

Source: Bank of Korea.

Vulnerability Assessment

By sector, in the credit market, the upwards trend of private credit leverage slowed, but high level of household debt and the uneven recovery accross the corporate sectors remain potential vulnerability factors. The household debt that has accumulated so far is likely to increase the debt repayment burden of households and constrain consumption of households, depending on changes in the financial market condition such as interest rate increases. While corporate credit is continuing

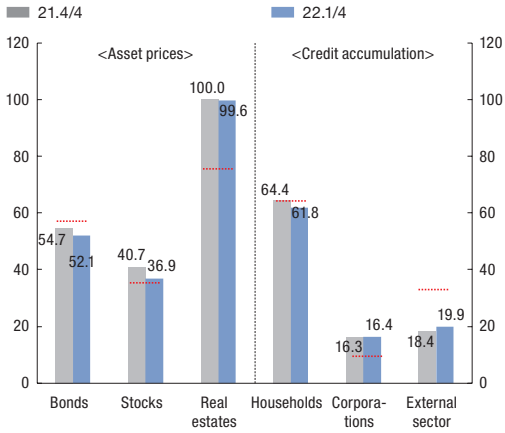
1) The Financial Stress Index (FSI) is a composite index (0-100) calculated by standardizing 20 monthly real and financial sector indicators related to financial stability. The warning and crisis thresholds are set at 8 and 22, respectively, using the "noise-to-signal ratio" method.
2) The Financial Vulnerability Index (FVI) is a composite index (0-100) calculated by standardizing 39 quarterly indicators concerning three criteria for assessment (asset prices, credit accumulation, and financial system resilience).

to rise rapidly, the uneven recovery by business sector has increased the differentiation of debt repayment capacities by borrower. Going forward, in the event of increases in global commodity prices rates and greater volatility in exchange rates and interest rates, the debt repayment capacities of marginal firms that are slow to recover may deteriorate. In particular, defaults on loans to self-employed and micro-sized business owners, which have rapidly expanded after COVID-19, may begin to accelerate, depending on the rise in loan interest rates and the pace of normalization of financial support measures.

In the asset markets, prices of bonds and stocks have adjusted moderately since the second half of last year, but real estate prices remain high considering the current national economic fundamentals. A rapid adjustment of asset price may occur if risk appetite and yield-seeking behavior in the markets changes rapid due to abrupt changes in financial and economic conditions at home and abroad.

As for financial institutions, the asset soundness of non-bank financial institutions may weaken and their liquidity risks may escalate in the event of changes in conditions at home and abroad. So far, asset soundness indices have been at favorable levels, but asset quality may deteriorate rapidly if loan interest rates rise and the financial support measures of the government and financial institutions are normalized. Furthermore, in the event the volatility of global financial markets rises significantly, liquidity and credit risks are likely to increase for non-bank financial institutions.

Financial imbalance-related indices[1)]



Note: 1) Dotted lines are the longterm average(Q1 07~Q1 22).
Source: Bank of Korea.

Risk Factors

As reviewed above, the domestic financial system is stable overall, but risk factors at home and abroad are increasing, calling for caution.

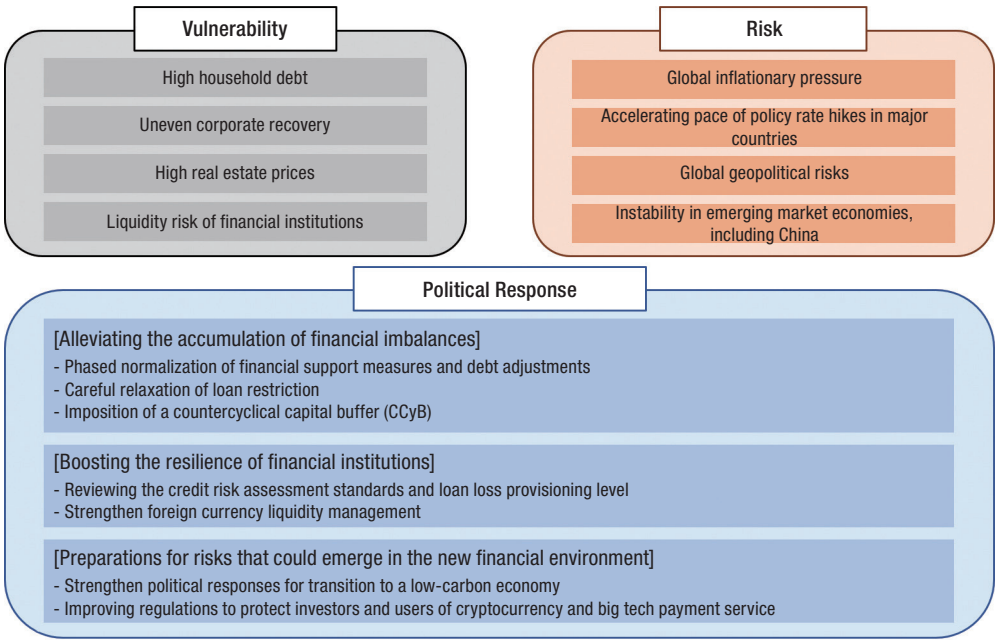
Surging global inflationary pressure, the accelerating pace of policy rate hikes in major countries, persistent global geopolitical risks, and instability in emerging market economies, including China, are likely to be major factors undermining the stability of the financial system.[3)] Policy rate hikes by major economies under escalating global inflationary pressure could lead to the sudden adjustment of asset prices through the rise of market interest rates and changes in risk appetites and also boost the default risk of vulnerable borrowers. Fur-

3) The results of the Systemic Risk Survey conducted of 80 domestic and overseas financial and economic specialists during the first half of 2022 showed that major risk factors included inflationary pressure associated with the rise in commodity prices and global supply chain disruptions (79.9%), monetary policy normalization in major economies (55.4%), and escalation of geopolitical risks due to the Russia-Ukraine war (41.2%). For details, refer to “Results of Systemic Risk Survey for the First Half of 2022” (BOK press release, May 30, 2022).

thermore, depending on the magnitude and pace of policy rate hikes in major economies, an outflow of foreign investment funds or increase in exchange rate volatility may occur. Meanwhile, if the war in Ukraine persists and unrest in emerging market economies such as China materializes, the resulting elevated volatility of global financial markets and global supply disruptions will likely weaken corporate earnings. As these risks are closely interrelated, a shock in a specific sector could be transmitted to the entire financial system, setting off a chain reaction.

Policy Implications

To ensure that the accumulation of private credit does not increase financial imbalances,[4] a harmonious implementation of monetary policy and macroprudential policy is necessary. For protecting real demand for housing, the pace and scope of the easing of loan restrictions need to be carefully managed to prevent rekindling expectations for housing price rises. In addition, as the Korean economy is gradually recovering from the impact of COVID-19, financial support policy needs to be modulated, in a way that more emphasizes debt repayment capacity of borrowers. While enterprises with sound recoveries should be encouraged to repay loans through a phased normalization of financial support measures, rescheduling for vulnerable borrowers and efficient debt workouts for marginal firms should be carried out. To prevent private credit from accumulating and concentrating in a specific sector, the imposition of a countercyclical capital buffer (CCyB) needs to be considered.[5]



4) Although there is no official, agreed-upon definition of "financial imbalance" among central banks and academics, the term generally refers toa phenomenon in which the simultaneous occurrence of excessive leverage and overvalued asset prices results inan excessive increase in the scale of liabilities and asset prices, compared with the real sector.

5) For details, refer to Box 6, "The Countercyclical Capital Buffer: Experiences and Impacts."

Meanwhile, as domestic and external risks are rising, a preemptive response to boost the resilience of domestic financial institutions needs to be prepared. Because credit risk may have been underestimated due to the financial support measures and low interest rates, credit risk assessment standards and loan loss provisioning levels should be reviewed, and related systems should be modified in ways that reflect future credit risk. In addition, non-bank financial institutions need to strengthen their foreign currency liquidity management to tackle the global liquidity crunch.

It is necessary to prepare for risks that could emerge in the new financial environment as well. Moreover, efforts should be made to preemptively cope with potential risk that could occur in the course of the transition to a low-carbon economy through the use of Climate Response Funds.[6] As the impact of crypto-assets expand[7] and more non-financial big tech firms enter the payment service market, related regulatory systems need to be improved to protect investors and users.

6) For details, refer to Box 7, "Impact of Rising Carbon Prices on Sectoral Value-Added."

7) For details, refer to Box 8, "Recent Trends and Risk Assessments in the Crypto-Asset Market."

Box 6.

The Countercyclical Capital Buffer: Experiences and Impacts

In Korea, the regulation of loans is currently the main macro-prudential policy tool used to limit the buildup of financial imbalances. However, there has been a continuous call for a more active use of the countercyclical capital buffer,[1] following the example of major countries, both to efficiently curb credit growth under market principles and increase banks' capacity to absorb losses in times of stress. This article examines the operation of the countercyclical capital buffer in Korea with experiences in major countries, and analyzes its expected impacts to derive policy implications.

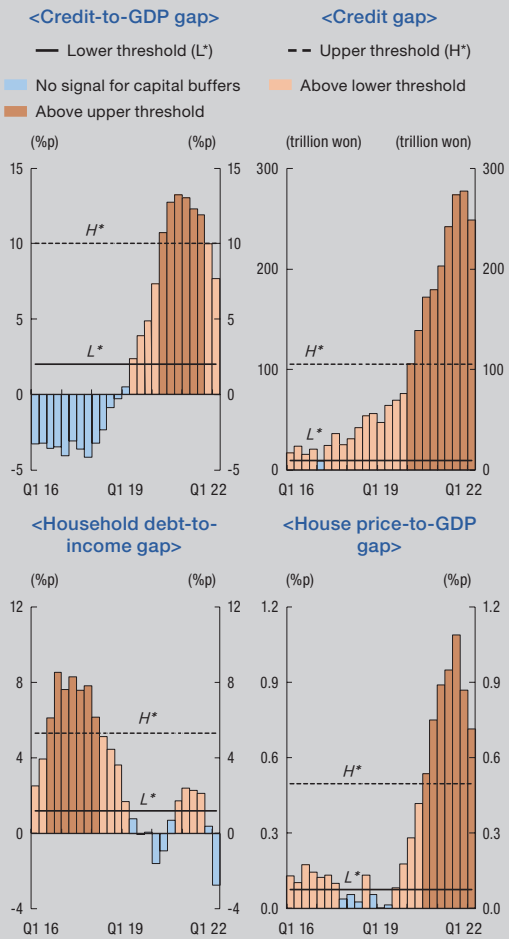
The Countercyclical Capital Buffer in Korea

The countercyclical capital buffer (hereafter "CCyB") was introduced in Korea in 2016. Currently, the CCyB requirement is determined based on a comprehensive consideration of credit accumulation indicators,[2] macroeconomic conditions, the soundness (resilience) of financial institutions, and systemic risks (financial imbalances).[3]

Since the initial introduction of the CCyB in 2016, its rate has been maintained at the default rate of 0% (of risk-weighted assets). However, as of the first quarter of 2022, most of the relevant indicators suggest a need for banks to build up a CCyB. Although the recent slowdown in household loan growth, caused by the tightening of loan restrictions and the Base Rate hikes, has somewhat weakened the signals to build up a CCyB, the most relevant indicators still display the levels leading to the decision to impose the CCyB; both the credit-to-GDP gap, the primary indicator, and secondary indicators, including the credit gap and the house price-to-GDP gap, are either close to or have surged past the upper thresholds, pointing to a strong need to dampen the accumulation of financial imbalances by slowing credit growth.

1) The Basel III requirement for banks to build up additional Common Equity Tier 1 Capital, corresponding to 0-2.5% of their risk-weighted assets, during periods of excessive credit growth.
2) The BCBS (2010) recommends the use of the credit-to-GDP gap, which is defined as the difference between the credit-to-GDP ratio and its long-term trend, as a common reference guide. The credit-to-GDP gap is currently used by the Korean supervisory authority as the primary indicator for the CCyB requirement. Secondary indicators include the credit gap, the household debt-to-income gap, and the house price-to-GDP gap.
3) The Korean supervisory authority determines the need to build up a CCyB on a quarterly basis and decides on a rate and the time period of the imposition of a CCyB through advance consultation with the BOK and other relevant authorities.

Reference guide for CCyB requirement[1)2)]



Notes: 1) The solid line indicates the lower threshold (L*), where it is required to start building up capital buffers, and the dotted line indicates the upper threshold (H*), at which the maximum buffer (2.5%) should be reached.
2) The lower and upper threshold guideline for the credit-to-GDP gap (L*=2%p, H*=10%p) is suggested by the BCBS based on historical banking crises. The threshold guidelines for other indicators are calculated by equivalent standards.

Sources: Bank of Korea, Korea Real Estate Board.

By time period, in 2016-2018, although some secondary indicators such as the household debt-to-income gap strongly signaled the need to build up CCyBs, the credit-to-GDP gap, the primary indicator, was still below the lower threshold. In 2019, the credit-to-GDP gap started to also signal the need to build up CCyBs. Nevertheless, given the slowing growth in GDP and household credit at that time, there was no urgent need to impose a CCyB. Since 2020, amid persisting real economic uncertainty caused by the prolonged pandemic a CCyB has not been imposed even though the signals to build up capital buffers have grown stronger.

Experiences of Major Countries

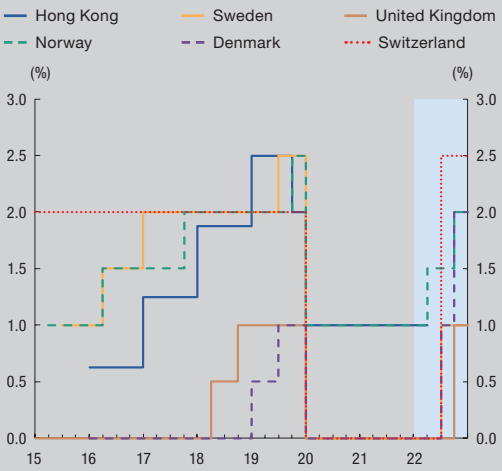
In most major countries, the CCyB was introduced[4)] and implemented in around 2016. Since then, this regulatory tool has been in active use in many countries, including France, Hong Kong, Luxembourg, Sweden, and the U.K. However, as the need to build up the CCyB is largely dependent on the discretionary judgment of the national authorities, the criteria used when deciding whether to impose it vary between countries, as well as the exact manner in which it is implemented. For example, in the U.K., a non-zero default CCyB rate (positive default CCyB) is used in a normal risk environment. In Switzerland, a sectoral countercyclical capital buffer (SCCyB),[5)] applying only to housing mortgage loans, was introduced in 2013. Meanwhile, since early in the COVID-19 pandemic, CCyB requirements were waived or eased in many countries. However, from the second half of last year, most countries decided to resume the

4) The CCyB was introduced principally in 27 BCBS (Basel Committee on Banking Supervision) member countries (excluding the EU). Among non-member countries, the CCyB is in use in Denmark, Norway, Iceland, Bulgaria, Czech Republic, and Romania, etc.

5) Unlike the CCyB in which the additional capital requirement is proportional to the size of a bank's total risk-weighted assets, the SCCyB is calculated based only on assets linked to a certain sector of the credit market, which is determined to have an excessive build-up of financial imbalances. In Switzerland, the introduction of the SCCyB has led to an improvement in the resilience of its banking system by slowing the growth of housing mortgage loans and causing the market share of banks with large mortgage loan assets to decrease.

imposition of CCyBs in response to the large accumulation of private credit and financial imbalances occurred during the pandemic period.

CCyB rates of selected jurisdictions[1)2)]



Notes: 1) Activated CCyB rates (any increases in the CCyB need to be preannounced by up to 12 months to give banks time to meet the additional capital requirements before they take effect).
2) The shaded area indicates announced CCyB rates.
Sources: BIS, central bank and supervisory authority of each country.

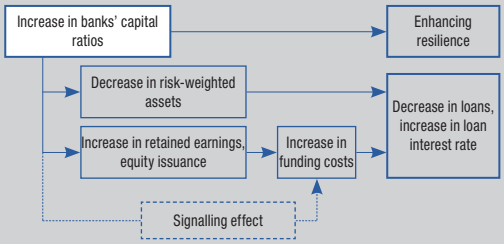
The CCyB is thus much more actively used in these countries than in Korea. The CCyB rate is flexibly adjusted according to the level of credit supply, the extent of the accumulation of financial imbalances, real economic and market liquidity conditions. The CCyB rate is adjusted upward during a credit boom to limit the supply of private credit and strengthen banks' resilience, and is adjusted downward in periods of crisis to prevent a sharp contraction in loans and ensure the stability of the financial intermediary function.Also of note is the fact that the CCyB is actively used especially in countries with a similarly high credit-to-GDP ratio as Korea.[6)]

Impact of the Imposition of a CCyB on the Growth of Bank Loans

Theoretically, banks can respond to the imposition of a CCyB by increasing retained earnings, issuing new shares or reducing risk-weighted assets in order to raise their capital ratio. If the increased capital buffer results in an increase in banks' overall funding cost, it induces banks to reduce loan assets with high risk weights, causing a drop in their credit supply.

6) Although the effect of an upward adjustment of the CCyB rate in slowing credit growth has so far been inconclusive, its downward adjustment in times of crisis appears to have some effect in preventing an excessively sharp contraction in credit [Jimenez et al., (2017), Sivec et al., (2019), etc.].

Transmission channels of CCyB requirement



Sources: Bank of England(2013)

As a CCyB has so far never been imposed in Korea, this poses a challenge for assessing its effectiveness. However, the effectiveness of the CCyB can be indirectly inferred[7] from the effects of the imposition of the Basel III capital conservation buffer[8] and that of capital requirements on domestic systemically important banks (D-SIBs) in 2016-2019 on the growth of domestic banks' loans. To examine the effect of a higher regulatory capital ratio following the tightening of capital regulation on banks' credit supply, on the one hand, and that of a combination of tighter capital regulation and a Base Rate hike on their credit supply, on the other, two bank panel (Q1 2009-Q4 2021, 17 banks) models[9] were constructed.

[Model I] $$\Delta L_{i,t} = \beta_0 + \beta_1 C_{i,t-1} + \beta_2 C_{i,t-1} * d^R_{i,t-1} + \gamma' X_{t-1} + \delta' Z_{i,t-1} + \alpha_i + \varepsilon_{t,i}$$

[Model II] $$\Delta L_{i,t} = \beta_0 + \beta_1 C_{i,t-1} + \beta_2 C_{i,t-1} * d^R_{i,t-1} + \beta_3 C_{i,t-1} * d^R_{i,t-1} * \Delta PR_{t-1} + \gamma' X_{t-1} + \delta' Z_{i,t-1} + \alpha_i + \varepsilon_{t,i}$$

(ΔL: loan growth rate, C: regulatory capital ratio, d^R: dummy varable for the tightening of capital regulation, PR: Base Rate, X: macroeconomic variables, Z: bank characteristic variables, α: bank-level fixed effect, i: bank, t: time (quarter)

The estimation results of Model I indicate that a 1%p increase in banks' regulatory capital ratio leads to an estimated 1.8%p drop in total loan growth. By type of loan, while this caused the growth of corporate loans to sharply slow (-1.3%p), the drop in the growth of household loans was not statistically significant. This appears to be due mainly to the fact that a rising cost of capital tends to make banks reduce corporate loans with high risk weights rather than household loans which were in high demand, as suggested by their past behavior.

A tighter capital regulation does not have an additional slowing effect on loan growth($\hat{\beta}_2$). However, as can be seen from the results of Model II, when the tightening of capital regulation occurs simultaneously with a Base Rate hike, this resulted in an additional effect of slowing loan growth. When the capital regulation is tightened concurrently with a Base Rate hike (+100bp), a 1%p rise in the regulatory capital ratio is estimated to lead to a 1.8%p decrease in household debt growth and a 0.8%p decrease in corporate loan growth.[10]

7) Even so, the analysis is limited by the fact that banks' capital ratio (16.5% at the end of 2021) has continuously remained above the regulatory minimum (10.5% and 11.5% for D-SIB), suggesting the possibility that the effect of a tightening of capital regulations is non-binding.

8) A Basel III regulation in which banks are required to routinely set aside additional Common Equity Tier 1 capital, corresponding to 2.5% of their total risk-weighted assets, to cushion against losses in periods of stress.

Model estimation results[1)2)]

		Dependent variable[3)]		
		Total loans	Household loans	Corporate loans
Model I	Banks' capital ratios($\hat{\beta}_1$)	-1.82*** (-7.54)	1.20 (0.62)	-1.30*** (-5.43)
	Tightening capital requirements($\hat{\beta}_2$)	0.08 (0.60)	-0.43 (-0.76)	-0.02 (-0.32)
Model II	Banks' capital ratios($\hat{\beta}_1$)	-1.67*** (-6.9)	1.30 (0.67)	-1.22*** (-5.12)
	Tightening capital requirements($\hat{\beta}_2$)	0.05 (0.87)	-0.50 (-0.89)	-0.04 (-0.78)
	Tightening capital requirements with rises in the Base Rate($\hat{\beta}_3$)	-0.90*** (-4.53)	-1.78* (-1.66)	-0.78*** (-3.97)

Notes: 1) ***, **, * refer to significance levels of 1%, 5% and 10%, respectively. Figures within parentheses refer to the t-statistics.
2) Sample size(N)=884(i=17, t=52).
3) YoY growth rates.
Sources: Bank of Korea staff calculation.

Policy Implications

In Korea, the supervisory authorities have mainly used the regulations of loans and liquidity to dampening excessive credit growth and reducing the accumulation of financial imbalances so far, rather than the CCyB. In most major countries, however, the CCyB has been a useful tool to flexibly respond to rapid changes in private credit conditions and the real economy. After a massive increase in private credit during the pandemic period, indicators are giving continuously strong signals of an excessive buildup of credit. The financial relief measures implemented during the COVID-19 crisis have resulted in a significant accumulation of credit risk and deferred defaults.[11)] The imposition of a CCyB can not only give more policy space to respond to a future crisis, but will also help strengthen banks' capacity to absorb losses[12)] by allowing them to set aside additional capital.

Notwithstanding, the results of an empirical analysis based on past data indicate that when banks' regulatory capital ratio increases, the resulting reduction in loan growth was centered mainly in corporate loans. Therefore, it could

9) In Model I, in order to separate the rise in the regulatory capital ratio caused by the tightening of capital regulation from the effect of a higher regulatory capital ratio in slowing credit growth, a dummy variable (d^R), indicating the time period of the tightening of capital regulation, was generated, and an interaction term of this dummy variable and the regulatory capital ratio (c) was included in the model. In addition to the Base Rate, the model included several other macroeconomic variables, such as GDP growth and housing price growth, as well as bank characteristic variables such as asset size (log-transformed) and the substandard-or-below loan ratio. Moreover, regarding household loans, a regulatory variable (maximum allowable LTV ratio) was added to take into account the fact that the change in household loan growth is likely to vary depending on the strength of loan restrictions. In Model II, to examine the effect of a combination of tighter capital regulation and a Base Rate hike, an interaction term of the Base Rate change (ΔPR) was included, in addition to the dummy variables of the increase in the regulatory capital ratio and the tightening of capital regulation.

10) Household loans appear to be more heavily affected by a Base Rate hike than corporate loans due to the fact that a signification portion of these loans have been used for real estate investment and, therefore, rising borrowing rates reduce the return on investment.

11) According to Box3. "Estimation of Potential Corporate Credit Losses at the Expiration of COVID-19 Loan Forbearance and Assessment", if domestic banks' potential expected and unexpected losses, estimated by controlling for the effects of COVID-19 policy measures, materialize, this is estimated to cause their capital adequacy ratio to drop by up to 1.4%p.

12) Banks' regulatory compliance burden will likely be moderate due to their currently high capital ratio. Given that their profits are also extremely high (net income of 16.9 trillion won in 2021), inducing banks to set aside additional capital will prevent an excessive amount of profits from becoming diverted into dividends and help increase their loss-absorbing capacity. During the COVID-19 period, banks were recommended to temporarily limit their dividend payout to 20% or below of net profit. Prior to the pandemic, the banking sector's dividend payout ratio was significantly above this level and had been on an upward trend (23.8% in 2016 → 26.2% in 2019).

also be useful to consider the introduction of a SCCyB for the household sector, especially if there is a new spiral in household loan growth. However, in this case, the SCCyB must be coupled with a mechanism to prevent balloon effects leading to an increase in corporate loans.

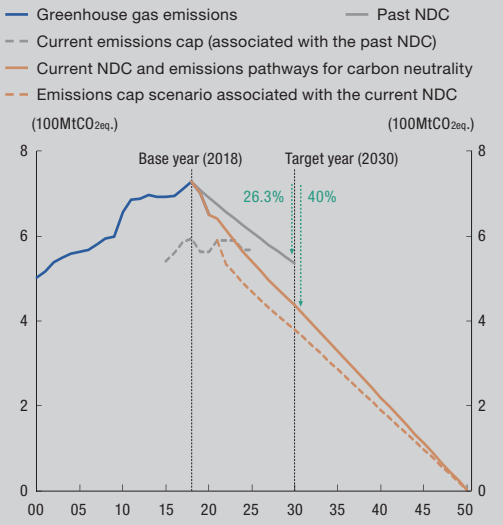
Box 7.

Impact of Rising Carbon Prices on Sectoral Value-Added

In a push for the transition to a low carbon economy, the government enacted the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis[1] (Sept. 2021), which entered into force early this year (Mar. 2022). Through a recently passed Enforcement Decree to this Act, the government raised the nationally determined contribution (NDC) target for 2030, the interim goal in the road map to achieving carbon neutrality by 2050, from a 26.3%[2] reduction of emissions below 2018 levels to a 40.0% reduction.

In order to reach the new emissions reduction goal for 2030(NDC), the government will likely strengthen the emissions trading scheme (ETS).[3] In Korea, the emissions trading scheme covers about 74% of the total national greenhouse gas emissions.[4] Given this coverage, the emissions trading scheme appears to be an effective tool to reduce emissions. Hence, the government is expected to lower the emissions cap in line with the new carbon reduction goal. The current emissions cap was set prior to the entry into force of the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis (Dec. 2020) and thus is not stringent enough to meet the current NDC for 2030 and the 2050 net-zero emissions goal.

Nationally Determined Contribution (NDC) and the emissions cap scenario[1]



Note: 1) Annual reduction rate for the emissions cap is assumed to be constant.

1) The Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis sets out provisions related to the plan to achieve carbon neutrality by 2050, including the nationally determined contribution (NDC) target for 2030, the establishment of the 2050 Carbon Neutrality and Green Growth Committee, and the creation of the Climate Response Fund.

2) This is the same as the NDC established at the signing of the Paris Agreement in 2015 (37% reduction below the business-as-usual level by 2030).

3) In an emissions trading scheme (ETS), the government allocates permits, set according to the NDC, to companies and when the actual amount of emissions exceeds or is less than the allocation, companies buy or sell permits from others willing to sell or buy them. In Korea, an ETS was introduced in January 2015.

4) The emissions trading scheme's coverage relative to the total national greenhouse gas emissions is currently 39% in the E.U., 28% in the U.K., 40% in Germany, and 51% in New Zealand. The coverage is therefore significantly higher in Korea than in most countries ("State and Trends of Carbon Pricing 2021," World Bank). Meanwhile, the auction share, the percentage of paid allowances that are auctioned through competitive bidding, stands only at 10% in Korea, much lower than in the E.U. (57%), U.K. (53%), Germany (100%), and New Zealand (56%). This implies that current compliance costs are comparatively low for most Korean companies ("Emission Trading Worldwide: ICAP Status Report 2022," International Carbon Action Partnership).

A lowering of the emissions cap in order to achieve the carbon neutrality goal could lead to a rise in the prices of emissions allowances. In the E.U., the annual rate of reduction of the emissions cap was adjusted upward in July 2021, from 1.74% to 2.2%. This caused the price of emissions allowances (EU Allowance futures) to jump 145% from EUR 32.9 per ton of CO_2 at the end of 2020 to EUR 80.7 per ton of CO_2 at the end of 2021.[5] If the annual rate of reduction of the emissions cap is likewise increased in Korea from 2.51% to 4.17%,[6] this could increase the price of emissions allowances by imposing a heavy burden on carbon-intensive firms, similarly to what happened in the E.U.

Using a scenario analysis, this article examines the impact of a rise in the price of emission allowances on the sectoral value-added. This article further investigates the changes in corporate default rates and stock prices against rising prices of emission allowances. The scenario assumes a rapid, short-term rise in the price of emissions allowances in Korea, at the same rate as in the E.U. during 2021. The analysis mainly uses the BOK's transition risk stress test methodology (BOK-climate stress test).[7]

Carbon prices[1] in the Korean ETS (Emissions Trading Scheme) and the EU ETS

Note: 1) KAU (Korean Allowance Unit) prices and EUA (EU Allowances) future prices converted by won-euro exchange rate.
Sources: Korea Exchange, ICE Futures.

Transmission Channels of Climate Policy Shocks

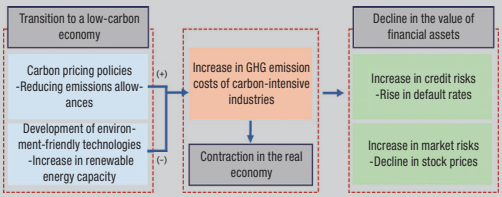
The government's carbon neutrality policy provides both challenges and opportunities to the economy. The strengthening of the emissions trading scheme, including the reduction of the emissions cap, will likely increase production costs for carbon-intensive firms, leading to a rise in default rates and a drop in stock prices. On the other hand, the development of environment-friendly technologies, such as renewable energy technologies, could lower the cost of greenhouse gas emissions and provide a new engine for economic growth by facilitating innovation in production technology.

During the transition to a low-carbon economy, if the negative effects of strengthening the

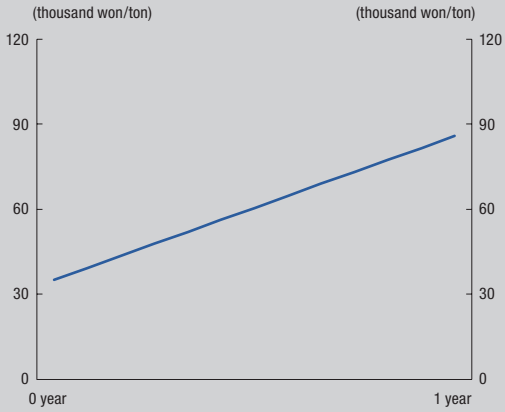
5) In March 2022, the price of emissions allowances in Europe crashed to EUR 58.3 per ton of CO_2, but climbed back to EUR 84.0 per ton of CO_2 at the end of May 2022.
6) The average annual rate of reduction necessary to achieve the current NDC for 2030.
7) For a detailed description of this methodology, refer to "Climate-related Transition Risks and Financial Stability," BOK *Quarterly Bulletin*, December 2021.

emissions trading scheme outweigh the benefits from advances in environmentally-friendly technologies, this will inevitably cause a decline in the value of corporate assets and more particularly of assets of carbon-intensive companies.

Transmission channels of climate policy shocks



Carbon price scenario[1)]



Note: 1) The scenario builds on the fluctuations of EUA (EU Allowances) prices in Dec.20~Dec.21.

Scenario Design

The scenarios assume a rapid surge in the price of emissions allowances and an increase in the production of renewable energy. The reference point of this scenario analysis is set at the end of December 2021.[8)] The baseline scenario assumes that the price of emissions allowances and the energy mix (electricity generation mix) stay at the same levels as at the reference point.

The scenario on the price of emissions allowances assumes that in order to reach the carbon neutrality goal by 2050, the government will drastically lower the emissions cap to be in line with the current NDC for 2030. Therefore, the price of emissions allowances in Korea is assumed to soar by 145%, at the same rate as in Europe (2021), during a one-year period.[9)] Specifically, the price of emission allowances is assumed to rise from 35,000 won at the reference point (end of 2021) to 85,900 won a year later.

Next, the scenario on the development of environment-friendly technologies assumes that the share of renewable energy in the electricity generation mix increases, in accordance with the 9th Basic Plan on Electricity Demand and Supply (Dec. 2020). Concretely, the renewable energy capacity is assumed to increase from 24.9GW at the reference point (end of 2021) to 29.4GW a year later, which would raise the share of renewable energy in the power generation mix by 0.8%p, from 7.5% (43,096 GWh) to 8.3% (51,020 GWh). At the same time, the share of nuclear energy in the power generation mix is also expected to grow, upon the completion of Shin-Hanul nuclear power plant1 and 2 (2.8 GW), from 27.4% (158,015 GWh) to 28.7% (177,045 GWh). On the other hand, the share of coal-fired power in the mix will likely decrease due to the increase inthe shares of renewable and nuclear energy.[10)]

8) The corporate financial data are obtained from the KIS-Value published by NICE Information Service. The emissions data are drawn from the National Greenhouse Gas Management System of the Ministry of Environment and the input-output tables are from the BOK.

9) It should be noted that the price of emissions allowances is not just affected by the emissions cap, but is also influenced by a variety of economic factors such as the progress in the commercialization of emission mitigation technologies and the growth rate of environment-friendly industries.

10) However, the electricity generation by coal is expected to increase slightly because of the construction of a previously-planned new coal plant (Anin coal-firedpower plant).

Scenarios for the electricity generation mix[1)2)]

(GWh, %)

Energy sources	Electricity generation in 2021	Electricity generation during the next year
Coal	197,966 (34.3)	203,290 (33.0)
Gas	168,287 (29.2)	176,981 (28.7)
Nuclear power	158,015 (27.4)	177,045 (28.7)
Renewable energy	43,096 (7.5)	51,020 (8.3)
Pumped storage	3,683 (0.6)	3,683 (0.6)
Others	5,671 (1.0)	2,839 (0.5)
Total	576,718 (100.0)	616,167 (100.0)

Notes: 1) The scenarios build on the Korean government's 9th Basic Plan on Electricity Demand and Supply.
2) Figures in parentheses are the proportion of the total electricity generation.
Sources: The 9th Basic Plan on Electricity Demand and Supply, The Monthly Report on Major Electric Power Statistics.

Results

Using a scenario analysis, this article examines the changes in credit and market risks associated with the rise in carbon prices. Concretely, the analysis investigates the impact of rising prices of emissions allowances and the increased production of renewable energy on the value-added, default rates, and stock prices by industries, focusing particularly on those that are heavy emitters of greenhouse gas.

The result shows that a sharp rise in carbon prices leads to an increase in production costs and a decrease in the value-added of carbon-intensive sectors. Although the negative effects of a steep rise in carbon prices are partially offset by the positive effects of an increased production of renewable energy, the extent is marginal. In particular, the value-added of carbon-intensive sectors, such as non-metallic mineral product manufacturing (e.g., cement), basic metals manufacturing (e.g., steel), and electricity, gas, steam, and air conditioning supply (e.g., fossil fuel power generation), falls 3.7%, 5.2%, and 10.9%, respectively, from their levels in the baseline scenario. On the other hand, the value-added of low-emitting sectors such as service industries drops only by 0.1% from their levels in the baseline scenario.

Changes in value-added by industry

(Mt, Mt/trillion won, %)

Industries	GHG emissions[1)]	Carbon intensity[2)]	Changes in the value-added[3)]
Manufacture of coke, briquettes and refined petroleum products	31.3	2.4	-2.9
Manufacture of chemicals and chemical products	59.8	1.6	-1.6
Manufacture of other non-metallic mineral products	46.9	3.9	-3.7
Manufacture of basic metals	122.4	4.6	-5.2
Electricity, gas, steam and air conditioning supply	236.6	10.2	-10.9
Others	90.6	0.1	-0.1

Notes: 1) The amount of GHG emissions in 2020 by the firms subject to the Emission Trading Scheme and the Target Management System.
2) GHG emissions over the value-added in 2019.
3) Compared to the baseline scenario.

The results further show that a sudden rise in carbon prices drives up the default rate among carbon-intensive firms and drags down their stock prices. Specifically, surging carbon prices increase the default rates of the non-metallic mineral product manufacturing (e.g., cement) and electricity, gas, steam, and air conditioning supply (e.g., fossil fuel power generation) sectors by 1.2%p and 1.1%p, respectively, compared to the baseline scenario. The stock prices of the firms in the non-metallic mineral product manu-

facturing (e.g., cement) and basic metals manufacturing (e.g., steel) decline by 31.3% and 19.4% from their levels in the baseline scenario. On the other hand, the surge in carbon prices has a limited effect on the default rate and stock prices of sectors other than carbon-intensive sectors.

Changes[1] in default rates and stock prices by industry

(%p, %)

Industries	Changes in default rates	Changes in stock prices
Manufacture of coke, briquettes and refined petroleum products	+0.5	-3.5
Manufacture of chemicals and chemical products	+0.1	-4.2
Manufacture of other non-metallic mineral products	+1.2	-31.3
Manufacture of basic metals	+0.2	-19.4
Electricity, gas, steam and air conditioning supply	+1.1	-6.2
Others	+0.01	-0.8

Note: 1) Changes in the annual default rates and stock prices compared to the baseline scenario.

Implications

The strengthening of the emissions trading scheme by the government, as part of a push for carbon neutrality, can potentially lead to a drop in the value of assets in carbon-intensive sectors. This implies that the impact of carbon pricing and the speed of energy transition on firm values could become significant in the near future. Nonetheless, it should be noted that this analysis assumes that firms make an investment in greenhouse gas reduction at the current pace and does not reflect future transition plans specific to each company.

To mitigate potential risk associated with the transition to a low-carbon economy, firms need to step up their investment in reducing greenhouse gas emissions. Meanwhile, when the government moves to strengthen the emissions trading scheme, they should carefully consider the potential negative consequences of this decision and use the Climate Response Fund[11] to alleviate the negative effects. As for investors, when making investment decisions, they should pay special attention to the changes in the government's carbon neutrality policy and the transition plans by companies.

11) In January 2022, the government established the Climate Response Fund in accordance with the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis. The Climate Response Fund, worth 2.4 trillion won as of 2022, is used to finance greenhouse gas emissions reductions (0.9 trillion won), the development of low-carbon industrial ecosystems (0.6 trillion won), support for the transition of vulnerable industries (0.2 trillion won) and related research and development (0.6 trillion won).

Box 8.

Recent Trends and Risk Assessments in the Crypto-Asset Market

After dramatic growth since 2020, the global crypto-asset market has faced increased uncertainty since early this year. Since policy rate hikes in major countries, the market capitalization of crypto-assets plummeted as investors fled from risk assets. Moreover, in May, investors' confidence in the crypto-asset market was hard hit by the de-pegging[1] of some of the major stablecoins.

Since the current uncertainties surrounding the crypto-asset market are likely to spread to the rest of the financial markets, this article examines key risk factors[2] in this market.

Recent Trends in Crypto-asset Markets

Global Market

The total capitalization of the global crypto-asset market increased 12-fold between the end of 2019 and the end of 2021, from USD 191.0 billion to USD 2.3104 trillion. This phenomenal growth was mainly due to the rapid rise of DeFi (decentralized finance)[3] during this period,[4] leading to the growth of cryptocurrencies that are highly usable with DeFi services, such as stablecoins and Ethereum. While the share of Bitcoin in the crypto-asset market fell to 38% at the end of 2021 from 68% in early 2020, those of stablecoins (combined top 10 stablecoins by market capitalization) and Ethereum increased to 7% and 19% from 3% and 7%, respectively, during the same period.

However, since early this year, the rise in the market's aversion to risk assets according to the policy interest rate hikes by the U.S. Federal Reserve and the collapse of TerraUSD made investors increasingly apprehensive about the overall crypto-asset market. As a result, the market capitalization of crypto-assets dropped by almost 41% to USD 1.3715 trillion (close to 1,709 trillion won) by May 31, 2022.

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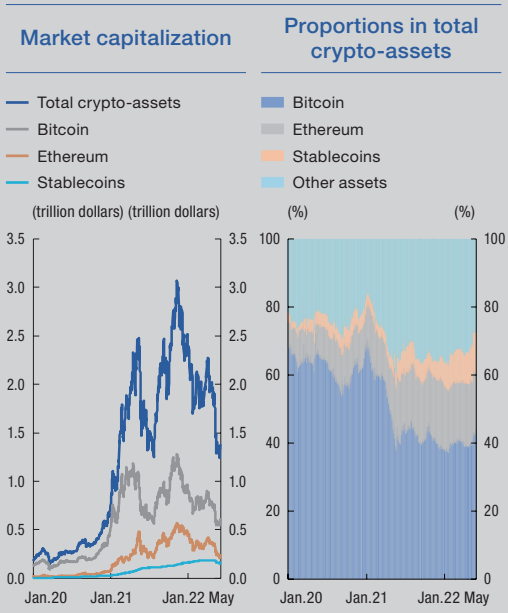
1) Stablecoins are cryptocurrencies that are pegged to a specific asset (usuallya fiat currency)to help stabilize their value. De-pegging means that the stablecoin's price becomes separated from the value of the linked asset (currency).

2) As key risk factors in the crypto-assets market, the Financial Stability Board (FSB) pointed out its structural vulnerabilities, the expandingconnection with the traditional financial system, and regulatory arbitrage (February 2022).

3) DeFi is a financial service for trading crypto-assets in which a transaction takes place without a central administrator, through the use of a smart contract programmed to work with a blockchain. Examples of DeFi services include yield farming in which users lend crypto-assets to generate returns and crypto-backed loans.

4) The total value locked (TVL) of DeFi has grown dramatically in recent years, by more than 390-fold, from USD 600 million (close to 696.6 billion won) at the end of 2019 to USD 235.6 billion (close to 280 trillion won) at the end of 2021. However, the sharp dropin cryptocurrency prices since early this year caused the TVL of DeFi to drop by 53% to USD 112.2 billion (close to 140 trillion won) by May 31, 2022 (DefiLlama).

Trends[1] of global crypto-asset markets



Note: 1) Stablecoins include the ten highest-ranked stablecoins in terms of market capitalization.
Source: CoinGecko.

Domestic Market

According to the Korea Financial Intelligence Unit(KoFIU), at the end of 2021, the total amount of crypto-assets held by domestic investors is about 55 trillion won,[5] equivalent to 2.1% of the domestic stock market capitalization (2,655 trillion won). If the recent drop in the value of global crypto-assets is taken into account, the domestic market capitalization of crypto-assets is likely to be close to 31 trillion won as of May 31, 2022.[6]

The share of major cryptocurrencies, such as Bitcoin and Ethereum, in the domestic market appeared to be relatively low compared to the global market. While Bitcoin and Ethereum respectively accounted for 37.9% and 19.0% of the global crypto market at the end of 2021, the corresponding shares were only 13.6% and 12.4% in the domestic market. This indicates that the proportion of crypto-assets with limited-market liquidity is relatively high in the domestic market. Meanwhile, the daily average value of crypto-asset transactions amounted to 11 trillion won (as of the 2nd half of 2021), corresponding to 20% of the market capitalization,[7] suggesting that a substantial portion of transactions are accounted for by trading aimed at taking advantage of short-term price fluctuations.

Key Risk Factors in the Recent Crypto-Assets Market

Continuation of High Price Volatility

Price volatility is much higher in crypto-assets compared to stocks and other risk assets, due to the inherent difficulty of valuation. Amid an increase in investors' aversion to risk assets since early this year, the U.S. S&P 500 index and the MSCI Emerging Market Index each fell 13% from the end of 2021. During the same period, Bitcoin

5) The data is from the "Survey of Virtual Asset service providers (2nd-Half 2021)," published by the Korea Financial Intelligence Unit(KoFIU). The results of this survey of domestic crypto-assets companies do not include the data of overseas exchanges or investors' assets stored in individual digital wallets. This survey is scheduled to be published twice annually, every half of the year.

6) The current value of crypto-assets was estimated by applying the global market capitalization reduction rate in the year-to-May 2022 to the domestic value sat the end of 2021, reported by the Korea Financial Intelligence Unit(KoFIU) for Bitcoin (7.5 trillion won), Ethereum (6.8 trillion won) and other miscellaneous crypto-assets (40.9 trillion won).

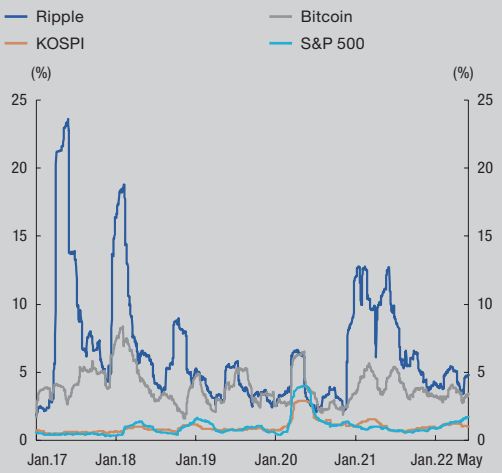
7) During the second half of 2021, the daily average value of transactions in the global crypto-asset market amounted to USD 131.4 billion, representing 5.7% of the total market capitalization at the end of 2021 (USD 2.3104 trillion). During the same period, the daily average value of transactions in the domestic stock market stood at 24 trillion won, about 0.9% of the market capitalization (2,655 trillion won)(CoinGecko, Statistics Korea).

lost 31% of its value, more than double the fall in the value of other risk assets (as of May 31, 2022).

Domestic investors are particularly heavily affected by the volatility of crypto-assets, due to the high share of assets other than Bitcoin and Ethereum. The high price volatility of these small-scale market capitalization cryptocurrencies could make losses worse for domestic investors. XRP (Ripple),[8] the third largest cryptocurrency in the domestic market, based on market capitalization, has lost 49% of its value this year (as of May 31, 2022).

In Korea, more than half of all crypto investors are people in their 30s and younger.[9] Therefore, the negative impact of losses in the volatile crypto-assets market might be concentrated on younger age groups' future income stream and consumption activity.

Trends of volatility[1] in crypto-asset prices and stock market indices



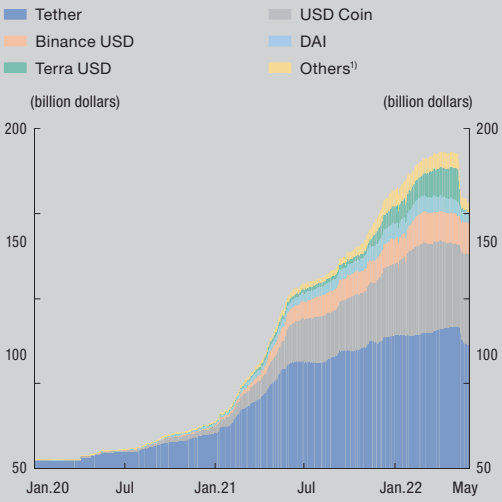
Note: 1) Volatility of daily rates of return (calculated by 60 days moving standard deviation).
Sources: CoinGecko, FRED, KRX.

Dwindling Confidence in the Price Stability of Stablecoins

Although stablecoins only account for about 10%[10] of the crypto market in market capitalization, they represent over 70% of the market in terms of use as a payment means.[11] Therefore, a decrease in confidence in the price stability of stablecoins can become a risk factor for the entire crypto-assets market.

8) XRP (Ripple) accounts for 10.2% of the domestic crypto-assets market, the third largest share after Bitcoin and Ethereum, while it only represents 1.7% of the global market (as of the end of 2021).
9) As of the end of 2021, cryptocurrency investors broke down by age as follows: 24% in their 20s and younger, 31% in their 30s, and 27% in their 40s. People in their 50s and 60s and older accounted for only a 14% and 4% share of total crypto investors, respectively (Korea Financial Intelligence Unit).
10) As of the end of April 2022, before the Terra USD collapse, the combined market capitalization of the top 10 stablecoins amounted to USD 186.1 billion, while the market capitalization of the overall crypto-assets market stood at USD 1.7847 trillion (CoinGecko).
11) In September 2021, around 75% of all trading on crypto trading platforms involved a stablecoin (FSB, Feb. 2022).

Trends of ten major stablecoins' market capitalization



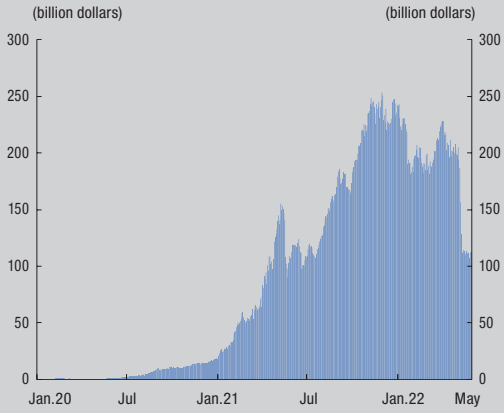
Note: 1) Sum of MIM, FRAX, TUSD, and USDN market capitalization.
Source: Coingecko.

The value of stablecoins is inherently unstable as they are not protected by a public safety mechanism such as deposit insurance or a lender of last resort. According to the method of guaranteeing price stability, stablecoins are divided into collateralized stablecoins and algorithmic stablecoins. Currently, there is no regulation regarding the composition of collateral assets used toback up collateralized stablecoins,[12] nor is there any audit or disclosure requirement for issuers of stablecoins. Therefore, there is a lack of transparency about collateral assets.[13] The level of confidence in price stability is even more questionable with algorithmic stablecoins, which are issued only based on the trust in the issuer without collateral. Recent "stablecoin runs" like the Terra USD collapsehave dramatically brought to the surface the intrinsic price instability of stablecoins.

Structural Vulnerabilities of DeFi

With the sharp growth of the total value locked in DeFi since 2020, its structural vulnerabilities, such as the accumulation of leverage and concentration, have increasingly become a risk.

Trends of DeFi total value[1] locked (TVL)



Note: 1) Total Value Locked, TVL
Source: DefiLlama.

Using a DeFi lending platform, crypto investors can continuously increase leverage.[14] For this reason, a drop in crypto-asset price can lead to a sudden liquidation of the collateralized cryp-

12) Examples include Tether, the stablecoin with the largest market capitalization; USD Coin (USDC);Binance USD; and DAI.
13) Although Tether Limited pledged to hold the entirety of its collateral assets in cash or cash-equivalent assets at the initial issuance of Tether, it did not keep this promise. In October 2021, it was found out that Tether Limited's collateral assets fell short of the total amount of Tether issued, the company was ordered by the Commodity Futures Trading Commission (CFTC) to pay fines totaling USD 41 million (about 50.5 billion won).
14) For example, an investor can borrow stablecoins from a DeFi platform by pledging crypto-assets as collateral and then purchase more crypto-assets using the borrowed stablecoins.
15) In May 2022, following a sharp drop in the prices of cryptocurrencies, DeFi lending platforms, including Anchor and COMP, liquidated close to USD 1.4 billion (nearly 1.7778 trillion won) worth of customer-pledged collateral (THE BLOCK).

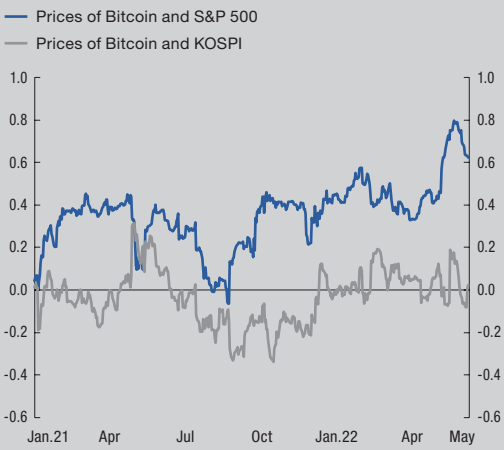
to-assets,[15] triggering a downward selling spiral and causing turmoil across the crypto ecosystem. However, there remains a lack of regulations to protect crypto investors from such risk.

Meanwhile, although intended as a decentralized financial space, DeFi is paradoxically faced with a significant level of concentration risk. DeFi relies heavily on a small number of blockchain technologies,[16] and the governance tokens[17] for decentralized decision-making are known to be in the hands of DeFi developers and a small number of market participants.[18]

Increasing Interface with the Financial Markets

Global financial institutions are growingly stepping into the crypto business in recent times[19] and rising numbers of investors are including crypto-assets in their portfolios.

Trends of correlation[1] between Bitcoin price and stock indices



Note: 1) Based on 60-day moving correlation coefficient of daily yield.
Sources: CoinGecko, KRX, FRED.

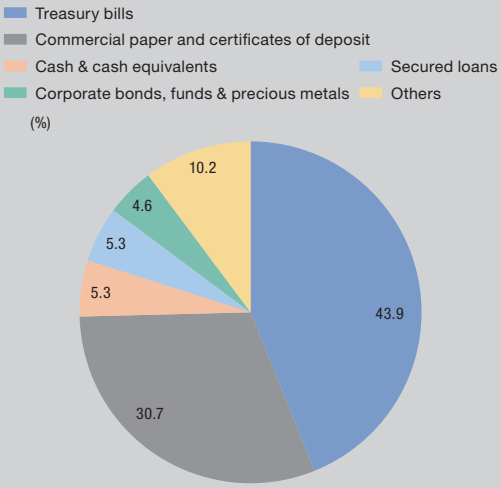
These connections between crypto-assets and mainstream finance have magnified the risk of transmission of price volatility from the crypto ecosystemtothe traditional financial markets. In 2021, crypto-assets transactions by companies jumped nearly 10-fold from 2020.[20] As a result, the prices of crypto-assets have recently been moving strongly in sync with stocks.

Meanwhile, Tether and some other collateralized stablecoins, which are backed by U.S. dollar-denominated financial assets, also act as a link between the financial system and the cryptoasset market. This means that a large wave of redemption requests on stablecoins could cause a massive selloff of collateral assets, potentially

16) At the end of 2020, 97% of all DeFi transactions were transactions in Ethereum. Ethereum continued to account for an important share of total DeFi transactions into 2021, amounting to 62% (as of the end of 2021, DefiLlama).
17) Tokens giving voting rights on DeFi services. The decision-making power of a DeFi participant is proportional to the number of governance tokens.
18) BIS (2021), “DeFi risks and the decentralisation illusion”, BIS Quarterly Review(2021.10)
19) Goldman Sachs, which became the first U.S. investment bank to open a cryptocurrency trading desk (Mar. 2022), recently started to issue crypto asset-backed loans (Apr. 2022). Other investment banks including Morgan Stanley and JP Morgan Chase made available cryptocurrency funds to their clients.
20) Corporate transactions in crypto-assets carried out on Coinbase, the largest U.S. crypto exchange, amounted to USD 120 billion in 2020 and rose to USD 1.1 trillion in 2021.

impacting the traditional financial markets.

Share[1] of stablecoin Tether's backed assets



Note: 1) End-2021 basis.
Source: Tether Limited.

In Korea, financial institutions' exposures to crypto-assets are limited as they are prohibited from directly owning or holding them.[21] Consequently, there is no strong correlation between the price of Bitcoin and domestic stock indices. However, domestic financial institutions have recently been acquiring stakes in crypto asset-related businesses or establishing joint-venture firms,[22] suggesting that the linkage between the crypto ecosystem and the financial markets will likely increase going forward.

Rising Cyber Risks

As cryptocurrencies are mostly traded and stored online, their increased use can lead to a rise in hacking and other forms of cyberattacks. Last year, the global value of crypto-assets stolen by hackers hit an all-time high of nearly USD 14 billion.[23] Cyberattacks targeting crypto exchanges,[24] digital wallets, or bridges connecting different blockchains,[25] are being continuously reported.

DeFi platforms, which have undergone rapid growth in recent years, use systems that are based on programming code. As a consequence, these platforms have facedanexplosionof fatal flaws in their code, and cyber-attackssuchasintroducing code bugs to steal crypto-assets. Investors have also suffered financial losses due to transaction delays, delays in depositing and withdrawing funds, and connection issues.[26]

In Korea, financial losses from cybercrimes re-

21) The government prohibits traditional financial companies from holding or purchasing crypto-assets, accepting crypto-assets as collateral, as well as investing in crypto firms (Dec. 13, 2017).
22) In 2020, KB Kookmin Bank established KODA, a digital asset custody firm, jointly with the blockchain firm Haechi Labs and the blockchain investment firm Hashed. In 2021, Hanwha Investment & Securities acquired a 6.14% stake in Dunamu, the company operating Upbit, Korea's largest cryptocurrency exchange.
23) "The 2022 Crypto Crime Report"(blockchain data platform Chainalysis).
24) Upbit (Nov. 2019, 58 billion won), the largest domestic cryptocurrency exchange, and Bithumb (Jun. 2018 and Mar. 2019, 33.6 billion won in total) have also suffered cyberattacks (Ministry of Government Legislation, "Trends in Virtual Asset Trading-related Legislations," 2021).
25) A special protocol, known as a "cross-chain bridge," is used to allow the exchange of information and cryptocurrencies between different blockchain networks. In March 2022, the Ronin Bridge, which connects Axie Infinity, a major P2E (play to earn) game (a game rewarding participants with digital cash or NFT tokens) with other blockchains, was hacked and USD 615 million worth of digital assets were stolen.
26) From 2019 to March 2022, incidents including transaction delays, connection issues, and pricing errors, were reported a total of 54 times at the top five domestic cryptocurrency exchanges (Upbit, Bithumb, Coinone, Korbit, and GOPAX) (Office of National Assemblyman Yun Chang-hyun, People Power Party).

lated to crypto-assets sharply increased by 15-fold, from 213.6 billion won in 2020 to 3.1282 trillion won in 2021.[27]

Implications

Although the crypto-assets market is significantly smaller than the stock market, the growing consensus among international organizations is that crypto-assets could become a threat to financial stability if the use of cryptocurrencies becomes more widespread and their linkage with traditional financial assets continues to be strengthened. In Korea where the linkage between crypto-assets and traditional financial assets is less extensive, their impact on financial stability islikelyto be more limited. Nevertheless, the correlation between the crypto-assets market and financial institutions must be continuously monitored.

As risks in the crypto-assets market are starting toemerge, governments around the world and international institutions[28] are discussing the regulation of cryptocurrencies. The sharp rise in the issuance of stablecoins and problems revealed through the Terra USD collapse and other similar incidents have led to an acceleration of legislative activity to regulate cryptocurrencies and more particularly stablecoins.[29]

In Korea, cryptocurrency-related regulations are currently centered on AML/CFT.[30] A comprehensive law to protect cryptocurrency investors is therefore yet to be put into place. Fortunately, however, several legislative bills are already pending at the National Assembly[31] and most of them include provisions related to the protection of investors, including the prohibition of unfair trading practices and market manipulation, information and disclosure requirements, and compensation for losses or damages.

Recent discussions on the regulation of the crypto-assets market

Country	Period	Discussion
Korea	May 2022	- The Presidential Transition Committee includes the enactment of 「the Basic Digital Assets Act」, which focuses on protecting crypto-assets investors, in policy tasks.
US	April 2022	- A Senator proposed a draft of the 「Stablecoin TRUST Act」, including related regulations such as the authority of issuing stablecoins.
EU	March 2022	- The draft MiCA(REGULATION on Markets in Crypto-assets, and amending Directive) regulation adopted by the European Parliament(under deliberation by the EU Council).
UK	April 2022	- HM Treasury announces plans to introduce legislation on stablecoins.

Souce : Governments and central banks.

27) National Police Agency press release (Mar. 30, 2022).

28) The Basel Committee on Banking Supervision (BCBS) is looking to reflect banks' crypto-asset exposures in the Basel Ⅲ regulatory framework, particularly in the capital adequacy requirement. Meanwhile, the Financial Action Task Force (FATF) released revised guidelines (Oct. 2021).

29) U.S. Secretary of the Treasury Janet Yellen stressed the need to regulate stablecoins by announcing that they pose a potential threat to the stability of the financial system (U.S. Senate Banking Committee hearing, May 10, 2022). Koh Seung-beom, the Chairman of the Financial Services Commission, stated that the legislation of the Framework Act on Digital Assets should be accompanied by discussions about a regulatory system and approach for stablecoins (May 17, 2022, National Policy Committee).

30) The recently enacted Act on Reporting and Use of Certain Financial Transaction Information (entry into force on Mar. 25, 2021) requires crypto-asset companies to report to the Korea Financial Intelligence Unit and imposes on them the obligation to undertake certain actions to prevent money laundering.

31) As of May 2022, several legislative bills are pending to enact new laws to regulate crypto-assets or amend existing laws, such as the Electronic Financial Transactions Act and the Act on Reporting and Use of Certain Financial Transaction Information, by adding new crypto-asset-related provisions.

BOK plans to continue to participate in international discussions related to the crypto-asset-market and confer and cooperate with the domestic authorities in related policymaking efforts. As an institution mandated to ensure financial stability, the BOK will carefully review risk factors in the crypto-assets market and make active efforts to identify and eliminate risks by closely working with financial institutions.

Analysis of Financial Stability Issues

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I. Impact of the Accelerated Monetary Policy Normalization of the US Federal Reserve on the Soundness of NBFIs

1. Background
2. Accelerated Monetary Policy Normalization by the US Federal Reserve and Impact on Financial Markets
3. Impact of Market Shock on the Soundness of NBFIs
4. Policy Implications

1. Background

Recently, as the monetary policy normalization by the US Federal Reserve has been proceeding more rapidly than expected, the volatility of price variables such as interest rates, exchange rates, and stock prices in domestic and international financial markets has increased dramatically. If the current global inflationary pressure persists, amid the acceleration of the US Fed's monetary policy normalization, volatility may rise further due to the reduction of global dollar liquidity in domestic and international financial markets and increased risk averseness.

In particular, with the global persistence of accommodative monetary policy for a long period of time and provision of financial support to cope with the COVID-19 pandemic, domestic non-bank financial institutions (NBFIs) have expanded their investment in risky assets and credit supply to vulnerable sectors. Thus, the impact of the US Federal Reserve's federal funds rate may be more significant than expected. Moreover, since NBFIs have achieved remarkable growth by focusing on high-risk, high-return investments and made significant contributions to strengthening the interconnectedness between financial institutions, it is more likely that the defaults of NBFIs will generate systemic risk.

Hereunder, this section examines the impact of the accelerated monetary policy normalization of the US Federal Reserve on the soundness of domestic NBFIs through shocks on domestic and overseas financial markets, with a focus on potential risks and implications.

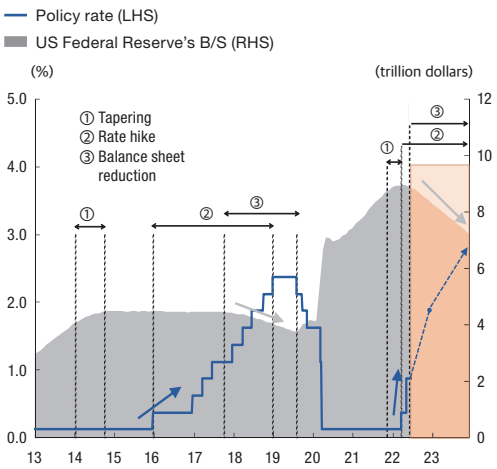
2. Accelerated Monetary Policy Normalization by the US Federal Reserve and Impact on Financial Markets

Recently, the US Federal Reserve's monetary policy normalization has been progressing at a remarkably quick pace. The Fed unexpectedly started tapering in November 2021 and raised the policy interest rate by 25bp in March this year[1] as concern over inflation jumped sharply due to the disruption of the global supply chain caused by the war in Ukraine and COVID-19 while US employment indicators were showing a solid recovery. In May, the Fed raised the policy interest rate by as much as 50bp for the first time since May 2000, and is now accelerat-

1) When discussion on tapering began at the FOMC meeting in June 2021, financial markets expected the tapering to start as late as the end of 2021, followed by interest rate hikes in the second half of 2022.

ing its monetary policy normalization through additional policy interest rate hikes[2] and curtailing the size of its balance sheet. The rate at which this normalization is occurring is much higher than that of the monetary policy normalization that took place between 2014 and 2019[3] (Figure Ⅰ-1, Table Ⅰ-1).

Figure Ⅰ-1. US Federal Reserve's recent monetary policy normalization and the process of monetary policy normalization after the global financial crisis[1]



Notes: 1) The shades of orange indicate the future plans of and projections for the US Federal Reserve.
Sources: US Federal Reserve.

Table Ⅰ-1. A comparison of the US Federal Reserve's monetary policy normalization after the global financial crisis and recent times

	After the GFC	Recent times
① Tapering[1]	Reduction of asset purchases by $10 billion each on 7 occasions between January and October 2014	Reduction of asset purchases by $15 billion per month since November 2021 and $30 billion per month since January 2022
② Rate hikes	A total of 9 policy rate hikes from December 2015 to December 2018, 25bp each (+225bp)	25bp policy rate hike in March 2022, 50bp policy rate hike in May 2022
③ Balance Sheet Reduction[1]	Reduction by $10 billion per month from October 2017, increase of scale by $10 billion every 3 months, reduction by $50 billion per month between October 2015 and July 2019	Reduction by $47.5 billion per month from June 2022, plan to reduce by $95 billion per month from September 2022

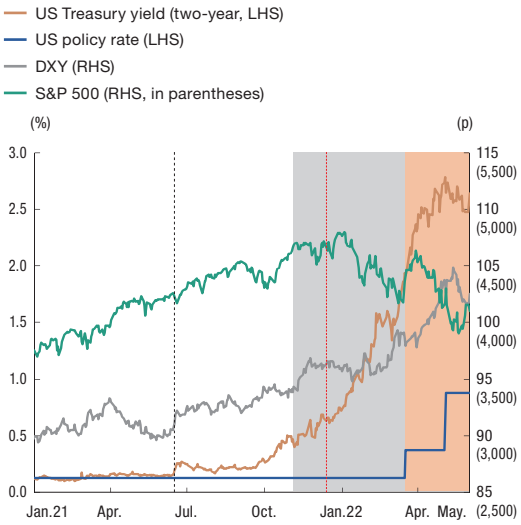
Note: 1) The amount is based on the maximum plan.
Source: US Federal Reserve.

As a result, price variables fluctuated by a wide margin due to the growing risk averseness in financial markets at home and abroad. In international financial markets, the US Treasury yield (two-year) rose gradually after the FOMC meeting in June 2021, when the Fed first mentioned tapering,[4] and increased steeply[5] after the FOMC meeting in December.[6] The US dollar (DXY) rose gradually after the June 2021 FOMC meeting, and increased dramatically after the federal funds rate hike

2) In June 2022, it took the giant step of implementing an increase of 75bp. However, the analysis of this Financial Stability Report covered the period until only May 2022.
3) Between 2014 and 2019, monetary policy normalization proceeded gradually. After two years following the start of tapering, the policy rate was raised four times, by 25bp each,over a period of one year and 10 months, after which the balance sheet began to shrink.
4) At the press conference of the FOMC meeting in June 2021 (June 15 to 16), Chairman Powell confirmed that the necessity of tapering had been discussed.
5) The US Treasury yield (two-year) rose by 212bp from 0.66% on December 15, 2021, to 2.78% on May 3, 2022 (highest recorded since December 5, 2018).
6) At the FOMC meeting in December 2021 (December 14 to 15), the US Federal Reserve increased the magnitude of tapering from USD 15 billion to USD 30 billion a month and withdrew its previous assessment that inflation was attributable to transitory factors.

in March[7] but declined slightly after May 12, 2022. US stock prices (S&P500) reached a record high on January 2, 2022, and plunged sharply thereafter (Figure Ⅰ-2).

Figure Ⅰ-2. Recent movements in US financial market prices[1)2)]

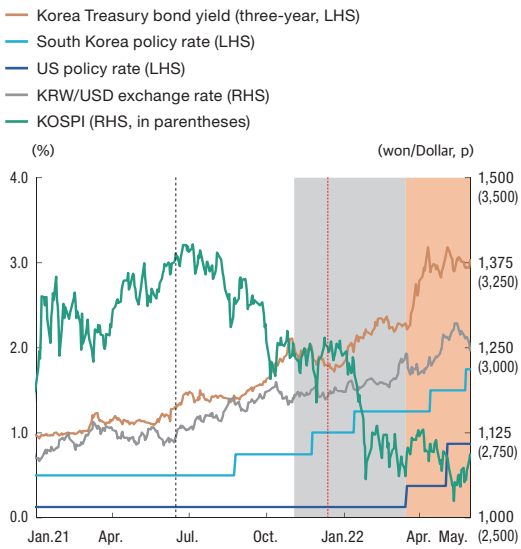


Notes: 1) The shades of gray indicate times of tapering, and shades of orange indicate times of the US Federal Reserve's policy rate hikes.
2) The black dotted line indicates the first mention of tapering (June 2022, FOMC) and the red dotted line indicates the beginning of acceleration of the US Federal Reserve's monetary policy normalization.

Source: Bloomberg.

Domestic financial markets moved largely in tandem with[8] global financial markets, with the Treasury bond yield (three-year) and exchange rate rising sharply and stock prices tumbling. The Treasury bond yield (three-year) rose by 190bp from 1.29% on June 16, 2021, to 3.19%[9] on April 11, 2022, as a Base Rate hike by the Bank of Korea was combined with the accelerating pace of the US Fed's monetary policy normalization. The KRW/USD exchange rate rose gradually with the stronger US dollar and jumped significantly after the interest rate hike by the Fed in March 2022. Stock prices (KOSPI) declined in the second half of 2021 and fell even faster along with the sharp decline in US stock prices after the FOMC meeting in December 2021 (Figure Ⅰ-3).

Figure Ⅰ-3. Recent movements[1)2)] in domestic financial market prices



Notes: 1) The shades of gray indicate times of tapering, and shades of orange indicate times of the US Federal Reserve's policy rate hikes.
2) The black dotted line indicates the first mention of tapering (June 2022, FOMC) and the red dotted line indicates the beginning of acceleration of the US Federal Reserve's monetary policy normalization.

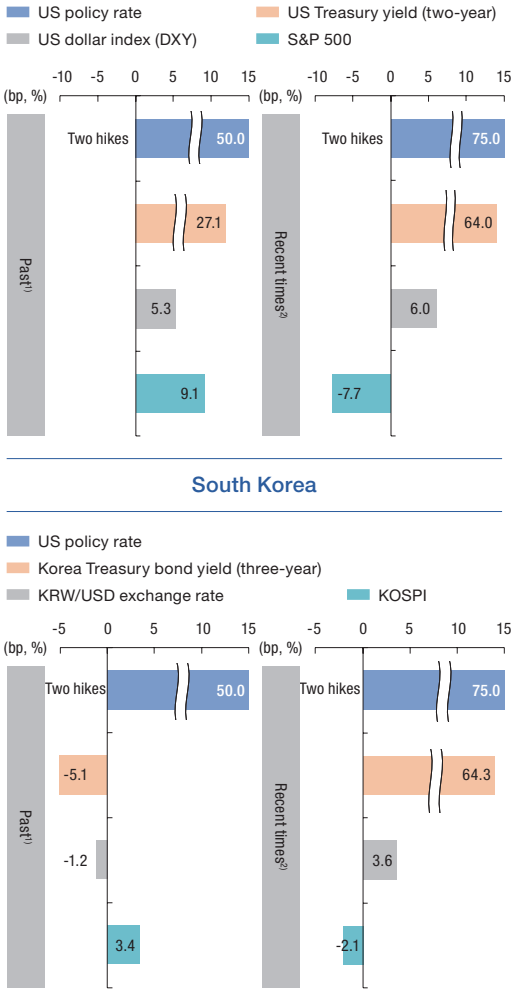
Sources: Bank of Korea, Bloomberg.

These shocks to domestic and overseas financial markets are drastically different from the monetary policy normalization seen after the global financial crisis. After the global financial crisis, the US Fed raised the policy

7) The US Dollar (DXY) appreciated by 6.3% in a short period of time from the March FOMC meeting (March 15 to 16) until May 12.
8) The IMF assessed that the unexpected policy rate hike by the US Federal Reserve had a greater spillover effect on the global financial markets than expected (WP/16/195, 2016).
9) That is the highest level since the 3.19% recorded on July 11, 2012.

rate twice (total 50bp), during which time the Treasury yield (two-year) rose by only 27bp and stock prices climbed by 9.1%. In domestic financial markets, the Treasury bond yield (three-year) and KRW/USD exchange rate edged down by 5bp and 1.2%, respectively, with stock prices (KOSPI) inching up by 3.4%[10] (Figure Ⅰ-4).

Figure Ⅰ-4. Movements in the US and domestic market prices of times of the US Federal Reserve's policy rate hikes



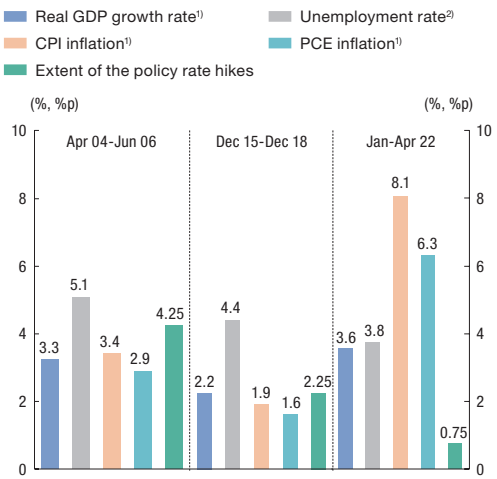
Notes: 1) One year after the US Federal Reserve's first rate hike after the global financial crisis (15.12.16.~16.12.15.).
2) Two months after the US Federal Reserve's first rate hike this year (22.3.16.~22.5.13.).
Sources: Bank of Korea, Bloomberg.

The monetary policy normalization of the US Federal Reserve is expected to proceed rapidly and interest rates to rise by a wider margin. Chairman Powell mentioned the possibility of more and even greater hikes, and the median policy rate predicted by FOMC participants

10) Bank of Korea lowered the Base Rate by 25bp in June 2016, after the US Federal Reserve raised its policy rate in December 2015.

(based on the June FOMC meeting) stood at 3.4% (up to 3.9%) at the end of 2022 and 3.8% (up to 4.4%) at the end of 2023. The latest inflation is causing more concern than the inflation seen during the 2004-2006 period, when the US Fed gradually raised the policy rate by as much as +425bp[11] amid the persistent inflationary pressure (Figure Ⅰ-5). Driven by the rise of raw material prices associated with the global supply chain disruptions and agflation,[12] inflationary pressure is likely to persist for a considerable period of time.

Figure Ⅰ-5. Extent of the US Federal Reserve's policy rate hikes in the past and major economic indicators



Notes: 1) Average of YoY rates of increase during the period.
2) Monthly average during the period.
Source: Bloomberg.

As a result, domestic and overseas financial markets are likely to experience a more significant contraction of investment sentiment compared to past periods of US policy rate hikes, amid the surging volatility of financial price variables such as interest rates, exchange rates, and stock prices.[13] Domestic market interest rates may face greater upward pressure due to the high domestic inflationary pressure compared to average years, coupled with the US monetary policy normalization. If the current global supply chain disruptions persist due to the protracted war in Ukraine and unrest breaks out in emerging markets, including China, it may lead to escalated volatility in domestic and overseas financial markets and expansion of financial unrest.

3. Impact of Market Shock on the Soundness of NBFIs

The escalation of volatility in domestic and overseas financial markets driven by the accelerated monetary policy normalization of the US Federal Reserve, protracted global geopolitical risks, and unrest in emerging markets may lead NBFIs to be exposed to market risk, liquidity risk, and credit risk, along with the movement of price variables such as interest rates, exchange rates, and stock prices, as they are relatively more vulnerable to external shocks than banks.

A. Major Potential Risks

Surge in liquidity risk of securities companies and credit-specialized financial companies

11) The US Federal Reserve raised the policy rate 17 times from June 2004 to June 2006, by a total of 425bp. Unlike it recent moves, however, the Fed raised the policy rate gradually over that period of time while maintaining close communication with markets.

12) Recently, international food prices have increased significantly due to the war in Ukraine and export restrictions put in place by major economies, and the upward movement is highly likely to persist due to poor harvests caused by abnormal climate conditions as well as structural factors such as the deterioration of food supply and demand and higher production costs.

If interest rates rise sharply over a short period and stock prices continue falling, undermining the flow of funds in financial markets, securities companies and credit-specialized financial companies (CSFCs) may face growing liquidity risk.

Securities companies have invested funds raised through short-term marketable instruments (56.1% of borrowings as of the end of 2021) in long-term bonds (41.0% of assets as of the end of 2021), and the liquidity risk is significant, considering the maturity mismatch between assets and liabilities (Figure Ⅰ-6). In particular, since funds raised through RPs sold, which is extremely short-term marketable borrowing, occupy a largeshare (73.8% as of the end of 2021), securities companies may face arisk of RP rollover in the event of market unrest, and if the value of securities offered for RPs sold falls due to an increase in interest rates, securities companies may have greater demand for liquidity to secure more collateral.[14] Debt guarantees of securities companies (KRW 43.6 trillion as of the end of 2021) may trigger additional demand for liquidity, and particularly, debt guarantees related to real estate PF (KRW 24.3 trillion) will likely lead to the fulfillment of guaranteed debt obligations if the real estate sector turns sluggish[15] (Figure Ⅰ-6). Moreover, in the event of a dramatic decline in global stock prices, liquidity demand due to margin calls[16] related to the self-hedging of equity-linked securities (ELS) is likely to increase. Although securities companies have decreased their balances of ELS issued due to the tightening of regulations in the wake of the ELS margin call incident in March 2020 and increased foreign currency cash assets, the share of self-hedging that caused margin callsin the past increased (Figure Ⅰ-6). A total of 14 securities companies have seen the share of their self-hedging against the balance of ELS they issued exceed 60%,[17] which is a risky level.

13) The impact of US policy rate hikes on the price variables of domestic financial markets was estimated using a VAR model, which found that a 1%p increase in US interest rates caused the domestic market interest rate (Treasury bond yield, three-year) to climb by as much as 0.4%p over six months, while stock prices (KOSPI) declined by a monthly average of 4.1% and the exchange rate climbed by a monthly average of 0.5%.
■ Model equation: $Y_t = \beta_1 Y_{t-1} + \cdots + \beta_3 Y_{t-3} + \delta X_t + \gamma' Z_t + \epsilon_t$
- Y: [US consumer price index, US producer price index, Korea consumer price index, Korea industrial production index, Korea Treasury bond yield (three-year), KOSPI, KRW/USD exchange rate], X: US shadow rate (proxy variable in place of policy rate), Z: constant term, drift term, and monthly dummy variable
- The period of analysis was from January 2014 to April 2022, and growth rates over the previous month were used for all variables except the interest rate.

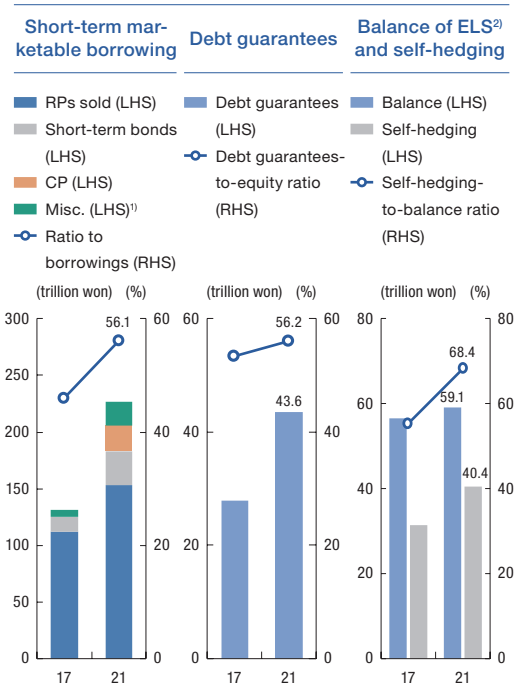
14) From September 2020, a guideline was issued to allow RP-buying institutions to apply a varying margin requirement of 103% to 120%, depending on the credit ratings of securities offered as collateral and the selling institution.

15) Due to the bearish investor sentiment amid the spread of COVID-19 in March 2020 whenreal estate project finance asset-backed securities became difficult to roll over, securities companies under wrote securities that failed to roll over, and their payments to fulfill guaranteed debt obligations soared to KRW 1.9 trillion (payment rate: 13.1%).

16) Securities companies issue domestic ELSs and hedge them with overseas financial derivatives. If the value of the underlying assets (stock prices overseas) falls sharply, they are required to provide additional margin (margin call). Securities companies faced a shortage of foreign currency liquidity due to margin calls (about KRW 1 billion) when global stock prices plunged in March 2020.

17) Some credit rating companies assess that if the self-hedging of derivatives-linked securities issued by a securities company exceeds 60% of the total, its exposure is relatively large. (“Assessment of risk factors for large securities companies due to the escalation of financial market variability,” May 2020, NICE Investors Service)

Figure Ⅰ-6. Liquidity risk exposure of securities companies



Notes: 1) Call money and outstanding bills.
2) Including ELB.

Sources: Financial institutions' business reports, Infomax (CP, short-term bonds).

It is also concerning that the liquidity ratio of securities companies recently dropped as liquid debts such as RPs sold increased significantly. The liquidity ratio and adjusted liquidity ratio of securities companies fell from 143.6% and 121.8%, respectively, at the end of 2015 to 127.7% and 111.1% at the end of 2021. In particular, the adjusted liquidity ratio, including contingent liabilities for some securities companies, was below 105%, approaching the supervisory requirement (100%), at the end of 2021.[18)]

Meanwhile, CSFCs may experience fundraising difficulties in the event of a market shock as they raise funds through the issuance of bonds or borrowing from financial institutions.[19)] Bonds issued by CSFCs set to mature in the next two years amount to KRW 50 to 70 trillion annually. In particular, as for CSFCs with lower credit standing (BBB or lower[20)]), the share of short-term borrowing (30.5%) is not small, meaning that their rollover risk may be significant (Figure Ⅰ-7). Furthermore, CSFCs with low credit standing have a much lower immediately available liquidity ratio,[21)] which measures a company's ability to meet its short-term obligations.

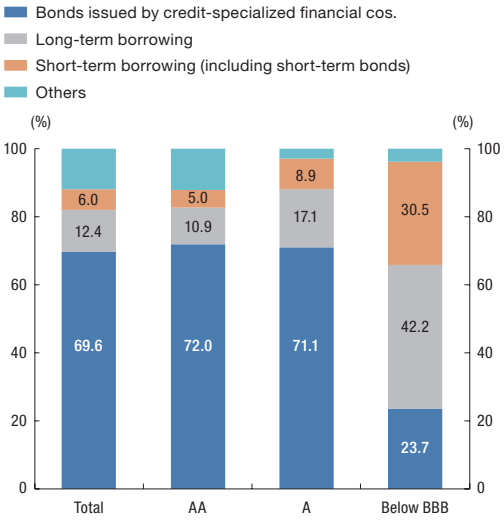
18) Since December 2020, financial authorities have strengthened the risk management and monitoring of securities companies whose adjusted liquidity ratio is less than 100%.

19) In March 2020, when financial instability deepened amid COVID-19, liquidity in financial markets deteriorated due to ELS-related margin call incidents at securities companies, and the interest rate spread of bonds issued by CSFCs (A+, three-year) (against three-year Treasury bonds) widened substantially (76bp on March 9, 2020 → 119bp on April 9), exacerbating the problem of bonds issued by CSFCs.

20) All credit card companies have a credit rating of AA, and CSFCs with a credit rating of BBB or lower are all capital companies.

21) At the end of the first quarter of 2022, CSFCs with a low credit rating had an immediately available liquidity ratio (liquid assets/liabilities maturing in one month) of 199.2%, lower than other institutions (AA: 407.4%, A: 322.4%), showing an insufficient ability to meet their short-term liabilities.

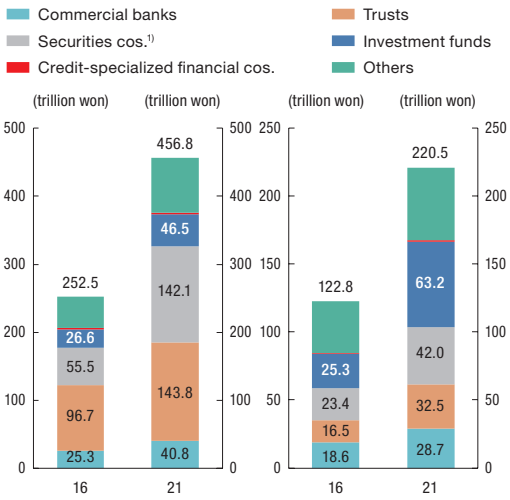
Figure Ⅰ-7. Fundraising structure by credit rating of credit-specialized financial companies[1)]



Note: 1) As of the end of 2021.
Sources: Financial institutions' business reports.

In addition, since securities companies and CSFCs raise most of their funds from securities companies, trusts, and investment funds, the liquidity risk of such companies may further rise if a large amount of funds exits from investment funds and trusts amid market unrest (Figure Ⅰ-8).

Figure Ⅰ-8. Fundraising sector of by securities companies and credit-specialized financial companies



Note: 1) Including Korea Securities Finance Corp.
Source: Bank of Korea.

Increase in market risk of securities and insurance companies

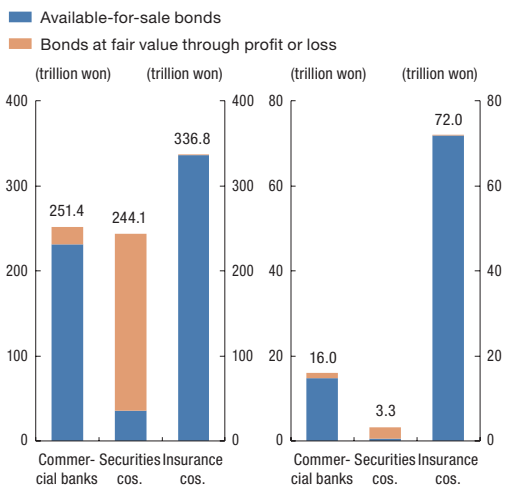
If bond and stock prices fall sharply over a short period, securities and insurance companies may experience reduced profitability and capital adequacy due to valuation losses[22)] on securities held.

As of the end of 2021, the value of bonds held by securities and insurance companies subject to fair valuation was KRW 244.1 trillion and KRW 336.8 trillion, respectively, and if the market interest rate rose by 100 to 200bp, it was estimated that such companies would suffer valuation losses of KRW 1.6 to 3.3 tril-

22) Securities held are divided into securities at fair value through profit or loss (securities designated at fair value through profit or loss, held-for-trading securities), available-for-sale securities, and held-to-maturity securities. Valuation gains/losses of securities at fair value through profit or loss are reflected in capital through income/loss in the current period, and valuation gains/losses of available-for-sale securities are directly reflected in capital. Held-to-maturity securities are not applicable as they are reported at cost.

lion and KRW 36.0 to 72.0 trillion, respectively[23)24)] (Figure Ⅰ-9).

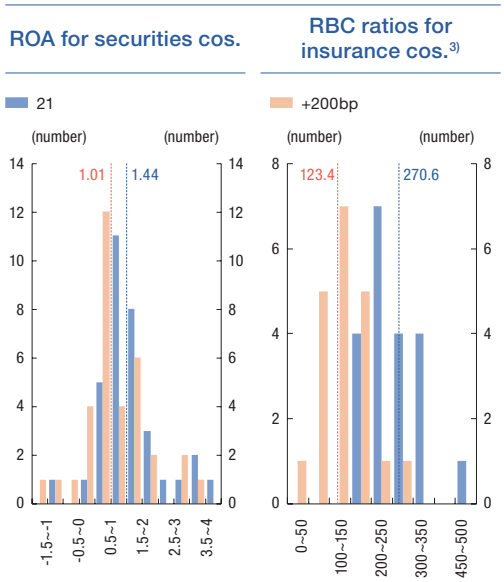
Figure Ⅰ-9. Current status of bond holdings and estimated bond valuation loss by sector



Notes: 1) As of the end of 2021.
2) Based on 200bp increase.
Sources: Bank of Korea staff calculation, Financial institutions' business reports.

Due to valuation losses on bonds, the return on assets (ROA) of securities companies is expected to decline by 0.21 to 0.43%p, and the risk-based capital (RBC) ratio of insurance companies will likely fall by 74 to 147%p.[25)26)] Regarding the distribution of the ROA of securities companies and RBC ratios of insurance companies in relation to bond valuation loss, a rise in the market interest rate of 200bp would lead to the ROA of two securities companies falling to a negative number and the RBC ratios of six insurance companies dropping under the regulatory ratio (100%) (Figure Ⅰ-10).

Figure Ⅰ-10. Changes[1)] in the distribution of ROA for securities companies and RBC ratios for insurance companies due to bond valuation loss[2)]



Notes: 1) The dotted lines and numbers indicate the average value for each distribution.
2) Based on 200bp increase.
3) Excluding 3 companies whose RBC ratios fall below 0.
Source: Bank of Korea staff calculation.

23) The analysis was conducted for 34 securities companies and 23 insurance companies that held bonds to be assessed at fair value. It was assumed that the size of the bonds held at the end of 2021 and the duration after hedge remained unchanged, and that the market interest rates at home and abroad rose by the same margin.

24) The size of bond valuation loss is in proportion to the duration. The duration for securities companies (0.7 years at the end of 2021, after hedge) was much shorter than that of insurance companies (10.9 years), and thus the bond valuation loss of securities companies was smaller.

25) Assuming that total assets and required capital remain constant, the change in ROA (net income/total assets) associated with a decrease in net income and available capital and the change in the RBC ratio (available capital/required capital) were estimated respectively.

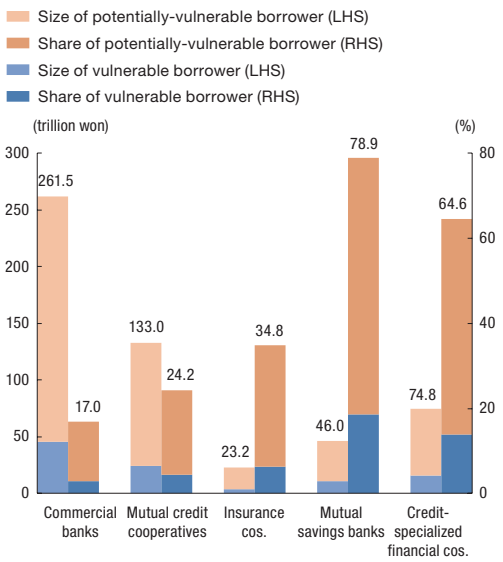
26) However, for insurance companies, the duration of assets is longer than that of liabilities, and thus after the introduction of the new solvency requirement regime (K-ICS) in 2023, the RBC ratio may improve along with the rise in market interest rates.

Meanwhile, in the event of a fall in stock prices, insurance and securities companies are likely to sustain a relatively significant impact on the valuation loss of stocks held.[27] In the event of a 20% decline in stock prices, the stock valuation losses of insurance and securities companies are estimated at KRW 9.2 trillion and KRW 4.9 trillion, respectively.[28]

Growing credit risk of savings banks and credit-specialized financial companies

If market interest rates continue rising, the soundness of household loans issued by NBFIs, such as savings banks and CSFCs (including sole proprietor loans of self-employed business owners) may deteriorate significantly. As of the end of 2021, the value of loans extended to the vulnerable household sector[29] by savings banks and CSFCs amounted to KRW 46.0 trillion and KRW 74.8 trillion, respectively, which accounted for the majority of household loans extended by these institutions (savings banks: 78.9%, CSFCs: 64.6%) (Figure Ⅰ-11).

Figure Ⅰ-11. Size and share[1] of loans to vulnerable households by sector



Note: 1) Ratio to total amount of household loans (including sole proprietor loans, as of the end of 2021).
Source: Bank of Korea (Consumer Credit Panel)

With the recent surge in interest rates, the delinquency rate of household loans extended by savings banks with the highest share of total loans to the vulnerable household sector is rising. The delinquency rate of sole proprietor loans seems to be stable, but this is likely largely attributable to the government's provision of financial support for loan maturity extension in relation to COVID-19, and going forward, the delinquency rate will likely climb (Figure Ⅰ-12).

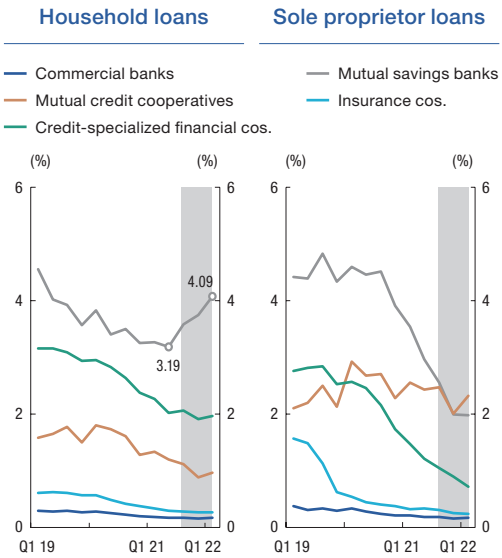
27) As of the end of 2021, the value of stocks held amounted to KRW 46.0 trillion (4.6% of total assets) for insurance companies and KRW 24.5 trillion (4.0% of total assets) for securities companies. The stock holdings of other financial institutions such as banks (KRW 2.9 trillion) and savings banks (KRW 0.9 trillion) were relatively small.

28) Here, the stock price decline was applied based on the assumption that the size of stocks held at the end of 2021 was unchanged.

29) This section defined the vulnerable household sector as vulnerable borrowers (multiple debts with low credit ratings or low income) and potentially-vulnerable borrowers (multiple debts with middle-income or middle credit ratings or dual debts with low income or low credit ratings).

30) This refers to loans extended to real estate businesses (real estate rental and supply and real estate-related services) and construction businesses. Real estate PF loans are included in real estate-related corporate loans.

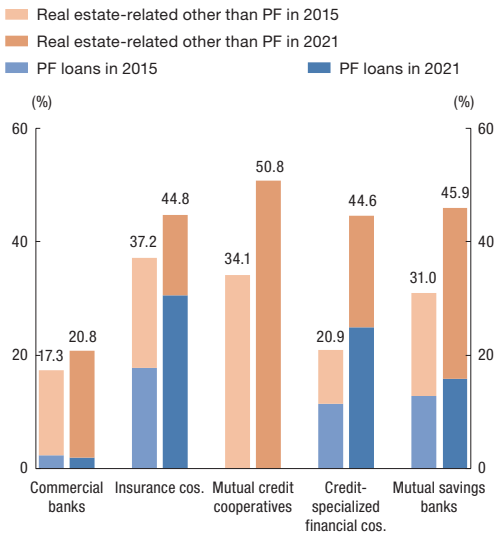
Figure Ⅰ-12. Delinquency rate[1] on household and sole proprietor loans by sector



Note: 1) The shades indicate the period of recent policy rate hikes in Korea.

Sources: Financial institutions' business reports.

Figure Ⅰ-13. Share[1)2)] of real estate-related corporate loans by sector

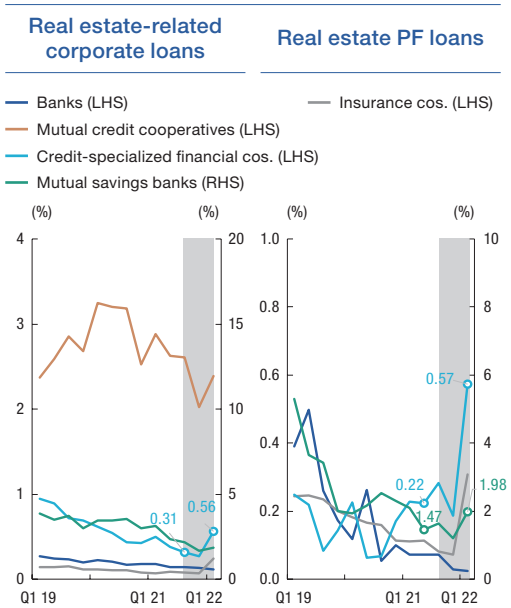


Notes: 1) Compared to the total amount (as of the end of the year) of corporate loans by sector.
2) Mutual credit cooperative loans cannot be classified as PF due to lack of statistics.

Sources: Financial institutions' business reports

If the real estate sector deteriorates amid increasingly large interest rate hikes, the credit risk of corporate loans[30] related to real estate for NBFIs may increase. From 2016 to 2021, corporate loans related to real estate extended by NBFIs increased at a much faster pace than for banks, with their share of corporate loans related to real estate out of total corporate loans approaching 50% (Figure Ⅰ-13). In particular, real estate PF loans, which carry larger individual loan amounts and repayment uncertainty, increased substantially for NBFIs. This means that such institutions will be more vulnerable when the real estate sector retreats. With the recent uptick in market interest rates, the delinquency rate of real estate-related corporate loans extended by CSFCs rose moderately, and the delinquency rate of real estate PF loans extended mostly by CSFCs and savings banks is also climbing (Figure Ⅰ-14).

Figure Ⅰ-14. Delinquency rate[1] of real estate-related corporate loans and PF loans by sector



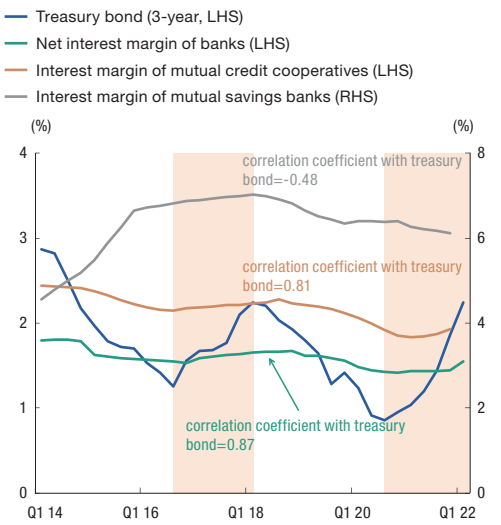
Note: 1) The shades indicate the period of recent policy rate hikes in Korea.

Sources: Financial institutions' business reports.

Shrinking interest margin of savings banks and credit-specialized financial companies

If the rise in market interest rates continues, mutual credit cooperatives, among deposit-taking institutions, are expected to see their interest margin widen, while that of savings banks is likely to narrow. This is attributable to the fact that, while mutual credit cooperatives have a higher share of loans with floating interest rates (84.7%), which are sensitive to the movement of market interest rates, savings banks have a higher share of loans with fixed interest rates[31] (84.1%), with loan interest rates being distributed around the legal maximum rate (20%),[32] leaving little room for higher loan interest rates. In fact, during the past period of rising interest rates, the interest margin of mutual credit cooperatives rose, while that of savings banks fell. Between the first quarter of 2014 and the first quarter of 2022, the correlation between the Treasury bond interest rate and interest margin was highly positive for mutual credit cooperatives and negative for savings banks (Figure Ⅰ-15).

Figure Ⅰ-15. Market interest rate and interest margin[1)2)] of deposit-taking institutions



Notes: 1) 4-quarter moving average of annualized interest profit and loss per total assets in case of mutual credit cooperatives and mutual savings banks.
2) Shaded area indicates a period of rising interest rates on treasury bonds.

Sources: Financial institutions' business reports, Korea Financial Investment Association.

Meanwhile, as CSFCs rely significantly on wholesale funding, higher market interest rates are immediately reflected in funding costs, but the loan interest rate hike is limited as their current rates remain at a high level,[33] leading to a reduced interest margin. For insurance companies, on the other hand, the interest rate sensitivity of return on operating assets(profits) is larger than that of the interest rate for insurance premiums reserves, which

31) Most loans issued by savings banks are either amortized loans with fixed rates and maturities of over one year or bullet loans with fixed rates and maturities of less than one year. As the increase in the interest rate is limited by the legal maximum interest rate, fixed interest rate loans are favorable for savings banks.

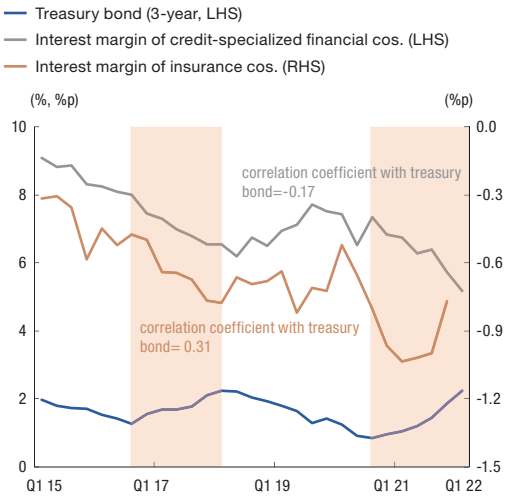
32) New unsecured loans with interest rates of 15 to 20% extended by savings banks in March 2022 amounted to KRW 0.7 trillion, accounting for 43.1% of total loans.

33) New household unsecured loans (including card loans) extended by four credit card companies during the fourth quarter of 2021 carried an average interest rate of 17 to 19% for borrowers with credit ratings of 6 to 10.

34) Insurance premium reserve refers to the amount of premium income insurance companies set aside to prepare for the payment of insurance money. The interest rate for the insurance premium reserves the average return to be paid to policy holders by insurance companies.

varies depending on the insurance product marketing strategy[34] (cost), and the interest margin[35] is likely to improve. During the past period of rising interest rates, the interest margin of CSFCs shrank, andt hat of insurance companies widened. Between the first quarter of 2015 and the first quarter of 2022, while the correlation coefficient between the Treasury bond yield and interest margin was weakly negative for CSFCs, it was positive for insurance companies (Figure Ⅰ-16).

Figure Ⅰ-16. Market interest rate and interest margin[1] of credit-specialized financial companies and insurance companies[2][3]



Notes: 1) Interest revenues per loan asset - interest rates on 3-year credit-specialized financial company bonds (A+).
2) For insurance companies, based on returns on operating assets - levy on premium reserves.
3) Shaded area indicates a period of rising interest rates on treasury bonds.

Sources: Financial institutions' business reports, Korea Financial Investment Association.

Increased risk related to insurance companies' exchange rate hedging

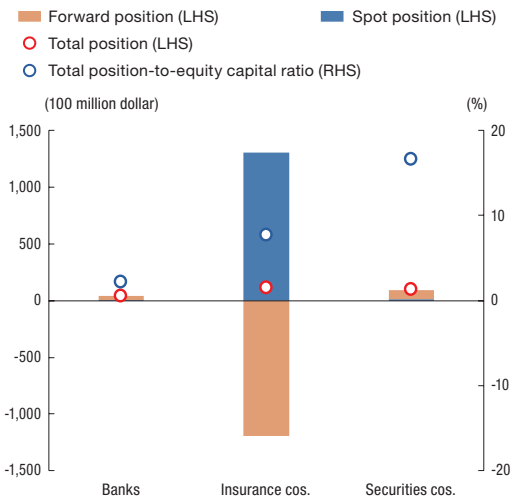
As domestic financial institutions do not have significant exposure to foreign exchange,[36] they are not very sensitive to exchange rate fluctuations. However, risks related to hedging of the foreign exchange of insurance companies may increase in the event of rising exchange rates. Domestic banks and securities companies maintain a balance between their foreign currency assets and foreign currency liabilities in terms of both spot and forward positions. However, insurance companies have more assets than liabilities in the spot position and more liabilities than assets in the forward position (Figure Ⅰ-17). This is largely attributed to the fact that insurance companies expanded their overseas investment[37] in foreign currency bonds with longer maturities in order to improve yields and manage interest rate risk, and hedged against exchange rate risk through short-term forward transactions.

35) This refers to the difference between the return on assets and the interest rate for the premium reserve.

36) Total position = spot position (spot foreign currency assets - liabilities) + forward position (forward foreign currency assets - liabilities).

37) Overseas investment of insurance companies rose from KRW 61.2 trillion at the end of 2015 to KRW 123.8 trillion at the end of 2021, comprising bonds (85.8%), stocks (1.2%), and alternative investments (13.0%).

Figure Ⅰ-17. Foreign exchange position[1] of domestic financial institutions

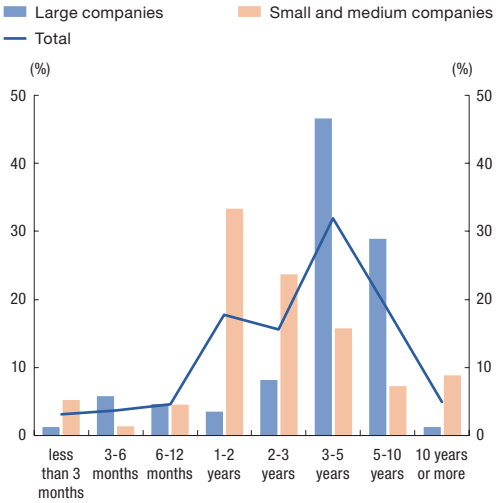


Note: 1) The data for banks are based on the end of February 2022 and those for insurance companies and securities companies are based on the end of 2021.

Sources: Bank of Korea.

As a result, in the event of maturity extension of forward exchange transactions through swap agreements, the costs of foreign exchange hedging[38] will likely rise due to the decline in the swap rate,[39] and rollover risk will climb in the case of a foreign currency liquidity crunch. In particular, because the maturities of foreign exchange hedge transactions of small- and medium-sized life insurance companies are relatively short, the hedging costs and rollover risk are likely to be high (Figure Ⅰ-18).

Figure Ⅰ-18. Maturity structure[1] of insurance companies' foreign exchange hedging



Notes: 1) Based on maturity date of FX swaps and CRS that insurance companies held at the end of 2021.
2) Three large companies with large amounts of assets (Samsung life insurance, Hanwha life insurance, Kyobo life insurance).

Sources: Financial institutions' business reports.

B. Stress Test

With the accelerated policy interest rate hikes by the US Federal Reserve, growing inflationary pressure, rising market interest rates, and slowing economy, a stress test was conducted

38) To fully hedge against the overseas investment (KRW 123.8 trillion, end of 2021) of life insurance companies through the rollover of three-month swaps for one year, if the swap rate is assumed to remain at the level seen at the end of April (-0.38%), the annual hedging costs would be KRW 1.9 trillion (123.8×0.38/100×4). If the exchange rate rises by KRW 50, the swap rate would fall by 0.08%p, and the annual hedging costs would rise to KRW 2.3 trillion.

39) Regression analysis using daily data between January 2019 and April 2021 showed that if the exchange rate rises by KRW 1, the swap rate would fall by 0.0016%p, with a significance level of 1%.

40) In this stress test, using different levels of increase in the Treasury bond yield and decline in the economic growth rate, the adverse and severe scenarios were set to consider multiple stress situations. ① Adverse scenario: rise of Treasury bond yield by 300bp (compared to the end of 2021), decline of economic growth rate to 0.9%p below BOK's projection (GaR 30%), ② Severe scenario: rise of Treasury bond yield by 400bp (over the end of 2021), decline of economic growth rate to 2%p below BOK's projection (GaR 20%).

using the Bank of Korea integrated stress test model (SAMP). Depending on the extent of rising market interest rates and a declining economic growth rate, adverse and severe scenarios were set.[40] The test assumed that the Treasury bond yield would rise[41] by 300 to 400bp from the level seen at the end of December 2021 and that the economic growth rate would be 0.9%p (GaR 30%) to 2%p (GaR 20%) lower than the Bank of Korea's projection (Table I-2).

Table Ⅰ-2. Scenarios[1] for major macroeconomic variables

(%, bp)

	Baseline[2]	Stress test scenarios	
		Adverse	Severe
GDP growth rate[3]	2.6	1.7	0.6
Inflation rate[3]	3.7	4.7	5.4
Stock price[4]	2,978	2,195	1,950
Treasury bond yield rate[5][6]	1.8	4.8	5.8

Notes: 1) Estimated using the Scenario Generation Module (Bayesian VAR).
2) Baseline GDP growth rate and inflation rate are based on BOK economic outlook (May 2022), and other variables are end of 2021 values.
3) Year-on-year basis, average of test period (Q1 2022 - Q4 2023).
4) Minimum of test period (Q1 2022 - Q4 2023).
5) 3-year treasury bond yield rate.
6) Maximum of test period (Q1 2022 - Q4 2023).
Sources: Bank of Korea, financial institutions' business reports.

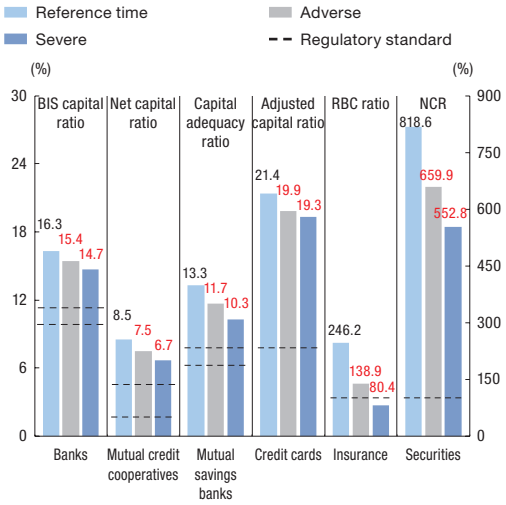
The stress test results[42] showed that the capital ratio of the majority of insurance and securities companies would fall significantly. Under the severe scenario, the majority of insurance and securities companies[43] could see their capital ratio fall below the regulatory level, owing to the valuation loss of securities related to the decline in bond and stock prices. However, the capital ratio of insurance companies is based on the current RBC system, and after the introduction of a new risk-based capital ratio (K-ICS) in 2023, the rise ininterest rates may have a positive impact on the capital ratio thanks to the fair valuation of insurance liabilities. Mutual credit cooperatives, savings banks, and credit card companies were estimated to have a lower capital ratio thanks to asset quality deterioration associated with borrowers' higher credit risk, and in particular, the capital ratio of savings banks with a high share of vulnerable borrowers may drop significantly (Figure Ⅰ-19).

41) It considered the recent rise of the Treasury bond yield (end of December 2021: 1.8% → end of May 2022: 3.0%), US Federal Reserve dot plot (median year-end projection at 2023: 3.8%, highest 4.4%, after FOMC meeting in June 2022), and inflation rate premise(+1.0 to 1.7%p over BOK projection, IaR: 70 to 80%).

42) Bank of Korea's stress test model used 11 macroeconomic variables, including the economic growth rate, inflation rate, Treasury bond yield, stock prices, exchange rate, credit supply growth rate, etc., as the scenario's premised values. Using these variables, credit losses (economic growth rate, Treasury bond yield, stock prices, exchange rate, credit supply growth rate, etc.), market losses (market price variables such as interest rate, stock prices, exchange rate, etc.), and interest income were estimated under each scenario. Based on these estimates (estimated change in profit and loss), the change in the capital ratio by sector of financial institutions (Figure I-19) was calculated. (For details of the model, refer to Systemic Risk Assessment Model (SAMP), Appendix 1 of Financial Stability Report, October 2012, p.137-146.)

43) The capital ratios of 16 of 51 insurance companies and four of 44 securities companies fell below the regulatory level.

Figure Ⅰ-19. Solvency stress test results[1)2)3)]



Notes: 1) Banks, mutual credit cooperatives, mutual savings banks and credit card companies are on the left side; insurance companies and securities companies are on the right side.
2) Reference time is the end of 2021.
3) Regulatory standards: 10.5% for banks (11.5% for D-SIBs), 2-5% for mutual credit cooperatives, 7% for mutual savings banks (8% for institutions with assets of more than 1 trillion won), 8% for credit card companies, and 100% for insurance companies and securities companies.

Source: Bank of Korea.

4. Policy Implications

Domestic NBFIs are expected to be significantly affected by the increased volatility of price variables in domestic and overseas financial markets amid the accelerated monetary policy normalization by the US Federal Reserve and deterioration of investor sentiment. Among NBFIs, securities companies, insurance companies, and CSFCs are assessed as being vulnerable to market and liquidity risks, while savings banks and CSFCs are vulnerable to credit risk.

As the Fed's monetary policy normalization accelerates, potential risks for NBFIs by sector could emerge and need to be preemptively addressed. As for securities companies and CSFCs, a stress test should be conducted under various scenarios to ensure the ability to proactively respond to market shocks such as liquidity risk. Moreover, financial authorities need to review whether existing contingency plans are appropriate for the latest developments to ensure a prompt response in the event of a liquidity shortage. In particular, because many life insurance companies could see their capital ratio dip below the regulatory level due to valuation losses from securities amid an unexpected and dramatic increase in interest rates, the supervisory authorities need to proactively address market worries through proper measures.[44)] Moreover, the impact of the introduction of IFRS17 in 2023 on capital ratios needs to be closely examined to devise a systematic response. Savings banks and CSFCs that are highly likely to experience loan defaults due to credit risk should review their credit risk and make efforts to provide additional loan loss reserves. Although financial institutions' exposure to foreign exchange risk is not significant, foreign exchange risk needs to be examined, and the oversight of risk related to hedging against foreign exchange risk of insurance companies needs to be strengthened since the impact of a contraction of US dollar global liquidity could be greater than expected.

44) In response to the decline of the RBC ratio amid the dramatic increase in the interest rate, on June 9, 2022, the Financial Services Commission announced a supplementary measure to recognize LAT surplus (insurance liabilities assessed at cost - LAT liabilities) as RBC available capital.

Furthermore, given that the interconnectedness among financial institutions, especially among NBFIs, has increased, monitoring and analysis need to be strengthened so as to identify and respond to systemic risks preemptively, and cooperation and concerted responses[45] among related institutions, including the sharing of stress test results, should be promoted.

45) In January 2019, the Financial Services Commission, Ministry of Economy and Finance, Bank of Korea, and Korea Deposit Insurance Corporation collaborated to develop and implement a measure to strengthen the soundness of the non-banking sector at the macro level.

II. Assessment of the Impact of Accumulated Household Debt Related to Asset Markets on the Consumption and Defaults of Household Borrowers

1. Background
2. Assessment of Interconnectedness between Household Debt and Asset Market
3. Impact of Household Debt on Consumption and Defaults of Household Borrowers
4. Assessment and Implications

1. Background

The expansion of household debt accelerated after the outbreak of COVID-19. When the rate of increase in household debt increases against the size of the economy,[1] the debt repayment capacity[2] of households in the event of an internal and external shock weakens, consumption slows, and the repayment of principal and interest is delayed, which could have a negative impact on finance and the economy. In particular, in Korea, as household debt is closely related to asset markets, such as the real estate market, any change in asset markets could cause loan defaults and destabilize the financial system.

This section examines the status of household debt and vulnerability in terms of interconnectedness with asset markets, assesses the consumption constraints and loan default possibility of household borrowers due to the accumulation of household debt, and derives implications.

2. Assessment of Interconnectedness between Household Debt and Asset Market

A. Interconnectedness in Terms of Debt Increase

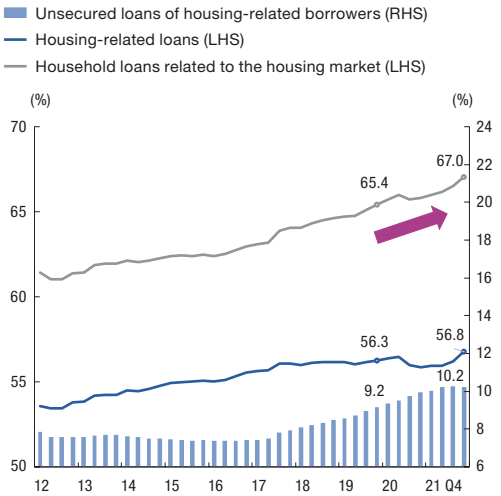
Interconnectedness with housing market

With the expectation of increasing housing prices after the outbreak of COVID-19, investment demand increased through borrowing, strengthening the linkage between the housing market and household debt. The share of housing-related loans,[3] such as home mortgage loans and leasehold deposit fund loans,[4] among household loans edged up from 56.3% at the end of 2019 to 56.8% at the end of 2021. If unsecured loans of borrowers of hous-

1) As of the end of the third quarter of 2021, the ratio of household debt to GDP stood at 106.7%, well above the OECD average (67.2%).
2) At the end of 2021, the loan-to-income ratio for household loan borrowers (LTI, 238.4%) and debt service ratio (DSR, 37.1%) rose from the ratios recorded at the end of 2019 (217.5% and 36.5%), up 20.9%p and 0.6%p, respectively.
3) Home mortgage loans include policy mortgage loans, and leasehold deposit fund loans include payment guarantee-based secured loans and leasehold deposit secured loans.
4) Leasehold deposit fund loans of tenants can be indirectly used to fund landlords' housing purchases (gap investment).

ing-related loans (10.2% at the end of 2021) are included, the share of household loans[5] related to the housing market rises by a larger margin (65.4% → 67.0%) (Figure II-1).

Figure II-1. Share of household loans related to the housing market

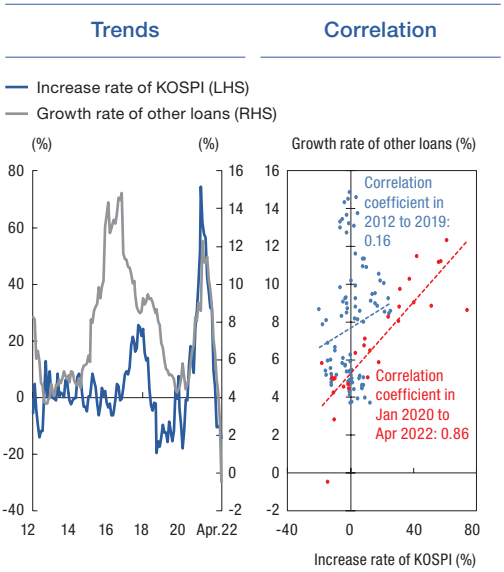


Source: Bank of Korea (Consumer Credit Panel).

Interconnectedness with stock market

As the stock investment of individual investors surged after the COVID-19 outbreak, the interconnectedness between household loans and the stock market further strengthened. During the 2020-2021 period, stock-related investment by households (KRW 191.6 trillion[6]) funded by borrowings is estimated to have been 18%[7] of total investment. As for the relationship between the growth rate of other loans and growth rate of stock prices before and after COVID-19, the correlation coefficient after COVID-19 (0.86) is much higher[8] than it was before the outbreak (0.16) (Figure II-2).

Figure II-2. Relationship between growth rate[1] of other loans and increase rate[1] of stock prices



Note: 1) Year-on-year basis.
Source: Bank of Korea.

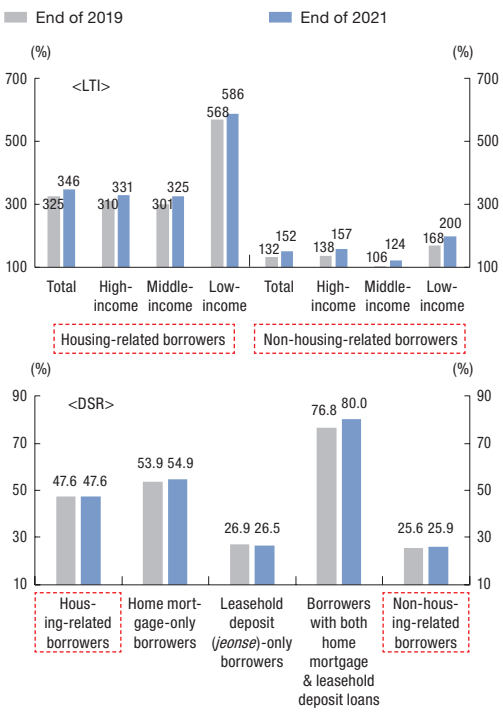
5) This represented 78% of the increase in total household loans (KRW 249 trillion) during the period (end of 2019 to end of 2021).
6) This refers to equity securities and investment funds held by households and nonprofit organizations in the flow of funds statistics.
7) It was assumed that the entire increase in other loans (KRW 19 trillion) during the 2020-2021 period, in excess of the past trend (2012-2019) and the entire increase in credit lines granted by securities companies (KRW 14.7 trillion) were spent to purchase stocks. Out of other loans, loans used for purposes unrelated to stock investment, such as loans not secured by housing, educational expenses, credit card payments by installment, and lease payments, were excluded.
8) In particular, unsecured household loans fluctuated significantly due to subscriptions to public offerings for large-scale IPOs (KakaoBank, LG Energy Solution, etc.) since 2020.

B. Assessment of Borrowers' Vulnerability

Level of dept repayment burden

With respect to the debt repayment burden of borrowers, the LTI (loans/annual income; 346.4% at the end of 2021) of borrowers with housing-related loans was more than double that of borrowers without such loans (152.0%). By level of income, there was a significant difference in LTI between low-income borrowers with housing-related loans (585.6%) and low-income borrowers without such loans (200.0%). The DSR (repayment of principal and interest/annual income) of borrowers of housing-related loans (47.6%)was also 1.8 times higher than that of borrowers without such loans (25.9%). In particular, borrowers with both home mortgage loans and leasehold deposit fund loans had a DSR of 80% (Figure II-3).

Figure II-3. Comparison[1] of LTI and DSR between housing-related borrowers and non-housing-related borrowers

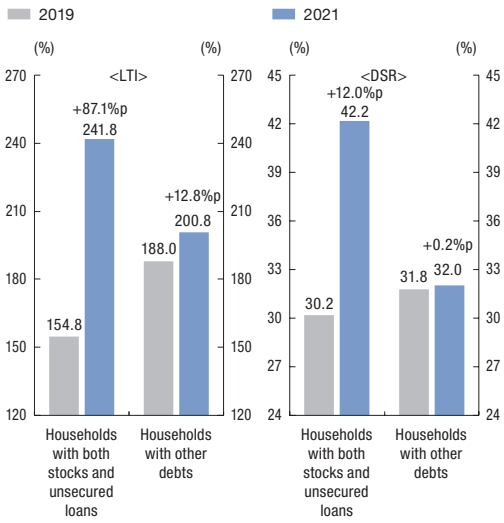


Note: 1) Based on borrowers

Source: Bank of Korea (Consumer Credit Panel).

Meanwhile, the debt repayment capacity of borrowers of stock-related loans is estimated to be weak. The LTI(financial debt/disposable income; 241.8% for 2021) and DSR(repayment of principal and interest/disposable income; 42.2% for 2021) for households with stocks and unsecured loans (for investment purposes other than housing purchases, etc.) were higher than households with other debts, and during the 2019-2021 period, the increases (LTI: +87.1%p, DSR: +12.0%p.) were significantly larger than those seen by other households (+12.8%p and +0.2%p, respectively) (Figure II-4).

Figure II-4. Comparison of LTI and DSR between equity-related borrowers[1)2)] and non-equity-related borrowers



Notes: 1) Household basis (based on Survey of Household Finance and Living Conditions, due to statistical constraints).
2) Households with both stocks and unsecured investment loans (based on estimation excluding loans not related to stock investment such as housing purchases, business funds, and living expense-related loans).

Source: Survey of Household Finances and Living Conditions.

Impact in the event of a shock

A scenario analysis[9] was conducted to examine changes in the DSR of borrowers due to changes in internal and external conditions, depending on whether they hold housing-related loans. The analysis results showed that, in the event of rapid change (adverse scenario) where financial and economic conditions such as income and the loan interest rate change suddenly, the DSR of borrowers with housing-related loans increases by a larger margin thanthat of borrowers without such loans (Table II-1).

Table II-1. Change of DSR between housing-related borrowers and non-housing-related borrowers

(%p)

By scenario	Changes of DSR(Compared to end of 2021)		
	Total	Housing-related loans	
		Borrowers	Non-borrowers
Baseline[1]	1.8	2.6	1.0
Optimistic[2]	-1.8	-2.7	-1.4
Pessimistic[3]	7.1	10.4	4.4

Notes: 1) The rates of increase in income and loans were assumed to remain unchanged from Q1 2022 (2.9% and 4.5% respectively, year-on-year basis) and average lending rates rose by 50bp.
2) It was assumed that the increase rate of income rose by 5%p and the growth rate of loans declined by 5%p, compared to the baseline scenario.
3) It was assumed that the increase rate of income declined by 5%p, the growth rate of loans rose by 5%p, and average lending rates rose by 50bp, compared to the baseline scenario.

Source: Bank of Korea staff calculation (Consumer Credit Panel).

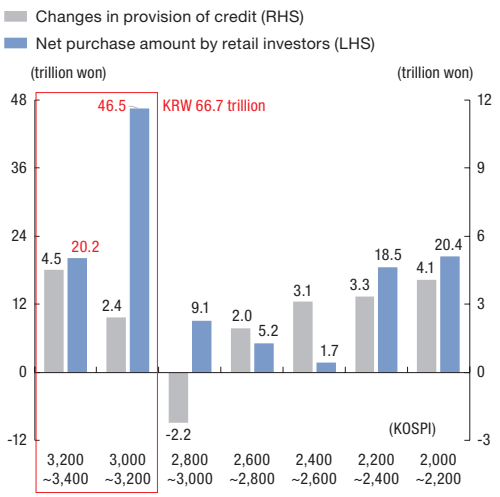
Meanwhile, borrowers who increased their loans for stock investment could see their investment losses rise in the event of a sudden drop in stock prices, resulting in more loan defaults. Out of the net purchase amount of domestic stocks by individual investors during the 2020-2021 period (KRW121.6 trillion), the amount purchased (KRW 66.7 trillion) when the KOSPI was over 3,000 accounted for 54.9%. Considering that the provision of credit (KRW 4.5 trillion) to individuals increased most when stock prices were high (KOSPI: 3,200 to 3,400), it is likely that stock investment relied significantly[10] on loans (Figure II-5). In addition, amid the surge in investment in overseas stocks made by domestic individual investors, investment became concentrated in only a few stocks. At the end of 2019, the top stocks among the overseas stock holdings of individuals[11] were distributed across multiple countries; by the end of 2021, however,they had become concentrated mostly in the United States.

9) Change in loan demand was considered as one of the factors for shocks under the scenarios because precautionary loan demand (funds for living expenses, etc.) could increase swiftly due to inflation. The baseline scenario assumed that, given the recent slowing of household loan growth, income and loans grew at the same rates as they did during the first quarter of 2022 (YoY, 2.9% and 4.5%), and that the average loan interest rate rose by as much as the rise of the average loan interest rate based on the balance at the end of March 2022 (YoY, +50bp). Based on this baseline scenario, the optimistic scenario and adverse scenario were set with different levels of changes in each variable.

10) During the period from January to September 2021, when the monthly average level of the KOSPI was over 3,000, other loans extended by banks and non-bank financial institutions grew by KRW 39.2 trillion, or 44.7% of the increase of the total of other loans during the 2020-2021 period.

11) At the end of 2019: Amazon (US) 4.5%, Goldwin (Japan) 4.3%, Jiangsu Hengrui Medicine (China) 3.0%, Nippon Steel (Japan) 1.7%, and Nexon (Japan) 1.6% / At the end of 2021: Tesla (US) 19.9%, Apple (US) 6.5%, Nvidia (US) 4.0%, Microsoft (US) 2.9%, Google (US) 2.9%, and Amazon (US) 2.4%.

Figure Ⅱ-5. Retail investors' net purchase amount,[1] by stock prices

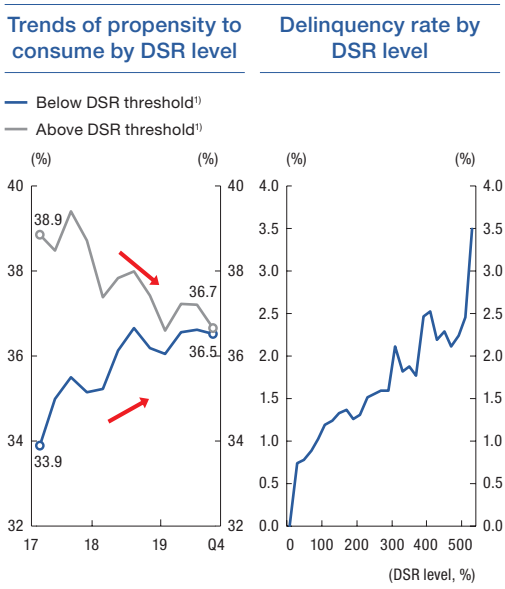


Note: 1) During the period between 2020 and 2021 basis.
Sources: Korea Exchange, Korea Financial Investment Association.

3. Impact of Household Debt on Consumption and Defaults of Household Borrowers

Generally, an increase in debt boosts consumption (flow effect), but if it diverges from income flows, it is known to constrain consumption byincreasing the debt repayment burden (stock effect).[12] A rise in borrowers' DSR leads to an increase in borrowers whose DSR exceeds the consumption threshold, which could put pressure on their propensity to consume. As for 2016, when the DSR was high, and years later, borrowers whose DSR was higher than the consumption constraint threshold (45.8%, refer to following explanation) saw their propensity to consume decline from 2017, and borrowers whose DSR was below the threshold had a higher propensity to consume. Meanwhile, if borrowers with a high DSR are unable to repay principal and interest through consumption reduction, asset sales, or additional borrowing, it could lead to bad loans. The delinquency rate of household loans during the 2012-2021 period rose in tandem with the increase inthe DSR (Figure II-6).

Figure Ⅱ-6. Relationship between DSR, consumption and delinquency rate



Notes: 1) Threshold for consumption restriction (DSR basis): 45.8%.
2) For borrowers from Q1 2012 to Q4 2021.
Sources: Bank of Korea (Consumer Credit Panel).

Hereunder, based on these characteristics, the impact of homeownership and change in asset prices on the consumption and defaults of household borrowers was analyzed empirically.

A. Impact of HomeOwnership

The threshold of DSR that constrains consumption was estimated using empirical analysis, and the change in the share of borrowers

12) Refer to Lombardi et al.(2017) and Kang Jong-gu (2017).

who exceed this level due to internal and external conditions was analyzed under various scenarios to review the effect of an increase in household debt related to asset markets on consumption.

Level of consumption constraint threshold

To determine whether homeownership affects the DSR threshold[13] that constrains consumption, consumption function models[14] were estimated according to the characteristics of borrowers. The estimation results showed that borrowers[15] who owned housing, which were identified by whether they had home mortgage loans, had a higher DSR threshold that constrains consumption (56.3%), representing a much lower proportion (2.6%) of total borrowers who are constrained in terms of consumption. This is likely attributable to the fact that these borrowers have a lower demand for precautionary savings to purchase assets in the future than those without housing and a greater capacity to obtain additional loans through asset holdings or to raise funds (Table II-2).

Table II-2. Estimation results of the threshold for consumption restriction by borrowers

(%)

	Threshold[1] for consumption restriction (DSR basis)	Shares[2] of borrowers with DSR above threshold
Total	45.8	8.4
■ Homeowners[3]	56.3	2.6
■ Non-homeowners	37.9	11.7

Notes: 1) All estimated coefficients meet the 1% significance level.
2) End-2021 basis.
3) Borrowers with home mortgage loans.
Source: Bank of Korea staff calculation (Consumer Credit Panel).

13) The DSR used in this section's consumption function model is a regulatory DSR for individual borrowers,based on the Household Debt DB. For borrowers' average propensity to consume, credit card payment and annual income were used, and "homeowners" refers to borrowers with home mortgage loans. The Household Debt DB contains the financial information of over one million individual borrowers, including loan size, by quarter. Analysis was conducted for the period from the first quarter of 2012 to the fourth quarter of 2021. To limit the scope of borrowers to those who engage in independent economic activity, this section excluded borrowers who were likely to consume by relying on the income of other household members (those whose consumption exceeded their income for more than one year) or who showed temporary and irregular patterns of credit card payments.

14) This section relied on the consumption model used to estimate a consumption constraint threshold during the financial stability review in September 2021. To capture the impact of the DSR level on consumption expansion and constraint, this model considered the quadratic term of DSR, which is known to be effective for explaining the situation where, asthe debt repayment burden approaches the consumption constraint threshold, the effect of debt boosting consumption declines, and if the burden exceeds the threshold, debt constrains consumption (Acrand et al. 2015; IMF GFSR October 2017). Moreover, to account for the impact of variation in asset prices, net return on asset investment after investment cost was added as another variable. That is, the household loan interest rate for stock investment and the actual cost of housing residence (i.e., price of leasehold deposits) for investment in housing were considered as opportunity costs.

■ Model equation (panel fixed effect model)

$$ACR_{i,t-0\ to\ 3} = \beta_0 + \beta_1 DSR_{i,t-1\ to\ 4} + \beta_2 DSR^2_{i,t-1\ to\ 4} + \beta_3 X_{i,t} + \beta' Z_{t-1\ to\ 4} + \gamma_i + \delta_{y,q} + \epsilon_{i,t}$$

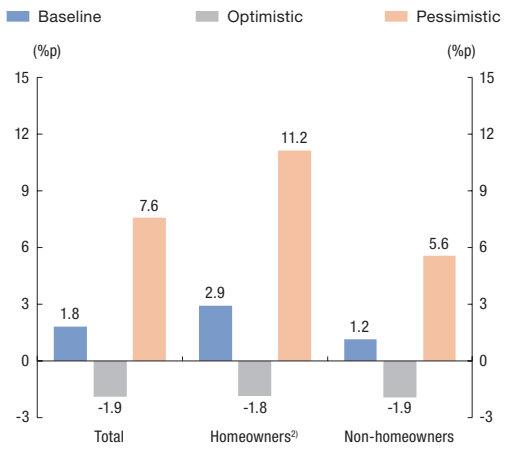
- ACR: average propensity to consume (average of recent four quarters); DSR: debt repayment burden by borrower (average of immediately-preceding four quarters); X: real asset price variables (housing price growth rate (YoY) - leasehold deposit price growth rate (YoY)) by characteristics of borrowers (age); Z: macroeconomic variables (economic growth rate (YoY), KOSPI rate of increase (YoY) - household loan interest rate), γ: fixed effect by borrower; δ: fixed effect by year and season.

15) For borrowers who do not have home mortgage loans andonly hold leasehold deposit fund loans, the consumption constraint DSR threshold was 33.0%, which is lower than that of borrowers with housing, with those who exceeded the threshold accounting for 15.7%.

Change in share of borrowers exceeding consumption constraint threshold

Although not many borrowers were constrained in terms of consumption, in the event of a macroeconomic shock, such borrowers may increase significantly, particularly among borrowers with housing. Under the three above-assumed scenarios (baseline, optimistic, and adverse), the change in the share of borrowers who exceed the consumption constraint threshold was examined. Under the baseline scenario, borrowers who own housing and exceed the consumption constraint threshold increased by 2.9%p, while those without housing rose by 1.2%p. Similarly, under the adverse scenario, the increase in the share of borrowers who own housing and exceed the consumption constraint threshold (+11.2%p) was much larger than the share of borrowers who do not own housing (+5.6%p) (Figure II-7). This is due to the fact that, as they rely significantly on loans to purchase homes, the burden of borrowers with housing to repay principal and interest in the event of a macroeconomic shock surged by a large margin.

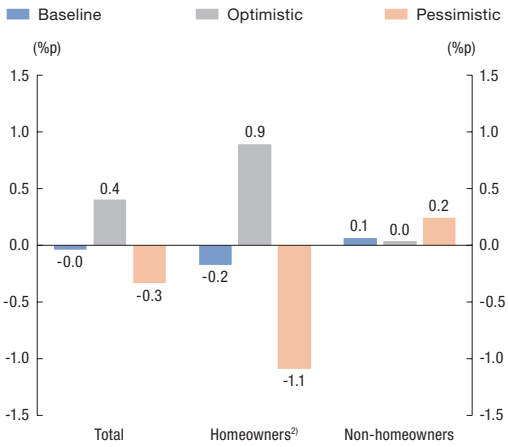
Figure II-7. Changes in the shares of borrowers[1] with DSR above threshold by scenario



Notes: 1) End-2021 basis.
2) Based on borrowers with home mortgage loans.
Source: Bank of Korea staff calculation (Consumer Credit Panel).

Hence, the extent of the decrease in the propensity to consume due to a higher DSR (baseline and adverse scenarios) was larger for borrowers with housing (Figure II-8).

Figure II-8. Changes[1] in propensity to consume according to changes in DSR by scenario



Notes: 1) Changes in propensity to consume caused by changes in DSR by scenario.
2) Based on borrowers with home mortgage loans.
Source: Bank of Korea (Consumer Credit Panel).

B. Impact of Change in Asset Prices on Consumption

Change in the value of assets owned by borrowers may affect their consumption.[16] Using the consumption model reviewed earlier, the impact of an adjustment of financial asset prices (stock prices) and real asset prices (housing prices) on consumption was empirically analyzed. First, for financial assets, a rise in net return on stock investment (stock price return - household loan interest rate) contributed to a consumption increase. On the other hand, as for real assets, a rise in housing prices or leasehold deposit prices was estimated to have a negative effect on consumption.[17] This is because a rise in housing prices and leasehold deposit prices could shrink household borrowers' capacity to consume due to the rise in residence-related costs.[18] However, regarding housing prices exceeding leasehold deposit prices[19] (cost of residing in housing) (housing prices - leasehold deposit prices), a wealth effect was observed. This suggests that the impact of a change in housing prices on consumption may vary depending on change in the housing market and the characteristics of borrowers[20] (Figure II-9).

Figure II-9. Impact[1] of changes in asset prices on propensity to consume

Notes: 1) Estimated regression coefficient basis. All estimated coefficients meet the 1% significance level.
2) Increase rate of KOSPI (YoY) - interest rate of household loans.
3) Increase rate (YoY) basis.
Source: Bank of Korea staff calculation (Consumer Credit Panel).

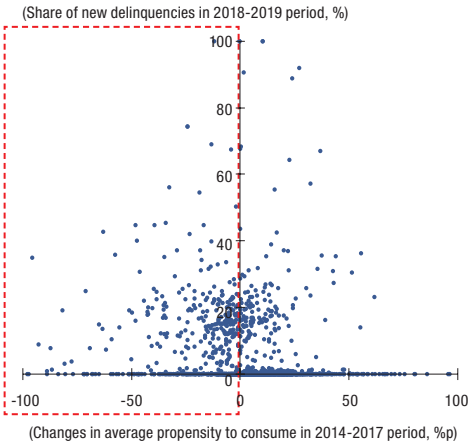
C. Relationship between Consumption ConstraintsDue to Excessive Debt and Defaults

Consumption constraints due to excessive debt may result in loan defaults. If the repayment burden of borrowers rises above a certain level, borrowers first reduce consumption. If that does not work, the situation is likely to lead to loan defaults. In fact, regardingthe new delinquent loans[21] that emerged

16) Refer to Mian et al. (2013), etc.
17) Prior studies, including Kim Gi-ho (2019), found that, with regard to the wealth effect associated with a rise in asset values in Korea, financial assets are positively related to consumption, and real assets are negatively related to consumption.
18) Rent as the cost of residential service can be calculated by applying the leasehold deposit/monthly rental prices conversion rate (based on housing prices and interest rate). If the interest rate is constant, a rise in housing prices and leasehold deposit prices leads to higher rent. Furthermore, if housing prices rise, the burden of taxes, such as the acquisition tax and comprehensive real estate tax, increases as well.
19) In terms of their value, housing assets can be viewed as a combination of durable goods offering residential service and investment assets.
20) If housing pricesrise by a larger margin than leasehold deposit prices, they make a greater contribution to an increase in the consumption of "gap investors" and owners of multiple homes in particular.

during the 2018-2019 period for borrowers whose propensity to consume changed from 2014 to 2017,[22] a significant portion of such delinquent loans occurred among borrowers[23] whose propensity to consume declined over the same period of time. This suggests that, as consumption contraction due to excessive debt fails to bring about an improvement in debt repayment capacity, loan defaults could occur (Figure II-10).

Figure II-10. Relationship[1)2)] between changes in propensity to consume and new delinquencies



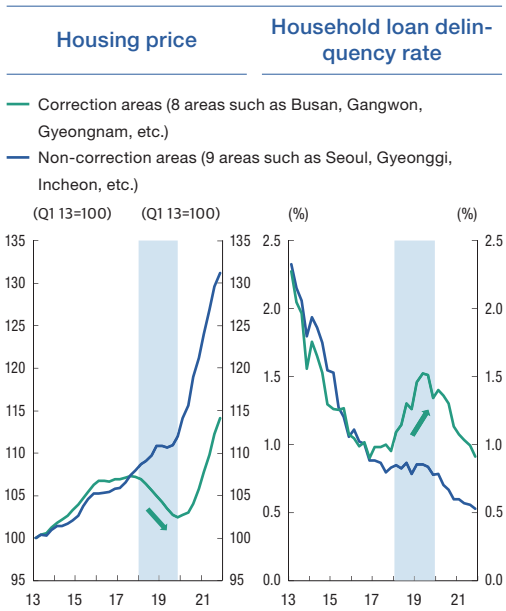
Notes: 1) Y-axis: the share of new delinquencies in 2018-2019 period (compared to loan amounts), X-axis: the changes in average propensity to consume (average of 2017 - average of 2014)
2) Observasions are average values obtained by reclassifying (grouping) individual borrowers based on income level, creditworthiness, age, region, etc.

Source: Bank of Korea (Consumer Credit Panel).

D. Impact of Change in Asset Prices on Defaults

A decline of asset prices could be a factor increasing loan default risks. A comparison of the delinquency rates of household loans for eight districts where housing prices rose and transitioned to a decline and delinquency rates fornine districts where prices continued to rise from 2015 to 2020 showed that the delinquency rate for districts with adjusted housing prices rose to a higher level than other districts (Figure II-11).

Figure II-11. Relationship between housing price correction and delinquency rate



Sources: Bank of Korea (Consumer Credit Panel), Korea Real Estate Board.

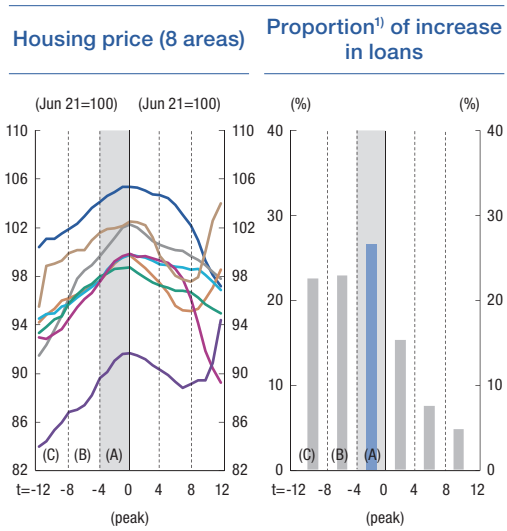
21) For borrowers who had a record of delinquent loans prior to 2017, delinquency could continue to rise after 2017 (endogeneity problem). Therefore, the analysis was done for borrowers who experienced new delinquency during the 2018-2019 period.

22) From 2014 to 2017, as in the current situation, a significant increase in household loans led to a rise in the debt repayment burden.

23) During the analysis period, the average propensity to consume of borrowers of household loans continued climbing (end of 2017: 50.4% → end of 2019: 53.8%). This suggests that new delinquent loans that occurred during the 2018-2019 period mostly among borrowers who reduced their propensity to consume were not attributable to the economic circumstances at the time.

In particular, while new loans (home mortgage loans) tended to be extended more intensely immediately before the housing price adjustment, the housing purchased through leverage during this period is more likely to dip into defaults (Figure II-12). The results of the empirical analysis[24] of the occurrence of new delinquent loans by the time of borrowings before housing prices reach theirpeak (based on LTI[25] variation) also showed that increased borrowings when housing pricesare near the peak (A) had a relatively high likelihood of delinquency after the housing price adjustment (Table II-3).

Figure II-12. Trends before and after the housing price peak and the proportion of increase in loans



Note: 1) The proportion of increase in loans during the period among all periods, home mortgage loans basis.

Sources: Bank of Korea (Consumer Credit Panel), Korea Real Estate Board.

Table II-3. Changes[1] in the probability of delinquency by the time of entry into the housing market

Dependent variable: New delinquency status(Time of changes in loans)	Independent variable : △LTI
(A) Loans in the 4th quarter before the peak - the peak (t_0-t_{-4})	0.0192***
(B) Loans in the 4th - 8th quarter before the peak (t_{-4}-t_{-8})	0.0013***
(C) Loans in the 8th - 12th quarter before the peak (t_{-8}-t_{-12})	-0.0007

Note: 1) Estimated coefficients are the probability of new delinquency and *** mean significance levels of 1%. 8 Areas with housing price correction basis.

Source: Bank of Korea.

4. Assessment and Implications

As discussed above, as household debt related to assets such as housing rose sharply after the outbreak of COVID-19, vulnerability to shocks, especially among borrowers holding assets, is assessed to have increased. Although the current consumption constraints and default risk of these borrowers are not cause for serious concern, the higher burden of debt repayment associated with accumulated liabilities related to asset purchases could constrain future consumption. Also, when the shock from an asset price decline is added, loan default risk is highly likely to rise.

To prevent this potential risk from emerging,

24) To determine whether the asset quality of loans varied depending on the time of entry of household loans into the housing market and borrowings, the delinquency status of loans by period was tracked using panel data analysis. The regression analysis model equation is as follows. $NDEF_{i,t(0),t(12)} = \beta_0 + \beta_1 \times \Delta LTI_{i,t(n),t(n-4)} + \epsilon_{i,t}$
If new delinquent loans occurred within 12 quarters after the asset price peak despite no delinquent loans prior to the asset price peak, NDEF=1; otherwise, NDEF=0: at t=n, t=n-4, change of LTI (ratio of loan to income) (n=0 {peak}, -4 {four quarters before peak}, -8 {eight quarters before peak})

25) Given that the average income of borrowers (1.6%, average of YoY growth rates during the analysis period) and loans (14.3%) both continued to rise before housing prices peaked, the higher LTI is largely attributable to the increase in loans rather than the decrease in income.

the excessive inflow of loan proceeds into asset markets should be curbed. First, while continuing to implement the principle that loans should be based on borrowers' debt servicing capacity (i.e., DSR regulation, etc.), efforts should be made to prevent a strengthening of households' propensity for profit-seeking in real and financial asset markets through leverage. In the longer term, while it is necessary to curb expectations over excessive price increases by expanding the housing supply to ensure smooth housing supply and demand, ways of relieving new demand for borrowings due to the burden of residential costs need to be sought out. One solution may be, for example, lowering households' reliance on housing-related loans through mutual funds for real estate investment (REITs).[26)]

Furthermore, an institutional base needs to be established to gradually reduce existing debts incurred to fund assets. In particular, a supportive measure needs to be devised to allow borrowers with excessive debts to adjust their asset and liability portfolio to a manageable level and proactively respond to default risks. Specifically, various options can be considered, including inducing a switch to amortization (partial repayment) for maturing unsecured loans and bullet loans, lowering taxes related to housing transactions intended to repay loans, or adjusting the age of eligibility for reverse mortgages.

26) Housing purchase or rental through leasehold deposits or monthly rents using REITs instead of loans from the financial sector (home mortgage loans, leasehold deposit fund loans, etc.) is expected to help curb loan growth related to the purchase of new housing.

Ⅲ. Recent Developments of Corporate Credit Allocation and its Relationship with Corporate Financial Indicators

1. Background
2. Allocation of Corporate Credit by Industry and Firm
3. Determinants of Corporate Credit and its Relationship with Corporate Financial Indicators
4. Assessment and Implications

1. Background

Recently, while the growth of household credit abated, corporate credit,[1] especially loans from financial institutions,[2] continued its high growth.[3] The ratio of corporate credit to nominal GDP stood at 114.5% at the end of 2021, exceeding the level seen during the foreign currency crisis (107.1%, end of 1997). Furthermore, the recent upward trend of the ratio is steeper than that seen during both the foreign currency crisis and global financial crisis (Figure III-1).

The increase in corporate credit has contributed[4] to the growth of the real economy by supporting investment and business activities and lowering the default risk of firms that experienced temporary difficulties by supplying liquidity during the crisis. On the other hand, there is concern that the excessive inflow of corporate credit into non-productive sectors or marginal firms could backfire by causing an increase in asset prices and delay and accumulation of defaults.

Hence, this article analyzes the status of the recent developments of corporate credit allocation by industry and type of firm[5] and the relationship between the corporate credit and financial soundness of firms and derives policy implications.

1) Generally, corporate credit is defined as the sum of loans from financial institutions, securities other than shares, and government loans among liabilities of non-financial corporations in the flow of funds statistics. In this analysis, we focus on corporate loans which have recently shown rapid growth. However, in the empirical analysis using corporate financial statements, the analysis is based on total borrowings including bonds such as corporate bonds.
Corporate credit stood at KRW 2,355 trillion at the end of 2021, an increase of 43.4% from the end of 2016 (KRW 1,642 trillion)

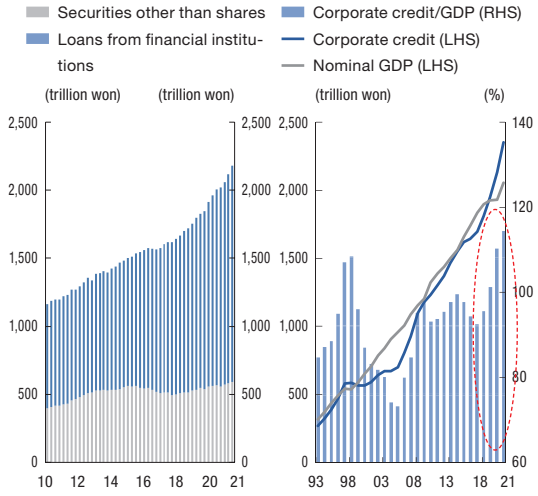
2) As for the contribution by item, loans accounted for the largest at 36.2 percentage points, while bonds and government loans accounted for 4.3 percentage points and 2.9 percentage points, respectively. In particular, loans increased by 56.7% from KRW 1,048 trillion to KRW 1,642 trillion.

3) The household credit growth rate (YoY) increased from 4.2% (end of 2019) to 8.0% (end of 2020), after which it declined slightly to 7.8% (end of 2021). The corporate credit growth rate, however, continued rising at a rapid pace from 7.4% (end of 2019) to 9.4% (end of 2020) and 10.5% (end of 2021).

4) Levine (2004) stressed that the development of the financial system can affect the growth of the real economy by softening the constraint on firms in terms of raising external funds.

5) The BIS (2022) also pointed out that it is necessary to analyze whether the allocation of corporate credit is supporting productivity enhancing investments.

Figure Ⅲ-1. Trend of corporate credit[1)]



Notes: 1) Sum of loans from financial institutions, securities other than shares, and government loans among the liabilities of non-financial corporations in the flow of funds statistics.
2) Excluding government loans.
3) Year-end balance of corporate credit / annual nominal GDP.
Source: Bank of Korea.

2. Allocation of Corporate Credit by Industry and Firm

A. Corporate Credit Allocation by Industry

First, the allocation of corporate credit[6)] by industry[7)] was examined using a loan concentration indicator.[8)] The analysis results showed that, as of the end of 2021, loan concentrations in real estate-related industries and accommodation and food service-related industries were the highest, at 2.6 and 2.4, respectively, meaning that relatively large amounts of funds flowed into these industries. For real estate-related industries, real estate prices having increased at a higher rate since 2017 seems to have raised the loan concentration. For accommodation and food service-related industries, the increase in the demand for funds due to the decrease in sales during COVID-19 and financial support for these companies seems to have increased the concentration of

6) Recently, corporate credit increased largely through loans, rather than bonds, and it is also difficult to identity the status of corporate bonds issued by industry. Thus, the status of corporate credit by industry was analyzed through only corporate loans, among the various instruments of corporate credit. Data on corporate loans relied on loan statistics by industry (Bank of Korea) that classified loans by business type, excluding household loans among Korean won-denominated loans extended by deposit-taking corporations.

7) This followed the manufacturing and service industries' classification in the KSIC (10th), with manufacturing industries being based on the middle classification category, and service industries being based on the large classification category. In calculating the shares of corporate loans and GDP by industry, other industries, such as the mining, construction, and agricultural, forestry, and fisheries industries, were excluded, and shares in the sum of manufacturing and service industries (excluding financial and insurance industries and public administration) were used.

8) An indicator that compares the share of corporate loans by industry with that industry's share of the GDP. If the loan concentration for a specific industry is larger (smaller) than 1, it means that a relatively large (small) amount of loans flowed into that industry compared to that industry's share of the GDP. Multiple studies, including the Bank of Korea Research Department (2005), Cho Ha-Hyun and Seung Won Jung (2008), Kim Jahye (2014), and Kim Jong-Hee (2018), have used this indicator to analyze the efficiency of corporate credit.

$$\text{Loan concentration of i indystry} = \frac{\text{corporate loan of i industry / Total corporate loan}}{\text{GDP of i industry / Total GDP}}$$

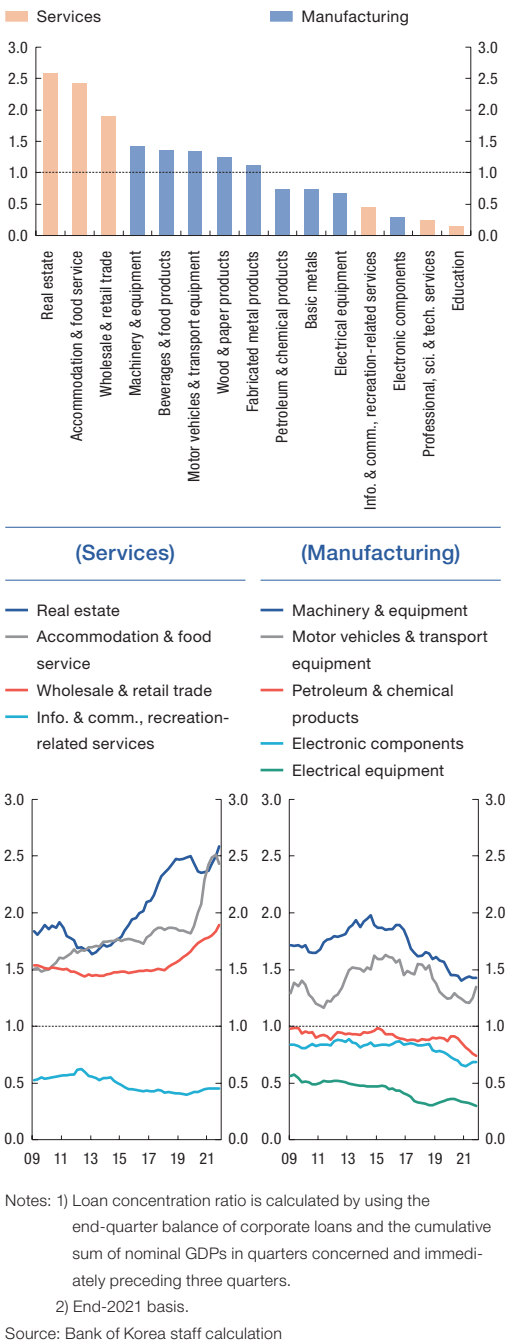
9) The loan concentration of real estate-related industries rose from 1.9 (end of 2009) to 2.1 (end of 2016) and 2.6 (end of 2021), and the loan concentration of accommodation and food service-related industries rose from 1.5 (end of 2009) to 1.8 (end of 2019) and 2.4 (end of 2021).

10) The decline of loan concentration in manufacturing industries after 2017 is attributed to a moderate decrease in manufacturing industries' share of GDP (2017: 38.8% → 2021: 36.2%, -2.6%p) coupled with a greater decrease in the share of loans extended to manufacturing industries (40.7% → 33.3%, -7.4%p).

loans.[9]

On the other hand, as for manufacturing industries, since 2017, the loan concentration in most industries declined,[10] and as of the end of 2021, it remained between 0.3 and 1.5. In particular, the loan concentrations in electronic parts (0.3), electrical equipment (0.7), and petrochemicals (0.7) manufacturing industries, representing a relatively high share of the real economy, all had loan concentrations below 1[11] (Figure III-2).

Figure Ⅲ-2. Loan concentration[1] level[2] and trend by industry



Notes: 1) Loan concentration ratio is calculated by using the end-quarter balance of corporate loans and the cumulative sum of nominal GDPs in quarters concerned and immediately preceding three quarters.
2) End-2021 basis.

Source: Bank of Korea staff calculation

11) As for petrochemicals, electronic parts, and electrical equipment, which are manufacturing industries that account for a significant proportion of GDP, the share of funding through direct financial markets (share of the balance of wholesale funding at the end of 2021 for listed companies: petrochemicals: 58.2%, electrical & electronics: 36.2%) is not small, and thus a decline in loan concentration does not always mean a deterioration of funding conditions. In fact, at the end of 2021, if loan concentration is calculated by including corporate bonds (except private placements) held by domestic financial institutions, loan concentration increased for petrochemicals (0.74 → 1.04), electronic parts (0.30 → 0.36), and electrical equipment (0.68 → 0.73).

Next, whether corporate loans flowed into productive industries was analyzed by reviewing the relationship between loan concentration and productivity by industry. Productivity, which indicates the level of efficiency in the use of inputs such as labor and capital used for corporate production, can be measured by capital productivity, labor productivity, and total factor productivity. This section analyzes[12] the relationship between corporate credit and capital productivity with a focus on capital productivity, which best suits the purpose of this analysis and is often used in literature, including Lee Jong-hwa (2000) and Borensztein & Lee(2005). For the capital productivity index, this section uses the ratio of gross value added to total assets[13] (value added/total capital), which is generally used in the Financial Statement Analysis of the Bank of Korea and by the Korea Productivity Center.

The analysis results showed that, after the global financial crisis, more corporate loans flowed into industries with relatively low capital productivity. After 2010, a negative correlation between productivity by industry and loan concentration is observed, and this trend has further strengthened[14] since 2017 (Figure III-3). By industry, while the amount of loans extended to real estate-related industries was relatively large, the value of loans to the professional and science and technology service industries was relatively small.[15] In addition, there were few cases of relatively greater productivity improvement in industries with increased loan concentration due to large inflows of loans.

12) Since the productivity level of each industry and company can vary depending on the method of assessment, caution is needed in interpreting the results of this section's analysis of the relationship between capital productivity and corporate credit. Additional research is needed for a more comprehensive analysis, including labor productivity and total factor productivity.

13) The ratio of gross value added to total assets is the ratio of value added to total capital (liabilities + capital) and a capital productivity indicator that shows how much value added a firm's total capital generates in a year. For capital productivity by industry, this article uses the gross value added-to-total assets ratio statistics compiled by the Korea Productivity Center. However, since the gross value added-to-total assets ratio includes the impact of change in capital as well as liabilities, it should be noted that the ratio is not a direct comparison between an increase in corporate credit (liabilities) and change in valued added.

14) The slope of the linear trend line between loan concentration and capital productivity remained nearly unchanged until the end of 2016. After 2017, the negative (-) absolute value increased gradually.

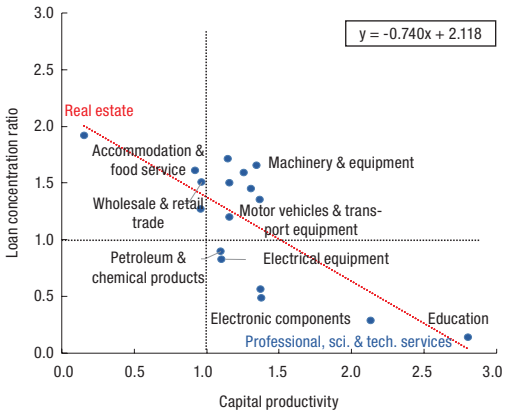
Trends of slope of the linear trend line between loan concentration and capital productivity (end-year basis)

2010	2012	2014	2016	2018	2020	2021
-0.74	-0.77	-0.77	-0.86	-1.07	-1.07	-1.11

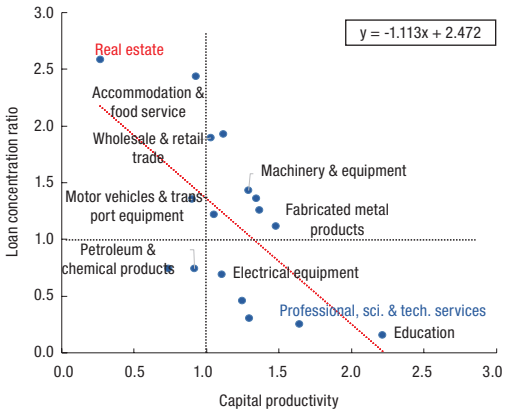
15) As of the end of 2021, real estate-related industries and professional and science and technology service industries accounted for 26.7% and 2.2% of total manufacturing industries and non-financial industries, respectively.

Figure Ⅲ-3. Relationship between loan concentration ratio and capital productivity[1] by industry

End-2010



End-2021[2]



Notes: 1) Capital productivity of each industry is normalized by setting the average value of all industries for each year to 1.
2) Due to data constraints, capital productivity figures for 2020 are used instead.

Sources: Bank of Korea staff calculation, Korea Productivity Center

B. Corporate CreditAllocation by Firm

The allocation of corporate credit by type of firm[16] was analyzed by considering ①capital productivity (ratio of gross value added to total assets),[17] ② profitability (return on assets), and ③ default risk[18] in order to review the efficiency[19] of corporate credit allocation in a broader sense.

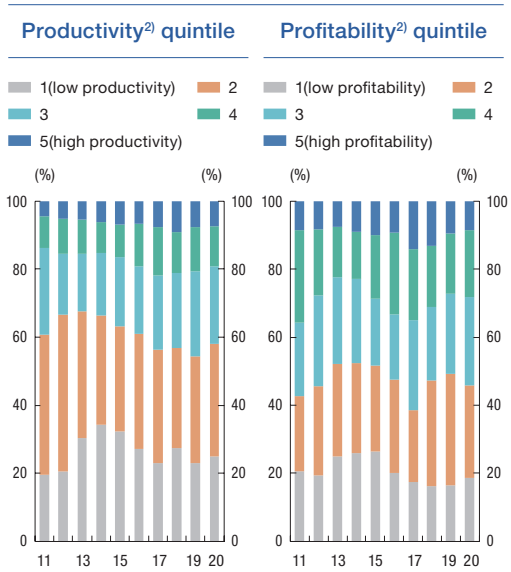
First, it was found that, regarding the allocation of corporate credit by productivity quintile, after the global financial crisis, corporate credit given to firms with lower productivity (1st& 2nd quintiles) accounted for an average of over 60% of the credit extended toexternal audit firms analyzed. As of the end of 2020, credit distributed to firms with lower productivity (1st& 2nd quintiles) accounted for 58.1%, three times the share (19.2%) of firms with higher productivity (4th & 5th quintiles). In terms of profitability quintile, after the global financial crisis, more credit was allocated to firms with low profitability, and this trend has deepened since 2017. As of the end of 2020, the share of credit given to firms with low profitability (1st& 2nd quintiles) was 45.9%, 1.6 times the share (28.2%) of credit extended to firms with high profitability (4th & 5th quintiles) (Figure III-4).

16) Since corporate credit is allocated to individual firms, not to industries, the allocation of corporate credit by firm, in addition to corporate credit by industry, needs to be examined. Among firms that are required to submit business reports in accordance with the Act on External Audit of Stock Companies (hereafter “external audit firms”), excluding financial and insurance companies, 22,687 firms were selected for analysis (end of 2020, 4,400 large enterprises, 18,287 small and medium-sized enterprises). For the analysis of corporate credit by firm, the financial statements of individual firms were linked to data on loans of each firm from financial institutions (source:Korea Credit Information Services).

17) Capital productivity by firm, as with capital productivity by industry, was calculated by dividing the value added of a firm by its total assets.

18)The default risk of an individual firm refers to the probability of such firm being restructured (business closure, negative net worth, etc.) within one year. It was estimated for each firm using the model of Pyoun, Dohoon and Kyungyeon Jeong(2021). For further details on the corporate default risk estimation model, refer to “Assessment of Recent Default Risk of the Corporate Sector and its Implications” in the Financial Stability Report of the Bank of Korea (December 2021).

Figure Ⅲ-4. Corporate credit[1] by capital productivity and profitability quintile

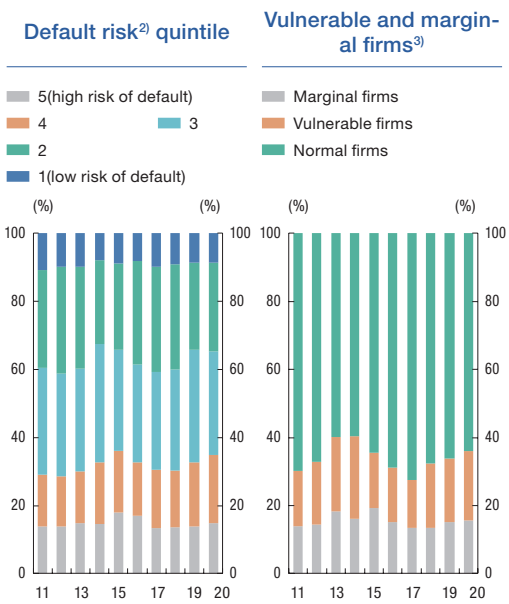


Notes: 1) Share of corporate loans from financial institutions by productivity and profitability quintile.
2) Capital productivity = gross value-added / total assets.
3) Return on total assets (ROA) = net income / total assets.
Sources: Bank of Korea staff calculation, KIS-Value, Korea Credit Information Services.

Interms of corporate default risk quintile, after the global financial crisis, firms with default risk in 2nd& 3rd quintiles accounted for about 60% of the credit extended to external audit firms analyzed. However, after 2017, while the share of credit provided to firms with medium default risk declined, the share of credit given to firms with high default risk (4th & 5th quintiles)rose gradually.

This trend was also observed in credit allocation by firms' debt repayment capacities. The share of credit provided to normal firms with favorable debt servicing capacities (interest coverage ratios above 1) (end of 2020, 64.0%) far exceeded the share of credit (36.0%) extended to vulnerable firms whose operating income alone cannot cover interest expenses (interest coverage ratios below 1). However, since 2017, the share of credit for vulnerable firms has gradually risen, and the share of credit for marginal firms (interest coverage ratios below 1 for three consecutive years) soared from 13.4% at the end of 2017 to 15.6% at the end of 2020 (Figure III-5).

Figure Ⅲ-5. Corporate credit[1] by default risk quintile and ICR vulnerability



Notes: 1) Share of corporate loans from financial institutions by default risk quintile and ICR vulnerability.
2) Default risk of individual firms estimated through the corporate default prediction model developed by BOK.
3) Firms with interest coverage ratios below 1 are classified as 'vulnerable firms,' and among them, firms with the ICR below 1 for 3 consecutive years are classified as 'marginal companies.'
Sources: Bank of Korea staff calculation, KIS-Value, Korea Credit Information Services.

As reviewed above, it was found that a sig-

19) Studies such as Lee Jong-hwa (2000), Borensztein & Lee(2005), and Suh, Jeong-eui and Jung-Mi Kang (2005) viewed an increase in corporate credit for sectors with high profitability (or profitability) or high growth potential as an indicator of credit allocation efficiency.

nificant portion of credit was distributed to firms with low productivity and profitability, suggesting that corporate credit allocation was somewhat inefficient at the individual firm level as well. Meanwhile, in terms of default risk, more credit was allocated into firms with low default risk, which implies that financial institutions gave more importance to asset quality management in the decision-making process related to corporate credit allocation. Still, it is to be noted that, after 2017, the share of credit for vulnerable and marginal firms with inadequate debt repayment capacities rose gradually.

3. Determinants of Corporate Credit and its Relationship with Corporate Financial Indicators

As it was found that, in terms of capital productivity and profitability, corporate credit has not been efficiently allocated recently, it is necessary to analyze what factors of a company determine corporate credit and whether there is any significant relationship between an increase in corporate credit and a change in future corporate financial soundness. To do this, based on the methodology of Borensztein& Lee (2005),[20] a fixed effects panel regression analysis model[21] was estimatedto analyze: ① the relationship between the current level of productivity, profitability, and default risk of an individual firm, on the one hand, and an increase in corporate credit (determinants of corporate credit), on the other, and ② the relationship between an increase in corporate credit and a change in the future productivity, profitability, and default risk of a firm (effects of corporate credit).[22]

A. Determinants of Corporate Credit[23]

First, an increase in corporate credit (firm's debt reliance[24]) was set as a dependent variable, and firms' productivity, profitability, default risk, and debt reliance in the previous year in addition to total assets (log transformation) and average interest rate of borrowings (total interest expenses/total borrowings)

20) Borensztein & Lee (2005) assessed the efficiency in the allocation of corporate loans using the data of manufacturing industries by sector (32) prior to the foreign currency crisis in Korea (1970 to 1996), and analyzed the impact of an increase in corporate loans (debt reliance) on future improvement in capital productivity and profitability. However, the model in this section is estimated using data of all industries by firm instead of data of manufacturing industries by sector and adds some control variables such as interest rates of borrowings to the model of Borensztein & Lee(2005).

21) According to the Hausman test, in all models, the null hypothesis was rejected, and thus the analysis was conducted with the fixed effect model instead of the random effect model.

22) In this section, considering that the relationship between corporate credit and corporate financial soundness has significantly changed amid the COVID-19 shock, financial statements of external auditfirms during the 2011-2019 period were used for the analysis.

23) The estimation of this analysis model was not done by distinguishing the demand-side factors and supply-side factors that influence an increase in corporate credit, but by examining the relationship between corporate credit from financial institutions and the capital productivity, profitability, and default risk of borrowing firms. Thus, caution is needed in interpreting the results.

24) As a firm grows, its borrowings tend to increase. The panel regression analysis of this section, as in the literature, analyzes the determinants of corporate credit and their impact on corporate financial soundness using debt reliance, which is defined as the ratio of total borrowings and bonds payable to total assets (firm size).

were set as explanatory variables to identify the determinants of corporate credit.

[Model Ⅰ]

$$\Delta cr_{i,t} = X_{i,t-1}\beta + \mu_i + \epsilon_{i,t}$$

$\Delta cr_{i,t}$: Firm i's debt reliance on year t

$X_{i,t-1}$: Firm i's explanatory variables on year t-1

μ_i : Fixed effects by firm

The estimation results showed that, in the wake of the global financial crisis, corporate credit has been determined by the default risk of a firm rather than its productivity or profitability. In single-factor models (① to ③) that include only one of three factors (productivity, profitability, or default risk), the coefficients of productivity and profitability were negative,[25] indicating that, currently, firms with higher productivity and profitability have a lower debt reliance. On the other hand, the coefficient of default risk was estimated to be negative with statistical significance, showing that firms with lower default risk have higher debt reliance. Meanwhile, in the multi-factor model that includes productivity, profitability, and default risk(④), the productivity and profitability coefficients were not statistically significant, with only the default risk coefficient being significant. This seems to reflect the practice of financial institutions that provide credit to place more weight on borrowing firms' default risk in order to increase the possibility of funds recovery (Table III-1).

Table Ⅲ-1. Result[1] of estimating[2] the model for the determinants of corporate credit

Explanatory variable[3]	Expected sign	Single factor model			Full model
		①	②	③	④
Debt reliance	(-)	-0.9296***	-0.9336***	-0.7220***	-0.7238***
Log of total assets	(+)	3.0282***	3.2733***	2.0742***	2.0800***
Average borrowing cost	(-)	-0.0678***	-0.0675***	-0.0263*	-0.0263*
Productivity	(+)	-0.0260***			-0.0043
Profitability (ROA)	(+)		-0.0437***		-0.0051
Default risk	(-)			-0.1166**	-0.1235*
R-squared		0.51	0.50	0.15	0.15
Prob(F-value)		0.00	0.00	0.00	0.00
No. of observations		176,667	176,667	174,984	174,984

Notes: 1) ***, **, * mean the coefficient is significant at 1%, 5% and 10% level respectively.
2) For nonfinancial firms subject to external audit, excluding outliers, from 2011 to 2019.
3) Each explanatory variable is one period lagged. Year dummies are included but not reported.

B. Relationship Between Corporate Credit and Future Corporate Financial Soundness

To analyze whether there is a significant relationship between corporate credit and a firm's future financial soundness (productivity, profitability, and default risk), a model for assessing the effects of corporate credit was estimated with a firm's future productivity, profitability, and default risk (average of current year and two following years) as dependent variables, and past debt reliance (average of immediately-preceding three years) as the explanatory variable.

25) Borensztein & Lee (2005) assessed that, prior to the foreign currency crisis, loans were not efficiently allocated to industries, which is proved by the study's finding that the productivity and profitability coefficients in relation to an increase in corporate credit were all negative, and some coefficients were not statistically significant.

[Model Ⅱ]

$$y_{i,T} = \rho y_{i,T-1} + \alpha cr_{i,T-3} + X_{i,T-3}\beta + \mu_i + \epsilon_{i,t}$$

(T= year t to t+2)

$y_{i,T}$: Firm i's productivity, profitability or default risk, averaged over 3 consecutive years from current years

$cr_{i,T-3}$: Firm i's debt reliance averaged over immediately-preceding 3 years

$X_{i,T-3}$: Firm i's other explanatory variables, averaged over immediately-preceding 3 years

μ_i : Fixed effects by firm

The estimation results showed that, with regard to firms that increased their credit in the past (rise in debt reliance), future productivity and profitability improved over time, and default risk fell significantly. The coefficient of past debt reliance was positive both in the productivity and profitability models and negative in the default risk model[26] (Table III-2).

Table Ⅲ-2. Result[1] of estimating[2] the model for the effects of corporate credit on productivity, profitability, and default risk

Explanatory variable[4]	Expected sign	Dependent variable[3]		
		Productivity	Profitability	Default risk
Lagged dependent variable	(+)	0.5679***	0.4956***	0.7047***
Log of total assets	(+/-)	-1.2371***	-2.1596***	0.3063***
Average borrowing cost	(-)	-0.0050*	-0.0052**	-0.0042***
Debt reliance	(+/-)	0.0374***	0.0487***	-0.0154***
R-squared		0.84	0.38	0.61
Prob(F-value)		0.00	0.00	0.00
No. of observations		88,092	88,092	88,067

Notes: 1) ***, **, * mean the coefficient is significant at 1%, 5% and 10% level respectively.
2) For nonfinancial firms subject to external audit, excluding outliers, from 2014 to 2019.
3) The dependent variable is future capital productivity, ROA, or default risk, averaged over three consecutive years from the current year (year t to t+2).
4) Each explanatory variable is the average of one to three years lagged values (year t-3 to t-1). Year dummies are included but not reported.

Next, to examine whether the effects of corporate credit on a firm's future corporate financial soundness vary by industry, a dummy variable by industry was added to the corporate credit effect assessment model (Model Ⅱ), and the following formula was estimated. The dummy variables by industry were set separately for real estate-related industries and accommodation and food service-related industries, where corporate credit has increased rapidly in recent years, and for other industries, by dividing them into manufacturing, services(excluding real estate-related and accommodation and food service-related industries), and other non-manufacturing industries.

26) Borensztein & Lee (2005) found that, in the panel model used to analyze the impact of an increase in credit extended to industries (t-3 period to t-1 period, average debt reliance) on future (average of t period to t+2 period) profitability and capital productivity, the coefficients of debt reliance were estimated to be negative and statistically insignificant, and assessed that the increased loans to industries in Korea before the foreign currency crisis failed to contribute to improving future profitability and capital productivity.

[Model Ⅲ]

$$y_{i,T} = \rho y_{i,T-1} + \Sigma_k \alpha_k I_k^{indu} cr_{i,T-3} + X_{i,T-3}\beta + \mu_i + \epsilon_{i,t}$$

(T= year t to t+2)

$y_{i,T}$: Firm i's productivity, profitability or default risk, averaged over 3 consecutive years from current years

$cr_{i,T-3}$: Firm i's debt reliance averaged over immediately-preceding 3 years

I_k^{indu} : Dummy variable by industry

$X_{i,T-3}$: Firm i's other explanatory variables, averaged over immediately-preceding 3 years

μ_i : Fixed effects by firm

The estimation results showed that the relationship between corporate credit and future corporate financial soundness, which was found to be positive in the all-industry model, varied somewhat by industry. In particular, as for real estate-related industries, the coefficient of debt reliance was not statistically significant in the profitability and default risk models, and in the productivity model, the coefficient was statistically significant, but smaller than those for other industries. This suggests that the impact of credit support on improving financial soundness for real estate-related industries may not be larger than in other industries. Meanwhile, as for accommodation and food service-related industries, the coefficient of debt reliance was not statistically significant in the productivity model, but was significant in the profitability and default risk models, with its absolute value being larger than for other service industries or other non-manufacturing industries. This suggests that, although credit support for accommodation and food service-related industries did not meaningfully improve the future productivity of supported firms, it can reduce their default risks by relieving liquidity constraints (Table III-3).

Table Ⅲ-3. Result[1] of estimating[2] the model for the effects of corporate credit on productivity, profitability, and default risk, by industry

Explanatory variable[4]		Expected sign	Dependent variable[3]		
			Productivity	Profitability	Default risk
Lagged dependent variable		(+)	0.5678***	0.4953***	0.7069***
Log of total assets		(+/-)	-1.2915***	-2.2598***	0.3325***
Average borrowing cost		(-)	-0.0044	-0.0038*	-0.0045***
Debt reliance	Manufacturing	(+/-)	0.0610***	0.0767***	-0.0307***
	Services[5]	(+/-)	0.0247***	0.0410***	-0.0085*
	Real estate	(+/-)	0.0187**	0.0176	-0.0044
	Accommodation & food service	(+/-)	0.0507	0.0611**	-0.0276*
	Other non-manufacturing[6]	(+/-)	0.0663***	0.1003***	-0.0237***
R-squared			0.83	0.34	0.57
Prob(F-value)			0.00	0.00	0.00
No. of observations			88,092	88,092	88,067

Notes: 1) ***, **, * mean the coefficient is significant at 1%, 5% and 10% level respectively.
2) For nonfinancial firms subject to external audit, excluding outliers, from 2014 to 2019.
3) The dependent variable is future capital productivity, ROA, or default risk, averaged over three consecutive years from the current year (year t to t+2).
4) Each explanatory variable is the average of one to three years lagged values (year t-3 to t-1). Year dummies are included but not reported.
5) Excluding real estate, accomodation & food service.
6) Non-manufacturing excluding services, such as construction, electricity & gas supply.

Furthermore, to examine whether the relationship between corporate credit and firms' future financial soundness varied depending on the characteristics of firms, dummy variables by the quintiles of firms' productivity, profitability, and default risk were added to the corporate credit effect assessment model (Model II).

[Model Ⅳ]

$$y_{i,T} = \rho y_{i,T-1} + \Sigma_k \alpha_k I_k^y cr_{i,T-3} + X_{i,T-3}\beta + \mu_i + \epsilon_{i,t}$$

(T= year t to t+2)

$y_{i,T}$: Firm i's productivity, profitability or default risk, averaged over 3 consecutive years from current years

$cr_{i,T-3}$: Firm i's debt reliance averaged over immediately-preceding 3 years

I_k^y : Dummy variables by the quintiles of firms' productivity, profitability and default risk

$X_{i,T-3}$: Firm i's other explanatory variables, averaged over immediately-preceding 3 years

μ_i : Fixed effects by firm

Table Ⅲ-4. Result[1] of estimating[2] the model for the effects of corporate credit on productivity, profitability and default risk, by quintile

Explanatory variable[4]		Expected sign	Dependent variable[3]		
			Productivity	Profitability	Default risk
Lagged dependent variable		(+)	0.5437***	0.4612***	0.6820***
Log of total assets		(+/-)	-1.1297***	-1.9744***	0.2515***
Average borrowing cost		(-)	-0.0056*	-0.0062**	-0.0051***
Debt reliance	1st quintile[5] (low)	(+/-)	0.0050	0.0042	-0.0314***
	2nd quintile	(+/-)	0.0162*	0.0249**	-0.0214***
	3rd quintile	(+/-)	0.0251***	0.0314***	-0.0186***
	4th quintile	(+/-)	0.0403***	0.0419***	-0.0114***
	5th quintile (high)	(+/-)	0.0680***	0.0748***	0.0018
R-squared			0.88	0.43	0.62
Prob(F-value)			0.00	0.00	0.00
No. of observations			88,092	88,092	88,067

Notes: 1) ***, **, * mean the coefficient is significant at 1%, 5% and 10% level respectively.
2) For nonfinancial firms subject to external audit, excluding outliers, from 2014 to 2019.
3) The dependent variable is future capital productivity, ROA, or default risk, averaged over three consecutive years from the current year (year t to t+2).
4) Each explanatory variable is the average of one to three years lagged values (year t-3 to t-1). Year dummies are included but not reported.
5) Capital productivity, profitability (ROA), and default risk quintile respectively.

The estimation results showed that firms with higher productivity and profitability or lower default risk have a greater positive relationship between corporate credit and future corporate financial indicators. In each model, firms with higher productivity and profitability had a larger positive value for the coefficient of debt reliance, and firms with lower default risk had a larger negative value for the coefficient of debt reliance. This result can be interpreted as meaning that, if corporate credit is provided to firms with high productivity and profitability and low default risk, the future productivity and profitability of such firms are more likely to improve or their default risk to fall. On the other hand, for firms with low productivity and profitability (1st quintile for each) or high default risk (5th quintile), the coefficient of debt reliance was not statistically significant, which suggests that credit support for insolvent firms is unlikely to make a significant contribution to improving their future financial soundness (Table Ⅲ-4).

4. Assessment and Implications

A review of the corporate credit allocation by industry after the global financial crisis found that a relatively large amount of corporate loans was extended to real estate-related industries and accommodation and food services-related industries, and recently this trend has strengthened, indicating that the efficiency of corporate credit allocation has declined somewhat. In particular, if a relatively large amounts of funds continue to flow into

real estate-related industries, which are highly related to asset markets, it would likely exacerbate financial imbalances in which excessive leverage expansion and asset price surges occur simultaneously, rather than increasing the profitability or reducing the default risk of real estate companies significantly. The analysis of corporate credit allocation by firm also found that more loans were allocated tofirms with low productivity and profitability, which is similar to the results of the analysis of corporate credit by industry. Moreover, the results of the panel regression analysis by firm, using financial statements of individual firms, showed that change in corporate credit was closely related to firms' default risk level.

Meanwhile, according to the analysis of the relationship between corporate credit and firms' future financial soundness by industry and firms' characteristics such as productivity, profitability, and default risk level, it is to be noted that, while corporate credit provided to vulnerable firms during COVID-19 reduced their default risk in the short term,[27] such effect of corporate credit may vary in the long term depending on firms' productivity, profitability, and default risk level. In particular, if the financial support for firms with high default risk continues longer than necessary, while firms' future financial soundness is less likely to improve, the credit market's natural selection mechanism[28] may weaken, and problems such as the delayed restructuring of insolvent firms and an increase in potential defaults may further intensify.

Based on these analysis results, the following policy implications can be derived. By alleviating the excessive inflow of corporate credit into specific sectors,[29] it is necessary to prevent problems such as the accumulation of financial imbalances and to allow limited resources to be more efficiently allocated for the national economy as a whole.[30] Furthermore, considering the intertemporal trade-off[31] of increasing corporate credit, the financial supports for businesses that have been kept in place since the beginning of the COVID-19 pandemic, should be normalized in line with the progress of economic recovery, so that corporate credit does not act as a

27) Pyoun, Dohoon and Kyungyeon Jeong (2022) assessed that financial support measures introduced for businesses during COVID-19 helped to reduce the default risk of the beneficiaries by relieving interest burden and supporting liquidity.

28) Uesugi (2008) defined the natural selection of an efficient credit market as the process of lower quality firms facing financial constraints by being charged higher borrowing costs (interest rate) and eventually being forced out of the market.

29) For instance, to relieve excessive inflow into the real estate sector, the sectoral countercyclical capital buffer (SCCyB) that Switzerland used to address sectoral systematic risks related to mortgages for residential real estate could be applied to corporate loans by industry, or the lending-limit regulation currently applied in some non-banking sectors could be applied more broadly.

30) Popov (2017) argued in his paper, which summarized recent literatures on the relationship between finance and economic growth, that there exist non-linearities between finance and economic growth, and the positive effect of finance on growth dissipates beyond a threshold of financial development.

31) The IMF Global Financial Stability Report (April 2021) pointed out that, through GaR(Growth-at-Risk) analysis, a rapid increase in corporate credit through policy support provided a short-term boost to growth, but an inter temporal trade-off arises because loose financial conditions also contribute to increasing the downside risks of growth in the medium term.

factor that increases risk related financial stability. However, since the effect of economic recovery is disseminated unevenly by industry or company size, selective support for small and medium-sized enterprises (SMEs) that are recovering slowlyneeds to be continued through policy financeand debt restructuring, but it is necessary to promptly implement a bold restructuring for marginal firms that are having difficulties continuing in business. In addition, in indirect financial markets, there is a limitation that loans tend to concentrate in sectors with greater collateral capacity, due to the characteristics of financial institutions that prioritize funds recovery. Given this, efforts should be made to increase access to capital markets[32] for innovative companies whose capacity for collateral is insufficient but have high growth potential so that they do not face financial constraints.

32) As a measure of improving companies' access to the capital market, the Business Development Company (BDC) scheme that the government intends to introduce to provide funds to support the growth of non-listed companies,- can be considered. For details of the scheme, refer to the press release of the Financial Services Commission, entitled "Government Approves Revision Bill to FSCMA for Introducing Business Development Companies" (May 26, 2022).

Ⅳ. Growth of Loans Issued to Self-employed Business Owners After COVID-19 and Assessment of Debt Repayment Risks

1. Background
2. Recent Growth of Loans to SEBOs
3. Debt Repayment Risk of SEBOs Due to Change in Future Financial Conditions
4. Implications

1. Background

After the outbreak of COVID-19, self-employed business owners, in response to sluggish income and sales, dealt with the difficulty of securing funds by taking more loans[1] from financial institutions, based on the government's financial support measures.

In this context, as loan interest is rising and the financial support measures are about to be terminated (September 2022), there is concern that the debt repayment capacity of self-employed business owners (hereafter "SEBOs") may deteriorate rapidly. Loans issued to SEBOs are held by borrowers who received loans from multiple financial institutions, and thus loan defaults in a certain financial sector could rapidly spread to other financial sectors.

This section examines how SEBOs used the loans that increased significantly since-COVID-19, as well as the probability of defaults due to changes in financial conditions and the impact on financial institutions, and derives policy implications.

2. Recent Growth of Loans to SEBOs

Loans extended to SEBOs as of the end of March 2022 amounted to KRW 960.7 trillion,[2] rising by 40.3% from the end of 2019, prior to COVID-19. Such increase is largely attributed to the increase in demand for working capital due to sluggish sales associated with the pandemic and significantly outpaced the growth rates of household credit and corporate credit during the same period (16.2% and 23.7%, re-

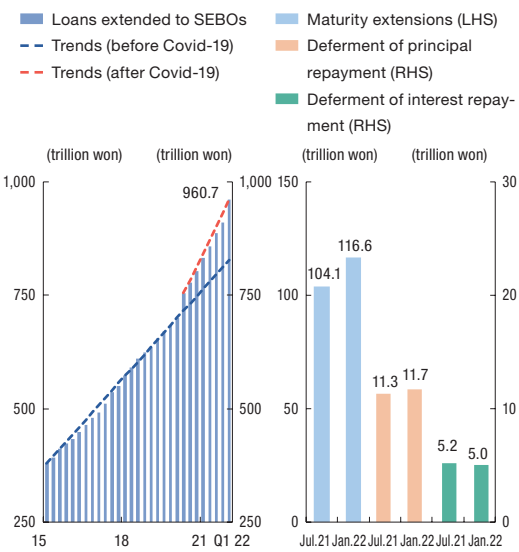
1) This section used the Consumer Credit Panel (panel data of about one million borrowers), defined self-employed business owners as borrowers of sole proprietor loans, and estimated the size of loans to SEBOs by summing household loans and sole proprietor loans they are holding. Usually, self-employed business owners, sole proprietors, and small business owners are terms with similar meanings, but they differ by their scope of coverage. Generally, self-employed business owners exclude unpaid family workers among non-salaried workers in employed persons (Statistics Korea). According to the Framework Act on Micro Enterprises, a small business owner is defined as a business owner with fewer than 10 full-time employees, and the number of employees differs by business sector: (i) mining, manufacturing, construction, and transportation: fewer than 10 people; (ii) other sectors: fewer than five people. Sole proprietors are individuals who supply goods and services independently and hold business registration with the National Tax Service. Meanwhile, different data for analysis uses different means of identifying self-employed business owners: individuals (Consumer Credit Panel, Tax Statistics Information Service, etc.), households (Survey of Household Finances and Living Conditions, etc.), and businesses (Small Business Survey, etc.).

2) At the end of March 2022, loans to SEBOs consisted of sole proprietor loans (KRW 625.1 trillion) and household loans (KRW 335.6 trillion). Sole proprietor loans to SEBOs accounted for 38.8% of total corporate loans, and household loans to SEBOs represented 19.1% of total household loans.

spectively). In addition, the financial support measures[3] that were implemented to relieve the financial difficulties of SEBOs who were hit the hardest contributed to increasing the rate of growth of loans provided to SEBOs.

As a result, considering the growth trend that prevailed prior to the rapid spread of COVID-19 (first quarter of 2015 to first quarter of 2020), the balance of loans to SEBOs as of the end of March 2022 is assessed as having exceeded the non-pandemic estimate (about KRW 828.2 trillion) by about KRW 132.5 trillion (Figure IV-1).

Figure IV-1. Status of loans to SEBOs and government financial support measures



Notes: 1) Balance of loans basis.
Sources: Bank of Korea(Consumer Credit Panel), Financial Services Commission.

A. Use of Loans to SEBOs

Regarding the use of loans extended to SEBOs based on the Survey of Household Finances and Living Conditions of Statistics Korea,

3) The government supplied funds to small business owners who suffered amid the pandemic through various methods such as maturity extension for existing loans, delay of principal and interest payments, and extension of new loans. In particular, the maturity extension and delay of principal and interest payments have been extended four times amid the protracted pandemic since their implementation in April 2020 (end of September 2020 → end of March 2021 → end of September 2021 → end of March 2022 → end of September 2022).

Government's Financial Support Measures for Small Businesses in Response to COVID-19

(trillion won)

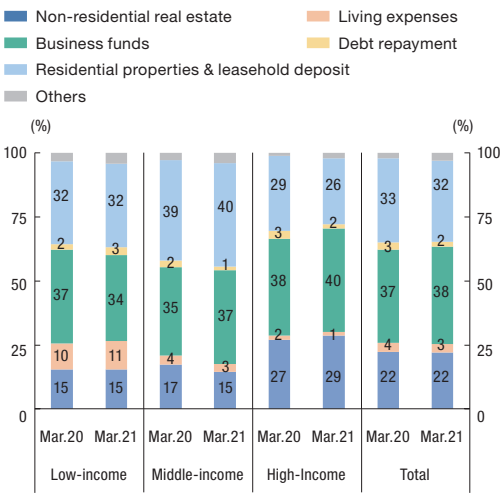
Measures	Implementation Period	Amount of Support
Maturity extensions & Deferment of Princial and Interest Repayment	April 2020 - September 2022 (scheduled)	133.4[1]
Primary financial support for small business owners	January - May 20 (end)	13.7
Secondary financial support for small business owners	May 20 to December 21 (end)	7.8
Hee-mang loan plus	January 2022 -	10.0[2]

Notes: 1) Based on the Balance of loans(end of January 2022), including the amount of support for SMEs
2) Target amount
Sources: Financial Services Commission, Ministry of SMEs & Startups

while low-income households increased their loans to coverliving expenses during COVID-19, high-income households did the same for investment in business or real estate.[4)]

The review of change in the use of loans extended to self-employed households that held financial debt before and after COVID-19 by income level showed that, for low-income households (lower 30%), the share of loans for living expenses or debt repayment (based on balance) rose, and for high income households (upper 30%), the share of loans for business investment and purchase of housing other than their own residence and real estate except housing climbed compared to the pre-pandemic period (Figure IV-2).

Figure IV-2. Shares[1)2)] of self-employed households' financial liabilities, by use



Notes: 1) Recalculated the income level among SEBO households with financial liabilities.
2) Balance of financial liabilities basis.
Sources: Bank of Korea staff calculation, Statistics Korea(Survey of Household Finances and Living Conditions).

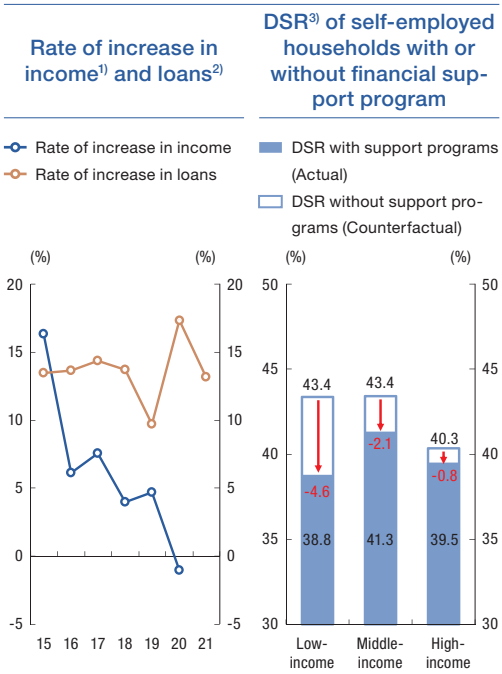
B. Effects of the Expansion of Loans to SEBOs

The expansion of loans to SEBOs helped relieve the funding difficulties of SEBOs who experienced a temporary decrease in income due to COVID-19. Moreover, the government's financial support measures made a significant contribution to lessening the debt repayment burden of SEBOs.

According to a counterfactual analysis of the DSR of self-employed households at the end of 2021, compared to the case without financial support,the DSR of low-income households (lower 30%) was 38.8%, down 4.6%p compared to the DSR without financial support (43.4%), and the DSR of high-income households (upper 30%) and middle-income households (30-70%) also declined by 0.8%p and 2.1%p, respectively (Figure IV-3).

4) Park & Kim (2018) analyzed the data of the Korean Labor & Income Panel Study and found that, from 2001 to 2015, high-income households took loans to fund real estate investment, while low-income households borrowed for consumption. This section also found that such trend emerged during COVID-19.

Figure Ⅳ-3. Income and loans of SEBOs and comparison of DSR with or without financial support programs

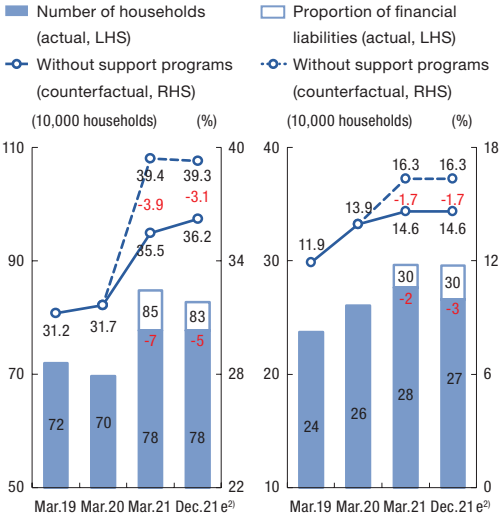


Notes: 1) Business income(including real estate rental income); 2021 has not yet been announced.
2) Loans of SEBOs identified by Consumer Credit Panel.
3) As of the end of 2021(estimated using data from March 2020) basis.

Sources: Bank of Korea(Consumer Credit Panel), Bank of Korea staff calculation, National Tax Service, Statistics Korea(Survey of Household Finances and Living Conditions).

Using the same method, the estimation of households in deficit and liquidity risk households at the end of 2021[5] showed that the number of households in deficit decreased by about 50,000 compared to the case without financial support measures (830,000 → 780,000), and the number of liquidity risk households decreased by about 30,000 (300,000 → 270,000) (Figure Ⅳ-4).

Figure Ⅳ-4. Change in self-employed households in deficit & liquidity risk households, with or without financial support programs



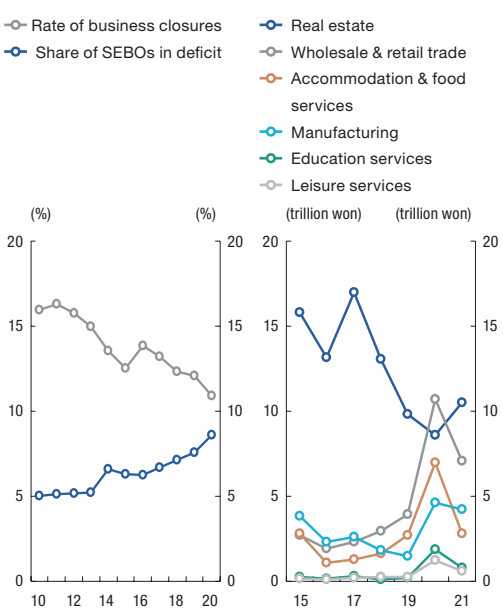
Notes: 1) Compared to the total balance of SEBO households' financial liabilities.
2) Estimated using the rates of increase in services production index, SEBOs' loans, consumption spending, etc.

Sources: Bank of Korea staff Calculation, Statistics Korea(Survey of Household Finances and Living Conditions).

On the other hand, the expansion of loans to SEBOs is assessed to have created the problems of delaying the restructuring of SEBOs-deemed unlikely to recover in the long term and boosting loans to the real estate industry (Figure Ⅳ-5).

5) Based on Giordana et al.(2019) and Karasulu(2008), households in deficit were defined as households with income less than their essential expenditures and loan principal and interest payments, and liquidity risk households were defined as households in deficit that can cover their deficits with liquid financial assets for less than one year. For details, refer to "Potential defaults of loans to self-employed households and implications," Financial Stability Conditions (March 2022)(BOK press release, March 24, 2022).

Figure Ⅳ-5. Trends of SEBOs' deficit, business closures, and loans by industry



Notes: 1) The number of loss reports among the number of business income reports of sole proprietors.
2) Sole proprietor basis.
3) Domestic banks' sole proprietor loans basis.
4) Year-on-year basis.

Sources: National Tax Service, Financial institutions' business reports.

After COVID-19, despite a significant increase in the share of SEBOs without business income mostly in the accommodation & food service industry and educational service industry, the rate of SEBOs who went out of business declined at a faster pace. Furthermore, as for the growth trend of loans to SEBOs by business sector (based on sole proprietors), loans to the wholesale & retail trade industry and accommodation & food service industry rose dramatically in 2020, when sales fell sharply due to COVID-19, and the growth rate of loans declinedin 2021, while loans to the real estate industry[6)] grew at a slower pace until 2020 and surged at an increasing rate in 2021. This growth of loans to the real estate industry has been pointed to as one of the factors that deepen financial imbalances, along with the expansion of housing-related loans in the household sector.

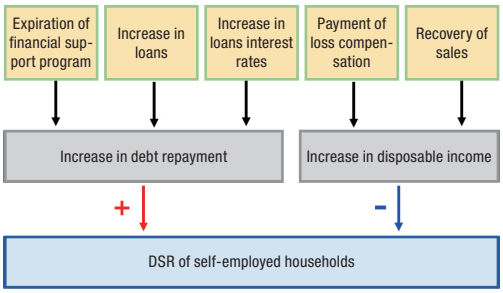
3. Debt Repayment Risk of SEBOs Due to Change in Future Financial Conditions

As loans to SEBOs have recently increased, there is concern that the rise in the market interest rate and termination of the financial support measures will significantly increase the debt repayment burden of SEBOs. On the other hand, the government's payment of large amounts of compensation for business losses[7)] will likely reduce the debt repayment burden of SEBOs. To measure the impact of these policy factors on the debt repayment capacity of SEBOs going forward, three scenarios–increase in interest rate, end of financial support measures, and payment of loss compensation–were established to run a stress test (Figure IV-6).

6) The net increase in sole proprietors who were engaged in real estate-related industries in 2020 (number of new registrations - number of business closures) stood at 250,000 people, representing half of the net increase in all sole proprietors (538,000 people).

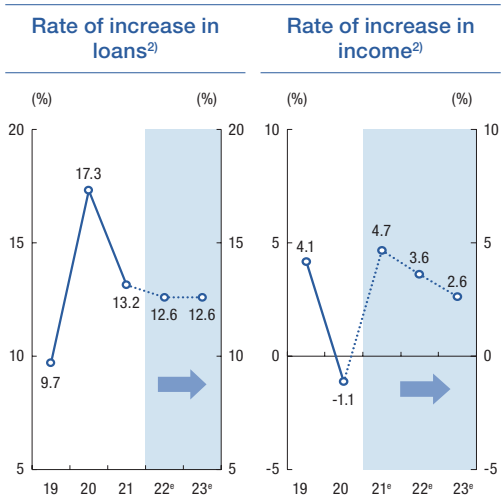
7) Since May 30, 2022, the government has made loss compensation payments worth over KRW 6 million per small business owner who suffered a decrease in sales due to the government's COVID-19 prevention measures.

Figure Ⅳ-6. Main variables affecting DSR of self-employed households



The baseline scenario of the stress test assumed that loans to SEBOs rose at the rate of growth observed prior to COVID-19[8] (12.6%), and that income increased by 3.6% and 2.6% in 2022 and 2023, respectively,[9] considering the recovery of sales by sector and the economic projection of Bank of Korea (Figure Ⅳ-7). It was further assumed that the loan interest rate remained at the current level until the end of 2023, and that the financial support measures[10] were extended again in September 2022 (Table Ⅳ-1).

Figure Ⅳ-7. Scenarios of loans and income[1] to self-employed households



Notes: 1) Disposable income basis.
2) Year-on-year basis.

Sources: Bank of Korea(Consumer Credit Panel), Bank of Korea staff calculation, Statistics Korea(Survey of Household Finances and Living Conditions).

To examine change in the debt repayment capacity of SEBOs along with change in financial conditions and policies, various scenarios were established: loan interest rate rises by 50bp in 2022 and 2023, respectively (Scenario I); financial support measures end in September 2022[11] (Scenario II); loss compensation of KRW 6 million is paid per household in 2022 (Scenario III); and multiple shocks occur simultaneously (complex shock scenario).

8) For the growth rate of loans to SEBOs in 2022 and 2023, the growth rate during the 2017-2019 period, prior to COVID-19, was applied.

9) The income of SEBOs in 2021 was estimated based on the Survey of Household Finances and Living Conditions and Service Industry Survey, and the income of SEBOs in 2022 and 2023 was adjusted in accordance with GDP projections.

10) It was assumed that 13% of sole proprietor loans were granted principal and interest payment deferrals in consideration of existing records of maturity extension and principal and interest payment deferrals.

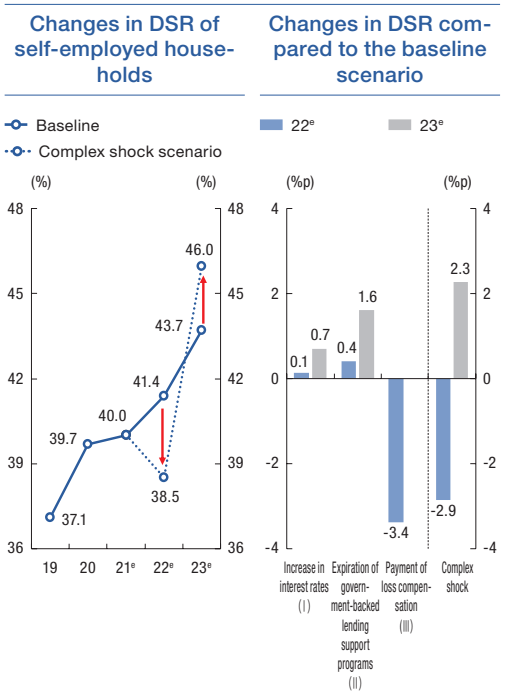
11) It was assumed that, after the end of the financial support measures, principal and interest payments that have so far been deferred will be amortized for the next five years, and the maturity of 80% of the principal and interest will be extended, with the remaining 20% being amortized over five years.

Table Ⅳ-1. Scenarios of main financial & policy variables

	Baseline	Shock scenario			
		Ⅰ	Ⅱ	Ⅲ	Complex
▪ Increase in loans interest rates (50bp per year)	×	○	×	×	○
▪ Expiration of financial support program (Sep.22)	×	×	○	×	○
▪ Payment of loss compensation (6 million won per household)	×	×	×	○	○

First, under interest rate hikes (Scenario I), the DSR of self-employed households rose by 0.1%p and 0.7%p in 2022 and 2023, respectively, compared to the baseline scenario. The termination of the financial support measures (Scenario II) would raise the DSR of self-employed households by 0.4%p and 1.6%pin 2022 and 2023, respectively (Figure Ⅳ-8). On the other hand, the government's payment of a fixed amount of loss compensation (Scenario III) would lower the DSR of self-employed households by 3.4%pin 2022. Lastly, in the event of the simultaneous occurrence of three shocks (complex shock scenario), the DSR of self-employed households would fall by 2.9%p in 2022 and rise by 2.3%p in 2023, compared to the baseline scenario.

Figure Ⅳ-8. Changes in DSR of self-employed households under the complex shock scenario

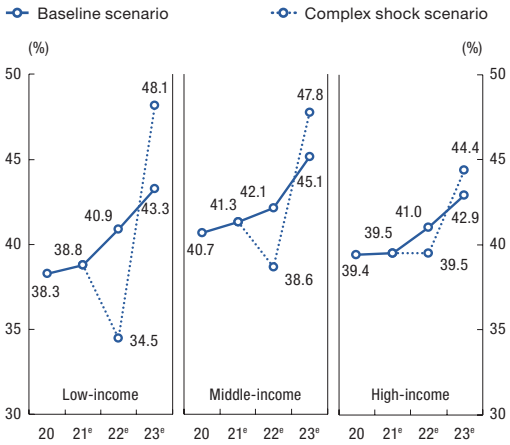


Sources: Bank of Korea staff calculation, Statistics Korea(Survey of Household Finances and Living Conditions).

Hence, the DSR of self-employed households is expected to remain at a favorable level this year, thanks to the recovery of sales associated with the relaxation of social distancing and payment of loss compensation,and despite the increase in the loan interest rate and termination of the financial support measures. Under the multiple-shock scenario, the DSR of self-employed households is estimated to fall from 40.0% in 2021 to 38.5% in 2022. After 2023, however, as the impact of the termination of the financial support measures is felt and the effect of loss compensation payment disappears, the debt repayment burden is likely to surge significantly. Under this scenario, the DSR of self-employed households would advance to 46.0% in 2023.

In particular, by income level, the DSR of low-income households (lower 30%) will likely drop to 34.5% in 2022 and rise to 48.1% in 2023[12] (Figure IV-9). In addition, low-income households would benefit from a greater burden relief effect due to loss compensation and be more vulnerable to the shock caused by the termination of the financial support measures.[13]

Figure Ⅳ-9. Changes in DSR of self-employed households under the complex shock scenario, by income level



Sources: Bank of Korea staff calculation, Statistics Korea(Survey of Household Finances and Living Conditions).

Meanwhile, in the case of an increase in the debt repayment risk of SEBOs, caused by such factors as anincrease in the DSR in tandem with a change in financial conditions, the credit risk of non-bank financial institutions is expected to increase. As of the end of March 2022, loans to vulnerable SEBOs[14] amounted to KRW 88.8 trillion, up 30.6% from the level seen just before COVID-19 (KRW 68.0 trillion, end of 2019), and after 2023, when the debt repayment burden is expected to rise, loans to SEBOs will likely increase rapidly (Figure IV-10). Moreover, given thatloans to SEBOs represent a higher share of borrowers with multiple loans from multiple financial sectors, defaults in a certain financial sector could quickly spread to other financial sectors.[15]

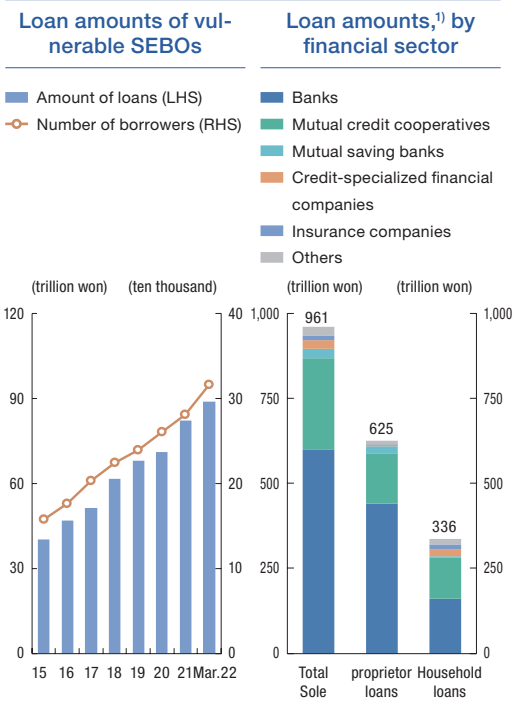
12) However, if part of the loss compensation (KRW 6 million) is used to repay principal and interest, the DSR of loans households in 2023 would be lower than the initial estimate (48.1%).

13) While the payment of loss compensation is estimated to substantially reduce the DSR of low-income households (2022, -7.5%p), it would lead to a slight decline (-1.9%p) for high-income households. In addition, while the end of the financial support measures would raise the DSR of low-income households by a large margin (+4.2%p in 2023), the impact on high-income households would be limited (+0.8%p).

14) This refers to low-income, low-credit rating borrowers with multiple loans. Due to data constraints, this section estimates multiple loans based on the number of lenders and number of sole proprietor loan products.

15) Based on the method of Jean Lim et al. (2018), borrowers with loans from two different financial sectors were collected, and the loan balance held by these borrowers is indicated by the thickness of the lines (figures indicate balances) in the figure.The interconnectedness of loans to SEBOs with multiple loans among financial sectors is illustrated as follows. SEBOs hold loans mostly from banks and have additional loans from mutual credit cooperatives and credit-specialized financial companies.

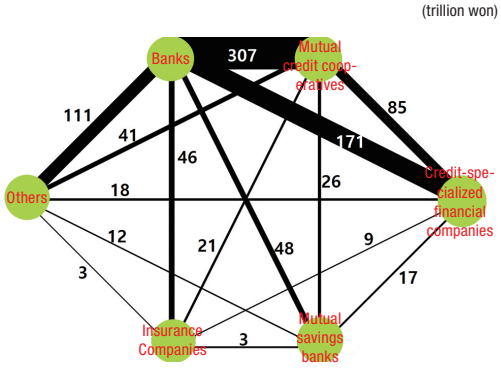
Figure Ⅳ-10. Status of vulnerable SEBOs and composition of SEBOs' loans



Note: 1) Loan amounts as of end-March 2022.
Source: Bank of Korea(Consumer Credit Panel).

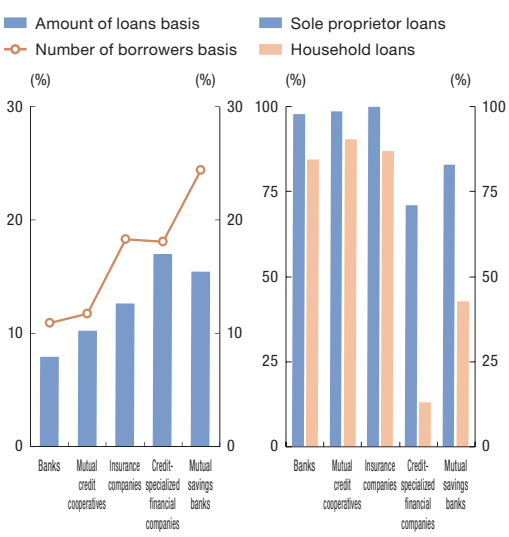
By sector, banks and mutual credit cooperatives (Shinhyup, Nonghyup, Suhyup, and Forestry Cooperatives) show large individual loan balances, lower shares of vulnerable borrowers, and higher shares of loans with collateral and guarantees, and thus the impact of the increased debt repayment risk of SEBOs seems to be limited (Figure IV-11). On the other hand, credit-specialized financial companies and savings banks have higher shares of vulnerable borrowers than other sectors and lower shares of secured or guaranteed loans. Thus, in the event the debt repayment capacity of SEBOs deteriorates, loans extended to SEBOs from these sectors are likely to be hit first.

Mutual linkage structure1) of SEBOs' multiple loans in the financial sectors



Note: 1) End-March 2022 basis.
Source: Bank of Korea (Consumer Credit Panel).

Figure Ⅳ-11. Vulnerabilities related to SEBOs' loans, by financial sector



Notes: 1) End-March 2022 basis.
2) Partial credit loan included.
Source: Bank of Korea(Consumer Credit Panel).

4. Implications

The recent growth of loans to SEBOs has significantly contributed to reducing the debt repayment burden and liquidity risk of SEBOs amid COVID-19. However, the continued growth of loans to SEBOs brings problems, including deepening financial imbalances through the expansion of loans to real estate industries, delaying the restructuring of SEBOs who are unable to recover, and intensifying the deferral and accumulation of potential defaults. Although defaults on loans to SEBOs appear to have fallen slightly thanks to the government's payment of loss compensation, it should be noted that, in the event of rising loan interest rates and growing adverse effects of the termination of the government's financial support measures, defaults on loans to SEBOs, especially among vulnerable borrowers, are likely to increase dramatically. Hence, the focus of financial support policies for SEBOs needs to shift from liquidity support to solvency support.[16)]

First, a phased termination[17)] of the maturity extension and payment deferral measures for self-employed business owners appears to be desirable. Thus, SEBOs who recovered income should be induced to repay their loans voluntarily considering the interest burden associated with rising market interest rates. However, for business owners who are not completely free of liquidity risk, owing to delays in improvement of business conditions, the interest payment deferral may be terminated,[18)] but

16) The IMF(2021) pointed out in its Staff Discussion Note that the growing default risk of SMEs could slow economic recovery, and that government policies for SMEs need to shift from liquidity support to solvency support (April 2021).

17) According to the BIS(2020) and websites of financial authorities of other countries, such as Australia and Hong Kong, that implemented principal and interest payment deferrals,such measureshave been terminated or the amount of support has been reducedthrough a gradual exit strategy. Australia limited the maximum deferral of principal and interest payments to 10 months, terminated support measures (1st: began in March 2020, ended in March 2021), and implemented additional measures when necessary (2nd: began in July 2021, ended in October 2021). Hong Kong encouraged firms that had exceeded the duration of its deferral measures by a certain period to use replacement loans and guided firms that had recovered their repayment capacity to repay part of the principal through amortization over a long period.

18) It should be noted that financial institutions can only cope with the probability of default through asset quality by assessing borrowers' debt servicing capacity through monitoring of interest payment.

the maturity extension and principal payment deferral measures should be kept in place for the time being in order to prevent a sudden increase in the debt repayment burden in the short term.

Moreover, SEBOs whose debt repayment capacity has deteriorated significantly due to a protracted decrease in sales or who are unlikely to recover need debt adjustment or support programs for business closure and business conversion.[19] To this end, it may be necessary to establish an organization specialized in purchasing and processing non-performing assets of financial institutions(bad bank program).[20] As such support could cause moral hazard among borrowers, when designing the target selection and debt adjustment methods, the overall characteristics of borrowers, such as structural vulnerability and possibility of rehabilitation, should be considered.

Meanwhile, regarding non-bank financial institutions, which have higher shares of vulnerable borrowers, there is concern that defaults on loans to SEBOs may increase rapidly. Hence, in granting loans to SEBOs, loan review should be strengthened and an additional loan loss provision needs to be set aside preemptively.

19) In the second supplementary budget, the government includeda contribution (KRW 0.7 trillion, passed on May 30, 2022) to establish a "new start fund for small merchants and self-employed business owners" (tentatively named) and plans to support the adjustment of repayment schedules and debt exemptions through the purchase of credit worth KRW 30 trillion over three years from October 2022. Meanwhile, debt adjustments for individuals include workout and individual debtor rehabilitation as a regular method and a bad bank program as a temporary measure.

Comparison of Debt Restructuring Scheme

	Work Out	Individual Rehabilitation	Bad Bank(Past Cases)
Authority	Credit Counseling & Recovery Service	Court	Government or Private Sector
Legal Basis	Microfinance Support Act	Debtor Rehabilitation and bankruptcy act	Evergreen Liquidation(2003), Hanmaum Finance(2004), Hee-Mang-Moa Finance (2005), Credit Recovery Fund(2008), National Happiness Fund (2013), etc
Adjustment Details	① Personal Work Out(over 3 months overdue): Average reduction of principal 44% ② Pre-Work Out(30-90 days overdue): Late interest reduction ③ Adjustment of debt before overdue(less than 30 days overdue):Late interest reduction	Average reduction of principal 60%	National Happiness Fund :Average reduction of principal 55%
Sharing Debt Adjustment Information	- Personal workout: 2 years after credit recovery is confirmed- pre-workout & Adjustment of debt before overdue : Unregistered	3~5 years after the approval of the repayment plan	Records are Deleted upon Cancellation of overdue information or Registration as "credit recovery support" & Faithful payment

Source: Financial Services Commission, Credit Counseling & Recovery Service, Oh(2014), etc.

20) According to Jin Kim et al. (2015), Jung-Han Koo (2012), and Oh Jong-Moon et al. (2019), a bad bank program promptly stabilizes the financial system by allowing dispersed credit and debts to be efficiently adjusted in a short period of time, thus enabling financial institutions to dispose of default loans and recover asset soundness and self-employed business owners to reduce debt to a tolerable level and resume economic activities promptly.

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