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Occasional discrepancies between constituent figures and totals as well as percentage changes are due to rounding.

There are no references to sources in tables and graphs originated in the Banco Central do Brasil.

Financial Stability Report

Preface

The Financial Stability Report (FSR) is a semiannual publication issued by the Banco Central do Brasil (BCB) that presents an overview of recent developments and the outlook on financial stability in Brazil, focusing on the main risks and on the domestic financial system resilience, as well as conveys the Financial Stability Committee (Comef) view on the policy and measures to preserve financial stability.

The BCB defines financial stability as the regular operation, over time and in any economic scenario, of the system responsible for the financial intermediation among households, non-financial corporations, and the government.

Extraordinarily, the April 2022 Report consists only of the chapter assessing the national and international financial systems. The Report presents an overview of the international financial markets; of the National Financial System (SFN) – with analyses of the risks related to liquidity, credit, profitability, and solvency; of capital and liquidity stress tests and their effects on institutions' solvency; – of the Financial Stability Survey (FSS); and of the operation of financial market infrastructures (FMIs).

The Statistical annex shows charts and tables underlying data and can be found on the FSR website, https://www. bcb.gov.br/en/publications/financialstabilityreport, as well.

Moreover, important time series for financial stability monitoring (e.g. total capital ratio, short-term liquidity ratio, delinquency ratio, and return on equity) can be downloaded from the Time Series Management System (SGS) in https://www3.bcb.gov.br/sgspub.

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Executive Summary

The BCB analyses indicate that there is no relevant risk to financial stability. Capital stress tests show that the banking system is prepared to face all simulated macroeconomic shocks. The SFN maintains provisions adequate to the level of expected credit losses, and comfortable capitalization and liquidity. This performance is in line with the recovery of the Gross Domestic Product (GDP), which, in the last quarter of 2021, was above the pre-pandemic level.

Prospectively, the elevated fiscal risk and the ongoing monetary tightening process continue to impact current financial conditions and, consequently, current and future economic activity. Regarding the risk associated with increased international geopolitical tensions after the beginning of the war between Russia and Ukraine, Brazil's reduced trade flow with the countries directly involved in the conflict suggests limited impact through this channel.[1]

The market's confidence in financial stability remains high, although it has pulled back slightly. Financial institutions (FIs) expressed concern about fiscal risk and domestic inflation, less confidence in the recovery of economic activity, and a drop in willingness to take risks.

At the global level, the financial systems of the major economies remain resilient. Financial institutions (FIs) in these countries sustain robust capital and liquidity levels. The conflict between Russia and Ukraine has caused the share of some FIs in those countries to lose value, including systemically important FIs on a global level, but so far, the prudential indicators of these institutions point to capital levels above the minimum required. Stress tests performed by jurisdictions indicate that the global financial system remains prepared to withstand additional shocks.

The dynamics for companies was similar to the first half of 2021: economic and financial situation improving, banking credit growing above the pre-pandemic pace, and risk materialization falling.

- The economic and financial situation of the companies continues to improve. Listed companies reduced leverage. Recovery is relevant also in a broader view, encompassing the entire set of companies. All economy sectors already achieved a real inflow higher than before the pandemic, including the "Media and Leisure" and "Telecommunications" sectors, which had not yet attained this.

- Large companies continued to fund themselves heavily in capital markets, mainly through two instruments. The first is debentures issuance. In this case, low interest rates and high liquidity fostered the demand for private bonds. The second is receivables acquisition by Receivables Investment Funds (FIDCs), due to factors related to payment arrangements and to the expansion of commercial funds.

- Bank credit to micro, small, and medium-sized enterprises (MSMEs) continues to grow above the pre-pandemic level. Although there were new grantings under the National Program to Support Micro and Small Companies (Pronampe) and the Credit Stimulus Program (PEC), the increase in the portfolio not linked to programs took center stage.

1 March 2022 Inflation Report, available at https://www.bcb.gov.br/en/publications/inflationreport/202203.

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- The risk materialization of bank credit to non-financial companies continues to drop. This is mainly due to reductions in defaults and restructuring of operations with larger companies compared to the portfolio growth. As far as smaller companies are concerned, although FIs raised their risk appetite, the risk materialization fell slightly.

- The outlook is for an increase in problem assets (PAs), although within historical patterns. Eventual cooling in credit growth and the more challenging economic scenario should impact the payment capacity of households and companies.

High risk appetite accelerates credit to households but does not yet result in an increase in problem assets in the portfolio.

- Among the modalities with higher risk and return, the growth of non-payroll deducted credit and credit cards stands out. In the latter case, with growth in revolving operations. Among the other modalities, rural credit enjoyed high growth, in line with the big picture of agricultural activity in the country.

- FIs increased their risk appetite, especially in non-payroll deducted credit and vehicle financing. Non-payroll deducted credit grew more in operations with a history of greater risk materialization, either unsecured or with a fiduciary guarantee. In terms of vehicle financing, the reduced supply of new cars deepened the trend of financing vehicles that are more than three years old. In addition, there was an increase in the average financing terms.

- Overall, the percentage of PAs remained stable, but the BCB is watching the rise in risk appetite. This is because the amount of PAs of the Length-of-Service Guarantee Fund (FGTS) line of housing finance and of the vehicle financing rose above the increase in these specific portfolios. Additionally, the scarcity of disposable income for debt repayment and a possible frustration in the performance of economic activity can raise the risk in the coming months.

After the rapid recovery in 2021, the profitability of the banking system should develop moderately in the coming periods.

- Return on equity has returned to pre-pandemic levels. Growth in net interest income, reduction in loan loss provisions (LLPs), and efficiency gains explain the earnings improvement in 2021.

- The credit margin was pressed by rising interest rates but should benefit from the more profitable credit mix and credit granting at higher rates. The monetary tightening started in March 2021 adjusted the funding cost more quickly relative to the return on credit, which put pressure on the credit margin. Nevertheless, the migration of the portfolio to higher return and risk profiles should continue into 2022 and favor credit return.

- Net provision expenses should not favor increased profitability as in the first half of 2021. This is because, after declining for about twelve months, these expenditures stabilized at the pre-pandemic level. In addition, the prospect of moderately rising defaults and the migration of portfolios to a higher risk mix may raise the level of PAs in 2022.

- Service revenues should grow less in 2022. This is because the improved economic activity, which drove the increase in services in 2021, should be weaker in 2022. Moreover, the competition is tougher.

Banks reduced the liquidity cushion built up in 2020 but remain with adequate liquidity for the regular operation of financial intermediation.

- Banks' liquidity risk management has been healthy. Banks that maintained very high short-term liquidity in the first year of the pandemic reduced liquid assets the most in 2021. Typically, banks have been directing liquid assets toward lending

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as the uncertainties related to the pandemic have subsided.

- Part of the investors increased their risk appetite and exchanged liquidity and low remuneration for longer and more profitable investments. As a result, the savings account lost its attractiveness, and long-term funding increased its share of total funding in the second half of 2021.

- The Short-Term Liquidity (Liquidity Coverage Ratio – LCR) and the Long-Term Liquidity (Net Stable Funding Ratio – NSFR) indicators were maintained at levels above the regulatory minimums by all banks subject to these requirements.

Sound capital base and stress test results continue to demonstrate the resilience of the banking system.

- The vast majority of FIs meet the minimum prudential requirements using only one of the components of the regulatory capital, the higher quality Common Equity Tier 1 (CET1). The perceived normalization of the effects of the pandemic allowed the system to increase the distribution of resources to shareholders.

- Provisions are sufficient to withstand expected credit losses. There is no indication of a need for new provisions that could compromise the available capital. Provisioning has been proving adequate to face losses stemming from both modified and non-modified operations.

- Capital stress tests results continue to indicate resilience to absorb all simulated scenarios shocks. Two scenarios were employed. The first considers a simultaneous decline in economic activity, inflation, and interest rate. The second would cause a drop in economic activity, with an increase in inflation and interest rates. Both results indicate there would be no material non-compliances.

- Liquidity stress test result indicates resilience of banking institutions to absorb short-term shocks. Despite the reduction in liquidity of FIs, the impact of potential liquidity support to investment funds managed by managers linked to members of the banking system still does not represent a point of attention.

FIs remain confident in the stability of the financial system, but perceptions about the economic and financial cycles worsened.[2]

- FIs' confidence in financial stability dropped slightly in the last two surveys but remains high. FIs assess that the financial system can react satisfactorily to high-impact events.

- "Fiscal risks" continued to be the most cited by the surveyed FIs, and the mention of delinquency and activity risks increased again. FIs' concern about domestic inflation is similar to the highest level of all surveys, seen in the run-up to the 2015-2016 recession. The respondents pointed out that the increase in inflation affects consumption and investment decisions, causes a drop in households' income and purchasing power, and leads to monetary tightening, affecting economic activity, indebtedness, and default.

- The negative perception of FIs about the business cycle grew significantly. Many FIs, which perceived the economy to be in "recovery" in August 2021, now rate the economy in "contraction" and "recession" in February 2022. The worsening perception about the economic cycle indicates less confidence in the recovery of economic activity.

- FIs' willingness to take risks reduced. FIs consider household and corporate leverage to be high.

2 The last survey was conducted in February 2022, before the outbreak of the conflict between Russia and Ukraine.

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Systemically important FMIs operated efficiently and safely throughout the second half of 2021.

- The financial system maintained sufficient intra-day liquidity to ensure a smooth flow of transactions in the Brazilian Payment System (SPB). The settlements in the interbank market occurred without any significant occurrence, and there was no risk of insufficient funds. As from April 2022, the balance of the instant payments account will be remunerated, reducing the cost of maintaining liquidity for making payments.

- The Pix considerably increased its relevance in the SFN and SPB. The Pix even came to represent 10.6% of total retail payments. Most transactions are still person-to-person, with potential for expansion in the other use cases.

- Financial risks of the financial assets, securities, and foreign currency markets were duly managed by the FMIs. Credit and liquidity exposures were adequately managed by the central counterparty every single day of the period.

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Decisions of the Financial Stability Committee on the Countercyclical Capital Buffer

At its regular meetings on November 18, 2021, and February 24, 2022, Comef decided to hold the Countercyclical Capital Buffer for Brazil ($ACCP_{Brasil}$) at 0% (zero percent).[3]

The Committee deems the financial system prepared to face the materialization of potential risks. The credit portfolio continues to perform well, provisions for credit losses are adequate, and banks remain liquid and well capitalized. Given reduced exchange rate exposure and dependence on external funding, the SFN's exposure to the effects of current international geopolitical tensions is low.

Comef found that credit continues to grow across the board and asset prices have been behaving benignly. Faced with risks related to economic activity and to the reduction in income available for households' debt repayment, it is important that banks continue to uphold their grantings' quality.

Overall, banks voluntarily keep capital and liquidity at levels above prudential requirements. Capital and liquidity adequacy is asserted by analyses and stress tests. Tests are evaluated at the Comef meetings and disclosed on its Minutes and on the FSR.

Thus, observing the tighter financial conditions, asset prices and expectations regarding the behavior of the credit market, the Comef considers it appropriate to maintain the $ACCP_{Brasil}$ at 0% (zero percent) in the coming meetings. This decision was made by the Comef in the exercise of its duties provided for in the Regulation attached to BCB Resolution 173, of December 09, 2021, and followed the principles and objectives described in Communiqué 30,371, of January 30, 2017.

3 Communiqués 37,942, of November 18, 2021 (available, in Portuguese, on https://www.bcb.gov.br/estabilidadefinanceira/exibenormativo?tipo=Comunicado&numero=37942), and 38,373, of February 24, 2022 (available, in Portuguese, on https://www.bcb.gov.br/estabilidadefinanceira/exibenormativo?tipo=Comunicado&numero=38373).

I

Assessment of National and International Financial Systems

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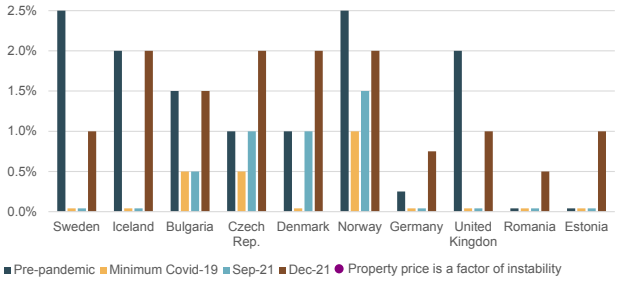
1.1 International financial markets

The financial systems of the main economies remain resilient. Their financial institutions hold robust capital and liquidity levels. Simulations carried out by the BCB and stress tests conducted by those jurisdictions suggest that the global financial system remains prepared to withstand additional shocks. The recent international geopolitical conflict caused losses in share prices of some financial institutions, including global systemically important banks (G-SIB). The BCB continues to monitor developments in financial and capital markets and, thus far, their prudential indicators show capital levels above the minimum regulatory requirements.

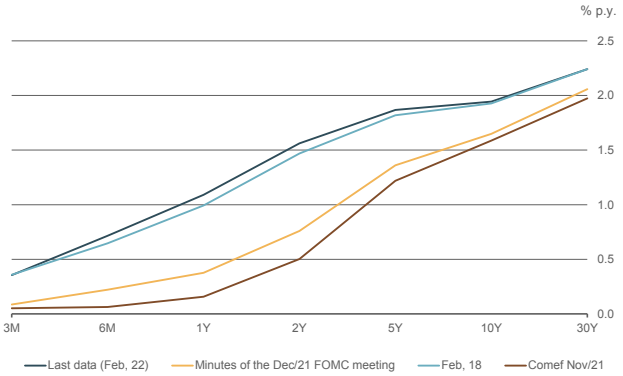
Several jurisdictions continue with the process of macroprudential policy normalization. Most of the assessed countries have already reversed the emergency reduction of the countercyclical capital buffer (CCyB) implemented during the COVID-19 pandemic. In some countries, CCyB rates are already above pre-pandemic levels, mainly owing to vulnerabilities in their real estate sectors (Chart 1.1.1).

Chart 1.1.1 – Countercyclical Capital Buffer (CCyB)



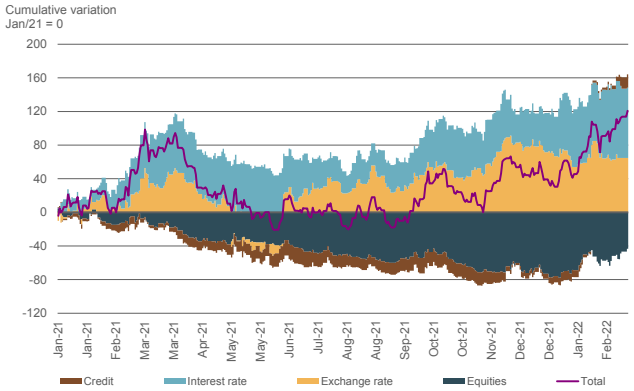
Global financial conditions have tightened since the previous meeting of Comef in November 2021. The beginning of monetary stimuli withdrawal in central economies and perspectives that the withdrawal process could accelerate in coming quarters contributed to the rise in long-term interest rates and to substantial repricing of certain assets, increasing financing costs in the main markets, especially in the U.S. The recent rise in geopolitical tensions helped increase uncertainty and market volatility (charts 1.1.3 to 1.1.5).

Chart 1.1.2 – USA: Yield Curve



Source: Refinitiv

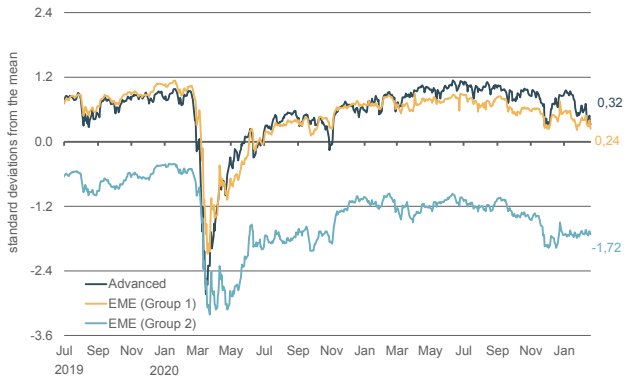
Chart 1.1.3 – USA: financial conditions



Obs.:The higher the value of the indicator, the more restrictive the financial conditions.
The metric reflects the change in financial conditions in terms of fed funds equivalence, in basis points.

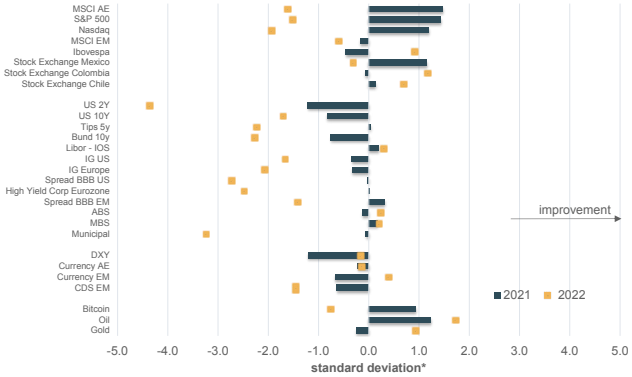
Sources: Refinitiv, Fed St Louis. Calculation: Banco Central do Brasil

Chart 1.1.4 – Risk appetite indicator (up to Feb, 18th)



Group 1: Chile, Indonesia, Malaysia and Russia
Group 2: South Africa, Brazil, Colombia, India, Mexico and Turkey
Sources: Bloomberg, Reuters e Fed St Louis – Calculation: Banco Central do Brasil

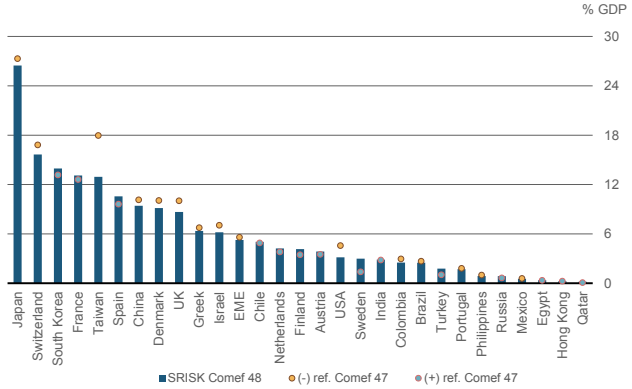
Chart 1.1.5 – Assets Performance (up to Feb, 22th)



*normalized to the days range in each analysis window
Sources: Bloomberg, Refinitiv, Fed. St Louis

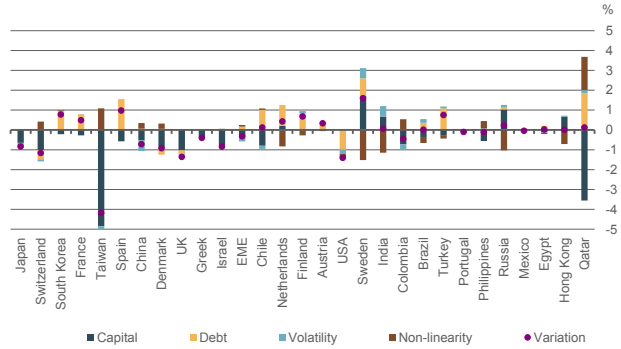
Systemic risk had been improving before the beginning of the Russian-Ukrain war. The main reason for the decline in the Systemic Risk Analysis (SRisk)[4] in both advanced and emerging market economies had been the gains in financial sector share prices. The drop in overall indebtedness reinforced that trend in advanced economies, although acting in the opposite direction in emerging markets. The SRisk is estimated at 7.4% of GDP for advanced economies and 5.3% of GDP for emerging market economies (Chart 1.1.6).

Chart 1.1.6a – *Systemic Risk Analysis* (SRisk)
SRisk/GDP (%)



Sources: Bloomberg. Calculation: Banco Central do Brasil

Chart 1.1.6b – *Systemic Risk Analysis* (SRisk)
Change in SRisk/GDP since last Comef



Source: Bloomberg.
– Calculation: Banco Central do Brasil

Potential problems in the Russian banking system due to sanctions against the country could damage other economies' financial sectors. Considering the interlinkages between the financial systems of the main economies, potential spillovers could be significant, but with a limited total impact. National banking sectors with largest Russian exposure could be more affected. The BCB remains vigilant and will, throughout the year, closely monitor the financial impact on banks exposed to the conflict (Chart 1.1.7).

4 Systemic risk indicator that measures financial institutions' capital needs in a global stress event. The concept was presented in the April 2021 issue of the Financial Stability Report.

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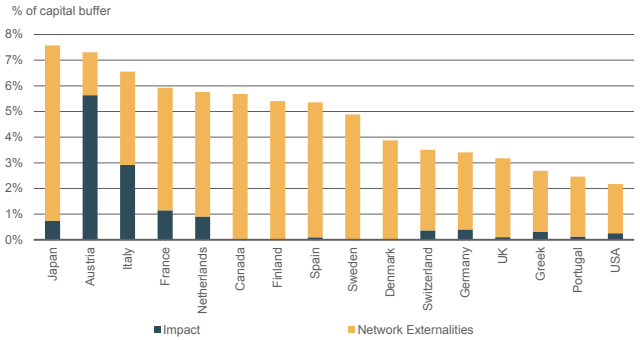
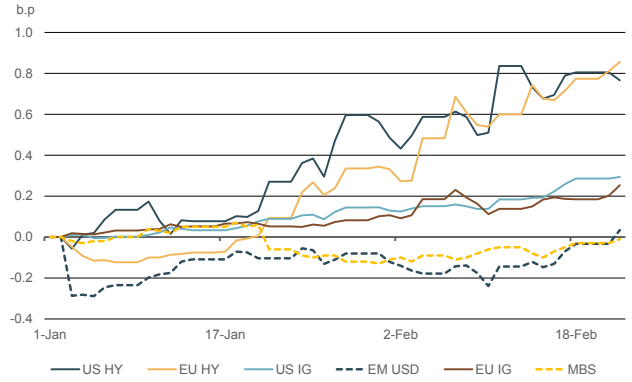
Chart 1.1.7 – Contagion from the Russian banking sector (networks model)



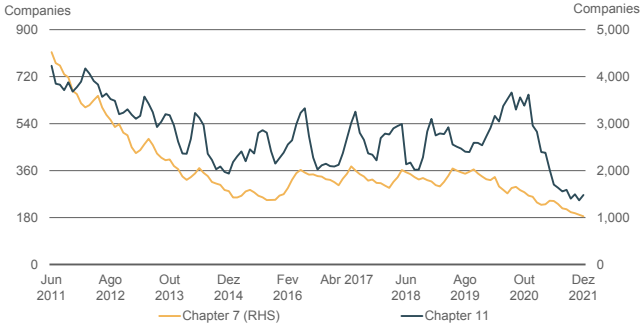
Stress level = 100%. Total loss of Russian capital buffer
Sources: BIS, Bloomberg and BCB. Data until sep/21
Calculation: Banco Central do Brasil

Chart 1.1.8 – Change of credit spreads in 2022



Source: Bloomberg

Chart 1.1.9 – Business closure indicators
USA: insolvencies, chap. 7 and 11[1/], three month moving average

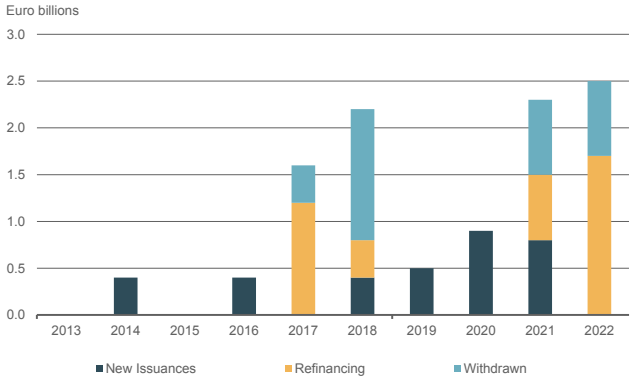


1/ Chapters 7 (liquidation) and 11 (restructuring) of the US Bankruptcy Code
Source: *American Bankruptcy Institute*

As a result of worsening risk appetite and global financial conditions, corporate credit spreads have increased substantially since the beginning of 2022, especially in the high yield segment (Chart 1.1.8). The market for European leveraged loans, for instance, was virtually closed to new issuances in January.

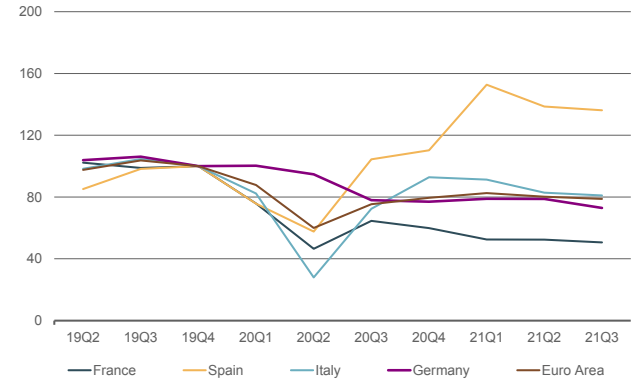
Progress with the pandemic throughout 2021, the recovery of economic activity and measures to support the private sector contributed to reducing bankruptcies in advanced economies. However, the deterioration of the geopolitical outlook is a risk factor to be monitored going forward and can have negative effects on the private sector, particularly in Europe, which is more exposed to the conflict (Chart 1.1.9).

Chart 1.1.8a – CLO issuances in Euros, YTD



Source: Barclays

Chart 1.1.9a – Europe: Bankruptcy by country
4th quarter 2019 = 100



Source: Eurostat

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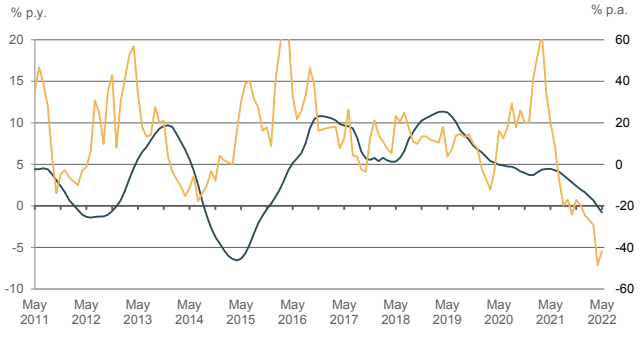
Comparatively to the pre-pandemic period (December 2019), there was a decline in delinquency rates and an increase in banks' provisioning of problem assets (December 2021). That trend was witnessed in most advanced and emerging market economies, although at different timings, depending on each jurisdiction. Nevertheless, risks to the outlook persist, especially linked to possible spillovers of the geopolitical conflict on delinquency rates, particularly for banks with larger Russian exposure.

In China, problems associated to the real estate market persist. The decline in both real estate sales and prices (Chart 1.1.10) brings to the fore the large uncertainty about developers' financial soundness. These companies face more restrictive financing conditions given their large indebtedness, triggering tensions in the local credit market.

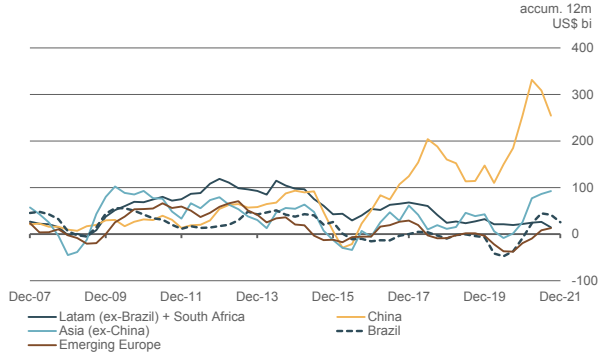
In the U.S., the rise in home prices and in mortgage rates has contributed to reducing housing affordability and to slowing down the housing market. Nonetheless, mortgage delinquency rates remain low, with new operations largely concentrated in low-risk households.

Chart 1.1.10 – Real estate industry in China



Sources: National Bureau of Statistics, Bloomberg

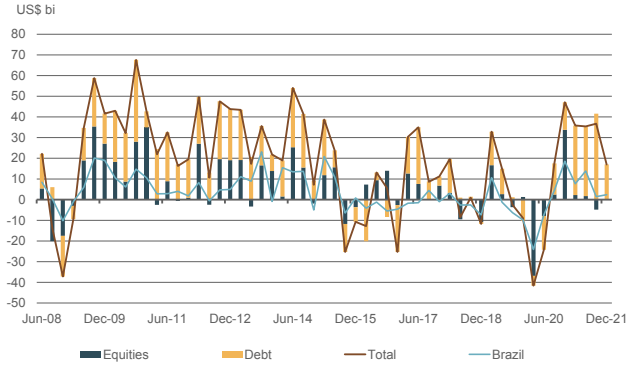
Chart 1.1.11 – Portfolio flows to emerging economies



Latam (ex-Brazil) + Africa = Chile, Colombia, Mexico, Peru and Africa
Ásia ex-China = South Korea, India, Indonesia and Thailand
Emerging Europe = Hungary, Poland, Czech Rep., Romania, Ukraine and Turkey
Sources: Central Banks, Bloomberg, BCB, CEIC

The materialization of extreme scenarios of financial assets' repricing in the global market could have significant impact on emerging market economies. The most recent data for international capital flows suggests a slowdown in inflows in Q4 2021, mainly due to expectations of U.S. monetary policy normalization. The dominance of China as the main destination for capital inflows has intensified during the pandemic, helped by its financial opening in recent years, the domestic "V-shaped" recovery and its attractive interest rates (Chart 1.1.11). The normalization of monetary and macroprudential policies in emerging market economies coupled with transparency in the conduct of monetary policy in the main advanced economies contribute to mitigating that risk.

Chart 1.1.11a – Portfolio flows to emerging economies



Sample from 8 countries (Chile, Colombia, South Korea, India, Poland, Ukraine, Poland and Brazil)
Sources: Central Banks, Bloomberg, BCB, CEIC

Although conditions remain stable so far in the main markets, and the most relevant international financial systems continue working without major frictions, the BCB continues to monitor their risks. The increase in market volatility could cause reductions in asset prices especially riskier ones – leading to an increase in margin requirements that, in certain markets, could trigger disorderly exits of leveraged positions, causing new declines in asset prices and new margin calls. Such dynamics could be especially relevant in commodity markets, one of the most affected by the conflict in Eastern Europe.

1.2 Financial system overview[5]

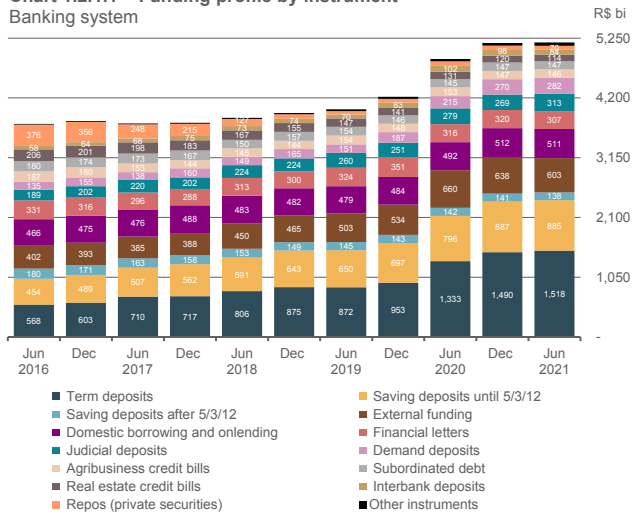
1.2.1 Liquidity

The banking system remains with an adequate level of liquidity to maintain financial stability and the regular functioning of the intermediation system, even with the reduction of voluntary buffers built up at the beginning of the pandemic. The system's aggregate levels of liquidity declined for the second consecutive semester, with FIs reducing the liquidity buffers they established at the onset of the pandemic, when adverse conditions required a higher level of liquid assets. This decline was more pronounced in public banks, who remain considerably more liquid than their private peers, indicating room for further adjustments. Lending increased faster than funding, which combined with managerial strategies to adjust liquidity positions, lead to a lower level of liquid assets in the second half of the year. Considering structural liquidity, capital instruments and long-term funding remained at comfortable levels to finance long-term assets, in particular credit growth. Finally, the BCB successfully implemented, as of November 2021, a new Liquidity Facility Lines (LFL) backed by private securities, generating a new source of liquidity and additional support for financial stability.

Domestic and external funding

After remaining stable for two consecutive semesters, funding started to grow again in the second half of 2021, influenced by the recovery of the economy and the monetary policy tightening. In absolute terms, we highlight the growth of the term deposit portfolio while, in relative terms, the evolution of the Agribusiness Credit Bills (LCA) portfolios (25%), Real Estate Credit Bills (LCI) (19%) and Real State Secured Bill (LIG) (62%), instruments that provide good return for customers and lower financial costs for banks. The balance of savings accounts remained stable – despite the negative net inflow recorded in the period, offset by credited earnings –, reflecting the loss of competitiveness compared to other investment options. Funding profiles by type of instrument and investor remained practically stable in the period (charts 1.2.1.1 to 1.2.1.2).

Chart 1.2.1.1 – Funding profile by instrument
Banking system

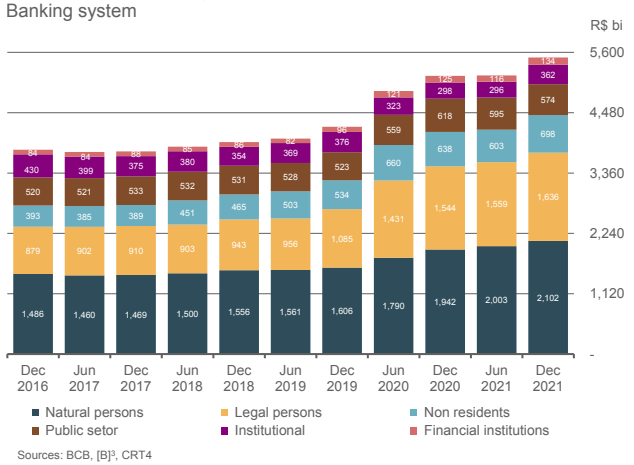


Sources: BCB, [B][3], CRT4

Term deposits: certificates of deposit, receipts of deposit, time deposits with special guarantee by the Credit Guarantee Fund (Fundo Garantidor de Crédito – FGC). Subordinated debts: subordinated certificates of deposit, subordinated financial letters and other capital instruments. Other instruments: structured notes, bills of exchange, mortgage notes, box spread strategies with options. Repurchase agreements (repo): refers only to repo collateralized by private-issued securities.

5 In section 1.1 Liquidity, the scope of the analyses is the banking system, comprised by commercial, multi-purpose, savings, foreign exchange and investment banks, and by financial conglomerates including at least one of these types of institutions. Within sections 1.3 Profitability and 1.4 Solvency, the scope of the analyses is the prudential conglomerates related to the banking system, as defined by Resolution 4,280, from October 31st, 2013, to which the minimal capital requirements, as stated by Resolution 4,193, from March 1st, 2013, are applied since January 1st, 2015. In section 1.5 Capital stress tests, the scope is the latter including the prudential conglomerates involving development banks. In section 1.2 Credit, the scope is the whole SFN.

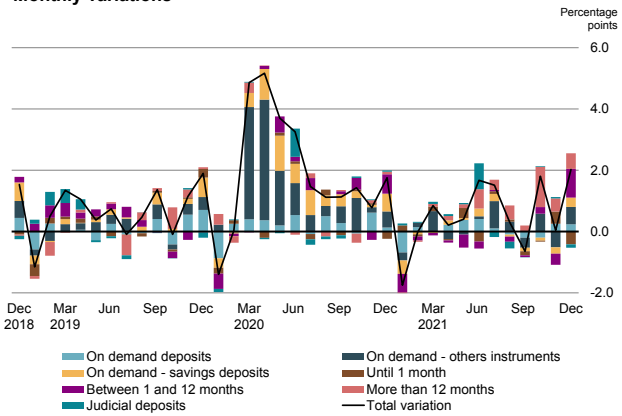
Chart 1.2.1.2 – Funding profile by type of investor
Banking system



Sources: BCB, [B]³, CRT4

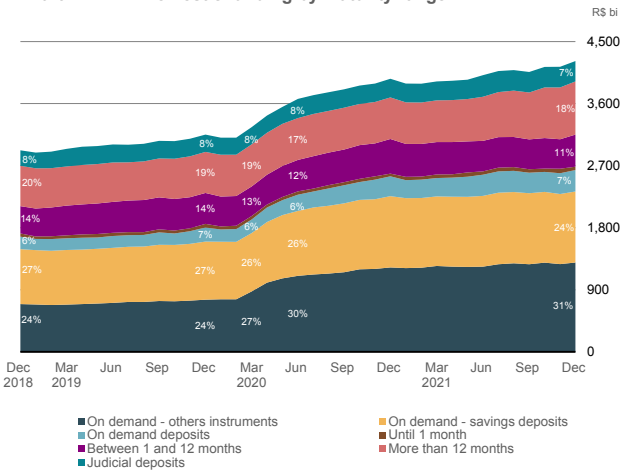
There was an increase in the share of long-term funding in the aggregate portfolio in the second half of 2021. This growth was opposed by a drop in the share of savings accounts in the funding position, which indicates investors greater appetite for risk, willing to exchange liquidity and low remuneration for longer and more profitable investments – especially in a scenario of high Selic rate (charts 1.2.1.3 and 1.2.1.4).

Chart 1.2.1.3 – Domestic funding by maturity range
Monthly variations



Sources: BCB, [B]³, CRT4

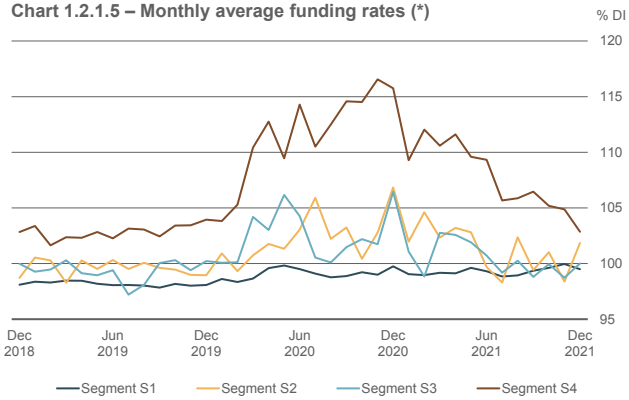
Chart 1.2.1.4 – Domestic funding by maturity range



Sources: BCB, [B]³, CRT4

The spreads of funding rates in relation to the interbank deposit rate (DI) continued to fall throughout the second half of the year, approaching the levels seen before the beginning of the Covid-19 pandemic. Over the period, the average rates of the S2 to S4 segments converged to rates similars to those practiced by the S1 segment, although with some volatility in the monthly comparison. The average funding rates of the selected instruments are closer to neutrality in relation to the cost of carrying the portfolio of liquid assets (Chart 1.2.1.5).

Chart 1.2.1.5 – Monthly average funding rates (*)



(*) Weighted average rate of these instruments: bank deposit certificates, bank deposit receipts, time deposits with special guarantee from the Credit Guarantee Fund (FGC), interbank deposits, agribusiness credit bills, real estate credit bills, financial letters (including with subordination clause), guaranteed real estate bills .

The stock of external funding remained stable. The perception of the SFN is of low risk of credit restrictions coming from the foreign market. The stock in dollars has remained stable since 2017, with values around US$200 billion, with a small reduction in borrowings by domestic debtors, offset by an increase in borrowings by overseas debtors. Its relative share in total funding fluctuated due to exchange rate volatility (charts 1.2.1.6 and 1.2.1.7). Its cost increased in the last quarter, reversing the downward trend that began in 2019, following the benchmark international interest rates (Chart 1.2.1.8).

Chart 1.2.1.6 – Profile of external funding
As a percentage of total funding

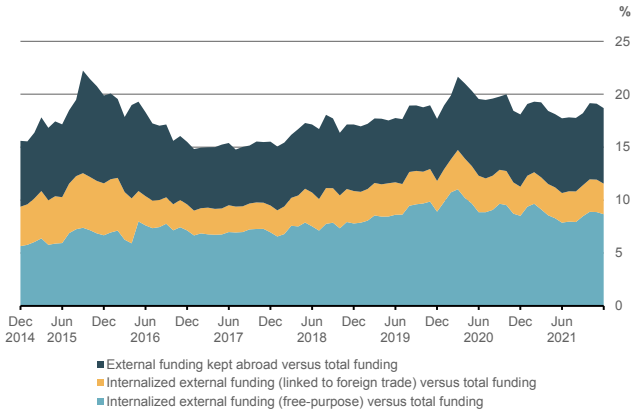


Chart 1.2.1.7 – Profile of external funding
Absolute amounts in dollars

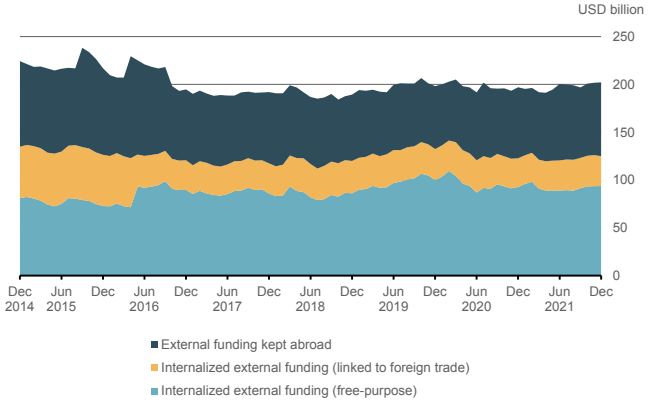
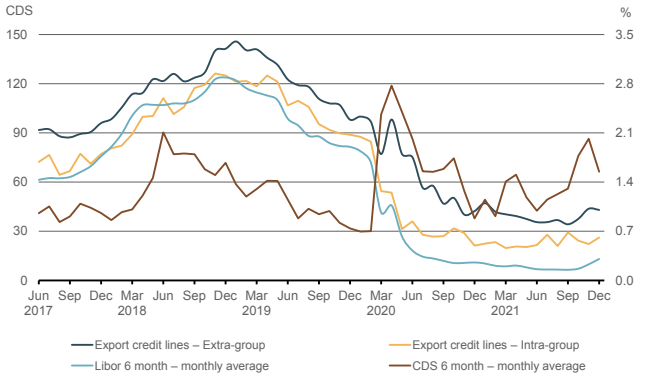


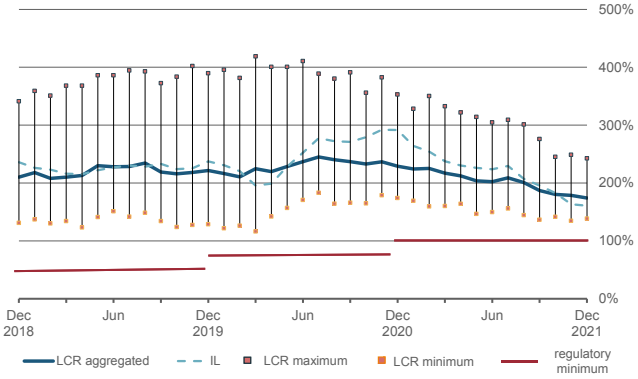
Chart 1.2.1.8 – External credit lines for export
Interest rates



Short-term liquidity

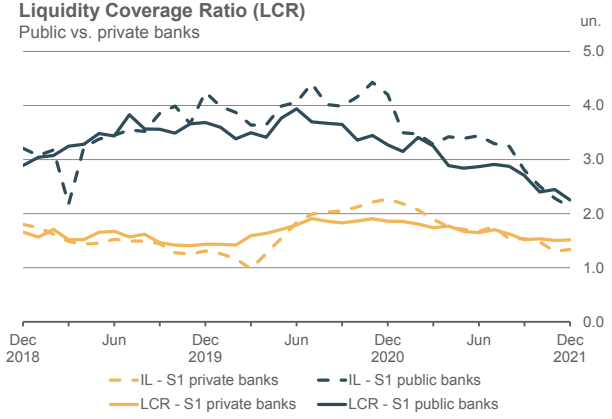
Short-term liquidity remains at levels compatible with institutions' risk profiles across the banking system. Following last semester's trend, the decline in liquidity levels stems from a less adverse scenario with regards the pandemic. The reduction observed in the S1 segment was concentrated in public banks, which are gradually closing the gap with respect to private peers by streamlining asset-liability management (charts 1.2.1.9 and 1.2.1.10).

Chart 1.2.1.9 – Liquidity Coverage Ratio (LCR)
High, low and aggregated[1/]



1/ Aggregated data for 6 FIs belonging to prudential segment S1.

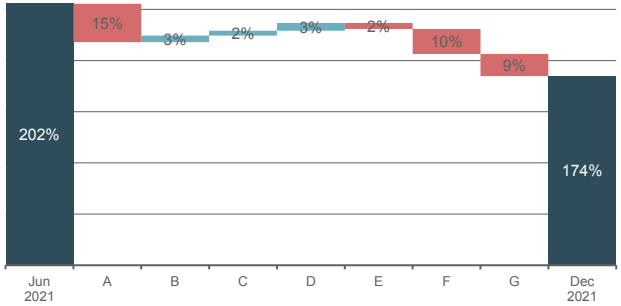
Chart 1.2.1.10 – Short-term Liquidity Index (IL) and Liquidity Coverage Ratio (LCR)
Public vs. private banks



1/ Aggregated data for 6 FIs belonging to prudencial segmento S1 .

The LCR[6] fell again in the semester but remains at a comfortable level – 1.7 times higher than the minimum requirement of 100%. This demonstrates the system's ability to support a credit growth scenario or absorb potential adverse shocks. The decrease in High Quality Liquid Assets (HQLA) was the main driver for the decline in the indicator and reflects lending growth. The reduction was led by institutions that accumulated liquid assets throughout 2020, representing healthy risk management in an environment of lower uncertainty (Chart 1.2.1.11).

Chart 1.2.1.11 – LCR changes in the 2nd Semester 2021
Banking System, breakdown of changes between dates

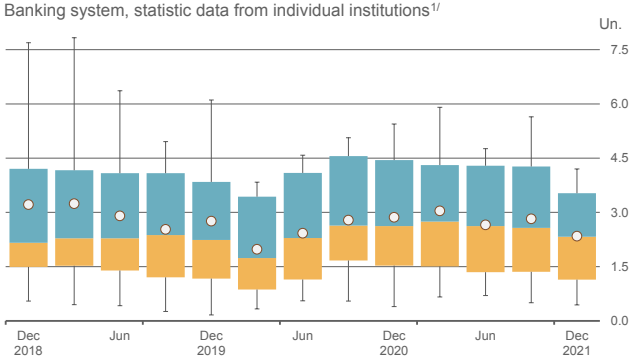


A – HQLA
B – Inflows from loans
C – Inflows from deposits in other FIs or Central Banks
D – Other inflows
E – Retail outflows
F – Wholesale outflows
G – Other outflows

1/ Percentage values in red and blue bars show how much each component of the LCR composition influenced the change of the ratio between June and December 2021. The decrease in HQLA (numerator) of the banking system was responsible for a drop of 15 ppt. in the LCR among periods. On the denominator side, the increase in expected outflows for the next 30 days (E, F and G) also contributed negatively, while expected cash inflows (B, C and D) increased, dampening the indicador´s fall.

The banking system, when considering FIs individually, continues to show comfortable levels of liquidity, despite the reduction in the second semester of 2021. The Liquidity Ratio[7] – which considers the effects of the application of stress scenarios – followed a downward trend, with lower values for all percentiles of its statistical distribution (Chart 1.2.1.12). The decrease was concentrated in institutions that had accumulated liquid assets in response to the pandemic and had stronger indices (>1.6) (Chart 1.2.1.13).

Chart 1.2.1.12 – Short-term Liquidity Index
Banking system, statistic data from individual institutions[1/]



1/The Short-term Liquidity Index of each FI is capped at the level of the 80th percetile. The values along the box and whiskers refer to the percentiles 10%, 25%, 50%, 75% and 90% respectively. The mean is represented by the circles.

6 The LCR is an index whose compliance is mandatory for all financial institutions in the S1 segment, pursuant to art. 2 of Resolution 4,553, of January 30th, 2017. The indicator requires institutions to maintain high liquid assets to support net cash outflows in the next 30 days, considering the stress scenario defined by the Basel Committee on Banking Supervision (BCBS) (www. bis.org/publ/C238. htm). See domestic regulation – CMN Resolution 4,401, of February 27th, 2015, and BCB Circular 3,749, of March 5th, 2015.

7 The IL – which covers the entire SFN – measures whether banks have enough liquid assets to cope with their short-term cash-flow needs in a simulated stress scenario (period of 21 business days) defined and calibrated by the BCB. The cash outflows arise from the run-off of maturing or redeemable liabilities, losses from market risk exposures, for instance, margin calls and settlements of derivatives, and others contractual payables over the next month. Institutions with IL above 1 have enough liquid assets to face those cash outflows. For further details about this indicator, please refer to Stress Test Section of the April 2020 edition of the Financial Stability Report.

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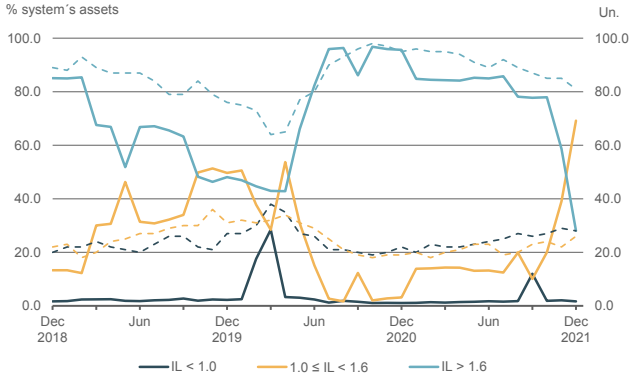
Chart 1.2.1.13 – Short-term Liquidity Index Banking Banking System – individual FIs by frequency bins[1/]



1/Straight line – % of system´s total assets; dashed line – number of institutions (right axis).

Long-term liquidity

FIs' funding structure remains adequate to finance long-term assets. S1 institutions, which must comply with the NSFR[8] limit, presented an increase in long-term funding sources, both in terms of regulatory capital and retail and wholesale funding maturing over one year (Chart 1.2.1.14). However, the loan portfolio expanded faster, being a preeminent factor for the aggregate decrease in the NSFR regulatory indicator. The other institutions in the banking system followed the same direction as the S1 segment, with the Structural Liquidity Indicator (ILE)[9] indicating that the vast majority of FIs maintain adequate levels of resources on their balance sheets (charts 1.2.1.15 and 1.2.1.16).

Chart 1.2.1.14 – Net Stable Funding Ratio breakdown (NSFR)
Available Sources of Funding (ASF) and Required Sources (RSF)

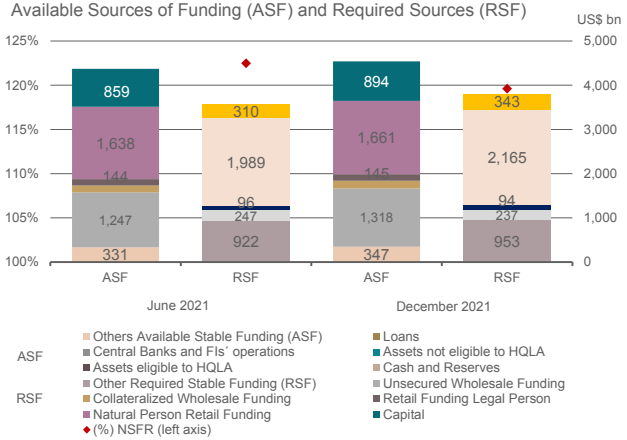
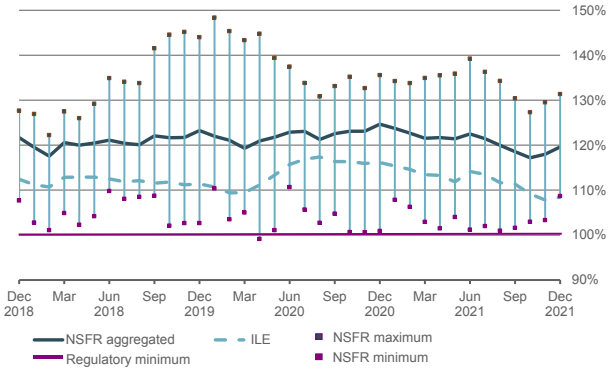
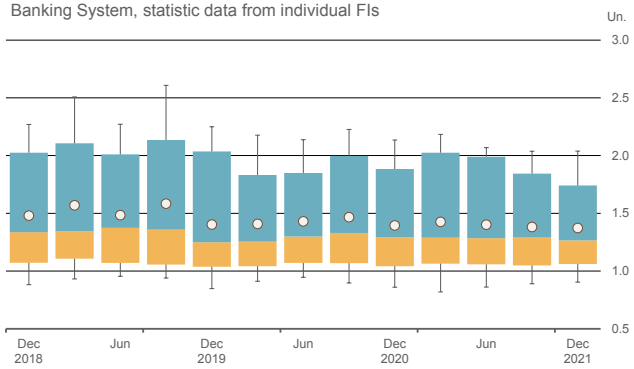


Chart 1.2.1.15 – Net Stable Funding Ratio (NSFR)
High, low and aggregated[1/]



1/ NSFR and ILE data series comprise institutions classified in the prudential segment S1 (currently 6 banks).

Chart 1.2.1.16 – Structural Liquidity Index[1/]
Banking System, statistic data from individual FIs



1/ The Structural Liquidity Index of each FI is capped at the level of the 80th percentile in each month, after capping the each index the statistics are calculated. The values along the box and whiskers refer to the ,percentiles 10%, 25%, 50%. 75% and 90% respectively. The mean is represented by the circles.

8 The NSFR was introduced in Brazil by CMN Resolution 4,616, of November 30th, 2017, with the methodology given by Circular 3,869, of December 19th, 2017, having started its effects from October 1st, 2018. It is a ratio that has a minimum regulatory amount of 100% and the compliance is mandatory for all financial institutions in the S1 segment, according to art. 2 of Resolution 4,553, of January 30th, 2017.

9 The ILE aims to measure whether banks have enough stable funding resources (numerator) to finance their long-term activities (denominator). Therefore, institutions with ILE equal to or greater than 1 are less susceptible to future liquidity problems. For details, see appendix Concepts and Methodologies, item b.

The implementation of new LFLs in November 2021 by the BCB[10] allows FIs to obtain liquidity from their portfolio of private securities. The announcement of LFLs improve institutions' liquidity management, as it allows access to loans using the stock of private securities that meet a set of characteristics as collateral.[11] The basket of guarantees to access the lines includes, in the first stage of the operation, debentures and promissory notes, currently totaling R$106 billion. Out of this total, R$59 billion were pre-positioned at the end of February 2022. From this pre-positioned amount, institutions contracted R$32 billion in Forward Liquidity Lines (LLTs) and used the benefit to offset reserve requirements by R$22 billion, releasing additional liquidity.

1.2.2 Credit

The growth of broad credit[12] continued consistent with economic fundamentals. The increase of bank credit to households accelerated, especially for those facilities with higher returns and, consequently, higher risks. Bank credit to MSMEs decelerated with the end of emergency credit programs but continued to grow at a pace above that observed in the pre-pandemic period. Large companies, in turn, accessed mainly the capital markets, which remained heated up. The amount of internalized external funding measured in USD has not changed.

FIs risk appetite continued to increase, especially in some credit facilities to households with higher returns and, consequently, higher risks. Throughout 2021, and especially in the second half of the year, non-payroll deducted credit increased mainly in higher risk operations, there was a growth in revolving credit card operations and the risk profile of vehicle financing credit granting remained high. Regarding real estate financing, despite the historically high level of credit granting, there was a deceleration due to the increase in interest rates.

Provisions remained adequate, above the expected credit losses estimated by the BCB for the credit portfolio. The share of problem assets in the credit to households followed the growth of credit outstanding; for companies, there was a decrease, in line with the improvement of their financial indicators. The prospective scenario is one of increasing problem assets, still within historical standards, given the slowdown in credit growth and a more challenging economic scenario, with possible impacts on the payment capacity of households and companies.

Broad credit and long run trend

Broad credit maintained growth in line with the stimulus and economic environment in the second half of 2021. The capital market continued to strengthen, being the main contribution for the broad credit-to-GDP gap to remain positive. In the case of bank credit, the evolution of credit to households also makes a positive contribution; for companies, there is some accommodation, either because of the cooling down of emergency programs for MSMEs, or because of the more modest growth rate for large companies in the second half of the year. External market continues with a contribution close to zero, with no relevant changes in relation to its previous trend. Prospectively, the increase in the gap in December

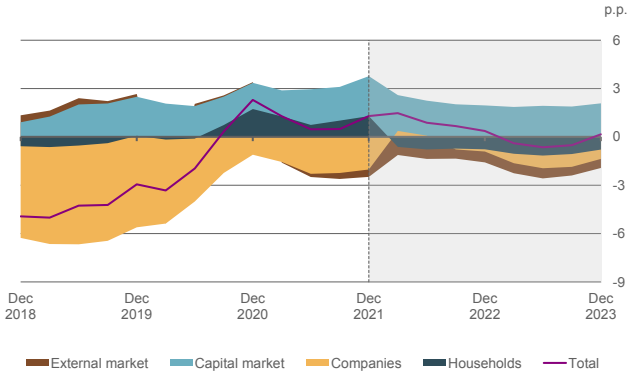
10 The BCB instituted and regulated, by means of Resolution BCB 110, of July 1st, 2021, two new liquidity lines: one meant for the management of temporary short-term cash flow mismatches (Immediate Liquidity Line – LLI, as abbreviated in Portuguese) and the other for tending to liquidity needs stemming from mismatches between FIs' assets and liabilities, encompassing operations up to 359 days long (Forward Liquidity Line – LLT, as abbreviated in Portuguese). Banks can access these lines by pledging eligible private securities to the BCB.

11 Resources represent 9.5% of the SFN's liquid assets.

12 Bank credit, private capital market debt instruments and internalized foreign debt.

2021 does not indicate a growth trend. Considering projections for GDP and broad credit, a broad credit-to-GDP gap close to zero is expected for the coming years (Chart 1.2.2.1).[13]

Chart 1.2.2.1 – Broad credit-to-GDP gap – Without FX variation
Shaded area: forecast



13 Broad credit-to-GDP gap is the benchmark indicator proposed by the BCBS to support CCyB decisions. Broad credit-to-GDP gap could signal excessive credit growth, which in turn could result in sudden corrections with detrimental effects on financial stability. According to the BCBS, should the gap exceed 2% of GDP, the country should consider increasing the CCyB. The BCBS, however, does not advocate the mechanical use of this indicator, because although there is empirical evidence of its predictive power, the metric has limitations, which are particularly important in the case of emerging economies and in times of crisis, such as the current one. Drehmann, M., Borio, C., and K. Tsatsaronis (2011). Anchoring countercyclical capital buffers: the role of credit aggregates, BIS Working Papers 355. Drehmann, M., and Juselius, M. (2011). Evaluating early warning indicators of banking crises: Satisfying policy requirements, BIS Working Papers 421. BCBS (2010). Guidance for national authorities operating the countercyclical capital buffer.

Companies

The financial situation of companies remained positive, even in a challenging economic scenario. Despite the inflationary persistence and the tightening of financial conditions, the improvement in economic activity positively affected the payment capacity of companies. Listed companies reduced their leverage (Chart 1.2.2.2). In a broader view, considering all companies, there was a significant recovery of inflows at real levels[14] (Chart 1.2.2.3), including sectors that had the most negative impact on the pandemic, such as "Media and Leisure".[15,16] Additionally, applications for judicial recovery remained below those recorded in previous years, close to the minimum levels in the series (Chart 1.2.2.4). Such improvement must be seen cautiously, since the evolution of the economic scenario can lead to a reduction in the payment capacity of companies, at least on specific segments.

14 Flows of receivables by means of payment documents ('boletos'), bank transfers ('TEDs'), debit and credit cards, instant payments ('Pix') and exports, according to the methodology used in section 2.2 – Covid-19 stress test, found in the REF published in October/2020, available at https://www.bcb.gov.br/content/publicacoes/ref/202010/RELESTAB202010-secao2_2.pdf.

15 The "Media and Leisure" sector includes restaurants, bars and similar establishments, hotels, travel agencies, and services for organizing fairs, congresses and parties, among others.

16 In the "Media and Leisure" sector, the accumulated flow in 2021 was close to pre-pandemic levels. In the other sectors, 2021 ended with real growth compared to 2020 and 2019.

Chart 1.2.2.2 – Net Debt
Listed Companies

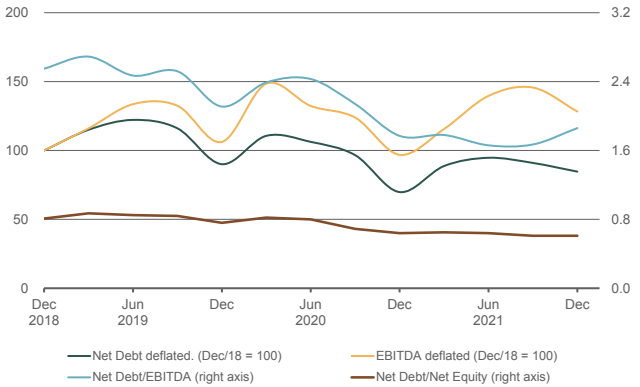


Chart 1.2.2.3 – Companies' inflows (deflated by IPCA)
All enterprises

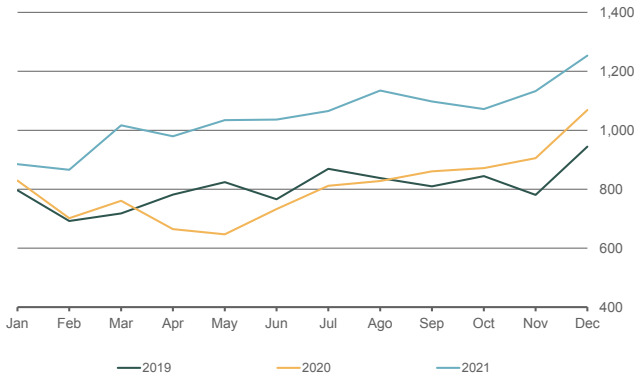
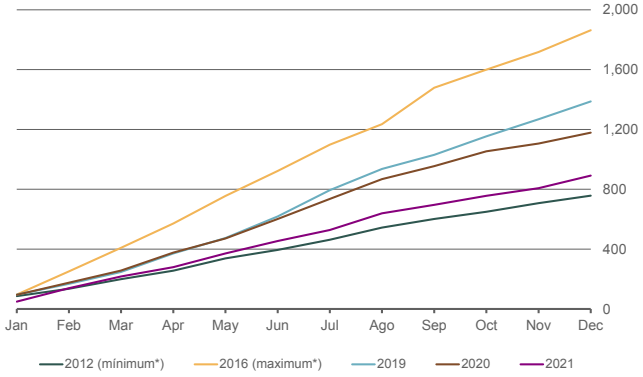


Chart 1.2.2.4 – Corporations in judicial recovery
Cumulative requests by year



Source: Serasa Experian *Minimums and maximums for the period between 2012 and 2021

Chart 1.2.2.5 – Corporate Indebtedness
Dec/2018 = 100

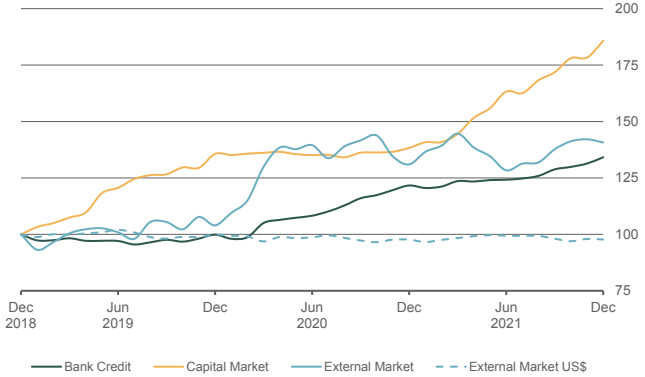
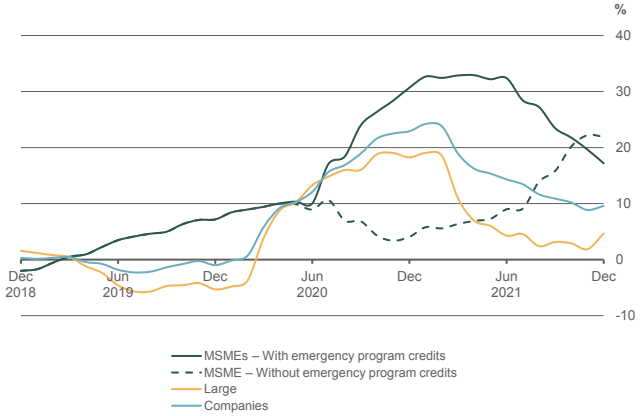


Chart 1.2.2.6 – Bank Credit
Annual Growth



The capital market remained in strong expansion, standing out as a funding source for companies. This source of financing was the main highlight of broad credit to enterprises, especially for larger companies. Bonds presented the highest growth in nominal values and FIDCs the highest percentage growth. About bonds, low levels of interest rates and a high liquidity environment have encouraged the demand for private bonds. FIDCs, on the other hand, recorded a vigorous growth due to more specific factors, such as the expansion of commercial funds and others related to payment arrangements. Regarding internalized external funding, values in dollar remained stable (Chart 1.2.2.5).

Bank credit to micro, small and medium enterprises continued to record high growth rates, higher than pre-pandemic levels. However, bank credit as a whole returned to the growth rates of the pre-pandemic period. Although there were new loan concessions under Pronampe and PEC, the highlight was the increase in the portfolio not related to emergency credit programs (Chart 1.2.2.6). For large companies, the increase was strongly influenced by transactions with acquired receivables.[17]

17 Receivables transactions, considered a low-cost option for companies and little risk to financial institutions. In general, these are transactions known as "confirming", in which the financial institutions advances the amount of the invoice in question to the supplier, who can collect this invoice in advance by financing it before its due date.

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Risk appetite of financial institutions increased in credit granting for smaller companies. The credit granting average score[18],[19] revealed that risk appetite for microenterprises has raised, aligned with movements observed in credit to households. For small and medium-sized enterprises, the average score remained at levels consistent with the pre-pandemic period (Chart 1.2.2.7) and, for large companies, there was a reduction during the second half of 2021.

Nevertheless, risk materialization slightly decreased in bank credit. Regarding MSMEs, credits considered as problem assets increased in the semester, even though the percentage in relation to the portfolio has reduced, due to the growth of the stock (Chart 1.2.2.8). For the coming months, it is expected an increase in the risk materialization in this segment, since that the portfolio growth probably will increase at a lower pace, due to factors such as higher interest rates and lower economic growth. Regarding large companies, the reduction of E-H rated loans portfolio and a smaller volume of non-performing and restructured operations caused the decrease of problem assets percentage (Chart 1.2.2.9), together with a contribution of portfolio growth (denominator effect). For the coming months, it is not expected a significant increase in the problem assets percentages for large companies, although specific cases can occur for certain borrowers or economic sectors.

Chart 1.2.2.7– Credit granting average score
By company size

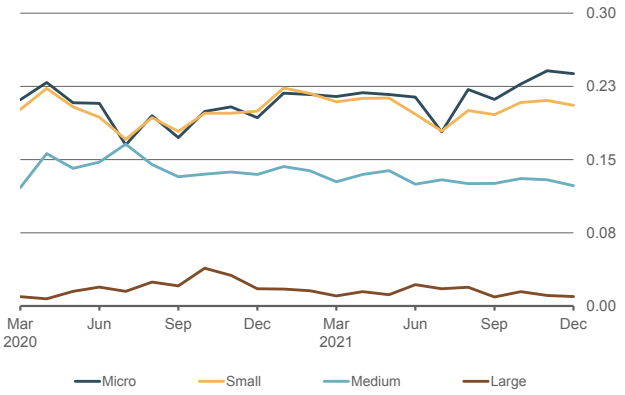
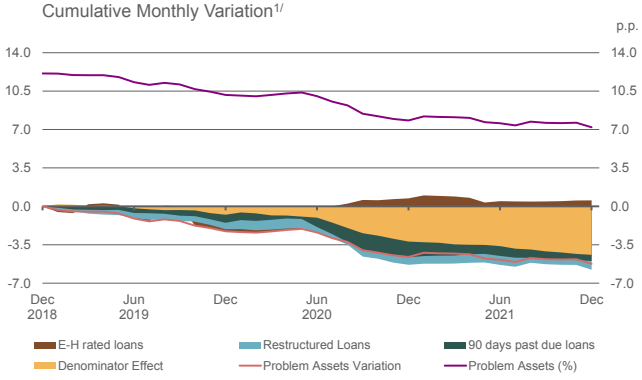
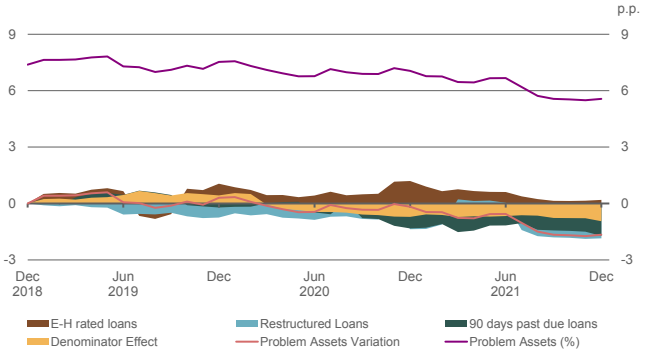


Chart 1.2.2.8 – Problem Assets – Micro Small and Medium Enterprises
Cumulative Monthly Variation[1/]



1/ The accumulated area shows how much each component has impacted, in percentage points, since December 2018, on the evolution of problematic assets percentage.

Chart 1.2.2.9 – Problem Assets – Large Companies
Cumulative Monthly Variation[1/]

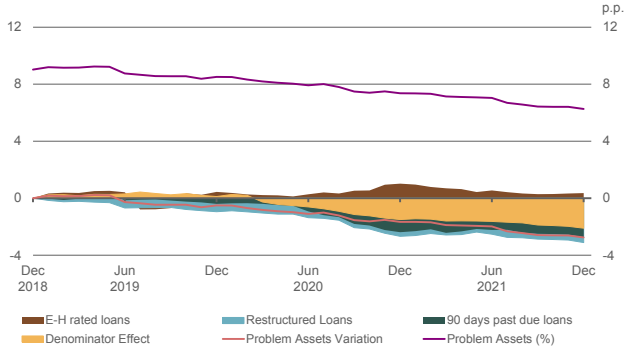


1/ The accumulated area shows how much each component has impacted, in percentage points, since December 2018, on the evolution of problematic assets percentage.

18 The credit granting average score is a measure that quantifies the credit risk of new operations in the reference month, determined by a proprietary statistical model of BCB. The higher the score, the riskier the operations.

19 For companies, the model is based on borrowers' variables. The scores of micro, small and medium-sized companies cannot be directly compared, given that different models were used to generate them. For large companies, the variable is the percentage of the credit granting for companies that either are already deteriorated or with a high chance of deteriorate within a period of three months.

Chart 1.2.2.10 – Problem Assets – Companies
Cumulative Monthly Variation[1/]

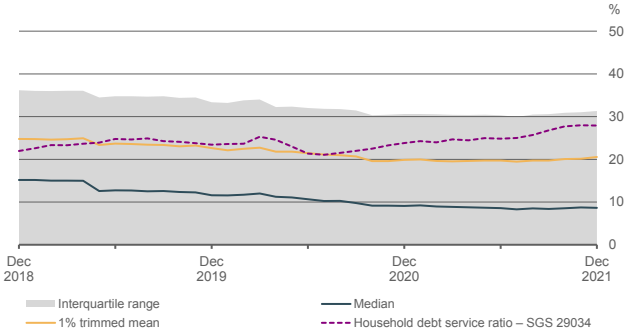


1/ The accumulated area shows how much each component has impacted, in percentage points, since December 2018, on the evolution of problematic assets percentage.

Households

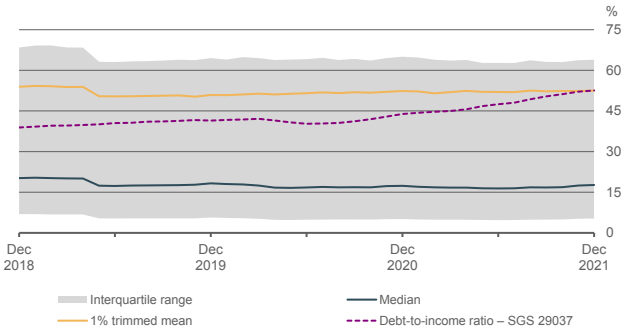
The payment capacity of borrowers showed relative stability. Although the household debt service-to-income and debt-to-income ratios measured at an aggregate level (dashed purple lines in charts 1.2.2.11 and 1.2.2.12) indicate stronger growth,[20] when this measurement is carried out considering the operations in banks' portfolios, the central measures of the borrowers' debt service-to-income and debt-to-income ratios indicate relative stability lately, with a small marginal increase.[21],[22] This stability in the distribution of the metrics on the granular level suggests the expansion of the credit portfolio in the SFN, with maintenance of its quality.

Chart 1.2.2.11 – Debt service-to-income ratio – Debtors[/1]
Dispersion of granular data – Seasonally adjusted



/1 (i) The interquartile range, the median and the 1% trimmed mean refer to data of the distribution of measures of the individualized debt service-to-income ratio of SFN borrowers. For this individualized calculation, credit card installments financed by merchants were not included in the debt service. (ii) The household debt service-to-income ratio, SGS time series 29034 of BCB, is an aggregate measure that compares the debt service of SFN borrowers to the restricted households gross disposable national income. For this measure, credit card installments financed by merchants are included in the debt service.

Chart 1.2.2.12 – Debt-to-income ratio – Debtors[/1]
Dispersion of granular data – Seasonally adjusted



/1 (i) The interquartile range, the median and the 1% trimmed mean refer to data of the distribution of measures of the individualized debt-to-income of SFN borrowers. For this individualized calculation, all credit of individuals are considered, except rural and corporate operations. The amount of these operations is then compared to the debtor's annual income. (ii) The household debt-to-income ratio, SGS time series 29034 of BCB, is an aggregate measure that compares the debt of SFN borrowers to the restricted households gross disposable national income accumulated in the last 12 months.

Credit growth accelerated, especially in riskier facilities. Credit to individuals evolved consistently with the economic scenario for the second half of 2021, with an emphasis on facilities with higher returns and, consequently, higher risks, such as non-payroll-deducted credit and credit cards – in the latter case, with growth in revolving operations. Differently from this profile, but also with significant growth, rural credit expanded in line with the general picture of agricultural activities in the country. On the other hand, payroll-deducted credit and vehicle financing

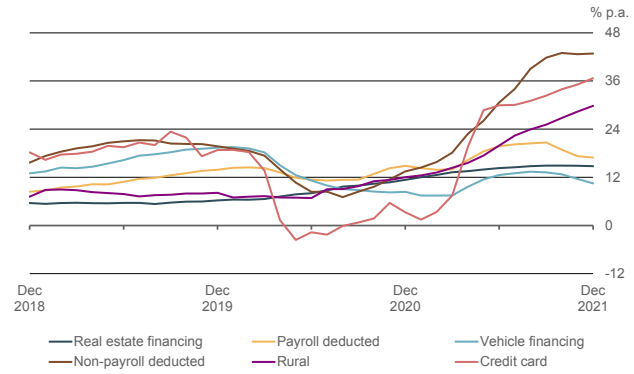
20 As explained in Selected Issue 2.2, "Household debt-to-income and debt service-to-income ratios", from the October 2021 Financial Stability Report, such metrics can be calculated for all households, either in aggregate or individually, i.e., considering data for individual debtors, as calculated here. The calculation in aggregate form compares, respectively, total debt and its service to the restricted households gross disposable national income (see Time Series 29037 and 29034).

21 In the same Selected Issue, it was argued that the relevant net inflow of borrowers in the distribution of household debt-to-income and debt service-to-income ratios tends to lead the distribution to a downward bias. Such a movement continued in the second half of 2021, which may reduce the pace of growth of household debt-to-income and debt service-to-income ratios for the borrower distribution.

22 The series break in May 2019 is due to the change in debtor identification limits in the Credit Information System (SCR) – more debtors now have their transactions individually identified.

reduced their annual growth rates in the second half of 2021 (Chart 1.2.2.13).[23]

Chart 1.2.2.13 – Credit outstanding – Year over year growth
By credit facility



Real estate financing has cooled down in line with the rise of the basic interest rates. Although the amount granted remained at historically high levels, the rise in interest rates has reduced the demand for housing credit (Chart 1.2.2.14). Because of the effect of the rise in interest rates and the increase in inflation, the use of other indexers in new contracts, other than the TR, practically did not occur at the end of 2021 (Chart 1.2.2.15).

Chart 1.2.2.14 – Real estate credit granting
By line of funding

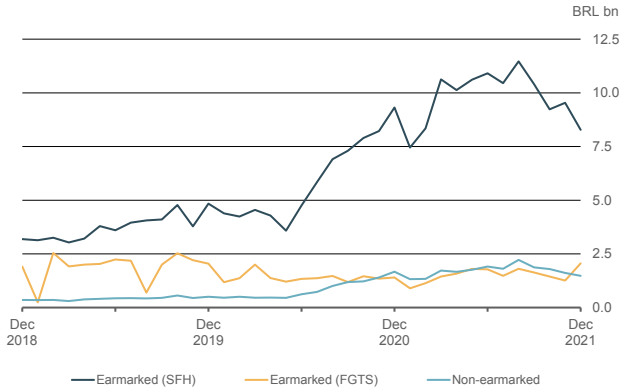
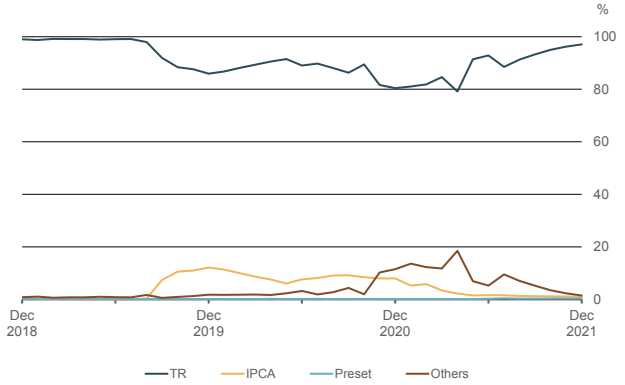
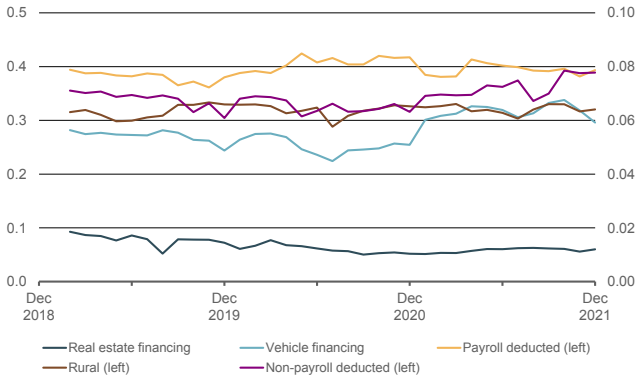


Chart 1.2.2.15 – Real estate credit granting
By indexing factor



Risk appetite of financial institutions increased, especially in non-payroll deducted credit and vehicle financing. The average credit granting scores[24] for both facilities grew during the year. The steep increase of the non-payroll deducted credit outstanding draws attention to this portfolio. For real estate financing, rural credit and payroll deducted credit, the credit granting scores remained stable.

Chart 1.2.2.16 – Credit granting average score
By credit facility



23 The figures presented here may differ from those in the BCB's time series, because the source here is the balance of the active portfolio of clients identified in the SCR.

24 For credit to households, the models were based on borrowers' information and on specific features of the operations. The scores of different facilities cannot be directly compared, since different models were used to generate them; therefore, the most appropriate comparison of the current score of a facility is with its own historical levels.

The trend towards an increase in the risk profile of vehicle financing credit granting remains. Due to the reduced supply of new vehicles, the vehicle financing market intensified a trend seen since 2018, with the increase in the financing of vehicles over three-years old (Chart 1.2.2.17). This occurred in tandem with the increase of average financing terms (Chart 1.2.2.18). Such contracts tend to exhibit higher risk behavior, with the expectation of an increase in problem assets in the future.

Chart 1.2.2.17 – Vehicle financing credit granting
By age of vehicle

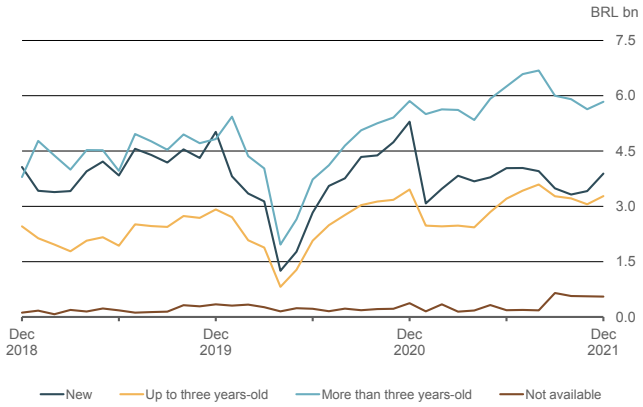
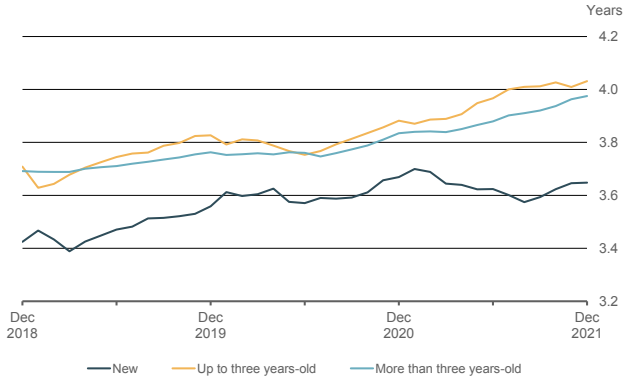


Chart 1.2.2.18 – Vehicle financing credit granting operation term
By age of vehicle



Non-payroll deducted credit grew in operations with a riskier profile. The growth of the non-payroll deducted credit portfolio was concentrated in operations without collateral or with a fidejussory guarantee in the second half of 2021 – these operations have a historical risk materialization profile that is higher than the other operations in the portfolio. Besides this, there was a significant increase in the number of SFN clients who started using this facility.[25] It should be noted, however, that this portfolio also includes the Length-of-Service Guarantee Fund (FGTS) yearly withdrawal anticipation operations, deemed less risky (charts 1.2.2.19 and 1.2.2.20).

Chart 1.2.2.19 – Non-payroll deducted credit granting
By type of guarantee

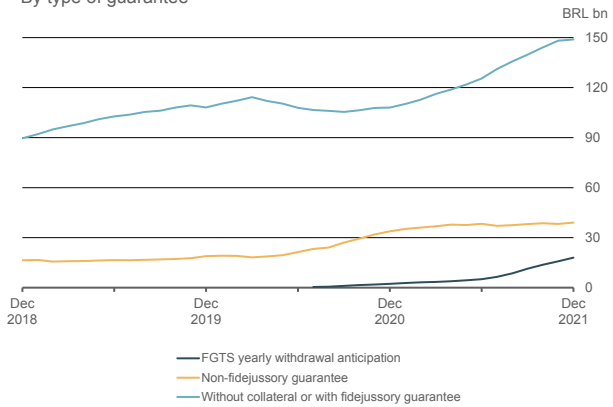
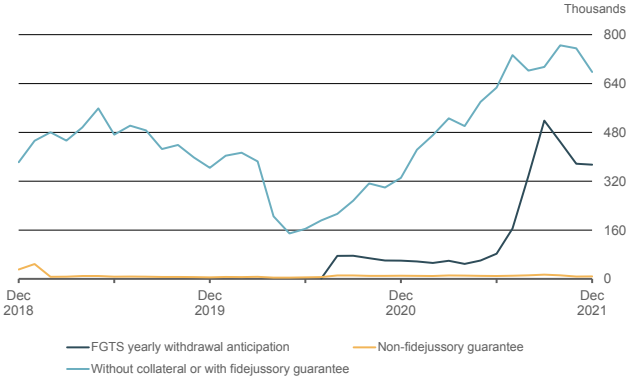


Chart 1.2.2.20 – Non-payroll deducted credit – Number of new clients
By type of guarantee



25 New non-payroll deducted credit clients are defined here as those who did not have, in the twelve months prior to the reference month, any non-payroll deducted credit operation in the SFN.

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Annex

The risk materialization came along with the growth of the portfolio (Chart 1.2.2.21). This movement occurred especially in facilities such as credit card (Chart 1.2.2.22) and non-payroll deducted credit (Chart 1.2.2.23): even with the increase of problem assets, the high portfolio growth resulted in stability or a slight decrease in the percentage of problem assets. In some facilities, however, there was an increase in the percentage of problem assets themselves, as observed in the FGTS line of real estate credit (Chart 1.2.2.24), and in vehicle financing (Chart 1.2.2.25), where the problem assets increase significantly more than the credit outstanding itself. The decreases in disposable income for debt payment and in real income, the increase in interest rates and the decrease in economic activity should lead to an increase in the percentage of problem assets in the upcoming months.

Domestic banking credit – By ownership and credit unions

The risk appetite of private banks remains higher than that of public banks in the second half of 2021. Private banks maintained a higher risk appetite than public banks in the main credit portfolios. This behavior can be observed by the higher growth of the credit portfolio (Chart 1.2.2.26) and by the higher level of risk taken in new credit contracts, especially in the household portfolio of payroll-deductible, non-payroll-deducted loans, and vehicle financing. Credit

Chart 1.2.2.21 – Problem assets
Cumulative monthly variation

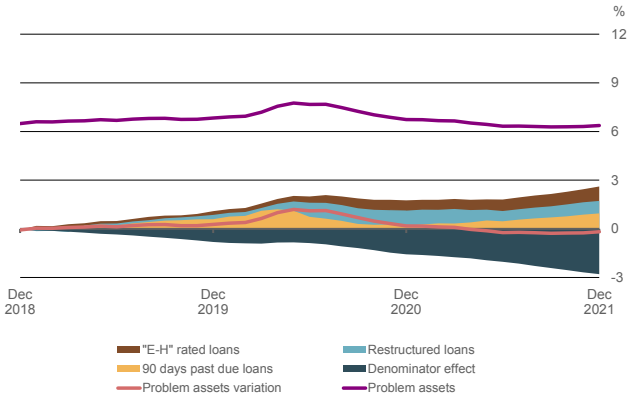


Chart 1.2.2.23 – Non-payroll deducted credit – Problem assets
Dec/2018 = 100

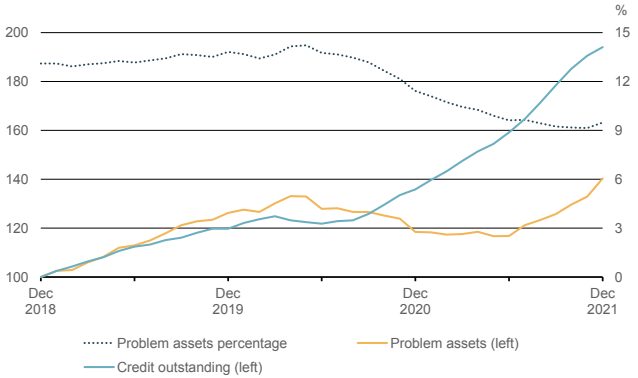


Chart 1.2.2.22 – Credit card – Problem assets
Dec/2018 = 100

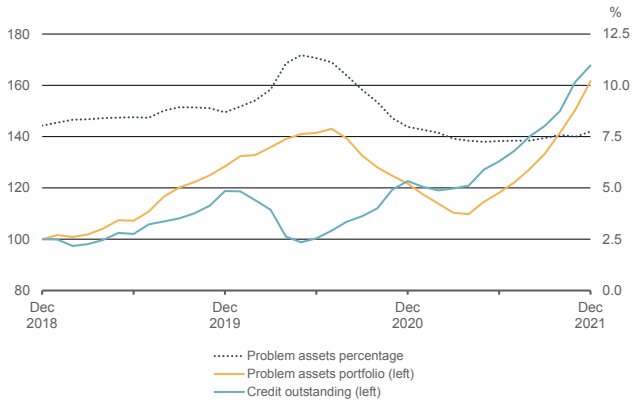


Chart 1.2.2.24 – Real estate financing – Problem assets
By line of funding

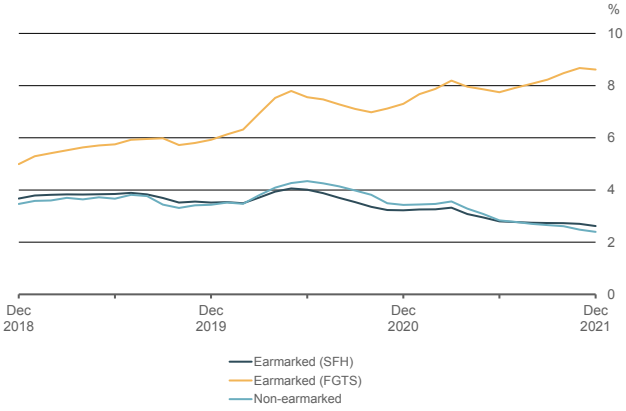


Chart 1.2.2.25 – Vehicle financing – Problem assets
Dec/2018 = 100

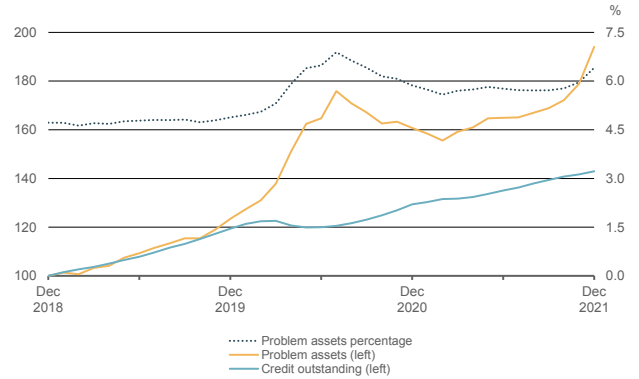
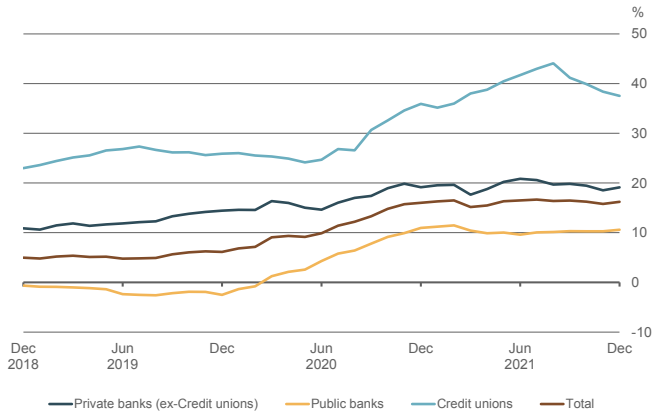


Chart 1.2.2.26 – Year over year credit growth
By segment



unions maintained the high growth of companies and household credit portfolios and presented a credit lending quality superior to that of other segments in the main household credit types.

Risks and provisioning

The risk already materialized in the domestic bank credit portfolio showed a slight reduction at the beginning of the second half of the year and stabilized in the last months of the year. The drop in the percentage of problem assets at the beginning of the semester was influenced by the reduction in the portfolio classified between "E" and "H" (Chart 1.2.2.27). The reduction was driven by public banks and credit unions. For private banks, the percentage of problem assets remained stable in the semester (Chart 1.2.2.28). The percentage of problem assets in the financial system remained below the level observed before the pandemic.

SFN provisions remained above than expected credit losses estimates. The level of provisions for credit losses showed a slight increase in the last semester. Considering the estimates of expected credit losses calculated by the BCB, the system's provisioning remains adequate. The adequacy of provisions is observed for both non-modified loans and loans that were modified during the pandemic. The segments of private banks, public banks, and

Chart 1.2.2.27 – Problem assets
By component

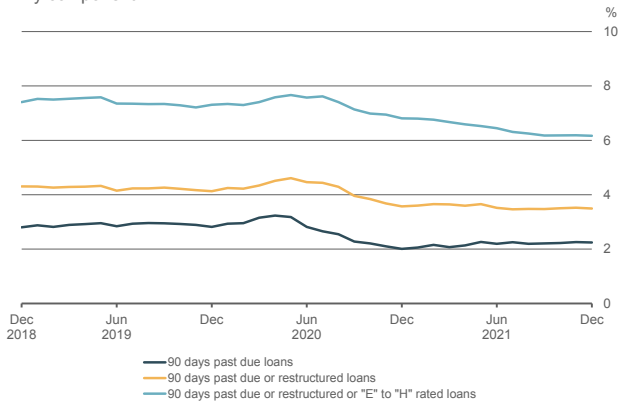
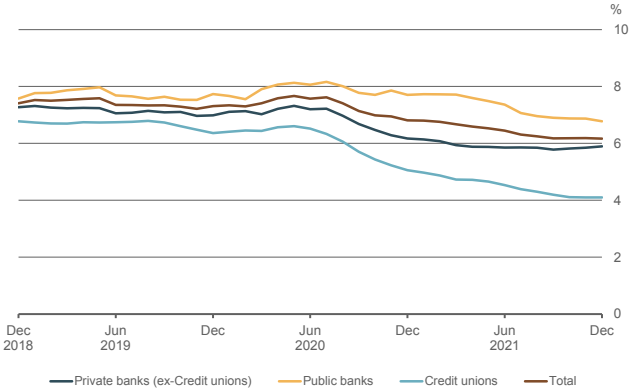


Chart 1.2.2.28 – Problem assets
By segment



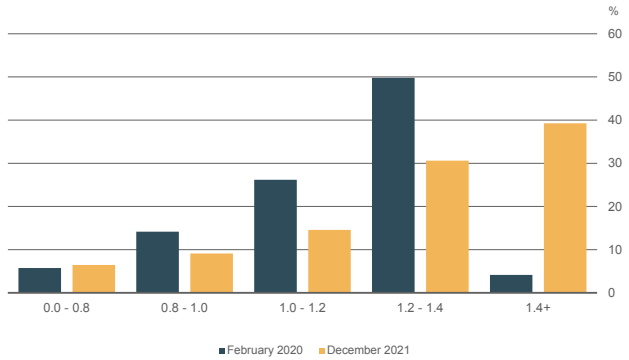
credit unions present provisions higher than expected credit losses. Considering all the domestic credit banking, the financial system has a coverage ratio of 1.34 (Table 1.2.2.1).

Table 1.2.2.1 – Expected loss and provisioning

Credit portfolio	Expected loss	Provision	Coverage
Modified loans	6.2%	10.2%	1.64
Non-modified loans	3.2%	3.6%	1.11
Total	4.1%	5.5%	1.34

Expected credit losses coverage by provision has increased since the beginning of the pandemic. Institutions with expected loss coverage greater than 1.0 (one) holds about 85% of the domestic banking credit portfolio in December 2021, while this proportion was 80% in February 2020. In December 2021, stands out the concentration of the credit portfolio in institutions with a coverage ratio above 1.2, that is, institutions with the capacity to absorb an increase of at least 20% in expected credit losses (Chart 1.2.2.29).

Chart 1.2.2.29 – Domestic credit portfolio
By expected credit loss coverage



1.2.3 Profitability

The system's profitability[26] continues to recover from the effects of the pandemic and should remain resilient in the short term. After a significant drop in the first half of 2020, the system's profitability returned to levels close to those observed before the pandemic. Loan loss provisions (LLPs)[27] have stabilized, and the current level of provisioning could be used to absorb any increases in PAs. The credit margin is under pressure due to rising funding costs but should benefit from a more profitable mix and from a repricing of the credit portfolio at higher rates. Service revenues should grow at a slower pace, and costs, although controlled, will likely continue under pressure because of inflation.

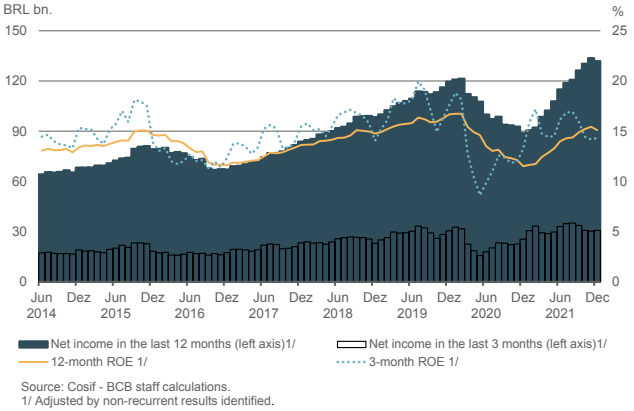
After a rebound in 2021, earnings should evolve more slowly. The system's net income was R$132 billion in 2021, 49% higher than in 2020 and 10% higher than in 2019. Return on Equity (ROE) was 15%, returning to pre-pandemic levels (Chart 1.2.3.1). Growth in net interest income,[28] reduction in LLPs and efficiency gains explain the earnings improvement. The profitability of the system should remain resilient, but profits will likely grow at a slower pace. The scenario for 2022 is of weaker economic activity, lower credit growth, normalization of default rates and higher funding and operational costs. These elements represent obstacles to the evolution of profitability ahead.

26 Profitability affects bank resilience. Banking systems with low profitability need more time to build their capital and liquidity ratios. This can restrict the availability of credit to the real economy and/or the ability of institutions to absorb shocks, such as losses in the credit and/or securities portfolios. Consistent low profitability also makes it difficult to obtain funds via capital markets, which can increase risks to financial stability.

27 In this section of the Report, we use the term "loan loss provisions" to refer to the expenses recorded on FI's income statement.

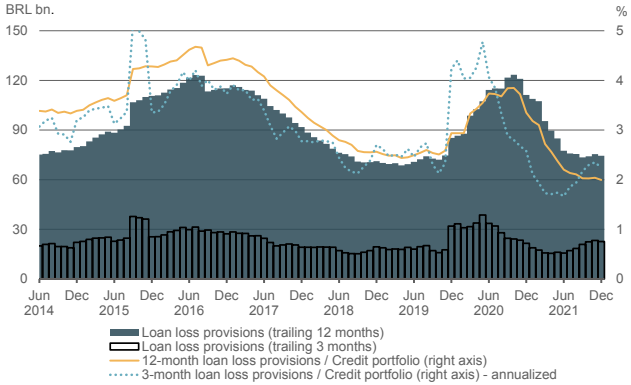
28 The net interest income (NII) grew, despite the rise in funding expenses. The movement was influenced mainly by the strong credit growth and the rise in interest income from the securities portfolio.

Chart 1.2.3.1 – Net profit and ROE[1/]
Banking system



Source: Cosif - BCB staff calculations.
1/ Adjusted by non-recurrent results identified.

Chart 1.2.3.2 – Loan loss provisions
Banking system

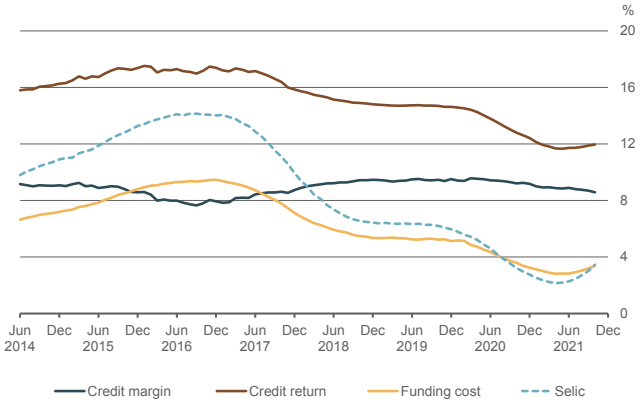


Source: Cosif - BCB staff calculations.

LLPs have stabilized, and the level of provisioning provides resilience to the system. After declining consistently since mid-2020, LLPs have stabilized at pre-pandemic levels (Chart 1.2.3.2). Given the less favourable economic scenario anticipated for 2022, the expectation is for a moderate rise in delinquency (towards pre-pandemic levels). The normalization of delinquency levels and the migration of portfolios to a mix of higher risk may increase the level of PAs throughout the year. Any increase will probably not cause significant difficulties to the system, given that the current level of provisioning could be used to absorb it, in whole or in part.

The credit margin[29] was under pressure with the rise in interest rates but should benefit from a more profitable credit mix and the repricing of the credit portfolio at higher rates. The monetary tightening that was initiated in March 2021 was significant[30] and promoted a faster adjustment of the cost of funding relative to the return on credit, which pressured the system's credit margin[31] (Chart 1.2.3.3). The higher interest rate environment, however, favours the repricing of the credit portfolio at higher rates. The migration to a higher return and risk portfolio profile, which started in 2021 and is expected to continue in 2022, also tends to benefit the return on credit throughout 2022. The combination of these effects should be positive for the system's credit margin in the next months.

Chart 1.2.3.3 – Credit margins
Trailing twelve months



Source: Cosif - BCB staff calculations.

29 Refers to the net interest margin from credit, calculated as the difference between the return on credit (credit income in the last twelve months divided by the average credit portfolio in the period) and the cost of funding (funding expenses in the last twelve months divided by the average stock of funding in the period).

30 From February 2021 to February 2022, the Selic rate increased 875 basis points, from 2% p.a. to 10,27% p.a. According to Focus Report of February 25, 2022, the Selic rate at the end of 2022 would be 12,25% p.a., an additional rise of 150 basis points in the year.

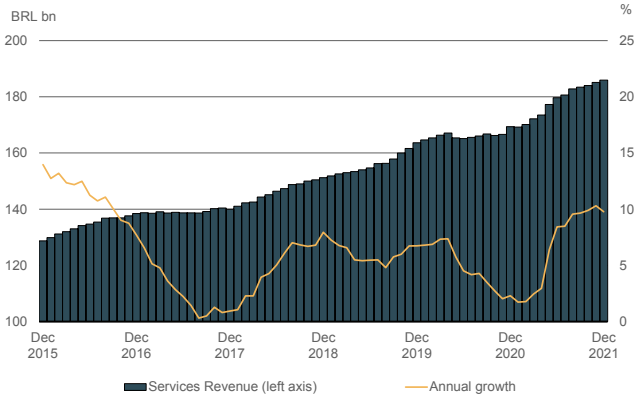
31 Due to the concentration of floating rate instruments and the short-term nature of Brazilian banks' funding, the cost of funding tends to respond more rapidly to changes in the Selic rate than the return on credit.

Service revenues are expected to grow less in 2022, while costs remain pressured by inflation. After growing at a slower pace due to the pandemic in 2020, service revenues grew by 10% in 2021, driven by improved economic activity (Chart 1.2.3.4). Due to weaker economic activity and fiercer competition, revenues from services are expected to grow less in 2022. Despite high inflation in 2021, banks were able to keep costs under control. Administrative expenses grew by 8%,[32] while inflation measured by the Extended National Consumer Price Index (IPCA) was 10% in 2021 (Chart 1.2.3.5). Inflation should continue to put pressure on institutions' operational costs in 2022.

1.2.4 Solvency

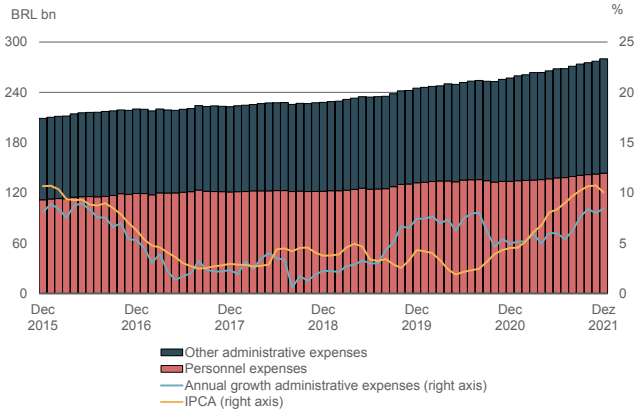
The banking system remains sound and apt to sustain regular economy functioning. Solvency does not represent a risk to financial stability, being the great majority of institutions able to fulfill the minimum prudential requirements[33] with solely Common Equity Tier 1 (CET1), the best quality capital (Chart 1.2.4.3). In face of the perception of recovery from the effects of the pandemic, the system has raised capital remuneration to shareholders, leading to the interruption of the upward trend in the solvency indexes which prevailed after the pandemic beginning (charts 1.2.4.1 and 1.2.4.2).

Chart 1.2.3.4 – Services Revenue
Trailing twelve months



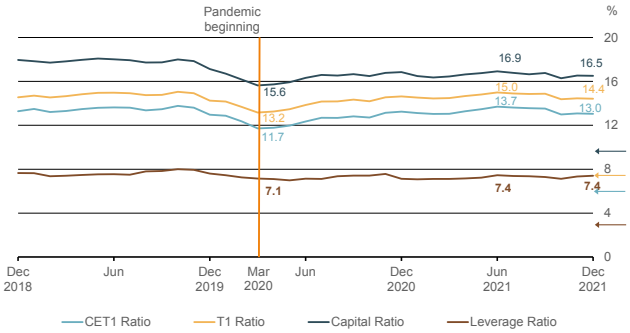
Source: Cosif - BCB staff calculations.

Chart 1.2.3.5 – Administrative expenses
Trailing twelve months



Sources: IBGE and Cosif - BCB staff calculations.

Chart 1.2.4.1 – Capital ratios and regulatory requirements[1]

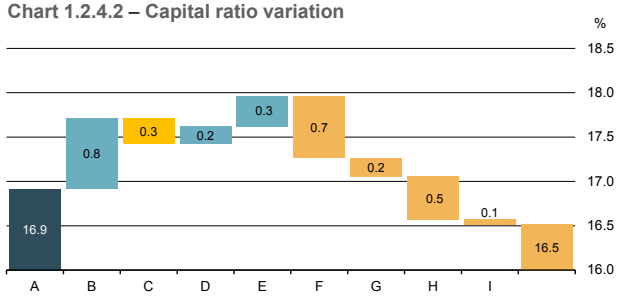


[1] Leverage ratio considers only institutions belonging to S1 and S2 segments, according to Resolution 4,615/17.

32 The exchange rate effect from expenses of subsidiaries and branches of Brazilian banks abroad was not significant in 2021. Without this effect, administrative expenses would have grown by only 8.4%, instead of 8,7%.

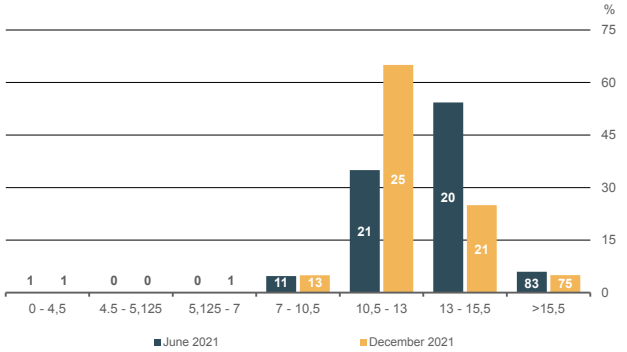
33 Considering all the risk-weighted requirements, including Basel Pillar 2, the capital shortfall amounts to R$70 million, corresponding to 0.007% of the system's regulatory capital.

Chart 1.2.4.2 – Capital ratio variation



A = Capital ratio - Jun 2021
B = Paid-up capital, retained earnings and profits
C = Accumulated other comprehensive income
D = Aditional Tier 1 Capital
E = Tier 2 Capital
F = RWA - Credit operations
G = RWA - Other credit-like assets
H = Credit RWA - Other
I = Other
J = Capital ratio - Dec 2021

Chart 1.2.4.3 – CET1 ratio
Frequency distribution weighted by assets[1]



1 Inside the bars are the number of financial institutions in the correspondent CET1 ratio range.

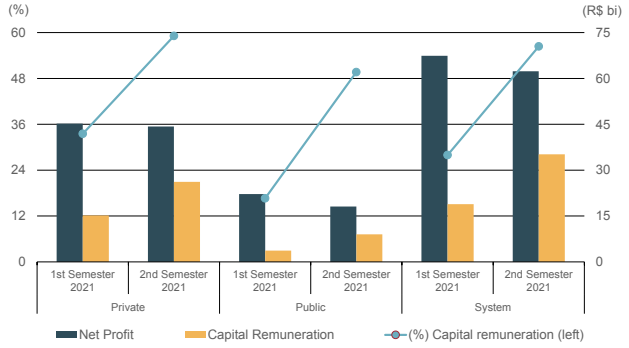
The lower CET1 growth stems mainly from higher earnings distribution. The issuance of instruments and currency depreciation raised the Tier 2 share in the regulatory capital. Due to the perception of normalization regarding the effects of the pandemic and in face of restrictions on capital remuneration[34] ending, institutions increased the percentage of profits distributed to their shareholders (28% in the first semester to 56% in the second) despite the reduction of semester earnings (Chart 1.2.4.4). Losses in available for sale securities originated by the interest rate hike were more than compensated by capital instruments issuance and by the impact of the exchange rate rise on instruments issued in foreign currency. Thus, there was an increase in the regulatory capital and a slight decline in the share of CET1, from 81% to 79% (Chart 1.2.4.5).

Credit operations were responsible for most of the increase in the Risk Weighted Assets (RWA) in the 2021 second half (Table 1.2.4.1), a result of the expansion of exposures in these operations, which receive a higher risk weight. According to the December 2021 regulatory framework,[35] the system still has a R$272 billion capital surplus.

34 Resolutions 4,797 and 4,820, respectively of 7th April and 2nd June, 2020 imposed restrictions to capital remuneration during the 2020 financial year.

35 According to the schedule established by Resolution 4,783, of March 17th, 2020, the capital conservation buffer requirement will return to 2.5% in April 2022, which will result in an increase of 4.4% in the required capital.

Chart 1.2.4.4 – Capital remuneration[1]



1 Capital remuneration values refer to the semester of the distribution, not the period in which the profits were earned.

Chart 1.2.4.5 – Capital structure

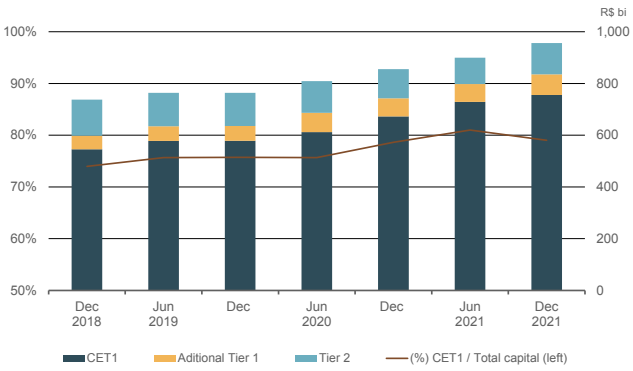


Table 1.2.4.1 – RWA Composition

R$ billions	System			Var. (%) Dec/Jun	
	Jun/21	Dec/21	Var. (%)	Public	Private
Total RWA	**5,321**	**5,792**	**8.9%**	**5.1%**	**4.5%**
Credit RWA	**4,523**	**4,986**	**10.2%**	**3.1%**	**4.7%**
Credit operations	2,205	2,436	10.5%	4.5%	4.5%
Mortgages	348	378	8.6%	3.1%	9.9%
Leasing	18	20	11.4%	24.2%	-3.3%
Interbank investments	149	167	12.2%	-14.7%	4.7%
Securities	309	353	14.0%	20.1%	16.0%
Derivatives	185	219	18.3%	-4.3%	2.1%
Fixed Assets	205	204	-0.4%	9.2%	-6.5%
Non-cancellable credit commitments	162	173	6.7%	12.1%	8.5%
Guarantees provided	261	309	18.4%	2.9%	0.0%
Tax assets	409	409	0.0%	2.3%	-4.5%
Other	620	695	12.2%	-7.5%	12.2%
Market RWA	**260**	**243**	**-6.6%**	**-0.1%**	**11.5%**
Operational RWA	**537**	**563**	**4.9%**	**21.0%**	**-1.2%**

1.2.5 Stress tests

Capital stress tests

In all simulated scenarios for capital stress tests, the banking system has shown adequate resilience. There are no relevant non-compliances in the adverse macroeconomic scenarios. Sensitivity analyses also show good resistance to isolated simulated factors, in addition to the stability of results compared to previously performed tests. The liquidity test indicates a comfortable amount of liquid assets in the event of cash outflows in adverse conditions or shocks to market parameters in the short term.

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Box: Macroeconomic stress test scenarios

Stress scenarios, called Stress 1 and Stress 2, described below, seek to describe an environment or context of stress through the state of the macroeconomic variables used (charts 1.2.5.1 to 1.2.5.5).

Scenario "Stress 1" assumes that the economy would halt its recovery trajectory, with a further GDP drop due to insufficient aggregate demand. This scenario is built on an assumed contraction of the GDP in 2022 with respect to the baseline scenario, using as reference the unexpected decline in GDP observed in 2015, in relation to the projections made in august, 2014, found on the Market Expectations System of the Central Bank of Brazil (Focus Report). It is also assumed that the world's recovery would be interrupted, resulting in a drop in the world's GDP, in a strengthening of the dollar, and a drop in commodity prices, thus affecting domestic activity. As to Brazil's economy, both household consumption and gross fixed capital formation would decline again, due to external factors such as an extension of the effects of the pandemic. The reduction in economic activity would generate a significant increase in the unemployment rate. The increase in the idle capacity of the economy would lead to a reduction in inflation, despite a small currency depreciation. In line with the Taylor rule, falling inflation would lead the BCB to reduce interest rates. Therefore, the scenario is characterized by a fall in economic activity, inflation, and interest rates.

Scenario "Stress 2" is characterized by a significant increase in uncertainty in the economy starting in 2022 Q3 due to fiscal deterioration, leading to increased risk premiums, sharp exchange rate depreciation, an increase in the economy's neutral interest rate, and a contraction in economic activity. To build this scenario of a confidence crisis, we used as reference the past episode of fiscal deterioration and economic uncertainty that took place from mid-2014 to early 2016. As for the first stress scenario, it is also assumed that the world's recovery would be interrupted, resulting in a drop in the world's GDP, a strengthening of the dollar, and a drop in commodity prices. Despite the fall in domestic GDP and the increase in the unemployment rate, here the inflationary effect of currency depreciation would prevail. The significant increase in inflation would lead the BCB to increase the interest rates. In this scenario, it is assumed that the BCB would move interest rates to ensure that inflation remains around the target throughout the fiscal year horizon. Hence, this scenario features a drop in economic activity, higher inflation, and interest rates.

It is important to note that the interest rates (Selic) path assumed in both scenarios serves the only purpose of providing macroeconomic consistency to the scenarios and by no means indicates nor suggests any compromise of the BCB should any of these scenarios materialize.

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Chart 1.2.5.1 – Inflation

Chart 1.2.5.3 – GDP – % variation

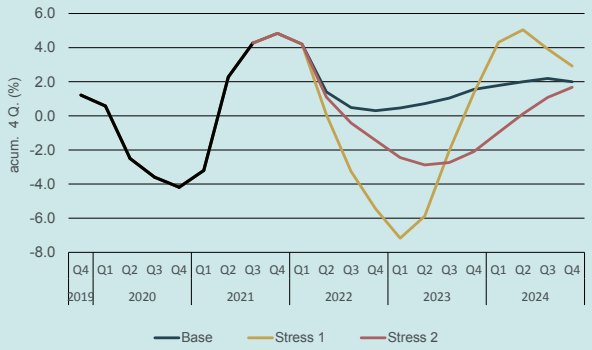


Chart 1.2.5.5 – Selic

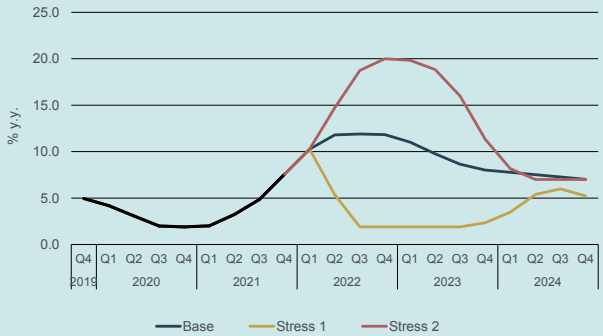


Chart 1.2.5.2 – FX

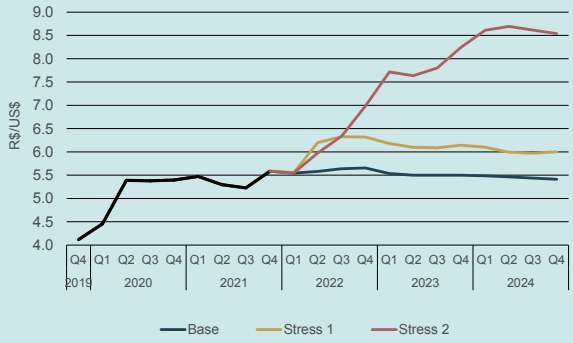
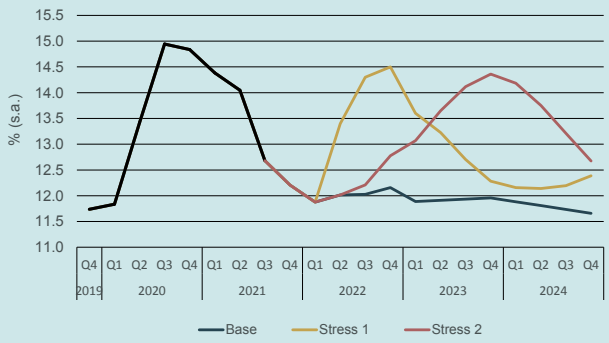


Chart 1.2.5.4 – Unemployment



The estimated need for capitalization of the system is low in both simulated scenarios confirming the adequate capacity of the system for loss absorption. The largest capital need would be 2.1% of the current PR of the system in the 8th quarter of the simulation of the "Stress 2" scenario (Chart 1.2.5.6). By the end of the simulation, capital needs reduce to 1.0% of the PR. For the "Stress 1" scenario capital need reaches 1.5% of the current PR of the system. APs, on the other hand, would reach 8.6% of total loans (Chart 1.2.5.7) in the "Stress 2" scenario. Institutions that together account for 91% of the total assets of the system would continue to show capitalization rates above the regulatory minimum (10.5%) by the end of the simulation (Chart 1.2.5.8).

Chart 1.2.5.6 – Capital Gap

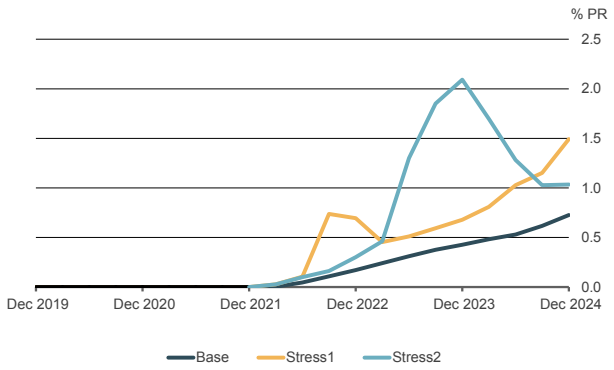


Chart 1.2.5.7 – Problem Assets

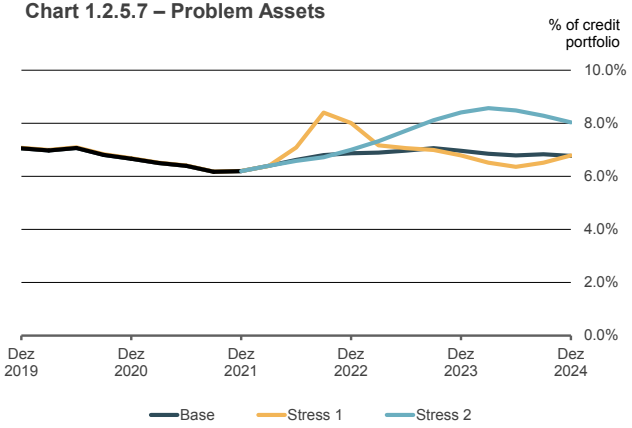
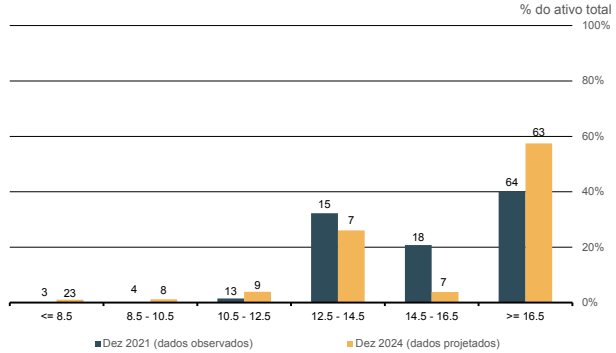


Chart 1.2.5.8 – Frequency Distribution of Assets By Capital Ratio Range
Stress 2 Scenario[1/]



1/ Values indicate the number of banks in each range.

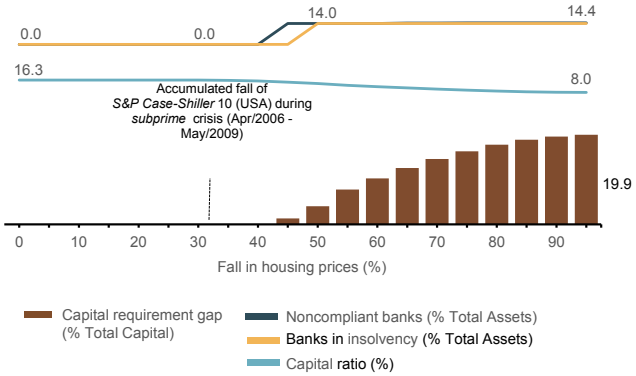
Sensitivity analysis

The system has low sensitivity to shocks in the exchange rate. There are no non-compliances even for an exchange rate equivalent to twice the rate observed in June 2021. The low observed net exposure inhibits adverse effects resulting from drastic fluctuations in the exchange rate.

Only very large positive shocks in the interest rate could generate some capital need. A shock equivalent to the greater variation observed would result in a need for capital of 0.5% of the PR, and the affected banks account for 2.6% of the system's assets. Hedge policies and the low exposure to assets that are sensitive to fixed-rates reduce the sensitivity to shocks in the interest rate.

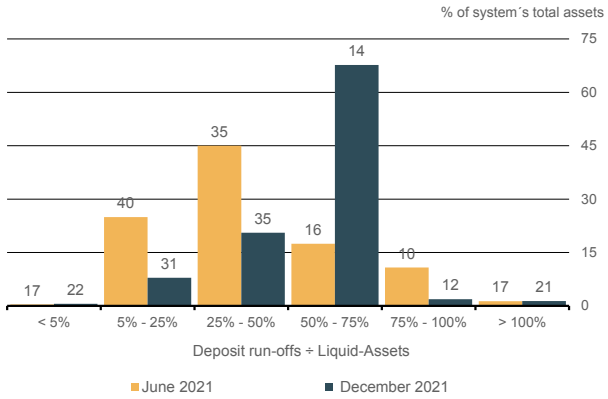
There is no need for capital even with the APs reaching their highest historical mark. It would be necessary for the APs to reach 12.7% of total loans to create a need for capital, a percentage higher than the historical maximum of 8.6% observed in May 2017 (Chart 1.2.5.10). In an extreme situation, if the proportion of problematic assets reaches 15.8% of the credit portfolio there would be a need for capital equivalent to 1.5% of the system's PR. This would represent 16.3% of the system's assets.

Chart 1.2.5.10 – Sensitivity analysis
Housing prices risk



Simulations of reductions in residential property prices show a very small possibility of non-compliance. There would only be a need for capital in the event of a nominal drop of at least 45% in the collateral price of real estate credit operations, updated by the IVG-R. This shock is superior to the 33% drop observed in the S&P Case-Shiller during the subprime crisis. Only a reduction of 50% or more in nominal prices would lead to insolvency, characterized by negative principal capital. In December 2021, the stock of the residential real estate loan portfolio had an average LTV of 54%, considering collateral prices updated by IVG-R. The concession criteria with low LTVs and the use of the Constant Amortization System (SAC) are healthy characteristics for real estate credit and contribute to the system's ability to absorb price shocks in extreme scenarios (Chart 1.2.5.11).

Chart 1.2.5.11 – Frequency distribution off deposits run-offs[/1]



1/ The values on the top of the bars refer to the number of financial institutions with the value of the expected earlier redemptions for next 30 days (run-offs) as a share of its liquid assets beloging to the corresponding interval.

Simulation of direct interbank contagion

The simulation suggests a low need for resources to recapitalize the system due to contagion caused by the bankruptcy of each financial institution individually. In the worst case, the need for capital resulting from contagion would be below 1% of the system's PR. This low impact is explained by the good level of capitalization of the system and the existence of an exposure limit per client, which restricts this type of exposure. In addition, most interbank transactions are carried out through repurchase agreements backed by TPFs, thus not propagating contagion due to the type of collateral. The remaining transactions have low volume in the aggregate of the financial system but are relevant in some particular cases, which explains the identified need for capital.

Liquidity Stress Testing

Liquidity stress tests reveals the resilience of banking institutions to withstand potential deposit run-offsas well as market losses stemming from stressed scenarios. The increase in funding volatility along the second half of the year raised estimates for depositor outflows under stress scenarios, although the proportion of outflows to liquid assets remained limited. Expected losses under market stress were not relevant.

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Stress tests featuring early withdrawal of deposits[36] suggests that the system's liquidity cushion is sufficiently large to safeguard financial stability and the regular functioning of the intermediation system, even under adverse scenarios. The current scenario shows a greater proportion of liquid assets committed to support potential deposit-run offs[37] for the major institutions. Considering the FIs individually, the changes were not relevant. Therefore, only a group of institutions jointly representing 1.2% of the system's assets have deposit run-offs representing more than 100% of their liquid assets (Chart 1.2.5.11).

The result of the shocks in the market parameters demonstrated that banking institutions had continued presenting resilience to face eventual cash outflows and potential devaluations in liquid assets[38] in the short-term horizon. This simulation is based on projections of shocks in market parameters through different scenarios,[39] estimating the amount necessary to cover losses arising from fluctuations in the prices of liquid assets positions, combined with other cash outflows of the institutions' resources.[40] The average increase in fixed interest rate and foreign exchange exposures combined with the reduction in liquid assets contributed to a rise in the market stress ratio on the institutions' liquid assets compared to June 2021, but at non-relevant levels (Chart 1.2 .5.13).

36 The early withdrawal of depositors' stress test aggregates a subset of components of the Short-Term Liquidity Ratio methodology (IL) associated with unexpected deposits outflows: deposit profile, early redemption and Brokered Deposits (CIs) to be due and CIs with early redemption clause. For further details about the ILs methodology, please refer to the April 2020 edition of the Financial Stability Report.

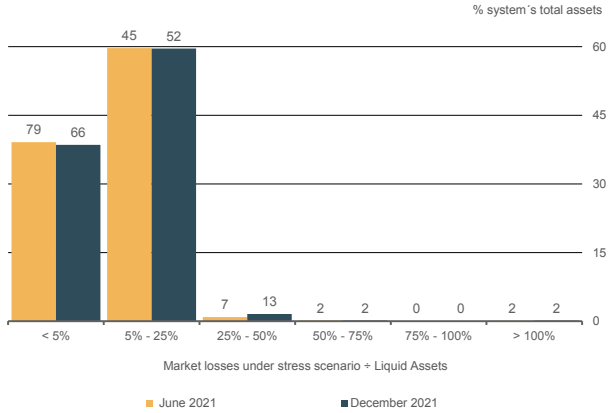
37 The scenario calibrated for the thirty-day horizon contemplates redemptions from the largest institutional depositors and other clients The shock applied to the withdrawal of other customers considers historical behavior for daily depositor balances with a 99% confidence interval applied to a series encompassing 100 business days. Additionally, there is a third category of investors considered in the stress scenario: those who have brokered deposits, for which specific shocks are applied.

38 The market stress simulation is based on projections of different scenarios for the yield curve, exchange rate, currency and inflation coupons. The stress tests consider the worst impact of high/low shock scenario for the different marks risk factors, independently, for each institution; that is, we may have two independent scenarios, one shock estimating an increase for a certain risk factor for an institution A and other a decrease for the same risk factor for an institution B. Resource losses/cash outflows include: (i) additional margin calls deposited in clearing houses; (ii) disbursements in positions of derivative markets; (iii) loss of value of liquid assets on repo agreements or given as a guarantee in clearing houses and BCB.

39 The stress tests consider the worst impact of high/low shock scenario for the different marks risk factors, independently, for each institution; that is, we may have two independent scenarios, one shock estimating an increase for a certain risk factor for an institution A and other a decrease for the same risk factor for an institution B.

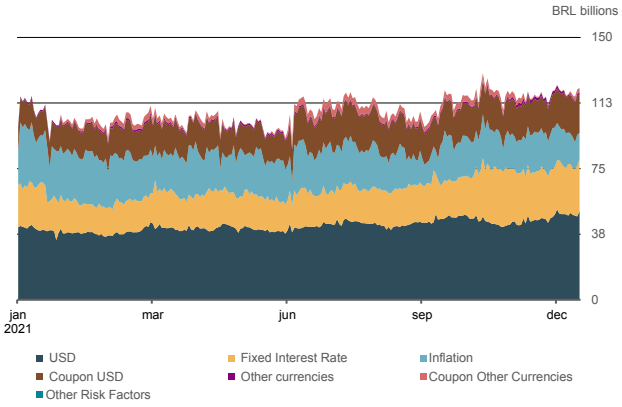
40 Resource losses/cash outflows include: (i) additional margin calls deposited in clearing houses; (ii) disbursements in positions of derivative markets; (iii) loss of value of liquid assets on repo agreements or given as a guarantee in clearing houses and BCB.

Chart 1.2.5.12 – Frequency distribution for market losses under a stress scenario[1/]



1/ The values on top of the bars refer to the number of institutions with estimated market losses under stress scenario as a share of liquid assets belonging to the corresponding interval.

Chart 1.2.5.13 – Impact of market stress by risk factors



The managerial liquidity indicator (IL), computed under stressed parameters for depositor outflows and market losses, maintains resilience – despite its reduction among public banks. There was a significant negative variation in the IL of public banks between June and December 2021. However, this decrease came mainly from managerial decisions to reduce excessive liquidity buffers, considering the slowdown of the pandemic, as well as ongoing efforts to close the gap with their private peers[41] (Chart 1.2.5.14). Private banks also demonstrated a reduction of the IL along the period, albeit less significant. As with public banks, market volatility and the increase in funding in the second half of the year raised the indicator's denominator, with liquid assets remaining more stable (Chart 1.2.5.15). Losses arising from the market stress scenario were not significant across the system.

Chart 1.2.5.14 – Short-term Liquidity Index (IL)[1/]
Public banks, monthly accumulated changes

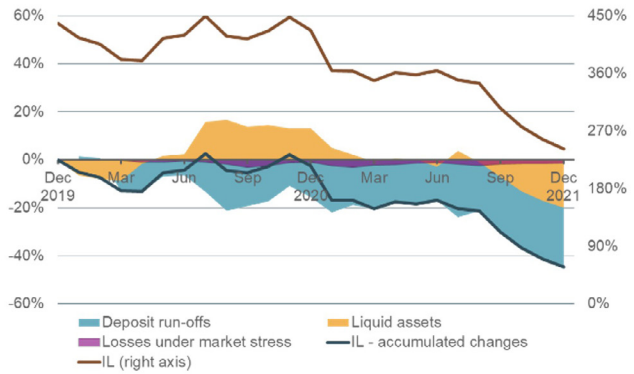
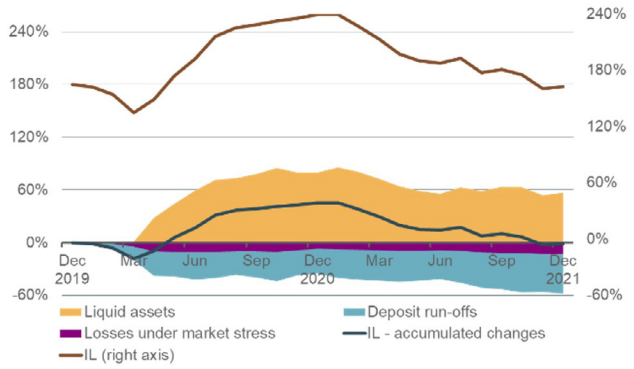


Chart 1.2.5.15 – Short-term Liquidity Index (IL)[1/]
Private banks, monthly accumulated changes

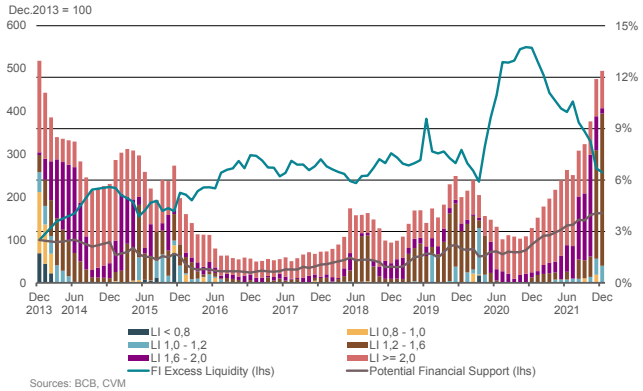


The estimated impact of potential liquidity support to investment funds[42] managed by bank-linked managers on the banking system participants is not a relevant matter of concern. The step-in risk is the ratio between the potential liquidity support to investment funds provided by their bank-linked managers – estimated in a scenario of strong withdrawals in investment funds – and the excess liquidity of their linked FIs – estimated from the liquidity stress tests performed by the BCB. This risk is assessed along with the other stress tests carried out by the BCB and exceeded 12% at the end of 2021. The increase was mainly due to the reduction in the liquidity level of the managing FIs, which remains comfortable (Chart 1.2.1.10). The step-in risk does not represent a relevant matter of concern.

41 In December 2021, despite significant reduction, the aggregate IL of public banks stood at 240% against their private peers' 180%.

42 The concept and methodology for assessing potential liquidity support to investment funds were presented in the October 2017 edition of the Financial Stability Report, available at https://www.bcb.gov.br/publications/financialstabilityreport/201710.Investmentfunds considered in the estimation of the potential support are those under CVM Instruction 555/2014, managed by entities belonging to the banking system, open-end and non-exclusive, not fund of funds, having a redemption no longer than thirty days and whose financial statements are not consolidated into prudential conglomerates.

Chart 1.2.5.16 – Investment funds' step-in risk
Potential support as a proportion of excess of liquidity of FIs, segregated by Liquidity Index range



Sources: BCB, CVM

1.3 Financial Stability Survey[43]

The confidence in the stability of the SFN assessed by the financial institutions remains high, although the perception of the economic and financial cycles has worsened. Fiscal risks remain relevant. The number of citations about "delinquency and activity" risks rose, reversing the declining trend in prior surveys. Concerns about domestic and global inflation are growing, particularly about the effects on economic activity, indebtedness, and delinquency. There was a slight reduction in confidence in the financial stability of the SFN. However, respondents perceived a decrease in the total average expected impact of the main risks to financial stability compared to the level observed at the end of 2021. This reduction mainly reflects the decrease in the average expected impact of fiscal risks in this period. Financial institutions perceive a worsening of the economic and financial cycles, with a more negative perception of economic activity and signs of lower risk appetite. However, even though they perceive the leverage of companies and households as high, its upward trend decreased, and stability increased. The index of confidence in the financial system's stability increased. Considering the balance of risks, most respondents expect and suggest that the value of the $ACCP_{Brazil}$ be maintained at 0%.

Risks to financial stability[44]

The financial institutions consider that fiscal risks remain as the most concerning for the SFN, but with oscillation in the period. The frequency of citations of fiscal risks as the most important rose from 33% in August 2021 to 47% in November 2021 and returned to 33% in February 2022 (Table 1.3.1). The movement mainly reflected the behavior of the uncertainties regarding the fiscal framework.

The downward movement in citations referring to delinquency and activity risks seen throughout 2021 stopped in this survey, while the concern regarding domestic inflation and its repercussions on the system grew. The citations of "delinquency and activity" risks as the most important decreased from 56% in May 2021 to 38% and 27% in the following surveys, increasing to 31% in February 2022 (Table 1.3.1). With the high vaccination coverage in Brazil and the reduction in the relative number of cases of severe infections due to COVID-19, several sectors of the economy, especially in the service segment, have resumed their activities. However,

43 The BCB conducts a quarterly survey to identify and monitor risks to financial stability according to the perception of regulated entities. Opinions reported here are those of the responding financial institutions. In the last edition of the FSS, the sample was made up of 54 financial institutions, which totaled 91.1% of the banking system's assets in December 2021. Since the previous edition of the Financial Stability Report, two FSS have been carried out, in October 18-26, 2021, and from January 26th to February 4th, 2022, both with 100% response rates..

44 Question: "For each of the three mentioned risks, indicate the probability and the impact, considering the following classes: i) probability: low (<1%); medium-low (1% -10%); medium-high (10 % -30%); high (> 30%); ii) impact (total SFN assets): very low (<0.1%); low (0.1% -1%); medium (1% -5%); high (5% -10%); very high (> 10%)".

the recent lesser dynamism of economic activity and the worsening of financial conditions are indicated as negative elements for the activity recovery. Also noteworthy is the growing concern with domestic inflation (tables 1.3.1 and 1.3.2), which is pointed out as a worsening factor in the economic scenario, acting through several channels. Respondents emphasized that the rise in inflation affects consumption and investment decisions, causes a drop in household income and purchasing power, and leads to monetary tightening, affecting economic activity, indebtedness, and delinquency.

At the international level, the risks associated with the persistence of global inflation, the rate of stimulus withdrawal in advanced economies, and the Chinese economic slowdown increased. It is important to note that the survey was conducted before the outbreak of the war in Ukraine. Despite accounting for only 13% of the citations as the most important risk (Table 1.3.1), concerns arising from the international scenario are relevant when considering the three most cited risks (Table 1.3.2). After the most severe phase of the COVID-19 pandemic, global economic activity has been recovering, while concerns have grown about the withdrawal of monetary stimuli in advanced countries, particularly in the U. S., which could jeopardize the flow of capital to emerging countries and cause national currency depreciation. The expectation of a slower development in China in the coming years due to adopting more inclusive and sustainable policies may trigger a restructuring of global production chains, with impacts not yet fully assessed by the market. Due to the timing of the study, the conflict in Ukraine and growing geopolitical tensions were also mentioned, but without prominence.

Table 1.3.1 – FSS – Citation frequency of the most important risk

Risk	Frequency (%)			Probability	Impact
	Aug 2021	Nov 2021	Feb 2022	Feb 2022	
Fiscal risks	33	47	33	Mid-High	High
Delinquency and economic activity	38	27	31	Mid-High	High
Domestic inflation	5	11	15	Mid-High	Medium
Global scenario	16	7	13	Mid-High	High

Table 1.3.2 – FSS – Average frequency of the most cited risks

Risk	Average frequency (citations/financial institution)			Probability	Impact
	Aug 2021	Nov 2021	Feb 2022	Feb 2022	
Global scenario	0.76	0.71	0.74	Mid-High	High
Delinquency and economic activity	0.78	0.58	0.70	Mid-High	High
Fiscal risks	0.76	0.80	0.67	Mid-High	High
Domestic inflation	0.11	0.29	0.31	Mid-High	High

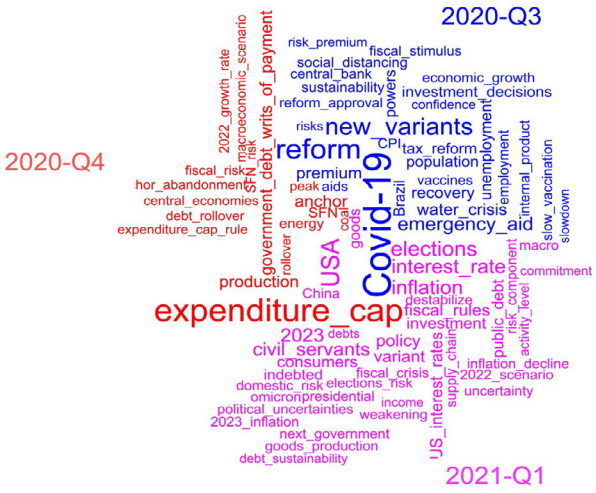
Note: The respondents answer the following question: "In the next three years, which risks to the financial stability does your institution deem as most relevant, considering the probability of occurrence and their impact on the SFN? Describe the three risks in order of importance (the most important first, considering the combination of the probability of the event occurring and the magnitude of losses as a fraction of the total SFN assets)". The BCB then classifies these descriptions into different risk categories for analysis. Table 1.3.1 presents information referring only to the risk considered the most important by each institution, while Table 1.3.2 refers to the three risks listed by each respondent.

The textual analysis of the survey shows an increase in concern about domestic and global inflation, the U.S. interest rate, and national elections, and a decrease in concern regarding the pandemic. The word cloud extracted from the description of the most important risks highlights expressions associated with macroeconomic conditions, such as "Inflation", "Interest", "GDP", "Debt", and "Uncertainty" (Chart 1.3.1). Terms related to the institutional environment and the international scenario, such as "Elections", "Inflation", "Fiscal Rules", "U.S.", and "U.S.-Interest", gained prominence (Chart 1.3.2).

Chart 1.3.1 – FSS – Word Cloud of the most important source of risk

Note: The word cloud is compiled from the textual analysis of descriptions of the most important risk. The size of the word is proportional to its frequency.

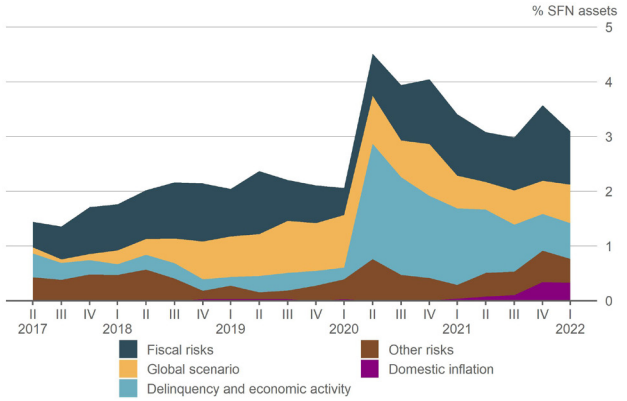
Chart 1.3.2 – FSS – Evolution of risk perceptions



Note: The comparative cloud is compiled from the textual analysis of descriptions of the most important risk. The color of the word indicates the FSS in which the word frequency was predominant. The word size is proportional to the difference between the word frequency in the corresponding FSS and the average frequency of the entire sample (the three FSS).

Respondents perceive fiscal risks to have the highest average expected impact on the SFN. The total average expected impact decreased between late 2021 and February 2022, almost returning to the August 2021 level. This movement mainly reflected fluctuations in the average expected impact of fiscal risks resulting from variations in the frequency, probability of occurrence, and impact of these risks (charts 1.3.3 and 1.3.4). The average expected impact of risks from the international scenario and the domestic inflation increased in this period, while that of "delinquency and activity" decreased. In terms of shock transmission channels in the SFN, there was a reduction in the probability attributed to an "Increase in risk aversion and uncertainty, affecting consumption and investment decisions" and to a "Decline in depositors' confidence, including flight-to-safety movements" (Table 1.3.3).

Chart 1.3.3 – FSS – Average expected impact



Note: The average expected impact of risk r is calculated as $I_r = \frac{1}{n}\sum_b probability_{br} * impact_{br}$, where n is the number of financial institutions, and probability and impact are values assigned by respondents to the r risk cited in the FSS. To aggregate the

risks into a single indicator, they are assumed to be independent. Hence, $I = \sum_r I_r$. All three risks pointed out by the financial institutions are considered. The measure I_r refers to the expected impact of a risk type from the point of view of the group of respondents. It is not a feature of the r risk class itself, but of the group's expectation about the materialization of that risk. For example, there could be a risk class with very high expected impact mentioned by only one respondent. In this case, the average expected impact of the risk from the respondents' point of view would be low.

Chart 1.3.4.a – FSS – Cited risks: probability, impact and frequency
Global scenario

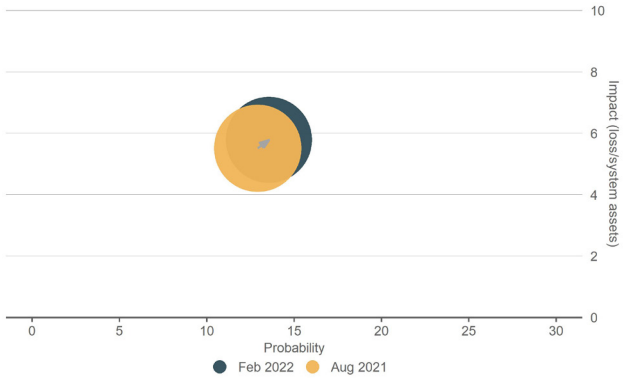


Chart 1.3.4.b – FSS – Cited risks: probability, impact and frequency
Delinquency and economic activity

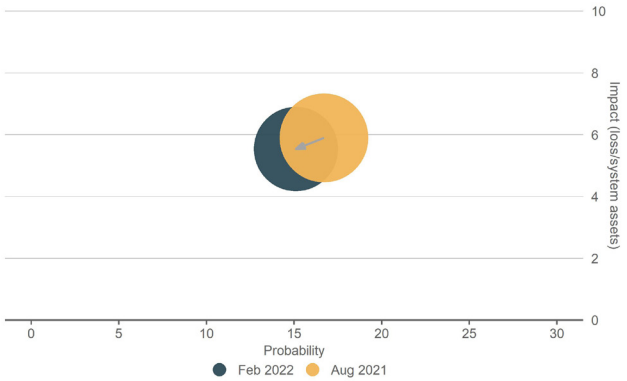


Chart 1.3.4.c – FSS – Cited risks: probability, impact and frequency
Fiscal risks

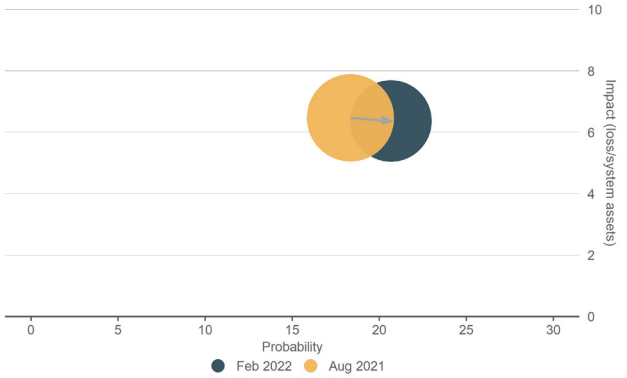
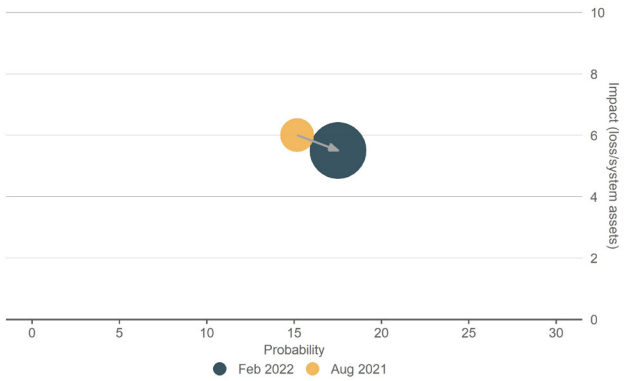


Chart 1.3.4.d – FSS – Cited risks: probability, impact and frequency
Domestic inflation



Note: The size of the circle represents the frequency of the risk. The x and y coordinates represent, respectively, the midpoint of the probability and impact classes.

Table 1.3.3 – FSS – Transmission channels of high-impact events

Transmission channel	Aug 2021 (median)	Nov 2021 (median)	Feb 2022 (median)	Distribution (last survey)
Contagion between markets and domestic institutions	4	4	4	1 2 3 4 5 6
Liquidity freeze, including interbank markets and foreign credit	3	3	3	1 2 3 4 5 6
Sharp decline in domestic financial asset prices, including collateral prices	4	4	4	1 2 3 4 5 6
Increase in risk aversion and uncertainty, affecting consumption and investment decisions	5	5	4	1 2 3 4 5 6
Decline in depositors confidence, including flight-to-safety	3	4	3	1 2 3 4 5 6
Capital flight and/or relevant exchange rate depreciation	4	4	4	1 2 3 4 5 6
Widespread credit rating downgrade, including sovereign ratings	4	4	4	1 2 3 4 5 6

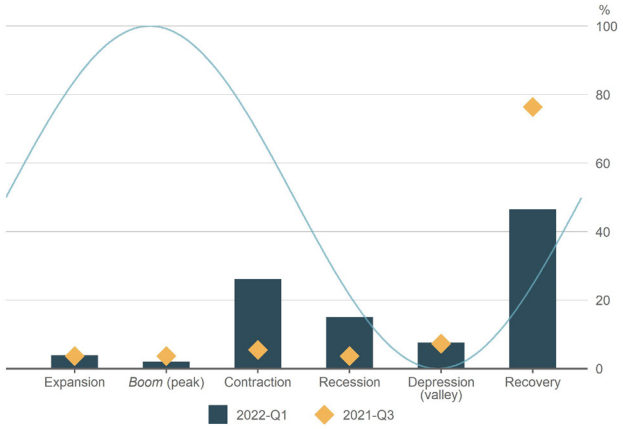
Probability

Very low 1 2 3 4 5 6 Very high

Economic and financial cycles

There was significant growth in the negative perception of the business cycle. There was important migration from the assessment that the economy is in "Recovery" to "Contraction" and "Recession" (frequency of downward trend increased from 9% in August 2021 to 41% in February 2022). The share of financial institutions that placed the business cycle in the recovery phase fell strongly from 76% to 46%. The fraction of respondents with a negative vision of the business cycle (contraction, recession, or depression) increased from 16% to 48%, indicating a decline in respondents' confidence in the recovery of economic activity (Chart 1.3.5).

Chart 1.3.5 – FSS – Economic cycle



The credit-to-GDP gap and degree of leverage of companies and households are considered high, but the perception of stability increased. The share of respondents who believe the gap is high increased from 49% in August 2021 to 56% in February 2022. In turn, the perception of stability in the credit-to-GDP gap rose to 41% in February 2022 from 27% in August 2022 (Chart 1.3.6.a). The degree of companies' (households') leverage is considered high by 74% (93%) of the financial institutions. However, the perception of stability increased from 40% (42%) in August 2021 to 61% (56%) in February 2022 (charts 1.3.6.c and 1.3.6.d).

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Chart 1.3.6.a – FSS – Financial cycles
Credit-to-GDP gap

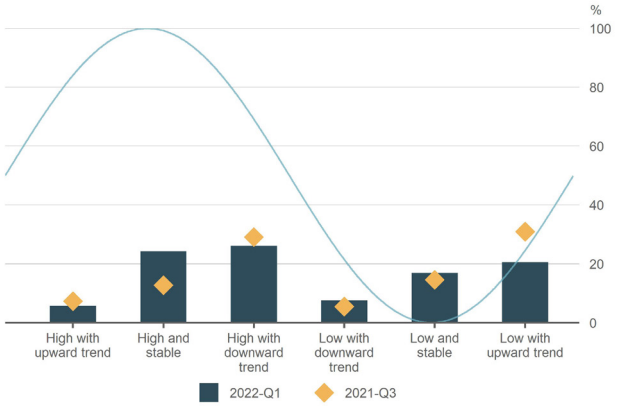


Chart 1.3.6.c – FSS – Financial cycles
Households leverage

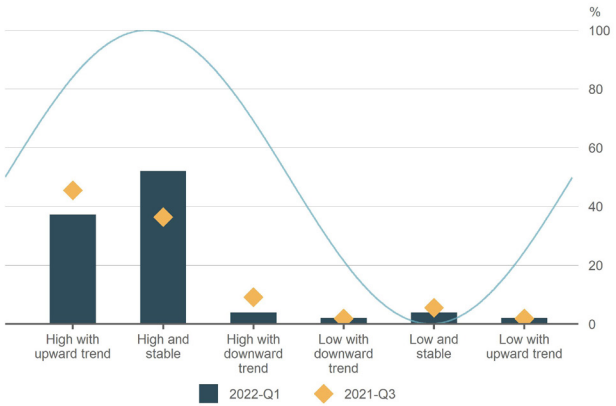


Chart 1.3.6.e – FSS – Financial cycles
Funding and liquidity

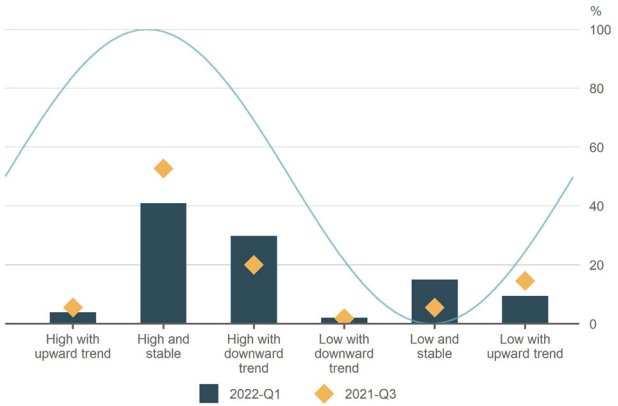


Chart 1.3.6.b – FSS – Financial cycles
Risk appetite

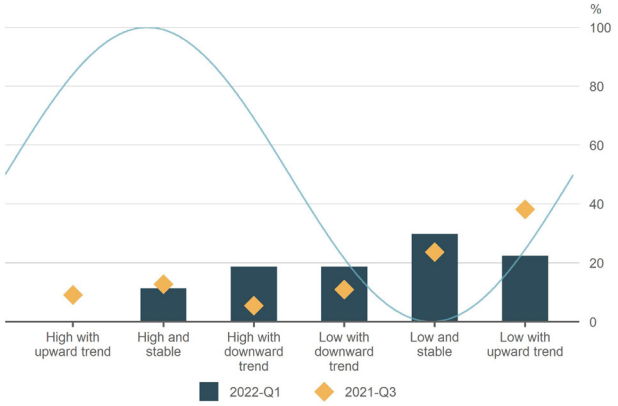


Chart 1.3.6.d – FSS – Financial cycles
Companies leverage

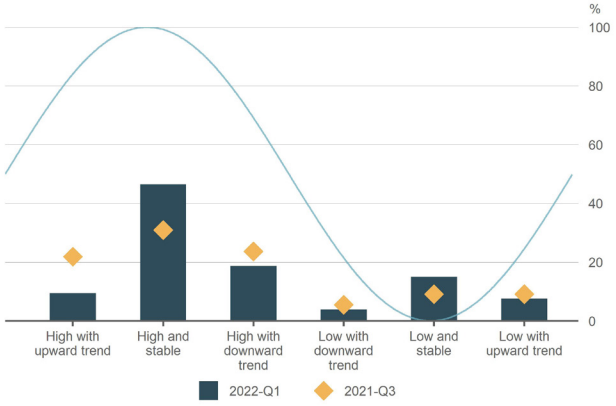
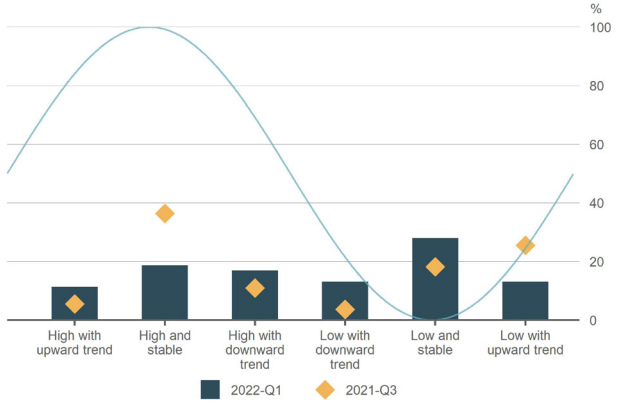


Chart 1.3.6.f – FSS – Financial cycles
Asset prices with respect to the fundamentals of the economy



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FIs' risk appetite diminished. About 70% consider low their risk appetite. There were reductions in the perception of stability (41% in February 2022, compared to 36% in August 2021) and in the perception of a downward trend (37% in February 2022, compared to 16% in August 2021) (Chart 1.3.6.b).

The perception of access to funding and liquidity is high but has become more negative. The divergence among FIs about asset prices in the economy remains, although with a worsening at the margin. About 74% of respondents perceive liquidity as high, up from 78% of the financial institutions in August 2021. Although the stability trend is predominant (56%), the downward trend increased (from 22% to 31%). The respondents' view on asset prices remains mixed, with 46% believing in a high level and 54% in a low level. Despite the predominance of a view of stability, the share of FIs that believe in a downward trend in asset prices increased from 15% in August 2021 to 30% in February 2022 (charts 1.3.6.e and 1.3.6.f).

Resilience and confidence in the financial system

The confidence index in the SFN stability remains high, despite a reduction in the last two surveys. Most FIs trust completely – or very much – in the resilience of the SFN, with the reduction reflecting a migration from "full confidence" to "high confidence". Despite two consecutive declines over the past six months, confidence in stability remains high. The "full confidence" and "high confidence" classes represent 78%, while the "reasonable confidence" class represents 22% of the citations in February 2022. There were no negative assessments – "no confidence" and "low confidence" classes – since the 2016Q3 survey (charts 1.3.7.a and 1.3.7.b). Financial institutions consider that the financial system's ability to react to high-impact events remains satisfactory (Table 1.3.4).

Chart 1.3.7.a – FSS – Index of confidence in the stability of the financial system
Evolution of confidence indexes

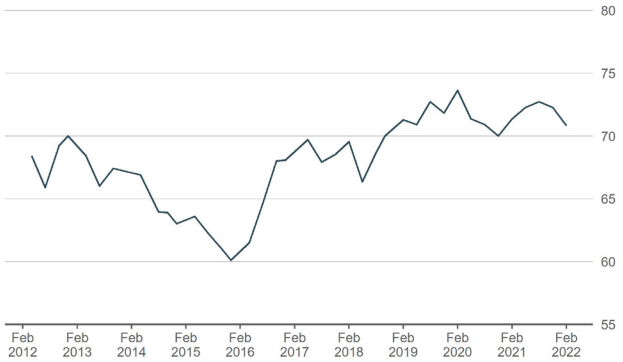


Chart 1.3.7.b – FSS – Index of confidence in the stability of the financial system
Relative distribution of confidence perceptions

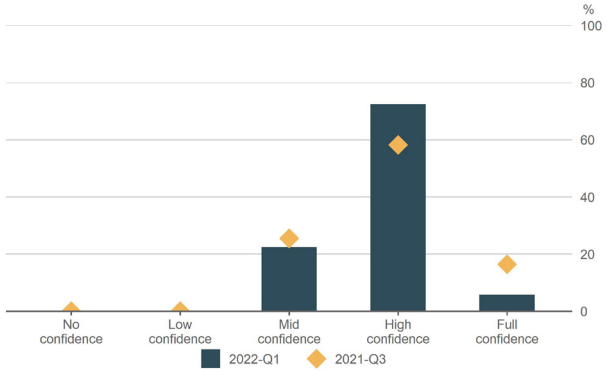


Table 1.3.4 – FSS – Financial system capacity of reacting to high-impact events

Financial system resilience factors	Aug 2021 (median)	Nov 2021 (median)	Feb 2022 (median)	Distribution (last survey)
Financial system capital adequacy	2	2	2	1 2 3 4 5 6
Financial system liquidity adequacy	2	2	2	1 2 3 4 5 6
Financial institutions monitoring and attention	2	2	2	1 2 3 4 5 6
Government and Regulatory Agencies monitoring and attention	2	2	2	1 2 3 4 5 6
Instrumental availbability for risk prevention and mitigation by the BCB	2	2	2	1 2 3 4 5 6

Median of the distribution of reaction capacities

Satisfactory 1 2 3 4 5 6 Unsatisfactory

Chart 1.3.8.a – FSS – Expectations and suggestions for the Countercyclical Additional Buffer (Brazil)
Expectations

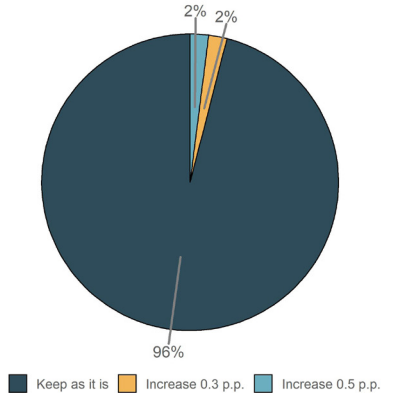
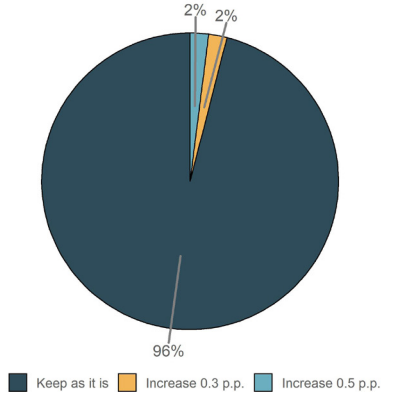


Chart 1.3.8.b – FSS – Expectations and suggestions for the Countercyclical Additional Buffer (Brazil)
Suggestions



Expectations for the Countercyclical Additional Buffer

Financial institutions expect and suggest $ACCP_{Brazil}$ at 0%. About 96% of respondents believe the $ACCP_{Brazil}$ shall remain at 0% and recommend keeping it at this level (charts 1.3.8.a and 1.3.8.b). This result has remained relatively constant during all the surveys.

1.4 Financial market infrastructure

In the second half of 2021, FMIs contributed to the safe and efficient functioning of markets. The systems were compliant to the regulatory requirements and to applicable international principles. These are necessary conditions for the stability of the SFN.

The financial system held enough intraday liquidity[45] to ensure the smooth flow of payments in the Brazilian Payment System (SPB).[46] Interbank market transactions were settled without any relevant issues and under low risk of intraday insufficient funds throughout the semester (Chart 1.4.1).[47] Every two and a half days the STR managed a turnover that nearly equals the Brazilian GDP. During the semester, the average need for funds to daily payments (NEL) was 2.7% of the total available liquidity, with a peak of 6.0%. The SPI reached 51 million transactions on a single day. In more than 95% of the time the institutions demanded no more than 25% of their liquidity to settle payments out of STR's operating schedule (Chart 1.4.2). From August 15th, 2022 onwards, the Instant Payment Account balance will be remunerated, reducing the costs incurred to provide liquidity to settle payments.

Chart 1.4.1 – Liquidity Potential and Effective Liquidity Needs

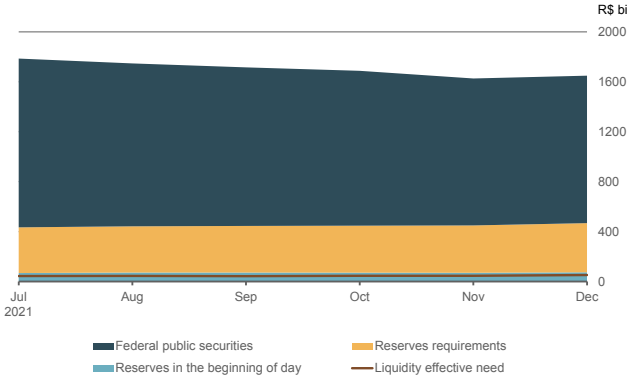
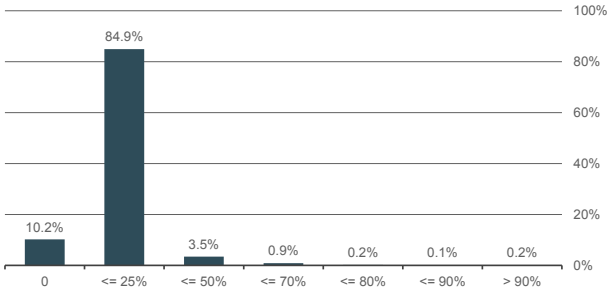
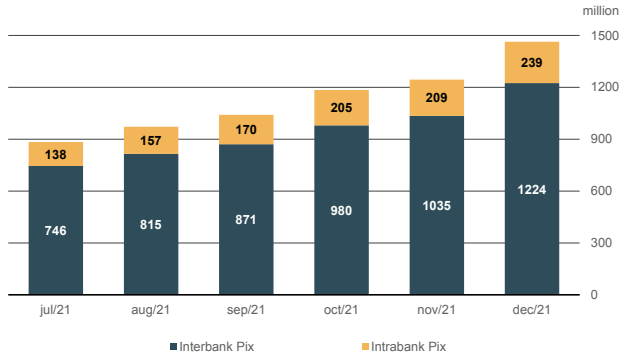


Chart 1.4.2 – After-Hours Liquidity Needs



Pix has considerably increased its relevance in the SFN and the SPB. Pix came to represent 10.6% of total retail payments. The average monthly growth in transaction volume was around 12%. Most transactions continue to be between persons, as shown in Chart 1.4.4, with potential for expansion in other use cases. The SPI maintained availability above 99.9% throughout the period and 99% of transactions were settled within 0.75 seconds.

Chart 1.4.3 – Interbank Pix (settled by SPI) and Intrabank Pix

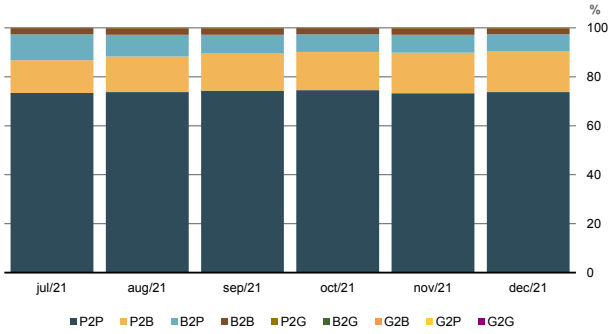


45 Aggregate balance of funds available for interbank payments and transfers.

46 Real-time gross settlement systems: Reserves Transfer System (STR), Instant Payment System (SPI) and Funds Transfer System (CIP-Sitraf).

47 Financial Institutions can transfer Reserve requirements balances to the Reserves accounts and convert Brazilian Government Bonds into Central Bank money by doing repo operations, both without intraday financial cost.

Chart 1.4.4 – Pix transactions types
Transaction percentage



(P = Person, B = Business, G = Government)
(e.g.: P2P = Person to Person)

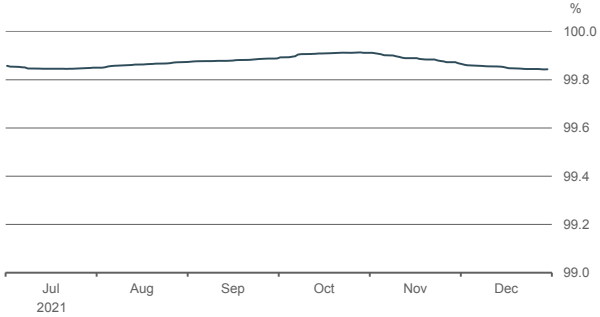
The financial risks of the markets for financial assets, securities and foreign currencies were properly managed by the FMIs. B3 S.A. acts as CCP in two systems: the B3 Clearinghouse and the B3 FX Clearinghouse. In both, the confidence level of the initial margin model is over 99%, in line with the Principles for financial market infrastructures (PFMI).[48] The stress scenarios employed by B3 were more severe than the observed variations of the main Primitive Risk Factors (FPRs)[49] in the period (Table 1.4.1). The margins required by B3 Clearinghouse were sufficient to cover the risk of a high percentage of investors' portfolios, as determined by the BCB (Chart 1.4.5).

Table 1.4.1 – B3 Clearinghouse
Primitive Risk Factors (PRF)

Discrimination	Low[1/]	High[1/]
Ibovespa spot	29%	24%
USD spot	22%	26%
Fixed rate 42	16%	61%
Fixed rate 126	22%	57%
Fixed rate 252	32%	52%
Fxed rate 756	33%	29%
DDI[2/] 180	9%	6%
DDI 360	9%	5%
DDI 1080	10%	8%

Sources: [B]³ and BCB
Own methodology
1/ Highest percentage of accumulated variation in 2 days in relation to the low and high scenarios in the 2nd semester of 2021
2/ Foreign exchange coupon.

Chart 1.4.5 – B3 Clearinghouse
Statistics of accuracy of the model for individual margin [1/]



1/ Simply put, the statistic corresponds to an average, over a moving period of 63 working days, of the ratio between (i) the number of portfolios that would not have suffered losses greater than those calculated by the individual margin model used by the CCP; and (ii) the total number of portfolios.

Sources: [B]³ and BCB
Own methodology

Credit and liquidity exposures were adequately managed by CCP throughout the whole period.[50] For B3 Clearinghouse, individual margins and prefunded additional resources would be sufficient to cover B3's credit exposure against the two participants whose joint default would result in the highest aggregate credit exposure (Chart 1.4.6). The liquid resources maintained by the B3 Clearinghouse would be sufficient to ensure the timely settlement of obligations coming from the two participants with the largest debt net

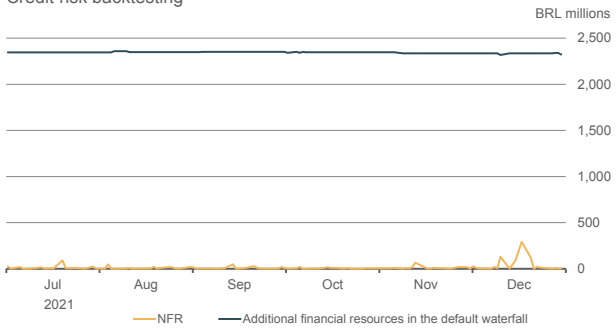
48 This confidence level relates to the estimated distribution of future exposure to settled financial instruments.

49 The primary risk factor associated with a derivative contract is the name given to the financial variables that are relevant to the formation of the contract price.

50 Backtesting indicates that the B3 Clearinghouse and the Foreign Exchange Clearinghouse are complying with SPB legislation and PFMI objectives.

positions. For the B3 FX Clearinghouse, the collateral required would be sufficient to cover credit exposures against each of the participants. Liquid resources held by the B3 FX Clearinghouse would be sufficient to cover the default of the participant with the largest obligation in Brazilian real (Chart 1.4.7) and in U.S. dollar (Chart 1.4.8).[51]

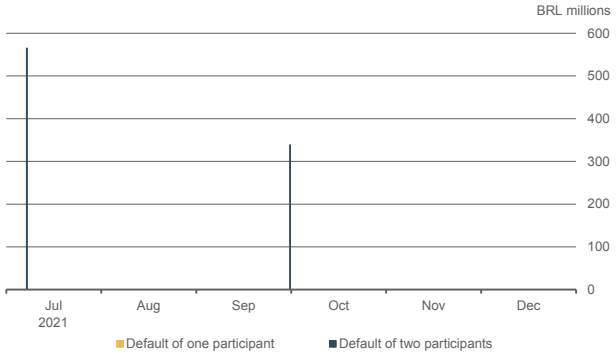
Chart 1.4.6 – B3 Clearinghouse
Credit risk backtesting



The NFR is calculated by comparing the financial result of the simulation of the closeout of the participant's positions and the value of the participant's collateral, in case the participant was declared defaulter. The closeout of the participant's positions is calculated by the CCP based on the closeout strategy calculated by the initial margin model and the real variations in the prices of the assets, calculated in the following days.

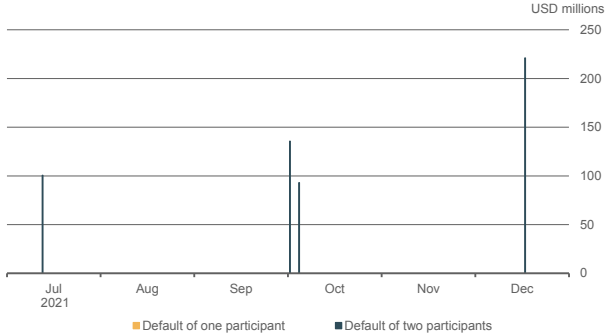
Sources: [B]³ and BCB
Own methodology

Chart 1.4.7 – B3 FX Clearinghouse
Liquidity shortage in BRL



Sources: [B]³ and BCB
Own methodology

Chart 1.4.8 – B3 FX Clearinghouse
Liquidity shortage in USD



Sources: [B]³ and BCB
Own methodology

51 Principle 7 of the PFMI determines: a) maintenance of sufficient liquid resources to timely settle the obligations arising from the default of the two participants, including companies controlled by them, which would generate the largest aggregate payment obligation for the CCP, in the case of CCPs that are considered systemically important in more than one jurisdiction, or that have a complex risk profile; or b) maintenance of sufficient liquid resources to timely settle the obligations arising from the default of the participant and its affiliates, which would generate the largest aggregate payment obligation for the CCP, in the case of the other CCPs. As the B3 FX Clearinghouse is systemically important only in Brazil, does not have a complex risk profile and only settles contracts for the purchase and sale of dollars in cash, the events represented in charts 1.4.7 and 1.4.8 are compatible with international recommendations.

Appendix

Banco Central do Brasil Management

Acronyms

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Banco Central do Brasil Management

Board of Governor

Roberto de Oliveira Campos Neto
Governor

Bruno Serra Fernandes
Deputy Governor

Carolina de Assis Barros
Deputy Governor

Diogo Abry Guillen
Deputy Governor

Fernanda Magalhães Rumenos Guardado
Deputy Governor

Maurício Costa de Moura
Deputy Governor

Otávio Ribeiro Damaso
Deputy Governor

Paulo Sérgio Neves de Souza
Deputy Governor

Renato Dias de Brito Gomes
Deputy Governor

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Acronyms

ACCP
Countercyclical Capital Buffer

ACCP$_{Brasil}$
Countercyclical Capital Buffer for Brazil

AE
Advanced Economies

BCB
Banco Central do Brasil

BCBS
Basel Committee on Banking Supervision

CCP
Central Counterparty

CDB
Bank Deposit Certificate

CET1
Common Equity Tier 1

CI
Brokered Deposits

CMN
National Monetary Council

Comef
Financial Stability Committee

CVM
Brazilian Security and Exchange Commission

DI
Interbank Deposit Rate

EME
Emerging Economies

FGTS
Length-of-Service Guarantee Fund

FIDC
Receivables Investment Funds

FMI
Financial Market Infrastructure

FPR
Primitive Risk Factors

FSR
Financial Stability Report

FSS
Financial Stability Survey

GDP
Gross Domestic Product

G-SIB
Globally Systemic Banks

HQLA
High Quality Liquid Assets

IBC-Br
Economic Activity Index measured by the BCB

IBGE
Brazilian Institute of Geography and Statistics

ILE
Structural Liquidity Indicator

IPCA
Extended National Consumer Price Index

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IVG-R
Residential Mortgage Collateral Value Index

LCA
Agribusiness Credit Bills

LCI
Real Estate Credit Bills

LCR
Liquidity Coverage Ratio

LFL
Liquidity Facility Lines

LIG
Real State Secured Bill

LLI
Immediate Liquidity Line

LLT
Forward Liquidity Line

LR
Leverage ratio

LTV
Loan-to-value

MSME
Micro, Small and Medium-sized Enterprises

NII
Net Interest Income

NSFR
Net Stable Funding Ratio

PEC
Credit Stimulus Program

PFMI
Principles for Financial Market Infrastructures

PNADC
Continuous National Household Sample Survey

Pronampe
National Program to Support Micro and Small Companies

RDB
Bank Deposit Receipt

ROE
Return on Equity

RWA
Risk-Weighted Assets

SAC
Constant Amortization System

SCR
BCB's Credit Information System

SFN
National Financial System

SGS
Time Series Management System

SPB
Brazilian Payment System

SPI
Instant Payment System

SRisk
Systemic Risk Analysis

STR
Reserves Transfer System

TED
Bank Transfer

TPF
Federal Public Security

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Concepts and Methodologies

Concepts and Methodologies – Capital Stress

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Concepts and Methodologies

a) Short-term Liquidity Ratio (IL) – Conceptually like the Liquidity Coverage Ratio (LCR), it is the ratio between the stock of liquid assets held by the institution and the net stressed cash flows (estimated disbursements in the next 21 business days under a stress scenario). Therefore, institutions with IL above one (100%) have enough liquid assets to withstand this stress scenario.

i. Liquid assets – liquid resources available for each conglomerate/institution to honor its stressed cash flows for the next 21 business days. It is the sum of highly liquid assets, release of required reserves (due to deposits run-off) and supplemental resources.

a. Highly liquid assets – these include: i) unencumbered Brazilian sovereign bonds held by the institution or received as a collateral in reverse repurchase agreement operations (reverse repos); ii) stocks listed in Ibovespa index; iii) liquid quotas of investment funds; iv) cash; and (v) free central bank reserves.

b. Release of required reserves – amount of the required reserves that would be released to the institution due to the deposit run-off estimated in the stressed cash flows calculation.

c. Supplemental resources – other options for monetization in the scenario's time-horizon, such as: Bank Deposit Certificate (CDB), Bank Deposit Receipt (RDB), Interbank Deposit (DI), long positions in box strategies (options), reverse repurchase agreements (reverse repos) backed by private securities.

i. Stressed cash flows – an estimate of the amount of cash that the institution needs within the scenario's timeframe (21 business days) under a stress scenario. The analyses take into account retail deposits run-off, wholesale funding run-off, market stress and net contractual cash flows.

a. Retail deposits run-off – estimate of the necessary amount to cover the retail-customers withdrawals in demand deposits, term deposits, savings accounts, box strategies, securities issued by the bank, and repurchase agreements (repos) backed by private securities.

b. Wholesale funding run-off – estimate of the necessary amount to cover the possibility of early redemption of the liability positions from the three largest market counterparties.

c. Market stress – estimate of the necessary amount to cover losses arising from market movements affecting the liquid assets or others positions that may cause a cash outflow of the institutions in the stress scenario. The losses comprise: i) margin calls; ii) pre-settlements of derivatives contracts; iii) losses on the marked-to-market values of the liquid assets.

d. Net contractual cash flow – payments due in derivatives positions and in contractual cash flows (assets and liabilities positions) with market agents, maturing within the horizon of the scenario.

b) Structural Liquidity Ratio (ILE) – It is the ratio between the available stable funding (part of the equity and liabilities on which the institution can rely for a one-year horizon) and the required stable funding (part of the assets, including off-balance-sheet assets, which must be financed by stable funding because they have long maturities and/or low liquidity). Institutions with ILE equal or above one (100%) are less susceptible to future liquidity problems. The calculation methodology is based on the final version of the Net Stable Funding Ratio (NSFR), which was introduced as a minimum mandatory compliance in October 2018.

i. Available stable funding – the funding that shall remain in the institution for at least a year. The main sources of banks' stable funding are the capital; non-redeemable liabilities with residual maturities above one year regardless of counterparty; and funding with no maturity or with a maturity of less than a year coming from retail customers.

ii. Required stable funding – the amount of stable funding needed to finance the long-term activities of financial institutions. Therefore, it takes into account the liquidity and the maturity of the assets of the institution. The long-term assets are mainly the credit portfolio maturing in over a year; non-performing assets; less liquid or encumbered securities (i.e. margin requirement in clearings); fixed assets; and the items deducted from the regulatory capital.

c) **Total Capital Ratio** – Basel Committee on Banking Supervision international concept, consisting of the system regulatory capital (RC) divided by the system RWA. In Brazil, until September 2013, the minimum required ratio was the factor "F", according to Resolution CMN 3,490, of 29th August 2007, and Circular BCB 3,360, of September 12th, 2007. Until October 2013, financial institutions and other institutions authorized to operate should observe the 11% limit established by the BCB, except for individual credit unions not affiliated to central units. From October 2013 on, the minimum required ratio has been disciplined by the Resolution 4,193, of March 1, 2013, which defines a convergent calendar, requiring 11% of RWA from October 2013 to December 2015; 9.875% in 2016; 9.25% in 2017; 8.625% in 2018; and 8% from 2019 on. On top of this requirement must be added a capital buffer, as mentioned in the Common Equity Tier 1 (CET1) Ratio topic.

d) **Tier 1 Capital Ratio** – According the Resolution 4,193, of 2013, a Tier 1 Capital requirement became effective from October 2013 on, corresponding to 5.5% of RWA, from October 2013 to December 014, and 6% from January 2015 on. On top of this requirement must be added a capital buffer, as mentioned in the Common Equity Tier 1 (CET1) Ratio topic.

e) **Common Equity Tier I Ratio (CET1)** – According the Resolution 4,193, 2013, a CET1 capital requirement became effective from October 2013 on, corresponding to 4.5% of RWA. In addition to this requirement, the Resolution established a capital buffer, composed by the following items: conservation, countercyclical and systemic. The conservation buffer requirement corresponds to the following RWA percentages: zero, until December 31, 2015; 0.625%, from January to December 2016; 1.25%, from January to December 2017; 1.875%, from January to December 2018; and 2.5% from January 2019 on. The countercyclical buffer requirement is limited to the following maximum RWA percentage: zero, until December 31, 2015; 0.625%, from January to December 2016; 1.25%, from January to December 2017; 1.875%, from January to December 2018; and 2.5% from January 2019 on. The systemic buffer requirement is limited to the maximum RWA percentage: zero until December 31st, 2016; 0.5%, from January to December 2017; 1.0%, from January to December 2018; and 2.0% from January 2019 on.

f) **Leverage ratio (LR)** – Basel Committee on Banking Supervision international concept, consisting of Tier I Capital to Total Exposure ratio. In Brazil, the BCB Circular 3,748, of February 27th, 2015, established the LR methodology. This index intends to complement the current prudential requirements, through a simple, transparent and non-sensitive risk metric. The leverage ratio minimum requirement of 3.0% was established by the Resolution CMN 4,615, of November 30th, 2017, which is effective from January 2018 on, applicable for institutions classified as S1 or S2, accordingly to the Resolution CMN 4,553, of January 1st, 2017.

g) **Household debt service-to-income ratio (DSTI)** – Defined as the ratio between monthly debt service and monthly income. A methodological review of the measure presented in the FSR issues of September 2014, March 2015 and October 2015, this measure uses data from BCB's Credit Information System (SCR) to calculate the ratio for each debtor in the SFN and, from individual data, calculates measures of central tendency for the SFN and other aggregation levels.

h) **Monthly debt service** – Credit outstanding due in 30 days, except for: a) real estate financing, whose 30-day due

amount is estimated by a constant amortization system; b) overdraft, whose debt service is defined as its monthly interest; and c) other revolving facilities, whose 30-day due amount is estimated by a Price amortization system. It considers all household loan facilities, except for rural and business facilities, even when loaned by an individual. Even though it is calculated, 30-day due amount in credit card purchases are not considered in the DSTI base measure, being included only in alternate measures of the indicator.

i) **Monthly income** – As a customer's income may vary when informed by different financial institutions, the following procedure applies: i) in case of more than one income bracket, the mode is used to select a single income bracket for the customer – if there is a tie among income brackets, the one with the largest amount of credit outstanding is chosen; ii) among the FIs which informed the selected income bracket, the largest informed income is chosen, capped by the lower and upper bounds of the income bracket; and iii) an estimate of income tax and social security contribution is deducted from the selected income.

j) **Companies' size** – Defined by an intern algorithm, which considers three sources of information: i) size of micro and small enterprises set by Federal Revenue of Brazil; ii) size mode informed by financial institutions in the Credit Information System (in case of tie, it is considered information of the financial institution in which the company has the greatest volume of debt); (iii) corporate indebtedness amount (bank credit, capital market, internalized external debt) to enclose size's boundaries. The criteria (i) and (ii) take into consideration annual gross revenue standards of Complementary Laws 123/2006 and 11,638/2007. The criteria (iii) is residual and classifies companies' sizes not set by criteria (i) or (iii).

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Concepts and methodologies – Capital stress

1.1 Stress test – Introduction

The stress tests executed in BCB comprise a macroeconomic stress test as well as sensitivity analysis to relevant risk factors. These exercises are simulations executed by the BCB to estimate potential losses and capital shortfalls in the banking system stemming from extreme adverse, but plausible, scenarios. It also provides assessment of the resiliency of either an individual institution or the banking system. Hence, it is possible to determine the impact on the capital of institutions taking into consideration unexpected, and thus, not provisioned losses caused by changes in macroeconomic variables.

For each stressed scenario new capital ratios (Basel Ratio, Tier 1 and CET1) are calculated. A financial institution is considered as non-compliant whether any of its capital ratios is below the minimum required and classified as insolvent in the case of total depletion of the CET1. The relevance of non-compliant and/or technically insolvent institutions is assessed and the additional capital required in order that no other bank could get non-compliant is calculated. The relevance of and individual entity is determined based on the representativeness of its Adjusted Assets with respect to the assets of the whole banking system.

The positive effects of the activation of the triggers related to Tier 2 and Additional Tier 1 capitals, in which values are converted into CET1 capital, are classified as income. Furthermore, the requirement of additional capital buffers, according to the Resolution 4,193 with the redaction given by the Resolution 4,443 from Oct. 29th, 2015, is taken into account in the calculation of capital shortfalls. And finally, the framework also considers the potential changes of registration and uses of deferred taxes and its implications on regulatory capital calculations, according to the Resolution 4,192, from Mar 1st, 2013, and posterior modifications.

1.2 Macroeconomic stress test

The macroeconomic stress test framework is an exercise that consists of the application of adverse macroeconomic scenarios and the simulation of how the balance sheet of each financial institution individually would behave under such scenarios. With that information in hands, capital shortfall of the whole system is calculated.

Scenario design

Three macroeconomic scenarios are designed, all of them with time horizon of twelve quarters, based on market information, having the following macroeconomic variables: 1) economic activity (Economic Activity Index measured by the BCB – IBC-Br); 2) exchange rate (Brazilian Real vs US Dollar parity); 3) Brazilian Benchmark Interest Rate (measured by the Selic rate); 4) inflation rate (measured by the Extended National Consumer Price Index – IPCA – accumulated in twelve months) and 5) unemployment rate (calculated by the IBGE based upon the Continuous National Household Sample Survey (PNADC).

The baseline scenario is built using the median of the market expectations (Focus report) for the following variables: economic activity, interest rates, FX (foreign exchange) rates and inflation. The GDP – Focus expectation – and the IBC-Br (VAR variable) are perfectly correlated. The Brazil's country risk premium, unemployment rate and commodity index are kept constant over the forecast horizon.

The other scenarios are described in core text of the FSR.

1.2.2 Stress simulation

The stress simulation is done by projecting six basic groups of the income statement, trying to represent the operational performance of banks presented in the last income statement (net non-operational income is not considered in the test):

1. Net interest income: comprises net credit income, accrued income from bonds and securities and funding costs;
2. Non-interest income: mark-to-market effects, hedges and exchange rates variations;
3. Fees & commissions;
4. Non-consolidated companies; 5. Administrative expenses and;
5. Provisions expenses.

In the "net interest income", credit and bonds/ securities income as well as funding costs are modeled based on the Selic rate. The total funding is adjusted according to their credit portfolio volume, in the proportion of 1:1. Provision expenses are estimated based on the problem assets evolution, resulting from the macroeconomic scenario.

The non-interest group is modeled by applying a shock on market risk sensible positions observed in the starting date of the test. The stressed market risk factors are obtained out of the macroeconomic scenario and positions are then recalculated. The result is the difference between the stressed and the initial values. This amount is applied on the first quarter of projection and incorporated into the result.

The BCB changed the methodology used to capture the interest risk exposures. Hence, from the second semester of 2018 onwards this method will be different. Until recently the shocks were applied only on the trading book positions, all of them informed by banks, according to the Circular 3,354, from June 25th of 2007. However, this criterion is no longer in place and now the framework will encompass all the liquid positions, notably both government and corporate bonds as well as derivatives. The effect of this change is that the number of exposures subjected to these shocks have increased, which make the "non-interest" group more significant in the stress test.

The "Fees & Commissions", "Non-consolidated companies" and "Administrative Expenses" groups are modeled by making use of dynamic panel data models, obtained with the same macroeconomic variables employed in the scenarios.

Besides the performance simulation, verified through the income statement, the Banco Central do Brasil has incorporated the inter-financial contagion into the macroeconomic stress test framework from the first semester of 2019 onwards. In each quarter of the stress test time horizon, there is a verification whether any institution falls below the minimum threshold of 4% of the Core Tier 1 capital ratio. If this is the case, the inter-financial contagion is estimated. The uncollateralized interbank exposures issued by that institution are assumed as losses in the creditors´ balance sheet, and then capital is recalculated. If any financial firm also falls below that threshold, the process is repeated iteratively until there is no more institution below the threshold. The stress test continues with new affected capital levels and the process is repeated in all quarters of the projection, until the end of the time horizon.

1.3 Sensitivity analysis – Introduction

Sensitivity analysis complements the macroeconomic stress test framework. Its objective is to assess the individual effects of credit or market risk factors that might affect the regulatory capital of institutions, causing eventual capital shortfalls. Those analyses are conducted by applying incremental variations in such risk factors, keeping the other factors fixed.

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1.3.1 Sensitivity analysis – Changes in market risk factors

The exposures subjected to interest rate changes (e.g. fixed rates, currency coupons, price indexes and interest rates) listed in the trading book are stressed. The positions at all vertices (from 21 to 2,520 days) are recalculated after the application of shocks as well as the financial impact on banks' capital positions. Stressed exposures also affect risk weighted assets (RWA) components. In the case of fixed rates, new regulatory parameters of capital requirements are recalculated based on every new yield curve generated by a shock.

Exposures in foreign currency, gold and other instruments subject to changes in the exchange rates are also stressed, and their impacts on capital and RWA estimated. Here we assume that all exposures are revalued following the percentage points projected for the stressed USD/exchange rate.

We apply shocks individually in each factor, the interest rate and the exchange rate, starting at their current values, in steps of 10% in both directions, until it reaches 200% and 10% of its current value, on the upside and on the downside, respectively. After recalculating capital ratios, we evaluate both the regulatory capital adequacy ratios and the solvency of banks.

The calculation of interest rate shocks follows the same methodology as for the "non-interest" items of the macroeconomic stress test. For the other risk factors all the balance sheet positions are considered.

1.3.2 Sensitivity analysis – Increases in problem assets

This analysis tries to measure the effect of problem assets increases over the regulatory capital of institutions. We increase problem assets up to 150% of its current level and compute the additional provision required. These additional provisions affect both banks' capital positions and the RWA component of the required capital. After recalculating capital ratios, regulatory capital adequacy and the solvency of banks are evaluated.

1.3.3 Sensitivity analysis – Fall in housing prices

The objective of this exercise is to estimate the impacts of fall in housing prices over the capital of financial institutions with outstanding mortgages. Prior to the simulations we proxy housing prices with the value of the updated collateral provided for the loan using the IVG-R index, adding the variations measured by the index since the date that the loan was generated until the date f simulation.

The analysis consists of reducing house prices, simulating a sequence of decreases in steps of 5 pp. In each step collaterals that become lower than 90% of the remaining loan are considered delinquent.

The loss of each delinquent loan is equal to the difference between the outstanding balance and the present value of the amount recovered from the foreclosure process. To calculate the recovered amount, we calculate new housing prices after shocks, net of taxes, maintenance fees and costs related to the foreclosure process. In addition, we consider that the sale in the foreclosure process is done with a discount proportional to the reduction of price due to the shock. The present value is obtained by discounting that sale amount by the 1-year future rate negotiated in the BM&FBovespa. New regulatory capital ratios of each institution are calculated considering the estimated losses to the related decline in housing price.

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