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International Reserves Management Report

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Summary

Executive Summary

The Banco Central do Brasil prioritizes the transparency of the international reserves management process. This publication is the 16th volume of the International Reserves Management Report, and it describes in detail the evolution of Brazil's international reserves, highlighting the changes in management throughout the year 2023.

The management of the international reserves is based on a sound governance framework, which comprises the hierarchy defined in its several decision levels, as well as an IT system with daily performance control and evaluation, and investment monitoring. To this end, a framework based on three pillars was conceived: i) benchmark portfolio; ii) operational limits, and iii) performance evaluation. In addition, market, credit, liquidity, and operational risks are also monitored daily.

The Board of Governors, within the Governance, Risk and Control Committee (GRC), is responsible for establishing the strategic goals and the risk-return profile of the international reserves. In accordance with the guidelines defined by the Board, the strategic allocation seeks a countercyclical behavior and protection against foreign exchange rate fluctuations, observing BCB's conservative risk appetite and criteria such as security, liquidity and profitability, prioritized in that order.

On December 31st, 2023, the international reserves amounted to US$ 355.03 billion. At the end of 2022, they amounted to US$ 324.70 billion. The average yearly Value at Risk (VaR) of the investments, a market risk metric that considers both the interest rate and foreign exchange rate components, was 6.1% in 2023, below the number of the previous year, which was 6.6%. The value registered in 2023 reached a similar level to that observed during the global financial crisis of 2008.

In 2023, the interest rate component of the VaR of reserves slightly decreased from the annual average of 2022, from 5.3% to 5.0%. This is because in 2023 there was a decrease in volatility of interest rates in fixed income markets in which international reserves are invested. The currency component of VaR also decreased, going from 2.2% in 2022 to 1.7% in 2023. Since the currency allocation has not changed significantly, this decrease is a consequence of the lower volatility of other currencies against the dollar compared to the previous year. As for credit risk, the average distribution of assets by rating in 2023 shows a concentration of exposure in counterparties with "Aaa" credit ratings. In comparison to 2022, the liquidity risk, which considers the average bid-ask spread of the assets in the portfolio, has decreased in 2023.

The return on the investments of the international reserves stems from some factors that influence the assets' values in the portfolios, such as the interest rate levels and the parity of the investment currencies against the US dollar (*numeraire* currency of the reserves). Throughout 2023, there were significant fluctuations in the US sovereign interest rates curve, with maturities of significant relevance to the reserves closing the year at levels slightly below those seen at the beginning of the period, with positive impact on the return of reserves. The level of interest rates throughout the year, in turn, led to a relevant gain in carry, which was responsible for the most significant part of the positive result. In terms of exchange rate, there was a small depreciation of the US dollar against the other currencies that make up the international reserves, which contributed on a smaller scale (when compared to interest rates) to determine the positive result. Therefore, the return of the international reserves investments in 2023 was positive by 5.11%, with 0.44% due to foreign exchange rate fluctuations and 4.67% generated by interest rates and other factors.

The International Reserves Management Report is divided into four chapters. The first one presents the foundations on which the international reserves management is based. Chapter 2 describes the investment policy of the reserves. The third chapter discusses the several risks involved in these investments. The last chapter describes the aggregate returns of the reserves, allowing us to verify the adequacy of the strategies *vis-à-vis* the long-term objectives defined by the BCB. The Report also contains an Annex with data from which the graphs are derived, as well as a glossary with the main terms used throughout the document.

1 International Reserves Management

This chapter presents the foundations upon which the management of the international reserves is based.

1.1 Economic environment

In the main Western economies, 2023 was marked by a monetary tightening policy adopted to combat the inflationary wave following the COVID-19 pandemic. During this period, there was an increase in short-term interest rates by central banks, inversion of the yield curves and significant volatility in fixed income markets.

These phenomena were consequence of uncertainties regarding the continuity of inflation and the solidity of economic growth. Price pressures from commodities and production chains, which cause inflation on the supply side, diminished in 2023. The effects of fiscal and monetary stimuli that affected demand in previous years also gradually weakened over the course of the year, culminating in a significant reduction in inflation.

In 2023, monetary authorities in the US and Europe continued the interest rate hike cycle that began in 2022, until there was evidence of falling inflation rates. Throughout the last quarter of 2023, the view that the global wave of inflation had been brought under control consolidated among market participants, generating expectations of interest rates cut and consequently a significant rise in assets prices.

Table 1.1 illustrates that, after a rebound in growth in 2021, the economy decelerated in 2022 and 2023. For 2024, growth is expected to be similar to that expected for 2023. Of particular note is Brazil's performance in 2023, which is higher than the previous year and the initial expectations for 2024, and the decline in Chinese growth since the pandemic.

Table 1.1 – Real GDP Growth (%)

Period	2021	2022	2023[1/]	2024[1/]
World	6.3%	3.5%	3.0%	3.1%
Advanced Economies	5.6%	2.6%	1.5%	1.5%
USA	5.9%	2.1%	2.1%	2.1%
Euro Zone	5.6%	3.3%	0.7%	0.9%
Japan	2.2%	1.0%	2.0%	0.9%
Emerging economies	6.9%	4.1%	4.0%	4.1%
China	8.4%	3.0%	5.0%	4.6%
India	9.1%	7.2%	6.3%	6.5%
Russia	5.6%	-2.1%	2.2%	2.6%
South Africa	-6.4%	4.9%	2.6%	1.0%
Brazil	5.0%	2.9%	3.1%	1.7%

Source: International Monetary Fund
1/ IMF projections for 2023 and 2024 obtained from the World Economic Outook published in January/2024.
2/ This group includes developing economies.

At the beginning of 2023, the prospect of an imminent recession in the United States predominated, based mainly on the behavior of economic indicators, the inversion of the yield curve, the restrictive monetary policy and high inflation. However, throughout the year, the US economy showed resilience through growth, a robust labor market and high consumption. By mid-October, the perception that further monetary tightening by the Federal Reserve (Fed) might be necessary prevailed. Meanwhile, data on inflation, unemployment, and growth, together with the Fed's communication from the last quarter, reversed this trend. It signaled the end of the interest rate hike cycle and the possibility of future cuts, resulting in a rapid and significant reduction in interest rates and a devaluation of the dollar against the main currencies by the end of the year.

By the end of 2023, there was a stronger understanding that inflation in the US would continue to fall, with no recession, but rather growth below potential and a slight rise in unemployment (still at levels considered low). This scenario, often described as "soft landing", signals possible interest rate cuts by the Fed. interest rate cuts by the Fed from 2024 onwards. As a result, the year 2023 ended in a climate of optimism in the US financial market.

On the other hand, the Euro Zone, still affected by the geopolitical tensions arising from the conflict between Russia and Ukraine, recorded lower economic growth than that of the USA. Nevertheless, in response to the high inflation inherited from 2022, it also adopted monetary tightening policies and, like the US, showed evidence of falling inflation throughout the year. With an economic performance less expressive and lower inflationary risks, from October onwards, expectations of interest rate cuts for 2024 were consolidated, which led to a positive market close in the region for 2023.

In the UK, economic performance came close to stagnation in 2023. Amid a disinflationary process, the country experienced interest rate hikes between December 2021 and August 2023. This policy resulted in a contraction in demand and a slight increase in unemployment, although still at low levels. Influenced by the US bond market, the British yield curve fell significantly from October onwards, with the market projecting interest rate cuts for the second quarter of 2024.

In turn, Japan did not experience the same inflationary levels seen in Western economies in 2022, maintaining inflation at around 3% during 2023. Due to the recent experience with deflation and adopting a cautious stance, it kept its short-term interest rate unchanged at -0.1%. Its policy of control of the yield curve also persisted, allowing, however, the 10-year rate to vary between 0% and 1%. This policy of monetary stimulus, in a context of contraction in Western economies, led to the depreciation of the yen against the US dollar throughout 2023.

Finally, the Chinese economy began 2023 with optimistic prospects of a robust recovery in growth, motivated by the resumption of economic activities after a long period of strict public health policies to contain COVID-19. However, throughout the year, these expectations were not fully realized, even though growth of around 5% was expected for 2023. The country faced weakened domestic demand, low consumer confidence and, especially, a sharp crisis in the real estate sector, characterized by the bankruptcy of major companies, a significant drop in the volume of sales and real estate prices, as well as the need

for government support measures. Unlike the rest of the world, the Chinese economy recorded low inflation, ending the year with deflation in both consumer and producer prices. As a result, there was a reduction in interest rates along the curve in China, accompanied by a devaluation of the renminbi against the dollar.

At the end of 2023, there was a projection of a smaller slowdown in global growth than expected at the beginning of the year. Given the cycle of global rate hikes, it was expected that there would be a recession in order for inflation to fall, something that has not materialized so far.

The main risks at the end of 2023 in the short-term horizon in the international scenario were: (i) inflationary pressure frustrating expectations of interest rate cuts and generating a fall in asset prices; (ii) continuation and/or worsening of geopolitical conflicts, causing additional sanctions and possible new supply shocks; (iii) a global recession as an effect of monetary tightening since 2022, with a potential impact on financial stability; (iv) institutional disruptions in central economies due to domestic political instability v) a substantial slowdown in the Chinese economy, with a worsening of its fragilities, causing a significant decrease in global demand.

1.2 Economic and financial indicators

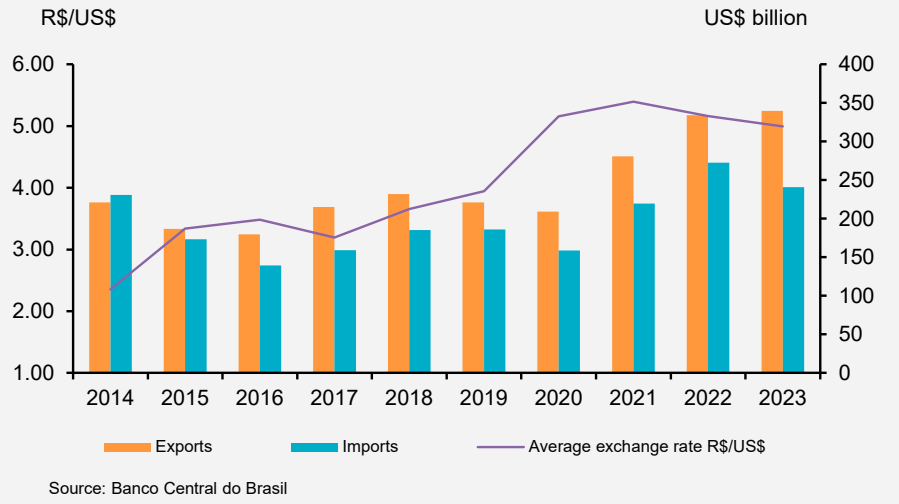
The amount of international reserves depends on several factors, such as domestic and foreign macroeconomic variables, as well as elements that impact the financial return of its investment portfolio. In this section, some indicators that influence the reserves are discussed.

1.2.1 Macroeconomic indicators

Graph 1.1 shows the evolution of the components of the Brazilian trade balance, i.e. exports and imports, as well as the dollar/real exchange rate from 2014 to 2023. The rise in Brazilian exports and fall in imports continued in 2023, compared to the figures for 2022, with a new record of US$ 98.8 billion in the balance. The nominal exchange rate ended 2023 with an appreciation of 7.21% compared to the end of 2022. The depreciation observed in the country since 2019 had a significant impact on the trade surplus shown in this graph in recent years.

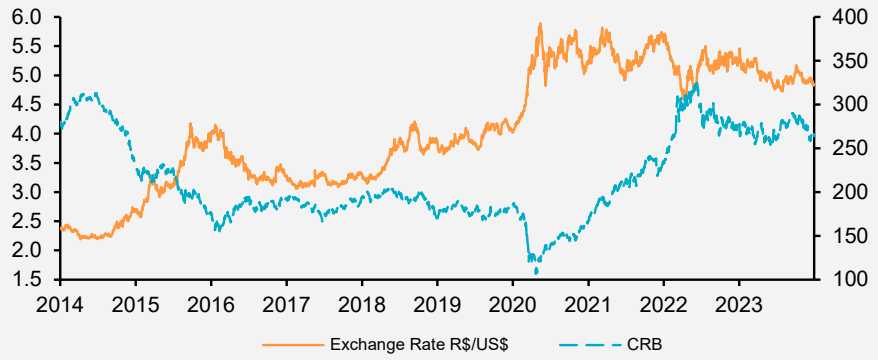
From the perspective of a country with a large share of commodities in its export basket, the impact of variations in the international prices of these products on the exchange rate is relevant. Graph 1.2 shows the relationship between the Commodity Research Bureau (CRB) commodity index and the dollar/real exchange rate over the years. Historically, these indices showed a negative correlation. However, since the beginning of the pandemic, with the change in risk perception in the financial market related to domestic situations, and with the supply issues specific to commodity markets, there has been a decoupling between these two indices. In fact, there is a rise in the CRB index between 2020 and 2022 (with only a small fall from 2022 onwards), with no associated movement of appreciation of the exchange rate.

Graph 1.1 – Trade balance and exchange rate (R$/US$)



Source: Banco Central do Brasil

Graph 1.2 – Exchange Rate (R$/US$) and CRB

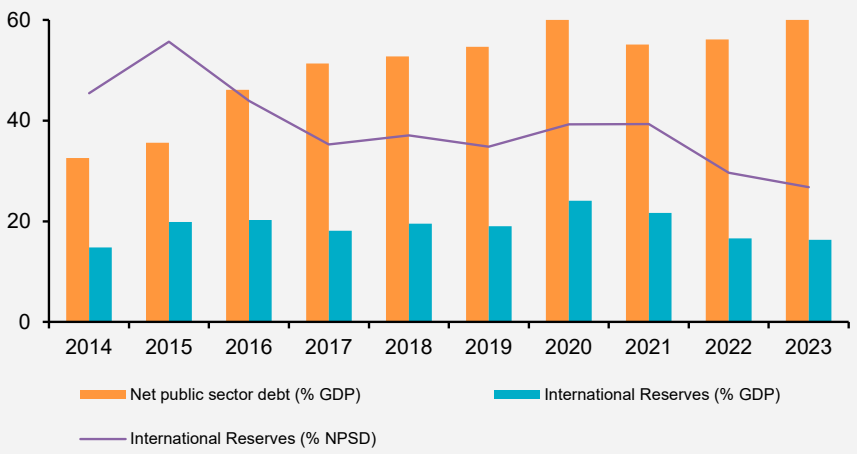


Source: Bloomberg

As Graph 1.3 illustrates, net debt reached 60.8% of GDP in December 2023. International reserves totaled 16.3% of GDP. It is worth noting that there was an increase in public sector net debt over the course of 2023 compared to 2022. The graph also shows the ratio between the volume of international reserves and net debt.

On December 31, 2023, Brazil's international reserves totaled, according to the cash-basis accounting, US$ 355.03 billion, an increase compared to the level of reserves observed at the end of 2022 (US$ 324.70 billion).

Graph 1.3 - Net public sector debt (NPSD), international reserves (% GDP) and international reserves (% NPSD)



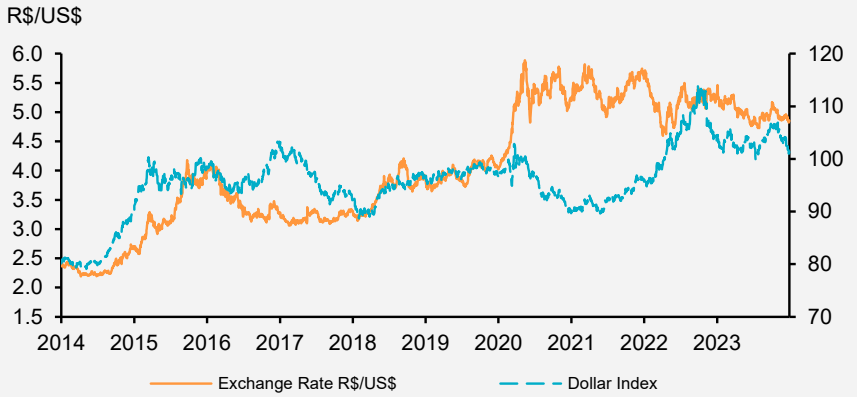
Source: Banco Central do Brasil

1.2.2 Financial indicators

Among the factors that affect the return of investments of the international reserves, indicators from the currency, equities and interest rate markets stand out.

In the currency markets, the appreciation or devaluation of the US dollar against other currencies influences part of the return of the investments of the international reserves. Graph 1.4 shows the evolution of the dollar index, the increase of which represents the appreciation of the US dollar in relation to a basket of currencies and, therefore, a devaluation of investments made in other currencies when measured in US dollars. As a comparison, Graph 1.4 also shows the dollar/real exchange rate. Apart from resulting from idiosyncratic issues in the Brazilian economy or from major global shocks (such as those caused by the Covid-19 pandemic), there is a correlation between the two series in the long term.

Graph 1.4 – Exchange rate (R$/US$) and Dollar Index

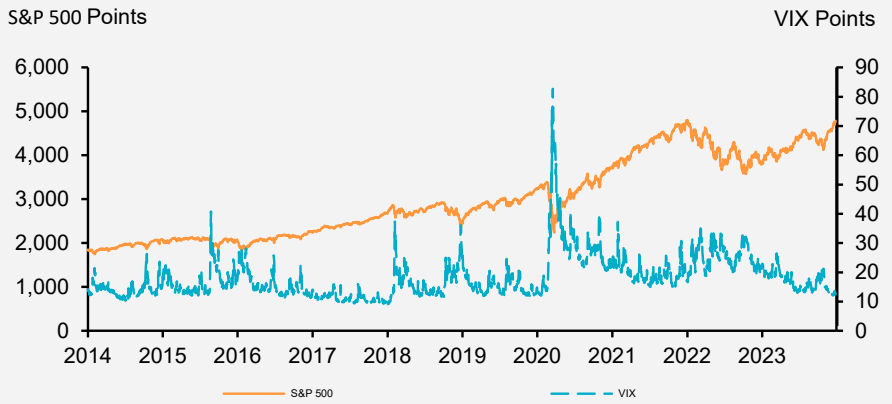


Source: Bloomberg

In relation to the US stock market, represented in Graph 1.5 by the S&P 500 index and the VIX (a measure of risk associated with the equity index), 2023 ended with the S&P 500 up 24.23% compared to the end of 2022. The S&P index was

positively affected by the perception of the end of the monetary tightening cycle by the Federal Reserve Bank, with signs of possible cuts in interest rates in 2024. It can also be seen from the graph that in 2023 the VIX index returned to pre-pandemic levels, showing a reduction in uncertainty in the markets since then.

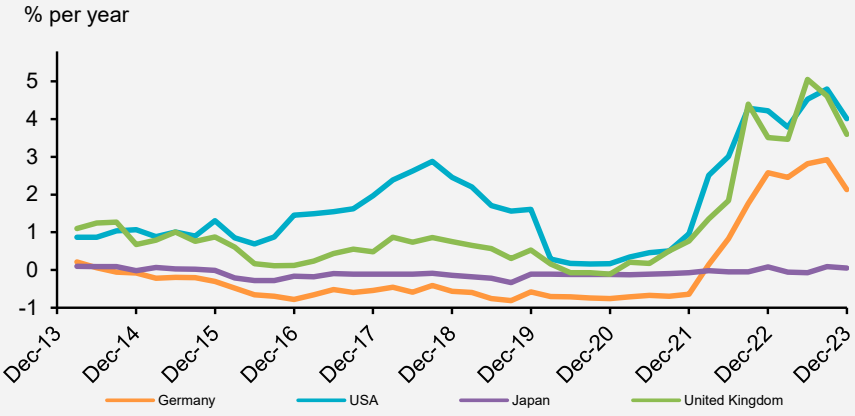
Graph 1.5 – S&P 500 and VIX



Source: Bloomberg

In the global sovereign fixed income markets, the year was highly volatile, reflecting uncertainty about the adequacy of the level of monetary tightening in central economies. In the last quarter of 2023, however, with clearer signs of cooling inflation in the US and Europe, the prospect of interest rate cuts throughout 2024 was consolidated in the markets. This led to a significant decrease rates over all maturities in the yield curves of the US and European economies, and the consequent appreciation of financial assets.

Graph 1.6 – Sovereign yields (3 years)[1/]



Source: Bloomberg
1/ Quarterly data

1.3 Governance

In accordance with Law 4595, of December 31st, 1964, the BCB has the exclusive responsibility to be depositary of the gold, foreign currency, and special drawing rights (SDR) reserves. In the BCB, it is the responsibility of the Board of Governors,

within the Governance, Risk and Control Committee (GRC), to establish the strategic objectives and the profile of risk and return of the country's international reserves.

The governance structure of the international reserves is supported by the Integrated Risk Management Policy of the BCB[1]. The investments are made in accordance with guidelines established by the GRC, which defines the risk-return profile by means of an appropriate benchmark portfolio, the operational limits for the authorized deviations from this benchmark and the performance evaluation criteria. The organizational structure reinforces the control and information flow mechanisms, enabling the institution to have an investment process focused on adequate risk management. The GRC was created in May 2017 aiming at the improvement of corporate governance, risk management and internal controls at the BCB, leading to a better decision-making process.

Risk management at the BCB considers several distinct risk dimensions, such as financial, strategic, reputational, legal, and operational. This integrated approach, known as Enterprise Risk Management (ERM), contributes significantly to the continuous improvement of the BCB's tasks, optimizing the allocation of institutional, human, and financial resources. Besides that, it makes things clear with respect to the institution's risk tolerance and helps to adequate it according to the BCB's strategic goals.

With the adoption of an integrated and structured risk management model, the BCB is aligned with the best international practices, consolidating its excellence in this area.

Reserve management is organized in two levels. The first level is the long-term strategic management, which is responsible for the investment allocation that contributes to most of the returns seen in the reserves. The SAA-Strategic Allocation Committee, of an advisory nature, is the instance that has, among other attributions, the task of presenting proposals to the GRC for investments of the reference (long-term) portfolio.

At the second level is the short-term management that may deviate from the benchmark portfolio within the limits set by the GRC. The active management has the objective of improving the returns in the short-term by taking advantage of circumstantial market opportunities. The TAA-Active Management Committee, of deliberative character, is the instance responsible for this activity.

The investment parameters and criteria are monitored by an internally developed system. The controls run on a daily basis, and any breach in the operational limits is automatically reported to all members of the GRC.

Regarding the operational aspects, the process of investing the international reserves is comprised of the investment, compliance, and settlement tasks. Compliance and settlement are critical procedures since they affect safety, liquidity, and profitability given that the reserves are traded in an environment of multiple currencies, regions, and time zones.

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1 According to Resolution BCB # 70, of February 11, 2021, available at BCB´s website. 0

The international reserves management process is subject to five different types of control: i) internal control by the International Reserves Department (Depin), through its Internal Control Division (Dicoi); ii) internal control by The Corporate Risks and Benchmarks Department (Deris); iii) internal control by the BCB's Audit; iv) external control by the Brazilian Court of Audit (TCU); and v) external control by an independent auditor.

2 Investment Policy

The investment policy reflects the risk preference of the Banco Central do Brasil

The GRC defines the investment policy based on the long-term strategic goals of the international reserves, such as: to provide confidence to the market that the country is capable of honoring its international commitments and support the execution of its exchange rate and monetary policy. As the strategic consequences of these goals, the BCB seeks a strategic allocation, based on the integrated national foreign currency Asset-Liability Management (ALM), that has a countercyclical behavior and reduces the country's exposure to exchange rate fluctuations. The Strategic Asset Allocation process also takes into consideration the portfolio diversification, average term of investment of the external debt and exposure to climate and environmental risks, among other factors deemed strategic. With these principles in mind, the strategic allocation is determined with the aid of risk-return optimization techniques, since the criteria of safety, liquidity, and profitability are considered, prioritized in this order.

The GRC defines a benchmark portfolio as a reference for the allocation of the reserves according to a long-term strategic profile that reflects the Central Bank's conservative risk appetite when it comes to risk and return . Short-term fluctuations in variables that affect asset prices, such as interest and exchange rates, are not considered in long-term decisions.

Intentional deviations from the benchmark portfolio related to oscillations in market conditions can be made and are monitored by internal control systems. In other words, the international reserves are actively managed, being allowed to marginally deviate from the benchmark portfolio within operational limits previously defined by the GRC.

The fundamental aspects of the investment policy of the international reserves are described below. In general, this investment policy can be segmented in terms of allocation by currency, by asset class and by average investment term. The data shown below have the US dollar as base currency, refer to the portfolio internally managed by the BCB and do not consider specific instruments used in the local market, such as dollar/real repo auctions.

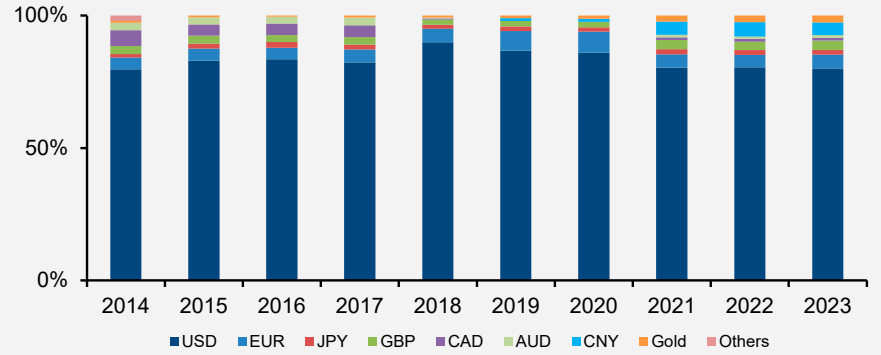
2.1 Currency allocation

As previously mentioned, one of the goals of the international reserves management is the reduction of the country's exposure to foreign exchange risk. Thus, the BCB seeks to build a diversified portfolio with a countercyclical behavior that provides, as a priority, the hedging of the exchange rate risk of the

gross external debt.[2] In December 2023, the currency allocation of the reserves was: 79.99% in US dollars (USD), 5.24% in euros (EUR), 4.80% in renminbi (CNY), 3.58% in sterling pounds (GBP), 2.60% in gold, 1.80% in Japanese yen (JPY), 1.01% in Canadian dollars (CAD) and 0.9% in Australian dollars (AUD). Graph 2.1 shows the evolution of the currency allocation at the end of each year.

We can see in Graph 2.1 that, for the whole period, the US dollar has been the currency with the largest share in the reserves. In 2019 and 2020, there was a small increase in the position in euros, followed by more currency diversification in 2021, without impact in the countercyclical profile of the portfolio as a whole, when compared to the investment profile in 2020. As a result, Canadian and Australian Dollar were included in the strategic allocation and the renminbi exposure grew and, due to its countercyclical characteristics in periods of market stress, gold exposure also increased. Since 2022, there was no significant change in the currency allocation of the international reserves.

Graph 2.1 – Foreign Currency Allocation[1/]



Source: Central Bank of Brazil
1/ Reserves in cash-basis accounting (end of period data)

2.2 Asset classes

The international reserves are invested primarily in fixed income assets, especially in sovereign bonds, agency bonds from several countries, bonds issued by supranational organizations and fixed-term bank deposits. Agencies are entities sponsored by a national government, created with the objective of promoting the development of certain sectors of the economy, and raising funds mainly through the issuance of bonds in the international markets. Central governments issue bonds in order to finance their fiscal deficits.

Supranationals are multilateral organizations, such as the World Bank and the Bank for International Settlements (BIS), which issue bonds and, in some cases, act as financial intermediaries. Local governments are subnational entities generally with more limited powers than those of the government of the country to which they belong. BCB also use exchange-traded funds (ETFs) as instruments, in order to

2 The values of gross external debt segmented by currency can be consulted in the statistics published monthly in the Banco Central do Brasil website.

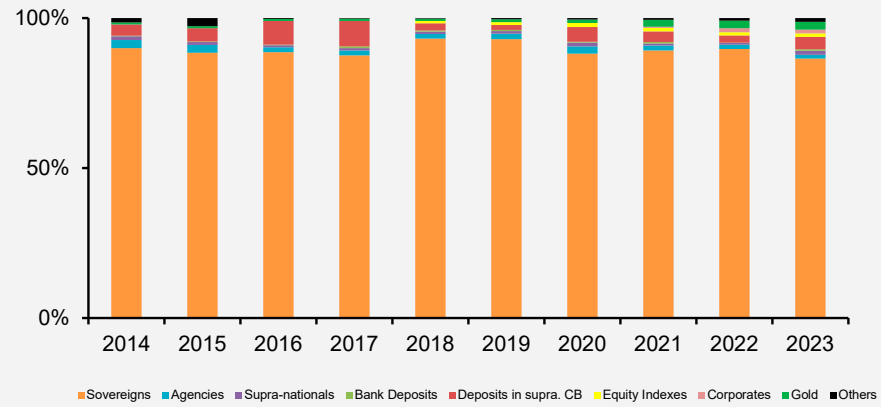
obtain exposure to fixed and variable income markets. In 2021, BCB has included green bonds in its strategic portfolio and, more recently, sustainability and social bonds have been added.

Graph 2.2 shows the percentage composition by asset class observed in the period from December 2014 to December 2023 (end-of-period data) and Graph 2.3 shows the same evolution in US dollars. In both graphs, allocation in ETFs is segmented by Stock Indices and US Corporates Investment Grade. BCB has exposure to US Stocks and, after 2021, exposure to the US Corporates Investment Grade indices has been added.

In December 2023, the reserves were allocated as follows: 86.57% in sovereign bonds; 4.13% in deposits in central banks and supranational organizations; 2.60% in gold; 1.38% in securities of supranational organizations; 1.23% in agency securities; 1.28% in Corporates Investment Grade ETFs; 1.13% in stock index ETFs; 0.44% in deposits in commercial banks; and 1.23% in other asset classes, such as local government bonds.

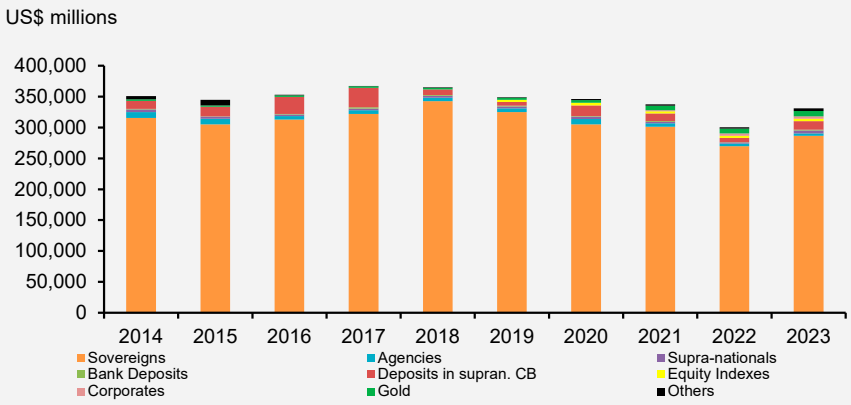
Exposure to the North American MBS (Mortgage-backed securities) market is currently carried out through TBAs (to-be-announced) and represented, at the end of the year, approximately 2.89% of the internally managed portfolio. Most of the TBA portfolio cash is invested in US Sovereign Bonds, accounted within the sovereign bonds portion from the previous paragraph.

Graph 2.2 – Asset Allocation[1/2/]



Source: Central Bank of Brazil
1/ Reserves in cash-basis accounting (end of period data)
2/ US MBS allocations made through ETF (terminated in 2021) and their respective historical values are included in "Others"

Graph 2.3 – Asset Allocation[1/2/]

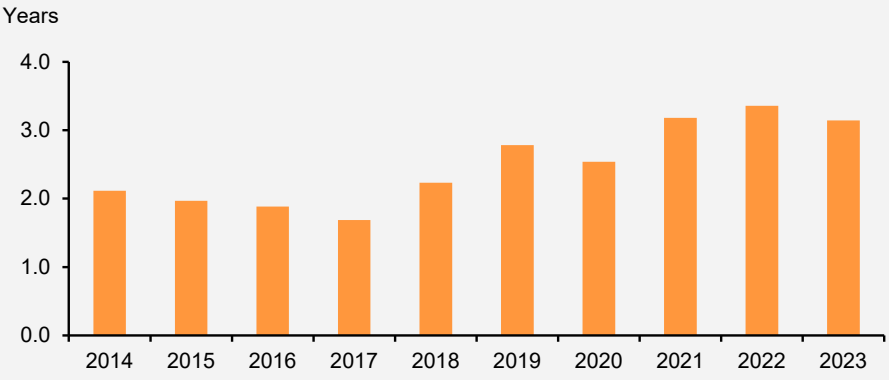


Source: Banco Central do Brasil.
1/ Reserves in cash-basis accounting (end of period data). Values in US$ millions.
2/ US MBS allocations made through ETF (terminated in 2021) and their respective historical values are included in "Others"

2.3 Average term of investment

The choice of the average maturity of the investment of the international reserves is aligned with the criteria of safety, liquidity, and profitability, in this order. Graph 2.4 shows the evolution of the average term of investment for the period between December 2014 and December 2023 (end of period data).

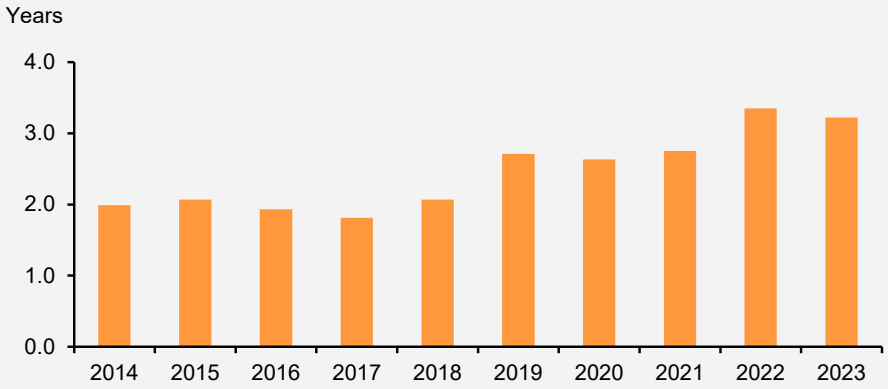
Graph 2.4 – Average term of investment - End of Period[1/]



Source: Central Bank of Brazil
1/ Reserves in cash-basis accounting (end of period data)

The investment parameters of the international reserves are based on an integrated management of national assets and liabilities. Since 2021, the average term of the external debt, public and private, is considered in the definition of the average term of investment of the reserves and, as a result, a broader range of maturities, which includes securities from 1 to 10 years, has been incorporated to most of the benchmark indices. Consequently, there was an increase in the portfolio's average term, which ended 2023 in 3.14 years (Graph 2.4).

Graph 2.5 – Average term of investment



Source: Central Bank of Brazil
1/ Reserves in cash-basis accounting (annual average).

3 Risk Management

Market, credit, liquidity, and operational risk are monitored in the international reserves' investment process.

The risk analysis related to the investment process is a key aspect to understand the financial performance and to align the benchmark portfolio to the investment objectives. As already mentioned, the different types of risks taken in international reserves investments are controlled daily by an IT system developed internally by the BCB. This system comprises the market, credit, and liquidity risks calculations, operational losses registration, and several other operational limit controls defined by the GRC.

The market risk of a portfolio is the risk of financial loss due to market price variations of the portfolio's assets. Liquidity risk refers to the risk of the owner of an asset not being able to sell it or closing a position when desired, without incurring in significant costs. Credit risk is the risk of an institution not being able to meet payments due to the securities issuance, deposits or any other contractual obligation or financial commitments made to investors. Operational risk is defined as the risk of direct or indirect loss resulting from inadequate or failed internal processes, people, and systems or from external events.

In addition to the risks mentioned above, the perceived impacts of climate risks on investment portfolios have motivated central banks to increasingly consider this information in their decision-making processes. Nevertheless, there are still no methodologies and metrics consolidated in the literature and in the international market as best practices in climate risk assessment for the construction of investment portfolios. On the other hand, there is an ongoing effort for investors and institutions to disclose and monitor the climate risks of their financial positions based on existing metrics in order to contribute to building a consensus regarding the best way to measure them. The BCB has gradually introduced parameters related to environmental and climate risks in the process of evaluation and selection of investments and of counterparties.

Additionally, the optimization exercises for the strategic allocation of international reserves take into consideration several asset classes, including those associated with green bonds[3].

3 For more information on sustainability initiatives at the BCB, including developments regarding international reserve investments, see the Report on Social, Environmental and Climate Social, Environmental and Climate Risks and Opportunities Report, available at: https://www.bcb.gov.br/en/publications/report-risk-opportunity.

3.1 Market risk

There are several sources of market risk related to the international reserves' management. The main one is the risk of price variation of the reserve currencies and the interest rates in these currencies. It is important to highlight that the reference currency (numéraire) used by BCB for the international reserves' management is the US dollar.

In order to measure the reserves market risk, the BCB uses the Value at Risk – VaR, as can be seen in the next section. Additionally, stress tests are used for measuring the sensitivity of the reserves to risk factors, as can be seen in section 3.1.2.

3.1.1 Value at Risk

The main market risk measure used by the BCB for the international reserves is the Value at Risk (VaR), risk metric that provides the portfolio's loss estimation for a certain time horizon and defined confidence level.

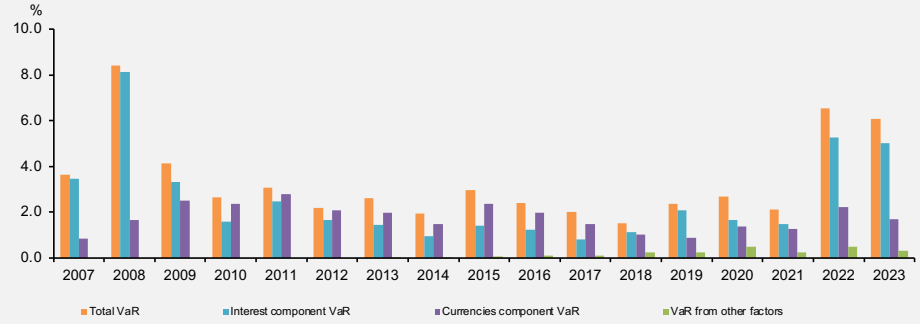
The VaR is calculated on a daily basis for the reserves and for the active management portion of the investments, with 95% confidence level for the time horizon of one day. That is, it is expected that a daily loss greater than the VaR should only happen 5% of the days. Besides the total VaR, the BCB also calculates its interest rate and exchange rate components, which represent the key market risk factors.

Graph 3.1 shows the average, for each year, of the annualized daily values of the VaR of international reserves in percentage terms, as well as the VaR arising from interest rate variations and that of currencies exposure. The total VaR reached 6.1% per year on average, below the value observed in the previous year, which was 6.6%. The total VaR in 2023 was close to the value observed during the global financial crisis of 2008.

In 2023, the interest rate component of the VaR of reserves declined relative to the 2022 annual average, from 5.3% to 5.0%, because of the decrease in volatility of interest rates in fixed income markets where the international reserves are invested. The currencies component of VaR also declined from 2.2% to 1.7% in 2023. As the allocation has not changed significantly, this decrease is also a consequence of the lower volatility in exchange rates observed in 2023.

The international reserves have exposures to risk factors related to US stocks and commodities. The volume invested in these classes is small when compared to the total volume of international reserves. Their contribution to risk decreased in 2023 compared to the previous year, mainly due to the lower volatility of these markets in the year. The average of the equities and commodities component of the annualized VaR was around 0.33% during 2023, compared to 0.48% in 2022.

Graph 3.1 – International reserves VaR[1/]



Source: Banco Central do Brasil
1/ Yearly average for each year of the annualized daily VaR.

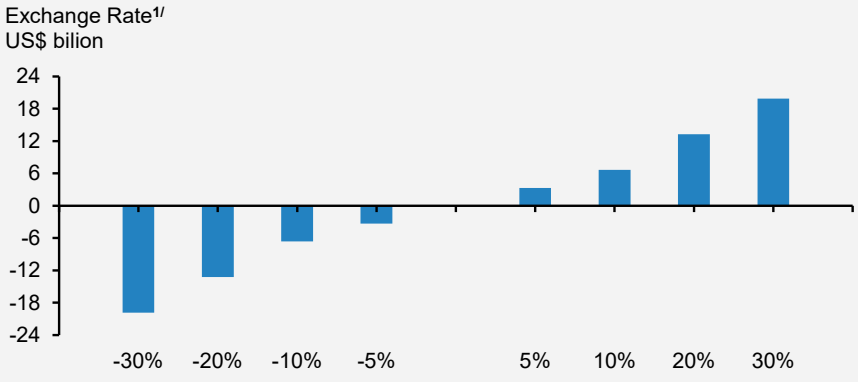
3.1.2 Stress tests

The stress test is another tool used for measuring the market risk of the international reserves' portfolio. It seeks to quantify the negative impact of shocks and hypothetical events that are unfavorable to the BCB's positions. Thus, the stress/crisis scenarios are designed to evaluate the potential financial losses caused by an adverse shock to each of the risk factors to which the reserves are exposed.

The tests are performed considering the BCB's positions at the end of 2023, and the risk factors used in these tests are the exchange rates of the US dollar against the remaining currencies in the reserves, as well as their respective the yield curves. Graph 3.2 shows the impact of the fluctuation of all the other currencies against the US dollar on the return of the reserves, varying in amplitude from 0% to 30%. Any appreciation of the US dollar against the remaining currencies on the reserves should have a negative impact on the returns.

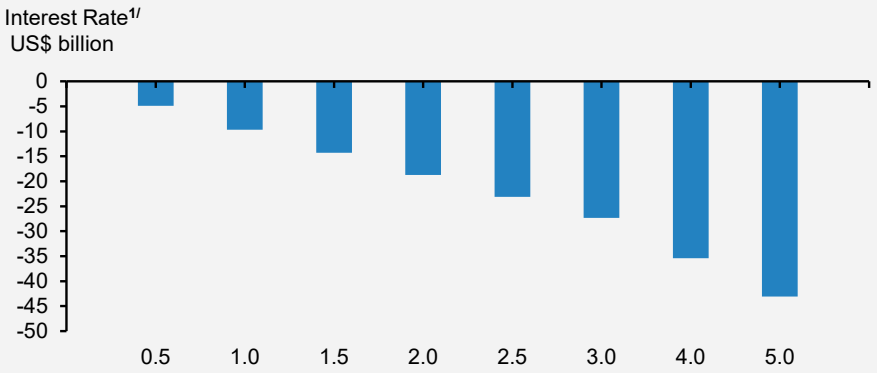
Graph 3.3 shows the results of parallel shifts of 0.5 to 5.0 percentage points to the yield curves of the markets where the reserves are invested. The larger the shift in the international interest rates, the larger the negative effect on the market value of the reserves. In 2023, interest rates closed the year near the levels they were at the end of 2022, and the positive result is explained mainly by carry.

Graph 3.2 – Forex stress test



Source: Banco Central do Brasil.
1/ Impact of the exchange rate variations against the US dollar on the value of the reserves, as of 12.31.2023.

Graph 3.3 – Interest rate stress test P/L



Source: Banco Central do Brasil.
1/ Impact of parallel shifts of the yield curves on the value of the international reserves, as of 12.31.2023.

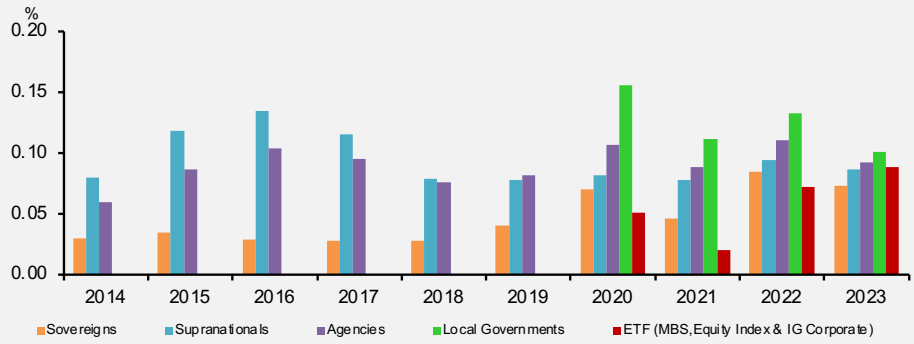
3.2 Liquidity risk

One of the pillars of the investment policy of the international reserves is liquidity. Therefore, restrictions in terms of asset classes are considered in the allocation process in order to mitigate liquidity risk. Liquidity risk corresponds to the risk of not being able to sell an asset or to close a position without incurring significant costs.

In order to guarantee an adequate level of liquidity for the international reserves, the BCB has guidelines that limit holdings' size and investment maturity. For sovereign, supranational and agency securities, there is a maximum purchasing limit per issuance as well as a maximum share of the outstanding amount for each asset. For ETFs, there is a limit related to the market capitalization of each fund. These operational limits have the goal of i) making sure that the eventual sale of these assets by the BCB will not affect their prices significantly; and ii) limit the impact of a given issuance in the portfolio return.

In addition to the controls already mentioned, the BCB also monitors the portfolio's liquidity risk using some liquidity cost scores. These scores take into consideration the bid-ask spreads of all the portfolio holdings, and they are calculated for each type of bond issuer (sovereigns, supranationals, agencies, local governments, and ETFs).

Graph 3.4 – Liquidity Risk1/2/



Source: Banco Central do Brasil
1/ Values refer to the respective portfolios.
2/ Calculated as the bid-ask spread relative to the asset's price

As we can see in Graph 3.4, the liquidity risk, computed as the difference between bid and ask prices, decreased in 2023 relative to 2022 for all asset classes, except for the ETFs, which can be explained by the allocations in ETFs which have less liquidity than the previously invested ones. We can also note that the liquidity risk of assets issued by sovereigns is consistently lower than that of assets issued by local governments, agencies, and supranational organizations.

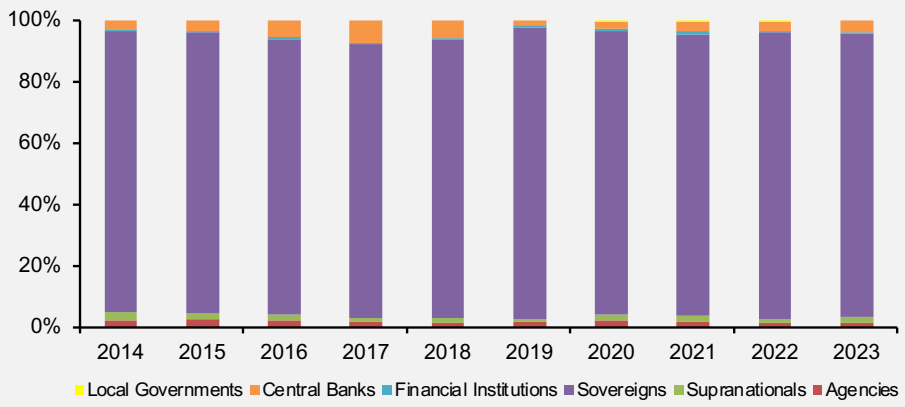
3.3 Credit Risk

The aim of this section is to present the annual evolution of the exposure of the international reserves to credit risk, as well as the control mechanisms for such exposure. In addition, we present some concepts concerning credit risk and the asset distribution according to three criteria: type of issuer or counterparty, geographic region, and creditworthiness.

Credit risk is defined as the uncertainty related to the occurrence of a credit event which results in a loss in value of holdings linked to this counterparty. A credit event occurs when a counterparty does not fulfill its payment commitments. The BCB's counterparties considered to pose a credit risk are the ones on which the BCB has claims, such as: agencies, central banks, central governments, financial institutions, supranational organisms, and local governments[4]. The category of financial institutions includes both commercial and investment banks. The graphs in this section show that most of the reserves is allocated in sovereign bonds, and, within this group, in US treasuries.

Graph 3.5. shows the distribution of the reserves allocated among different asset classes since 2013 and the allocation in sovereign bonds represent the greater portion. In 2023, the allocation was similar to that of 2022, with a small relative decrease in sovereigns to the detriment of the other asset classes.

Graph 3.5 – Allocation by issuer and counterparty type



Source: Banco Central do Brasil
1/ Average yearly values

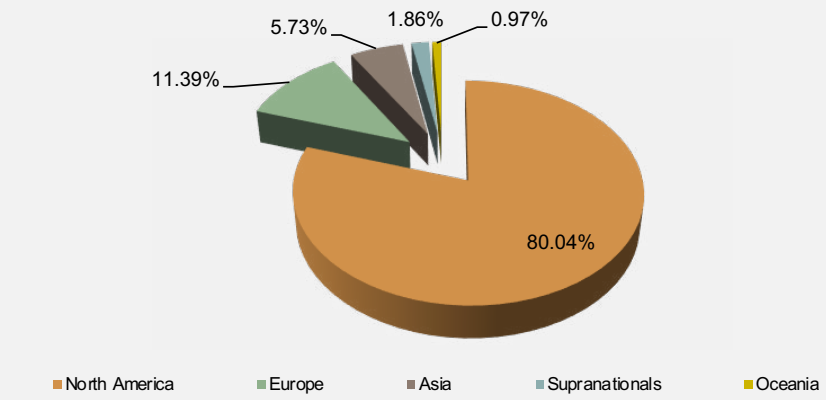
4 ETFs can have their market value affected by the credit risk of the underlying assets, as in the case of corporates. However, such exposures are not included in the charts in this section.

The portfolio's credit risk level is a function of its composition and of the issuers and/or counterparties' credit quality. The individual credit risk of agencies, supranational organizations and local governments authorized for investment by BCB is low due to the limits established, considering that only investments in fixed income instruments with high credit quality are allowed, according to the rating of credit risk assessment agencies and also according to internal assessments.

As for the credit risk control of financial institutions, two types of limits were put in place: one per transaction and other for the entire portfolio. Each transaction is subject to operational limits that define the minimum credit quality, the maximum exposure per issuer or counterparty and the maximum term of each exposure. Market indicators and accounting information are also considered in the credit analysis of the counterparties and issuers of the bonds in the reserves' portfolio. The aggregate limits for the portfolio aim at restricting the total credit exposure. Pursuing this goal, the BCB employs a statistical model of credit risk developed internally.

Graphs 3.6 and 3.7 refer to average exposure data for 2023. The allocation of assets with credit risk by geographic region is shown in Graph 3.6. Most of the allocation (80.04%) is in North American issuers and counterparties. As previously mentioned, this is due to the large share of the reserves that is invested in United States sovereign bonds, as a consequence of the prevalence of the US dollar in the reserves. Graph 3.7 shows the allocation by credit risk rating, and we can see that 85% of the exposure has a Aaa rating, whereas 9% has a Aa rating and 6% a A rating[5].

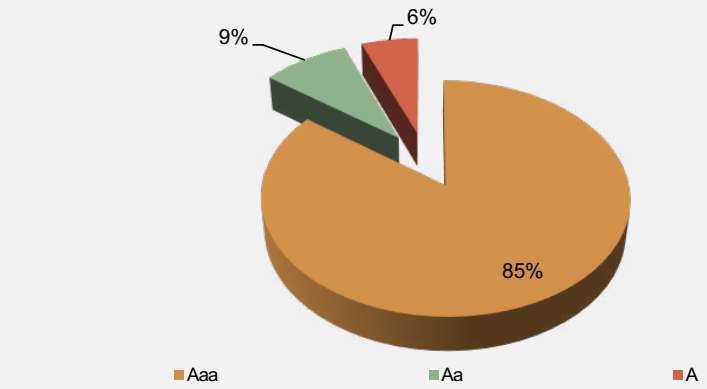
Graph 3.6 – Allocation by region



Source: Banco Central do Brasil

5 The international reserves also have a portion of 0.3% allocated to assets rated lower than A.

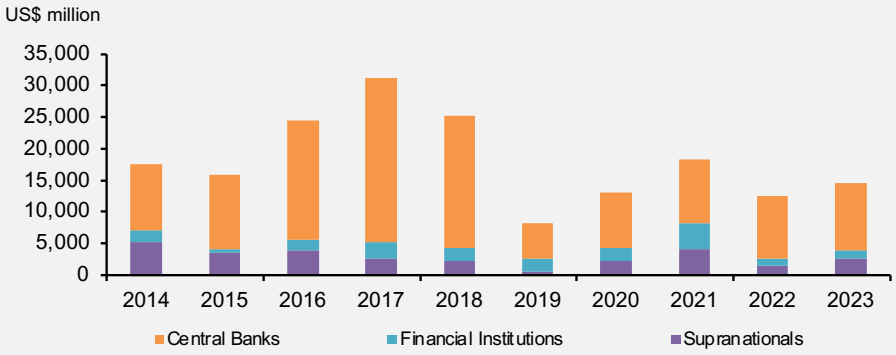
Graph 3.7 – Allocation by credit rating



Source: Banco Central do Brasil

Graph 3.8 shows the exposure's evolution to credit risk arising from money market instruments[6]. It should be noted that this exposure is due to time deposit operations, repurchase agreements and/or derivatives such as swaps and forwards with financial institutions, central banks, and supranational organizations, and does not include bonds. In 2023, the exposure to supranationals and financial institutions increased compared to 2022 levels.

Graph 3.8 – Total credit risk exposure to money market operations[1/2/]



Source: Banco Central do Brasil
1/ Values in US$ million (yearly averages).
2/ Deposits, repurchase agreements, forex.

3.4 Operational risk

Operational risk can be defined as the possibility of direct or indirect loss resulting from failure, deficiency or inadequacy of internal processes, systems, or external events. In the past, this type of risk was controlled only with the use of qualitative management practices. Current practices, on the other hand, seek to measure operational risks by means of quantitative models as robust complements of internal controls. The Integrated Risk Management Policy of BCB is driven by guidelines and recommendations contained in relevant references

6 Money Market instruments are short-term investments such as fixed-term deposits and repos.

in risk management and business continuity such as, Committee of Sponsoring Organizations of the Treadway Commission (COSO), ISO 31000, ISO 22301, among others, and in Basel recommendations.

The tools of operational risk management (set out in this Policy) and used at BCB during the stages of identification, assessment, prioritization, treatment, monitoring and review of risk are: Risk and Control Self-Assessment (RCSA), the Key Risk Indicators (KRIs) and the Incident History Log (IHL).

In the RCSAs, the risks associated with each process and their root causes are identified through the perception of the business managers. They are classified according to the nature of the potential incidents with negative impacts. The initial approach to the risk self-assessment is performed through interviews where the most relevant risks associated to each business process are identified and classified according to an event-based taxonomy. The result of this identification and evaluation process of the operational risks allows a broad view of the processes, actions, and projects as well as their interactions. This allows the design of risk mitigation measures by the organization. Thus, risks in the processes associated with the management and execution of policies of the international reserves are currently identified and plans for the mitigation of those risks are already defined.

The IHL consists in the creation of a data base of operational risk incidents, which can be of two types: miss and near-miss. This tool makes it possible to monitor incidents as well as analyze trends, which lead to better controls. Considering incidents that took place is a powerful tool in reevaluating processes, avoiding new losses, and correcting perceptions as to the potential risks of each business line.

KRI help assessment and monitoring of the processes related to the international reserves management.

When it comes to operational aspects, international reserves management involves trading, compliance, and operations settlement processes. Compliance and settlement are considered critical as they may affect safety, settlement, and profitability in a framework with different currencies, countries, and time zones.

For compliance and settlement processes, transaction volume and asset diversification are both important as they represent additional workflows, and thus more exposure to operational risk. In 2023, turnover reached US$ 3.79 trillion, with 5,710 transactions, an estimated 95,918 SWIFT messages and 844,876 accounting records. Unlike the values registered in the contracts, which consider the trade value, the compliance and settlement processes consider all flows related to the transactions due to the operational risks.

In 2023, the total number of operational incidents represented 2.2% of the total transactions.

4 Returns

The performance evaluation allows for the verification of the strategy suitability vis-à-vis the defined strategic objectives.

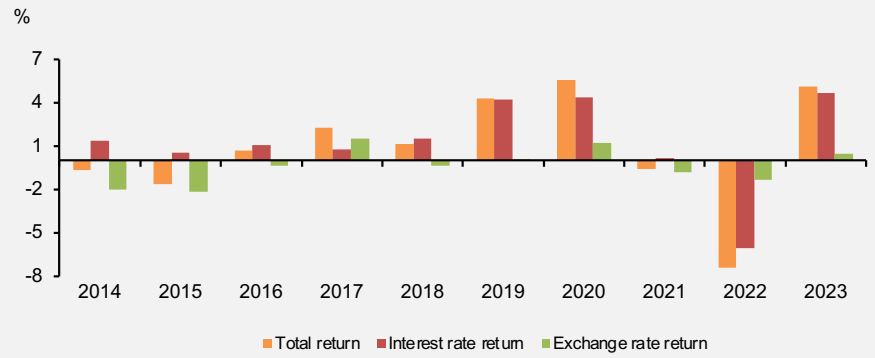
The analysis of returns obtained from the international reserves must be done considering the strategic objectives of the BCB and the different mechanisms used for its calculation. The BCB considers the accounting result for the preparation of its balance sheet and the data from the managerial system developed internally to support the investment decisions and the internal controls.

The accounting return, however, is not the most appropriate metric from the point of view of investments decision making, as the returns are not calculated relatively to the amount invested, which changes due to purchases and sales of foreign currency. Besides, since the reserves are invested in the international markets, measuring the result in Brazilian Real incorporates the US dollar-Brazilian Real exchange rate fluctuations into the investment performance, which makes it hard to analyze the returns of each market. In order to solve these problems, the BCB calculates the returns on the reserves investments using a managerial system that allows the portfolio to be evaluated on a daily basis, according to international standards, making it possible to follow the investment strategies in each of the markets.

The return on the investments of the international reserves stems from some factors that influence the value of the portfolios, such as the interest rate levels and the exchange rate of the investment currencies against the US dollar (numeraire currency of the reserves). Throughout 2023, there were significant upward and downward movements in the US sovereign yield curve, whose values for the relevant maturities for the international reserves ended the year at a slightly lower level than at the beginning of the period, and this generated part of the positive return. The high level of interest rates throughout the year, in turn, led to a significant gain with carry, responsible for the most significant part of the positive return. In terms of exchange rates, there was a depreciation of the US dollar in relation to the other currencies that make up the international reserves, which also contributed (to a lesser extent, when compared to interest rates) to the to the positive result. Thus, the accumulated return of the internally managed international reserves was a 5.11% gain, with a positive return of 4.67% resulting from mark-to-market on interest rates and on other factors and the remaining gain of 0.44% due to changes in exchange rates.

The returns of the internally managed reserves are shown in Graph 4.1. The interest rate and currency return components are also shown in it. For operational reasons, the yield return is the component with no consideration of currency price variation, and it is highlighted due to the predominance of fixed income investments in the reserves.

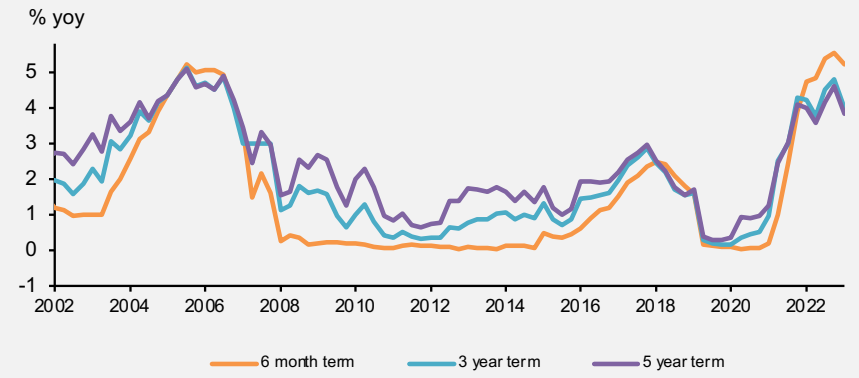
Graph 4.1 – Returns of the international reserves[1/]



Source: Banco Central do Brasil
1/ This refers to the internally managed portion of the reserves

As seen in the graph 4.2, the recent rise in the US interest rates stands out among the highest in the last 20 years, both in terms of magnitude and speed. In 2023, there was some stabilization of interest rates at higher levels than in recent periods, albeit with great volatility, which led to a significant return on investments with carry.

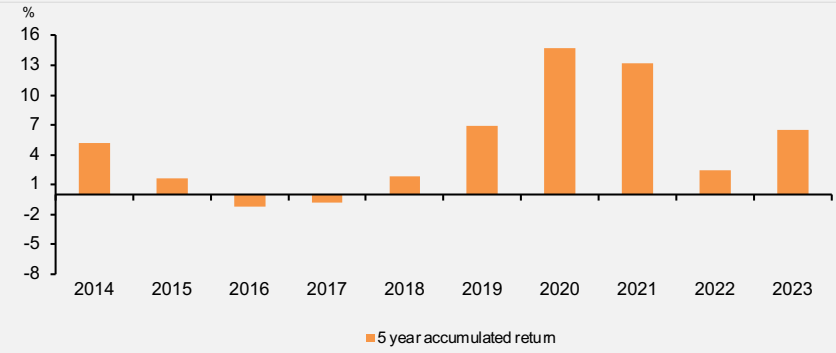
Graph 4.2 – US sovereign rates: 6 month term, 3 year term and 5 year term[1/]



Sources: Banco Central do Brasil and Bloomberg
1/ Quarterly data

The strategic allocation of the international reserves considers a long-term investment horizon. In this sense, the following graph shows the accumulated percentage return over five years (moving window) measured in US dollars, for the last ten years. The accumulated results were positive, except for the values for the years 2016 and 2017. Additionally, the accumulated return of the international reserves between January 2019 and December 2023 was positive by 6.48%.

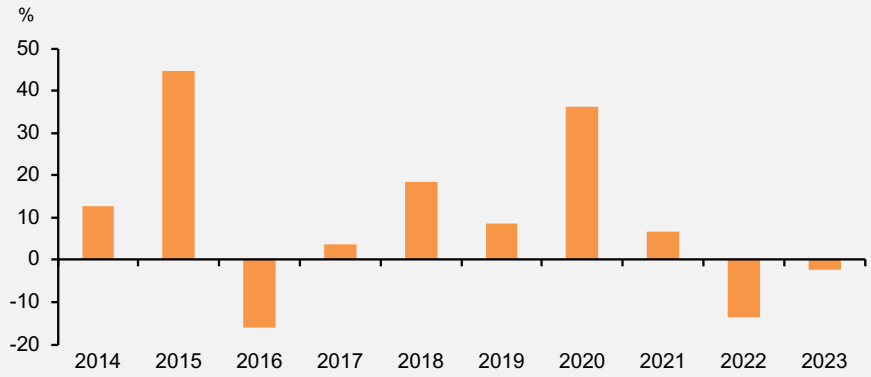
Graph 4.3 – International reserves 5 year accumulated return (moving window)[1/]



Source: Banco Central do Brasil
1/ This refers to the internally managed portion of the international reserves

Complementary analysis can be made considering the Brazilian Real as the base currency for the reserves. The parity between the Brazilian Rreal and the US Dollar was R$/US$ 5.22 at the end of 2022, closing 2023 at R$/US$ 4.84. Thus, the Brazilian Real appreciated against the US Dollar in 2023, which means that there is a management loss of 2.47% for the reserves in Brazilian Real in the period. Graph 4.4 shows the result over the last ten years, in BRL, of the internally managed reserves.

Graph 4.4 – Returns of the international reserves in Brazilian Real[1/]



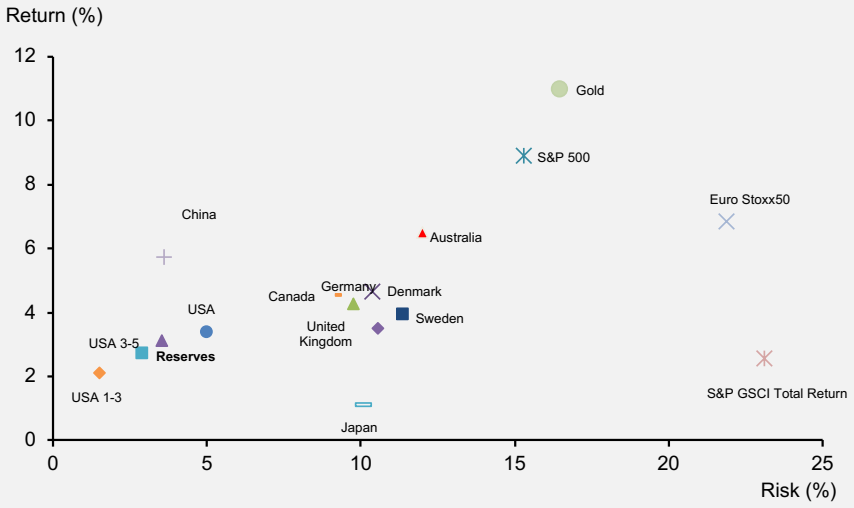
Source: Banco Central do Brasil
1/ This refers to the internally managed portion of the reserves.

4.1 Risk-return profile

This section compares the risk-return profile of investments of the international reserves in the period from January 2001 to December 2023 across some asset classes. The BCB's investment horizon is long term, and the analysis of the risk-return profile is based on monthly values, obtained from the management system. Graph 4.5 presents the average return and the annualized standard deviation based on monthly data. The U.S. Treasury bonds are represented by the indexes of 1 to 3 years maturity (USA 1-3), 3 to 5 years maturity (USA 3-5) and the whole curve (USA). Sovereign bond indices for Germany, the United Kingdom, Canada,

Denmark, Sweden, Australia, China and Japan are also shown in the graph. In addition, the gold, S&P 500, Euro Stoxx 50 and S&P GSCI Total Return Commodities indices were also included. The graph makes it possible to compare the risk-return profile of the reserves with that of these indices, using the US dollar as the base currency. The returns are consistent with the investment policies and with the risk- return preference of the GRC.

Graph 4.5 – Risk (%) *vs.* return (%) profile[1/2/]



Sources: Banco Central do Brasil and Bloomberg
1/ Annualized return (USD as the base currency), from Jun/2001 to Dec/2022, with the exception of Canada (from Aug/2002) and China (from Jan/2004).
2/ Standard deviation of monthly returns (%)

Annex

Note

This annex presents tables with the data used for the graphs shown in this report. It does not include the data from chapter 1, from graph 4.2 and Section 4.1, as they can be obtained from historical series available to the public. The numbers of the tables are the same of the graphs presented in the report.

The tables use managerial data with respect to the operations performed in the international reserves management process.

Table 2.1 – Foreign Currency Allocation[1/2/]

Period	USD	EUR	JPY	GBP	CAD	AUD	CNY	Gold	Others
2014	79.70%	4.50%	1.25%	3.08%	5.98%	2.73%	0.00%	0.74%	2.02%
2015	82.95%	4.62%	1.81%	3.01%	4.29%	2.65%	0.00%	0.66%	0.01%
2016	83.46%	4.42%	2.13%	2.60%	4.35%	2.59%	0.00%	0.70%	-0.25%
2017	82.25%	4.97%	1.83%	2.82%	4.49%	2.88%	0.00%	0.76%	0.00%
2018	89.93%	5.13%	1.49%	1.92%	0.47%	0.30%	0.00%	0.75%	0.00%
2019	86.77%	7.35%	1.73%	2.11%	-0.12%	0.00%	1.10%	0.94%	0.12%
2020	86.03%	7.85%	1.72%	2.02%	0.00%	0.00%	1.21%	1.19%	0.00%
2021	80.34%	5.04%	1.93%	3.47%	1.01%	0.97%	4.99%	2.25%	0.00%
2022	80.42%	4.74%	1.86%	3.15%	1.01%	0.92%	5.37%	2.52%	0.00%
2023	79.99%	5.24%	1.80%	3.58%	1.01%	0.98%	4.80%	2.60%	0.00%

1/ Reserves in cash-basis accounting (end of period data)
2/ Negative values reflect short positions on the currency

Table 2.2 – Asset Allocation[1/2/]

Period	Sovereigns	Agencies	Supra-nationals	Bank Deposits	Deposits in supra. CB	Equity Indexes	Corporates	Gold	Others
2014	89.99%	2.70%	1.26%	0.24%	3.69%			0.74%	1.38%
2015	88.47%	2.57%	1.01%	0.16%	4.50%			0.66%	2.62%
2016	88.70%	1.60%	0.70%	0.20%	7.87%			0.70%	0.24%
2017	87.64%	1.61%	0.74%	0.65%	8.49%			0.76%	0.11%
2018	93.18%	1.56%	0.78%	0.36%	2.47%	0.74%		0.75%	0.17%
2019	93.03%	1.78%	0.86%	0.41%	1.63%	1.04%	0.00%	0.94%	0.33%
2020	88.18%	2.45%	1.22%	0.23%	4.99%	1.29%	0.00%	1.19%	0.45%
2021	89.26%	1.64%	0.63%	0.47%	3.61%	1.13%	0.44%	2.25%	0.58%
2022	89.71%	1.43%	0.61%	0.10%	2.42%	1.04%	1.34%	2.52%	0.83%
2023	86.57%	1.23%	1.38%	0.44%	4.13%	1.13%	1.28%	2.60%	1.23%

1/ Reserves in cash-basis accounting (end of period data)
2/ US MBS allocations made through ETF (terminated in 2021) and their respective historical values are included in "Others"

Table 2.3 – Asset Allocation[1/2/]

US$ million

Period	Sovereigns	Agencies	Supra-nationals	Bank Deposits	Deposits in supran. CB	Equity Indexes	Corporates	Gold	Others
2014	315,597.47	9,477.06	4,419.05	827.55	12,944.62			2,605.51	4,851.33
2015	305,183.33	8,866.73	3,493.59	533.12	15,526.57			2,290.09	9,051.54
2016	313,064.35	5,640.11	2,467.90	713.05	27,766.31			2,479.09	837.69
2017	321,978.04	5,897.99	2,709.60	2,399.18	31,177.89			2,793.00	425.04
2018	342,687.09	5,732.24	2,850.67	1,307.10	9,068.31			2,770.03	626.54
2019	324,986.38	6,199.78	2,990.23	1,422.02	5,702.82	3,619.18	0.00	3,280.61	1,142.21
2020	305,099.82	8,484.21	4,228.92	802.57	17,256.33	4,452.57	0.00	4,100.02	1,565.15
2021	301,252.94	5,546.21	2,125.66	1,570.65	12,176.41	3,800.31	1,495.69	7,582.10	1,962.33
2022	269,624.84	4,288.41	1,838.38	290.74	7,268.82	3,117.14	4,037.11	7,586.52	2,492.03
2023	286,536.39	4,064.39	4,571.65	1,465.73	13,661.16	3,753.15	4,237.17	8,609.12	4,084.76

1/ Reserves in cash-basis accounting (end of period data)
2/ US MBS allocations made through ETF (terminated in 2021) and their respective historical values are included in "Others"

Table 2.4 – Average term of investment[1/]

Period	Years
2014	2.11
2015	1.97
2016	1.88
2017	1.69
2018	2.23
2019	2.78
2020	2.54
2021	3.18
2022	3.36
2023	3.14

1/ Reserves in cash-basis accounting (end of period data)

Table 2.5 – Average term of investment[1/]

Period	Years
2014	1.99
2015	2.07
2016	1.93
2017	1.81
2018	2.07
2019	2.71
2020	2.63
2021	2.75
2022	3.35
2023	3.22

1/ Reserves in cash-basis accounting (end of period data)

Table 3.1 – International Reserves VaR[1/]

Period	Total VaR (%)	Interest rate VaR (%)	Currency VaR (%)	Others VaR (%)
2014	1.9	1.0	1.5	0.0
2015	3.0	1.4	2.4	0.1
2016	2.4	1.2	2.0	0.1
2017	2.0	0.8	1.5	0.1
2018	1.5	1.1	1.0	0.2
2019	2.4	2.1	0.9	0.2
2020	2.7	1.7	1.4	0.5
2021	2.1	1.5	1.3	0.2
2022	6.6	5.3	2.2	0.5
2023	6.1	5.0	1.7	0.3

1/ Yearly average for each year of the annualized daily VaR.

Table 3.2 – Forex stress test [1/]

Variation	Return
	US$ billion
-30.0%	-19.87
-20.0%	-13.25
-10.0%	-6.62
-5.0%	-3.31
5.0%	3.31
10.0%	6.62
20.0%	13.25
30.0%	19.87

1/ Impact of the exchange rate variations against the US dollar on the value of the reserves, as of 12.31.2023.

Table 3.3 – Interest rate stress test[1/]

Variation	Return
	US$ billion
0.5%	-4.9
1.0%	-9.7
1.5%	-14.3
2.0%	-18.8
2.5%	-23.1
3.0%	-27.3
4.0%	-35.4
5.0%	-43.1

1/ Impact of parallel shifts of the yield curves on the value of the international reserves, as of 12.30.2022.

Table 3.4 – Liquidity risk[1/2/]

Period	Sovereigns (%)	Supranationals (%)	Agencies (%)	Local Gov. (%)	ETF - MBS, Stock Indexes & IG Corporate (%)
2014	0.03	0.08	0.06		
2015	0.03	0.12	0.09		
2016	0.03	0.13	0.10		
2017	0.03	0.12	0.10		
2018	0.03	0.08	0.08	0.13	0.02
2019	0.04	0.08	0.08	0.15	0.02
2020	0.07	0.08	0.11	0.16	0.05
2021	0.05	0.08	0.09	0.11	0.02
2022	0.08	0.09	0.11	0.13	0.07
2023	0.07	0.09	0.09	0.10	0.09

1/ Values correspond to their respective portfolios
2/ Calculated as the average bid-ask spread.

Table 3.5 – Allocation by issuer and counterparty type

Period	Agencies	Supranationals	Sovereigns	Financial Institutions	Central Banks	Local Governments
2014	2.32%	2.81%	91.36%	0.53%	2.97%	
2015	2.78%	1.90%	91.48%	0.45%	3.38%	
2016	2.12%	2.08%	89.81%	0.47%	5.52%	
2017	1.71%	1.51%	88.96%	0.68%	7.15%	
2018	1.57%	1.37%	90.82%	0.59%	5.63%	0.01%
2019	1.73%	0.93%	95.17%	0.57%	1.56%	0.04%
2020	2.28%	1.81%	92.41%	0.63%	2.68%	0.19%
2021	1.83%	2.11%	91.51%	1.21%	3.10%	0.24%
2022	1.59%	1.18%	93.30%	0.34%	3.34%	0.24%
2023	1.42%	1.86%	92.49%	0.50%	3.55%	0.18%

Table 3.8 – Total credit risk exposure with money market operations[1/ 2/]

Period	Supranationals	Financial Institutions	Central banks
2014	5,233	1,863	10,395
2015	3,556	551	11,853
2016	3,948	1,598	18,862
2017	2,697	2,490	26,095
2018	2,181	2,186	20,812
2019	518	2,025	5,652
2020	2,169	2,091	8,908
2021	4,162	3,970	10,177
2022	1,575	952	10,062
2023	2,558	1,379	10,560

1/ Values in US$ million (yearly averages).
2/ Deposits, repurchase agreements, forex.

Table 4.1 – Returns of the international reserves[1/]

Period	Total return (%)	Interest rate return (%)	Exchange rate return (%)
2014	-0.64	1.40	-2.03
2015	-1.60	0.58	-2.18
2016	0.70	1.07	-0.37
2017	2.27	0.74	1.53
2018	1.17	1.55	-0.38
2019	4.33	4.25	0.08
2020	5.57	4.38	1.19
2021	-0.62	0.20	-0.82
2022	-7.45	-6.09	-1.36
2023	5.11	4.67	0.44

1/ This refers to the internally managed portion of the reserves.

Table 4.3 – 5 years accumulated returns (moving window) of the international reserves [1/]

Period	5 years Return (%)
2014	5.17
2015	1.64
2016	-1.21
2017	-0.79
2018	1.86
2019	6.96
2020	14.75
2021	13.25
2022	2.49
2023	6.48

1/ This reffers to the internally managed portion of the reserves.

Table 4.4 – Returns of the international reserves in Brazilian Real[1/]

Period	Return in BRL (%)
2014	12.67
2015	44.68
2016	-15.95
2017	3.80
2018	18.49
2019	8.53
2020	36.11
2021	6.72
2022	-13.47
2023	-2.47

/1 This referes to the internally managed portion of the reserves

Glossary

The definitions present the unique objective of helping the general understanding of the concepts described in the report.

Active management
Particular way of financial management in which it is tried to anticipate movements of market, variations of liquidity and other dynamic facts, with the objective of obtaining a better risk adjusted return in relation to the benchmark.

Basis Point (b.p.)
One basis point corresponds to 0.01 percentage point.

Benchmark
It is a reference portfolio that is typically used as representation of the choice of risk and return of the investor.

CDS
Credit Default Swap. Financial instrument through which it is possible to buy or sell insurance against default of assets issued by companies or countries.

CRB
Commodity Research Bureau. Commodities index price daily evaluated by Thomson Reuters/Jefferies.

Default
Technical situation in which the debtor does not fulfill a contractual obligation.

ETF (Exchange Traded Funds)
Index funded traded like stocks in exchanges. The indices can be composed of either fixed income (e.g. MBS) or equity (e.g. S&P 500)

Government agencies
They are agencies sponsored by governments with the objective of supporting strategic areas of the economy as construction, education etc.

MBS (Mortgage-Backed Securities)
Fixed-income securities guaranteed by bundled mortgages or real estate loans.

Money market
Segment of the financial market composed of short-term assets (until one year) and usually of major liquidity, such as commercial papers, certificates of negotiable deposits (CDs), treasury bills, buybacks agreements (repos), etc.

Rating
Grade given by a risk agency that expresses the credit risk of institutions, countries and assets.

Rating Agencies
They are agencies, usually private, which rate the credit risk of institutions, countries and assets.

Spread
Price difference between the quotations for buying and selling an asset or between quotations of two different assets.

Supranationals
Bonds issued by multilateral organisms, such as the International Monetary Fund (IMF), the Interamerican Bank for Development (IDB), the Bank for International Settlements (BIS), the World Bank (Bird) etc.

Swift
Society for Worldwide Interbank Financial Telecommunications. It is a global system of telecommunications whose main objective is to provide message service, which enables the Banco Central do Brasil to settle operations with international reserves.

Treasuries/T-bills
Debt instruments issued by the North American Treasury. Treasury bills (T-bills) are issued with up to one-year term and do not pay coupons before maturity. The other treasuries (bonds and notes) are issued with a higher term and pay coupons periodically.

Value at Risk
Estimated value for the investment loss, in a certain time horizon, with a given confidence level.

VIX
Implicit volatility index, based upon S&P500 calls.

Volatility
Degree of prices variability or assets returns.

Yield
Profitability. Dividend or interests paid as percentage of the current value.


BANCO CENTRAL DO BRASIL