



ISSN 2175-9251

International Reserves Management Report

Volume 14 | January 2023



ISSN 2175-9251

International Reserves Management Report

Volume 14 | January 2023

International Reserves Management Report

Yearly Publication by Banco Central do Brasil / Corporate Risks and Benchmarks Department

The text and corresponding tables and graphs were elaborated by the Corporate Risks and Benchmarks Department (*e-mail*: deris@bcb.gov.br).

Information about the report

Phone: +55 (61) 3414-2685

Reproduction permitted only if source is stated as follows: International Reserves Management Report, volume 14.

Citizen Service Division:

Banco Central do Brasil
SBS – Quadra 3 – Bloco B – Edifício-Sede – 2º subsolo
70074-900 Brasília – DF
Phone: 145 (in Brazil)
Internet: <https://www.bcb.gov.br/acessoinformacao/faleconosco>

Summary

Executive Summary, 5

1 International Reserves Management, 7

- 1.1 Economic environment, 7
- 1.2 Economic and financial indicators, 10
 - 1.2.1 Macroeconomic indicators, 10
 - 1.2.2 Financial indicators, 12
- 1.3 Governance, 13

2 Investment Policy, 15

- 2.1 Currency allocation, 15
- 2.2 Composition by asset class, 16
- 2.3 Average term of investment, 18

3 Risk Management, 20

- 3.1 Market risk, 21
 - 3.1.1 Value at Risk, 21
 - 3.1.2 Stress tests, 22
- 3.2 Liquidity risk, 23
- 3.3 Credit Risk, 24
- 3.4 Operational risk, 27

4 Returns, 29

- 4.1 Risk-return profile, 31

Annex, 33

Glossary, 38

Executive Summary

This publication is the 14th 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 2021.

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 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.

On December 31st, 2021, the international reserves amounted to US\$362.20 billion. At the end of 2020, they amounted to US\$355.62 billion. The average yearly Value at Risk (VaR) of the investments, a market risk metric that takes into account both the interest rate and foreign exchange rate components, was 2.1% in 2021, lower than in the previous year. This is due to the fact that there was a large volatility shock between March and May of 2020, whereas there was no such shock in 2021. Regarding credit risk, the average asset distribution by rating in 2021 shows high exposure to Aaa-rated counterparties. In 2021, liquidity risk, measured by the bid-ask spread of bonds and ETFs in the investment portfolio decreased when compared to the previous year.

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). Over the year, there was a slight increase in interest rates in the USA, offset by a positive result in investments in U.S. inflation-linked bonds and Chinese government bonds, in addition to gains with the U.S. stock index. This movement generated a positive result with interest rates and other factor exposures of 0.20%. On the other hand, the US dollar appreciated against the other currencies of the reserves, which led to a foreign exchange result of -0.82%. Thus, considering these contributions together, the Brazilian international reserves had a result of -0.62% in 2021.

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 Banco Central do Brasil (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

The year 2021 was affected by the continuation of the Covid-19 pandemic and its ramifications for the economy. The vaccination process, which began in some countries as recently as in the last month of 2020, the emergence of more contagious and more lethal variants of the virus, the demand shock caused by the economic reopening, and supply shocks in commodity and industrialized product markets marked the dynamics of the global economy.

The beginning of the year saw a peak in cases and deaths from Covid-19, which was reflected in the cooling of the global economic recovery that had been underway since the second half of 2020. Social isolation measures, accompanied by fiscal measures such as aid to households and businesses and monetary stimulus, led economies to record high levels of demand for goods and low levels of demand for services.

Pandemic-related restrictions also had an effect on the supply of goods and services. Frequent interruptions in supply chains affected industry, anomalies in the flow of international trade affected transportation, and strong fluctuations in demand affected the production of commodities, especially oil and natural gas.

Starting in the second quarter, with the advance of vaccination, and consequently more robust reopening movements, there was a resumption of growth in demand for services, bringing the central economies closer to full employment levels. Demand for products remained high, given the accumulation of savings due to the stimuli since the start of the pandemic.

Over the following months, a scenario of pressure on both the supply and demand sides began to set in, driving a strong global increase in producer prices, which was reflected in rising inflation, especially in the West.

New waves of Covid-19 emerged around the world throughout the year, often linked to new variants. However, the negative impact of each subsequent wave on demand was lower than the previous ones, indicating the adoption of successful practices aimed at avoiding the disruption of economic activity.

Thus, the situation at the end of 2021 was one of high demand pressure, combined with a supply still affected by the uncertainties of the pandemic, especially due

to disruptions in production chains and cautious investment in oil production. This led to high consumer inflation in the U.S., Europe, and several emerging Western economies. Thus, there was uncertainty as to the temporary nature of these inflationary shocks and as to the need, present and future, for monetary tightening in these economies, as well as their effect on economic growth in the short and medium terms.

Table 1.1 illustrates the rebound in economic activity in 2021 after the sharp drop in 2020, leading to world economic growth of 5.9% in the year, according to IMF projections. Also highlighted in the table is that projections for 2022 indicate that the central economies should show growth rates above their long-term potential. It is also noted that, among the emerging economies, the Asiatic ones should grow more robustly than the others, with China and India standing out as the largest economies among these countries.

Period	2019	2020	2021 ^{1/}	2022 ^{1/}
World	2.8%	-3.1%	5.9%	4.4%
Advanced Economies	1.7%	-4.5%	5.0%	3.9%
USA	2.3%	-3.4%	5.6%	4.0%
Euro Zone	1.5%	-6.3%	5.2%	3.9%
Japan	0.0%	-4.6%	1.6%	3.3%
Emerging economies ^{2/}	3.7%	-2.1%	6.5%	4.8%
China	6.0%	2.3%	8.1%	4.8%
India	4.0%	-7.3%	9.0%	9.0%
Russia	2.0%	-3.0%	4.5%	2.8%
South Africa	0.1%	-6.4%	4.6%	1.9%
Brazil	1.4%	-4.1%	4.7%	0.3%

Source: International Monetary Fund

1/ IMF projections for 2021 e 2022 obtained from the World Economic Outlook published in January/2022.

2/ This group includes developing economies.

The US began 2021 at the height of a Covid-19 wave in which they reached a peak in daily deaths. Simultaneously, mass vaccination was proceeding at a rapid pace. The new administration, at its inception, passed new relief measures in March, adding fiscal stimulus of around \$1.9 trillion to the economy. As the vaccination progressed, the economy was reopened, reactivating many areas of the service sector without penalizing the sale of goods. The unemployment rate fell rapidly over the year, from 6.7% in December 2020 to 3.9% in December 2021. With signs that the level of the labor force would not return to the level of 2019, it was observed that there was difficulty in filling job openings and the level of resignations hit a record, indicating that the American economy was now operating at full employment. The hesitation of part of the American population to return to work modulated the pace of growth throughout the year.

With retail sales on the rise, low interest rates, a large volume of savings accumulated since the beginning of the pandemic, problems in production chains, and high commodity prices, US inflation rose from 1.4% in 2020 to 7%

at the close of 2021, well above the 2% target of the monetary authority. Thus, at the end of 2021 the Federal Reserve Bank began to indicate the possibility of gradually reversing the quantitative easing policy and, throughout the year 2022, start raising the benchmark interest rate. It should also be noted that the fiscal stimulus present in the first two years of the pandemic expired by the end of 2021. The yield curve started to rise as of October, but still at historically low levels and significantly negative real interest rates.

The Eurozone also started 2021 with the deadliest wave of Covid-19 to date, but vaccination did not have as fast an initial pace as in the US. However, by the European summer, Eurozone vaccination already exceeded that of the US, and there was a reopening of activities. As the region generally adopted a policy of subsidizing job retention during times of greater social isolation, the unemployment rate fluctuated substantially less in the Eurozone than in the U.S., and over the course of 2021 fell to the pre-pandemic level of around 7%. In the last months of 2021, escalating oil and natural gas prices, combined with several negative renewable energy production shocks, put pressure on electricity and fuel prices. As a result, inflation in the Eurozone reached the 5% level, which led to the possibility of a future reduction in monetary stimulus by the monetary authority.

China has had a strict Covid-19 control policy, so that the number of cases and deaths as a proportion of the population was among the lowest in the world. To achieve such an epidemiological result, the restriction measures have severely hit retail sales, which are far below the pre-pandemic trend. On the other hand, Chinese industry has heated up strongly as global demand has risen, even impacting international commodity prices. The Chinese real estate sector, in turn, suffered negative shocks after years of investment, with some of the largest companies going into default, with a resulting slowdown. Because of this sectoral disparity, the global increase in producer prices hit China, but was not passed on to the consumer. In fact, by the end of 2021, it was estimated that the Chinese monetary policy would move in the opposite direction of the major Western economies, toward more stimulus.

Japan was another example of an Asian country that managed to contain the spread of the virus at the cost of tight restrictions. Economic activity, while recovering, was still below the pre-pandemic level at the end of 2021. The yen depreciated by more than 10% over 2021 against the US dollar. This is due to the fact that the Bank of Japan has shown no sign of easing the strong monetary stimulus in the face of consumer inflation that continues to hover around 0%, even in the face of rising global prices. For 2022, it is expected that there will be a heating up in economic activity due to a fiscal package of about 10% of GDP, which has not yet significantly affected inflation or interest rate expectations.

The main risks that presented themselves at the end of 2021 in the short-term horizon in the international scenario were: (i) the prospect of conflict between Russia and Ukraine, due to Russian troop maneuvers on the border between the two countries, which could lead to a crisis with Europe and the US; (ii) stronger than anticipated inflationary pressure in the US, requiring monetary tightening, which could lead to financial instability among the central economies and the flight of resources from emerging countries to the US while generating losses in international reserves; iii) the emergence of more infectious, lethal and/or

vaccine-resistant variants of the virus that causes Covid-19, leading to new mobility restrictions and a sharp global economic slowdown iv) pressures in commodity markets, especially energy and metals, with supply unable to grow as fast as demand, causing generalized price hikes and broad action to reduce liquidity by central economies to contain inflation, leading to economic and financial problems; v) a slowdown of the Chinese economy, caused by domestic sectorial imbalances, leading to lower global growth and negative commodity price shocks, especially negative for exporting countries.

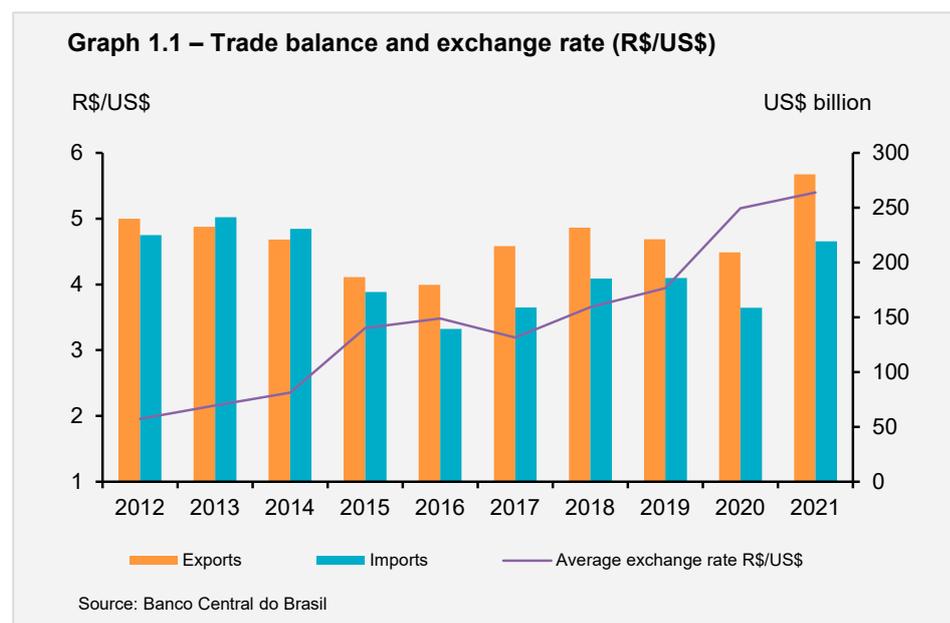
1.2 Economic and financial indicators

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.

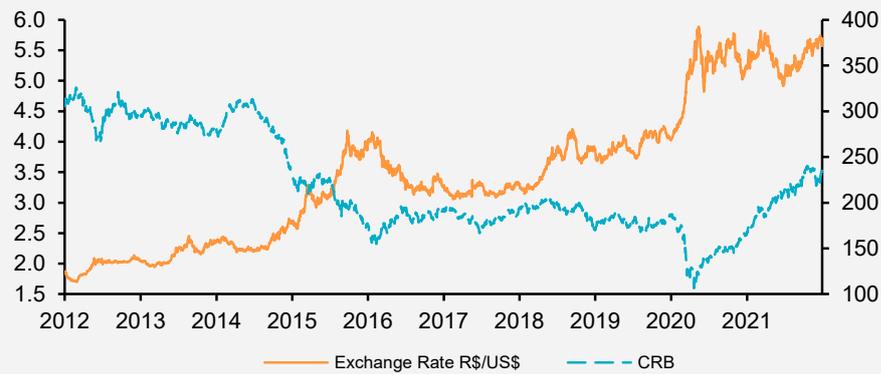
1.2.1 Macroeconomic indicators

Graph 1.1 shows the behavior of the Brazilian trade balance, that is, exports and imports, as well as the behavior of the Brazilian real / US dollar exchange rate, in the period from 2012 to 2021. There was a strong increase both in Brazilian exports and imports in 2021 compared to the 2020 figures, as well as the positive balance, which was a record US\$ 61.2 billion. The nominal exchange rate ended 2021 with a depreciation of 7.21% compared to the end of 2020 and 38.2% compared to 2019. The exchange rate depreciation observed in the country over the past two years had a significant impact on the trade surplus shown in this graph.

Since commodities are a significant part of Brazilian exports, the impact of international commodity prices on the exchange rate is relevant. Graph 1.2 shows the highly negative correlation between the Brazilian real/US dollar exchange rate and the Commodity Research Bureau (CRB) commodity index.



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

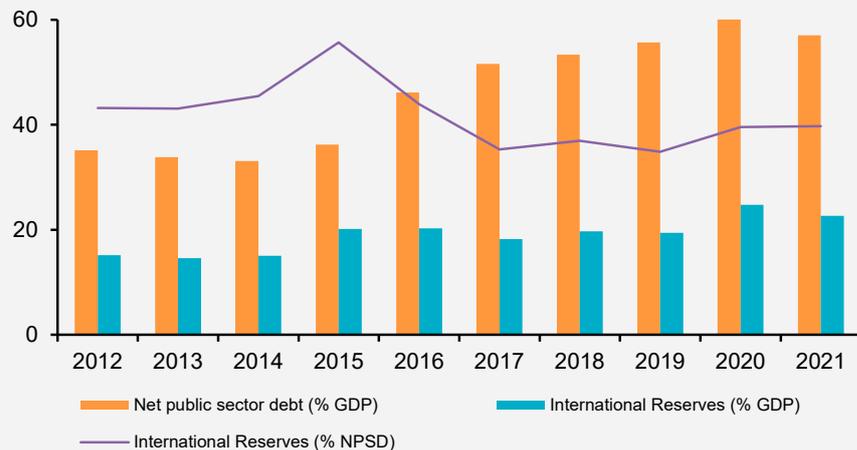


Source: Bloomberg

As shown in Graph 1.3, the net public debt reached 57% of GDP. The level of international reserves in Brazil reached 22.6% of GDP in 2021. The graph also shows the ratio between reserve volume and net public debt.

As of December 31st, 2021, Brazil’s international reserves amounted to US\$ 362.20 billion. At the end of 2020, this value was US\$ 355.62 billion. In 2021, the IMF deposit (\$15 billion) related to the new Special Drawing Rights (SDR) allocation contributed to the change in the volume of reserves.¹

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

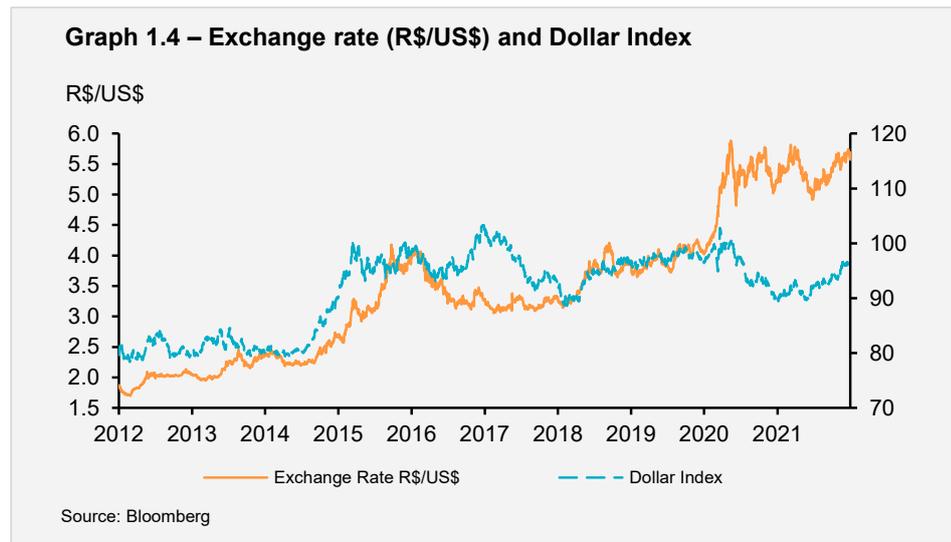


Source: Banco Central do Brasil

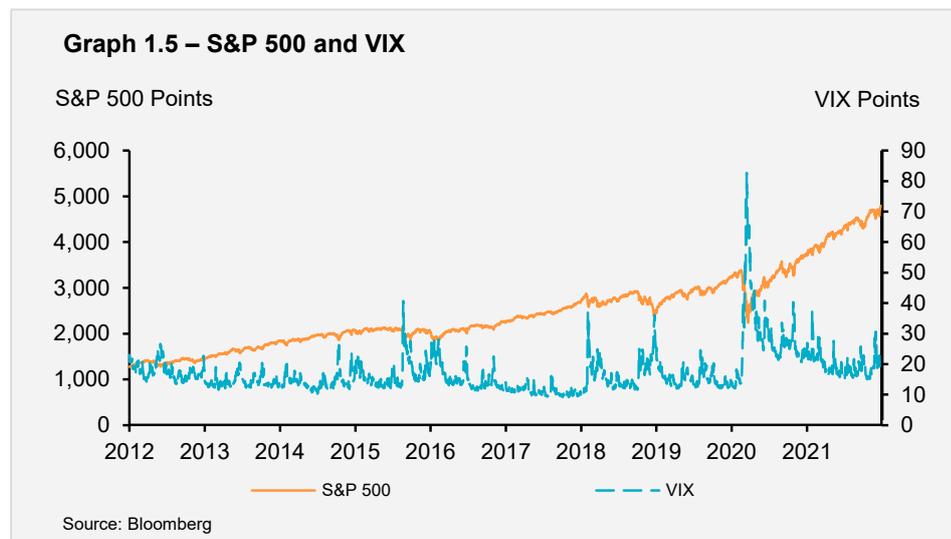
¹ According to page 4 in the link: https://www.bcb.gov.br/content/estatisticas/hist_estatisticassetorexterno/202108_Texto_de_estatisticas_do_setor_externo.pdf.

1.2.2 Financial indicators

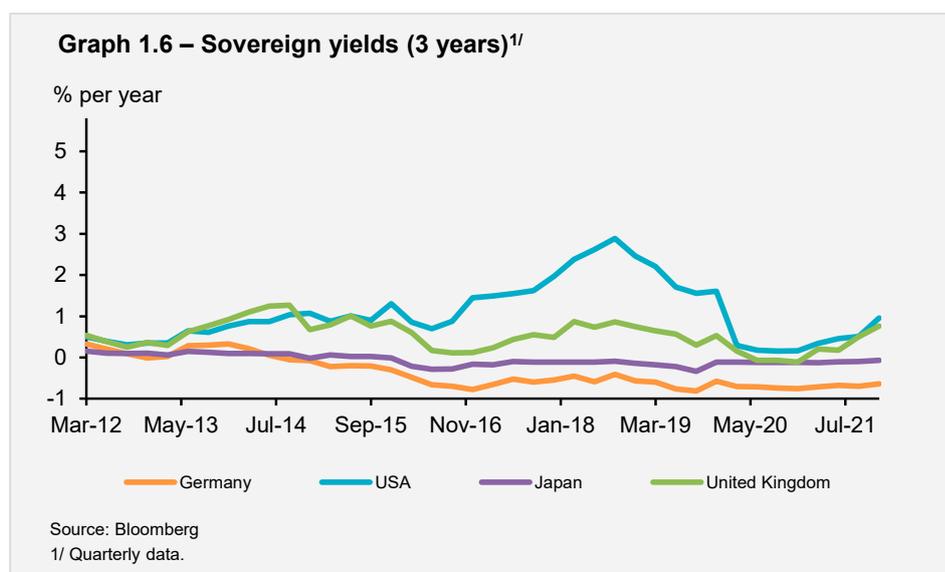
Among the factors affecting the returns of the reserves, we highlight currency, equity and interest rate market indicators. In the currency markets, the value of the US dollar in relation to its counterparts is responsible for part of the international reserves returns. In Graph 1.4, the Dollar Index is plotted alongside the Brazilian real/US dollar exchange rate. Despite the high correlation with the dollar index for the complete period, it is noted that both series presented evolution in opposite directions since the start of the pandemic in 2020, due to idiosyncratic issues of the domestic economy.



Regarding the US stock market, represented in Graph 1.5 by the S&P 500 index and the VIX (risk measure associated with the stock index), 2021 ended with the S&P 500 up 26.89% from the end of 2020. The S&P 500 index was up gradually and consistently throughout 2021, reflecting both the strong economic recovery in the US and globally, and the high availability of liquidity guaranteed by the monetary stimulus regime.



In the case of interest rates, the global fixed income markets in 2021 were marked by the beginning of yield curve rises in the US and UK, given the pressures on the price level in these economies, while others, such as the Eurozone and Japan do not show significant changes. The increase is verified due to the beginning of the cycle of interest rate hikes in the UK and the perspective of the beginning of the benchmark rate hike in the US for 2022. On the other hand, even with some inflationary pressure, the monetary authority in the Euro Zone sees no need for interest rate hikes in the short term. In Japan, inflation remains very low, although it has risen to a positive value.



1.3 Governance

In accordance with Law 4595, from 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 an integrated risk management policy of the BCB. 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.

With regard to 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 security, liquidity, and profitability given that the reserves are traded in an environment of multiple currencies, regions, and time zones.

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, within the GRC, 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 that has a countercyclical behavior and reduces the country's exposure to exchange rate fluctuations. 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. Recently, parameters related to environmental and climate risks are being gradually introduced in the decision-making process as complementary tools both for the selection of investments and for the evaluation of counterparties.

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 institutional preferences of the BCB 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.

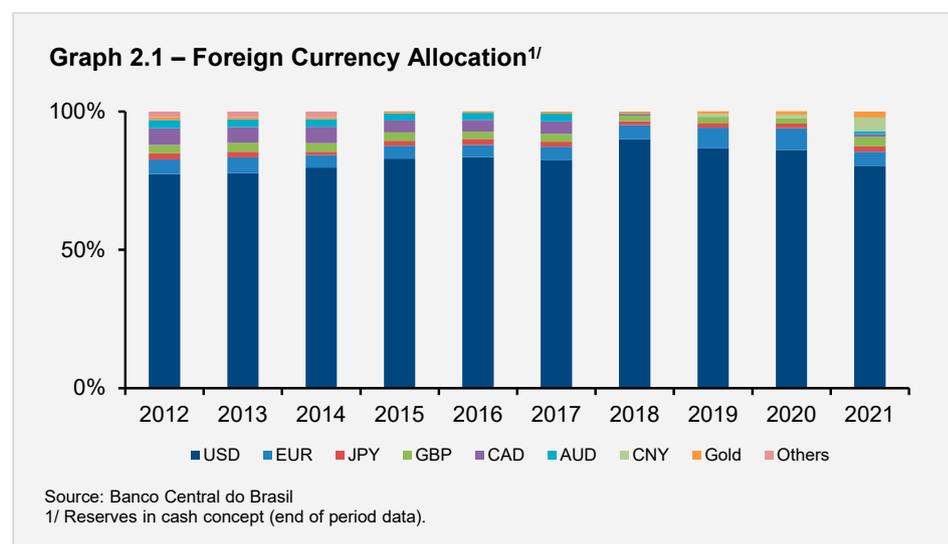
The fundamental aspects of the investment policy of the international reserves are described below. In general, this investment policy can be segmented in terms of distribution by currency, by class of assets and by average investment term. The data shown below have the US dollar as base currency, refer to the portfolio internally managed by the BCB and do not take into account 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 2021, the currency allocation of the reserves was: 80.34% in US dollars, 5.04% in euros, 4.99% in renminbi, 3.47% in sterling pounds, 2.25% in gold, 1.93% in Japanese yen, 1.01% in Canadian dollars and 0.97% in Australian dollars. 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 prejudice to 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, with holdings of approximately 1% each, the renminbi contribution (CNY) was increased to approximately 5% of the portfolio and the position of gold was raised to 2.25% due to its countercyclical characteristics in periods of market stress.



2.2 Composition by asset class

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. The 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

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.

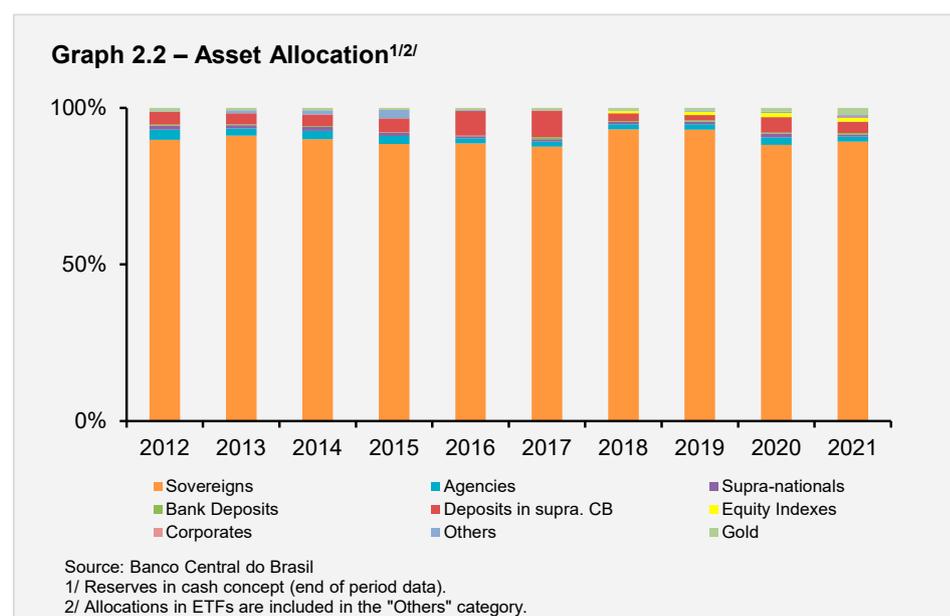
with more limited powers than those of the government of the country to which they belong. In 2018, the BCB began to use exchange-traded funds (ETFs) as instruments, in order to obtain exposure to fixed and variable income markets. Also in 2018, the BCB started to invest in local government bonds (from provinces in countries with high credit ratings).

The following graphs show the allocation in ETFs segmented by Stock Indices and US Corporates Investment Grade. Since 2016, BCB has exposure to US Stocks and, after 2021, exposure to the US Corporates Investment Grade has been added. In the MBS (Mortgage-backed securities) market, investments in ETFs were liquidated, for, in 2021, MBS exposures to be carried out exclusively by means of TBAs (To-be-announced).

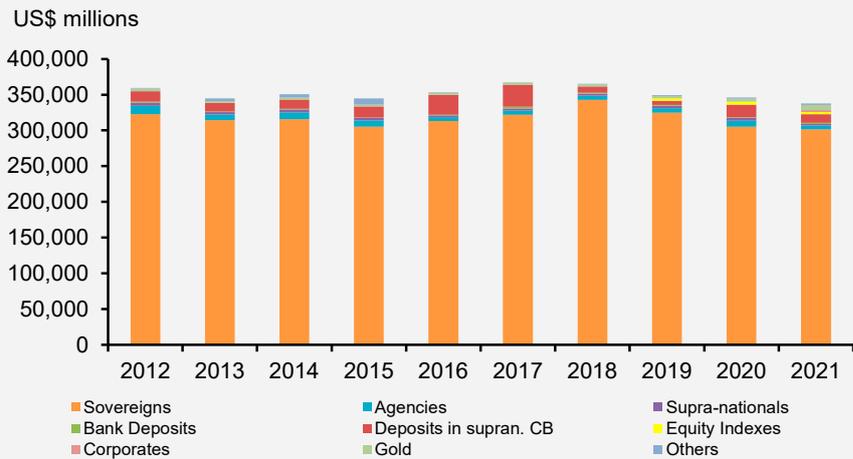
In December 2021, the reserves were allocated as follows: 89.26% in sovereign bonds; 3.61% in deposits in central banks and supranational organizations; 1.64% in agency securities; 1.13% in stock index ETFs; 0.63% in securities of supranational organizations; 0.47% in deposits in commercial banks; 0.44% in US Corporates Investment Grade ETFs; 2.25% in gold; and 0.58% in other asset classes, such as local government bonds. In 2021, the Central Bank included green bonds as an asset class in its investment universe, and these bonds became part of its strategic portfolio. The bonds allowed are issued by governments agencies or supranational organizations, and their shares in the investments are incorporated into the percentages shown above.

TBAs, which are used to implement the investment in US MBS, represented, at the end of the year, approximately 2.97% of the internally managed portfolio. Most of the TBA portfolio cash was invested in US Sovereign Bonds, accounted within the sovereign bonds trench from the previous paragraph.

Graph 2.2 shows the asset class distribution, in percentage terms, in the period from December 2012 to December 2021 (end of period data). Graph 2.3 shows the same evolution in terms of US dollars.



Graph 2.3 – Asset Allocation^{1/2/}

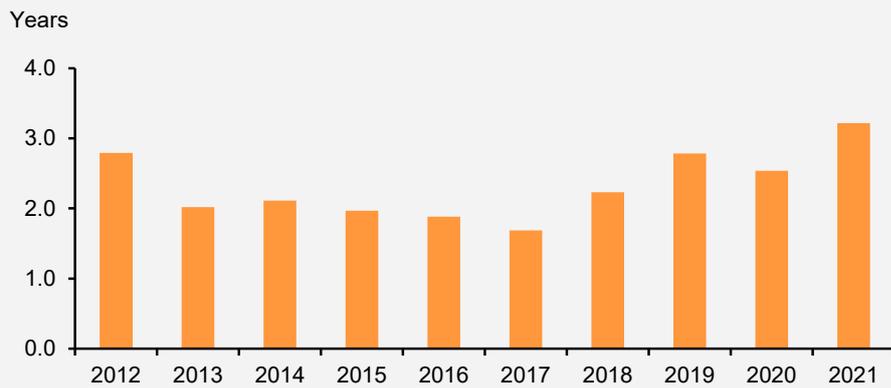


Source: Banco Central do Brasil
 1/ Reserves in cash concept (end of period data). Values in US\$ millions.
 2/ Allocations in ETFs are included in the "Others" category.

2.3 Average term of investment

The choice of the average maturity of the investment of the international reserves reflects the risk preferences of the GRC. It 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 2012 and December 2021 (end of period data).

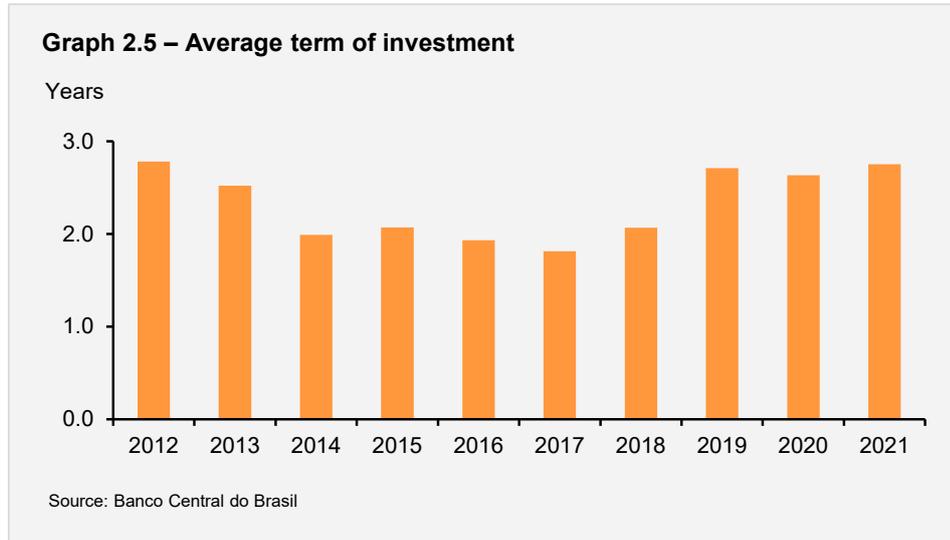
Graph 2.4 – Average term of investment – End of Period^{1/}



Source: Banco Central do Brasil
 1/ Reserves in cash concept (end of period data).

The investment parameters of the international reserves are based on an integrated management of national assets and liabilities. The average term of the external debt, public and private, is considered in the definition of the average term of investment of the reserves. In 2021, there was an increase in the average

term, which ended the year at 3.18 years. When considering the annual mean of the average investment term (Graph 2.5), this increase is also observable in the last year (2.75 years).



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 mentioned before, the different kinds 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.

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 may be 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 has 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 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 classes of assets, 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 currencies that make up the reserves 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). The VaR is a statistical measure related to the volatility of the prices of the assets held in a portfolio, based on the recent history of the risk factors. For a given probability p , the VaR is an estimate of the p quantile of the return distribution of a portfolio for a given time horizon. This means that a loss greater than the VaR should be expected to happen only p fraction of the time.

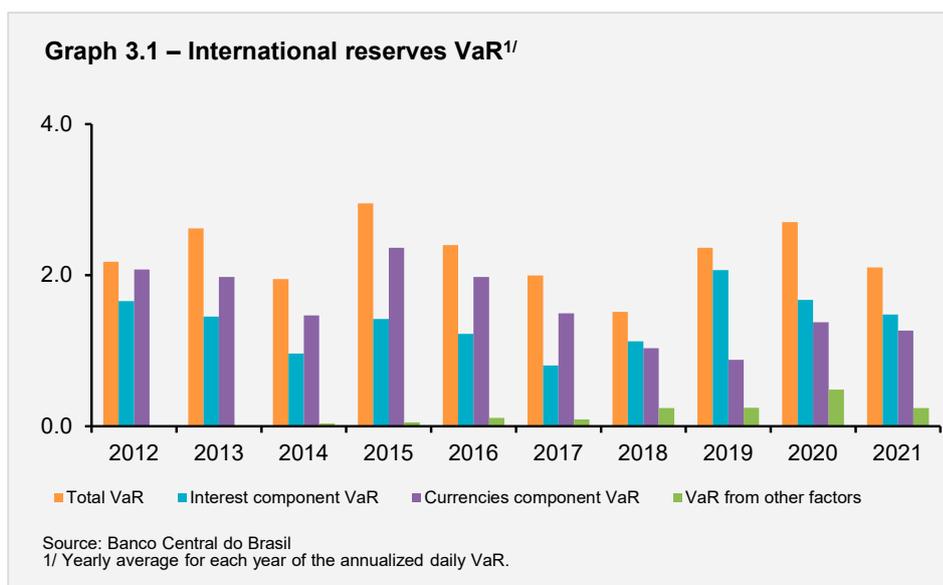
The VaR is calculated on a daily basis for the reserves, with probability 5% for the time horizon of one day. That is, if the return distribution remains the same, a daily loss greater than the VaR should only happen 5% of the days. Besides the total VaR, the BCB also calculates its interest rate and exchange rate components, which are computed by taking into account these two types of risk factors separately.

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. The total VaR reached 2.1% per year on average, down from the value observed in the previous year, which was 2.7%.

In 2021, the interest rate component of the VaR of reserves fell relative to the 2020 annual average, from 1.7% to 1.5%. This is since in 2020 there was a large volatility shock between March and May, which did not occur in 2021. Still, there is an upward trend in volatility in the last quarter of the year.

The currency component of VaR fell from 1.4% to 1.3%. As the allocation has not changed significantly, this drop is a consequence of the lower volatility registered in 2021.

The international reserves have exposures to risk factors related to US stocks and commodities. Despite the increase in exposures in 2021, the volume invested in these classes is small when compared to the total volume of international reserves. Their contribution to risk decreased in 2021 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 0.24% during 2021, compared to 0.48% in 2020.



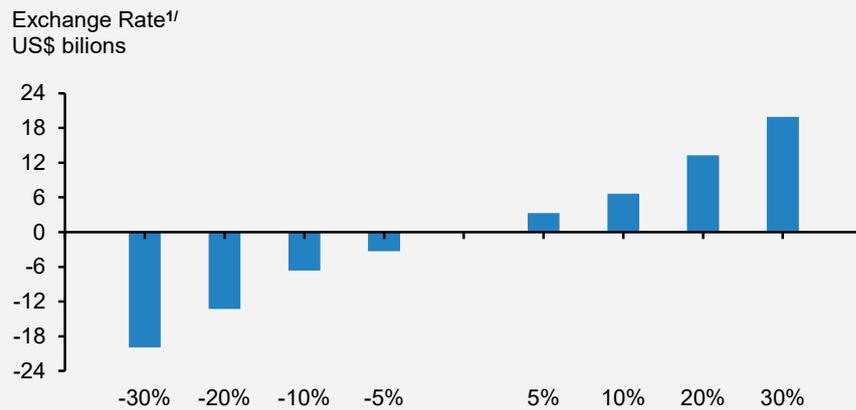
3.1.2 Stress tests

The stress test is another tool used for measuring the market risk of the international reserves' holdings. It seeks to quantify the negative impact of shocks and 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 2021, 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 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.

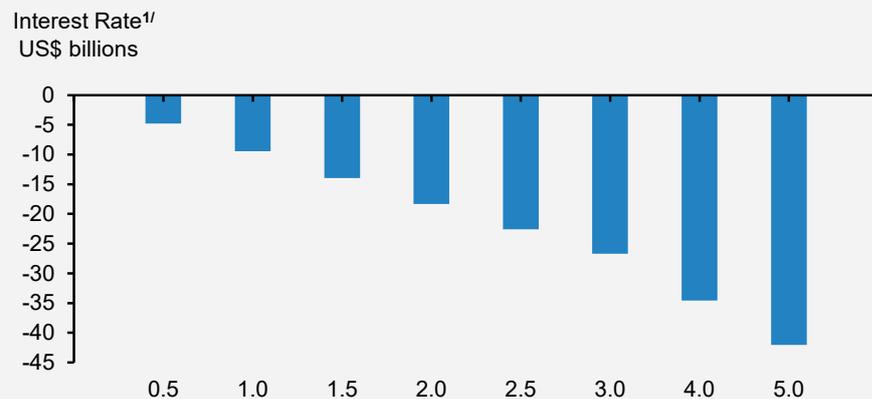
Graph 3.3 shows the results of parallel shifts of 0.5 to 5.0 percentage points to the yield curves of the markets where the reserves are invested. The larger the shift in the international interest rates, the larger the negative effect on the market value of the reserves.

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 12.31.2021.

Graph 3.3 – Interest rate stress test



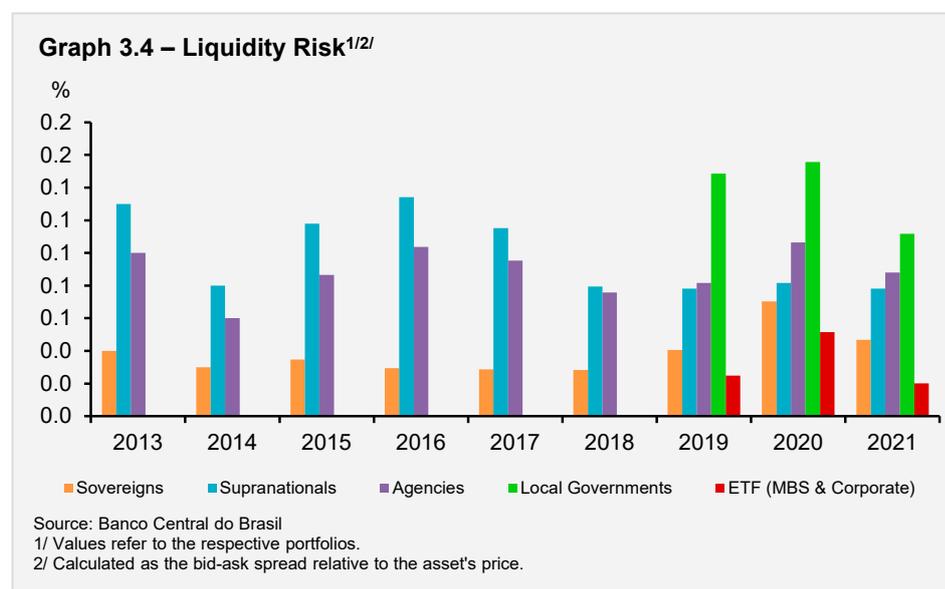
Source: Banco Central do Brasil
1/ Impact of parallel shifts of the yield curves on the value of the international reserves, as of 12.31.2021.

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 taken into account 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. 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).



As we can see in Graph 3.4, the liquidity risk, computed as the difference between bid and ask prices, decreased in 2021 relative to 2020 for all asset classes except for the supranationals. 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. Nonetheless, it is higher than that of the ETFs, which is expected since the latter are traded in stock exchanges.

The liquidity risk measured for sovereign issuers went from 0.0704% in 2020 to 0.0467% in 2021, while it was 0.082% for supranational issuers in 2020 and reached 0.078% in 2021, and for agencies it was 0.106% in 2020 and reduced to 0.088% in 2021; for local governments, it was 0.156% in 2020 and 0.112% in 2021; and for ETFs, it was 0.052% in 2020 and 0.020% in 2021.

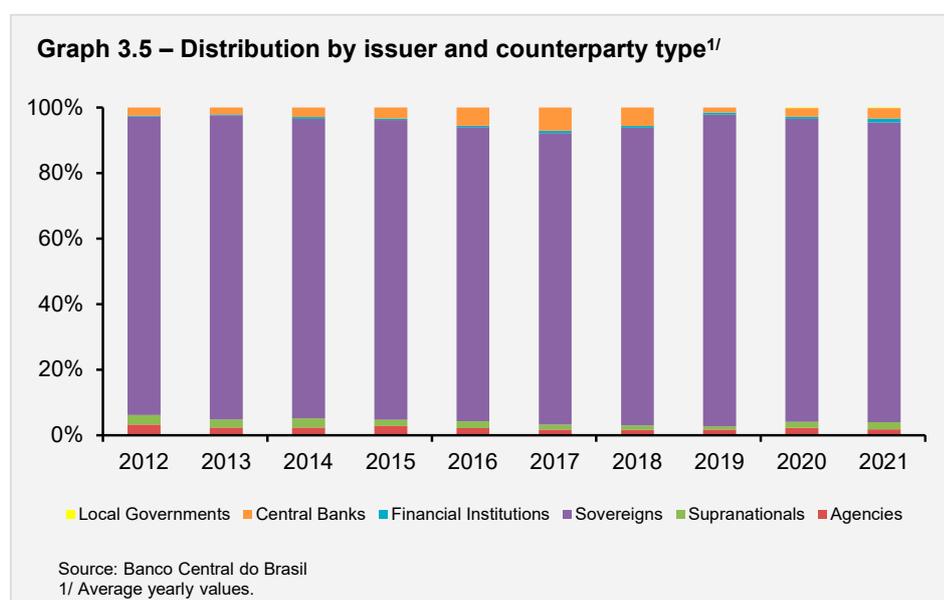
3.3 Credit Risk

The aim of this section is to present the annual evolution of the exposure of the international reserves to credit risk since 2012, 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 (downgrade or default of a counterparty), 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 along the period under analysis, which remained stable throughout the entire period. In 2021, the distribution was similar to that of 2020, with a small relative increase in supranationals, central banks, local governments and financial institutions to the detriment of sovereign and agency bonds.

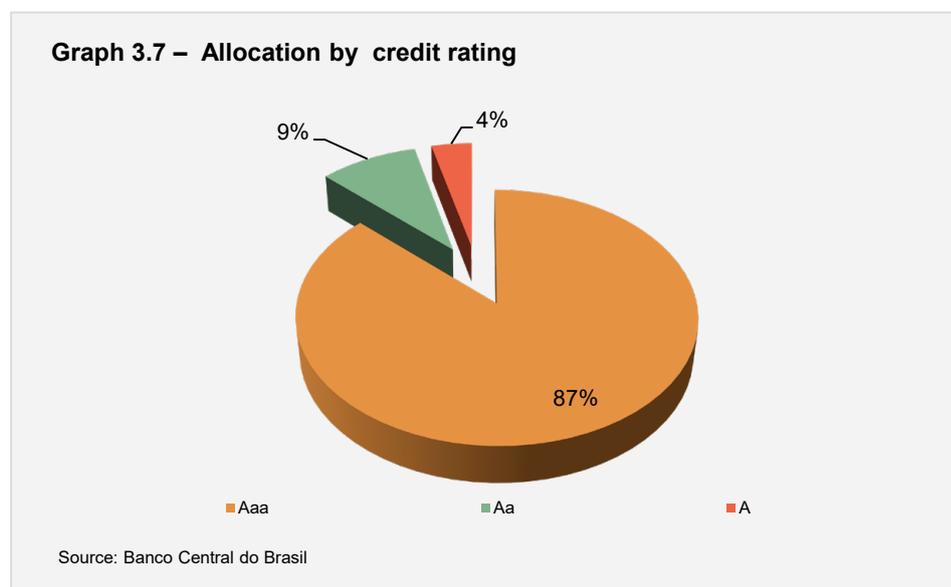
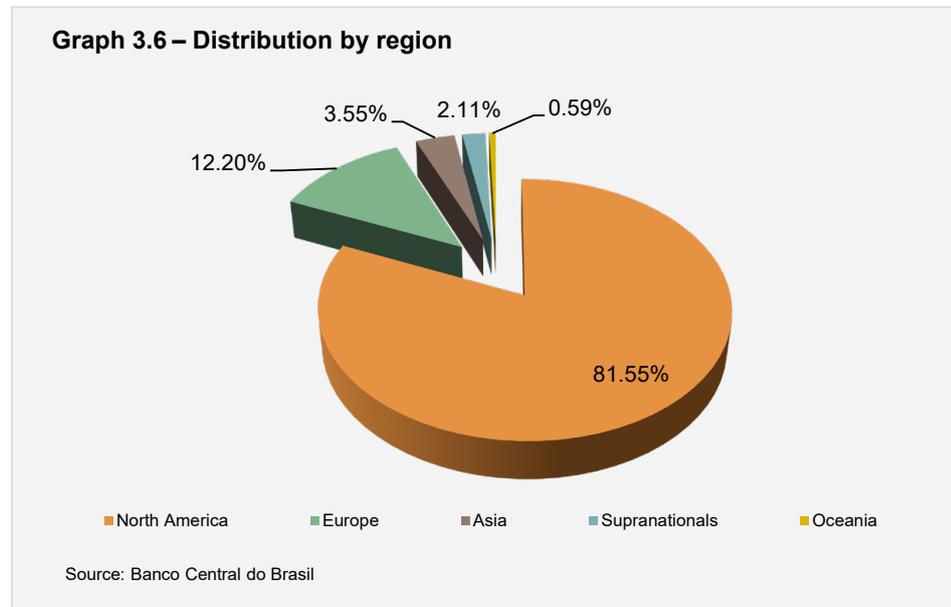


The portfolio's credit risk level is a function of its composition and of the issuers and/or counterparties' credit quality. The individual credit risk of agencies, supranational organizations and local governments authorized for investment by BCB is low due to the limits established, considering that 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.

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.

Graphs 3.6 and 3.7 refer to average exposure data for 2021. The distribution of assets with credit risk by geographic region is shown in Graph 3.6. Most of the allocation (81.55%) 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 distribution by credit risk rating, and we can see that 87% of the exposure has a Aaa rating, whereas 9% has a Aa rating and 4% a A rating.⁵

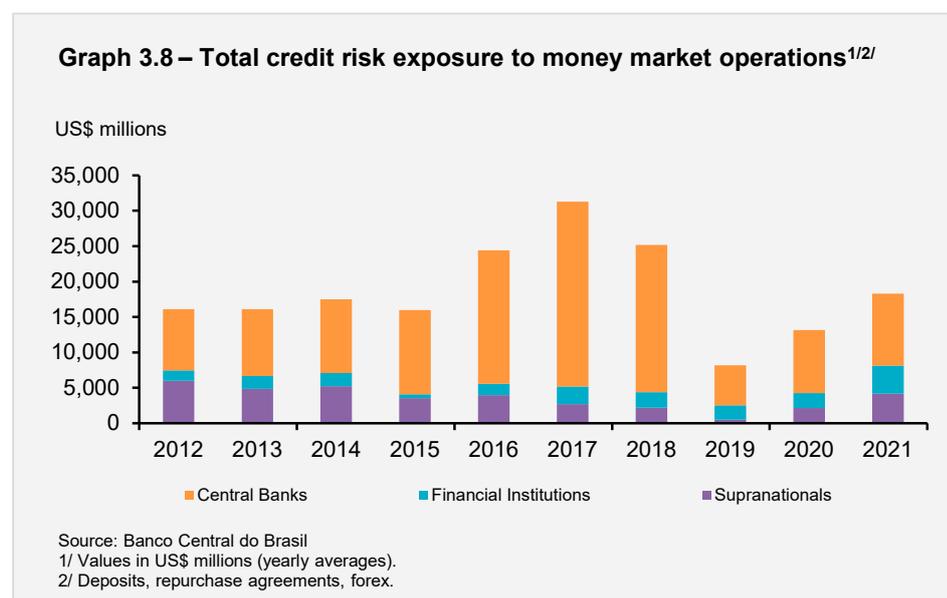


Graph 3.8 shows the exposure’s evolution to credit risk arising from money market instruments.⁶ It should be noted that this exposure is due to time deposit operations, repurchase agreements and/or derivatives such as swaps and forwards with

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

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

financial institutions, central banks and supranational organizations, and does not include bonds. In 2019, the exposure to supranationals and financial institutions decreased considerably due to strategic decisions. In 2021, the volume of money market operations increased in relation to the 2 previous years.



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 main reference in risk management and business continuity such as, Committee of Sponsoring Organizations of the Treadway Commission (COSO), ISO 31000, AS/NZS 4360: 2004, 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 survey, analysis, prioritization, treatment, monitoring and review of risk are: Risk and Control Self-Assessment (RCSA), the Key Risk Indicators (KRIs) and the Event History Log (EHL).

In the RCSAs, the risks associated with each process and their likely 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.

The EHL consists in the creation of a data base of operational risk incidents, which can be of two types: events and quasi-events. This tool makes it possible to monitor incidents as well as analyze trends, which lead to better controls. Taking into account the events that actually took place is a powerful instrument in reevaluating processes, avoiding new losses, and correcting perceptions as to the potential risks of each work process.

With the implementation of an integrated non-financial risk model at the BCB, Key Risk Indicators (KRIs) were developed for evaluation and monitoring of risk. The KRIs, computed in an automated fashion from data generated in the day-to-day execution of tasks, aim to be predictive tools. Since the KRIs are highly correlated with the risks, they help in measuring the level of exposure and in managing the risks themselves. When associated with pre-defined thresholds, they can trigger an alarm, and thus allow a timely implementation of control measures for the risk in question as well as its consequences.

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 security, settlement and profitability in a framework with different currencies, countries and time zones.

For compliance and settlement processes, transaction volume and asset diversification are uniquely important as they represent additional workflows, and thus more exposure to operational risk. In 2021, turnover reached US\$ 4.51 trillion, with 9,906 transactions, an estimated 88,409 SWIFT messages and 748,799 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 2021, the total number of operational incidents represented 2.6% of the total transactions.

4

Returns

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

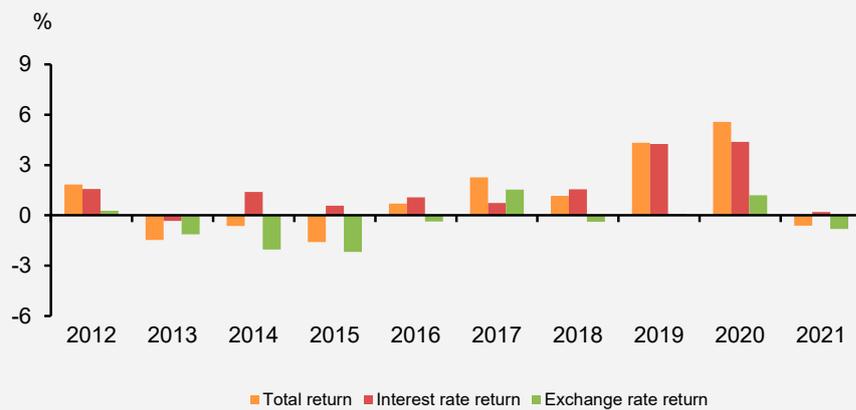
The analysis of returns obtained from the international reserves must be done considering the strategic objectives of the BCB and the different mechanisms used for its calculation. The BCB considers the accounting result for the preparation of its balance sheet and the data from the managerial system 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 levels and the parity of the investment currencies against the US dollar (numeraire currency of the reserves). Over the year, there was a slight increase in interest rates in the USA, offset by a positive result in investments in U.S. inflation-indexed bonds and Chinese government bonds, in addition to gains with the U.S. stock index. This movement generated a positive result with interest rates and other factors of 0.20%. On the other hand, the US dollar appreciated against the other currencies of the reserves, which led to a foreign exchange result of -0.82%. Thus, considering these contributions together, the Brazilian international reserves showed a result of -0.62% in 2021.

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. 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.

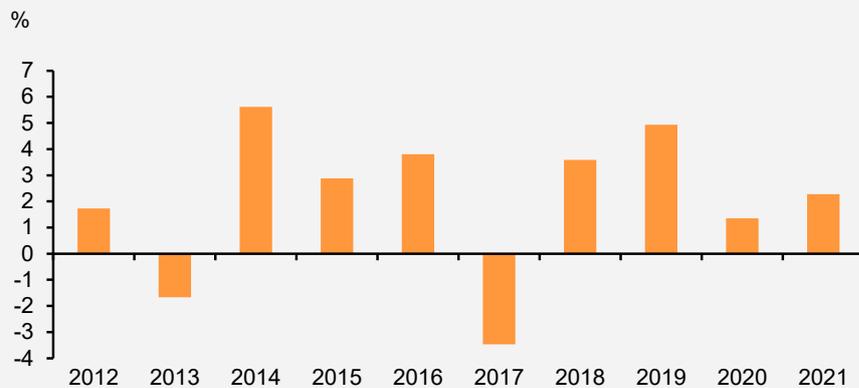
Graph 4.1 – Returns of the international reserves^{1/}



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

On the other hand, considering the Special Drawing Right (SDR)⁷ as the base currency, the result of international reserves was positive by 2.27%, reflecting the fact that the reserves have a higher percentage of U.S. dollar than the composition of the SDR. At the end of 2021, 95.77% of Brazilian international reserves were allocated in the currencies that make up the SDR. The historical result in this currency for the reserves managed internally by the Central Bank is shown in Graph 4.2.

Graph 4.2 – Returns of the international reserves in SDR^{1/}

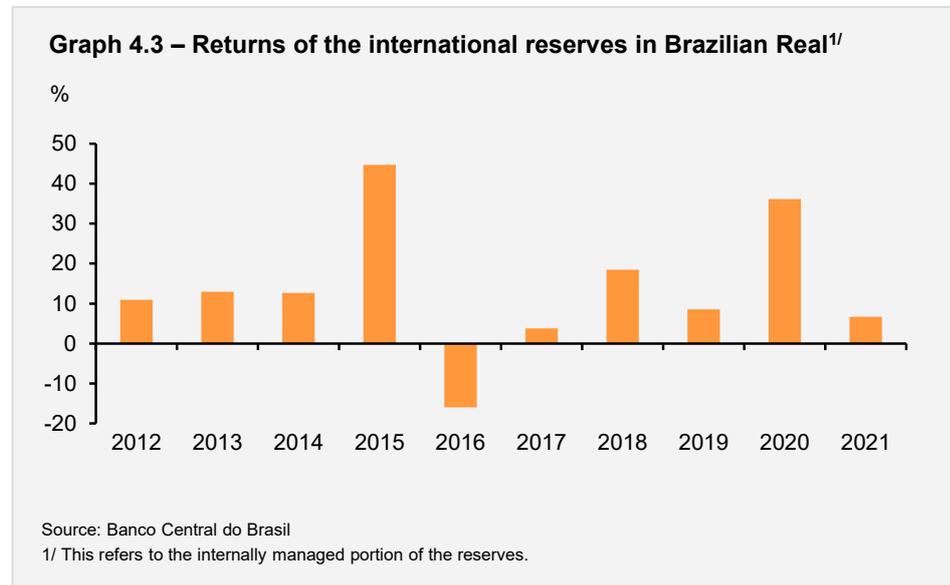


Source: Banco Central do Brasil
 1/ This refers to the internally managed portion of the reserves.

Measuring the returns of the reserves in Brazilian Real brings yet another perspective into the evaluation of the performance. In this case, similarly to the measurement in US dollars, the return is dominated by the exchange rate between the Brazilian Real and the reserve currencies.

⁷ Currency basket defined by the IMF. The SDR is composed of US dollar (41.6%), euro (31.3%), sterling pound (8.2%), Japanese yen (7.4%) and renminbi (11.4%) – as of 12.31.21.

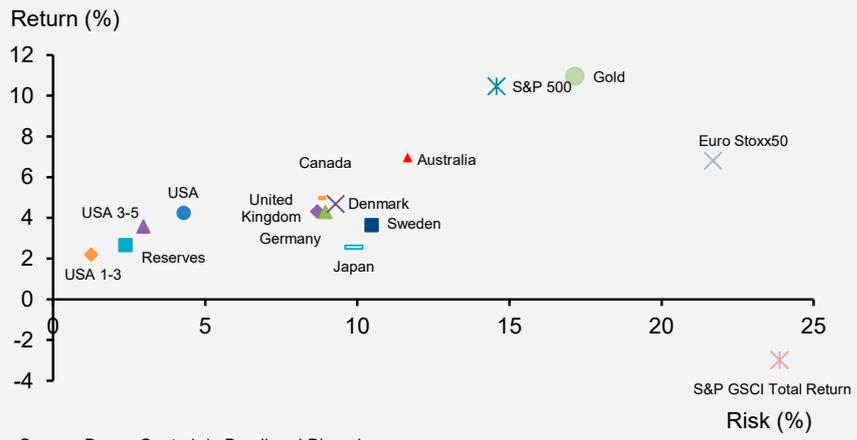
However, since the volatility of the Brazilian Real is significantly higher than that of the US dollar against other currencies, the return measured in this numeraire is even more influenced by the exchange rate fluctuations. The consolidated return of the reserves measured in Brazilian Real in 2021 was 6.72%. Graph 4.3 shows the returns in Brazilian Real over the past 10 years.



4.1 Risk-return profile

This section compares the risk-return profile of investments of the international reserves in the period from June 2004 to December 2021 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 4.4 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 and Japan are also shown in the graph. In addition, the gold, S&P 500, Euro Stoxx 50 and S&P GSCI Total Return 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 Board of Governors.

Graph 4.4 – Risk (%) vs. return (%) profile^{1/2/}



Source: Banco Central do Brasil and Bloomberg

1/ Average return compared to standard deviation (% annually) from Jun/2004 to Dec/2021. US Dollar is base currency.

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 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
2012	77.40%	5.20%	2.30%	3.00%	6.00%	3.00%	0.00%	1.00%	2.10%
2013	77.70%	5.70%	2.00%	3.20%	5.80%	2.70%	0.00%	0.76%	2.14%
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%

1/ Reserves in cash concept (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
2012	89.87%	3.19%	1.23%	0.41%	4.07%			1.00%	0.22%
2013	91.17%	2.31%	1.05%	0.27%	3.47%			0.76%	0.99%
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%

1/ Reserves in cash concept (end of period data).

2/ Allocations in ETFs are included in the "Others" column.

Table 2.3 – Asset Allocation^{1/2/}

Period	Sovereigns	Agencies	Supra-nationals	Bank Deposits	Deposits in supran. CB	Equity Indexes	Corporates	Gold	Others
2012	322,808.50	11,472.40	4,423.14	1,485.20	14,614.54			3,580.96	793.65
2013	314,166.09	7,956.67	3,605.44	919.47	11,961.18			2,602.27	3,393.73
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

1/ Reserves in cash concept (end of period data).

2/ Allocations in ETFs are included in the "Others" column.

Table 2.4 – Average term of investment^{1/}

Period	Years
2012	2.79
2013	2.02
2014	2.11
2015	1.97
2016	1.88
2017	1.69
2018	2.23
2019	2.78
2020	2.54
2021	3.21

1/ Reserves in cash concept (end of period data).

Table 2.5 – Average term of investment^{1/}

Period	Years
2012	2.78
2013	2.52
2014	1.99
2015	2.07
2016	1.93
2017	1.81
2018	2.07
2019	2.71
2020	2.63
2021	2.75

1/ Reserves in cash concept (annual average).

Table 3.1 – International Reserves VaR^{1/}

Period	Total VaR (%)	Interest rate VaR (%)	Currency VaR (%)	Others VaR (%)
2012	2.2	1.7	2.1	0.0
2013	2.6	1.5	2.0	0.0
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

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

Table 3.2 – Forex stress test ^{1/}

Variation	Return US\$ billions
-30.0%	-19.91
-20.0%	-13.27
-10.0%	-6.64
-5.0%	-3.32
5.0%	3.32
10.0%	6.64
20.0%	13.27
30.0%	19.91

1/ Impact of the exchange rate variations against the US dollar on the value of the reserves, as of 12.31.2021.

Table 3.3 – Interest rate stress test^{1/}

Variation	Return US\$ billions
0.5%	-4.8
1.0%	-9.4
1.5%	-13.9
2.0%	-18.3
2.5%	-22.6
3.0%	-26.7
4.0%	-34.6
5.0%	-42.0

1/ Impact of parallel shifts of the yield curves on the value of the international reserves, as of 12.31.2021.

Table 3.4 – Liquidity risk^{1/2/}

Period	Sovereigns (%)	Supranationals (%)	Agencies (%)	Local Gov. (%)	ETF MBS & Corporate (%)
2013	0.04	0.13	0.10		
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

1/ Values correspond to their respective portfolios.

2/ Calculated as the average bid-ask spread.

Table 3.5 – Distribution by issuer and counterparty type

Period	Agencies	Supranationals	Sovereigns	Financial Institutions	Central Banks	Local Governments
2012	3.23%	2.93%	90.98%	0.42%	2.44%	0.00%
2013	2.35%	2.45%	92.81%	0.27%	2.11%	0.00%
2014	2.32%	2.81%	91.36%	0.53%	2.97%	0.00%
2015	2.78%	1.90%	91.48%	0.45%	3.38%	0.00%
2016	2.12%	2.08%	89.81%	0.47%	5.52%	0.00%
2017	1.71%	1.51%	88.96%	0.68%	7.15%	0.00%
2018	1.57%	1.37%	90.82%	0.59%	5.63%	0.00%
2019	1.73%	0.93%	95.17%	0.57%	1.56%	0.00%
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%

Table 3.8 – Total credit risk exposure with money market operations^{1/ 2/}

Period	Supranationals	Financial Institutions	Central banks
2012	5,967	1,485	8,654
2013	4,830	1,833	9,424
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

1/ Values in US\$ millions (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 (%)
2012	1.84	1.57	0.27
2013	-1.46	-0.33	-1.14
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

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

Table 4.2 – Returns of the international reserves in SDR^{1/}

Period	SDR Return (%)
2012	1.73
2013	-1.66
2014	5.62
2015	2.88
2016	3.80
2017	-3.46
2018	3.59
2019	4.93
2020	1.35
2021	2.27

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

Table 4.3 – Returns of the international reserves in Brazilian Real^{1/}

Period	Return in BRL (%)
2012	10.95
2013	12.96
2014	12.67
2015	44.68
2016	-15.95
2017	3.80
2018	18.49
2019	8.53
2020	36.11
2021	6.72

1/ This refers 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