

THIRD RAMP SURVEY



Central Bank Reserve Management Practices

—
INSIGHTS INTO PUBLIC
ASSET MANAGEMENT

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Abstract:

The World Bank Treasury’s Reserve Advisory and Management Partnership (RAMP) conducted its third survey on reserve management practices in 2021. One hundred and nineteen central banks, from different regions, income groups, and reserve levels, contributed to the survey, which included questions on investment policies, asset allocation, risk management, environmental, social, and governance (ESG) investing, and business continuity. The pandemic underlined the importance of safety and liquidity for reserve portfolios. We find that central banks maintained their conservative investment approach, focusing on high-quality fixed-income assets denominated in US dollars and euros. At the same time, against a backdrop of ultra-low interest rates in major economies, we also observe that central banks continued, in their search for yield, to gradually diversify their reserves into more currencies and asset classes within fixed income. Survey results also indicate that central banks’ risk management practices show room for improvement, especially in institutions that have expanded into nontraditional asset classes, including those that invest in corporate credit. Meanwhile, reserve managers could further enhance internal risk and reporting practices to strengthen oversight. ESG investing is still rarely adopted by central banks, and fewer than a quarter of respondents have included ESG objectives in their investment policy. Crucially, this is largely explained by the focus of reserve portfolios on high-quality fixed-income assets, among which ESG instruments and strategies are rarely encountered. We learn that, in order to maintain business continuity, central banks implemented home-based work in 2020, but technological drawbacks and cybersecurity concerns tended significantly to obstruct any ambition to attain fully remote reserve management operations.

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1. Introduction

The World Bank Treasury's Reserve Advisory and Management Partnership (RAMP) launched its third survey on central banks' reserve management practices in the first quarter of 2021. The previous two surveys have allowed central banks to benchmark their practices against those of peer institutions.² Moreover, the data has helped RAMP improve its technical assistance for its members. The goal of this third survey is to continue expanding the understanding of reserve management policies and practices. The three surveys cover essential areas of reserve management and examine their evolution over time.

We conducted the third RAMP survey at the height of the COVID-19 pandemic. Reserve managers faced several unprecedented shocks in 2020. While many governments restricted economic activity and movement to save lives and to combat the spread of the virus, economic activity ground to a halt worldwide. To boost their economies—severely hit by the pandemic in 2020—many central banks in advanced and developing economies introduced unprecedented monetary policy including near-zero or negative policy rates and large asset purchase programs to provide liquidity. Some countries faced extraordinary liquidity needs in foreign currency and had to use their reserves to meet the demand for foreign currency. Additionally, reserve management was more challenging because interest rates decreased sharply—to historically depressed levels—in developed economies, where most portfolios are invested. Finally, central banks had to adjust their operations to confront an extraordinary environment where most staff had to work from home.

This survey continues to expand the understanding of reserve management practices globally. This year, the survey questionnaire covered not only questions on (i) governance; (ii) asset allocation; (iii) portfolio management; and (iv) risk management, but also entailed additional questions on (v) environmental, social, and governance (ESG); (vi) pandemic business continuity; (vii) audit; and (viii) public disclosure. The survey contained 41 questions. Some of the questions gave a pre-defined set of potential responses, while others requested specific data.

² The Inaugural RAMP survey was published in 2019. Ninety-nine central banks responded to our first survey, reflecting data from the first quarter of 2018. The second survey was published in 2020 containing information from 105 central banks with data from the third quarter of 2019.

A record-breaking number of central banks contributed to this survey—119.³

Institutions from different regions, income groups, and reserve levels responded.⁴ Table 1 depicts relevant metrics⁵ and shows that reserve levels and reserve adequacy metrics vary considerably by category.⁶ Although most participants provided extensive information, some did not answer all questions. Accordingly, this report identifies the number of respondents in the text, charts, or tables when presenting survey results.

Survey results are presented in an aggregate format to preserve anonymity.⁷ We aggregate data across different categories, including geographic region, country income group, reserves size, reserve adequacy levels, and monetary policy and exchange rate regimes. To identify changes between surveys and assess differences in the respondents' responses across surveys, we only consider central banks that responded to both surveys.⁸ The report presents the patterns that then emerged. Moreover, the Appendix shows detailed results for the most relevant questions.

³ The percentages reported in this report are based on the number of respondents for each question, where 100 percent refers to the total number of respondents replying to a given question, this being either equal to or below 119. The number of respondents to each question is reported in each chart.

⁴ This report uses the World Bank's customized income group categories based on GNI per capita calculated using the World Bank Atlas Method. It separates countries into "low income" (GNI per capita of US\$1,035 or less in 2020); "lower middle income" (US\$1,036 to US\$4,045); "upper middle income" (US\$4,046 to US\$12,535); and "high income" groups (US\$12,536 or more) (World Bank Group 2020). For the purpose of this analysis, "lower- middle-income" and "low-income" countries have been grouped into the same category.

⁵ The definitions of the categories are set out in such a way that an approximately similar number of institutions is represented in each category.

⁶ The adequacy of central banks' levels of foreign exchange reserves can be measured in various ways, including coverage of imports and short-term debt obligations. Unless otherwise specified, this report uses the term "adequacy" to denote a central bank's possession of sufficient reserve assets to execute its mandate and achieve its objectives.

⁷ Confidentiality facilitates central banks' participation and candid and comprehensive responses, given the sensitive nature of their operations.

⁸ Similarly, we only analyze responses across surveys when the survey questions are comparable.

Table 1. Survey Participants' Reserve Levels and Adequacy Metrics

	NUMBER OF CENTRAL BANKS	AVERAGE GDP PER CAPITA (CURRENT US\$)	AVERAGE TOTAL RESERVES (US\$ MILLION)	AVERAGE TOTAL RESERVES TO GDP	AVERAGE IMPORT COVERAGE (MONTHS)
Geographic region					
Americas & Caribbean	23	9,831	41,376	0.3	5.8
Europe & Central Asia	41	27,769	89,297	0.2	4.2
Middle East & Africa	32	4,554	18,782	0.4	5.3
South & East Asia and Pacific	23	14,932	321,990	0.4	6.9
Country income group					
High income	44	36,851	137,436	0.3	4.3
Upper middle income	34	6,245	164,279	0.4	6.7
Lower middle & low income	41	1,965	25,409	0.2	5.3
Size of assets under management (US\$)					
Less than 3 billion	30	10,061	1,222	0.2	3.4
3 to 10 billion	31	9,498	6,297	0.2	4.9
10 to 50 billion	25	15,657	27,733	0.3	5.6
More than 50 billion	33	26,384	362,272	0.4	7.0
Foreign exchange regime					
Not applicable	2	4,310	896	0.1	1.7
Floating	60	24,449	129,882	0.2	5.0
Soft Peg	50	5,474	87,802	0.4	6.0
Hard Peg	7	16,260	77,775	0.6	5.0
Grand Total	119	15,668	106,937	0.3	5.3

Source: IMF's World Economic Outlook with data as of 2020, and World Bank's World Development Indicators with data as of 2019.

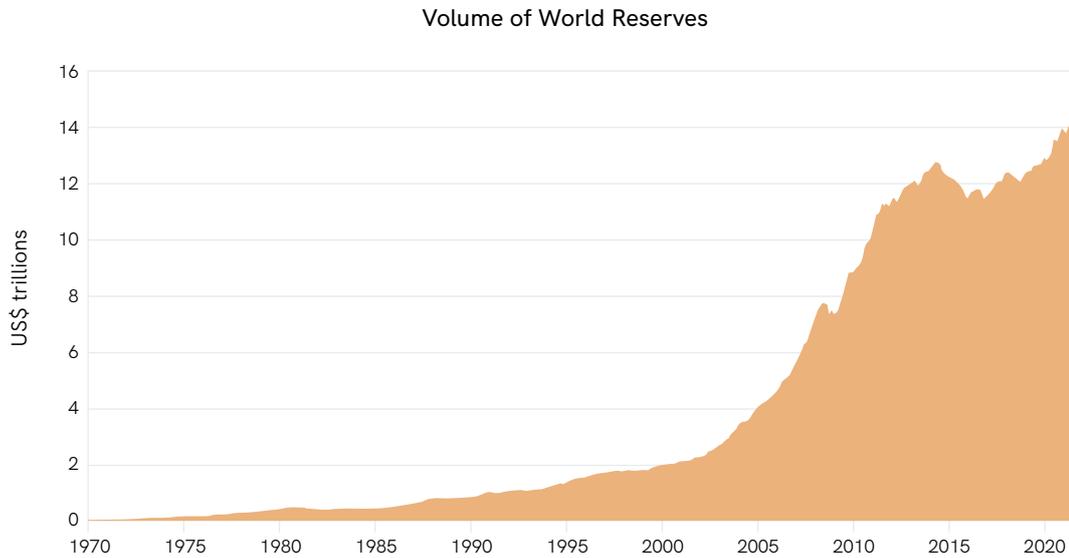
Notes: GDP = gross domestic product.

- Total reserves comprise holdings of monetary gold, special drawing rights, reserves of International Monetary Fund members held by the International Monetary Fund, and holdings of foreign exchange under the control of monetary authorities. The gold component of these reserves is valued at year-end (December 31) London prices. Data are in current US dollars.
- Respondents have been classified using the country income group categories defined by the World Bank as of June 2020.
- The respondent central banks' assets under management (AUM) were categorized into four groups such that each group has a similar number of survey participants.
- All averages are simple averages (not weighted by reserves levels).

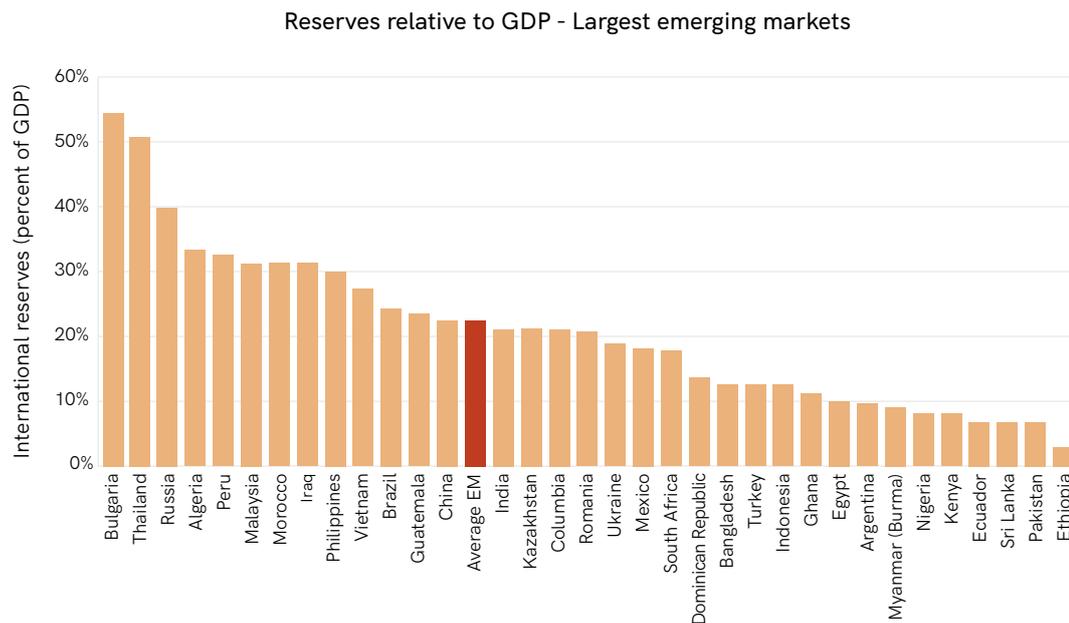
Even though some central banks used reserves to provide foreign liquidity, at the global level, foreign reserves have continued to grow during the pandemic and

are now at historically high levels (Figure 1). Survey participants' reserve levels also grew on average by about 12 percent from the end of 2019 to the end of 2020.

Figure 1. Accumulation of foreign reserves worldwide



Source: International Financial Statistics (IMF).
Note: Last observation as of June 2021.



Source: International Financial Statistics (IMF) as per World Bank country classification.
Note: Data as of 2020. EM=emerging markets.

This report has three parts. Section 2 presents the survey's key findings. Then, section 3 shows more detailed data and discusses significant patterns. Finally, section 4 explains the implications for policy engendered by these findings.

2. Key Findings

The analysis of the survey reveals many critical findings and highlights some changes to reserve management practices. This section summarizes the main results of our survey.

Governance

Concerning **governance**, self-insurance against external shocks remains the primary objective for holding reserves. By contrast to the situation revealed by our 2018 survey, macroeconomic objectives have become more relevant—such as conducting foreign exchange policies and servicing international debt obligations. This could be related to the economic shock that most countries experienced in 2020. Most respondents identify safety and liquidity as the most critical principles in reserve management. Respondents deem these principles to be no less important than they were in 2018; meanwhile, the perceived relevance of income generation decreased. Despite the sharp reduction in interest rates in 2020, the economic crisis may have accentuated the importance of safety and liquidity relative to income generation.

Investment policies: tranching and risk tolerance

In their **investment policies**, three-quarters of respondent central banks divide their reserve portfolios into tranches in the strategic asset allocation (SAA) process, representing a 10 percent drop from our 2020 survey. Central banks with reserves above \$50 billion and those located in Europe and Central Asia and high-income countries are less likely to use tranching. Differences in tranching practices may be the result of specific institutional and macroeconomic conditions.

To define the **institutional risk tolerance**, Value at Risk (VaR), defined as the worst expected portfolio return, is the most common metric that central banks use. Almost half of respondent central banks used this metric, while 43 percent of survey respondents utilize the probability of negative returns. More than 40 percent of central banks use more than one metric.

It is also interesting to note that the preferred risk tolerance metric for high-income and upper-middle-income countries is VaR. In contrast, lower-middle and low-income countries prefer to use the probability of negative returns. By region, central banks in the Americas and the Caribbean prefer to use the probability of negative returns, while those in Europe and Central Asia prefer VaR.

Strategic asset allocation

Compared to our 2020 survey, we observe that central banks have **reduced portfolio duration**, most visibly in the investment tranche. This may indicate that central banks have sought to prepare their portfolios for a potential increase in interest rates once the economic impact of the pandemic subsides.

In terms of **currency composition**, although the US dollar and the euro continue to be the most important currencies in reserve portfolios, central banks expanded eligibility and exposure to other currencies from 2020 to 2021. The most notable change in currency composition is a significant increase in the participation of the Chinese renminbi at the expense of the US dollar, the euro, and the British pound. The average allocation to the Chinese renminbi of respondent central banks amounted to two percent compared to an average 62.5 percent allocation to the US dollar and a 21.5 percent average allocation to the euro.

In line with reserve management objectives, **asset classes with high liquidity and low risk** continue to be the most frequently used instruments in central bank portfolios. Nevertheless, most institutions have small allocations to nontraditional asset classes such as corporate bonds, emerging market bonds, covered bonds, mortgage-backed securities, or equities.⁹ Individual allocations to these asset classes did not exceed five percent on average, compared to a 34 percent average allocation to bonds, a 23 average allocation to bank deposits, a 12 percent average allocation to supranational bonds, and a 10 percent average allocation to money market instruments. Respondents reported an average allocation to gold of eight percent. It is interesting to note that while 60 percent of central banks hold gold in their reserve portfolios, only 20 percent of them include it in their strategic asset allocation. In several countries, historical precedents or the requirement to buy gold from local producers may determine the level of gold holdings.

By income level, the central banks of high-income countries have concentrated their portfolios in government bonds, while lower-middle- and low-income countries tend to favor bank deposits. At the same time, the central banks of high-income countries have the highest average allocation to nontraditional asset classes—13.8 percent on average—followed by their upper-middle-income counterparts (6.5 percent, on average) and lower-middle-income and low-income countries (3.6 percent).

Finally, compared to our 2020 survey, central banks expanded eligibility and exposure to most asset classes within fixed income, indicating an unabated appetite for gradual diversification.

⁹ The criterion for classifying asset classes as nontraditional was whether fewer than 50 percent of the respondents reported the asset class as eligible.

Use of external managers

Central bank reserve managers continue to use external managers in their investment operations. Three-quarters of respondents use external managers. Knowledge transfer and return enhancement are the main motivations to hire external managers. In addition, a significant number of central banks use external managers to create exposure to nontraditional asset classes. Between 2018 and 2021, the number of central banks with external management programs increased marginally from 69 to 72 percent.

Management of credit and market risk

Central banks continued to manage **credit risk** by investing mainly in debt with high credit ratings. As in previous surveys, most participants continue to have minimum ratings in the investment-grade category (BBB+/BBB/BBB- or above). In that category, the most frequent minimum credit rating for all asset classes is A+/A/A-. Rating agencies remain the primary source of information on credit risk, with almost all the survey respondents using credit ratings. In addition, 82 percent of respondents use other methodologies to assess credit risk. At the same time, 53 percent of central banks are not using aggregate credit risk measures. Without these measures, an institution is unable to assess whether credit risk in the portfolio is consistent with its institutional risk tolerance.

Most central banks use duration limits to manage market risk, as reserve portfolios mainly consist of fixed income instruments. However, it is notable that many central banks do not use probabilistic risk metrics as hard limits, for example VaR and expected shortfalls (Conditional VaR). In addition, only 20 percent of central banks that deploy active risk use tracking error and a risk budgeting framework to monitor and manage their active decisions and ensure that they optimally deploy active risk.

The detailed findings on risk management highlight that there is still room for central banks to strengthen their risk management framework. Enhancing risk management practices is particularly important for central banks with corporate credit exposure, diversified portfolios in terms of currency and asset class, and active risk, including deviations from their strategic asset and currency benchmarks.

Reporting on investment results to the board, investment committee, and the public

Survey results indicate that the investment committee usually receives more information on risk and performance than the governor or the board, but reports often lack some key metrics. The investment committee usually has more oversight over the day-to-day management of the portfolios, and it is reasonable that they receive more comprehensive reports. More than half of central banks include the most rel-

evant risk and performance metrics in the investment committee reports. However, most central banks do not report tracking error, credit VaR, or rating breakdowns to the investment committee, the governor, or the board. Improving risk and performance reports, while avoiding excessive frequency or detail, is an essential step to enhance the governance of the investment process.

Environmental, social, and governance (ESG) investing

Survey answers to the questions on ESG reveal that the adoption of ESG investing in reserve management is still low, with fewer than a quarter of respondents having included ESG objectives in their investment policy. A critical limitation here is the focus of reserve portfolios on high-quality fixed-income assets, among which ESG instruments and strategies are rarely encountered.

Having a positive impact and contributing to their reputation are the main drivers of ESG implementation in central banks. Impact investment through green, social, and sustainability bonds is a preferred ESG strategy for central banks that implement this practice. Nonetheless, the proportion of portfolios invested in green, social, and sustainability bonds is minimal, as can be expected given the very modest (albeit increasing) size of this market segment.

Business continuity management

The COVID-19 pandemic placed an enormous operational burden on most institutions. From an operational perspective, roughly half the central banks were not prepared for a pandemic in 2019. Although most institutions changed their work arrangements in response to the pandemic, moving toward a fully remote operation proved to be complex. Remote work arrangements from home were challenging because certain critical functions, especially settlement and payment areas, could not be performed remotely. Cybersecurity and lack of appropriate hardware and software were the main constraints in that respect.

Public disclosure

Although most institutions produce internal reports, disclosing extensive information on reserve management activities to the **public** is not typical. The only data that most central banks (60 percent) reveal are the currency composition of reserves. A significant proportion also publishes eligible asset classes (50 percent), performance (44 percent), and asset allocations (41 percent). Fewer than a quarter of central banks divulge their investment policies, guidelines, risk metrics, or the characteristics of external management programs.

3. Results and Observations

This section provides the survey results and identifies prominent patterns. It also highlights notable changes compared to the previous survey results. The subsections are: (i) governance; (ii) strategic and current asset and currency allocation; (iii) portfolio management; (iv) risk management; (v) ESG; (vi) pandemic business continuity; (vii) audit, and (viii) public disclosure.

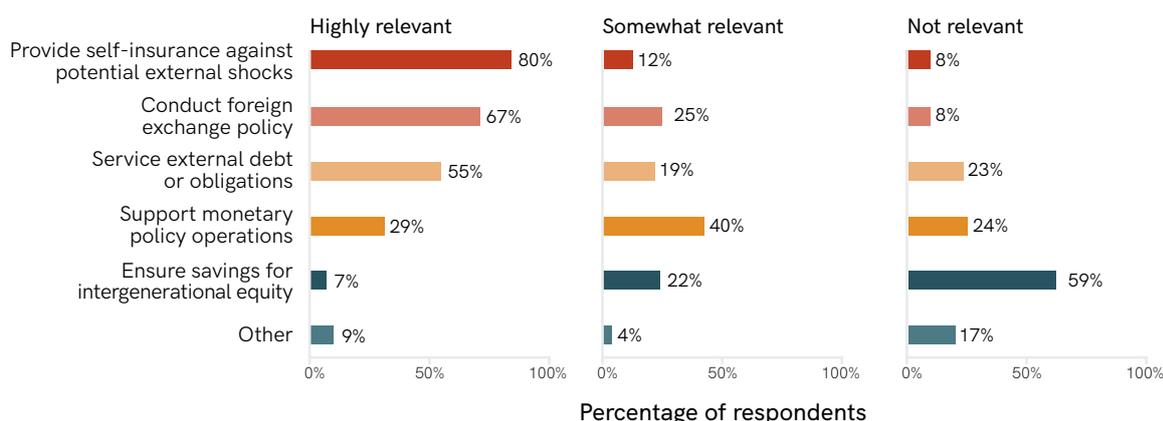
3.1. GOVERNANCE

a. Investment objectives

Central banks have various objectives for holding foreign exchange reserves. These include self-insurance against external shocks, conducting foreign exchange policy, servicing external debt or other obligations, and supporting monetary policy operations. These objectives determine crucial decisions for reserve management, including risk tolerance, investment horizon, and currency and asset allocation.

This survey found that self-insurance against external shocks remains the primary objective for holding reserves. Most respondents (80 percent) consider self-insurance a highly relevant objective (see Figure 2). Conducting foreign exchange policy (67 percent) and servicing external debt or other obligations (55 percent) are also highly relevant. By contrast, few central banks (seven percent) regard saving for intergenerational equity as an investment objective.

Figure 2. Investment Objectives



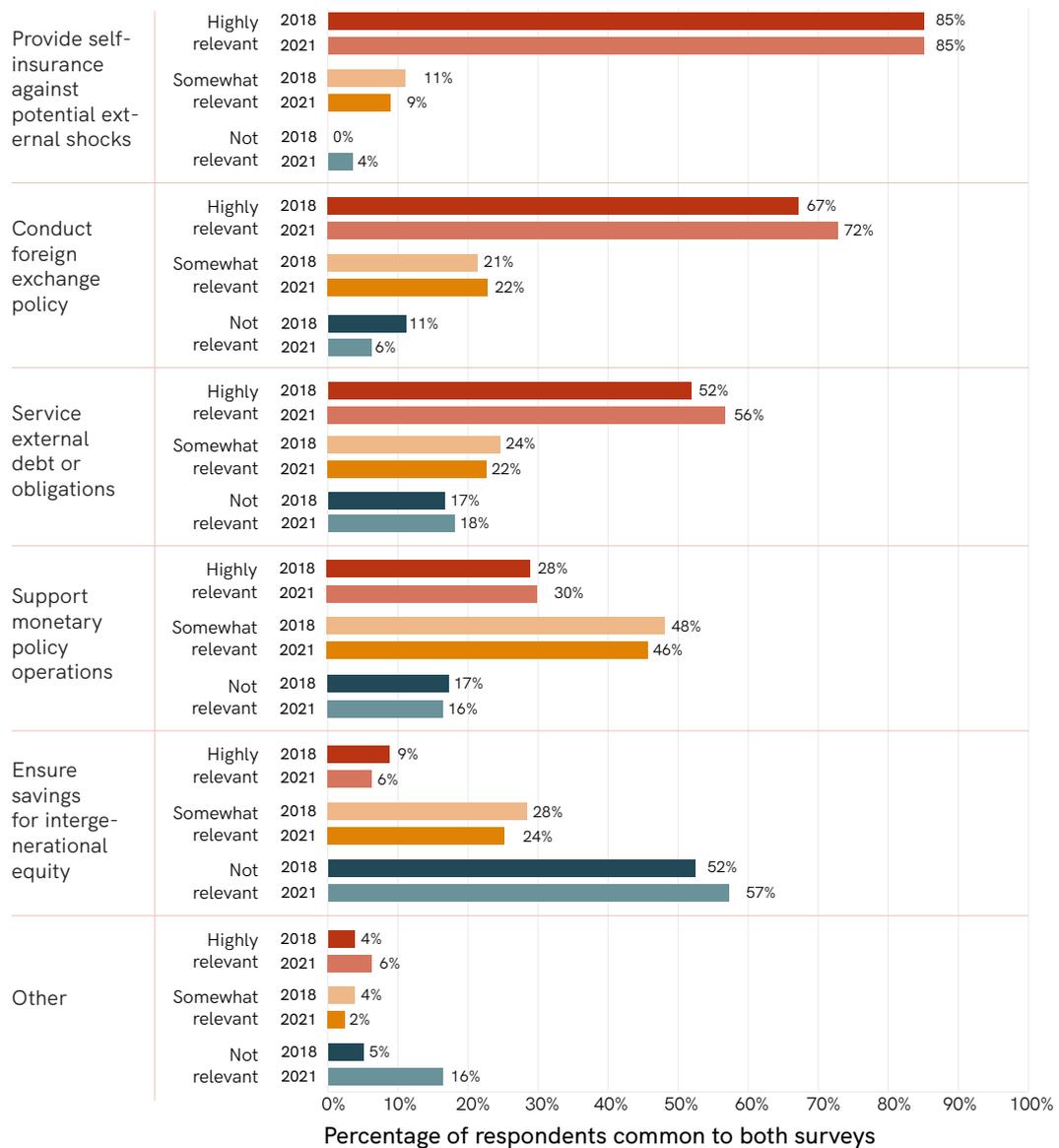
N=119.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: The responses may not add up to 100 percent because some respondents to the question did not classify all choices presented.

Compared to our 2018 survey, the importance of pursuing macroeconomic objectives through reserve accumulation increased while the intergenerational savings objective became less important for respondents.¹⁰ A higher proportion of institutions rank conducting foreign exchange policy, servicing external debt or obligations, and supporting monetary policy operations as highly relevant (Figure 3). On the other hand, the percentage of respondents indicating that saving for intergenerational equity is not relevant increased by seven percent. The COVID-19 pandemic was a black swan event that highlighted to central banks the importance of holding reserves to navigate a challenging macroeconomic environment.

Figure 3. Changes in investment objectives



N= 82.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

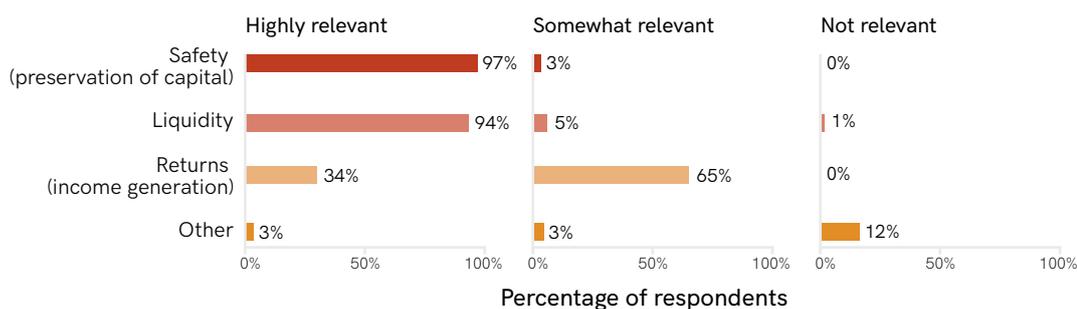
Note: The responses may not add up to 100 percent because some respondents to the question did not classify all choices presented.

¹⁰ This question was included in the first RAMP survey (2019), but not in the second (2020).

b. Investment principles

Safety and liquidity continue to be the essential principles of reserve management (Figure 4). More than 94 percent of respondents identified those principles as highly relevant. By contrast, income generation (returns) was highly relevant for only a third of central banks. For the majority (65 percent), income generation was somewhat relevant. As foreign reserves are a significant component of central banks' balance sheets, returns matter for these institutions, but less than safety and liquidity.

Figure 4. Investment Principles



N=119.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: The responses may not add up to 100 percent because some respondents to the question did not classify all choices.

Respondents judged that safety and liquidity were as crucial in 2021 as in 2018, but the perceived relevance of income generation as an objective of reserve management activity decreased.¹¹ More than 96 percent of central banks classified safety and liquidity as highly relevant in 2018 and 2021. However, the percentage of respondents that considered returns as highly relevant decreased slightly (by seven percent). Similarly, more respondents now consider income generation as somewhat relevant (an eight percent increase).¹² Despite the sharp reduction in interest rates in 2020 in major economies, the economic crisis and market volatility may have accentuated the importance of safety and liquidity for central banks in line with their objective, while income generation may now appear less significant.

¹¹ This question was included in the first RAMP survey (2019), but not in the second (2020).

¹² We cannot discern any geographic pattern.

3.2. STRATEGIC ASSET ALLOCATION

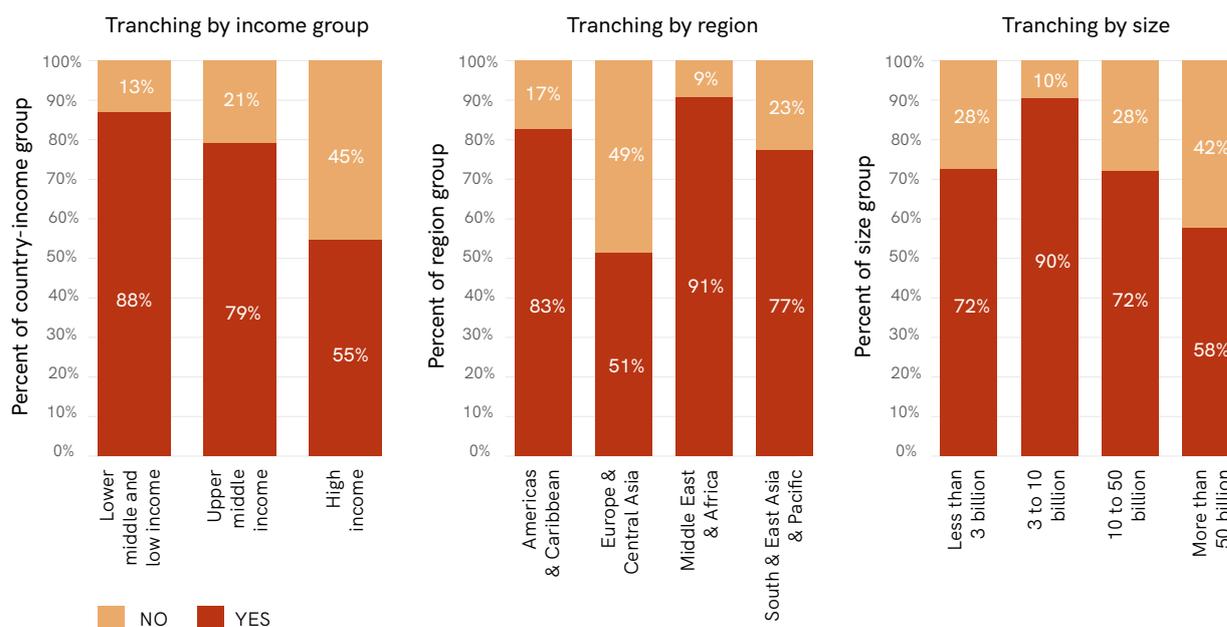
a. Tranching

Dividing reserve portfolios into tranches is common in the strategic asset allocation process. Typically, central banks divide reserve portfolios into tranches—such as those for working capital, liquidity, and investment—which differ by investment objectives, liquidity needs, and investment horizon. Seventy-three percent of the respondents use this practice. Interestingly, the proportion of respondents that use tranching decreased by 10 percent from 2020 to 2021, explained mostly by more central banks responding to this question. As noted in the previous RAMP surveys, some central banks may find tranching helpful in enhancing diversification and lengthening the portfolio's investment horizon (the investment tranche). A tranching framework may make it easier for staff to communicate objectives linked to specific portfolio tranches more easily to their board and investment committee. From a methodological standpoint, institutions can achieve both—diversifying their reserves and extending the investment horizon—without tranching.

While most central banks use a tranching framework, we found substantial differences across central banks. Figure 5 shows tranching by size, region, and income group. Most institutions with reserves between \$3 and \$10 billion, those located in the Americas and the Caribbean, Middle East and Africa, and those in lower-middle and low-income countries used tranching. By contrast, central banks less likely to have significant short-term liquidity needs (reserves above \$50 billion, located in Europe, or other high-income countries, and with floating exchange rate regimes) were less likely to tranche their reserve portfolios, which may explain why their portfolios carry more risk.¹³

¹³ Central banks without tranches have a longer average investment horizon (36 versus 25 months in central banks with tranches), a higher average duration (23 versus 17 months), and a higher average allocation to nontraditional asset classes (11 percent versus 7 percent).

Figure 5. Tranching by size, region, and income group



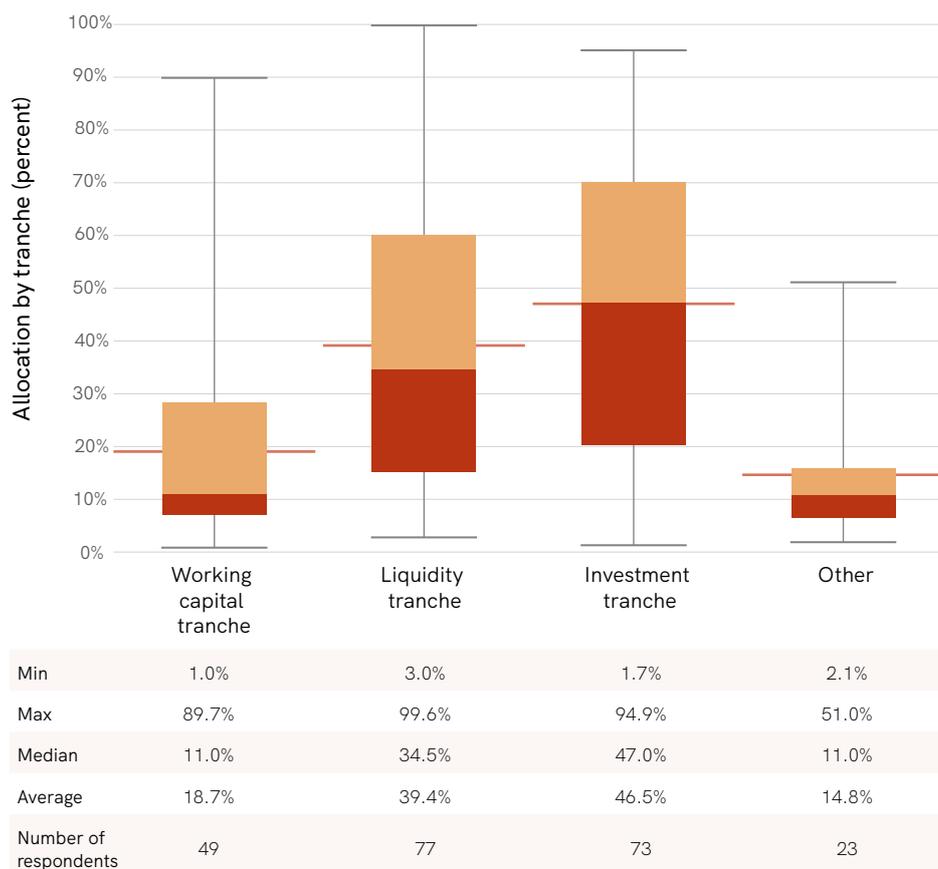
N=118.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

The survey results indicate that the investment tranche accounts for the largest share of reserves, followed by the liquidity and working capital tranches. Figure 6 shows a box plot with the distribution of the allocation of the tranches in reserve portfolios, identifying the minimum, the second quartile group, the median, the third quartile group, and the maximum of our survey respondents. The investment tranche accounted on average for 46 percent of total reserves. In contrast, the liquidity and working capital tranches accounted for an average of 39 and 19 percent, respectively. Empirical evidence indicates that central banks may determine the size of the liquidity tranche on the basis of reserve adequacy metrics.¹⁴ If that were to hold, then the considerable size of the average investment tranche would suggest that many respondent central banks have adequate reserves to cover short- and medium-term liquidity to manage their macroeconomic objectives.

¹⁴ According to Heller 1966, there are three motives for holding international reserves: transactional, speculative, or precautionary. Empirical results (see, for example, Aizenman 2007) support precautionary (versus mercantilist) motives. In this case, reserves play the role of self-insurance against sudden stops in capital flows. Jeanne and Rancière (2011) develop a model of the optimal level of international reserves for a small open economy. The model focuses on the benefits of holding reserves for crisis mitigation and the reduction of the probability of sudden stops and is consistent with the average level of reserves in emerging market countries since 1980, with the exception of Asia since 1998.

Figure 6. Participation of tranches in reserve portfolios



N=78.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: The distribution for each tranche is based on the total number responding to the question. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

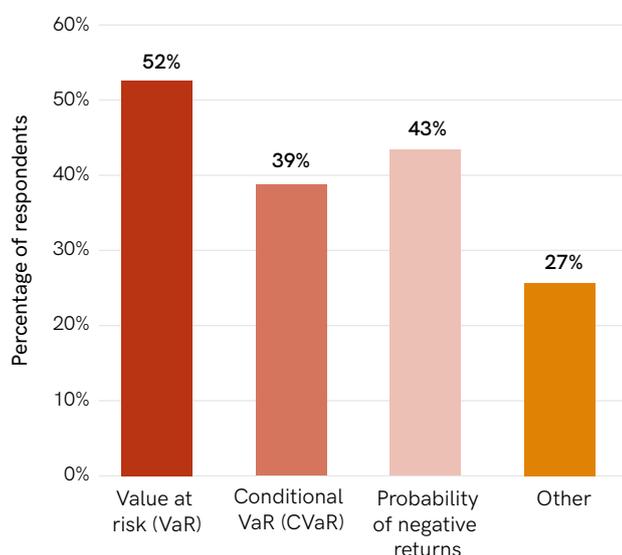
b. Risk Tolerance and Investment Horizon

Almost half of the respondents use a Value at Risk (VaR) metric to explain the risk tolerance of their reserve management operations. VaR is defined as the worst expected return of the portfolio over a predefined probability and time horizon. Forty-three percent of institutions used the probability of negative returns, and 39 percent of respondents deployed Conditional Value at Risk (CVaR) (Figure 7) to state the risk tolerance of their reserve management operations. Roughly 40 percent of respondents use more than one metric.¹⁵ The preferred risk tolerance metric for high-income and upper-middle-income countries was VaR, while lower-middle and low-income countries preferred to use the probability of negative

¹⁵ Setting a probability of negative returns at 5 percent is equivalent to a VaR of zero percent with 95 percent confidence.

returns. By region, central banks in the Middle East and Africa preferred to use the probability of negative returns. In contrast, those in Europe preferred VaR, which may reflect the yield level available in their major reserve currency. Finally, central banks with less than \$10 billion in reserves prefer to use the probability of negative returns, while those with more than that amount prefer VaR.

Figure 7. Metric to define risk tolerance in Strategic Asset Allocation (SAA) framework



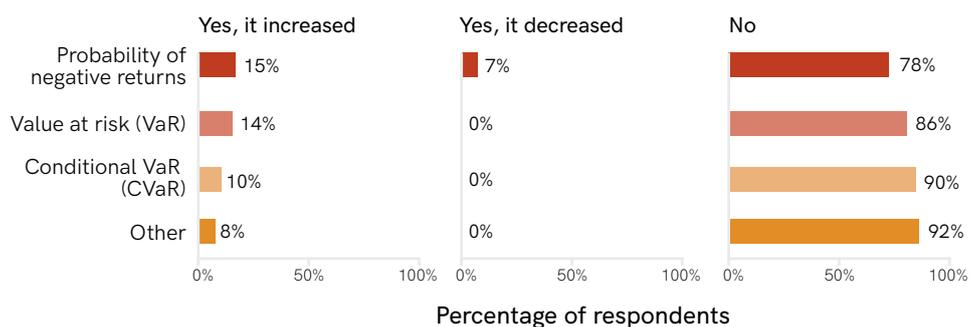
N=114.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Our survey finds that some central banks decided to increase their risk tolerance levels during 2020, probably in response to the low-yield environment and the increased levels of market volatility.

When asked whether central banks changed their risk tolerance measures in 2020, 15 percent of respondents that use the probability of negative returns reported increasing the threshold for negative returns. Fourteen percent of respondents increased the absolute level of VaR, and 10 percent increased the absolute level of CVaR (Figure 8). The small proportion of central banks that increased their institutional risk tolerance probably had to respond to the low-yield environment and the increased levels of market volatility to maintain their strategic asset allocation. Again, with yields closer to zero percent—or even below, in many major economies—there is an increased probability of negative returns on fixed-income instruments. Thus, the accrued interest is not enough to compensate for potential decreases in market prices. Events in the US Treasury markets in March 2020 and the bouts of market volatility during 2020 may explain why some institutions also decided to increase the threshold for their VaR and CVaR measures. When asked whether institutions added or excluded risk tolerance metrics, almost all institutions responded that they did not change the number of risk measures used. During 2020, nearly all institutions neither added new risk measures nor excluded existing ones.

Figure 8. Changes in thresholds of risk tolerance metrics



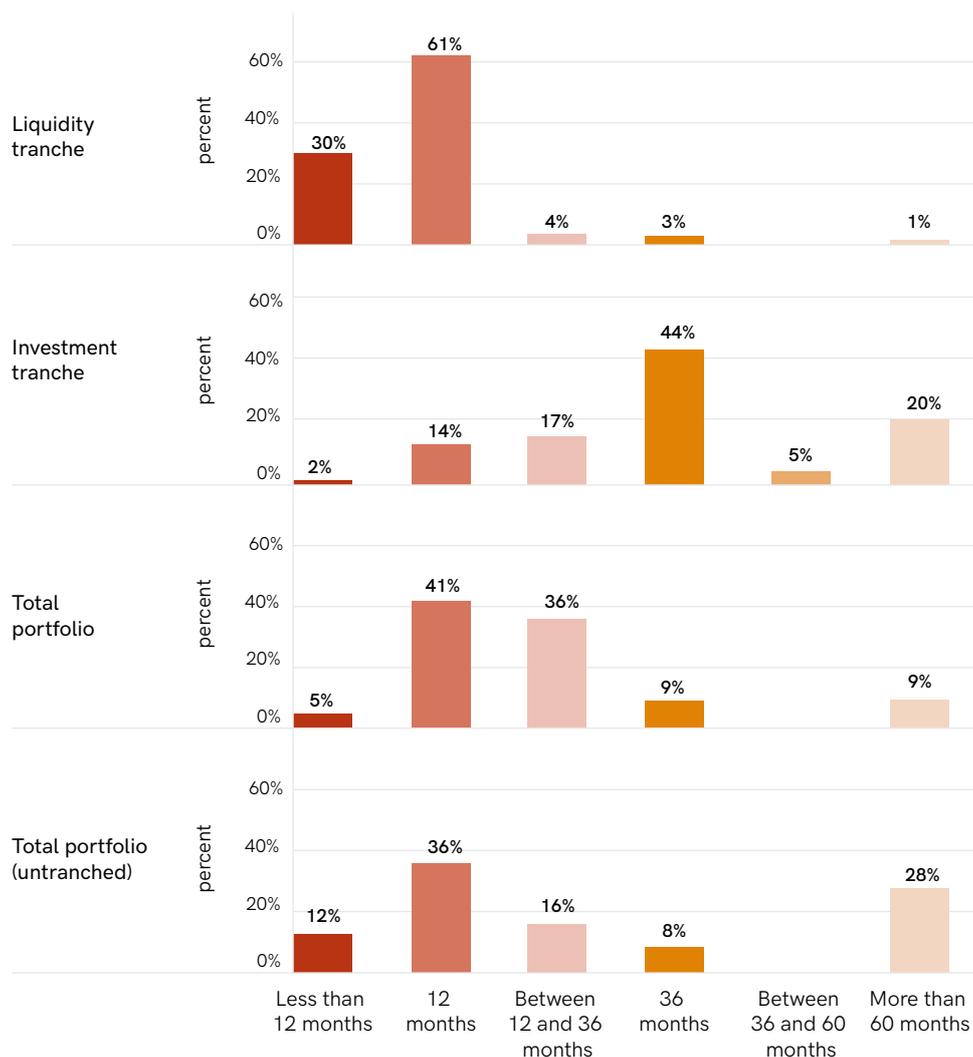
N=115.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Not surprisingly, for central banks that use a tranching framework, the duration of the investment tranche is substantially higher than that of the liquidity portfolio. Reserve managers assign a different investment objective to the investment tranche. They typically use the tranche to construct investment portfolios with a longer investment horizon than the liquidity tranche to pursue higher returns.¹⁶ Our survey results confirm this notion. Survey respondents reported an average investment horizon of 42 months for their investment tranche compared to 13 months for the liquidity tranche (Figure 9).

¹⁶ Siegel (2008) argues that a longer investment horizon goes hand in hand with an increasing ability to take risk and increase expected returns.

Figure 9. Investment horizon of tranches and total portfolio

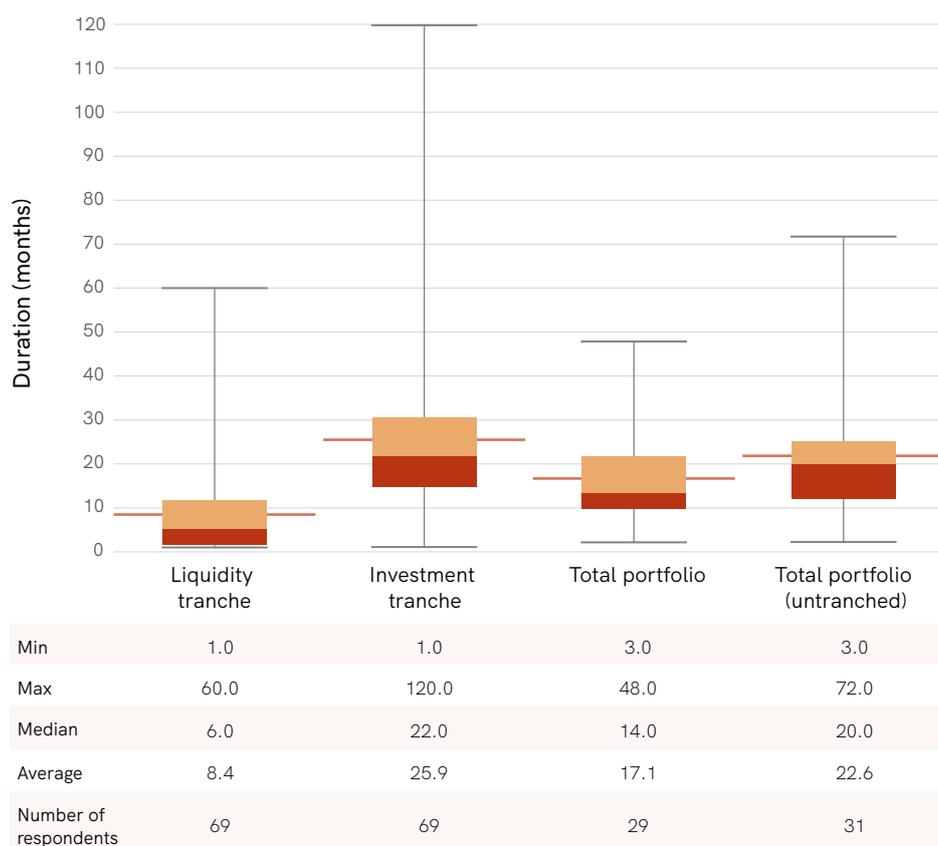


N=111.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

In line with their portfolio objectives, central banks continue to hold portfolios of low duration, and the average duration of their total portfolio stood at 22 months at the end of 2020. Figure 10 illustrates that central banks without a tranching framework had a higher overall average portfolio duration (23 months) than those with tranching frameworks (17 months).

Figure 10. Duration of total portfolio and by tranche



N=80 and N=31 for untranching.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

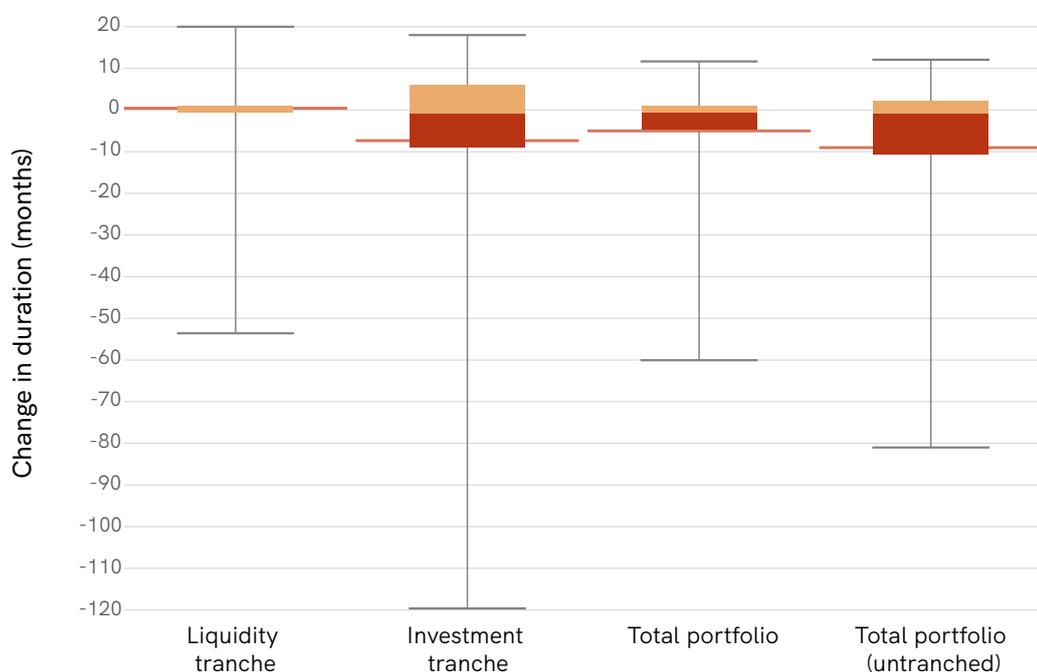
Note: The distribution of the duration for each tranche is based on the total number responding to the question. This figure displays the minimum, the second quartile group, the median, the third quartile group, and the maximum of the duration to each tranche and the portfolio as a whole. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Comparing survey results of 2021 with those of 2020, we find that central banks reduced portfolio duration significantly—by an average of seven months. Central banks without a tranching framework decreased the average duration of their portfolio slightly more, by eight months, on average (Figure 11). Central banks with a tranching framework mainly reduced the duration of the investment tranche while leaving that of the liquidity tranche essentially unchanged.

The shortening of duration from 2020 to 2021 is probably a reaction to the ultra-low interest rates seen during most of 2020 and may therefore be temporary. As major central banks continued to use all of the tools at their disposal to provide monetary policy stimulus with the onset of COVID, yields on fixed-income securities decreased substantially. By shortening the duration, reserve managers may be

preparing their portfolio for a potential increase in rates when major central banks unwind their unprecedented policies as the global economy recovers from the pandemic.

Figure 11. Changes in duration (compared to the previous survey)



	Liquidity tranche	Investment tranche	Total portfolio	Total portfolio (untranchéd)
Min	-53.0	-120.0	-60.0	-81.0
Max	21.0	19.0	12.0	13.0
Median	0.0	0.0	0.0	0.0
Average	0.4	-7.2	-4.6	-8.4
Number of respondents	48	48	21	15

N=72.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks, Second RAMP survey on the Reserve Management Practices of Central Banks.

Note: The distribution of the duration for each tranche is based on the total number responding to the question. This figure displays the minimum, the second quartile group, the median, the third quartile group, and the maximum of the duration to each tranche and the portfolio as a whole. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

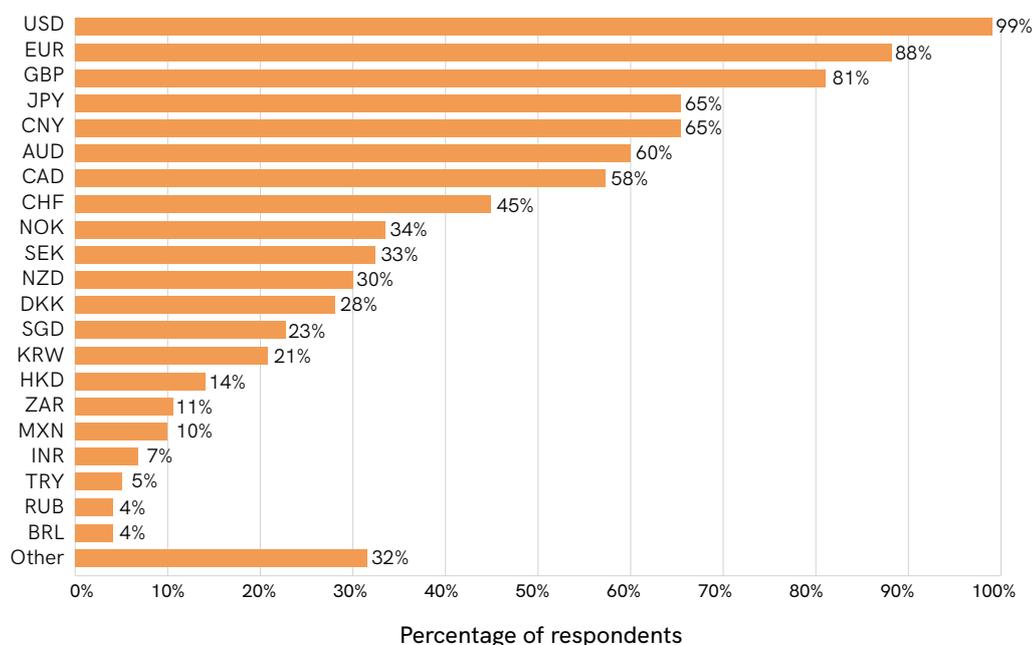
c. Eligible Currencies and Actual Currency Composition of Reserves

Some authors argue that the composition of the balance of payments and portfolio management objectives help explain the currency composition of reserve portfolios (Wang 2019). Here, the structure and denomination of external debt,

intervention needs, and asset and liability management may significantly influence the currency composition of reserves. On the other hand, central banks also consider the liquidity profile of assets denominated in different currencies to determine eligible currencies (depending on their desire to diversify currency exposure). While the structure of the balance of payments is more important for the currency composition of the liquidity tranche, portfolio management concerns play a more critical role in shaping the design of the investment tranche (Alekasir et al. 2019).

The US dollar continues to be the most widely allowed currency in reserve portfolios. Nearly all respondents indicated that they could invest in the US dollar. Most institutions also allow investments in the other currencies that make up the special drawing rights (SDR) basket: 88 percent can invest in the euro, 81 percent in the British pound, 65 percent in the Japanese yen, and 65 percent in the Chinese renminbi (Figure 12). Notably, the Australian and Canadian currencies are also eligible for more than half of central banks.

Figure 12. Percentage of respondents that may hold each currency as part of their foreign exchange reserves



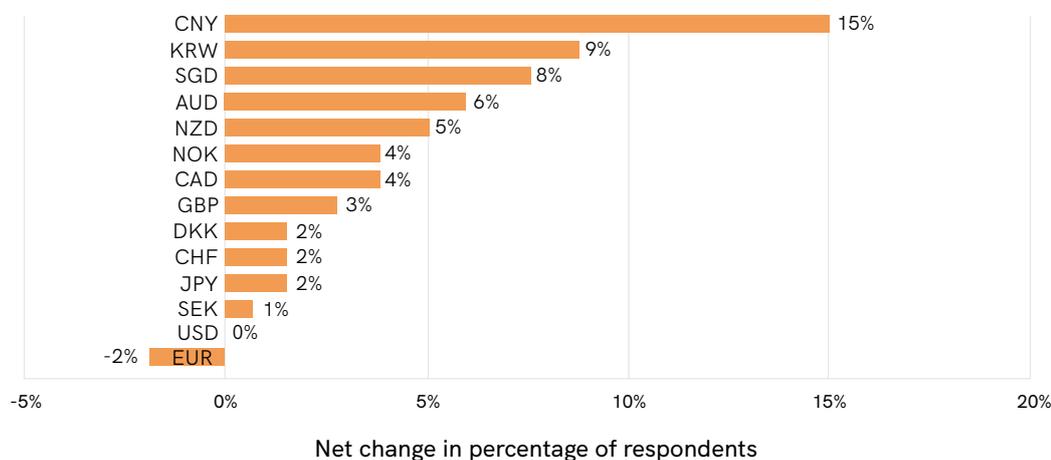
N=113.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Since our last survey in 2020, central banks have expanded the list of eligible currencies considerably. The Chinese renminbi (CNY) notably benefitted from this development. Now two-thirds of institutions allow CNY investments, on a par with the Japanese yen (JPY). The eligibility of the Chinese currency had increased by 15 percent compared to our last survey. At the same time, central banks also

expanded into other currencies and away from the US dollar and the euro (see Figure 13). Some notable examples of this trend include the Australian dollar, the Canadian dollar, and some Asian currencies, such as the Singaporean dollar or the Korean won.

Figure 13. Changes in currency eligibility (compared to the previous survey)



N=97.

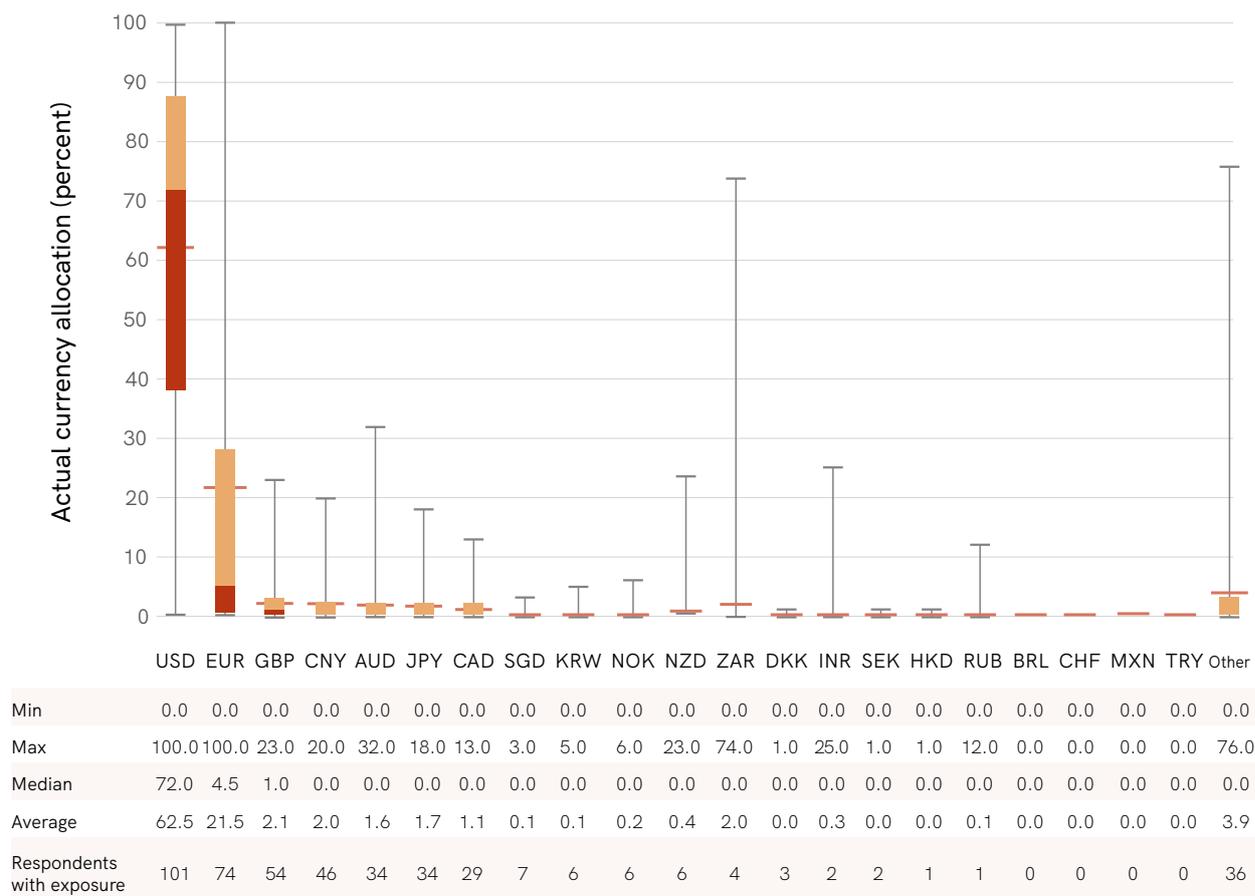
Source: Third RAMP survey on the Reserve Management Practices of Central Banks, Second RAMP survey on the Reserve Management Practices of Central Banks.

The US dollar still predominated in reserve portfolios, followed by the euro. In 2021, respondent central banks allocated an average of 62.5 percent of their reserves to the US dollar, followed by the euro, to which they assigned an average of 21.5 percent of reserves. These results are consistent with the IMF’s Currency Composition of Official Foreign Exchange Reserves (COFER),¹⁷ although it is worth noting that the IMF reports the aggregate currency composition across all countries while this survey analyzes the distribution of individual responses. Figure 14 shows the distribution range of the currency composition of all respondents’ foreign exchange holdings, including those that reported no allocation to the respective currency. In the case of the euro, although a small number of central banks had large allocations to the currency, most respondents had small exposures or no allocation.¹⁸ The individual average allocations to all other currencies are still relatively low (below three percent). However, taken together, exposure to currencies other than the US dollar and the euro accounted for an average of 16 percent of reserve portfolios, suggesting that most portfolios have small exposures to multiple currencies.

¹⁷ <https://data.imf.org/?sk=E6A5F467-C14B-4AA8-9F6D-5A09EC4E62A4>

¹⁸ The median allocation to the US dollar is 72 percent, and the average is 63 percent. In the case of the euro, the median allocation is 5 percent, and the average is 22 percent.

Figure 14. Distribution of allocations to individual currencies



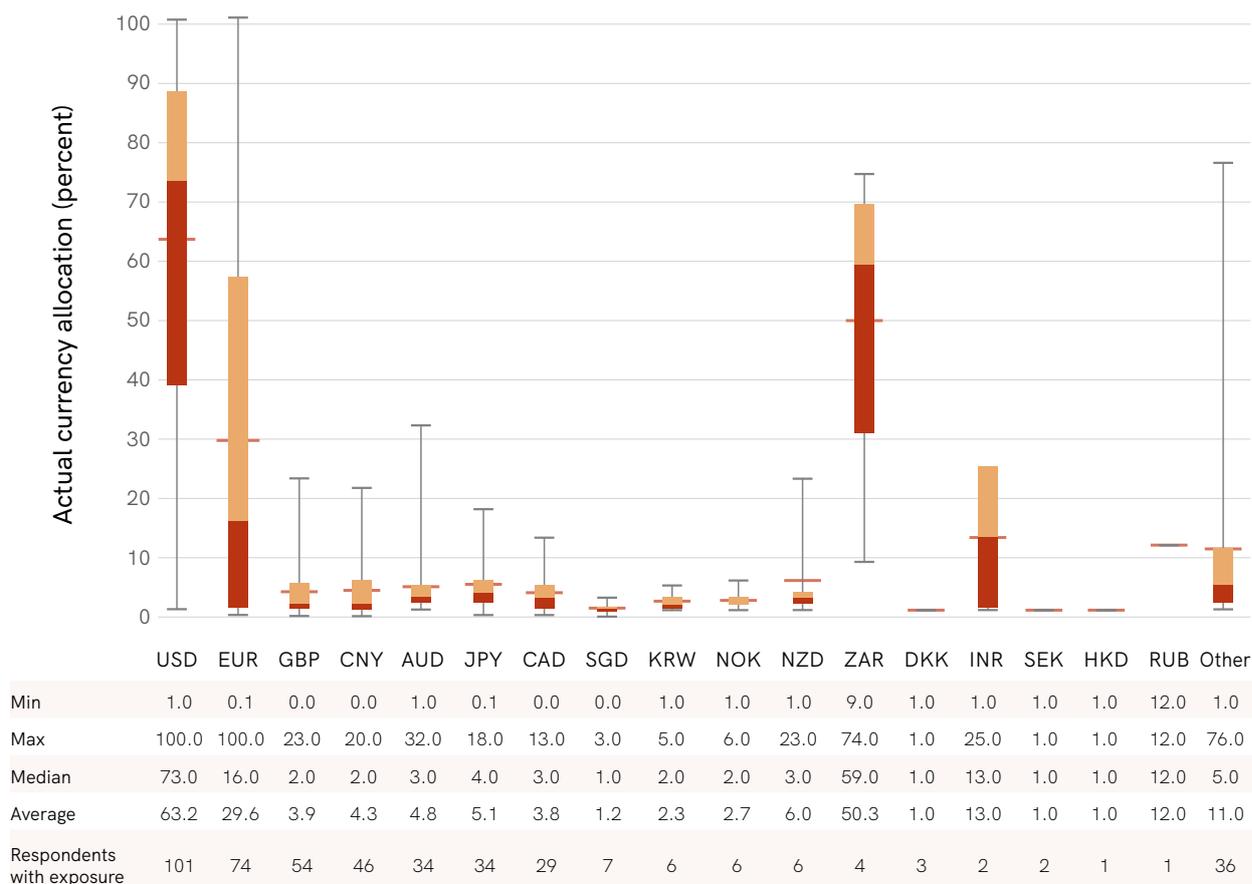
N=102.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: This figure displays the distribution of the actual allocation to the different currencies. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for the 102 respondents to the question. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Considering only the central banks with exposure, the US dollar and the euro maintain their significant lead in the reserve currency space (Figure 15). More than half of the surveyed central banks had exposure to the British pound, and their average allocation amounted to 3.9 percent. Exposure to CNY accounted for the fourth-highest number of central banks (with an exposure that averages 4.3 percent). A third of respondents also had exposure to the Japanese yen (average share of 5.1 percent) and the Australian dollar (average share of 4.8 percent).

Figure 15. Distribution of allocations to individual currencies for respondents with exposure



N=102.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: This figure displays the distribution of the actual allocation to the different currencies. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for the 102 respondents to the question. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Analyzing the currency composition of central banks by region, income group, and reserve level, we find that trade and financial flows are important inputs for this allocation decision(Table 2).¹⁹ As noted, the average central bank in the survey held 62.5 percent of the portfolio in US dollars and 21.5 percent in euros. However, countries in the Americas and the Caribbean had the greatest average exposure to the US dollar (91 percent). In comparison, countries in Europe had the largest average allocation to the euro (41.6 percent). By income group, the participation of the US dollar was higher in middle- and low-income countries. The share of the euro was greater in high-income countries: this is in keeping with its importance in

¹⁹ Ito and McCauley (2019) also show that the currency composition of reserves relates strongly to the co-movement of the domestic currency with key currency and the currency invoicing of trade.

Europe. With regard to reserve levels, the participation of the dollar decreased, and that of the euro increased with increasing size of reserves. These results suggest that countries with smaller reserves and lower-income levels concentrated on the US dollar because of the currency's importance in global trade and financial flows.

Table 2. The average allocation to individual currencies by geographic region, country income group, and size

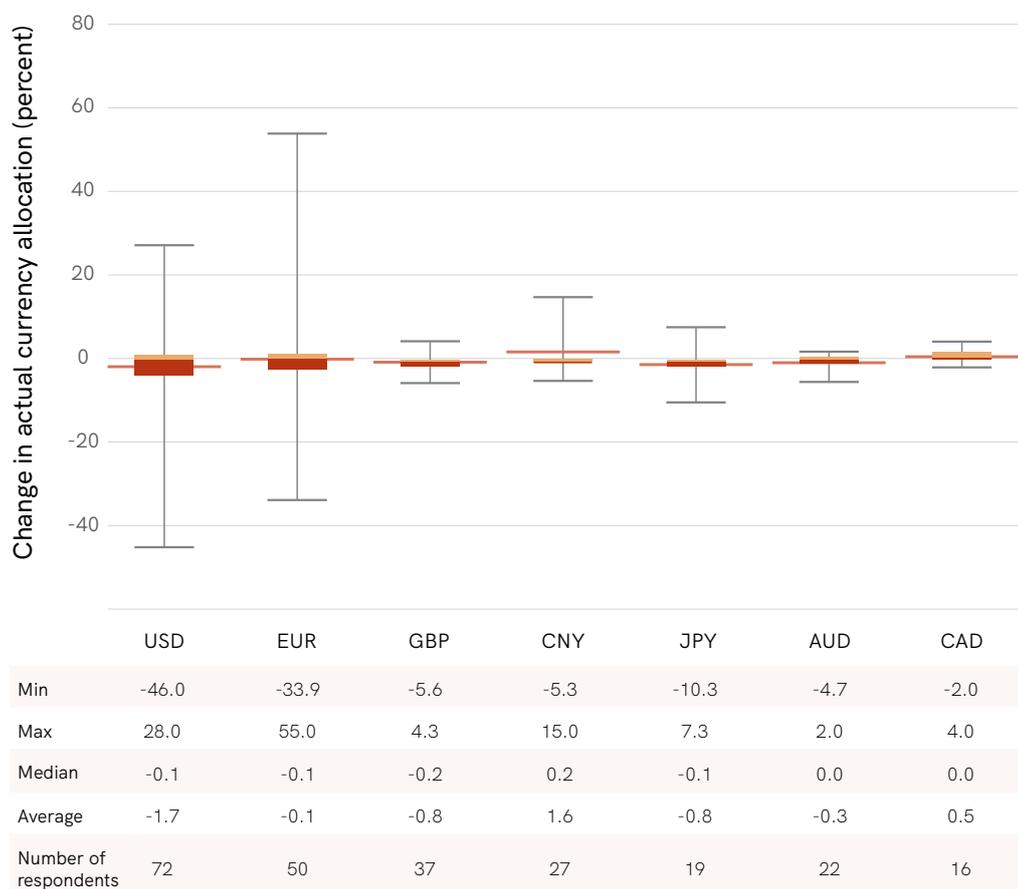
Geographic region	USD	EUR	GBP	CNY	JPY
Americas & Caribbean	91.4	2.1	2.1	0.7	0.4
Europe & Central Asia	41.1	41.6	2.4	1.5	3.2
Middle East & Africa	66.8	16.3	1.6	2.7	0.5
South & East Asia and Pacific	68.7	5.1	2.3	3.7	2.4
Country-income group					
High income	52.7	30.3	3.3	1.2	3.3
Upper middle income	64.4	21.7	1.4	1.6	1.0
Lower middle & low income	72.0	11.4	1.3	3.1	0.5
Size of assets under management (US\$)					
Less than 3 billion	66.3	16.8	1.5	0.9	0.3
3 to 10 billion	64.5	25.0	1.9	1.9	1.1
10 to 50 billion	59.6	24.6	2.5	3.6	3.2
More than 50 billion	58.6	19.9	2.7	1.7	2.7
Foreign exchange regime					
Not applicable	20.5	50.5	0.0	0.0	0.0
Floating	56.5	25.9	2.8	2.0	3.1
Soft Peg	71.3	13.7	1.2	2.3	0.5
Hard Peg	62.7	32.0	3.8	0.0	0.0
Grand Total	62.5	21.5	2.1	2	1.7

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Compared to our 2020 survey, the Chinese renminbi became a more critical component of reserve portfolios while the role of the US dollar declined on average by almost three percent. From 2020 to 2021, the average allocation to the renminbi increased by two percent, while the share of the dollar decreased by slightly more (Figure 16). Other reserve currencies, such as the euro, the British pound, the Australian dollar, and the Japanese yen also decreased as a share of reserve portfolios. The interest rate differential between China and other countries may explain

this phenomenon—the Chinese CNY now offers the highest nominal yield among the leading reserve currencies. Countries like Australia and Canada, which were previously attractive for reserve managers, reduced their policy rates to almost zero percent in recent years. At the same time, the increasing importance of CNY may also be a reflection of its inclusion in the SDR basket in 2016.

Figure 16. Distribution of changes in major currency allocation (compared to the previous survey)²⁰



N=72.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

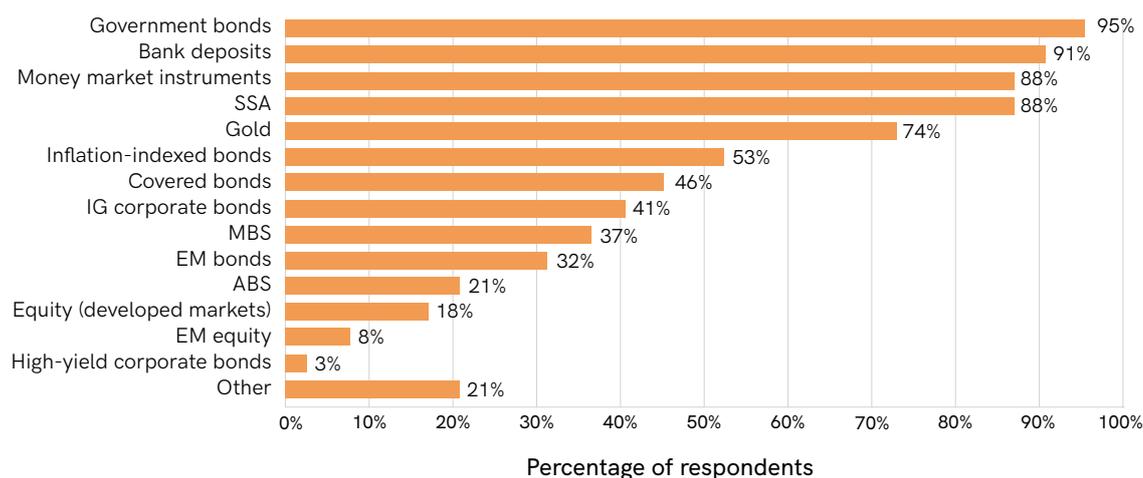
Note: This figure displays the distribution of the changes in actual allocation to the different currencies compared to our previous survey. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for the 72 respondents in common between the two surveys. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

²⁰ The currencies displayed in this chart refer to those currencies that at least 50 percent of respondent central banks identified as eligible for investment.

d. Eligible Asset Classes

As in previous RAMP surveys, central banks favored asset classes with high liquidity and low risk in line with their capital preservation and liquidity objectives (Figure 17). Ninety-five percent of central banks were eligible to invest in bonds; 91 percent in bank deposits; 88 percent in sovereign, supranational, and agency (SSA) securities;²¹ and 88 percent in money market instruments (see Figure 17). Seventy-four percent of the respondents also allow investments in gold and 53 percent in inflation-indexed bonds.

Figure 17. Eligible asset classes



N=113.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: ABS=asset-backed securities, EM=emerging market, IG=investment grade, MBS=mortgage-backed securities, SSA=supranational, sovereign, and agency.

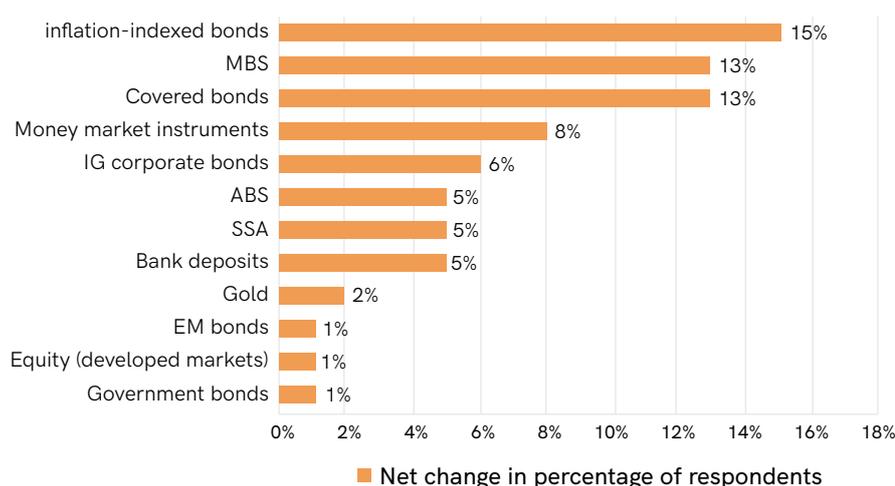
Almost three-quarters of central banks were allowed to invest in nontraditional asset classes such as corporate bonds, emerging market bonds, covered bonds, mortgage-backed securities (MBS), and equities. For this survey, we classify as traditional asset classes any that more than 50 percent of the respondent central banks deem to be eligible. As Figure 17 highlights, therefore, bank deposits, government bonds, money market instruments, supranational, subsovereign & agencies, gold, and inflation-linked bonds belong to the traditional asset classes. At the same time, we categorize the remainder of the asset classes identified in Figure 17 as nontraditional. While these asset classes are typically riskier on a stand-alone basis, they also tend to offer higher expected returns and increase portfolio diversification (Hentov et al. 2019). A search for yield amid an environment of low or negative interest rates in developed markets may be driving the interest in riskier asset classes. The preferred nontraditional asset class was covered bonds (46 percent of respondents), followed by investment-grade corporate bonds (41 percent),

²¹ The sovereign securities in the SSA category are typically in foreign currency. When governments issue in their own currency, it is considered a government bond.

mortgage-backed securities (37 percent), emerging market bonds (32 percent), and asset-backed securities (ABS) (21 percent). Finally, equity investing was still rare for central banks: as many as 18 percent of institutions can invest in developed market equities and eight percent in emerging market equities.

Compared to our 2020 survey, central banks continued to expand their universe of eligible asset classes to most asset classes within fixed income, reflecting a continued appetite for diversification (Figure 18). Within the traditional asset classes, inflation-linked bonds saw the most significant increase in eligibility—now 61 percent of institutions allow investments in these securities, versus 46 percent in 2020. As regards the nontraditional assets, the eligibility of mortgage-backed securities (MBS) saw the most significant increase (13 percent). More central banks may be interested in MBS to enhance returns, while maintaining high credit quality. Other nontraditional asset classes added to reserve managers' eligible universes are covered bonds (53 percent of central banks in 2021, compared to 40 percent in 2020) and corporate bonds (42 percent of central banks in 2021, compared to 36 percent in 2020). The proportion of central banks that allow equity investments did not change significantly.

Figure 18. Changes in asset class eligibility (compared to the previous survey)



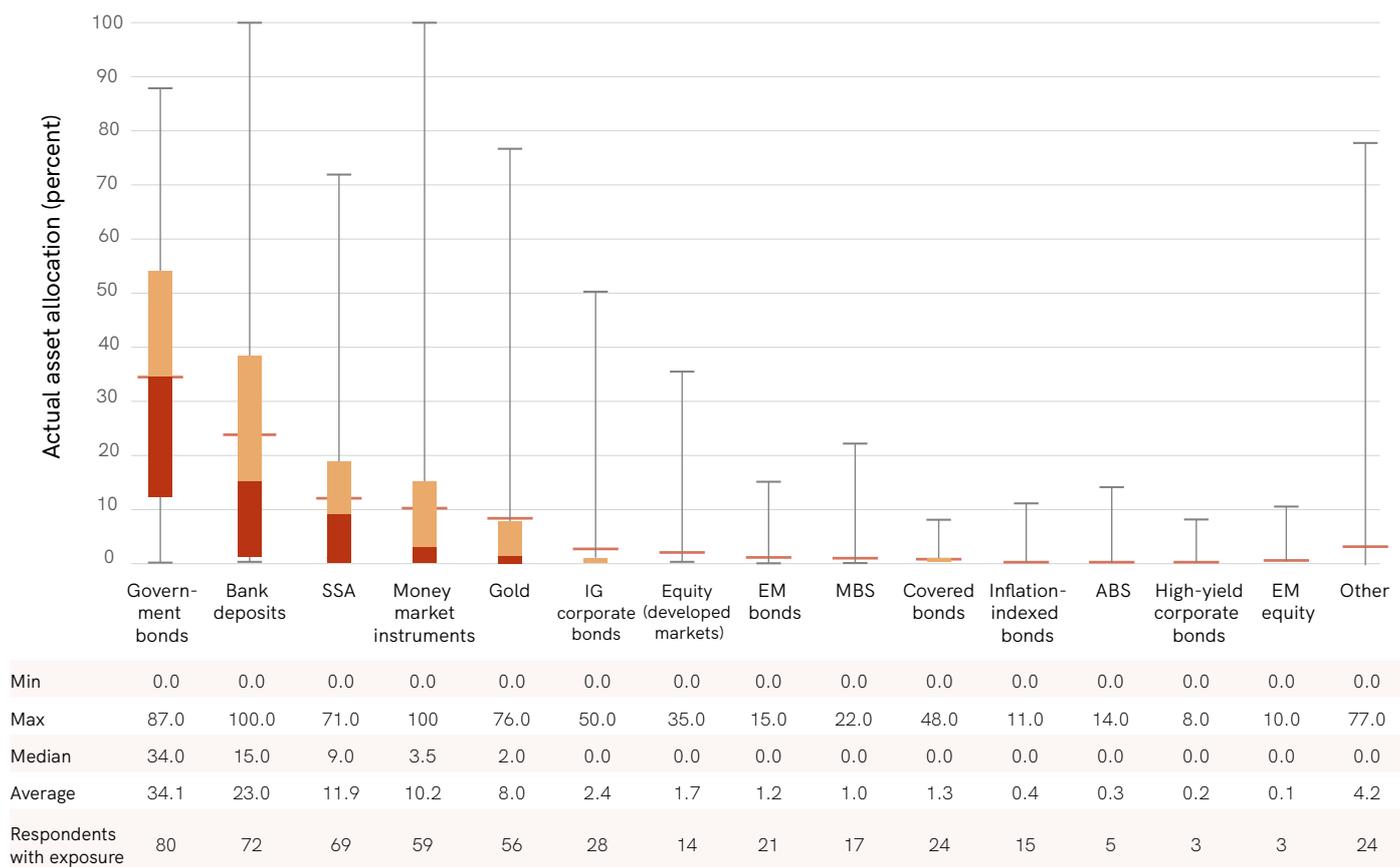
N=85.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks, Second RAMP survey on the Reserve Management Practices of Central Banks.

Note: ABS=asset-backed securities, EM=emerging market, IG=investment grade, MBS=mortgage-backed securities, SSA=supranational, sovereign, and agency.

Our 2021 survey results highlight that traditional asset classes have the highest allocation in reserve portfolios. The median and average allocation to government bonds stood at 34.1 percent. For the other traditional asset classes, allocations to these asset classes differed significantly across survey respondents because the median and average allocation vary considerably. For example, central banks held an average of 23 percent in bank deposits with a median allocation of 15 percent. Similarly, reserve managers allotted an average of 11.9 percent to SSA securities with a median of nine percent (see Figure 19).

Figure 19. Distribution of allocations to individual asset classes



N=92.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: This figure displays the distribution of the actual allocation to the different asset classes. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for the 92 respondents to the question. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Note: ABS=asset-backed securities, EM=emerging market, IG=investment grade, MBS=mortgage-backed securities, SSA=supranational, sovereign, and agency.

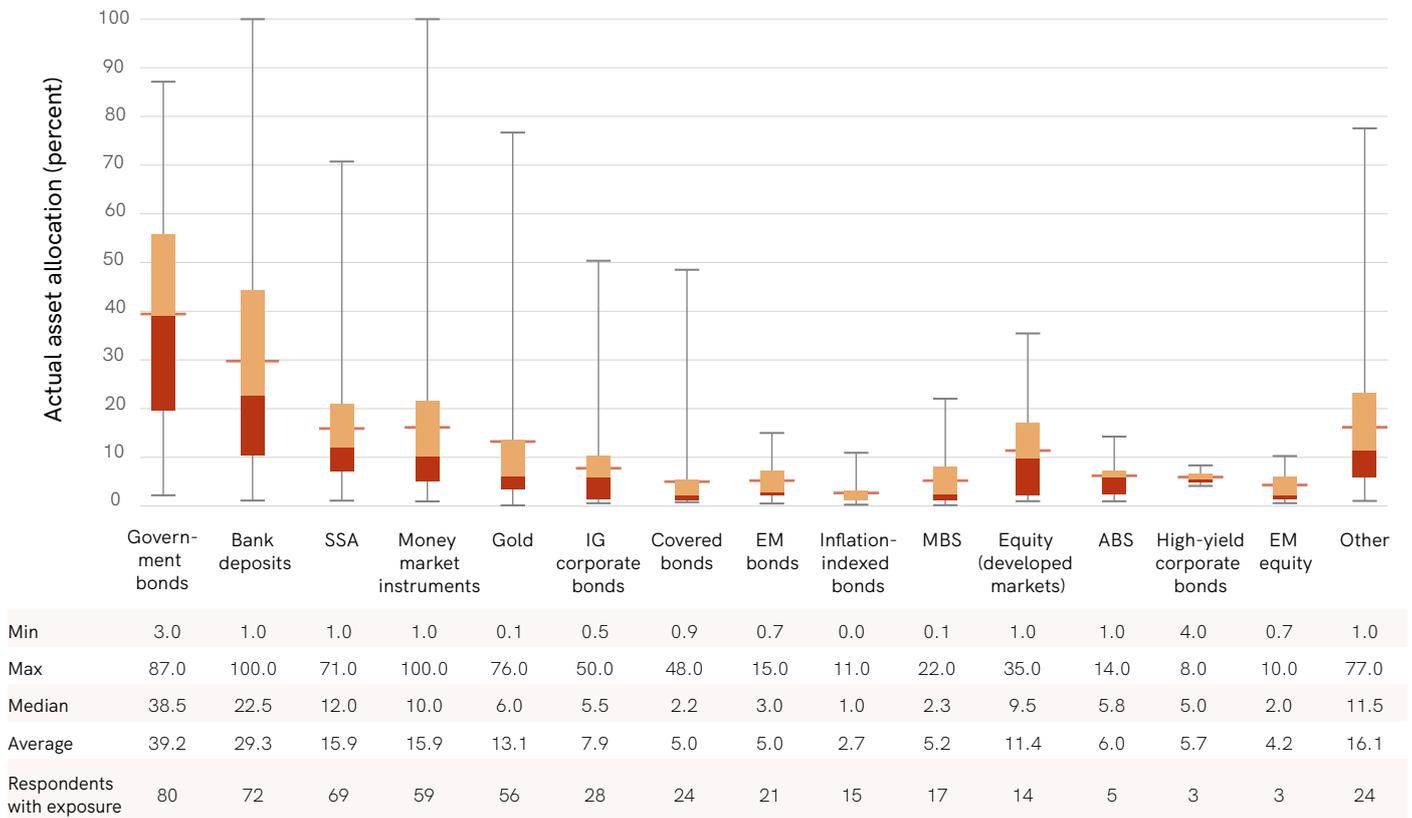
Despite the increasing endeavor of central banks globally to include nontraditional asset classes in reserve portfolios, on average, these asset classes still only make up a small portion of reserve portfolios, with an average allocation of 8.2 percent across all respondent banks. On average, reserve managers held about 80 percent of their reserve in four asset classes: government bonds (34.1 percent), bank deposits (23 percent), supranational (11.9 percent), and money market instruments (10.2 percent). Gold is also a reserve asset, with an average allocation of 8 percent. In terms of nontraditional asset classes, investment-grade corporates had the highest average allocation across central banks (2.4 percent), followed by developed market equities (1.7 percent) and emerging market bonds (1.2 percent).

Furthermore, the allocations to each nontraditional asset class are small, limiting the potential return enhancement that these asset classes could provide. The average individual share of these types of assets is below 12 percent of total reserves.

Figure 20 shows the reported asset allocations of respondents' portfolios and presents only data for the institutions that indicated exposure to a specific asset class. (It does not, therefore, reflect the impact of central banks who did not report an allocation.) For each financial instrument, the Figure displays the range of institutions' reported shares and quartiles, as well as the median and average.

In most cases, the median allocation to nontraditional asset classes was below 10 percent. Figure 20 provides the number of central banks that invest in this specific asset class. Breaking down respondent central banks' exposure to individual non-traditional asset classes shows that the highest number of central banks allocated to investment-grade corporates. Thirty percent of respondent central banks had an average exposure of nearly eight percent of total reserves. Twenty-three percent of respondents invested in emerging market bonds with an average allocation of 5 percent. Eighteen percent of respondents had investments in mortgage-backed securities, and 15 percent in developed market equities, with an average allocation of 5.2 and 11.4 percent, respectively.

Figure 20. Distribution of the allocation to individual asset classes for respondents with exposure



N=92.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: This figure displays the distribution of the actual allocation to the different asset classes. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for the 92 respondents to the question. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Note: ABS=asset-backed securities, EM=emerging market, IG=investment grade, MBS=mortgage-backed securities, SSA=supranational, sovereign, and agency.

The analysis of asset allocations of reserve portfolios by reserve level, region, and income group reveals several notable patterns (Table 3). As discussed above, central banks held an average allocation of 34.1 percent in government bonds. They also had an average allocation of 23 percent in bank deposits, twelve percent in sovereign, supranational, and agency (SSA) bonds, and ten percent in money market instruments. These average allocations notably change if we compare reserve portfolios across regions. Central banks in Europe and Central Asia exhibited the largest allocation to nontraditional assets. At the same time, South and East Asia and Pacific institutions invested the most on average in traditional asset classes. Respondents in the Americas and the Caribbean had relatively larger allocations to government bonds but smaller allocations to other asset classes. In Europe and Central Asia, the average participation of government bonds, SSA, and gold was relatively large. Nevertheless, exposure to bank deposits and money market products was more muted, probably due to the negative rates in Europe. In the Middle East and Africa, central banks had the smallest average allocation to government bonds and the largest average allocation to bank deposits while maintaining a considerable exposure to SSA. Finally, countries in the Pacific and South and East Asia had relatively large average allocations to all traditional asset classes, especially government bonds.

By **income level**, central banks of high-income countries invested the most in nontraditional asset classes, with an average allocation of 13.8 percent. Lower-middle- and low-income countries, in turn, present the lowest allocation to nontraditional asset classes, with a 3.6 percent allocation on average, while investing the most in traditional assets.

In terms of the specific asset classes, high-income central banks had reserve portfolios concentrated in government bonds. By contrast, lower-middle- and low-income countries had the largest allocation in bank deposits.

Comparing the composition of reserve portfolios across the **absolute size of reserves**, we find that central banks that manage less than \$3 billion had a rather large allocation to bank deposits, probably indicating a less sophisticated investment framework. At the same time, institutions with more than \$50 billion of reserves had a higher share of their reserves invested in government bonds and only limited exposure to deposits, which may be the result of the difficulties that tend to arise when investing large portfolios in less liquid instruments.

Finally, in terms of the **foreign exchange regime** of the respondents, we observe that countries with a floating regime invested the most in nontraditional asset classes, with an allocation of 10.8 percent on average (compared to only eight percent for the sample as a whole).

Table 3. Average allocation to individual asset classes by geographic region, country income group, and reserve size²²

	GOVERNMENT BONDS	BANK DEPOSITS	SSA	MONEY MARKET INSTRUMENTS	GOLD	TRADITIONAL ASSET CLASSES	NONTRADITIONAL ASSET CLASSES
Geographic region							
Americas & Caribbean	43.2	19.1	12.8	8.7	3.2	88.2	7.8
Europe & Central Asia	37.1	12.0	12.7	7.5	14.4	83.9	10.6
Middle East & Africa	26.1	37.3	9.4	11.4	5.1	89.6	6.4
South & East Asia and Pacific	31.5	21.8	15.5	19.4	4.3	92.9	6.2
Country income group							
High income	41.7	8.9	11.9	9.4	10.0	82.5	13.8
Upper middle income	32.0	21.0	17.4	11.8	8.4	91.2	6.5
Lower middle & low income	27.7	38.8	8.2	10.0	5.6	90.5	3.6
Size of assets under management (US\$)							
Less than 3 billion	25.1	34.0	11.8	12.2	4.3	87.5	8.7
3 to 10 billion	31.7	27.8	12.6	7.5	4.7	84.4	9.4
10 to 50 billion	35.8	20.3	11.5	13.9	11.4	93.3	5.2
More than 50 billion	45.4	7.4	11.6	7.9	12.9	86.2	9.0
Foreign exchange regime							
Not applicable	8.0	92.0	0.0	0.0	0.0	100.0	0.0
Floating	43.9	10.0	11.8	9.1	8.8	84.4	10.8
Soft Peg	22.5	36.5	12.8	12.1	7.3	91.2	6.0
Hard Peg	42.1	18.3	9.1	7.9	8.1	85.5	5.2
Grand Total	34.1	23	11.9	10.2	8	87.6	8.2

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

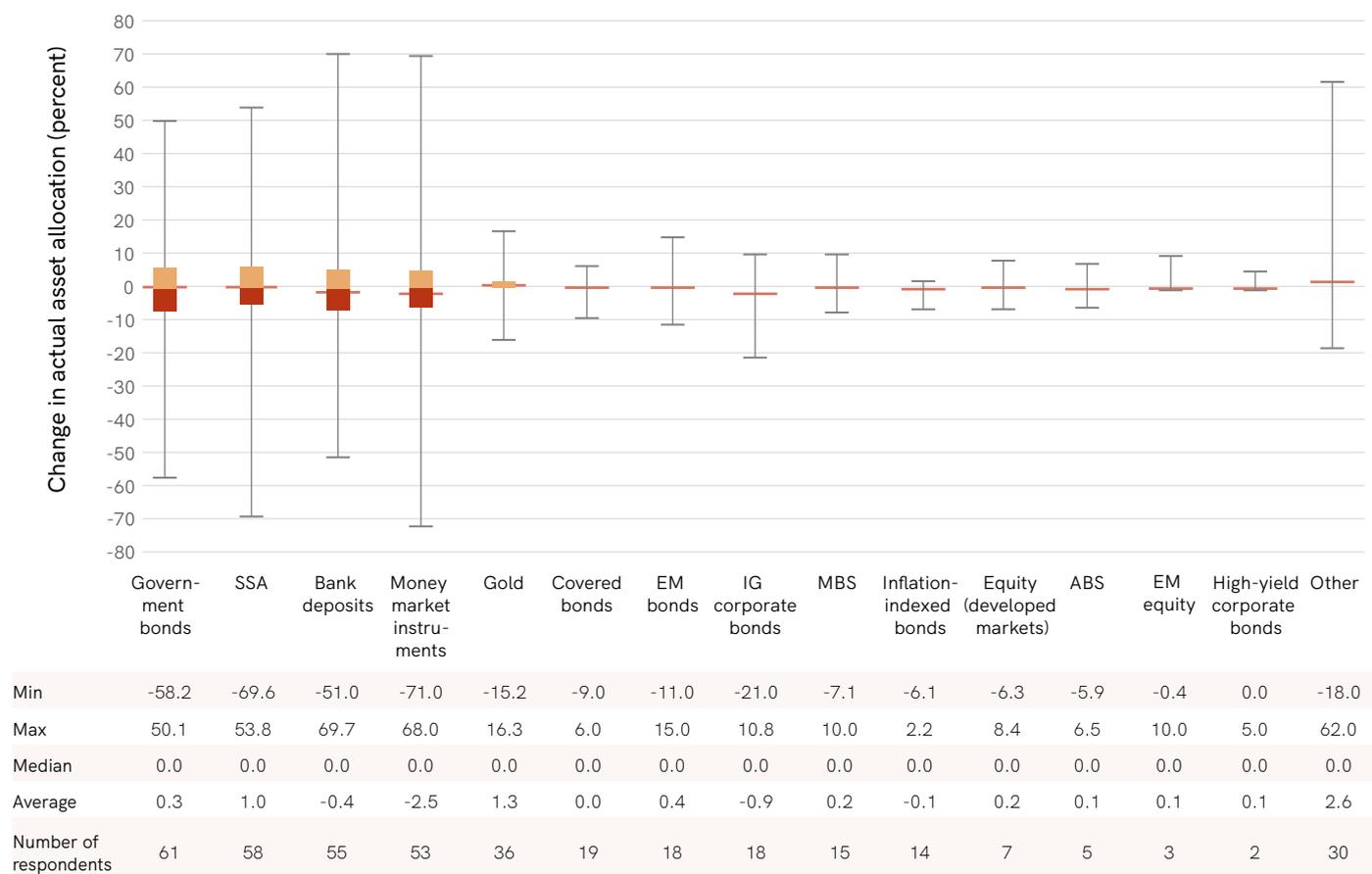
Note: SSA=supranational, sovereign, and agency.

Comparing this year's survey results with those of 2020, we note that institutions slightly shifted the makeup of their traditional assets. On average, reserve managers reduced the allocation to bank deposits and money market instruments. At the same time, central banks also altered the composition of their nontraditional assets as investment-grade corporate bonds saw an average one percent decline in allocation. The average share of bank deposits and money market products decreased by 0.4 and 2.5 percent, respectively. In parallel, the average allocation to government bonds grew slightly (Figure 21) by an average of 0.3 percent. This rebalancing may

²² The classification of traditional and nontraditional asset classes excludes the asset type "other".

be a reaction to the challenge of investing in short-term products in the current yield environment and the need to improve expected returns. Finally, another notable change compared to the 2020 survey is the average increase of allocation to gold, though this may simply reflect a 20 percent increase in the price of bullion from the end of 2018 through to the end of 2020.

Figure 21. Changes in asset allocation (compared to the previous survey)



N=65.

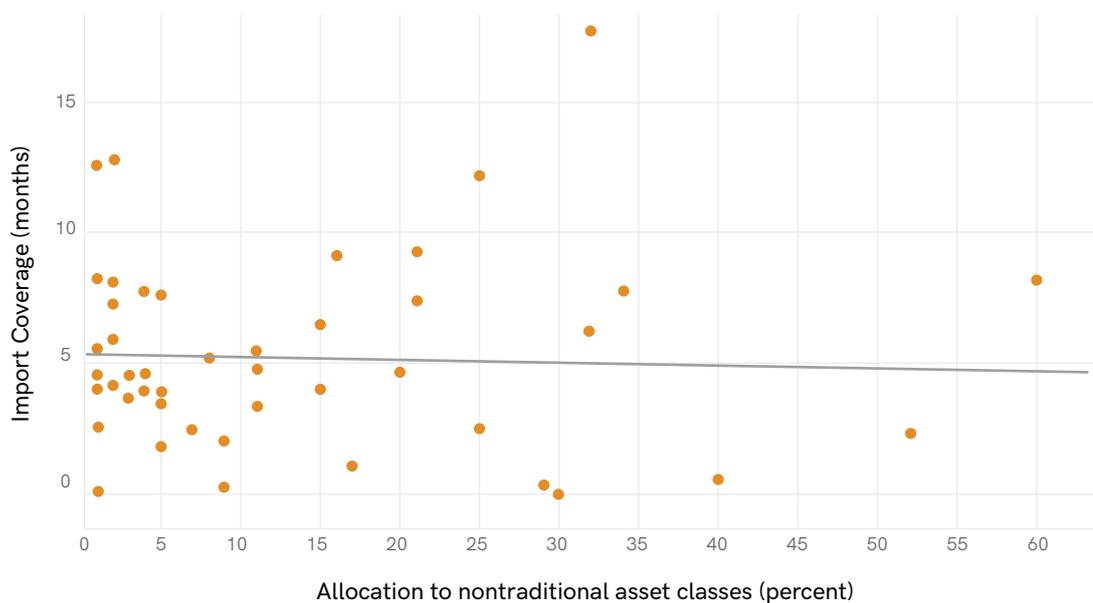
Source: Third RAMP survey on the Reserve Management Practices of Central Banks, Second RAMP survey on the Reserve Management Practices of Central Banks.

Note: This figure displays the distribution of the changes in actual allocation to the different asset classes compared to our previous survey. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for the 65 respondents in common between the two surveys. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Note: ABS=asset-backed securities, EM=emerging market, IG=investment grade, MBS=mortgage-backed securities, SSA=supranational, sovereign, and agency.

This survey again confirmed the results of our previous two surveys on central bank risk-taking and reserve adequacy. We cannot find a clear relationship between the level of risk central banks take in their reserve management operations as proxied by their allocation to nontraditional assets with their import coverage as a proxy for a central bank's reserve adequacy (Figure 22).

Figure 22. Import coverage and allocation to nontraditional asset classes



N=48.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Another notable observation is that central banks rarely include gold in their SAA optimization framework. The third RAMP survey attempted to gain further insights on central bank gold holdings. Therefore, the survey included a question on how central banks treat gold in their strategic asset allocation exercise. We found that 76 percent of central banks had gold in their foreign reserves. At the same time, only 20 percent of those institutions include gold in their SAA optimization framework, suggesting that the allocation to gold in central bank reserve portfolios is rarely decided on the basis of risk and return considerations or correlations with other asset classes. In several countries, historical precedents or the requirement to buy gold from local producers may determine the level of gold holdings, explaining why this asset is not included in the optimization framework.

3.3 PORTFOLIO MANAGEMENT

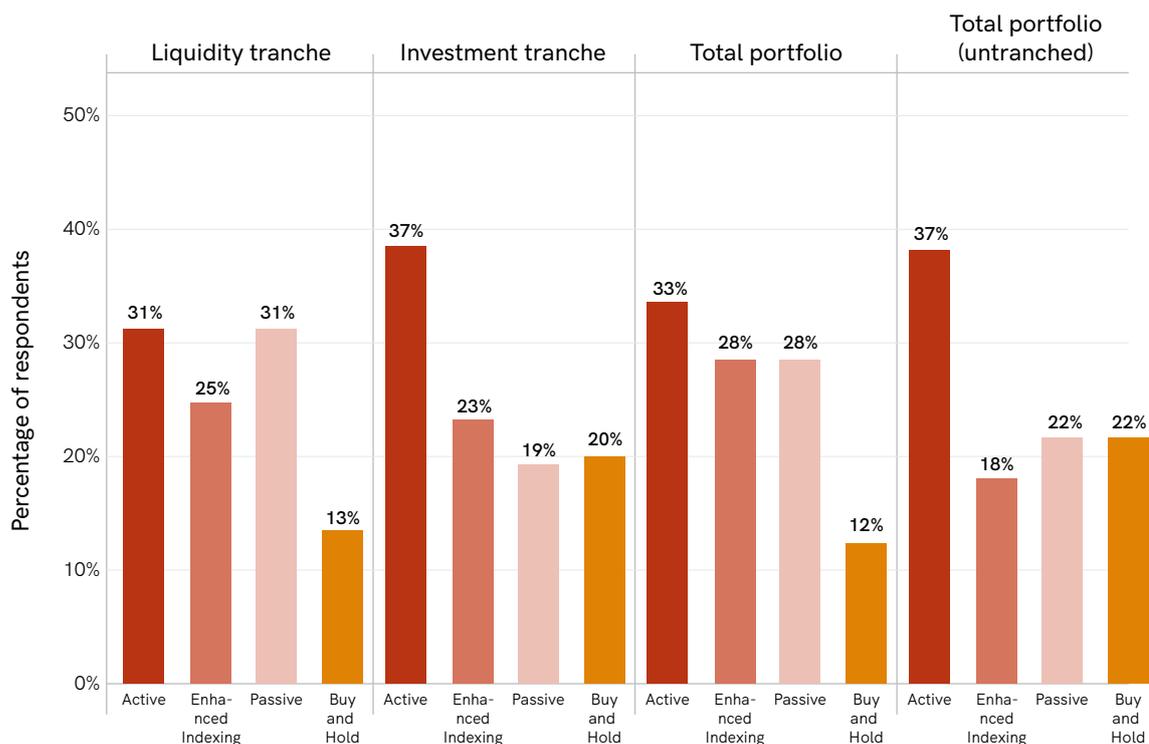
a. Active management

An active investment approach is one of the investment styles that central banks use to manage reserve portfolios. In the absence of a benchmark, portfolio managers often buy securities and hold them until they mature. For institutions with

a consistent SAA framework, the choice is typically between passive and active management. Passively managed portfolios attempt to replicate the composition of their benchmark. On the other hand, actively managed portfolios deviate from the benchmark in pursuit of a higher return. An active investment strategy will always be more resource-intensive than a passive strategy because it requires investment management skills in both the portfolio and the risk management teams. However, central banks can deploy various strategies for active management. An arguably less intensive, and more risk-averse approach is an enhanced indexing strategy that permits only limited deviations from the benchmark.

The survey found that most respondents (almost 80 percent) managed their portfolios actively. For institutions that deploy a tranching framework, the investment style deployed by institutions varies by tranche (Figure 23). As the investment horizon increased, respondent central banks appeared to have a higher tolerance for active risk in their portfolios. We find that 56 percent of respondents use either active management or enhanced indexing for their liquidity portfolio, and this percentage increases slightly to 60 percent for the investment tranche.

Figure 23. Portfolio management style by tranche



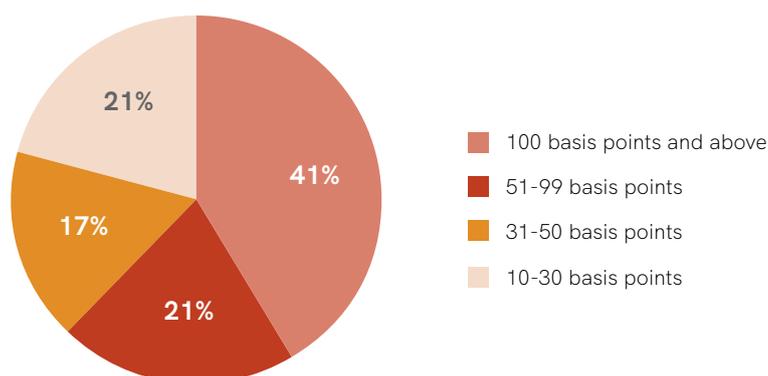
N=116.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Most central banks use an active management style, but many have a separate risk metric to limit active risk-taking. This survey inquired about the maximum

tracking error or active risk central banks deploy for active management at the subportfolio level.²³ Tracking error limits are a good indicator of the extent of active risk-taking. Only 27 percent of institutions with active risk use tracking error limits to manage their active risk-taking. Of these institutions, over half of the respondents had tracking error limits below 100 basis points (Figure 24), whereas 41 percent utilized limits of 100 basis points or more.

Figure 24. Maximum tracking error for actively managed portfolios or portfolios that apply enhanced indexing



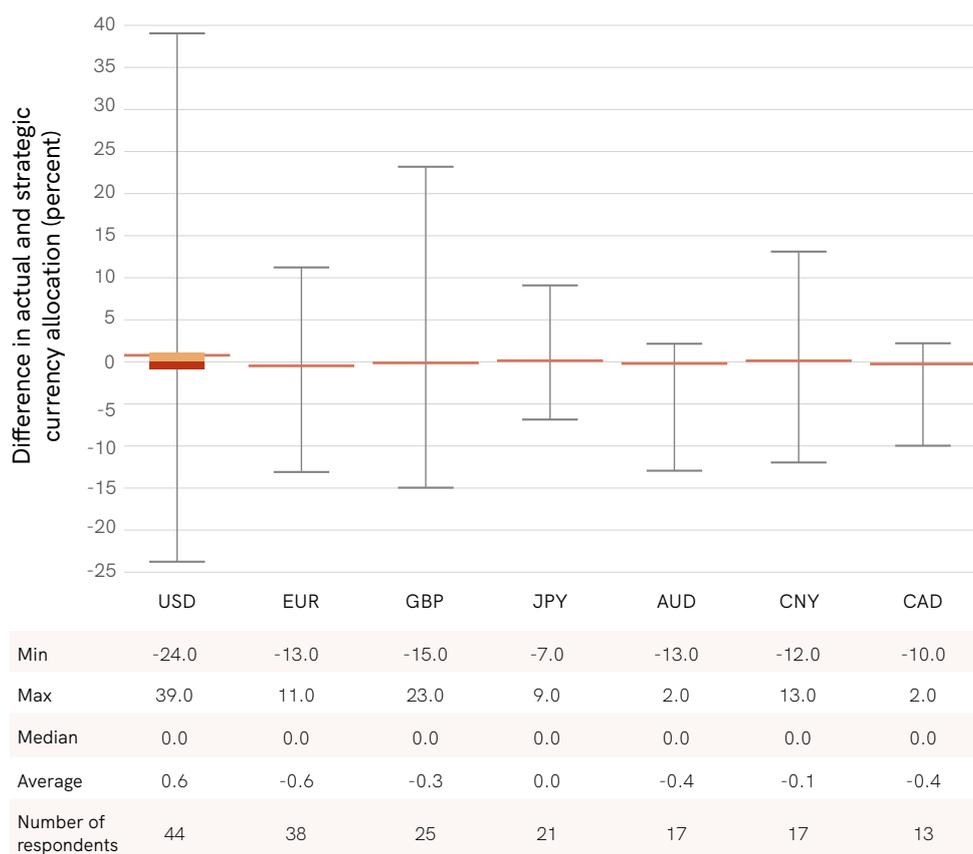
N=24.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Reserve managers can take active risk by deviating from their benchmark currency composition. Our 2021 survey results show that reserve managers did not take much active currency risk (Figure 25). Generally, most central banks tended to keep the currency composition of their portfolios close to their benchmarks—the median difference between the portfolio and the benchmark for all currencies is zero percent, with a trivial dispersion for most participants. Nonetheless, two currency allocations stood out. Central banks allocated an average 0.6 percent higher share of their reserves to the US dollar than their strategic asset allocation. The opposite was true for the euro—the central banks had on average a 0.6 percent lower allocation to that currency than their strategic asset allocation.

²³ Tracking error is the standard deviation of expected returns relative to the benchmark. It is one of the most common metrics used to assess the level of active risk in a portfolio.

Figure 25. Currency deviations from the benchmark



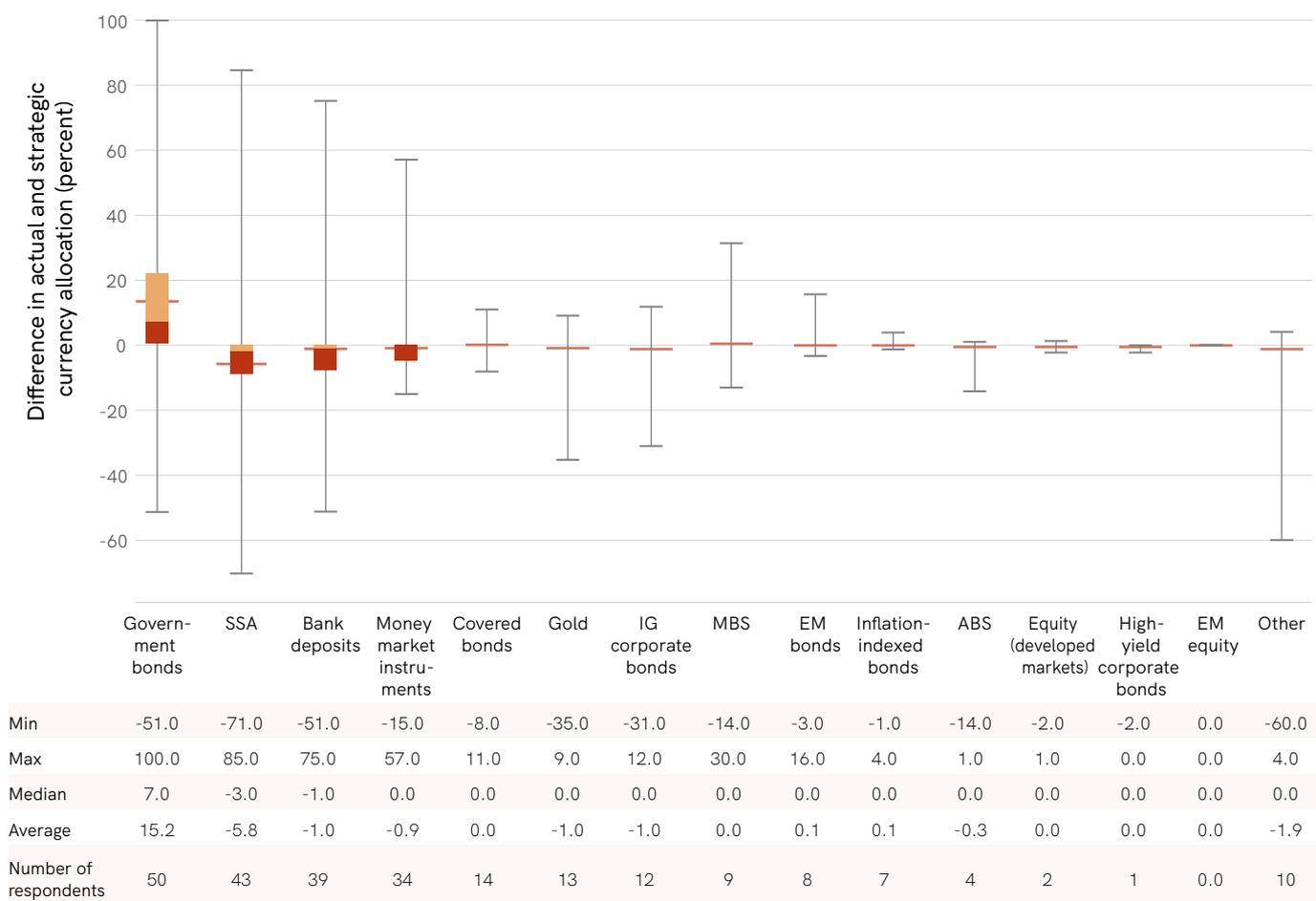
N=78.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: This figure displays the distribution of the difference in actual and strategic currency allocation. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for 78 respondents. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Regarding active deviations from the strategic asset allocation, our latest survey indicates that reserve managers took significant positions away from their strategic asset allocation weights. In our 2021 survey, reserve managers revealed considerable overweight in government bonds and underweight in SSA securities (Figure 26). On average, reserve portfolios had an allocation to government bonds that was 15.2 percent above their benchmarks. The median overallocation to government bonds for all respondents amounted to seven percent, indicating that many central banks hold these overweight positions. In contrast, on average, central banks were underweight in SSA securities by six percent, which may be driven by a heightened focus on liquidity and the expectation of spread widening.

Figure 26. Asset class deviations from the benchmark



N=90.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: This figure displays the distribution of the difference between actual and strategic asset allocation for the different asset classes. It shows the minimum, the second quartile group, the median, the third quartile group, and the maximum for 90 respondents. The data are divided into four equal-sized quartiles made up of 25 percent of the data. The lines dividing the groups (2nd and 3rd) are the quartiles. The median marks the midpoint of the data and is displayed as the line between the 2nd and the 3rd quartile groups. Half of the data are either greater than or equal to this value, while the remaining 50 percent are smaller than this value. The upper and bottom whiskers represent the maximum (highest point) and minimum (lowest point). The horizontal red line refers to the average of each category.

Despite the widespread use of active investment management styles and strategies, the practice of active risk budgeting is still limited at central banks.

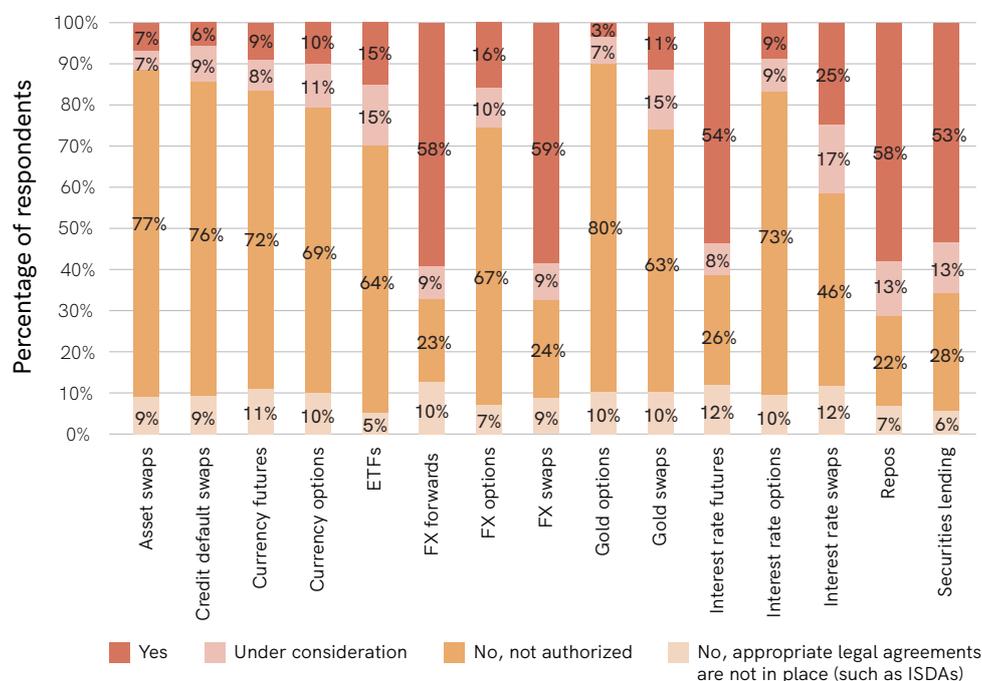
Risk budgeting compares active strategies using a similar metric (tracking error) to find an efficient active risk allocation. Best practice in investment management holds that reserve managers should build a robust risk budgeting framework to deploy active risk efficiently. Only 27 percent of organizations that took active risk systematically allocated tracking error across active strategies or asset classes. Using an active risk budgeting methodology becomes particularly important when institutions use active investment management strategies and deviate significantly from their strategic currency and asset composition. Several factors may explain the limited adoption of active risk budgeting strategies by central banks, not least the likelihood that institutions may have insufficient resources and skillsets to design a proper risk budgeting allocation framework (see Section 3.4).

b. Derivatives, Investment Instruments, and Investment Strategies

As institutional investors increase risk and diversification, the use of derivatives, investment instruments, and strategies tends to rise. Derivatives allow investors to hedge risks, facilitate the implementation of new asset classes, or even increase expected returns by giving more flexibility to portfolio managers. These properties are particularly beneficial for more complex portfolios. Additionally, investment instruments like Exchange Traded Funds (ETF) simplify the access to nontraditional asset classes at a low cost. Finally, investment strategies such as repurchase agreements (repos) and securities lending allow institutions to generate additional returns.

Our survey found that central banks deployed a limited number of derivatives, investment instruments, and investment strategies (Figure 27). More than 50 percent of reserve managers used foreign exchange forwards, swaps, and interest rate futures. As for investment strategies, more than half of institutions have authorized repurchase agreements and securities lending. Other central banks may not have adopted these alternative instruments and strategies because they may not be permitted to use them. Even when the use of these instruments is not debarred, institutions may lack the complex legal documentation entailed. Meanwhile, institutions may have only a weak framework for collateral management—or none at all—or may in any case be wary about taking on the counterparty credit risk embedded in these transactions.

Figure 27. Use of derivatives, investment instruments, and investment strategies

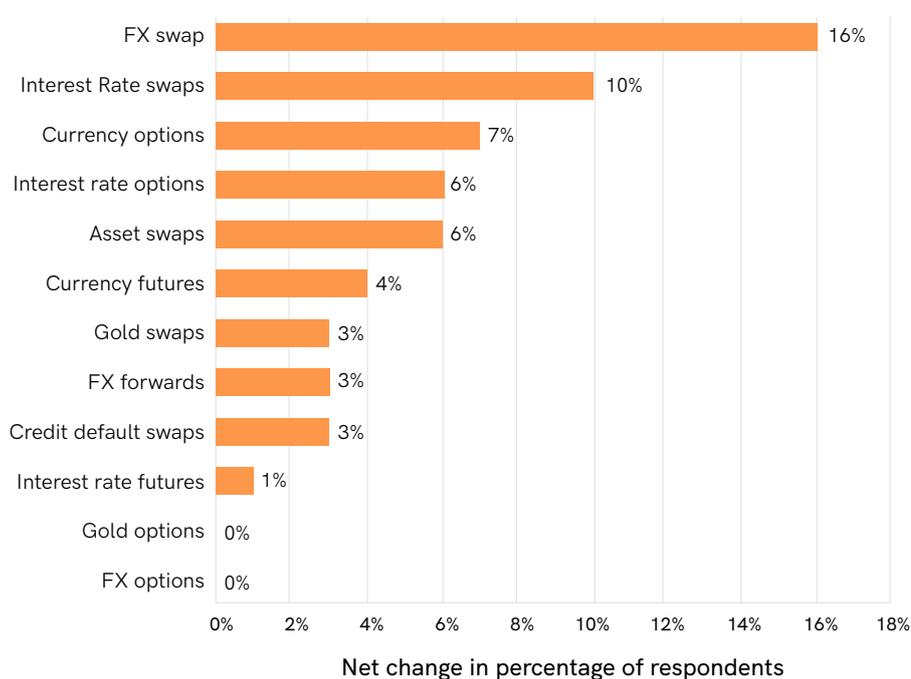


N=112.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

The use of most derivatives increased from 2018 to 2021. Foreign exchange and interest rate swaps are the derivatives that have attracted the most attention—an additional 16 and 10 percent of central banks have included these instruments respectively in their investment guidelines in the past three years (Figure 28). Also, more central banks started using currency options (seven percent increase), interest rate options (six percent increase), and asset swaps (six percent increase). However, central banks do not necessarily trade derivatives frequently or in considerable amounts even if they are eligible to do so. Some of the obstacles to trading these instruments more actively may include the lack of legal documentation, limited dealer capacity, and accounting complexities.

Figure 28. Net change between surveys in the percentage of central banks that use each derivative



N=70.

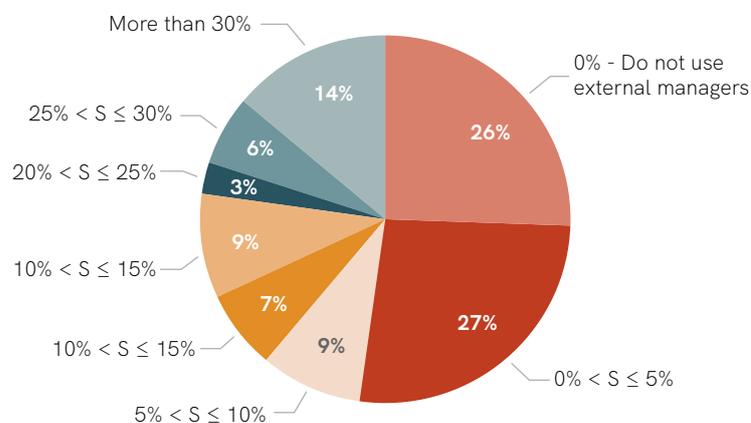
Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

c. External Management

Although central banks continue to hire external managers, these tend, as previously, to manage only a small portion of reserve assets. We observe that 75 percent of respondents have at least one external manager (Figure 29). At the same time, there is significant dispersion in the share of the overall reserve portfolio delegated to third parties. Thirty-seven percent of central banks with external managers allocate less than five percent of reserve assets to external management programs,

while only 14 percent of respondents delegate more than 30 percent.²⁴ The latter group of central banks had an average of 51 percent of their reserves managed externally. From 2018 to 2021, the number of central banks that used one or more external managers rose from 69 to 72 percent of all respondents.

Figure 29. Share of institutions' reserve assets externally managed as of December 31, 2020



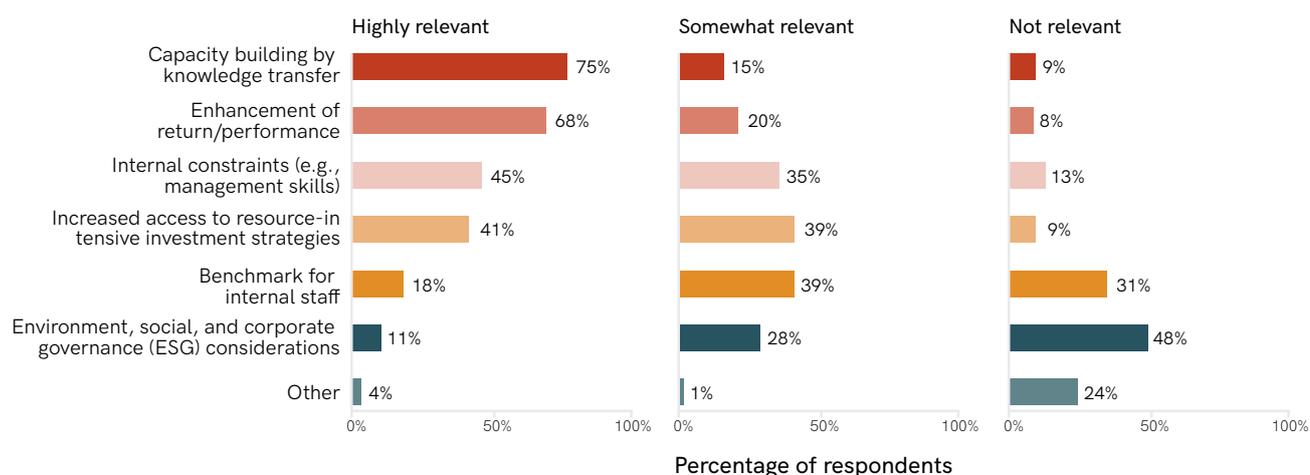
N=115.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Knowledge transfer and return enhancement are the main motivations when hiring external managers. More than 70 percent of respondents cite these factors as highly relevant to their decision to hire external managers. A significant proportion of institutions also cite internal constraints (45 percent) and increased access to investment strategies (41 percent) (Figure 30).

²⁴ Most central banks with external asset management programs work with fewer than five financial institutions (77 percent) (Figure 29). However, there are significant differences in the average number of external managers by income level, region, and absolute size of reserve. Central banks in high-income and upper-middle-income countries are more likely to have six or more external managers (27 percent of central banks in each of those income groups). By region, central banks in the Pacific and South and East Asia are more likely to have six or more external managers (30 percent of institutions in those regions). Also, respondents with higher reserve levels are more likely to have many more managers: 53 percent of central banks with more than \$50 billion in reserves have six or more managers, compared to only five percent for those with less than \$3 billion.

Figure 30. Relevance of considerations when opting to hire external managers to manage part of reserve assets (percentage of respondents with external managers)

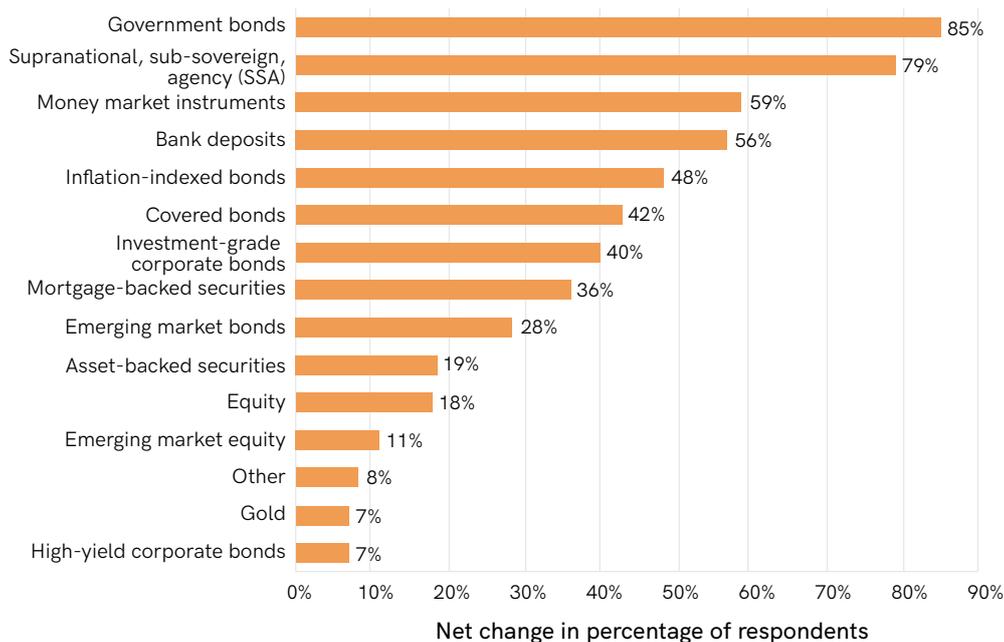


N=104.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

A significant number of central banks use external managers to get exposure to nontraditional asset classes. Most institutions allow external managers to invest in traditional asset classes such as government and SSA bonds. However, more than a third of respondents with external managers allow investment-grade corporate bonds, mortgage-backed securities, and covered bonds. A lower proportion of central banks uses external managers to invest in emerging market bonds, asset-backed securities, and equity (Figure 31).

Figure 31. Asset classes used by external managers



N=85.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

3.4 RISK MANAGEMENT

Managing risks is an essential component of the reserve management process.

A robust risk management framework identifies and quantifies the most relevant risks to help institutions maintain them within predefined levels (International Monetary Fund 2014). Credit and market risk management are critical in these extraordinary times, and the survey had questions on these areas. Additionally, managing active risk arising from active investment strategies is a crucial component of a central bank's risk management framework. Finally, reporting relevant risk from reserve management operations is also a part of decision-making for central bank reserve managers.

Industry practice suggests that reserve managers' risk management has to evolve as they invest in a broader set of asset classes, move down the credit spectrum, or take on significant active risk. Table 4 describes the risk management tools available to appropriately manage risk and exposure to different asset classes on a stand-alone basis. In other words, it assesses whether a portfolio that only has that asset class should use a specific risk management methodology. In our analysis of central banks' risk management operations, we use this framework to assess risk management in central banks.

Table 4. Recommended (minimum) risk management tools by asset class

ASSET CLASS	CREDIT RISK					MARKET RISK					
	Credit ratings from rating agencies	Market indicators (e.g. bond spreads, CDS spreads, equity prices)	Internal model that combines some of the indicators above	Fundamental credit analysis (e.g., debt to equity, interest coverage)	Quantitative models provided by third parties (e.g., Moody's EDF, Bloomberg SRSK)	Duration limit	VaR limit	Expected shortfall (CVaR) limit	Maximum currency deviations from the benchmark	Tracking error (TE) limit	Sector limits
Bank deposits	Yes	Yes for commercial bank deposits		Yes for commercial bank deposits		Yes (different from maturity limit to manage liquidity risk)			Yes, if currency deviations are allowed		Yes for commercial banks
Money market instruments	Yes	Yes for commercial bank and corporate issuers		Yes for commercial bank and corporate issuers		Yes			Yes, if currency deviations are allowed		Yes for commercial banks and corporates
Government bonds (developed markets)	Yes	Yes for issuers with lower ratings		Yes for issuers with lower ratings	Desirable for issuers with lower ratings	Yes	Yes, if investing in securities with maturities above one year	Yes, if investing in securities with maturities above one year	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes for issuers with lower ratings
Inflation-linked bonds	Yes	Yes for issuers with lower ratings		Yes for issuers with lower ratings	Desirable for issuers with lower ratings	Yes	Yes, if investing in securities with maturities above one year	Yes, if investing in securities with maturities above one year	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes for issuers with lower ratings
Supranational, sovereign, and agency (SSA)	Yes	Yes for issuers with lower ratings		Yes for issuers with lower ratings	Desirable for issuers with lower ratings	Yes	Yes, if investing in securities with maturities above one year	Yes, if investing in securities with maturities above one year	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes for issuers with lower ratings
Covered bonds	Yes	Yes for issuers with lower ratings		Yes for issuers with lower ratings		Yes	Yes, if investing in securities with maturities above one year	Yes, if investing in securities with maturities above one year	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes for issuers with lower ratings
Agency mortgage-backed securities						Yes	Yes	Yes	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes

ASSET CLASS	CREDIT RISK					MARKET RISK					
	Credit ratings from rating agencies	Market indicators (e.g. bond spreads, CDS spreads, equity prices)	Internal model that combines some of the indicators above	Fundamental credit analysis (e.g., debt to equity, interest coverage)	Quantitative models provided by third parties (e.g., Moody's EDF, Bloomberg SRSK)	Duration limit	VaR limit	Expected shortfall (CVaR) limit	Maximum currency deviations from the benchmark	Tracking error (TE) limit	Sector limits
Asset-backed securities	Yes	Yes for instruments with lower ratings		Yes for instruments with lower ratings		Yes	Yes	Yes	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes
Investment-grade corporate bonds	Yes	Yes	Desirable	Yes	Desirable	Yes	Yes	Yes	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes
High-yield corporate bonds	Yes	Yes	Desirable	Yes	Desirable	Yes	Yes	Yes	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes
Equity (developed markets)							Yes	Yes	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes
Emerging market bonds	Yes	Yes	Desirable	Yes	Desirable	Yes	Yes	Yes	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes
Emerging market equity							Yes	Yes	Yes, if currency deviations are allowed	Yes, if active management is allowed	Yes
Gold	Yes for gold deposits						Yes	Yes		Yes, if active management is allowed	Yes

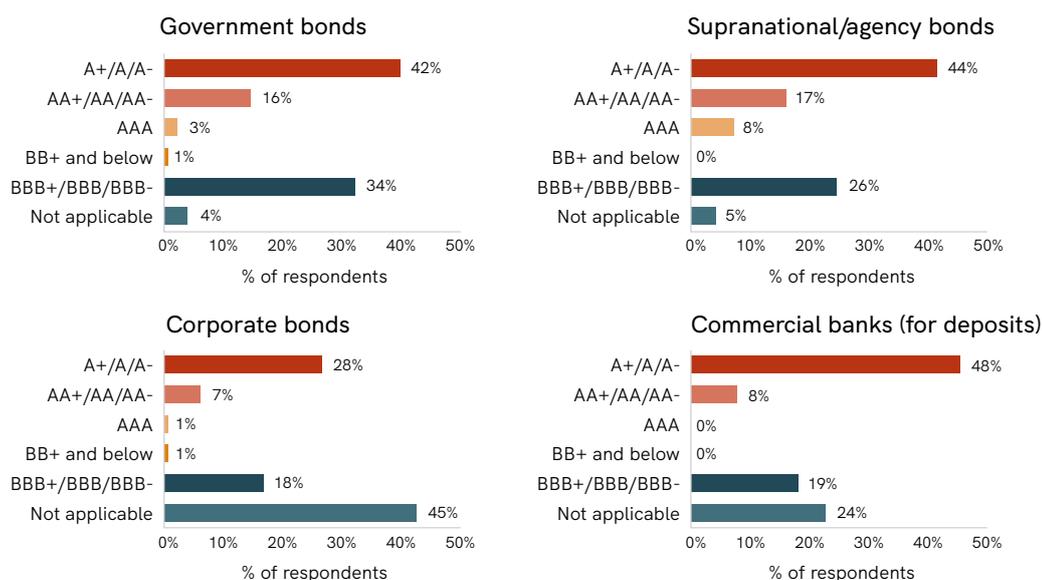
Source: Authors' assessments.

Note: Depending on how these limits are established, some of them could be nonbinding (e.g., an institution only has a CVaR limit but also monitors duration and VaR).

a. Credit Risk Management

Central banks managed credit risk by mainly investing in debt securities with high credit ratings (Figure 32). Credit risk is especially concerning for central banks because defaults may impact their reputation. As seen in the previous surveys, most survey participants had minimum ratings in the investment-grade category (BBB+/BBB/BBB- or above), mainly in line with their investment objective of safety and liquidity. For all asset classes, the most frequent minimum credit rating was A+/A/A-, confirming the continued conservative stance of central banks.

Figure 32. Minimum credit rating for eligible issuers in the asset classes listed



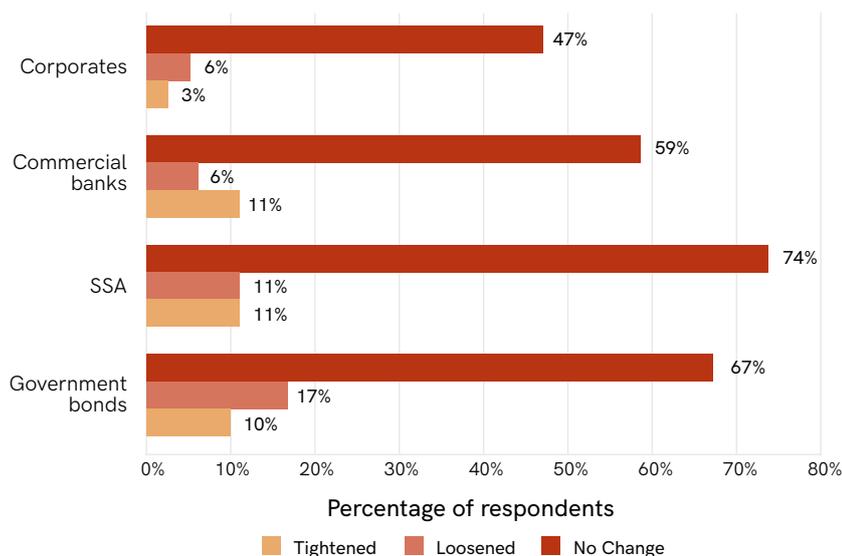
N=114, N=111, N=106, and N=108, respectively.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Compared to our 2020 survey, most central banks kept their minimum credit ratings unchanged for most asset classes, although some loosened their ratings for government bonds, SSA bonds, and commercial bank deposits (Figure 33).

Notably, 17 percent of central banks reduced their minimum ratings for government bonds and 11 percent for SSA bonds, typically by one notch. At the same time, 10 percent of the institutions tightened their minimum rating requirements for government bonds. There was a marginal increase in minimum credit ratings of commercial bank deposits—11 percent of the respondents tightened them, and only six percent loosened them.

Figure 33. Number of central banks with changes in credit ratings from the 2020 survey

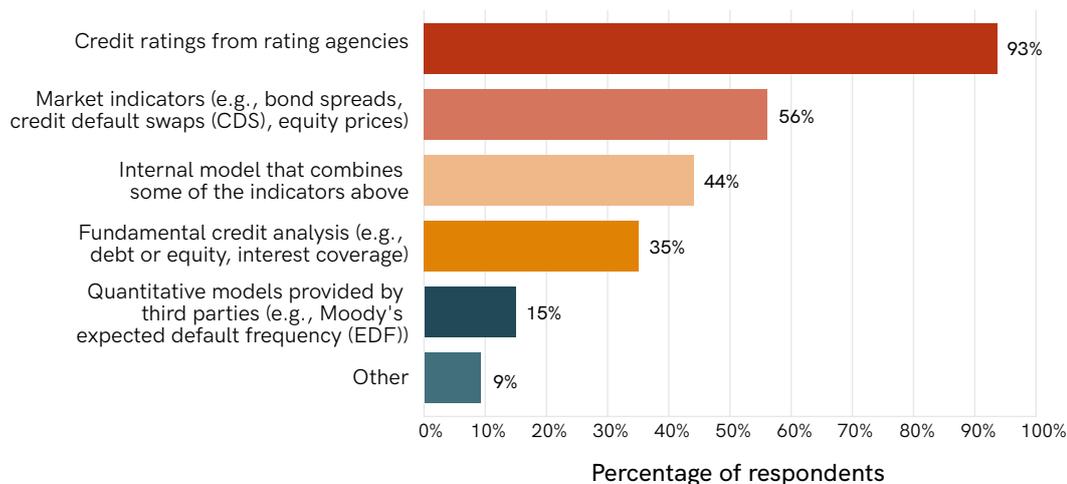


N=72, N=80, N=84, N=79, respectively.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks, Second RAMP survey on the Reserve Management Practices of Central Banks.

Rating agencies remain the primary source of information on credit risk (Figure 34). Since the previous survey, the use of methodologies for credit risk analysis had not changed significantly. Almost all central banks that responded to our survey used credit ratings in their risk management process. Nevertheless, although all respondents that invested in corporate bonds use credit ratings, they do not rely exclusively on these ratings, opting instead to complement them with other methodologies (Figure 35); 72 percent use market indicators, such as bond spreads, CDS spreads, or equity prices, while internal credit risk models to assess credit risk are less common (24 percent). For central banks with minimum credit ratings of BBB-/BBB/BBB+, internal credit risk models play a more critical role. Forty-four percent of institutions in that group use them (see Figure 36), the same percentage as the complete sample.

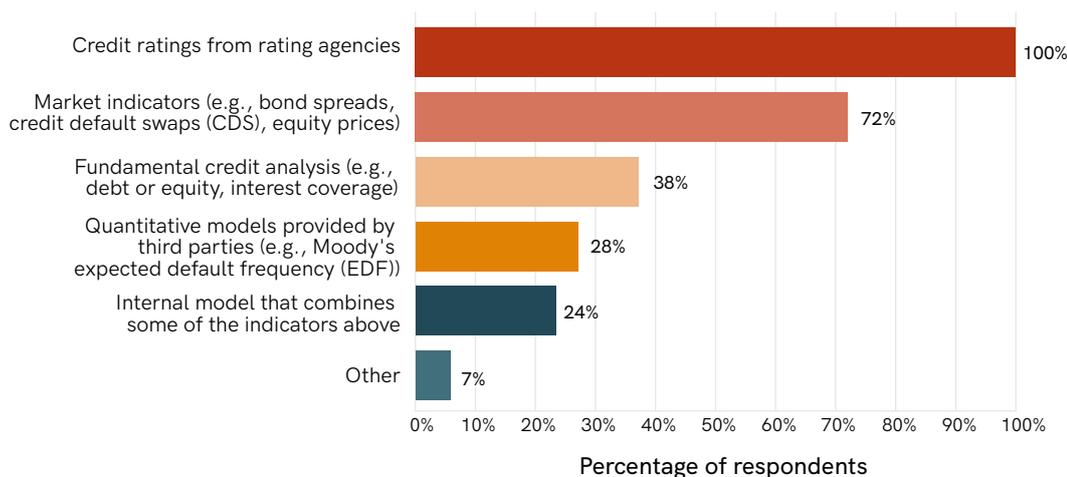
Figure 34. Credit risk assessment methodologies used for issuers and counterparties



N=117.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

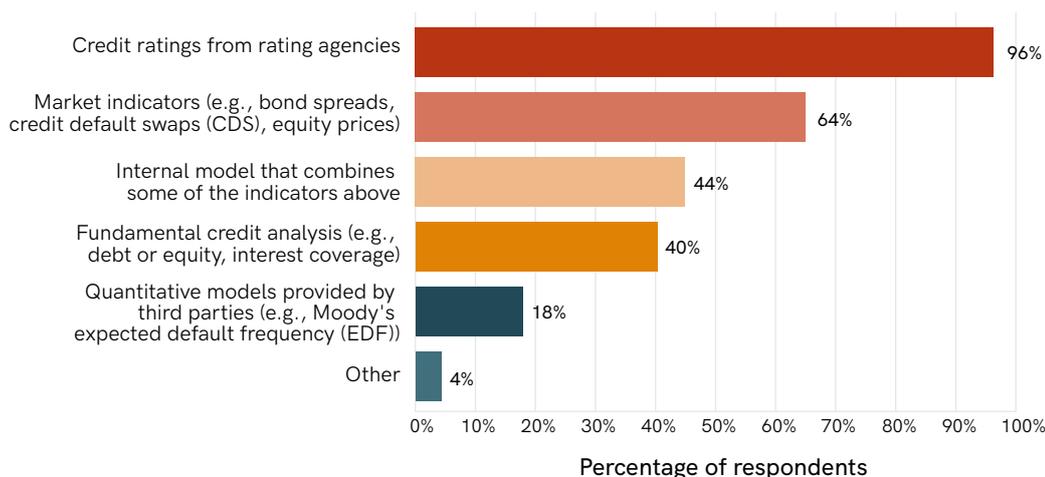
Figure 35. Credit assessment methodologies for respondents with corporate credit exposure



N=29.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Figure 36. Credit assessment methodologies for respondents with minimum credit rating of BBB-/BBB/BBB+



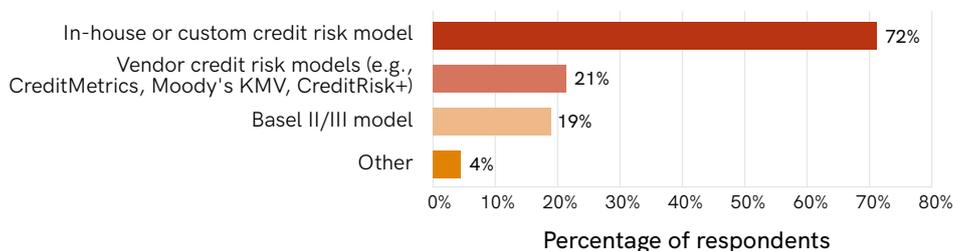
N=45.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

A significant number of central banks that take credit risk in various portfolios do not produce aggregate credit risk measures. Only 47 percent of respondents use a portfolio credit risk model to calculate numbers such as expected and unexpected loss, credit value at risk (VaR), and expected credit shortfall (conditional credit value at risk). Most institutions that produce these metrics (72 percent) use an in-house or custom credit risk model. Basel II- or III-type models or those provided by vendors are not frequently used, with 19 percent of central banks using Basel III-

type models, and 21 percent using vendor models. However, compared to our 2020 survey, institutions have made some progress in using in-house risk models. The share of central banks deploying that methodology increased from 49 to 60 percent of total respondents from 2020 to 2021 (Figure 37).

Figure 37. Credit risk model used



N=53.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

b. Market Risk Management

Central banks utilized multiple metrics to manage market risk in their reserve management operations. Market risk refers to the risk of losses arising from movements in market prices. As most reserve portfolios are concentrated in high-grade fixed-income instruments, duration is the most essential market risk measure. Eighty-three percent of institutions have limits on portfolio duration to manage duration risk (Figure 38).²⁵

Forty-three percent of central banks with multiple currency portfolios deployed limits on the maximum currency deviation from the benchmark to manage their tactical currency risk. Nevertheless, 57 percent of central banks did not. While they could choose to manage the currency risk through other quantitative risk measures such as VaR limit, only 12 percent of central banks with multiple currency exposures do so. However, most respondents do not deviate from the currency composition of the benchmark.

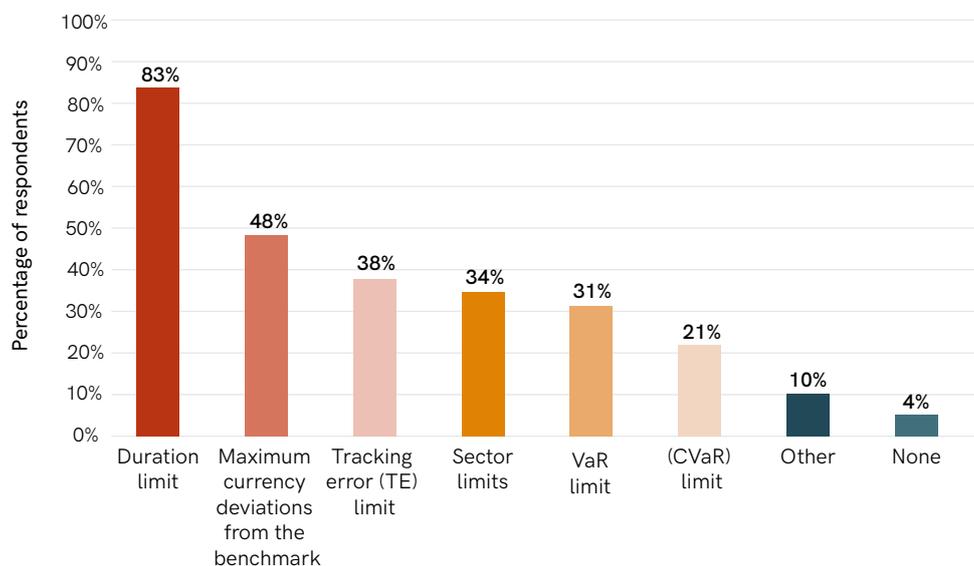
For central banks with a diversified asset composition, capturing the risk of these portfolios beyond simple duration limits is highly desirable. Probabilistic risk limits are critical tools for central banks to consider because of the various market risks embedded in their reserve portfolios. For example, instruments with embedded options such as MBS, ABS, and callable bonds have exposure to factors that cannot be captured by employing simple duration limits (such as volatility, spreads changes, or inflation). Best practice suggests that VaR and CVaR limits are appropriate tools to manage the risks embedded in these asset classes. Although these limits are often included in the strategic asset allocation process, it is remarkable that only a third of respondent central banks with diversified asset class portfolios

²⁵ Duration risk refers to the sensitivity of fixed income instruments prices to changes in yields.

have adopted these types of probabilistic risk tools to measure and limit the overall market risk at the individual and total reserve portfolios.

Comparing our 2021 survey results with those of 2020, we do not find any significant changes despite central banks' efforts to build more diversified asset portfolios, suggesting that there continues to be room for improvement.

Figure 38. Limits used to manage market risk



N=118.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

c. Active risk

Only a small portion of central banks deployed limits on tracking error to manage the active risk of their portfolios. As mentioned above, 80 percent of central banks employ an active style when managing their portfolio. According to industry best practice, one important tool to manage the active risk is to use tracking error limits. But only 27 percent of respondents that adopt an active management style put in place such limits to control the active risk of their portfolio; this reveals scope for the enhancement of practices.

d. Reporting and Transparency

Reserve managers reported on a variety of risk measures to boards and investment committees at regular intervals. Boards and investment committees typically approve changes to the reserve management investment policies and guidelines (Anasashvili et al. 2020). The board and the investment committee regularly receive reports on exposures and risk metrics at the individual and reserve portfolio levels to oversee reserve management activities. Several survey questions asked

respondents to specify what type of risk measures they report to the board and investment committee and how frequently.

The investment committee usually received more information on risk and performance than the governor or the board, but reports often lacked some key metrics (Table 5). The investment committee usually has more oversight over the day-to-day management of the portfolios, and it is reasonable that they receive more comprehensive reports. The investment committee reports of more than half of central banks do include the most relevant risk and performance metrics. However, most central banks do not report the tracking error, the credit VaR, or the rating breakdown to the investment committee, the governor, or the board. International experience suggests that comprehensive risk and performance reports—albeit at reasonable intervals and uncluttered with excessive detail—are critical for boards and investment committees to properly manage and monitor reserve management activities. An empirical study that looks at governance structures and reporting also suggests that central banks where the head of risk management directly reports to the board hold more diversified currency and asset portfolios, controlling for reserve adequacy and the overall institutional environment. The anchoring of risk at the board level may further allow reserve managers to run riskier reserve portfolios controlling for reserve adequacy and the macroenvironment as well as for the broader institutional environment (Klingebiel et al. 2021).

Regarding the **frequency of such reporting**, 45 percent of respondents reported to their boards quarterly. In comparison, reserve managers issued reports to the governor and the investment committee monthly (41 and 49 percent respectively).

Table 5. Risk and performance indicators reported to the governor, board, or investment committee (percentage of respondents)

	Absolute return	Excess return	Tracking error	Duration	Market VaR/CVaR	Credit VaR/CVaR	Rating breakdown	Other
Governor	76%	67%	36%	71%	50%	18%	46%	7%
Board	79%	66%	35%	67%	48%	20%	47%	8%
Investment committee	86%	76%	48%	86%	62%	24%	58%	6%

N=117.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

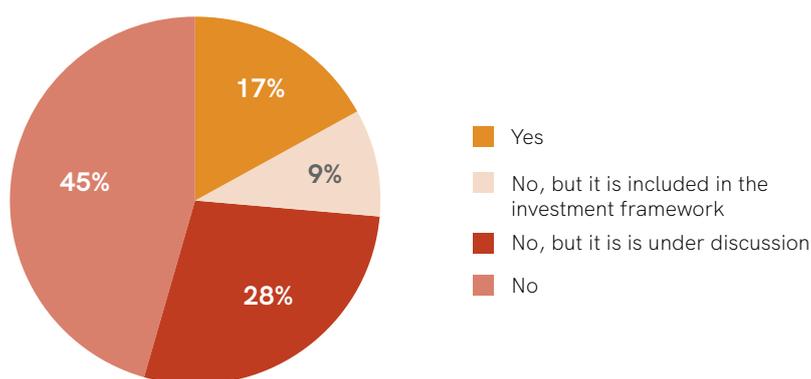
3.5. ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG)

Including Environmental, Social, and Governance (ESG) factors in the investment analysis is becoming more common. Climate change and the social challenges

arising from the COVID-19 pandemic have raised the institutional investor’s awareness of their impact on the environment and society. As a result, global sustainable investment grew 15 percent between 2018 and 2020, reaching \$35 trillion (Global Sustainable Investment Alliance 2020).

Reserve managers are also participating in this trend, although the adoption of ESG investing is still low. Twenty-six percent of respondents included ESG objectives in their investment policy or investment framework (Figure 39).²⁶ Most institutions with such a policy or framework applied these strategies to their internally managed portfolios (94 percent), while 52 percent also used them in their externally managed portfolios. Moreover, almost a third of central banks are considering ESG, signaling that the adoption of this investment style may grow in the future. However, nearly half of respondents were neither implementing nor considering the adoption of ESG in their investment operations. The low adoption rate of ESG in reserve portfolios is attributable to the fact that central banks concentrate on high-quality fixed-income assets, where the availability of ESG instruments and strategies is limited (see Bouyé, Klingebiel, and Ruiz 2021).

Figure 39. Inclusion of environmental, social, and governance (ESG) factors in the investment policy



N=117.

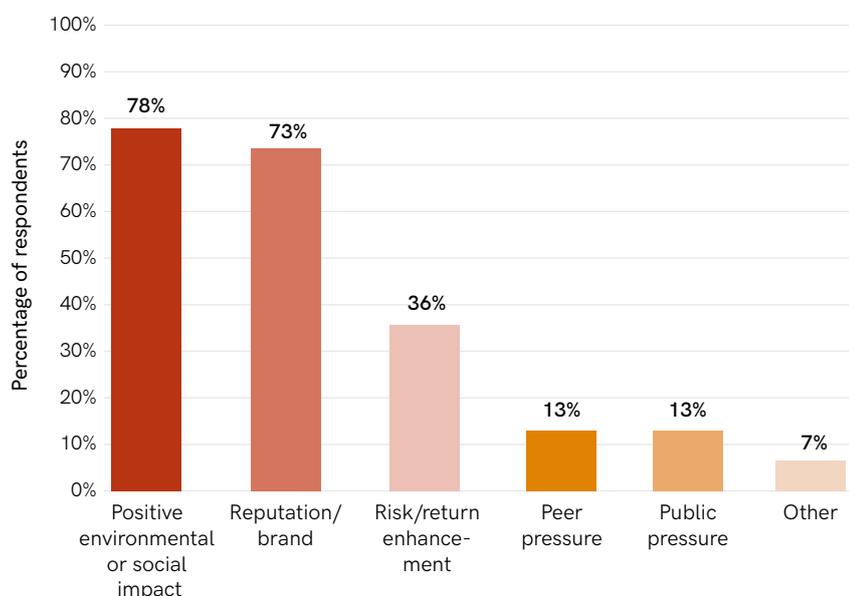
Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Having a positive impact and maintaining their reputation are the main drivers of ESG implementation in central banks. Almost three-quarters of central banks implementing ESG allude to impact and reputation as motivating factors (Figure 40).

²⁶ Compared with the 2019 survey, the number of institutions that have included ESG in the reserve portfolio has not changed. The 2019 survey had one question on ESG adoption. In contrast, the 2021 survey changed the wording of that question, including references to the investment policy and framework, and included new questions to understand the motivations, the approaches, and the allocations to those strategies. Some of the questions included specific definitions to facilitate interpretations (e.g., negative screening or green bonds). In view of those changes, we do not attempt to compare the two surveys when direct comparison is no longer possible.

Central banks are crucial entities in their countries, and, leading by example, they may promote ESG adoption in both the private and the public sectors. Interestingly, improving the risk-return profile of the portfolios or responding to public or peer pressure is not essential for central banks, despite typically being cited as highly relevant factors for other institutional investors.

Figure 40. Motivating factors to incorporate ESG (institutions with ESG in their investment policy or framework)



N=45.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

ESG implementation varied by region, income level, and level of reserves. The breakdown by region shows that South and East Asia and the Pacific are the regions that led on ESG implementation (45 percent of institutions in those regions), followed by Europe and Central Asia (40 percent).²⁷ Another interesting observation is that ESG adoption increases with income level because 42 percent of central banks in high-income countries have implemented ESG, compared with 28 percent in upper-middle-income and 12 percent in lower-middle and low-income countries. Finally, central banks with more significant reserve levels were more likely to execute this strategy—58 percent of institutions with more than \$50 billion in reserves do so, significantly above those with \$10–50 billion (36 percent), \$3–10 billion (3 percent), or less than \$3 billion (12 percent).

Reserve portfolios that include equities were also more likely to have ESG in their investment process. Fifty-five percent of central banks invested in equities

²⁷ In the Americas and the Caribbean 14 percent of central banks have implemented ESG, compared to seven percent in the Middle East and Africa.

also adopted ESG. However, only 22 percent of institutions without equities did so, again highlighting that the availability of investment strategies in high-grade fixed income strategies is a constraining factor (Bouyé, Klingebiel, and Ruiz 2021).

Impact investing through green, social, and sustainability bonds was the preferred ESG strategy in central banks (Table 6).²⁸ Two-thirds of central banks that had implemented ESG, either in the investment policy or investment framework, bought thematic bonds issued by SSA. Approximately a third of these institutions also bought labeled corporate bonds. The second most prevalent approach was negative screening, applied mainly to corporate bonds (45 percent of central banks with ESG), government bonds (32 percent), and equity (32 percent). A third of the respondents in this group also claimed to use ESG integration to invest in corporate bonds. Other ESG approaches were not adopted at a significant frequency.

Table 6. ESG strategies used (percentage of institutions with ESG)

	Government/ SSA bonds	Corporate bonds	High-yield bonds	Equity
Negative/exclusionary screening	32%	45%	10%	32%
Positive/best-in-class screening	16%	16%	0%	6%
ESG integration	23%	35%	10%	16%
Impact investing (i.e., green bonds, social bonds, sustainability bonds)	68%	35%	3%	Not applicable
Impact investing different from green, social, or sustainability bonds	6%	3%	0%	3%
Active ownership and engagement	3%	10%	3%	19%

N=31.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Nevertheless, the participation of green, social, and sustainability bonds in portfolios is minimal. Eighty-two percent of central banks with green bonds issued by governments and SSA have one percent or less of their portfolios invested in these instruments. Only two central banks have an investment above 10 percent of the portfolio. Fewer respondents buy social or sustainability bonds; even if they do, exposures are much smaller. As highlighted in Bouyé, Klingebiel, and Ruiz (2021),

²⁸ In this document, green, social, and sustainability bonds are also referred to as thematic or labeled bonds.

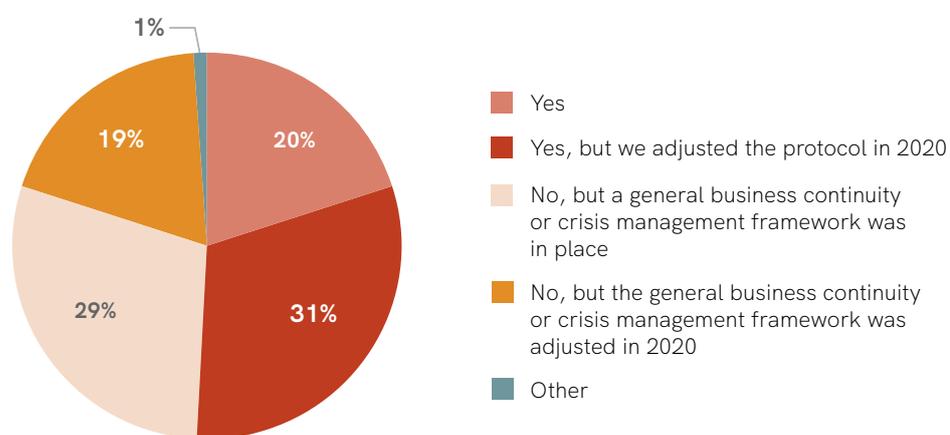
although the market capitalization of these types of bonds is growing significantly, the overall market size for these instruments is still negligible. This presents a significant obstacle for any central bank seeking to increase its allocation here.

3.6. PANDEMIC BUSINESS CONTINUITY MANAGEMENT

The COVID-19 pandemic placed an enormous operational burden on most institutions. To conduct their unprecedented monetary policy and business operations seamlessly during the pandemic, many central banks implemented a set of business continuity or crisis management measures. This year's survey included several questions on central banks' business continuity practices.

From an operational perspective, around half of central banks had not prepared for a pandemic before 2020. COVID-19 was an unprecedented event insofar as epidemics in recent decades had neither spread globally nor resulted in generalized lockdowns. Consequently, 48 percent of respondents did not have business continuity protocols or arrangements in place for a pandemic scenario in 2019 (Figure 41). Thirty-one percent of respondents had protocols or arrangements in place for a pandemic but had to change them in 2020 as COVID-19 cases grew worldwide. Only 20 percent of central banks had a pandemic business continuity framework in place that did not need any adjustment.

Figure 41. Did your institution have business continuity protocols and arrangements in place for a pandemic scenario as of December 31, 2019?



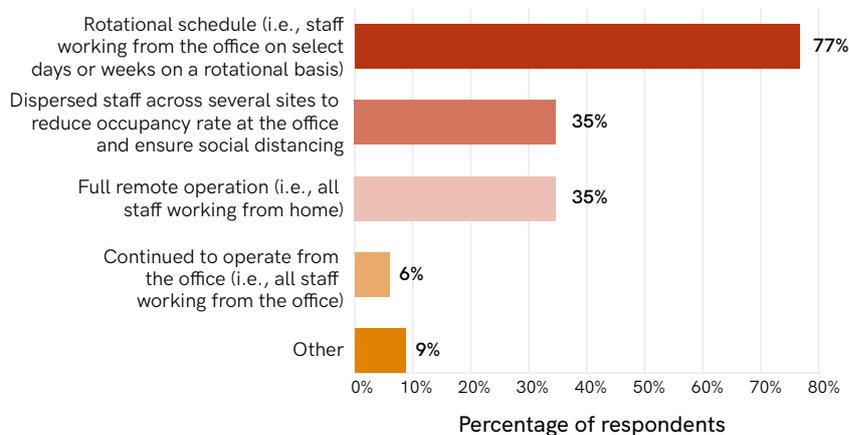
N=117.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Although most institutions changed their work arrangements in response to the pandemic, fewer than half of the central banks moved to a full working-from-home mode. As COVID-19 emerged in various countries, most central banks im-

plemented a rotational schedule, where staff would work from the office on certain days or weeks and work from home at other times (Figure 42). Nearly 40 percent of central banks conducted full remote operations (working from home). Very few central banks continued to operate from their offices exclusively.

Figure 42. Work arrangements adopted in response to the pandemic



N=116.

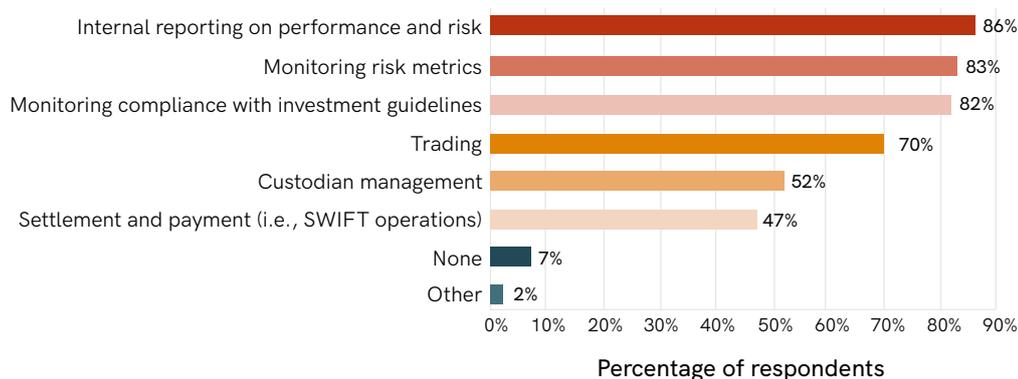
Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: Respondents could choose more than one answer. Therefore, results do not add up to 100 percent.

For many central banks, working remotely proved difficult as staff could not perform all of the critical functions outside the office, mainly back-office operations.

Approximately half of the central banks could only perform settlement and payment operations and custody management from the office (Figure 43). At the same time, two-thirds of respondents could fully execute trades remotely, and more than 80 percent of respondents could perform critical functions, such as reporting or compliance from home. Only seven percent of respondents indicated that they could execute any of these functions exclusively in the office.

Figure 43. Reserve management activities that can be performed remotely

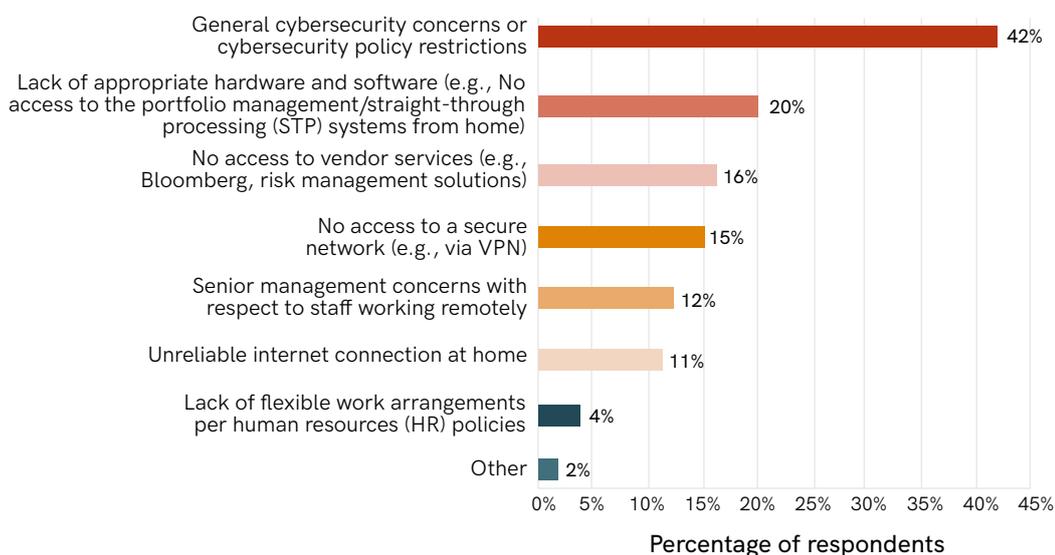


N=112.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Central banks cited cybersecurity and a lack of appropriate hardware and software as the main constraints to perform activities remotely (Figure 44). Most respondents indicated that they have access to secure networks, reliable internet connections at home, and access to vendor services. Interestingly, senior management concerns about remote work or the lack of human resource policies for flexible work arrangements did not seem to be a significant constraint.

Figure 44. Main constraints to remote working



N=105.

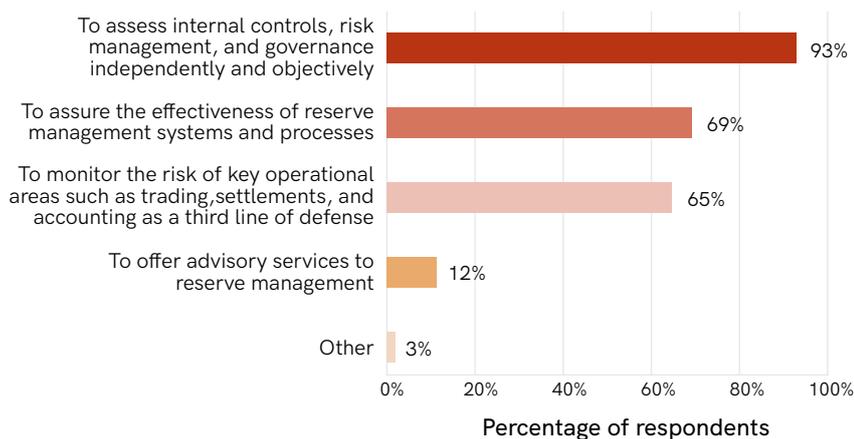
Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

3.7. AUDIT

Auditing reserve management activities is critical for central banks. An independent internal audit should regularly evaluate procedures and controls to monitor compliance with the institution's policies and articulate proposals to the board or senior management to improve the governance and organizational structure (International Monetary Fund 2014). For most central banks, reserve management plays a critical role in the institution's financial situation, if not the most important. As a result, auditors review the processes deployed in reserve management, usually during the annual audit of the financial statements. Auditors are the so-called "third line of defense" in reserve management, after those that execute the operations (front office) and those that monitor risk and compliance (middle office). Auditors assess and assure that the governance framework is effective and policy and process are in place.

The survey found that auditors play three essential roles. The first and most important is to perform an independent assessment of internal controls, risk management, and governance (93 percent of respondents) (Figure 45). The second role is to assure the effectiveness of reserve management systems and processes (69 percent). Finally, auditors monitor the risk of critical operational areas such as trading, settlements, and accounting (65 percent). Therefore, an effective auditing function is essential for a well-performing reserve management process.

Figure 45. Internal audit of reserve management operations: roles

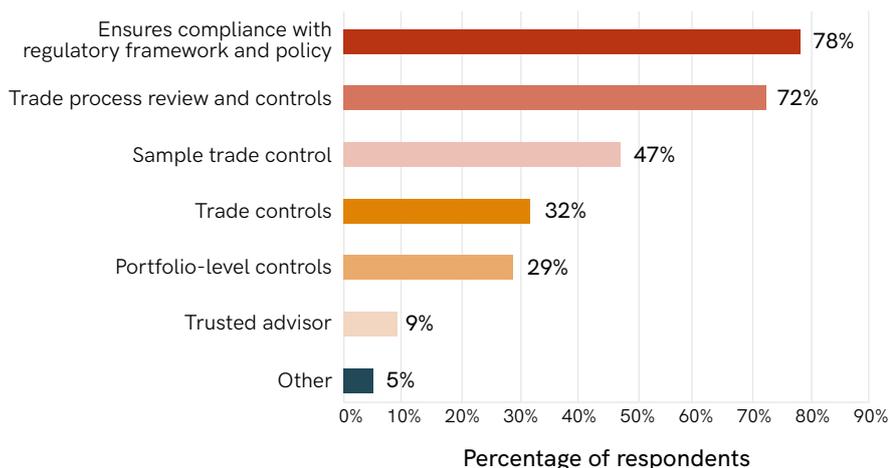


N=118.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Ensuring compliance with the regulatory framework and policies and reviewing trade processes and controls are the main activities of internal audit. More than three-quarters of internal audit teams at respondent central banks executed these activities (Figure 46). For a considerable number of respondents (47 percent), auditors also performed sample trade controls. However, the analysis by income level reveals notable differences. For high-income countries, the essential activities of their internal audit function were sample trade control (76 percent of institutions in this group), followed by acting as a trusted advisor (64 percent). For middle- and low-income countries, internal auditors were focused on ensuring compliance with policies and the regulatory framework (89 percent for upper-middle-income and 78 for lower-middle and low-income countries) and the review of trade processes and controls (76 percent for upper-middle-income and 68 percent for lower-middle and low-income countries).

Figure 46. Internal audit of reserve management operations: activities

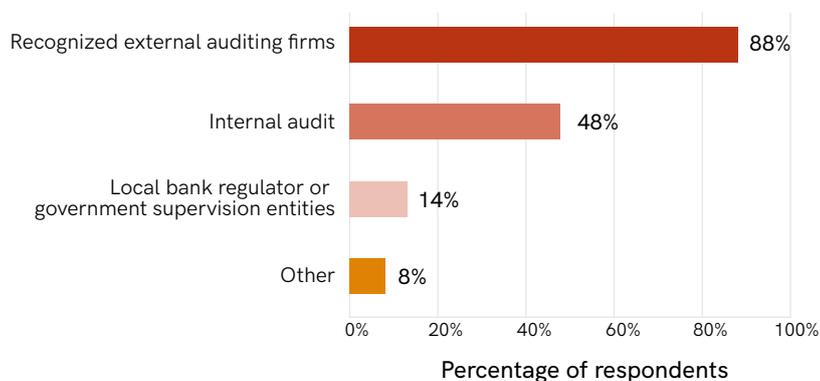


N=116.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Recognized external auditing firms are frequently in charge of auditing financial statements. More than 80 percent of surveyed central banks had this arrangement. Internal audit also performed this function in approximately half of the central banks (Figure 47), but more frequently in upper-middle-income countries (71 percent) and the Americas and the Caribbean (68 percent). However, given the unique role of central banks, for 68 percent of respondents, both internal and external auditors reviewed the financial statements.

Figure 47. Responsibility for auditing financial statements



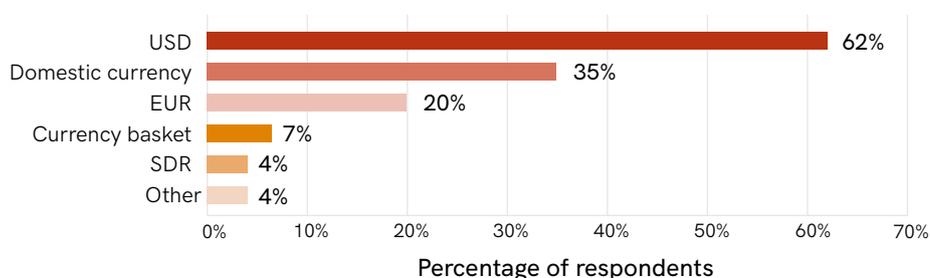
N=118.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

3.8. THE NUMERAIRE AND PUBLIC DISCLOSURE POLICIES OF CENTRAL BANKS

The US dollar remains the most frequently used numeraire for reporting purposes, followed by the domestic currency (Figure 48). More than 60 percent of central banks reported performance in US dollars and 35 percent in local currency. Using the SDR or another currency basket was unusual. A breakdown by region shows that countries in the Americas, the Caribbean, the Middle East, and Africa deployed the US dollar as numeraire more regularly (90 percent of respondents in the Americas and the Caribbean and 79 percent of those in the Middle East and Africa). European and Central Asian central banks utilized either the domestic currency (43 percent) or the euro (43 percent).²⁹ Institutions in South and East Asia and the Pacific preferred the US dollar (68 percent) and frequently used the domestic currency (50 percent).

Figure 48. Currencies used for performance reporting as a numeraire

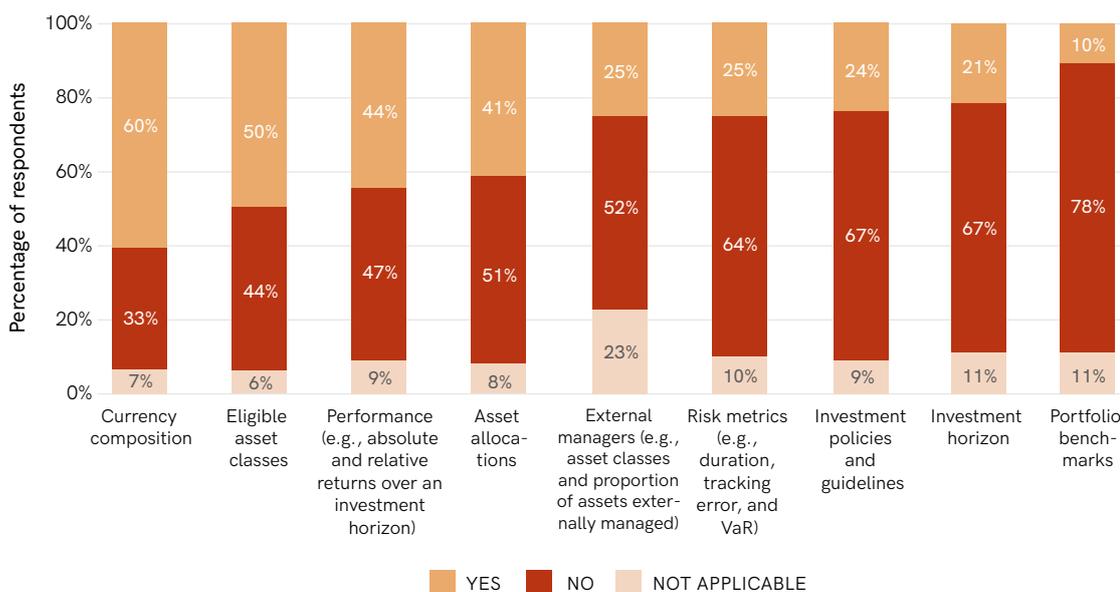


N=118.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Although most institutions produce internal reports, disclosing extensive information on reserve management activities to the public was unusual (Figure 49). The only data that most central banks (60 percent) revealed was the currency composition of reserves. A significant proportion also published information on eligible asset classes (50 percent), performance (44 percent), and asset allocations (41 percent). However, central banks did not generally share with the public the main guiding principles of the investment policy or granular information on reserve management practices. Fewer than a quarter of central banks divulged their investment policies, guidelines, risk metrics, or the characteristics of external management programs.

Figure 49. Information disclosed to the public, either on a mandatory or voluntary basis (percentage of respondents)



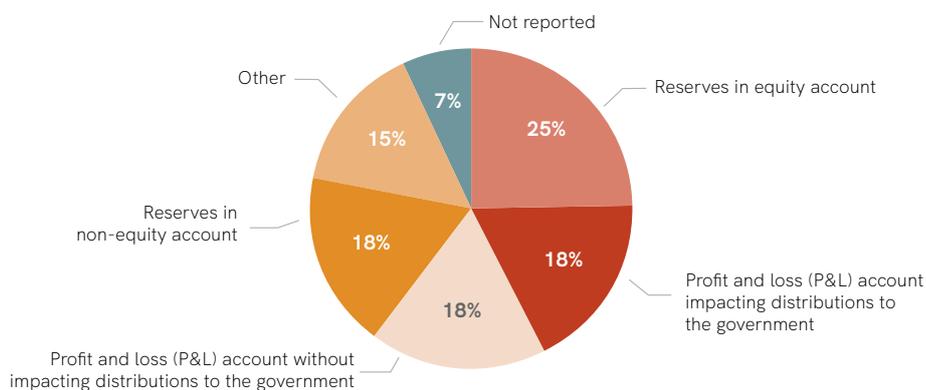
N=116.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

3.9. ACCOUNTING PRACTICES FOR GOLD

Accounting practices for gold vary considerably. As explained in section 3.2, this survey included questions on gold. The most common approach to report returns on gold was to account for unrealized gains and losses as reserves, either in equity or a non-equity account (43 percent). For 36 percent of institutions, the mark-to-market valuation of gold affected the profit and loss account. Notably, few institutions (18 percent) include unrealized gains and losses on gold in calculating distributions to their governments (Figure 50).

Figure 50. Accounting practices for unrealized gains and losses on gold



N=85.

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

4. Concluding Observations and Policy Implications

The COVID-19 pandemic upended reserve management operations in central banks. These institutions had to respond simultaneously to three significant shocks. Some countries liquidated part of their reserve holdings to cope with increasing liquidity needs in foreign currency. Additionally, lockdowns forced institutions to redesign operations as their staff had to work from home. Finally, the policy response in developed markets caused a significant decrease in interest rates, improving the return on reserves in 2020 but worsening it for 2021 and beyond.

We conducted the third RAMP survey during the COVID-19 pandemic. We found several striking changes between the 2020 and the 2021 surveys as institutions responded to this challenging environment. Central banks put more weight on safety and liquidity than on return to respond to the potentially higher reserve need. Furthermore, they adjusted their operations and were able to execute a significant number of functions remotely. Finally, reserve managers decreased portfolio duration and expanded eligibility and exposure to more currencies and asset classes, going beyond the traditional choices.

Central banks confronted the crisis, and managed through it: in so doing, they innovated in certain areas. Investment operations added derivatives and instruments. Furthermore, more central banks engaged with external managers. They also explored how to implement ESG in their portfolios.

Nonetheless, as identified in the two previous RAMP surveys, risk management and transparency have not evolved on a par with asset allocation and portfolio management. The survey results highlight that reserve managers do not measure and manage credit and market risk with state-of-the-art tools. Enhancing risk management practices is particularly important for institutions with exposure to nontraditional assets. Most institutions also remain reluctant to improve the transparency of their reserve management practices. Improving practices in these areas will be vital if the art and science of reserve management are to evolve further.

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Appendix

Table A.1. Use of Tranching

Geographic region	TRANCHING	NO TRANCHING
Americas & Caribbean	82.6%	17.4%
Europe & Central Asia	51.2%	48.8%
Middle East & Africa	90.6%	9.4%
South & East Asia and Pacific	77.3%	22.7%
Country-income group		
High income	54.6%	45.5%
Upper middle income	79.4%	20.6%
Lower middle & low income	87.5%	12.5%
Size of assets under management (US\$)		
Less than 3 billion	72.4%	27.6%
3 to 10 billion	90.3%	9.7%
10 to 50 billion	72.0%	28.0%
More than 50 billion	57.6%	42.4%
Foreign exchange regime		
Not applicable	100.0%	
Floating	60.0%	40.0%
Soft Peg	83.7%	16.3%
Hard Peg	100.0%	
Grand Total	72.9%	27.1%

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Table A.2. Average Investment Horizon of the Tranches (months)

Geographic region	LIQUIDITY TRANCHE	INVESTMENT TRANCHE	TOTAL PORTFOLIO	TOTAL PORTFOLIO (UNTRANCED)
Americas & Caribbean	9.6	49.1	21.5	31.7
Europe & Central Asia	13.6	31.3	12.4	43.1
Middle East & Africa	10.7	43.2	26.2	15.3
South & East Asia and Pacific	18.8	39.0	66.0	22.0
Country-income group				
High income	20.6	45.5	30.3	46.2
Upper middle income	9.5	38.9	20.5	18.7
Lower middle & low income	10.2	42.0	20.8	27.4
Size of assets under management (US\$)				
Less than 3 billion	10.2	49.0	16.3	35.0
3 to 10 billion	11.4	41.4	23.6	9.7
10 to 50 billion	7.5	31.8	12.0	19.7
More than 50 billion	23.7	41.4	37.6	56.0
Foreign exchange regime				
Not applicable	7.0	60.0		
Floating	12.0	32.5	17.9	40.9
Soft Peg	9.8	43.1	23.6	25.1
Hard Peg	33.6	73.2	66.0	
Grand Total	15.6	52.2	35.8	33.0

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Table A.3. Average Duration of the Tranches (months)

Geographic region	LIQUIDITY TRANCHE	INVESTMENT TRANCHE	TOTAL PORTFOLIO	TOTAL PORTFOLIO (UNTRANCED)
Americas & Caribbean	7.1	23.8	19.6	39.5
Europe & Central Asia	12.5	25.3	14.2	21.3
Middle East & Africa	7.2	25.7	19.9	11.7
South & East Asia and Pacific	6.9	29.6	6.0	21.0
Country-income group				
High income	14.1	29.0	19.2	25.8
Upper middle income	7.4	28.5	17.9	12.5
Lower middle & low income	5.4	22.1	11.5	22.4
Size of assets under management (US\$)				
Less than 3 billion	8.3	26.7	16.0	20.6
3 to 10 billion	7.2	22.6	20.2	5.7
10 to 50 billion	5.4	28.0	15.6	15.9
More than 50 billion	14.8	29.3	14.2	31.5
Foreign exchange regime				
Not applicable	2.0	19.5	4.0	
Floating	10.0	22.8	15.5	25.0
Soft Peg	6.3	28.5	18.8	15.9
Hard Peg	13.0	28.8	24.0	
Grand Total	7.8	24.9	15.6	20.4

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Table A.4. Eligibility by Currency (percentage of respondents within group)

Geographic region	USD	EUR	GBP	JPY	CNY	AUD	CAD	CHF	NOK	SEK	Other	NZD	DKK	SGD	KRW	HKD	ZAR	MXN	INR	TRY	BRL	RUB		
Americas & Caribbean	100%	83%	74%	52%	43%	48%	57%	43%	39%	39%	26%	39%	30%	30%	17%	13%								
Europe & Central Asia	97%	82%	74%	67%	59%	62%	56%	38%	28%	21%	36%	18%	23%	15%	13%	5%	3%	5%	3%	5%	3%	5%		
Middle East & Africa	100%	94%	84%	63%	75%	56%	59%	56%	38%	44%	31%	28%	31%	16%	25%	13%	28%	16%	9%	9%	9%	9%	3%	
South & East Asia and Pacific	100%	100%	95%	84%	84%	79%	58%	42%	32%	32%	32%	47%	32%	42%	37%	37%	11%	21%	21%	5%	5%	11%		
Country-income group																								
High income	100%	81%	74%	67%	60%	62%	60%	36%	40%	36%	17%	36%	36%	19%	21%	14%	10%	12%	10%	10%	7%	5%		
Upper middle income	97%	97%	94%	73%	67%	76%	67%	58%	39%	42%	42%	42%	33%	36%	27%	24%	3%	9%	3%				3%	
Lower middle & low income	100%	89%	76%	58%	68%	45%	47%	45%	21%	21%	39%	13%	16%	16%	16%	5%	18%	8%	8%	5%	5%	5%		
Size of assets under management (US\$)																								
Less than 3 billion	100%	93%	69%	38%	41%	34%	34%	28%	10%	7%	31%	14%	3%	14%	3%		14%						3%	
3 to 10 billion	97%	90%	83%	67%	63%	60%	60%	53%	40%	43%	33%	37%	37%	27%	27%	13%	17%	20%	10%	13%	10%	7%		
10 to 50 billion	100%	88%	88%	76%	72%	64%	60%	44%	28%	32%	28%	24%	24%	12%	16%	4%			4%					
More than 50 billion	100%	83%	83%	83%	83%	83%	76%	55%	55%	48%	34%	45%	48%	38%	38%	38%	10%	17%	14%	7%	7%	7%		
Foreign exchange regime																								
Not applicable	100%	100%	50%								50%													
Floating	100%	88%	82%	79%	79%	72%	68%	51%	44%	40%	28%	39%	39%	32%	32%	21%	9%	14%	7%	7%	5%	2%		
Soft Peg	100%	91%	83%	57%	57%	53%	51%	40%	23%	26%	36%	21%	17%	15%	11%	6%	13%	6%	6%	4%	4%	6%		
Hard Peg	86%	71%	57%	29%	14%	29%	29%	43%	29%	29%	29%	29%	29%	14%	14%	14%	14%		14%			14%		
Grand Total	99%	88%	81%	65%	65%	60%	58%	45%	34%	33%	32%	30%	28%	23%	21%	14%	11%	10%	7%	5%	4%	4%		

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Table A.5. Eligibility by Asset Class (percentage of respondents within group)

Geographic region	GOV. BONDS	BANK DEPOSITS	MM INSTRUMENTS	SSA	GOLD	NON-TRADITIONAL	INFLATION-INDEXED BONDS	COVERED BONDS	IG CORPORATE BONDS	MBS	EM BONDS	ABS	OTHER	DM EQUITY	EM EQUITY	HY CORPORATE BONDS
Americas & Caribbean	100%	96%	100%	100%	74%	83%	74%	35%	35%	65%	26%	30%	17%	9%		
Europe & Central Asia	95%	87%	85%	87%	82%	77%	46%	56%	44%	18%	26%	10%	28%	28%	5%	3%
Middle East & Africa	88%	97%	84%	81%	66%	69%	50%	41%	34%	41%	34%	28%	22%	9%	9%	6%
South & East Asia and Pacific	100%	84%	89%	84%	74%	68%	47%	47%	53%	37%	47%	21%	11%	21%	21%	
Country-income group																
High income	100%	78%	93%	93%	68%	85%	59%	51%	54%	41%	37%	22%	20%	37%	15%	5%
Upper middle income	94%	100%	91%	85%	70%	76%	61%	52%	33%	42%	33%	24%	24%	9%	6%	
Lower middle & low income	90%	97%	82%	85%	85%	62%	41%	36%	33%	28%	26%	18%	21%	5%	3%	3%
Size of assets under management (US\$)																
Less than 3 billion	90%	97%	83%	86%	62%	69%	45%	48%	41%	31%	17%	24%	28%	14%	7%	3%
3 to 10 billion	97%	97%	90%	87%	87%	73%	57%	47%	43%	37%	27%	30%	20%	17%	3%	3%
10 to 50 billion	92%	84%	92%	88%	84%	84%	48%	48%	32%	32%	36%	4%	12%	4%		
More than 50 billion	100%	86%	90%	90%	66%	72%	62%	41%	45%	48%	48%	24%	24%	34%	21%	3%
Foreign exchange regime																
Not applicable	100%	100%	100%	100%	50%	100%	50%	50%		50%		50%				
Floating	100%	84%	95%	93%	69%	81%	62%	52%	52%	43%	41%	22%	22%	29%	12%	3%
Soft Peg	87%	98%	81%	81%	81%	64%	45%	36%	30%	28%	23%	19%	19%	6%	4%	2%
Hard Peg	100%	100%	83%	83%	83%	83%	33%	67%	33%	50%	17%	17%	33%			
Grand Total	95%	91%	88%	88%	74%	74%	53%	46%	41%	37%	32%	21%	21%	18%	8%	3%

Source: Third RAMP survey on the Reserve Management Practices of Central Banks.

Note: ABS=asset-backed securities, DM=developed market, EM=emerging market, Gov.=Government, HY=High-yield, IG=investment grade, MBS=mortgage-backed securities, MM=money market, SSA=supranational, sovereign, and agency.