

World Bank Treasury Papers

Inaugural RAMP Survey on the Reserve Management Practices of Central Banks

Results and Observations

The Reserves Advisory and
Management Partnership (RAMP)



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ABSTRACT

In the Spring of 2018, the World Bank Treasury's Reserves Advisory and Management Partnership (RAMP) concluded its inaugural survey on central banks' reserve management practices. RAMP sought to assess whether there had been a significant evolution in this activity over the last two decades given:

1. The substantial increase in global foreign exchange reserves over that time period, and
2. The extraordinary policy responses to the unprecedented macroeconomic and investment environment during and after the global financial crisis.

The survey results show that most central banks continue to employ a traditional approach: their reserve holdings are concentrated in high-quality fixed-income assets and the minimum credit rating for their investments

remains conservative. At the same time, the data suggest important changes are under way, as a material number of central banks reported more diversified portfolios with exposure to nontraditional asset classes: a third of respondents hold corporate credit, most of which is investment grade, and almost one in five own mortgage-backed securities or equities, although mostly in limited allocations. Analysis of this information did not find a relationship between respondents' measures of reserve adequacy and the size of their exposure to nontraditional asset classes. The data exhibit considerable cross-country differences in the way central banks manage their reserves and, in some circumstances, the analysis suggests that these differences correlate with respondents' country income groups.

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Keywords: Exchange Reserve; reserve management; asset class; level of foreign exchange reserve; management of foreign exchange reserves; reserve adequacy; investment horizon conditional value at risk; short-term external debt; strategic asset allocation; global gross domestic product; asset and liability management; currency composition of reserves; Enterprise Risk Management; minimum credit rating; foreign exchange policy; foreign exchange assets; survey results; financial instrument; investment policy; corporate bond; money market instrument; Special Drawing Right; basket of currency; knowledge and learning; emerging market bond; returns; eligible asset; investment committee; domestic currencies; reserve portfolio; risk tolerance; monetary policy operation; global financial crisis; external shock.

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ACKNOWLEDGEMENTS

This report shares results and observations arising from data that the reserves advisory and Management Partnership (RAMP) collected from 99 central banks from around the world as part of its inaugural survey of these institutions' reserve management practices. although published under an institutional rubric, it is the product of the work of many individuals.

In writing this report, the authors benefited from valuable contributions from a host of others and are grateful for their support. Initial and subsequent drafts received comment from the following World Bank colleagues: George

Bentley, Eric Bouye, Steen Byskov, Otilia Iulia Ciotau, Mehmet Coskun Cangoz, Roberto De Beaufort Camargo, Erik Feyen, Bjoern Geir From, Natan Goldberger Rico, Attila Juhasz, Azzedine Lazizi, Robert Lucas, Wendy Mendes, Stephane Piot, Mahmut Rustem Sen, and James Seward. The following colleagues at the Bank of International Settlements also provided feedback: Pierre Cardon, Stijn Claessens, Mike McMorrow, Vahe Sahakyan, and Michela Scatigna. The authors would also like to thank the staff of the 99 central banks who answered the survey's questions. Without their input, none of this would have been possible.

ABBREVIATIONS

ABS	Asset-backed securities
ARA	Assessing reserve adequacy
AUD	Australian dollar
CAD	Canadian dollar
CHF	Swiss franc
CVaR	Conditional value at risk
EM	Emerging market
ESG	Environmental, social, and governance
EUR	Euro
GBP	British pound sterling
GDP	Gross domestic product
IMF	International Monetary fund
JPY	Japanese yen
KRW	Korean (rep. of) won
MBS	Mortgage-backed securities
NOK	Norwegian krone
NZD	New Zealand dollar
RAMP	Reserves advisory and Management Partnership
RMB	Renminbi
SAA	Strategic asset allocation
SDR	Special drawing rights
SEK	Swedish krona
SGD	Singapore dollar
SSA	Supranational, sovereign, and agency
USD	United States dollar
VaR	Value at risk
ZAR	South African rand

1 INTRODUCTION

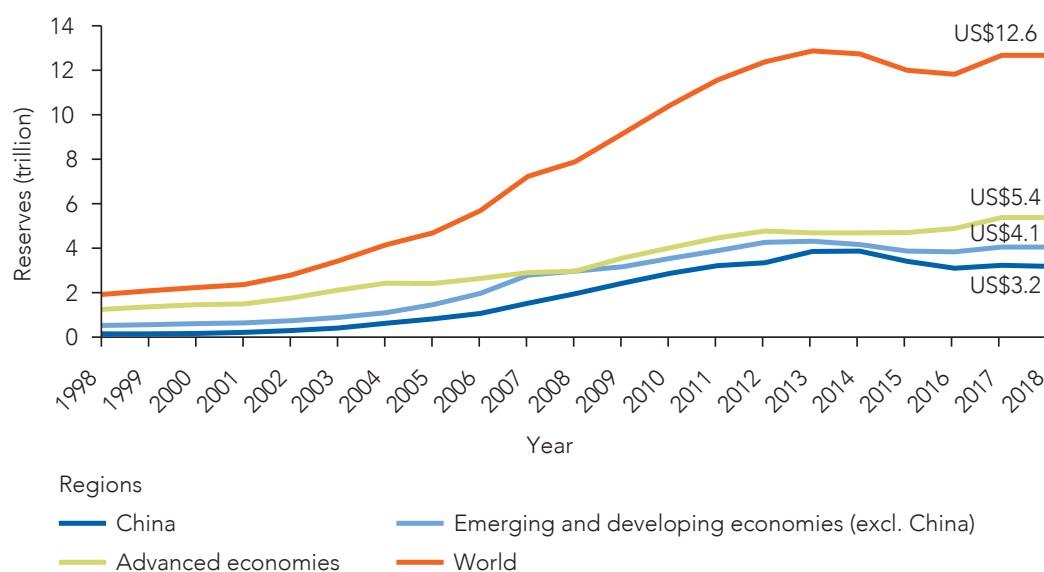
Over the past two decades, global foreign exchange reserves have increased more than six-fold, reaching US\$12.6 trillion as of March 31, 2018.¹ Aggregate reserves peaked in 2014 and decreased moderately thereafter for approximately two years — mostly due to a decline in emerging market economies’ reserves that arose in part from a fall in commodity prices — before rebounding (see figure 1.1). Reserve accumulation has also exceeded the expansion in trade over the last 20 years (see figure 1.2).

This historically unprecedented growth in foreign exchange reserves accelerated the evolution of central banks’ asset management practices.² Many of these institutions expanded their focus beyond the traditional investment objectives of liquidity and safety to include

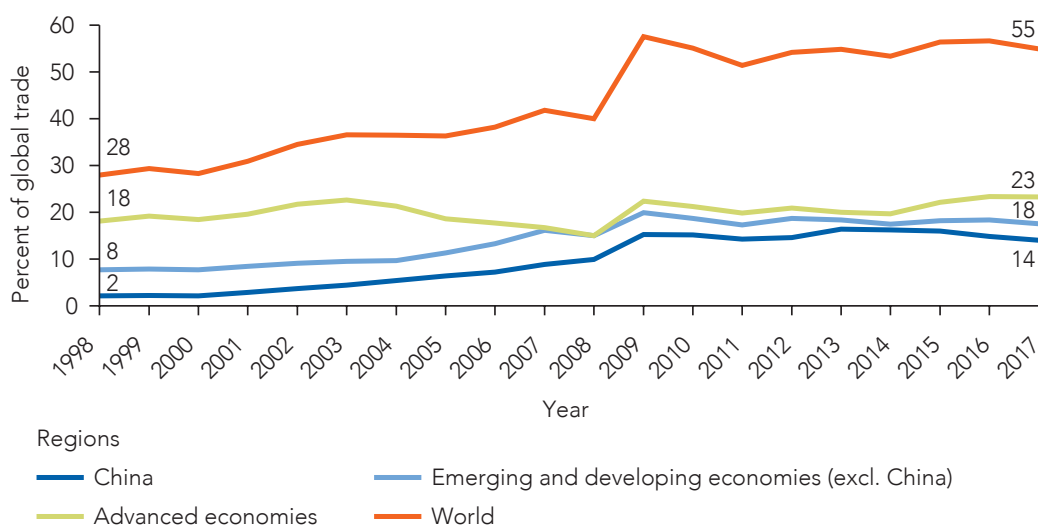
returns. In doing so, they faced additional challenges arising from the extraordinary policy responses to the unprecedented economic conditions following the financial crisis.

The World Bank Treasury’s Reserves Advisory and Management Partnership (RAMP) concluded its inaugural survey on central banks’ reserve management practices in the spring of 2018. The goals were to take stock of and develop a more complete understanding of these institutions’ reserve management policies and practices globally. The survey’s objectives were (1) to construct a picture of reserve management activities across multiple regions; and (2) to provide an opportunity for central banks to benchmark their actions and perspectives against peer institutions.

FIGURE 1.1
Global foreign exchange reserves, 1998-2018



Source: IMF, International Financial Statistics.

FIGURE 1.2**Global foreign exchange reserves as a percentage of global trade, 1998-2017**

Sources: World Bank, World Development Indicators; IMF, International Financial Statistics.

The survey addressed key areas of public asset management. Its content covered (1) governance and policy; (2) strategic asset allocation; (3) portfolio management; (4) risk management; and (5) performance reporting and transparency. The survey posed 36 questions across these areas, some of which requested additional information depending on the participants' answers. Some queries gave a prescribed set of potential responses; others requested specific data.

The results comprise input from 99 central banks and reflect an overall response rate of approximately 80 percent. Respondents represent countries with different income levels and from multiple regions (see table 1.1).³ Their amounts of foreign exchange assets and levels of reserve adequacy cover a wide range.⁴ Although most participants provided substantial amounts of information, some did not answer every question. When presenting data, this report identifies the number of

institutions responding to the relevant question (or each section of a question when necessary), either in the main text or in corresponding charts and tables.

Data is presented in an aggregate and unattributed format to maintain respondents' anonymity.⁵ Observations on this information arise from assessments through various lenses, including country-income group, measures of reserve adequacy, and monetary policy and exchange rate regimes. Where this analytical process identified patterns, the report shares these findings.

The remainder of this report is organized in three parts. Section 2 highlights its key findings. Section 3 describes the survey's results and offers observations on patterns in the data. finally, Section 4 discusses potential policy implications arising from the responses and analysis.

TABLE 1.1**Survey participant's reserve levels and adequacy metrics**

REGION	NUMBER OF CENTRAL BANKS	MEDIAN GDP PER CAPITA (USD)	NATIONAL RESERVE LEVELS		RESERVE ADEQUACY METRICS	
			MEDIAN TOTAL RESERVES (000,000 USD)	MEDIAN OF TOTAL RESERVES TO GDP	MEDIAN MONTHS OF IMPORT COVERAGE	MEDIAN OF TOTAL RESERVES TO SHORT-TERM DEBT OBLIGATIONS
Americas and Caribbean	16	9,934	11,314	0.16	5.1	2.1
East Asia and Pacific	17	5,902	80,692	0.25	5.9	1.6
Europe and Central Asia	35	14,117	25,191	0.19	3.4	0.9
Middle East and North Africa	7	4,828	25,106	0.30	9.1	2.8
South Asia	5	1,861	7,268	0.16	8.4	3.5
Sub-Saharan Africa	19	1,708	2,353	0.15	4.0	2.4
COUNTRY-INCOME GROUP						
High income (reserve)	16	16,069	33,159	0.27	5.8	1.6
High income (non-reserve)	16	51,265	75,901	0.06	2.5	0.1
Upper middle income	30	7,491	12,501	0.22	5.5	2.7
Lower middle income	28	2,739	5,901	0.15	5.1	1.6
Low income	9	662	2,108	0.13	4.0	19.1

Source: World Bank, World Development Indicators (October 2018).

Note: GDP = gross domestic product.

a. Some charts in this report present data on a country-income group basis. Percentages in these charts are based on the total number of survey respondents in a given country-income group, rather than the number of institutions in a country-income group that provided data on the specific topic. Therefore, percentages in these charts will not sum to 100 if the number of respondents to the question were less than the overall survey sample of 99 institutions.

NOTES

1. This report defines "foreign exchange reserves" as the pool of non-domestic currency denominated assets a central bank or monetary authority holds for meeting a defined range of objectives. The reserve management entity is responsible for the investment of this wealth and curation of associated risks. At times, this report may use terms such as "reserve assets," "reserve holdings," or "foreign currency reserves" or even "reserves" in referencing this pool of wealth.

2. Eichengreen, B., and M. Flandreau. 2014. A Century and a Half of Central Banks, International Reserves and International Currencies. https://www.norges-bank.no/contentassets/3fba8b3a3432407d929ae9218db1ffc4/04_eichengreen_and_flandreau2014.pdf

3. This report uses the World Bank's customized country-income group categories based on GNI per capita calculated using the World Bank Atlas Method. It separates countries into "low income" (less than \$1,005); "lower middle income" (\$1,006–\$3,955); "upper middle income" (\$3,956–\$12,235); and "high income" groups (more than \$12,235) (World Bank Data team 2017). Because of the report's subject matter, it further divides the "high income" category into "high income reserve" and "high income non-reserve" batches. The former encompasses only those that print currencies most often held as foreign exchange reserves by other central banks. the latter encompasses all others in the high-income country category.

4. There are various ways of measuring the adequacy of central banks' levels of foreign exchange reserves, including coverage of imports and short-term debt obligations. Unless otherwise specified, this report uses the term to reference a central bank's possession of sufficient levels of reserve assets to execute its mandate and achieve its objectives.

5. RAMP staff believes that confidentiality would facilitate central banks' participation and candid and comprehensive responses given the sensitive nature of their operations.

2 KEY FINDINGS

Managers of foreign exchange reserves have had to respond to two major market developments over the last twenty years, a substantial increase in the amount of these assets globally and the extraordinary policy responses to the unique macroeconomic and investment environment after the global financial crisis.

The survey's key findings suggest that, despite these factors, most central banks continue to employ a traditional reserve management approach. Their investments remain concentrated in high-quality fixed-income assets and the minimum credit rating for these holdings remains conservative.

At the same time, the data suggest that important changes are underway as a material number of central banks reported more diversified portfolios with exposure to non-traditional asset classes. A third of respondents hold corporate credit, most of which is investment grade, and almost one in five own mortgage-backed securities (MBS) or equities, although mostly in limited allocations. Our analysis of this information did not find a relationship between respondents' measures of reserve adequacy and the size of their exposure to non-traditional asset classes. The data exhibit considerable cross-country differences in the way central banks manage their reserves and, in some circumstances, our analysis suggests these differences correlate with respondents' country-income groups.

The key findings on governance and policy are as follows:

1. Central banks use a diverse set of arrangements to guide and implement their reserve management activities. They divide these responsibilities among various institutional bodies and use distinct approaches to execute mandates like investment policy development and

construction of a strategic asset allocation (SAA).

2. Self-insurance against external shocks is the primary motive for holding foreign exchange reserves that central banks most frequently consider highly relevant. They also deem conducting foreign exchange policy and servicing external debt of similar importance albeit less often. Saving for intergenerational equity does not appear to be a major concern even with the substantial increase in global holdings of foreign exchange assets.
3. Most central banks measure reserve adequacy in one way or another. They most frequently use the import coverage method followed by short-term external debt ratio, broad money ratio, and the IMF's Assessing Reserve Adequacy (ARA) metric.¹
4. The United States dollar (USD) and domestic currency are the most frequently used numeraire currencies. Almost all central banks in the middle- and low-income country groups use the U.S. dollar as numeraire. In contrast, a substantial majority in high-income reserve countries use domestic currency.
5. Almost all central banks consider safety and liquidity as highly relevant priorities. More than a third also highlight returns as an important motive and almost all the others identify it as somewhat relevant to their reserve management strategies.

The key findings on SAA are as follows:

1. Most institutions use tranching, typically separating reserves into liquidity and investment portfolios. Most adopt an investment horizon of more than one year

for foreign exchange (FX) assets allocated to portfolios focused on returns. They employ various metrics to express their risk tolerance.

2. Assets denominated in the U.S. dollar and euro (EUR) are the dominant formats for investments. Multiple currencies that central banks consider as eligible investment denominations do not comprise substantial amounts of their portfolios. One in ten respondents indicated that, in the near term, they will establish an allocation to financial instruments valued in renminbi (RMB). These institutions identified allocations to U.S. dollar and renminbi assets as most likely to increase over this period.
3. The dominant asset classes for portfolio composition are government bonds, bank deposits and money market instruments. Over half of central banks are authorized to purchase non-traditional investments, such as MBS and corporate bonds. One third of institutions own corporate bonds and almost one in five have exposure to MBS and equities.

The key findings on portfolio management are as follows:

1. Three quarters of respondents show a high willingness to take on active risk, using either an enhanced indexation or active style.
2. Most institutions use external managers to implement part of their SAA across a range of investment styles. Almost all of them consider the possibilities of knowledge transfer, capacity building and higher returns as highly relevant to their work with these agents. A majority allocate less than

10 percent of their reserves to third party managers.

The key findings for risk management are as follows:

1. Respondents reported a relatively conservative approach to fixed income investment as measured by minimum credit rating requirements. All but one do not allow investments below a rating of "BBB" for government or corporate bonds. Approximately two-thirds use "A-" as the minimum credit rating for sovereigns. Credit ratings are central banks' main credit risk assessment mechanism. Still, 60 percent indicated they use other methodologies to measure and manage the likelihood of default on the obligations in their reserve portfolios.
2. Most central banks manage market risk using duration and currency limits. About a third also determine limits based on probabilistic risk measures such as VaR (value at risk), CVaR (conditional value at risk), and tracking error. Approximately two-thirds also incorporate stress testing into their risk management activities.

The key findings for reporting and transparency are as follows:

1. More than half of central banks disclose information (voluntarily or mandatorily) on currency composition, asset classes, investment universe, and reserve management performance. A majority of institutions do not provide information on institutional regulation, risk metrics, benchmarks, external managers and investment horizon.

NOTES

1. The IMF's ARA metric is a composite of multiple factors relevant to reserve adequacy, including short-term debt, broad money, and imports (International Monetary fund 2018).

3 RESULTS AND OBSERVATIONS

This section describes the survey's results and shares observations where the authors identified notable patterns. Its subsections track the five main areas of public sector asset management that were the foci of the survey's questions: (1) governance and policy; (2) strategic asset allocation; (3) portfolio management; (4) risk management; and (5) performance reporting and transparency.

GOVERNANCE

Governance and organizational structure

Governance in reserve management refers to the institutional arrangements and processes for policy development and investment of foreign exchange assets. An effective framework ensures clear delegation and separation of responsibilities and establishes the policymaking structure, pathways of accountability, and checks and balances associated with preserving and generating returns from reserves. It defines who makes decisions and who is responsible for them, as well as how they are made, and reflects country-specific institutional, social, and regulatory considerations (de Abreu Faria and Ermes Streit 2016).

One model for implementing effective governance is a "three-tier" structure comprising (1) a board, (2) investment committee, and (3) operational units. Under this framework, the board typically sets the policy parameters for reserve management and establishes the investment objectives and horizon, risk tolerance, tranching criteria, and SAA. It formalizes these decisions through its approval of an investment policy and delegates oversight of reserve management to the investment committee. This body is responsible for setting and approving the investment

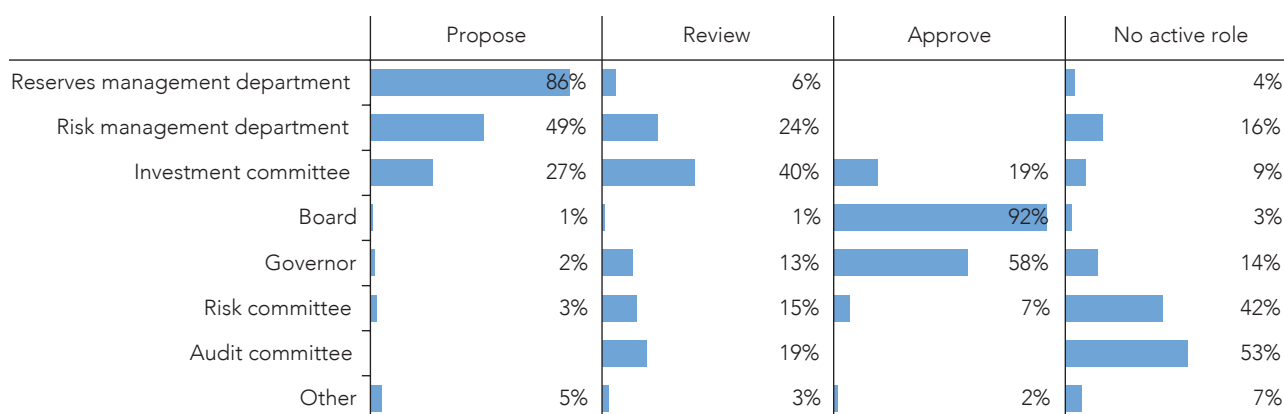
guidelines, which operationalize the investment policy, including the SAA. Operational units are responsible for implementing the board's policy decisions and these guidelines.

Some central banks use a two-tier approach without a separate investment committee. Under this framework, the board may be comprised of members with substantial technical skills and experience. In contrast, where a board's members represent stakeholders from a broader cross section of society, a formal investment committee may be needed to ensure access to the necessary expertise. These different frameworks suggest that a specific structure is less important to effective governance than ensuring that decision makers have sufficient judgment and knowledge to execute their responsibilities.

The survey results show that central banks use diverse arrangements to guide and implement their reserve management activities. Respondents divide these governance responsibilities among various institutional bodies in different ways. They also use distinct approaches to execute mandates like investment policy development and SAA.

While almost all respondents (92 percent) indicated that a board approves the investment policy, their responses show that numerous entities are involved in its proposal and review (see figure 3.1). With respect to proposing the investment policy, most (86 percent) answered that the operational department responsible for managing foreign exchange reserves proposes the policy and almost half (49 percent) indicated that the risk department also plays a role. When it comes to reviewing the investment policy, a little less than half of respondents (40 percent) use an investment committee while some indicated that the risk management department (24 percent), audit committee (19 percent) and/

FIGURE 3.1
Investment policy decision-making process



N^a = 97

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

a. "N" denotes the total number of institutions responding to the question, unless otherwise indicated.

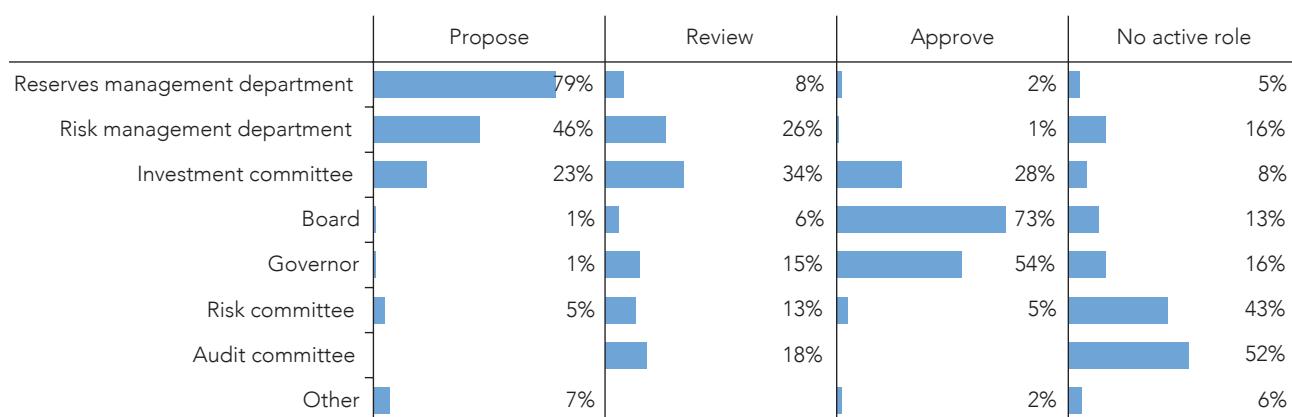
or risk committee (15 percent) also help to discharge this function.

Most central banks (73 percent) responded that the board approves their SAA, while (28 percent) answered that an investment committee owns this responsibility (see figure 3.2). The SAA—a central bank's neutral asset allocation given its risk tolerance—is one of the most critical aspects of effective reserve management. Empirical evidence suggests that an SAA is the key driver of long-term investment success (Ibbotson and Kaplan 2000).¹ A central bank's objectives, risk tolerance and investment horizon all shape this model allocation. The frequent involvement

of the board may show central banks' keen understanding of its importance.

The main risk arising from assigning SAA approval to an investment committee is that the board may not understand the source of negative portfolio performance should market volatility cause returns that do not meet the organization's long-term objectives. However, if the board does not have the financial expertise to understand the technical aspects of the SAA, delegating its approval to an investment committee may be appropriate. In this case, it is critical the committee ensures the board understands the implied risk and return characteristics of the approved SAA.

FIGURE 3.2
SAA decision-making process



N = 96

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

FIGURE 3.3**Organizational structure for reserve management responsibilities**

Reserves management and open market operations in the same department	63% - Yes	38% - No	N = 88
Reserves management's front, middle, and back offices in the same department	46% - Yes	54% - No	N = 90
Reserves management's front and middle offices in the same department, back office in a separate department	36% - Yes	64% - No	N = 86
Reserves management risk team is located in the same department as enterprise risk management	32% - Yes	68% - No	N = 81
N = 98			

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

Survey results show that central banks also adopt diverse arrangements for the day-to-day management of foreign exchange reserves. These operations involve units that: (1) initiate and execute trades and manage portfolios; (2) measure and report on risk and performance; and (3) settle portfolio trades. These are often referred to as the respective responsibilities of the front office, middle office and back office, which suggests a strict division of responsibilities among units that does not exist in practice. Almost half of respondents indicated that they do not house these operations in separate departments and, in fact, combine front, middle and back office functions in one unit (see figure 3.3).

Motives for holding reserves

Central banks have various motives for holding foreign exchange reserves. These include (1) self-insurance against external shocks; (2) conducting foreign exchange policy; (3) servicing external debt or other obligations; and (4) supporting monetary policy operations. These aims tend to shape components of institutional investment policy and operations, including reserve adequacy determinations, investment objectives, currency composition, investment horizon, risk tolerance, and numeraire.

Survey results show that self-insurance against external shocks is the primary motive for holding reserves, with most respondents (84 percent) considering it a highly relevant objective (see

figure 3.4). Many also considered conducting foreign exchange policy (66 percent) and servicing external debts or other obligations (55 percent) as highly relevant motivations.²

Saving for intergenerational equity did not appear to be a major reason for central banks' reserve management even with the substantial increase in global foreign exchange reserves. Very few (nine percent) identified it as a highly relevant objective.³

Respondents' motives for holding foreign exchange reserves differ across country-income categories.⁴ All institutions in low-income and lower middle-income countries reported that these assets are highly relevant to insuring against external shocks and servicing external debt or other obligations (see figure 3.5). This finding is consistent with a view that these countries may be more vulnerable to contagion and, in certain periods, may have greater difficulty accessing capital markets. Most high-income non-reserve country institutions (81 percent) also consider self-insurance a critical objective. In contrast, less than half (44 percent) of central banks in high-income reserve countries deem it important, an outcome consistent with their option to print reserve currency in periods of market distress.

Choice of reserve adequacy metric

Like a central bank's motives for holding reserves, the metrics it uses to evaluate the

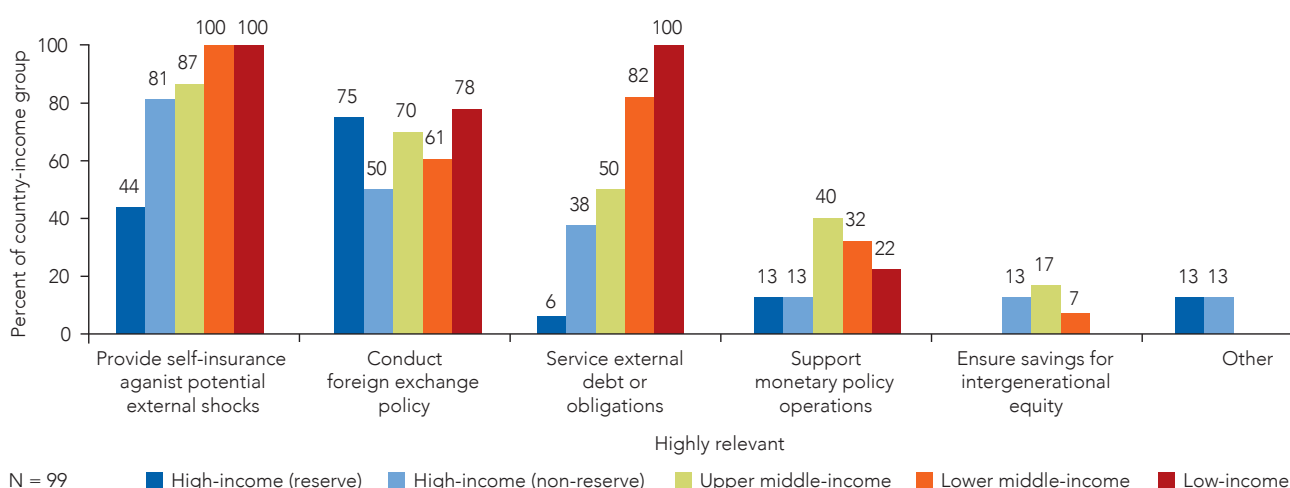
FIGURE 3.4
Motives for holding foreign exchange reserves

Motives	Highly relevant	Somewhat relevant	Not relevant
Provide self-insurance against potential external shocks	84%	10%	1%
Conduct foreign exchange policy	66%	20%	12%
Service external debt or obligations	55%	21%	16%
Support monetary policy operations	27%	46%	17%
Ensure savings for intergenerational equity	9%	26%	52%
Other	4%	5%	5%

N = 99

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

FIGURE 3.5
Motives for holding foreign exchange reserves by country-income group



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

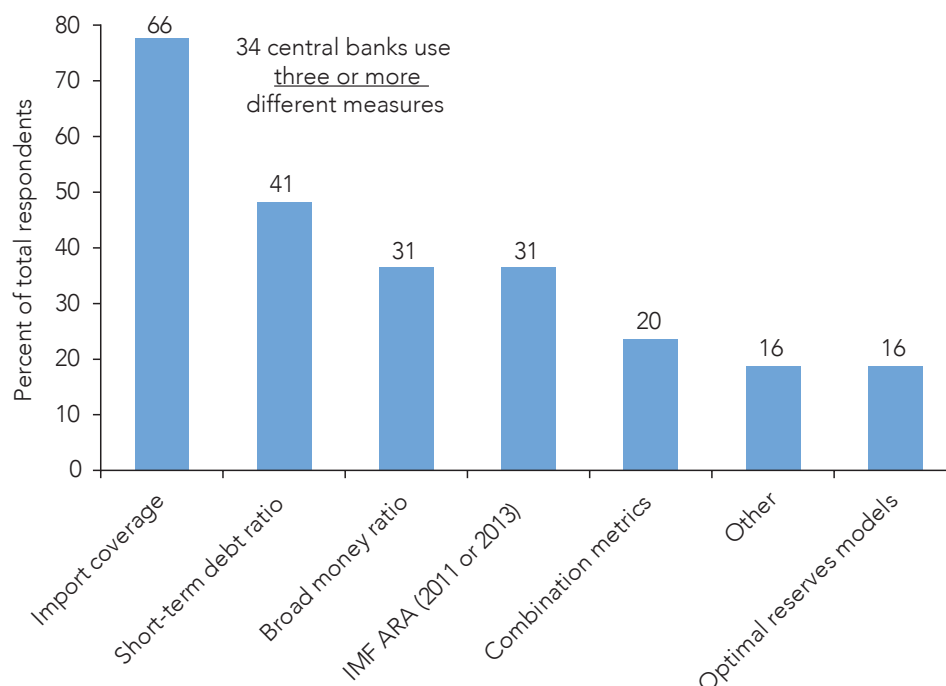
adequacy of these assets shape the course of its day-to-day operations. One measure may indicate its reserves are adequate while another may not. Much is at stake with this outcome, including the institution's understanding of its capacity to conduct currency interventions and diversify its reserve portfolios to include non-traditional asset classes.

There are various methodologies that institutions can use to assess reserve adequacy. The most commonly adopted tend to be those related to trade and capital flows, such as import coverage and short-term external debt ratio. Beyond these basic assessments, more sophisticated methodologies incorporate

combinations of these and other indicators (International Monetary fund 2011, 2013). Survey results show that most respondents (88 percent) measure reserve adequacy in one way or another.⁵ There were 12 central banks that indicated they did not make this assessment, including seven institutions from middle-income countries.

Respondents who assess reserve adequacy most frequently reported using the import coverage method (78 percent) followed by short-term external debt ratio (48 percent), broad money ratio (36 percent), and the IMF's Assessing Reserve Adequacy (ARA) metric (36 percent) (see figure 3.6). Of the 85 central

FIGURE 3.6
Reserve adequacy measures



N = 85

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

banks who provided this information, 62 percent reported using at least two metrics and 40 percent employed at least three.

Central banks in low-income countries reported primarily using two methodologies to measure reserve adequacy—import coverage and short-term debt ratio (see figure 3.7). All respondents in this group use import coverage, while some (33 percent) use short-term external debt ratio.⁶ These choices contrast with the practices of respondents in high-income reserve currency countries, who reported using these metrics infrequently if at all. This difference may be explained by borrowers in a reserve currency country having greater access to loans from international investors in their own domestic currency.

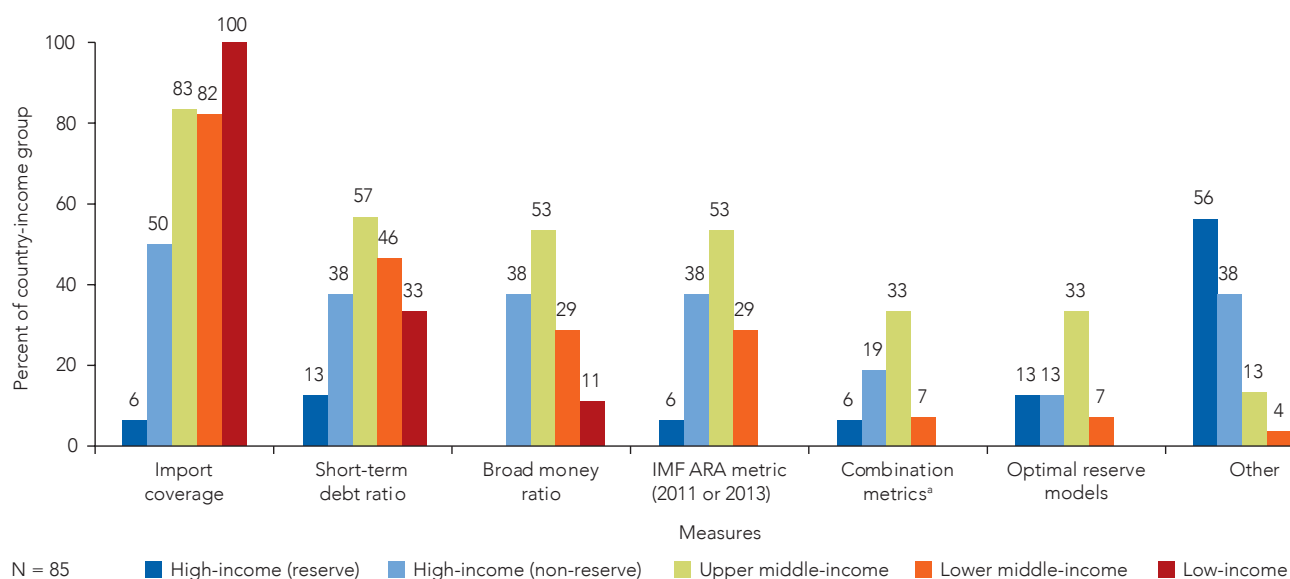
Choice of numeraire

The choice of numeraire, like the selection of reserve adequacy metrics, tends to frame how a central bank understands its reserve management operations. A numeraire is the

specific currency or basket of currencies used to measure investment performance. Empirical evidence shows that different numeraires can produce different risks and returns for a portfolio. Therefore, the numeraire tends to influence a reserve manager's optimal currency and asset allocation strategy (Papaioannou, Portes, and Siourounis 2006).

Traditionally, a central bank's choice of numeraire reflects one or more priorities. For example, an institution that seeks to execute an active foreign exchange policy would benefit from using as its numeraire the currency that it will deploy during an intervention. Another may select a basket of currencies as numeraire weighted according to the composition of trade and/or debt flows. Meanwhile, a central bank concerned with the impact on its balance sheet of fluctuations in the value of reserve assets may choose domestic currency as its numeraire.⁷ One seeking to accomplish multiple objectives may even utilize more than one numeraire for its reserve portfolios or may report its investment results in multiple currencies.⁸

FIGURE 3.7
Reserve adequacy assessment by country-income group



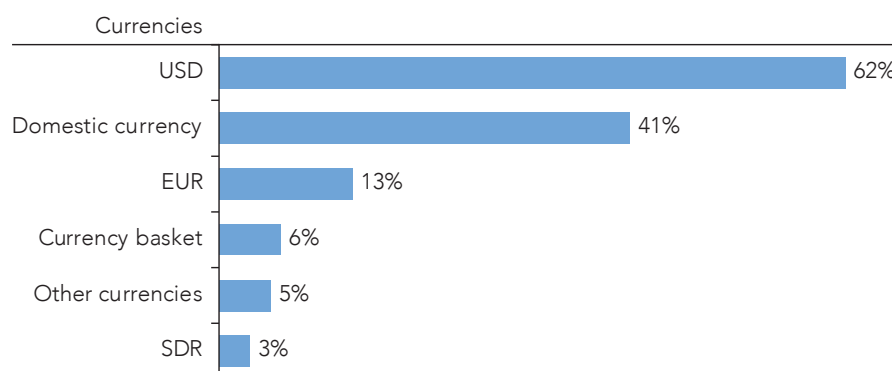
Source: RAMP Survey on the Reserve Management Practices of Central Banks.
a. Expanded Greenspan-Guidotti rule or Wijnholds and Kapteyn.

Survey results show that the U.S. dollar (62 percent) followed by domestic currency (41 percent) are respondents' most frequently used numeraire (see figure 3.8). This may represent a substantial change in practice since the global financial crisis during which many central banks faced dollar liquidity challenges.⁹ Only six percent of central banks reported the use

of a basket of currencies as a numeraire. It is possible that some respondents who indicated reporting in the U.S. dollar also track asset values in currency baskets weighted according to trade flows.

Survey data also show almost all respondents in the low- and lower middle-income country

FIGURE 3.8
Numeraire



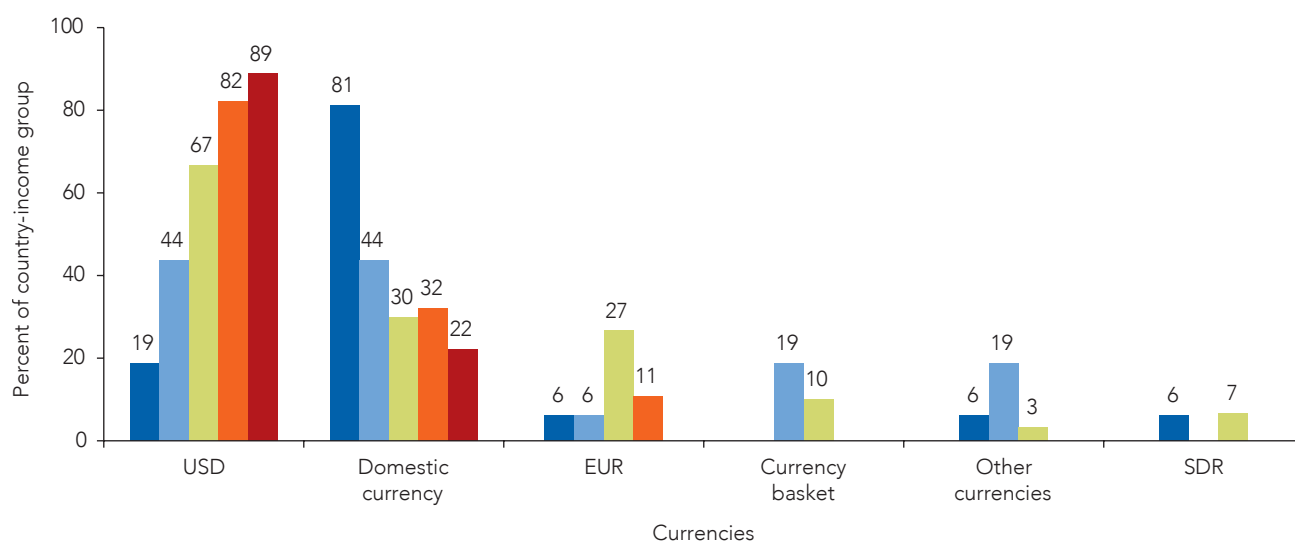
25 central banks selected two or more of the above currency options

N = 98

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

Note: Euro-area central banks that use the euro as numeraire are reported in the "domestic currency" basket only. Non-euro-area central banks that use the euro as numeraire are reported in the "euro" basket. SDR = special drawing rights.

FIGURE 3.9
Numeraire choice by country-income category



N = 98 ■ High-income (reserve) ■ High-income (non-reserve) ■ Upper middle-income ■ Lower middle-income ■ Low-income

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

groups (89 percent and 82 percent, respectively) use the U.S. dollar as numeraire (see figure 3.9). In contrast, a substantial majority of central banks in high-income reserve countries (81 percent) use domestic currency as their numeraire.

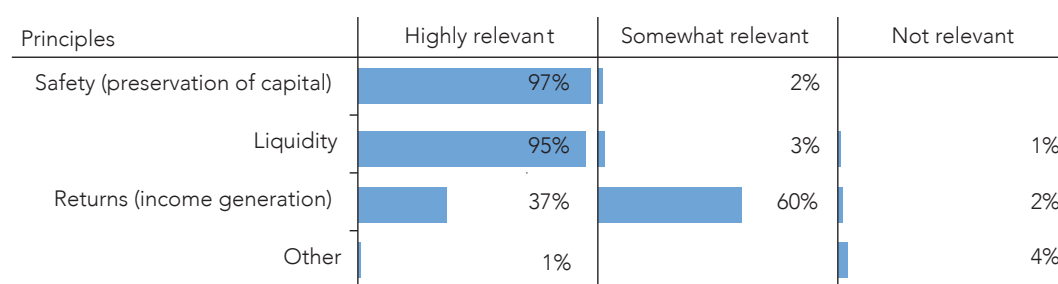
Investment principles of reserve management

A central bank engages in reserve management to maximize the likelihood that it will have sufficient liquid foreign exchange assets to achieve its policy objectives. Typically, its investment activities seek to strike a balance among three priorities—liquidity; safety

(preservation of capital); and returns (income generation). These aims are complementary when interest rates are high enough to generate satisfactory positive returns for conservative strategies. However, in low or negative interest rate environments, they become less so because safe and liquid asset classes generate small or even below zero returns.

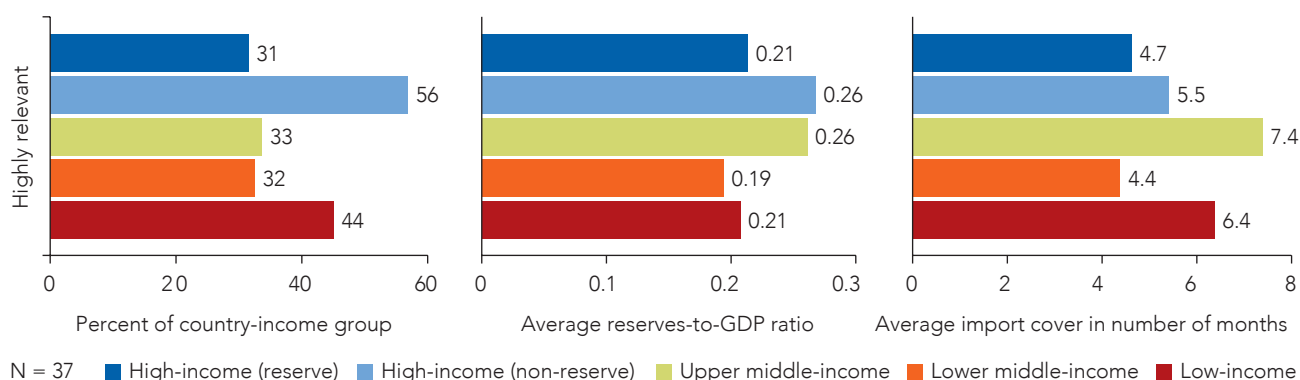
Almost all respondents identified safety (97 percent) and liquidity (95 percent) as highly relevant investment principles (see figure 3.10). This is consistent with traditional approaches to reserve management that emphasize these priorities as fundamental.

FIGURE 3.10
investment principles



N = 99

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

FIGURE 3.11**Central banks by country-income group that consider return generation highly relevant**

Source: RAMP Survey on the Reserve Management Practices of Central Banks.
 Note: GDP = gross domestic product.

More than a third of respondents (37 percent) also identified returns as an important objective and almost all the others (60 percent) identified it as somewhat relevant to their reserve management strategies. This focus on returns is less typical for central banks and may be a product of the prolonged period of unprecedented low interest rates for reserve currency assets in the aftermath of the global financial crisis.

The focus on returns appears to be the most pronounced for central banks in the high-income non-reserve country-income category. Overall, approximately a third of respondents within each country-income group identified investment growth as a highly relevant investment objective. High-income non-reserve country central banks (56 percent) most frequently prioritized portfolio gains¹⁰ and almost half of low-income country respondents (44 percent) indicated they were highly focused on this priority. The analysis did not find a relationship between the sufficiency of institutions' import coverage and their consideration of returns as highly relevant (see figure 3.11).¹¹

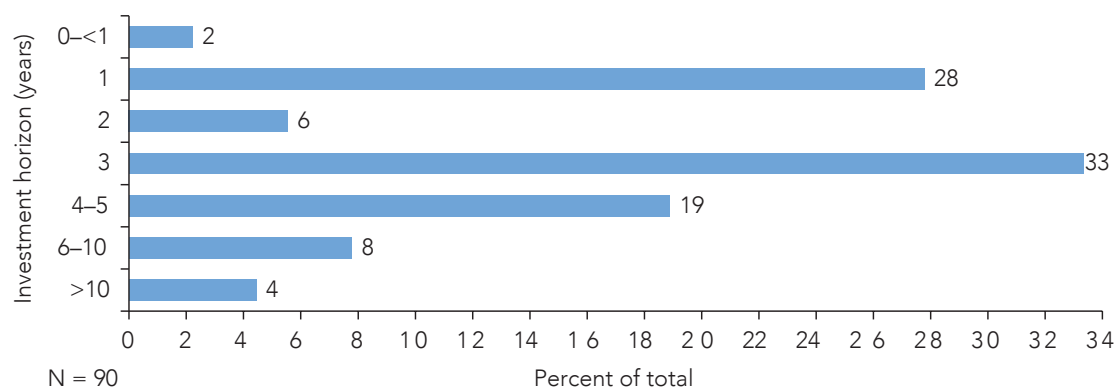
Investment horizon and risk tolerance

Investment horizon and risk tolerance are important policy parameters that influence how a central bank achieves its investment objectives. The former refers to the period

over which an institution evaluates risk and performance. The latter defines a reserve manager's overall appetite for investment risk and is determined according to its ability to withstand asset volatility over the period in which it evaluates risk-adjusted performance.

Survey results show that most respondents (70 percent) have adopted an investment horizon of more than 1 year for foreign exchange reserves allocated to portfolios focused on returns (see figure 3.12). All things being equal, extending this risk and performance measurement period beyond one year allows a central bank to adopt an asset allocation that incorporates more risk and, as a result, has a greater opportunity for returns. Institutions in high-income countries reported having longer investment horizons than counterparts in middle-income countries.

A central bank may use various metrics to help set and express its risk tolerance. These include probability of negative returns, expected shortfall, and value at risk (VaR). Using probability of negative returns allows an institution to clearly communicate its capital preservation priorities whereas other risk measures are less easy to translate into public discourse. Survey results show that, for the liquidity tranche, 56 percent of respondents use probability of negative returns, 43 percent VaR, and 41 percent expected shortfall. For the investment tranche, the use of the three metrics is similarly frequent (between 41 percent and 47 percent).

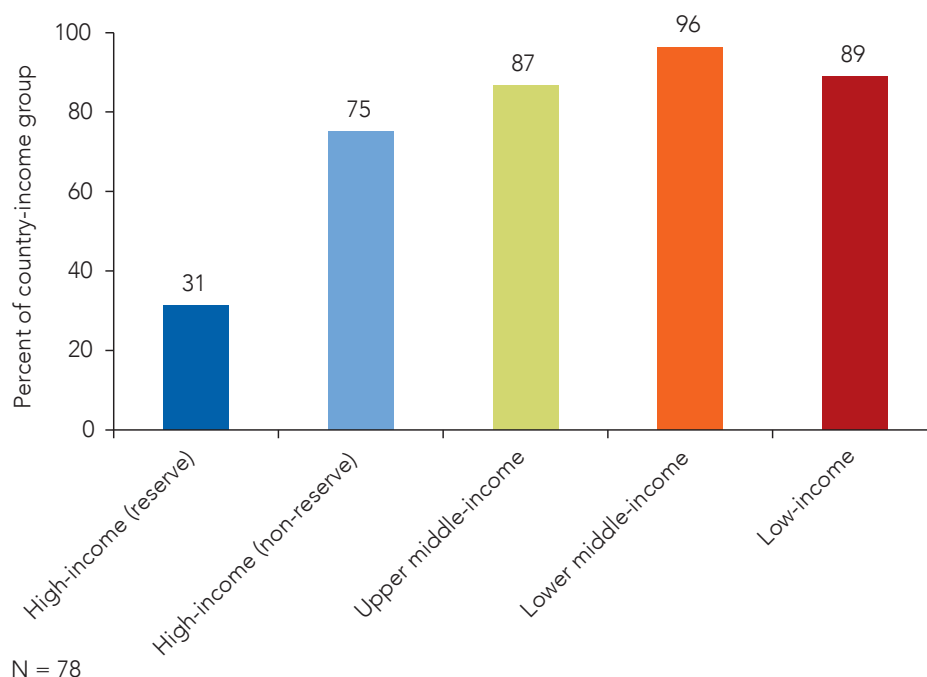
FIGURE 3.12**Investment horizon of investment tranche**

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

STRATEGIC ASSET ALLOCATION

As discussed above, empirical evidence shows that the SAA is the primary driver of a reserve manager's investment performance. Building a SAA involves multiple steps that aim to translate investment policy into an asset allocation that achieves a central bank's investment objectives

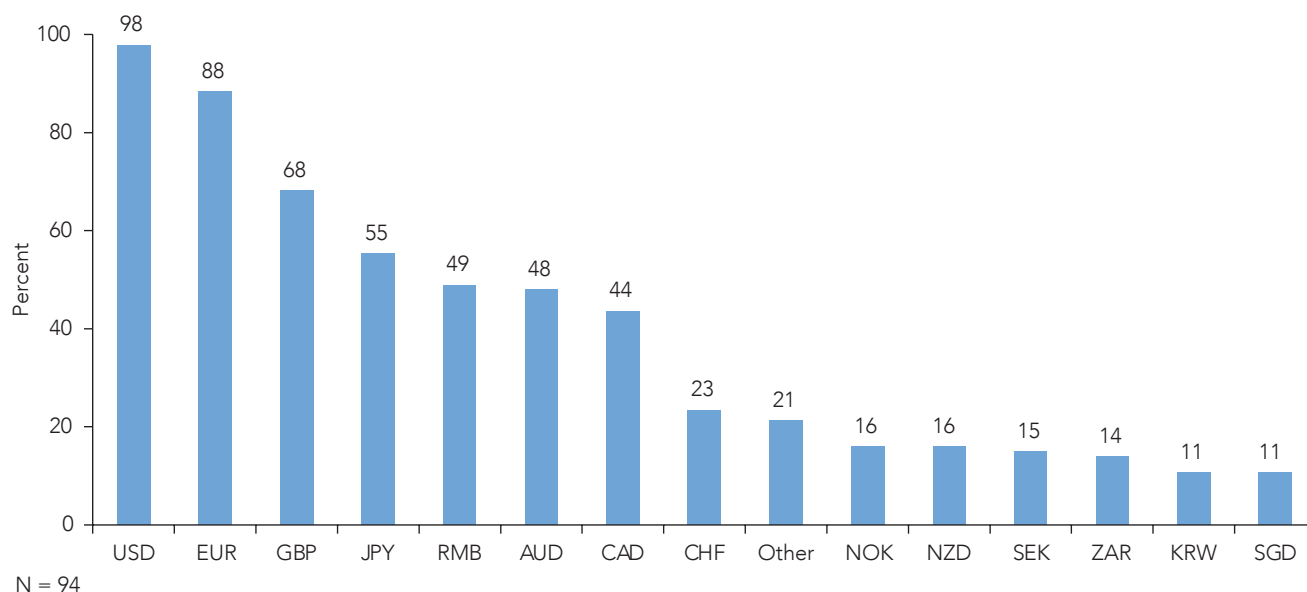
over the applicable investment horizon. As a first step, an institution decides whether to use tranching as a tool to build its SAA. Next, it identifies eligible currencies and asset classes. Only investments denominated in these currencies and matching these financial instruments may be included in its reserve portfolio.

FIGURE 3.13**Use of tranching by country-income group**

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

FIGURE 3.14

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



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

The use of tranching

One common tool for constructing a SAA is “tranching.” In this approach, a central bank segregates foreign exchange reserves into discrete sub-portfolios. The structure and relative size of each of these “tranches” is based on an assessment of liquidity needs across various time horizons and reserve adequacy scenarios. Each segregated account is characterized by a distinct objective, risk profile, set of eligible asset classes, currency composition and investment horizon (International Monetary Fund 2015).¹²

Most respondents (80 percent) reported using tranching. Less than a third of high-income reserve country central banks used this approach as part of their SAA (see figure 3.13). Institutions in countries with non-reserve currencies of all income levels were far more likely to use the practice (between 75 percent and 96 percent).

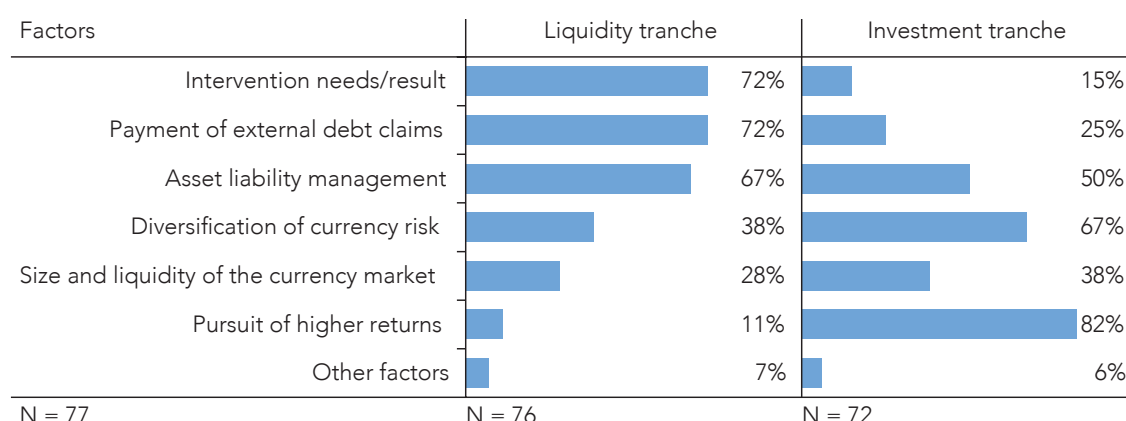
Eligible currencies and actual currency composition of reserves

Almost all respondents identified as eligible currencies the U.S. dollar (98 percent) and the euro (88 percent) (see figure 3.14). Many

indicated that they could invest in assets denominated in the British pound sterling (68 percent) and the Japanese yen (55 percent) while almost half (49 percent) reported that the renminbi is part of their currency composition. Its inclusion in the special drawing rights (SDR) basket in October 2016 may drive this result. The renminbi eligibility data are notable because they suggest that, in terms of asset-denomination preference, the currency is on par with or may even have surpassed others such as the Australian dollar and the Canadian dollar. Analyzing the data by country income category or level of reserve adequacy does not yield materially significant patterns.

Macroeconomic considerations and portfolio management concerns drive the actual currency composition of reserve portfolios.¹³ The former consists of the structure and denomination of external debt, intervention needs, and asset and liability management. The latter consists of the diversification of currency risk and the returns, availability, and liquidity of assets denominated in different currencies. Intervention requirements and payment of external debt claims tend to be more relevant to a liquidity tranche. Meanwhile diversification of currency risk and pursuit of higher returns play a more important role in shaping the investment

FIGURE 3.15
Factors shaping currency composition



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

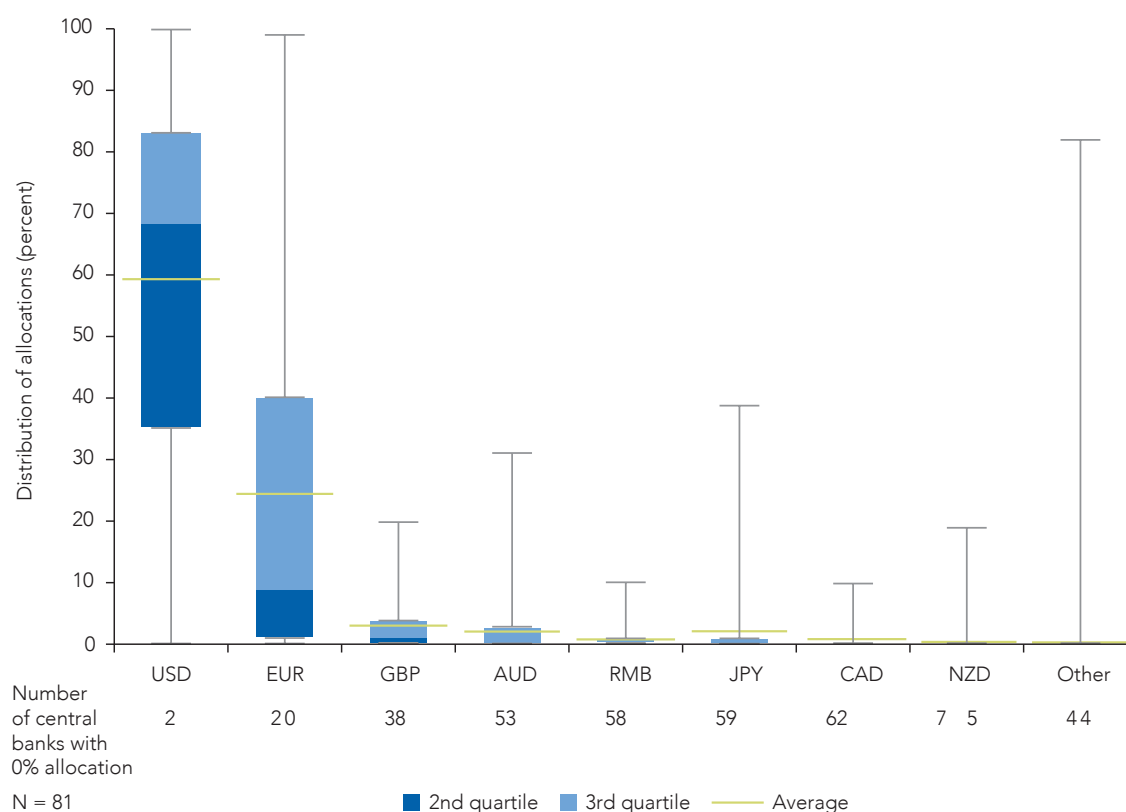
tranche. The survey results are consistent with this understanding (see figure 3.15).

The U.S. dollar and the euro are the dominant currency denominations for central banks' reserve assets.¹⁴ Figure 3.16 shows the distribution range of the currency composition of all respondents' foreign exchange holdings, including those with a zero allocation. For each

currency, it displays the range of institutions' reported shares and quartiles, as well as the median and average.

The median for the proportion of assets invested in U.S. dollar-denominated securities is 68 percent and for euro-denominated assets it is nine percent. The average proportion for euro-denominated holdings (25 percent) is significantly

FIGURE 3.16
Distribution of all respondents' allocations to individual currencies



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

higher than the median, suggesting that a few institutions' euro assets skew the average higher.

Despite recent changes in the relative sizes of large economies, these results are consistent with historical data showing U.S. dollar-denominated assets' decades-long dominance of reserve portfolios (International Monetary Fund 2019). Most trade and capital flows still take place using the U.S. dollar or the euro, which may explain their predominance in reserve positions, even though, over the long term, the U.S. and euro-area economies' shares of global gross domestic product have been in decline.¹⁵ These factors may also partially explain respondents' comparatively large holdings of euro-denominated assets relative to those denominated in non-U.S. dollar currencies, even though many euro-denominated financial instruments have negative yields.

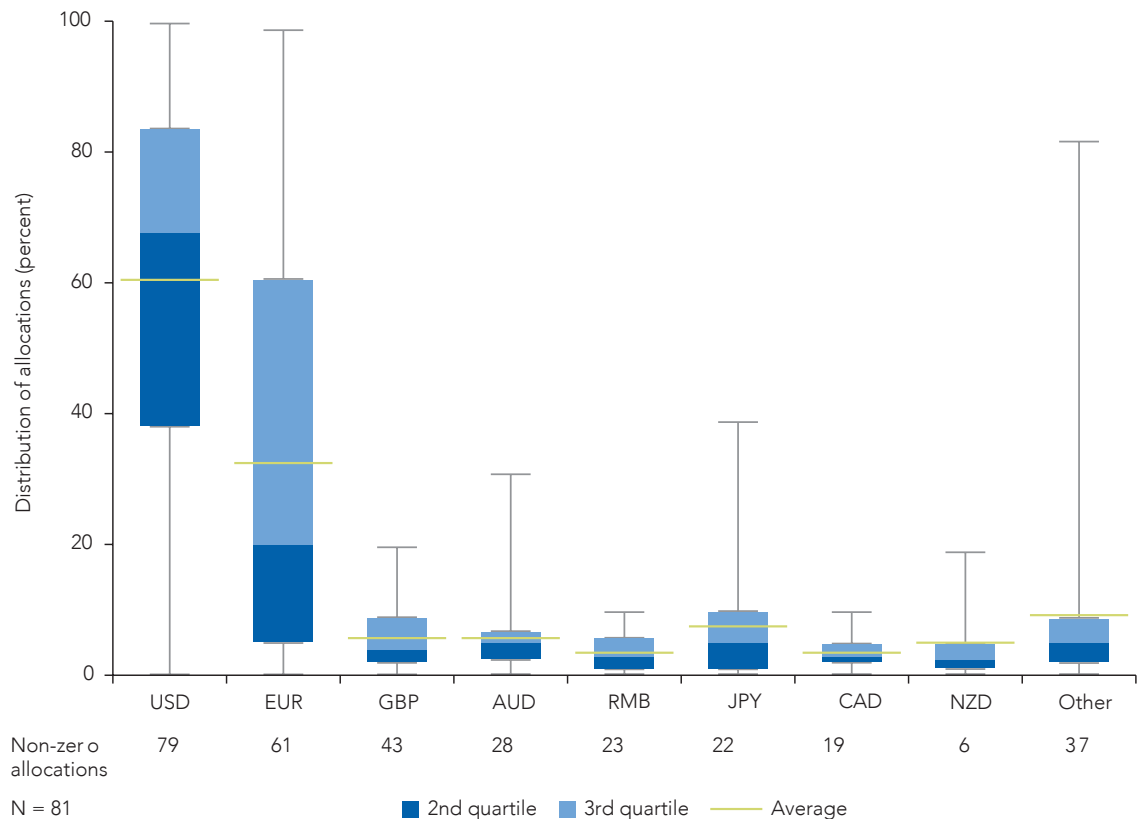
Survey data indicates that multiple currencies that central banks consider eligible from an investment perspective nonetheless do not comprise substantial amounts of their portfolios.

Figure 3.17 comprises information gleaned from the reported currency composition of respondents' foreign exchange reserves and shows only data for institutions that indicated exposure to a specific legal tender. Therefore, the figure does not reflect the impact of respondents who reported a zero allocation. For each currency, it reports the number of central banks that had an allocation and displays the range of reported shares and quartiles, as well as the median and average.

The divergence between eligible currencies and actual holdings is most visible for the Australian dollar, Canadian dollar, British pound sterling, Japanese yen and renminbi. All have eligibility frequencies of between 44 percent and 68 percent. However, none has a median share of exposure above five percent. These results suggest that any shift away from the U.S. dollar or the euro as dominant reserve currencies is, at present, not substantial.

Their average and median levels for actual allocations remain high while shares of reserve

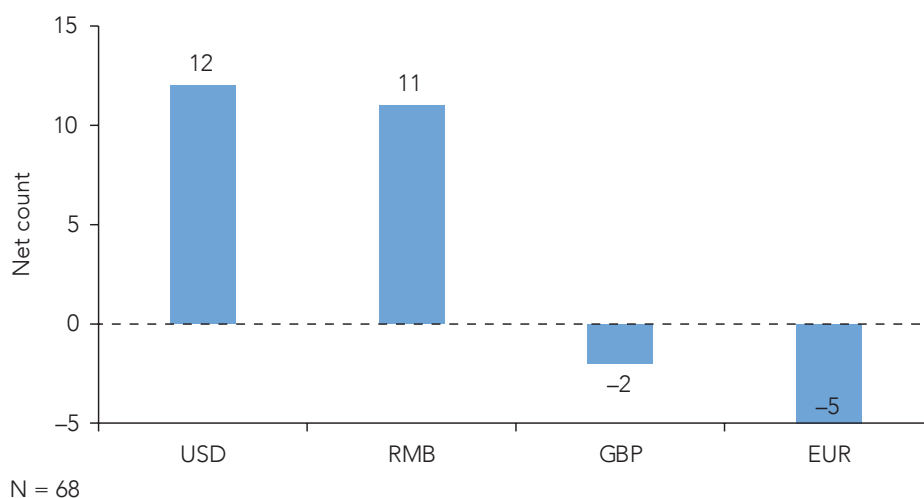
FIGURE 3.17
Distribution of allocations to currencies for central banks with exposure



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

FIGURE 3.18

Net number of central banks that plan to increase or decrease an allocation to specific currencies within 2 years



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

Note: The "net count" for a specific currency is calculated by subtracting the number of central banks that reported an intention to decrease their allocation from the number of institutions that intend to increase their allocation. Central banks that reported "no intended changes" to a given currency allocation have no impact on the net count.

assets denominated in other currencies are low. The Japanese yen aside, the relative size or liquidity of these moneys' capital markets may drive their small share.¹⁶ Challenges associated with accessing renminbi-denominated assets and capital flow management measures in china may also contribute to the currency's reported allocations.

There is some evidence suggesting that, in the near term, central bank allocations to the renminbi are likely to rise. Respondents from 68 institutions provided data on expected changes to their actual currency composition over the next two years. Many of those with plans to change their allocations reported a likelihood of increasing shares of assets denominated in the U.S. dollar and the renminbi while some anticipated reducing exposure to those denominated in the British pound sterling and the euro (see figure 3.18).

Eligible asset classes and actual asset class composition of reserves

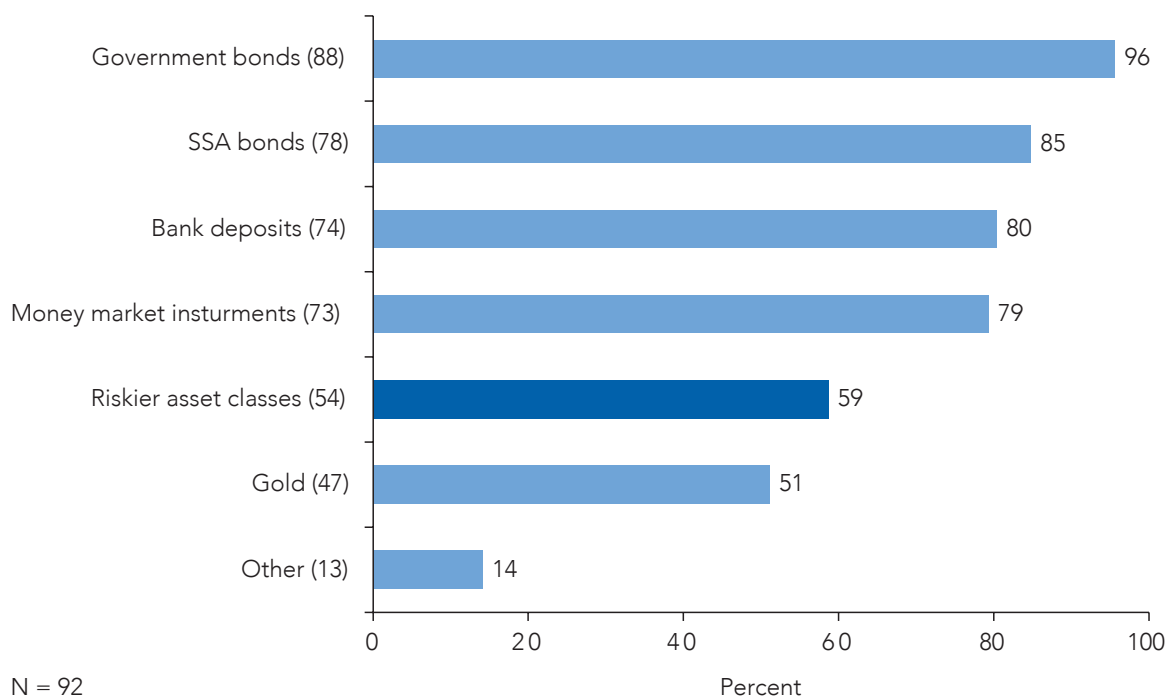
Central banks have broad authorization to purchase traditional reserve management investments. Respondents most frequently cited as eligible asset classes financial instruments generally considered to be highly liquid and low-

risk, such as: government bonds (96 percent); sovereigns, supranational and agency securities (85 percent); and money market instruments (79 percent) (see figure 3.19). This data is consistent with the investment aim of liquidity and safety (preservation of capital), which 95 percent of institutions identified as a highly relevant policy objective. A high proportion of respondents (80 percent) also indicated that they were able to hold bank deposits. While safe and convertible in the very short-term, when held with commercial banks for terms longer than overnight, these assets take on counterparty risk and have less liquidity than government bonds.

More than half of respondents (59 percent) reported having the ability to invest in "riskier asset classes," suggesting a willingness to increase the diversification of their reserve holdings in pursuit of higher returns. Within this category, the most frequently cited financial instruments were corporate bonds (56 percent), emerging market bonds (44 percent) and covered bonds (39 percent) (see figure 3.20).

Even as some institutions show a willingness to diversify their reserve portfolios, respondents most frequently identified traditional asset classes as their dominant investment choice (see figure 3.21). Figure 3.21 shows the distribution

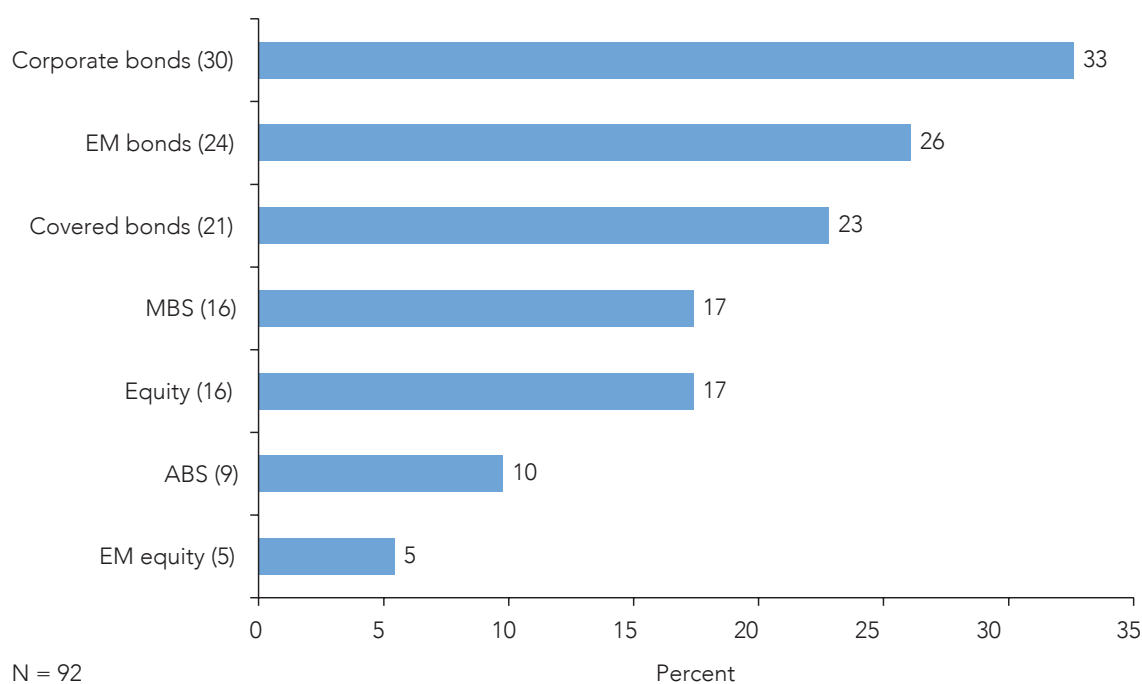
FIGURE 3.19
Eligible asset classes



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

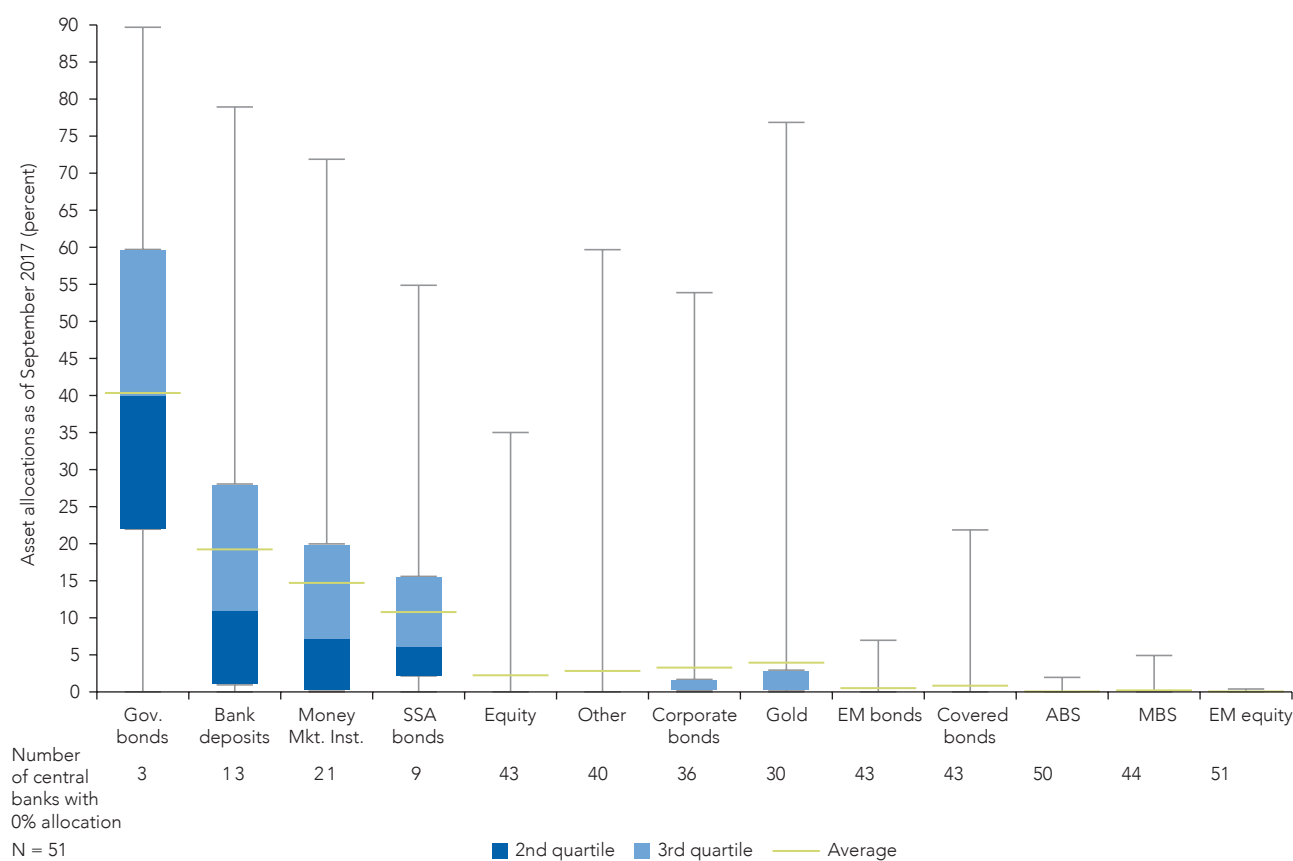
Note: The category of "riskier asset classes" comprises corporate bonds, emerging market bonds, covered bonds, mortgage-backed securities, equity, asset backed securities and emerging market equity. SSA = supranational, sovereign, and agency.

FIGURE 3.20
Higher risk financial instruments that are eligible asset classes



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

Note: ABS = asset-backed securities; EM = emerging market; MBS = mortgage-backed securities.

FIGURE 3.21**Distribution of all respondents' allocations to individual asset classes**

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

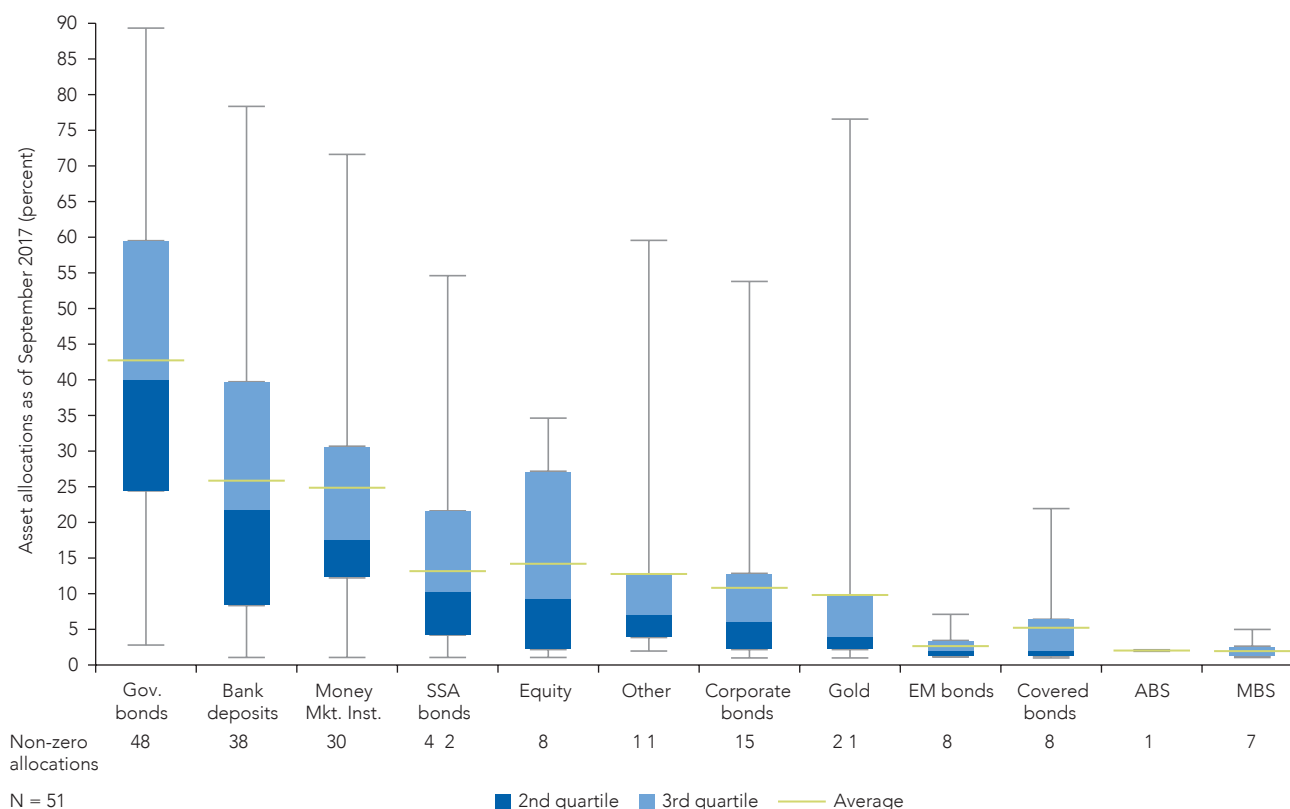
Note: ABS = asset-backed securities; EM = emerging market; MBS = mortgage-backed securities; SSA = supranational, sovereign, and agency.

range of the asset allocation for respondents' foreign exchange reserves, including those with a zero allocation. For each category of financial instruments, it displays the range of institutions' reported shares and quartiles, as well as the median and average.

The most frequently held securities are government bonds and supranational, sovereign, and agency (SSA) securities, followed by bank deposits and money market instruments—holdings broadly consistent with the policy objective of safety and liquidity. The median allocation to these investments is 40 percent, six percent, 11 percent, and seven percent respectively, including those institutions that do not have exposure to these asset classes. In contrast, the median allocation to riskier asset classes such as corporate bonds, emerging markets bonds, and equity is zero percent, suggesting that these financial instruments are still of limited or no importance for many central banks.

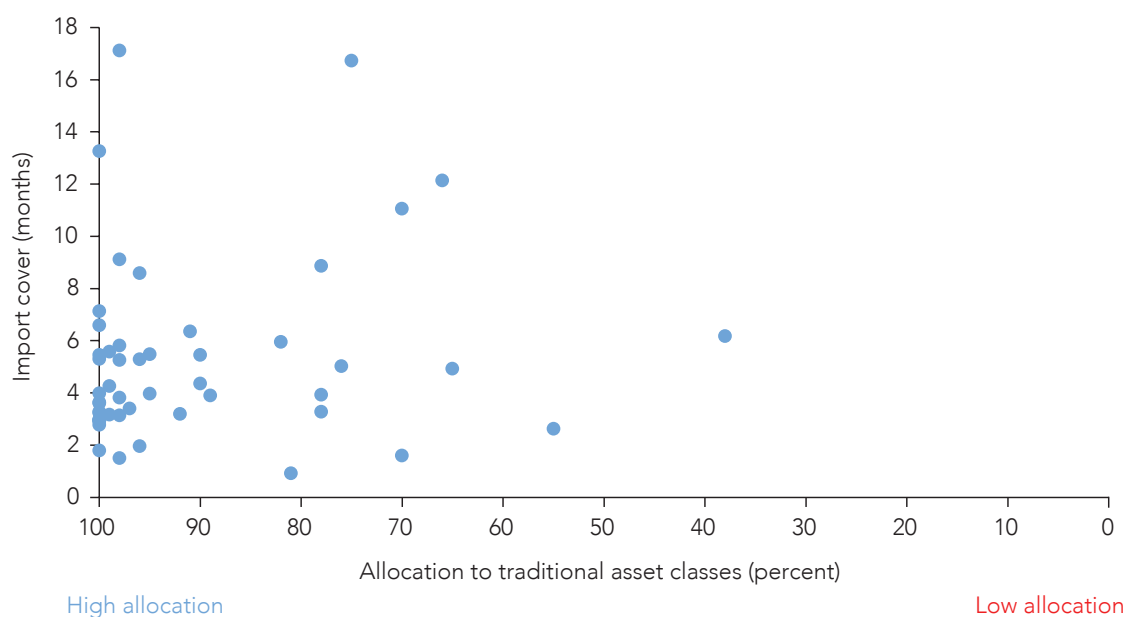
Central banks that have investments in riskier asset classes tend to limit these holdings to small shares of their reserve portfolios. Figure 3.22 is comprised of information gleaned from the reported asset allocations of respondents' foreign exchange reserves and shows only data for the institutions that indicated exposure to a specific asset class. Therefore, it does not reflect the impact of central banks who reported a zero allocation. For each financial instrument, it displays the range of institutions' reported shares and quartiles, as well as the median and average. Of the 51 central banks that provided allocation data, less than one third (29 percent) hold corporate bonds and less than a fifth (16 percent) hold equities. For both asset classes, the median allocation is below ten percent.

Survey data does not show a material relationship between respondents' allocations to traditional asset classes and measures of reserve adequacy (see figures 3.23 and 3.24 and figure A.1–A.4 in appendix A). Analysis did not

FIGURE 3.22**Distribution of the allocation to individual asset classes for respondents with exposure**

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

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

FIGURE 3.23**Comparison of allocation to traditional asset classes and months of import coverage of foreign exchange reserves**

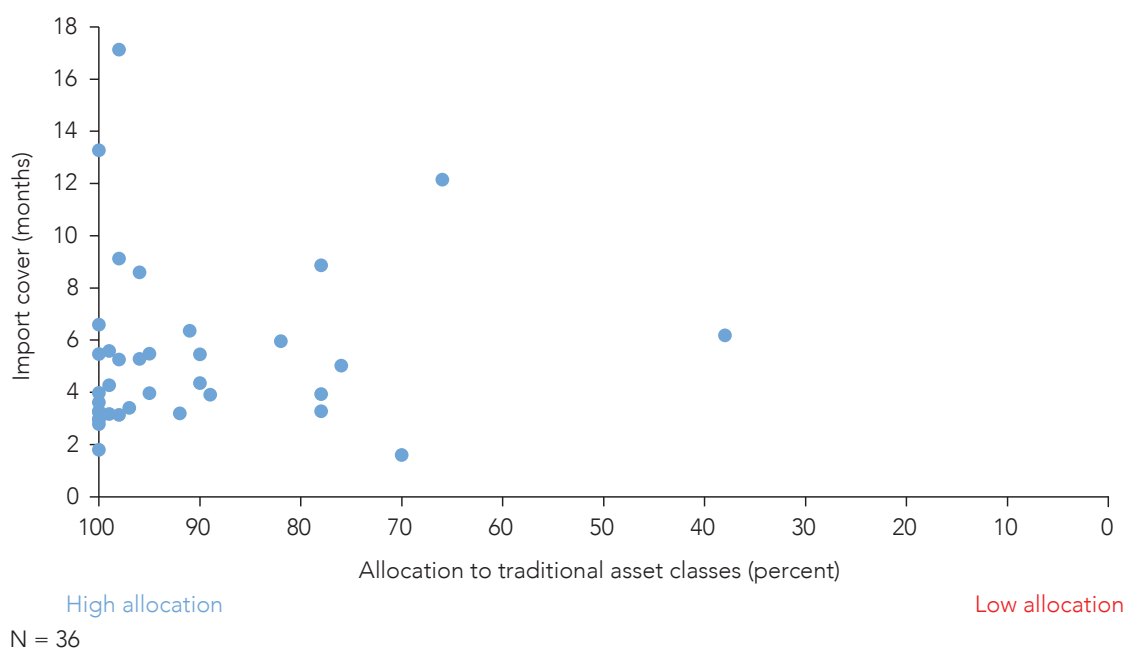
N = 50

Source: World Bank and RAMP Survey on the Reserve Management Practices of Central Banks.

Note: Traditional asset classes comprise bank deposits, government bonds, money market instruments, gold, and supranational, sovereign, and agency bonds.

FIGURE 3.24

Comparison of allocation to traditional asset classes and months of import coverage of foreign exchange reserves of emerging market respondents



Source: World Bank and RAMP Survey on the Reserve Management Practices of Central Banks.

Note: Traditional asset classes comprise bank deposits, government bonds, money market instruments, gold, and supranational, sovereign, and agency bonds.

suggest an obvious pattern between reserve levels and reported holdings of bank deposits, government bonds, money market instruments, gold, and sovereign, supranational and agency bonds. This conclusion holds when using months of import coverage as a measure of sufficiency of foreign exchange reserves or other metrics, and also when the data analyzed comes only from respondents in emerging markets.

PORTFOLIO MANAGEMENT

Portfolio management style

A reserve manager has the option of using different investment styles to implement its SAA. A central bank's risk tolerance and capacity for risk and portfolio management may have an impact on its manager's ultimate choice. Styles differ in several ways, including whether they are passive or active. The former replicates the risk and return characteristics of a specific benchmark; the latter allows for discretionary departures from these standards within defined risk limits in pursuit of higher returns than the benchmark. Compared to a passive approach,

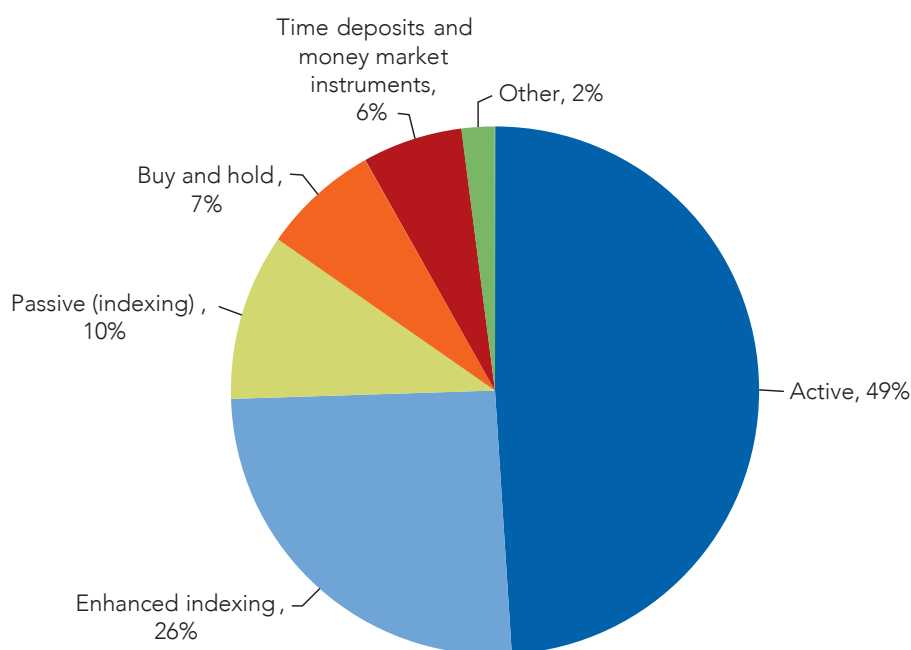
active management is more resource- and skill-intensive, demanding more expertise and support in both portfolio and risk management. As a result, it may be beyond the capacity of some institutions to pursue. Central banks that do not use a benchmark to guide allocations tend to invest in time deposits and money market instruments or fixed income assets that they hold to maturity.

Most central banks adopt portfolio management styles that use active approaches (see figure 3.25). Three-quarters of respondents indicated implementing their SAA using an active style (49 percent) or enhanced indexation (26 percent). The remaining use passive management (ten percent), a buy- and-hold strategy (seven percent) or invest in only time deposit and money market instruments (six percent).

External management of reserve assets

One option a central bank can use to address the skill and resource demands associated with active management is to employ an external

FIGURE 3.25
Portfolio management styles



N = 98

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

manager to implement a part of its SAA. Almost three-quarters (72 percent) of the 94 respondents providing data on the use of third-party service providers reported using organizations outside their institutions for investment management services. These results show central banks in low-income countries (78 percent) and high-income non-reserve countries (88 percent) doing so far more frequently than counterparts in high-income reserve countries (25 percent) (see figure A.5 in appendix A).

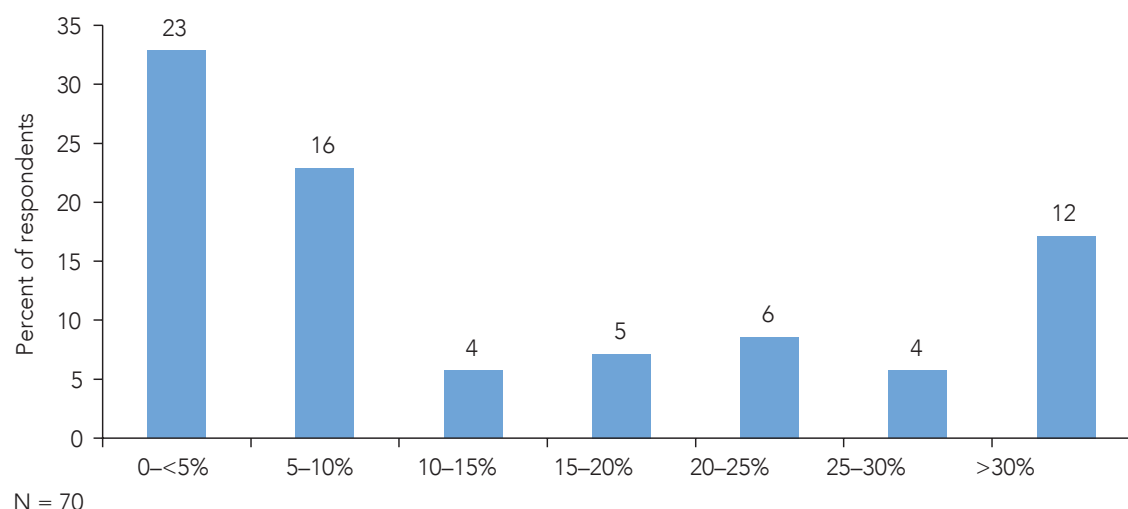
Other reasons may also motivate a central bank to use an external manager. For example, since these service providers often have significant expertise, their support can create opportunities to share knowledge and build internal capacity. In addition, there is a perception that they may be able to deliver higher returns. At minimum, these third parties can serve as a standard against which to measure the results of internally-managed portfolios.

FIGURE 3.26
Reasons for hiring external managers

Factors	Highly relevant	Somewhat relevant	Not relevant
Capacity building/Knowledge transfer	87% (69)	9% (7)	3% (2)
Enhancement of return/Performance	78% (62)	16% (13)	1% (1)
Internal constraints (e.g. management skills)	42% (33)	39% (31)	13% (10)
Increased access to resource-intensive investment strategies	35% (28)	48% (38)	8% (6)
Benchmark to internal staff	25% (20)	43% (34)	23% (18)
Other	4% (3)	1% (1)	3% (2)

N = 79

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

FIGURE 3.27**Foreign exchange reserve allocations to external managers**

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

Generating higher returns, however, does not appear to be the most important factor. Of the respondents who use external managers, 87 percent cited as highly relevant to their decision the possibilities of knowledge transfer and capacity building (see figure 3.26). A slightly smaller share (78 percent) cited performance considerations as an important driver of their choice.

Even though engaging external managers is common, central banks generally apportion them only a small fraction of their assets. Of the 70 respondents who indicated using third parties as investment advisors, a majority (56 percent) tasked them with overseeing less than 10 percent of their portfolios (see figure 3.27). Less than one fifth (17 percent) enlisted them to manage more than 30 percent.

Use of derivatives

Survey results indicate that central banks deploy derivatives extensively (see figure 3.28). They appear to use them primarily for hedging purposes and, to a lesser extent, for active management. The 74 respondents who provided data on this issue most frequently employ FX forwards, interest rate futures/bond futures, and FX swaps (61 percent, 59 percent and 54 percent respectively). Other types of derivatives are not yet widely utilized.

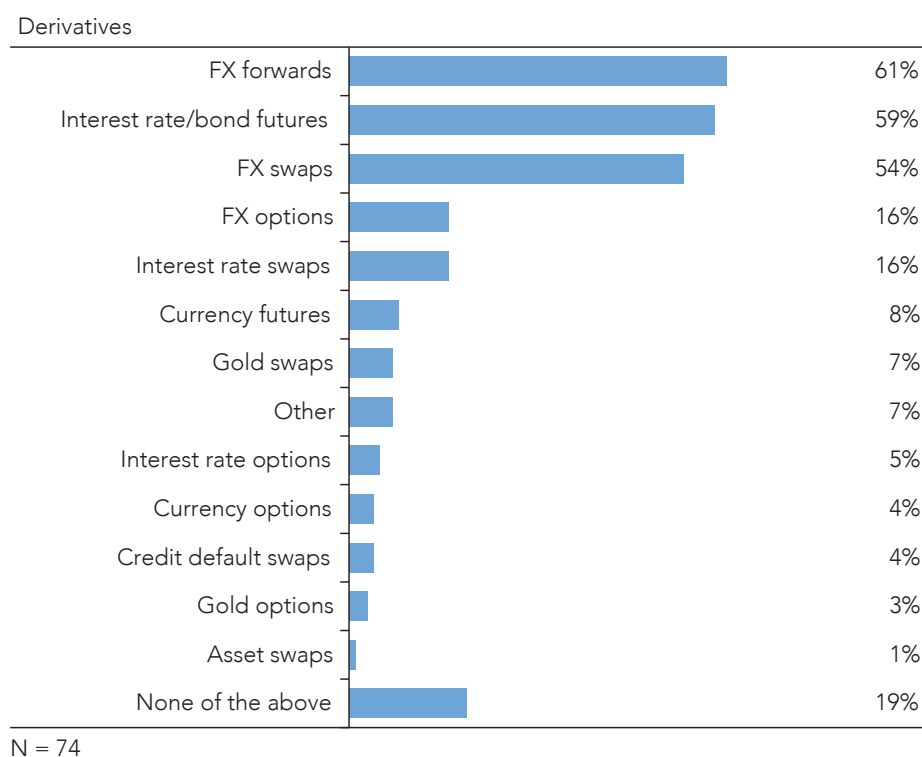
Consideration of environmental, social, and governance (ESG) factors

ESG factors are tools that can help an asset manager assess environmental, social and governance aspects of an asset issuers' operations. They aim to evaluate how a borrower or company is run and the impact of its business practices on society. Examples include a corporation's carbon footprint, employment practices and governance framework. Use of these factors is an evolving investment approach that is currently most developed in its application to public equities and corporate bonds.

Although central banks have some awareness of ESG factors, these tools do not play a significant role in their investment frameworks. Only 11 percent of respondents confirmed taking them into account (see figure 3.29). Meanwhile 68 percent indicated they play no role in their current approach to reserve management.

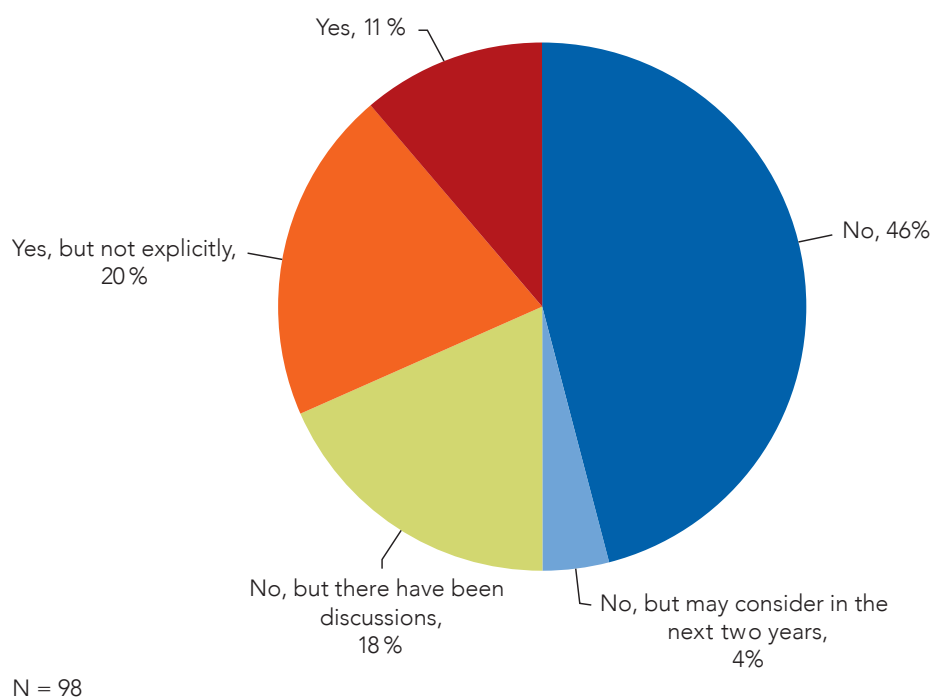
Respondents with equity exposures are more likely to use ESG factors as part of their investment framework (see figure 3.30). This result does not hold for those central banks investing in corporate bonds (see figure A.7 in appendix A).

FIGURE 3.28
Use of derivatives



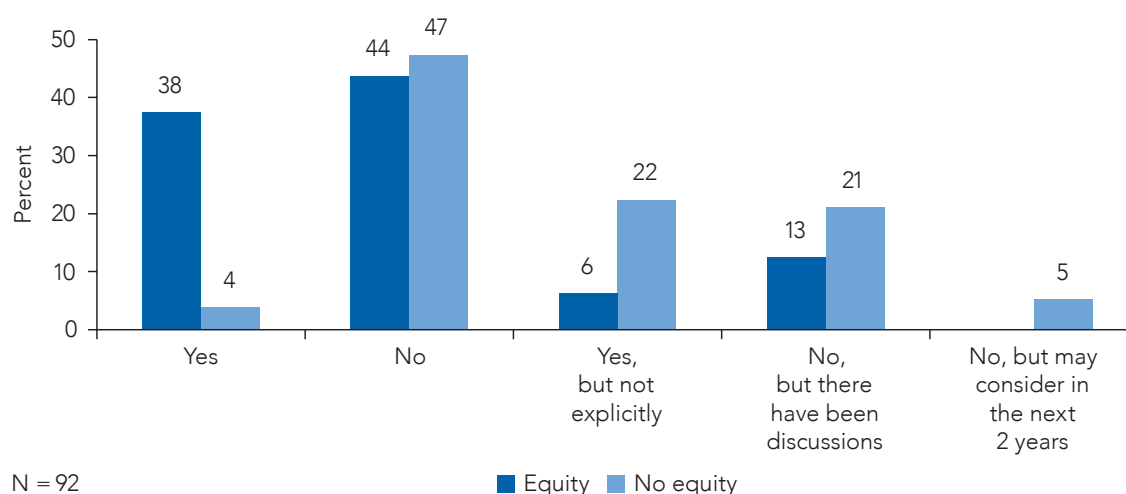
Source: RAMP Survey on the Reserve Management Practices of Central Banks.
Note: FX = foreign exchange.

FIGURE 3.29
Incorporation of ESG factors into the investment framework



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

FIGURE 3.30
ESG and equity investing



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

RISK MANAGEMENT

A central bank faces a variety of risks in its reserve management operations. Two of the most important are credit-related hazards and market-related issues. The former arise from the possibility of loss due to an obligor's deteriorating credit quality, most often in the form of a rating downgrade or default. This danger includes counterparty concerns, making it especially relevant to corporate bond investors and holders of term deposits with commercial banks. The latter stem from the possibility that the price of an asset will decline due to market

factors. A comprehensive risk management framework helps an institution identify and assess the magnitude of these threats and maintain them within limits consistent with its tolerance.

Credit risk management

Most central banks appear to have a relatively conservative approach to fixed income investing based on their minimum credit rating thresholds (see figure 3.31). Almost all respondents (98 percent) indicated that they could not invest in sovereign or corporate debt that is less

FIGURE 3.31
Minimum credit ratings by asset class

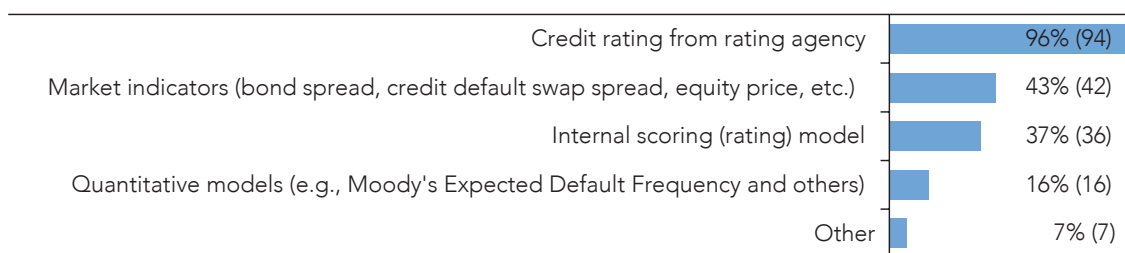
Ratings	Government bonds	Supranational/ agency bonds	Corporate bonds	MBS/ABS
AAA	3% (3)	5% (4)	8% (3)	26% (9)
AA+/AA/AA-	20% (18)	36% (31)	23% (9)	24% (8)
A+/A/A-	44% (40)	38% (32)	31% (12)	24% (8)
BBB+/BBB/BBB-	29% (26)	21% (18)	33% (13)	15% (5)
BB+ and below	1% (1)		3% (1)	
Other	2% (2)		3% (1)	12% (4)
Total	100% (90)	100% (85)	100% (39)	100% (34)

N = 91

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

Note: ABS = asset-backed securities; MBS = mortgage-backed securities.

FIGURE 3.32
Credit assessment methodologies

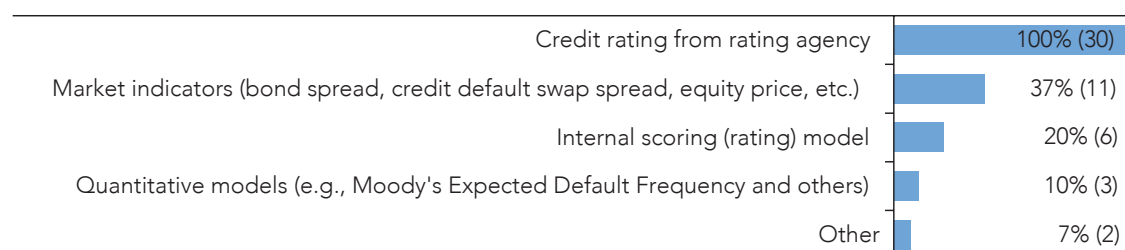


30 central banks use three or more methodologies

N = 98

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

FIGURE 3.33
Credit assessment methodologies for respondents with corporate credit exposure



14 central banks that invest in corporate bonds use only credit ratings from rating agencies

N = 30

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

than investment grade. They most frequently cited the rating group of "A+/A/A-" as the acceptable minimum for both government bonds (44 percent) and corporate bonds (31 percent). However, similar ratings across different asset classes do not signal the same level of credit risk. For example, corporate debt with the same credit rating as sovereign debt has a higher likelihood of default.¹⁷ Since non-public debt tends to have a higher risk profile than public obligations, it may be appropriate to use a different risk tolerance and additional expertise when measuring and managing its credit risk.

A reserve manager can use numerous methodologies to develop an understanding of the credit risk in its portfolio. While almost all respondents reported using credit ratings (96 percent), many (60 percent) indicated using

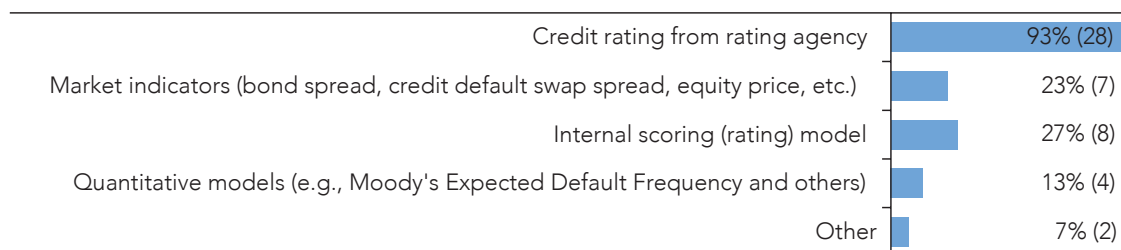
more than one metric to measure and manage the likelihood of default on the obligations in their reserve holdings (see figure 3.32).

Of the 30 respondents that invest in corporate bonds, almost half (47 percent) or 14 rely only on credit ratings from external agencies (see figure 3.33). At least six of these 14 central banks are authorized to invest in corporates with ratings as low as BBB+/BBB/BBB-.

Most respondents with authorization to invest in BBB- rated instruments for at least one asset class use credit ratings to assess credit risk (see figure 3.34). Within the group of 30 institutions that invest in corporate bonds, the use of other credit assessment methodologies, such as market indicators, internal scoring models and quantitative models, is less frequent than it is across the complete sample.

FIGURE 3.34

Credit analysis techniques of respondents with minimum credit ratings of BBB- for at least one asset class



N = 30

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

Market risk management

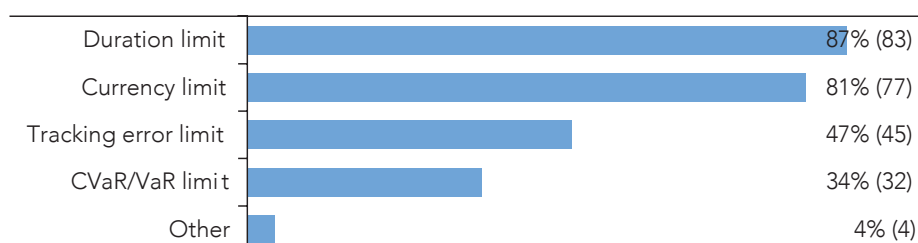
A reserve manager can use numerous methodologies to develop an understanding of the market risk in its portfolio. Most respondents indicated using duration limits (87 percent) and currency limits (81 percent) (see figure 3.35). The use of probabilistic risk measures such as tracking error (47 percent) and CVaR/VaR (34 percent) are less common.

Respondents do not appear to adjust their market risk measurement practices according to their investment styles. The subset of central banks that use active or enhanced indexing styles use the different risk metrics with close to the same frequency as those that do not use active management strategies (compare figure 3.35 with figure 3.36).

This suggests that some central banks may be able to gain a deeper understanding of the market risk in their portfolios. Specifically, duration and currency limits are frequently deployed by fixed income investors to measure market risk and are relatively easy to calculate. However, these metrics only capture one risk factor (namely changes in interest rates or exchange rates) and are difficult to compare with other risks in a portfolio. When an asset pool is exposed to other sources of risk, such as credit risk, optionality, and/ or equity, probabilistic measures are better at measuring market risk because they also consider the correlation between different risk factors. These measures require advanced analytics, which may explain why they are not as widely adopted as duration and currency limits.

FIGURE 3.35

Metrics for measuring market risk

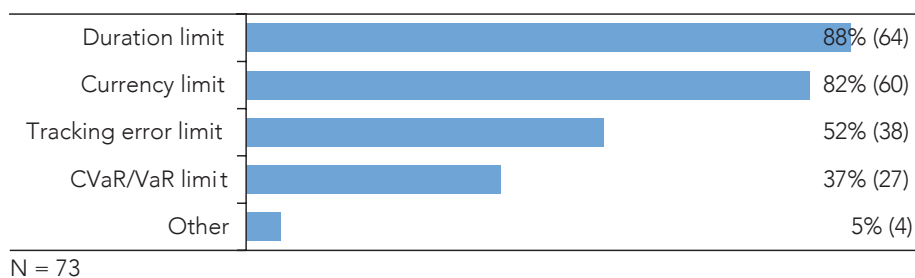


49 central banks use three or more limits

N = 95

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

Note: CVaR = conditional value at risk; VaR = value at risk.

FIGURE 3.36**Market risk measurement metrics for respondents that use active or enhanced indexing styles**

Source: RAMP Survey on the Reserve Management Practices of Central Banks.
 Note: CVaR = conditional value at risk; VaR = value at risk.

Stress test and scenario analysis

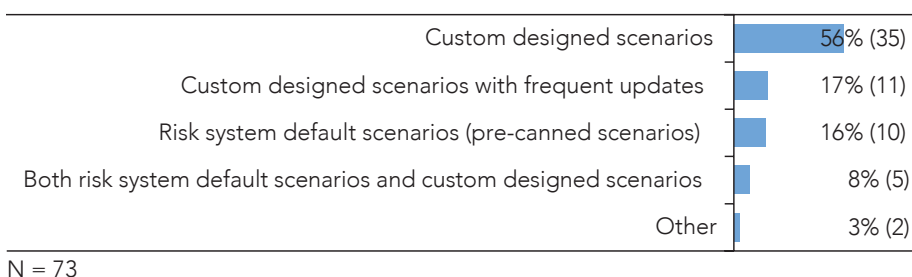
A reserve manager can use stress testing and scenario analysis to enhance risk management because these tools address issues that cannot be captured by traditional risk models and metrics. A stress test, for example, is not bounded by recent or historical market data calibration and return distribution assumptions. This flexibility allows for it to be tailored to various market scenarios, making it a particularly effective tool for uncovering portfolio risk during a period of distress.

Approximately two-thirds of respondents reported using stress testing. When analyzed by country-income group, the data show that 80 percent of high-income (reserve) and 83 percent of upper middle-income country central banks apply stress tests, whereas 89 percent of low-income country respondents do not. For those

institutions that apply stress tests, the majority use custom designed scenarios (56 percent), followed by custom designed scenarios with frequent updates (17 percent) and risk system default scenarios (16 percent) (see figure 3.37).

PERFORMANCE REPORTING AND TRANSPARENCY

Internal reporting on portfolio risks and returns helps a central bank evaluate the soundness of its investment policy and promote accountability. This process enables a reserve manager to test the reasonableness of assumptions underlying its choice of benchmarks, eligible asset classes and investments. Through performance attribution, it also allows an institution to identify the key decisions driving results (Bailey, Richards and Tierney 2018).¹⁸ A board can also use reporting data to verify that managers are implementing their investment programs

FIGURE 3.37**Types of stress scenarios employed**

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

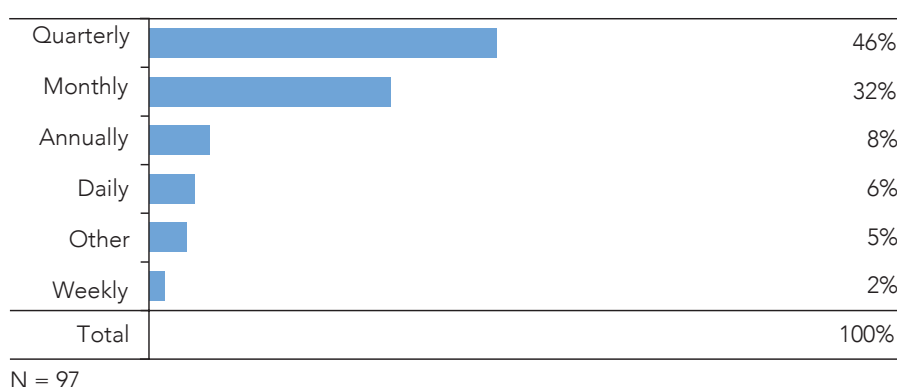
effectively and prudently. Where this evidence suggests weaknesses either in the investment policy or its implementation, changes can be made to assist the institution in its efforts to achieve its long-term objectives.

Most respondents (78 percent) indicated that they generate these statistics either on a monthly or a quarterly basis (see figure 3.38). Two-thirds conduct performance attribution

and half of these do so using a factor-based model (see figure A.6 in appendix A).

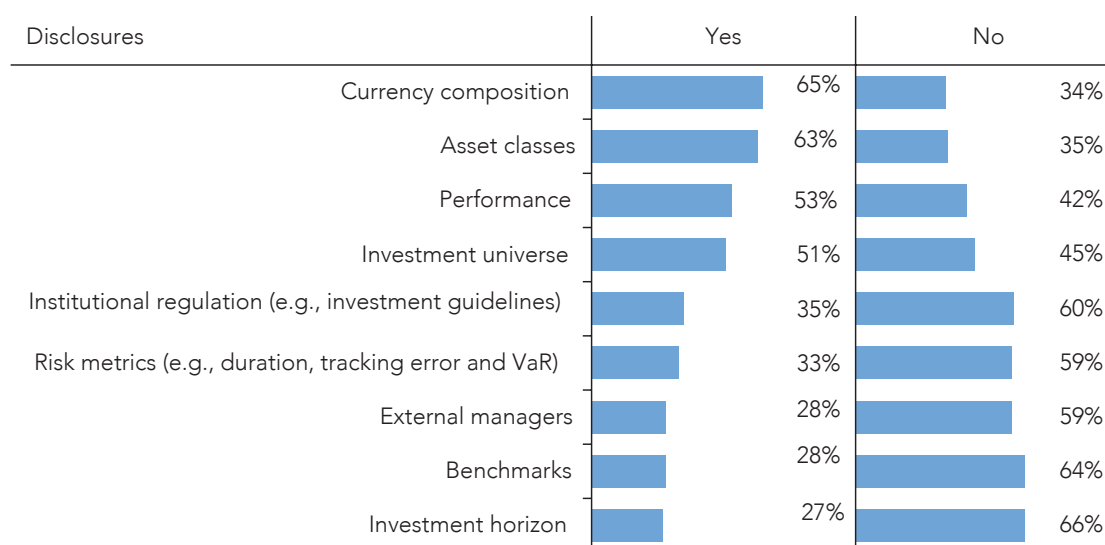
Sharing performance-related data externally can bolster confidence in public asset managers, buttressing a central bank's credibility, legitimacy, and independence. National regulations sometimes set minimum levels of transparency by laying out specific categories of information that must be disclosed. In

FIGURE 3.38
Highest frequency of reporting to the board



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

FIGURE 3.39
Mandatory or voluntary disclosure of reserve management performance



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

Note: VaR = value at risk.

some cases, institutions choose to produce information beyond that required by law.

Survey results show that respondents take different approaches to producing information on reserve management activities for outside audiences. More than half disclose their currency

composition (65 percent) and approved asset classes (63 percent) (figure 3.39). A majority publish their performance statistics (53 percent) and investment universe (51 percent). In contrast, only about a third release information on their investment guidelines (35 percent) and benchmarks (28 percent).

NOTES

1. The SAA is often referred to as the “neutral” long-term asset allocation because it does not reflect short-term views on the trajectory of any asset class or currency (Cardon and Joachim 2004).
2. There were 99 central banks that responded to this question. Currency regime data is available for 87 of the countries in which they reside. Of these 87, 46 have free-floating regimes (International Monetary fund 2018). An analysis that assessed these responses according to foreign exchange regime type and monetary policy factors did not find any material correlation.
3. An analysis did not show a meaningful relationship between central banks that identified this motive as highly relevant and their reserve-to-GDP ratio or country-income category.
4. An analysis of this data using various reserve adequacy metrics did not produce noteworthy findings.
5. All but one of the survey’s 99 participants answered questions related to reserve adequacy measurement. The 88 percent is based on the number of respondents to the question not the total number of survey participants.
6. The short-term external debt ratio methodology aims to ensure sufficient foreign exchange liquidity to cover external debt in the event of a sudden loss of access to international capital markets.
7. An institution’s accounting policy also has an impact on the way currency fluctuations affect the value of foreign exchange reserves.
8. For example, a central bank may divide its reserve holdings into separate tranches, each configured to achieve a different investment objective. The tranches may use different numeraires consistent with their specific aim.
9. This result is substantially different from a Bank of International Settlements’ survey conducted in 2008, which found that less than a third of respondents used the U.S. dollar as currency numeraire (Borio et al. 2008). This apparent change in reserve management practice may be a lesson learned from the crisis.
10. Neither respondents’ reserve-to-GDP ratio nor ARA level appear to explain the focus on returns. This outcome does not change when the analysis is done using only institutions within the same country-income group.
11. Short-term debt-to-GDP ratio was also used to test this hypothesis and no relationship was found.
12. Tranching allows the asset allocation of foreign exchange reserves to be dedicated to a specific investment objective. Separating assets into these discrete categories enables a reserve manager to confirm the allocation’s risk-adjusted basis is appropriate to its objective. Where a reserve manager uses multiple tranches, the different asset allocations combine to form a single overall portfolio. It is therefore critical to account for correlations across the tranches to achieve an optimal and efficient overall allocation.
13. Some research has found that the currency composition of reserve portfolios depends mainly on trade flows, financial flows, and currency pegs (Eichengreen and Mathieson 2000). In some cases, the currency used to measure portfolio risk and return may also drive currency composition (McCauley 2008; Borio et al. 2008).
14. Overall, 81 central banks provided this information. They provided the actual weightings of their currency composition as of Sept. 30, 2017.
15. According to the Society for Worldwide Interbank Financial Telecommunications (SWIFT), U.S. dollar- and euro-denominated transactions comprised over 80 percent of cross-border payments in 2017 (SWIFT 2018). Research suggests that the drivers of currency composition are based on long-term or mid-term macroeconomic perspectives and country specific considerations (Dooley, Lizondo, and Mathieson 1989; Eichengreen and Mathieson 2000; McCauley and Chan 2014). These tend to change only gradually, which may also explain the reason for the U.S. dollar and the euro’s continued dominance of foreign exchange reserves.
16. Respondents’ reported reserve shares by currency as of September 31, 2017, is similar to IMF data on the currency composition of official foreign exchange (COFER). The IMF shows a 64 percent share for the U.S. dollar, a 19.7 percent share for the euro, a 4.4 percent share for the British pound sterling, a 4.2 percent share for the Japanese yen, a 2 percent share for the Canadian dollar, a 1.8 percent share for the Australian dollar, and a 1.1 percent share for the renminbi as of September 31, 2017 (International Monetary Fund 2019).
17. According to Fitch Ratings, one-year global corporate finance default rates were positive between 1990 and 2014 (0.11 percent, 0.03 percent, 0.07 percent, and 0.17 percent for aaa-, aa-, a-, and BBB-rated debt, respectively), while they were 0 percent for sovereigns over a similar period (from 1995 to 2014) (Fitch Ratings 2015).
18. “Performance attribution provides an informed look at the past. It identifies the sources of difference-from-benchmark returns (differential returns) and their impacts on an account’s performance.” Fitch Ratings 2015.

4 CONCLUDING COMMENTARY

Over the past 20 years, managers of foreign exchange reserves have had to respond to two major market developments—a substantial increase in the amount of these assets globally and the extraordinary policy responses to the unprecedented macroeconomic and investment environment after the global financial crisis.

The survey's key findings suggest that, despite these factors, most central banks continue to employ a traditional reserve management approach. Their investments remain concentrated in high-quality fixed-income assets and the minimum credit rating for these holdings remains conservative.

At the same time, the data indicate that important changes are underway as a material number of central banks reported more diversified portfolios with exposure to non-traditional asset classes. A third of respondents hold corporate credit, most of which is investment grade, and almost one in five own mortgage-backed securities or equities, although mostly in limited allocations. Our analysis of this information did not find a relationship between respondents' reserve adequacy and the size of their exposure to non-traditional asset classes. The data exhibit considerable cross-country differences in the way central banks manage their reserves and, in some circumstances, our analysis suggests these differences correlate with respondents' country income groups. These trends suggest at least three areas of opportunity for central banks to enhance their reserve management operations. First and foremost, they highlight the need for further development of strong governance frameworks consistent with existing institutional arrangements. Here the goal is to adhere to a principal-based governance structure that

achieves a clear delegation of responsibilities and a separation of functions, and establishes adequate oversight. As central banks invest in more asset classes, a strengthened governance framework should generate investment decisions that are consistent with an institution's risk tolerance.

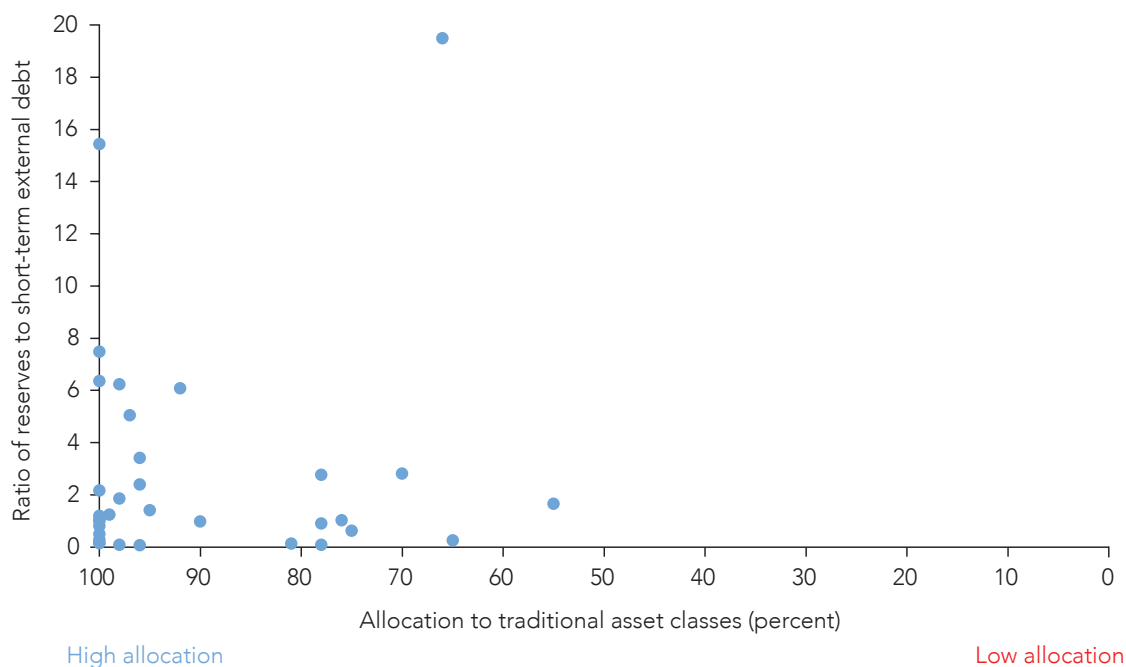
Second, risk management should become more robust in response to the increase in actively managed portfolios and the greater diversification in currency and asset allocations. Central banks that are increasing their credit exposure are encouraged to revisit their process of credit risk management by improving their analysis of bond issuers, counterparties and collateral. In addition, market risk methodologies, such as stress tests and scenario analyses, need to be at the center of this framework to complement the limitations of traditional risk models and to account for potential tail risks.

Third, enhanced transparency may be necessary to retain and enhance central bank legitimacy because larger and more diversified foreign exchange reserves mean their operations take on more risk. Central banks need to find the proper balance between providing enough information to relevant stakeholders and maintaining an efficient investment operation. Country-specific considerations, such as institutional and political factors, can influence the degree of disclosure. However, more and better public disclosure is likely to increase the effectiveness of reserve management and the credibility of a central bank, as its stakeholders and the public develop a better understanding of its investment objectives, policy and track record.

APPENDIX A

FIGURE A.1

Respondents' foreign exchange reserve allocation to traditional asset classes and level of short-term external debt coverage

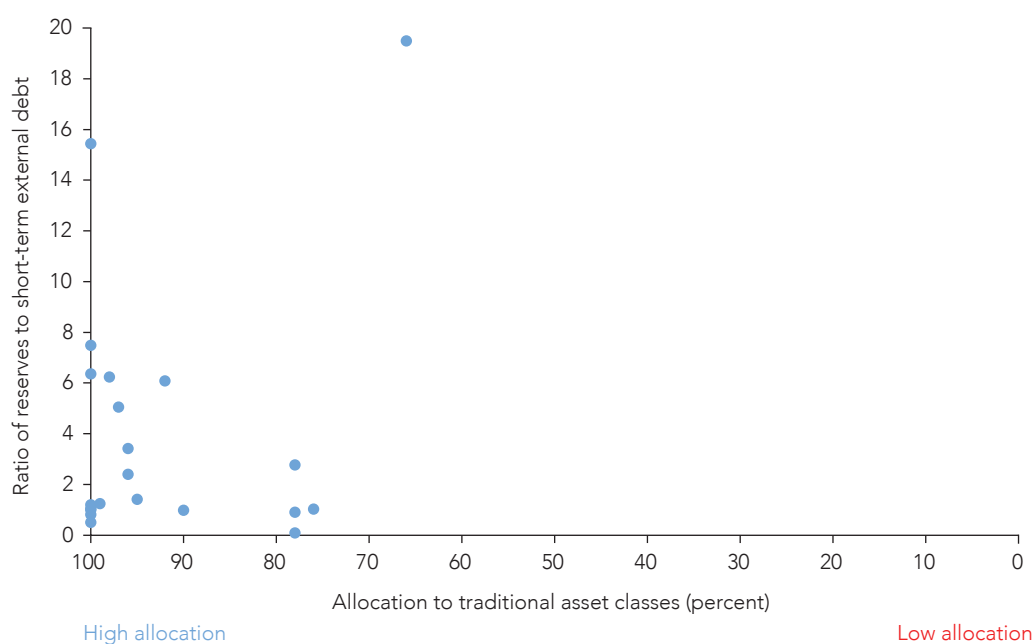


N = 33

Source: RAMP Survey on the Reserve Management Practices of Central Banks, IMF, and CEIC.

FIGURE A.2

Emerging market respondents' foreign exchange reserve allocation to traditional asset classes and level of short-term external debt coverage

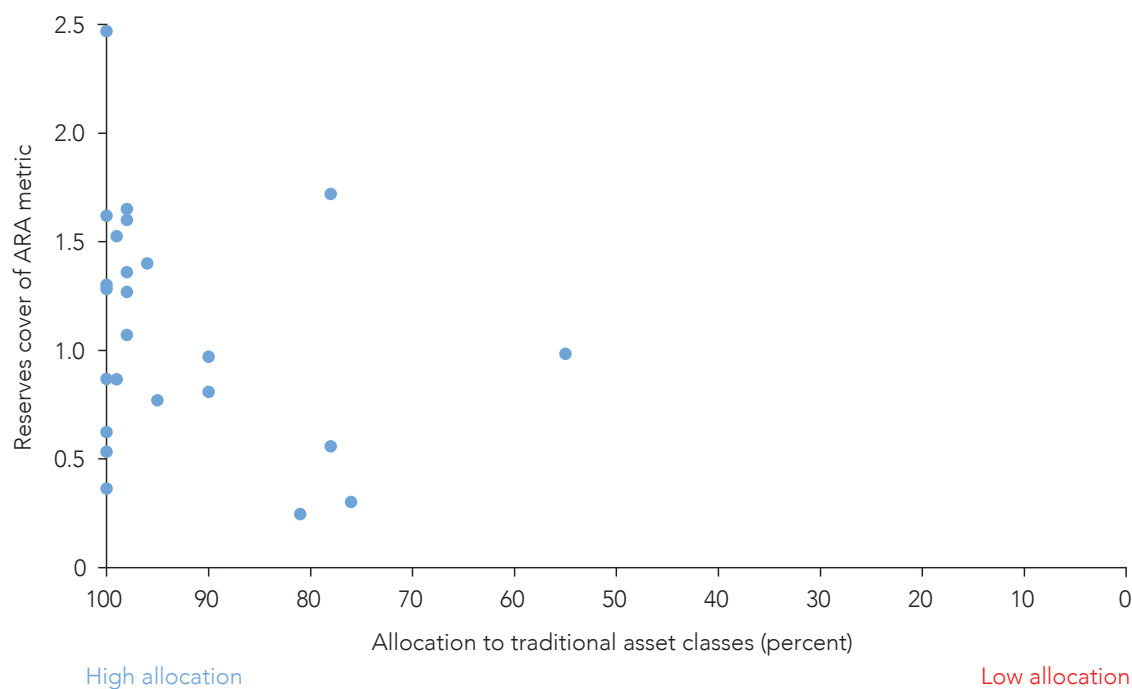


N = 21

Source: RAMP Survey on the Reserve Management Practices of Central Banks, IMF, and CEIC.

FIGURE A.3

Respondents' foreign exchange reserve allocation to traditional asset classes and reserve cover of ARA metric level



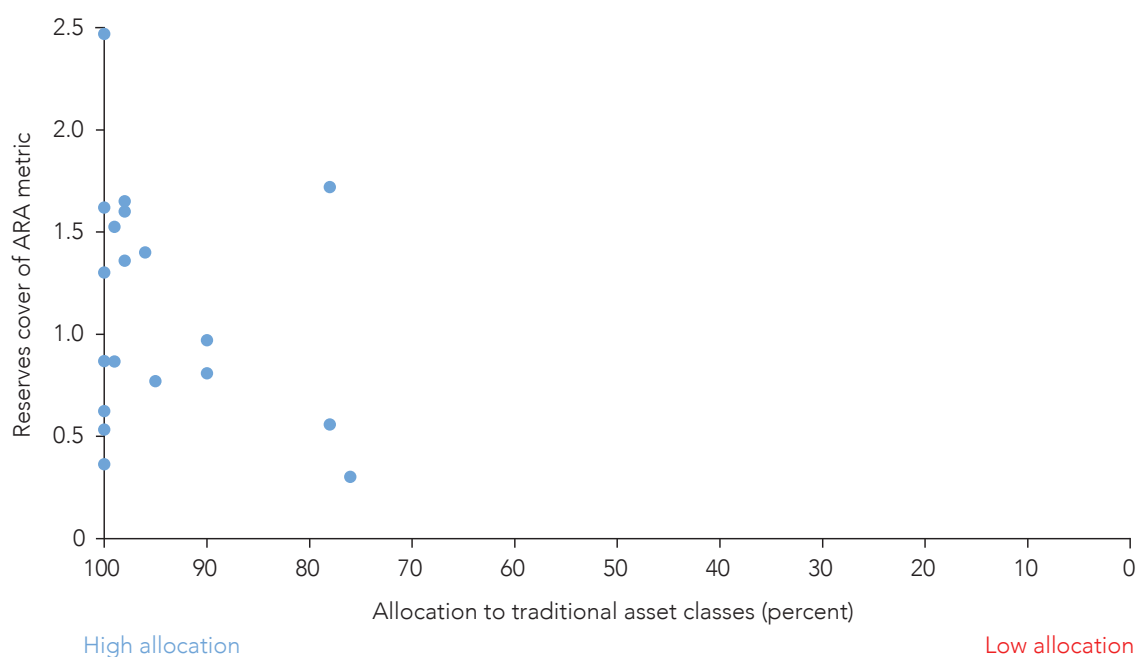
N = 24

Source: RAMP Survey on the Reserve Management Practices of Central Banks and IMF.

Note: ARA = Assessing Reserve Adequacy.

FIGURE A.4

Emerging market respondents' foreign exchange reserve allocation to traditional asset classes and reserve cover of ARA metric level



N = 19

Source: RAMP Survey on the Reserve Management Practices of Central Banks and IMF.

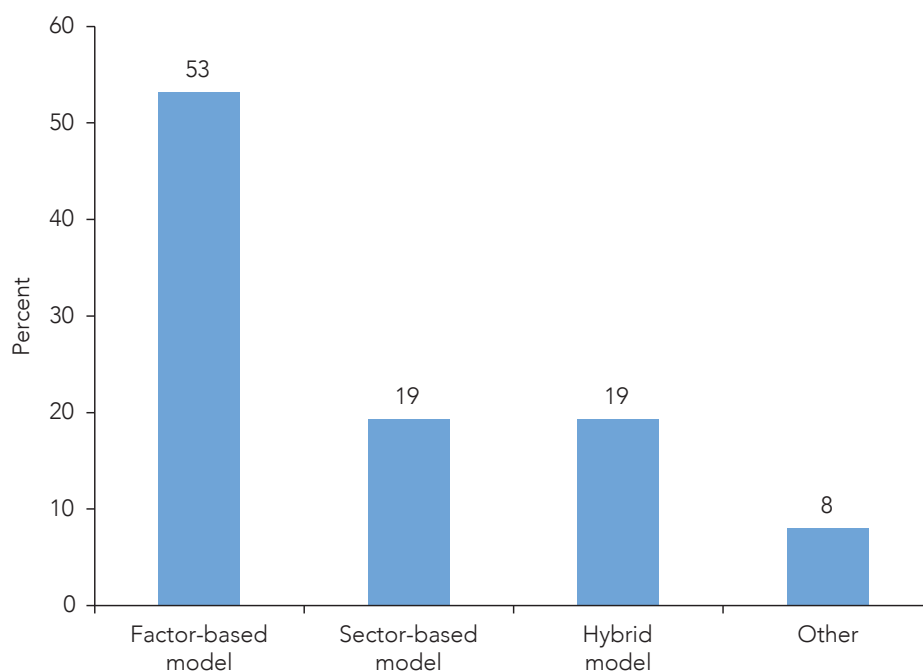
Note: ARA = Assessing Reserve Adequacy.

FIGURE A.5**Use of external managers by country-income group**

	High-income reserve	High-income (non-reserve)	Upper middle-income	Lower middle-income	Low-income
No	69%	6%	30%	11%	22%
Yes	25%	88%	60%	89%	78%

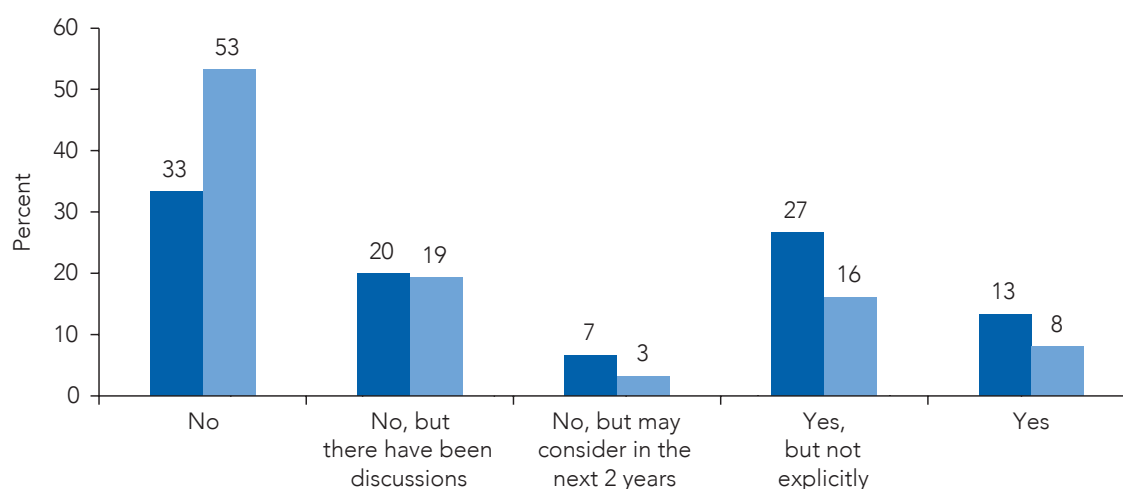
N = 94

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

FIGURE A.6**Performance at attribution models**

N = 62

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

FIGURE A.7**ESG and investing in corporate bonds**

N = 92

■ Corporate bonds ■ No corporates

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

Note: ESG = environmental, social, and governance.

For further information on this paper or any other in the World Bank Treasury Papers Series, please contact Maria Margarita Sanchez at msanchez@worldbank.org.