



SUMMARY OF COUNTRY PRACTICES

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Introduction

16. This document has been developed to accompany the Guidelines for Foreign Exchange Reserve Management that were approved by the Executive Board of the International Monetary Fund in September 2001.¹ The work in this area has been undertaken by the Fund as part of the broader work program to strengthen international financial architecture, promote policies and practices that contribute to stability and transparency in the financial sector, and reduce external vulnerabilities of member countries.

17. The Guidelines identify areas of broad agreement among practitioners on reserve management principles and practices that are applicable to a broad range of countries at different stages of development and with various institutional structures for reserve management. In doing so, the Guidelines serve to disseminate sound practices more widely, while recognizing that there is no unique set of reserve management practices or institutional arrangements that is best for all countries or situations.

18. In the course of the Board discussions on the Guidelines, Executive Directors of the Fund asked the staff to prepare an accompanying document that would contain sample case studies of countries that have developed their capacity in the

areas of reserve management addressed in the Guidelines. At the same time, the Board requested that this report should not expand or add to the Guidelines and welcomed further consultation with members that would form part of this process.

19. In response, staff from the IMF have prepared this document based on case studies prepared by reserve management entities in 20 countries² to illustrate how a range of countries from around the world, at different stages of economic and financial development and institutional structure, have developed their capacity in reserve management in the areas indicated in the Guidelines.³ A number of countries included in the sample also contributed to the development of the Guidelines. As with the process adopted for the Guidelines, the preparation of this accompanying document has sought to foster country ownership of the product and to ensure that the descriptions of individual country practice are well grounded. The initial draft was discussed at a meeting held in Washington, D.C. on October 25,

¹The Guidelines can be found on the IMF's website, <http://www.imf.org/external/np/mae/ferm/eng/index.htm>. A summary is contained in Appendix 1 to this document.

²The focus in this document is on management of reserves by a monetary authority or a central bank acting as a principal or as an agent for another repository of reserves such as an exchange fund. A number of countries also maintain separate stabilization or national savings funds often related to nonrenewable resources. The management of such funds has not been included in the sample case studies.

³Appendix 3 presents the countries that have participated in the preparation of this document and the diverse nature of their economic and financial conditions.

2002 in which 16 case study countries, the BIS, and the World Bank participated. This document has benefited from the insights of the participants and incorporates the feedback received at and subsequent to the meeting.

20. This document is organized as follows. Part I provides a summary of illustrative country prac-

tices on how the main sections of the Guidelines are applied. Part II includes the country case studies as prepared by the reserve management entity of each of the participating countries. The Guidelines are shown in Appendix 1, and Appendix 2 contains a compilation of some supplementary information provided by countries.

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Illustrative Practices from the Country Case Studies

21. This chapter draws together the practices followed by reserve management entities that have prepared the case studies contained in Part II. The aim is to highlight the different ways in which countries can implement reserve management policies as well as to illustrate how the key principles contained in the Guidelines have been implemented in practice without advocating a single way to implement them. Furthermore, reserve management practices are continually evolving in response to market developments and individual country circumstances. The practices are grouped in accordance with the five sections of the Guidelines: (i) reserve management objectives, scope, and coordination; (ii) transparency and accountability; (iii) institutional framework; (iv) risk management framework; and (v) the role of efficient markets.

Reserve Management Objectives, Scope, and Coordination

Overview

22. The Guidelines in this section address the main objectives of reserve management, the scope of reserve management, and coordination between monetary and external debt management policies. They indicate that reserve management should seek to ensure that (i) adequate foreign exchange reserves are available for meeting a defined range

of objectives;⁴ (ii) liquidity, market, and credit risks are controlled in a prudent manner; and (iii) subject to liquidity and other risk constraints, reasonable earnings are generated over the medium to long term. Reserve management activities may also encompass the management of liabilities, other short foreign exchange positions, and the use of derivative financial instruments. The Guidelines also indicate that reserve management strategies should be consistent with and supportive of a country's specific policy environment, and may also need to take into account strategies for the management of external debt to reduce external vulnerability. In countries where reserve management and debt management responsibilities are entrusted to the same authority, consistent strategies can be achieved through well-coordinated asset/liability management. Where reserve management and debt management responsibilities are split between authorities, however, the respective policy objectives may differ.

23. The objectives of reserve management have been well articulated by all the countries in the case

⁴For insights on reserve adequacy, which is outside the scope of the Guidelines, see the following papers available on the IMF website: Issues in Reserve Adequacy and Management: <http://www.imf.org/external/np/pdr/resad/2001/reserve.htm>; Debt- and Reserve-Related Indicators of External Vulnerability: <http://www.imf.org/external/np/sec/pn/2000/pn0037.htm>; <http://www.imf.org/external/np/pdr/debtres/index.htm>.

studies. They emphasize the importance of liquidity and security, as well as maximization of income or reduction in costs subject to these constraints. It is evident from the country case studies that reserve management strategies are strongly influenced by the policy environment in which a country operates. Exchange rate management policy of the country strongly influences reserve management strategy since it determines the liquidity policy and the risk-return trade-off. Some countries that fund reserves by external borrowing adopt an asset-liability management approach. In some other countries, government foreign debt is taken into account as one of the factors determining certain aspects of reserve management strategy such as currency composition of reserves, while in determining other aspects such as duration, interest rate risk and liquidity considerations predominate. One country, however, sees a risk in integrating government liabilities with reserve management, while another reserve manager considers separation of sovereign liability management from asset management a safeguard to ensure the unencumbered nature of reserves.

Country application

Reserve management objectives

24. It is evident from the case studies that countries hold reserves to support a range of objectives, the most common ones being the use of reserves as a tool for exchange rate policy per se, for meeting objectives of monetary policy, and for reducing external vulnerability. In the last few years, there has been a distinct shift by many countries toward flexible or floating exchange rate arrangements. Nevertheless, in almost all cases, maintaining a capacity to intervene in the market continues to be an important objective even though countries with floating rate arrangements do not need to intervene in the markets regularly. For these countries, the objectives of holding reserves are for crisis prevention, for providing confidence to markets, and as a buffer to manage exchange rate volatility. A few countries hold a portion of the reserves as an investment fund primarily to enhance national wealth.

25. Maintaining a capacity to intervene in the markets, to support the exchange rate regime, or

to contain excessive volatility in the foreign exchange markets is one of the objectives for holding reserves in the following countries: Brazil, India, Korea, Latvia, Oman, Tunisia, and Turkey. In Chile, reserves are used as a policy instrument to safeguard the stability of the local currency and normal functioning of internal and external payments. Hong Kong SAR holds reserves primarily to safeguard the exchange value—the secondary objective being to promote the stability and integrity of the monetary and financial systems.

26. The countries of Colombia, the Czech Republic, India, Israel, Korea, and Turkey hold reserves to provide confidence to markets and reduce their vulnerability to financial crises. Israel perceives its reserves as allowing some flexibility in setting the currency composition of public sector debt, while the Czech Republic holds reserves to meet both known and potential obligations of the central bank, the major portion of which are interventions and clients' payments (mainly those of the government).

27. Canada holds its reserves to provide foreign currency liquidity to the government and to help promote orderly conditions in the domestic foreign exchange market. Similarly, in the United Kingdom (U.K.) reserves are also used to provide foreign currency services to government departments, as well as being available for official intervention. New Zealand holds reserves to preserve the functioning of the foreign exchange market for domestic currency in the event of a crisis; and Australia, to fund foreign exchange operations in support of its broader monetary policy function.

28. While the specific circumstances of countries affect the choice of reserve management strategies, the objectives of reserve management in all the countries emphasize liquidity and security; and subject to liquidity and security constraints, maximization or optimization of return. In other words, liquidity, and preservation of capital are major objectives of reserve management. Preservation of purchasing power of reserves is a long-term objective cited by some countries such as Hong Kong SAR, India, Israel, and Tunisia. Latvia has mentioned that while stability (capital protection), liquidity, and income are the primary requirements, it also puts some emphasis on returns. Similarly,

Mexico has indicated that with the implementation of a floating exchange regime in 1995, it has been increasing the weight that it places on return enhancement, while placing high attention on other risks involved in investment decisions.

29. Where reserves are borrowed, minimizing the carrying cost of reserve assets is an important objective. In Canada, the level of foreign reserves has been increased to reflect increased flows in foreign exchange markets and to bring the level more in line with other comparable sovereigns. This increase, in turn, has required reserve managers to focus on asset-liability and risk management, and on reducing the cost-of-carry of reserves while maintaining a high degree of liquidity and capital safety. New Zealand has also noted that it actively manages the reserve portfolio to meet immediate liquidity needs for any intervention and to maximize risk-adjusted net returns, or minimize risk-adjusted net costs, subject to the former objective.

30. Some countries make explicit references to reserve management as management of national wealth. For example, Norway has indicated that, over the years, the objectives of funding intervention and immunization of government foreign debt have become less important and the more important objective has become managing reserves as national wealth to earn higher returns. Botswana, with its high level of reserves, has created a long-term fund (Pula Fund) with the expectation of earning a higher return than conventionally managed reserve portfolios by investing part of the assets in long-term bonds and equities. Hong Kong SAR manages a part of the Exchange Fund assets in an investment portfolio to preserve the long-term purchasing power of the Exchange Fund's value for future generations.

31. Another objective of reserve management is to assist the authorities to gain access to valuable information through interaction with financial markets, which can be useful in their other functions, such as oversight and development of domestic financial markets. Israel has noted that reserve management helps in accumulation of information and expertise that can be of value to other core functions of the central bank, such as the formulation of monetary policy or exchange rate policy. Similarly, New Zealand has indicated that

managing reserves helps to develop and maintain a broad skill base in foreign securities and foreign exchange dealings to support the central bank's ability to conduct foreign currency market intervention or respond to other crises. It also enhances the bank's general understanding of financial markets, instruments, and practices.

Scope

32. A common feature in almost all countries participating in the case studies is that reserves consist of external assets that are readily available and controlled by the reserve management entities.⁵ Derivative financial instruments are also included in the scope of reserve management functions. In addition, reserve management encompasses management of liabilities, which reserve management entities may acquire for the sole purpose of funding reserves or in the context of their monetary or other functions.

33. In Canada, reserve management activities consist of the management of foreign currency assets and liabilities, and includes the use of derivative financial instruments. Similarly, New Zealand manages the foreign currency liabilities used to fund reserves, since this strategy does not expose the bank to significant foreign exchange risk. In the U.K., in addition to managing reserve assets, the Bank of England also acts as the government's agent for foreign currency liability management. In Chile, Colombia, the Czech Republic, Latvia, and Turkey, the scope of reserve management includes foreign currency liabilities of the central bank.

Reserve management strategy and coordination

34. Reserve management strategies are strongly influenced by the policy environment in

⁵In Oman, foreign currency revenues of the government in excess of budgeted prices of oil are held in a fund known as the State General Reserve Fund. This portion of the external reserves of the country is owned and managed directly by the government and may be utilized in case of a budget shortfall. There is an institutional arrangement for consultation between the central bank and the fund on various investment-related issues, such as composition of benchmark and portfolio performance.

which a country operates, in particular its monetary and exchange arrangements. Under a free float, a public commitment by the authorities not to operate in the foreign exchange market gives the reserve manager greater latitude in structuring the duration and liquidity of the portfolio. In practice, however, authorities may seek to maintain a capacity to intervene in exceptional circumstances to ensure orderly markets during times of very sharp adjustments of the exchange rate or market pressures or, more generally, to be able to counter unforeseen internal or external shocks. Canada holds reserves in highly liquid U.S. dollar-denominated assets to fund foreign currency liquidity requirements and intervention activity. Other countries that are under a floating exchange rate arrangement, such as Brazil, Colombia, Chile, the Czech Republic, Korea, and Turkey, also maintain a capacity to intervene in the market in exceptional circumstances.

35. For countries that operate a fixed exchange rate or similar regimes, the reserve management strategy involves providing adequate liquidity to defend the exchange rate regime. Hong Kong SAR, which operates a currency board regime, has created a backing portfolio by designating certain asset and liability items as those specifically related to currency board operations. The reserve assets backing the monetary base are invested in highly liquid U.S. dollar-denominated securities. Latvia pursues a fixed exchange rate target versus the SDR with a ± 1 percent intervention band. It holds highly liquid instruments in its portfolio, which can be realized in times of market stress. Since it holds reserves in excess of the monetary base and the size of intervention is unlikely to exceed the monetary base, it invests a good proportion of the reserves that are not necessary for intervention purposes with the objective of earning higher risk-adjusted returns. For Oman, which operates a fixed exchange rate regime, the strategy is to clear the local foreign exchange market on a day-to-day basis, as well as provide a credible cushion against current and capital account shocks.

36. Countries with intermediate exchange rate regimes, such as a managed float, require the authorities to support the exchange rate arrangement. This may call for more or fewer interven-

tions depending on market evolution and conditions, with consequences for the choice of the appropriate level of liquidity that would need to be maintained. India intervenes in the markets to even out lumpy demand or supply in thin markets and to prevent destabilizing speculation while facilitating foreign exchange transactions at market rates for all permissible purposes. Liquidity is, therefore, an important consideration in reserve management. The reserve management strategy in Tunisia, which operates a managed float arrangement, ensures that it has adequate liquidity for meeting its intervention needs in order to avoid sharp adjustments in the Tunisian dinar exchange rate.

37. Reserve management strategies may also take into account strategies for the management of external debt for purposes of reducing external vulnerability. Some countries implement an asset-liability management strategy that incorporates the country's sovereign debt. Others hedge only the liabilities that are on the books of the reserve management entity. In other cases, reserve managers consider external debt as one of the factors influencing reserve management strategy.

38. Countries that adopt asset-liability management strategies include Canada, New Zealand, and the United Kingdom. In Canada, the Exchange Fund Account (EFA) is financed with foreign currency-denominated liabilities issued by the Government of Canada. The government has also used long-term interest and currency swaps to fund foreign exchange reserves, obtain cost-effective financing, and permit flexibility in managing liabilities. The reserve management framework follows a well-coordinated asset-liability management framework. The Financial Markets Division of the Department of Finance works with the Bank of Canada, the government's fiscal agent, on all aspects of debt management. As the fiscal agent, the Bank of Canada is specifically responsible for the operational aspects of debt management, including foreign currency borrowing. It also operates the Government's Risk Management Unit.

39. In New Zealand, the Reserve Bank of New Zealand has a close relationship with the debt management office with regard to funding reserves, since that office raises funds and passes them on to

the central bank by way of loans. The central bank, however, decides on the timing and nature of reserves funding consistent with its reserves management strategy. Under this arrangement, risks arising from reserve assets and liabilities are managed by the central bank. According to the Reserve Bank of New Zealand, this strategy does not expose it to significant foreign exchange risk, and assists in maintaining its independence because it is less exposed to political risks that can arise when a government, or a public sector entity, reports large losses from risk positions. In the U.K., the Bank of England manages the reserves held in the Exchange Equalization Account (EEA) and also acts as the Treasury's agent for foreign currency liability management. This allows the official foreign currency balance sheet to be managed as a single entity. The reserve assets may also be financed by sterling-denominated liabilities swapped into foreign currency if the prevailing interest and swap rates provide a more cost-effective means of financing than borrowing directly in foreign currency.

40. Many countries take into account the currency composition of sovereign debt while determining their reserve management strategy. Brazil replicates, in the amount of core reserves, the currency distribution of the short-term sovereign external debt. Chile's reserve management strategy takes into consideration, among others, the short-term external debt servicing needs. Hungary takes into consideration the currency composition of foreign currency debt of the government when determining the optimal net currency structure to the extent that it does not conflict with other objectives of holding reserves. Korea takes into account the currency composition and duration of the government's foreign debt when determining currency composition and target duration of the foreign reserves in order to reduce foreign exchange rate and interest rate risk. Norway sets aside an immunization portfolio that is equivalent to government foreign currency debt.

41. Turkey presents a different scenario whereby the reserve management strategy is influenced by a relatively large amount of foreign currency deposits of Turkish workers living abroad, as well as other foreign currency liabilities due to domestic banks and international institutions.

These liability accounts have a major impact on the design of reserve management strategies. Government foreign debt is managed by the Treasury, but external cash flows associated with external debt are factored into reserve management strategy.

42. In Colombia, the central bank board is in close coordination with the Ministry of Finance so as to ensure the sustainability of fiscal policy and the maintenance of adequate foreign exchange liquidity levels. However, there is no direct link between reserve management and debt management as each pursues different investment objectives. In Mexico, no explicit coordination exists with external debt management; however, in the past, reserves have been managed to hedge currency risk arising from liabilities to the IMF. In addition, the Central Bank of Mexico is responsible for investing and managing the resources pledged as collateral following the 1989 negotiations of the Mexican Brady Bonds.

43. The Czech Republic treats central government debt separately from the position of the central bank because of difficulties in differentiating between government positions and positions of other institutions and companies financed from the central budget. In Latvia, the central bank closely coordinates with the state treasury on debt policy, but reserve management is not influenced by the currency composition or the maturity of government debt. Each institution is responsible for managing its foreign exchange and interest rate positions. However, all foreign currency liabilities on the books of the central bank are fully hedged to minimize any adverse effects on the bank's income statement. In Israel, the central bank is, at present, not involved in liability management, nor are the reserves managed with a view to hedge interest rate exposure of government. This separation is regarded as an important safeguard for maintaining the unencumbered status of reserve assets.

Transparency and Accountability

Overview

44. The Guidelines in this section promote transparent disclosure of the allocation of reserve management responsibilities. These include agency

responsibilities, broad objectives and key elements of policy adopted, general principles governing the reserve management entity's relationship with counterparties, and the availability of periodic information on official foreign exchange reserves. The Guidelines encourage the inclusion of the conduct of reserve management activities in the independent annual audit of the reserve management entity's financial statements, and the publication of the audited financial statements. These guidelines follow the Principles of the IMF Code of Good Practices on Transparency in Monetary and Financial Policies.⁶

45. The case studies clearly indicate that there is a trend toward greater transparency in disclosing information on reserves and key elements of reserve management policy and performance. The level of disclosure varies depending on country-specific circumstances. A significant number of countries surveyed subscribe to the IMF's Special Data Dissemination Standard (SDDS). Some countries view the disclosure of certain sensitive and confidential information as affecting their flexibility to manage the exchange rate regime, or their ability to cope with a crisis.

46. Accountability is ensured by including the conduct of reserve management activities in the annual audit of the reserve management entities' financial statements in almost all cases. The audit is conducted by independent external auditors, which, in some cases, is the national auditor and, in some others, a reputable private firm. In a few cases, both the national auditor and a private firm perform the audit. Almost all reserve management entities have their financial statements regularly audited by independent external auditors.

Country application

Clarity of roles, responsibilities, and objectives of financial agencies responsible for reserve management

47. In most countries surveyed, the allocation of roles and responsibilities of financial agencies

overseeing the reserve management function is explicitly stated in the laws and guidelines governing the reserve management entity. Furthermore, some countries disclose governance arrangements in public documents and websites.

48. In a few countries where foreign exchange reserves are owned by the government and held in a separate fund, management responsibilities between the central bank and government have been clearly spelled out and disclosed. In Canada, the EFA, which is governed by the provisions of the Currency Act, is held in the name of the Ministry of Finance at the Bank of Canada and managed jointly by the Ministry and the Bank of Canada. This is disclosed in the annual report of the EFA. In addition, *Bank of Canada Review* articles have detailed the chain of authority, decision making, and delegation of reserve management responsibilities. In Hong Kong SAR, the Exchange Fund set up under the Exchange Fund Ordinance is owned by the government, and the authority for investments rests with the Financial Secretary. The Hong Kong Monetary Authority manages it on a day-to-day basis under the authority delegated to it, and within the investment policy approved by the Exchange Fund Advisory Committee. In the U.K., the roles and responsibilities of the Treasury and Bank of England are clearly defined and disclosed. The EEA funds are available to the U.K. government for intervention, whereas the central bank would use its own holdings of foreign currency assets if it intervened in the foreign exchange markets to support its monetary policy operations.

49. In Botswana, the law states that the Bank of Botswana shall be responsible for establishing and maintaining a primary international reserve (liquidity portfolio) and the long-term investment fund (Pula Fund), subject to meeting the requirements of the primary reserve. The income from the Pula Fund is divided between the central bank and the government in proportion to the investment in the Fund. The Bank of Botswana's financial statements disclose the government's share of the Pula Fund and the income on the fund distributed to government. However, the Bank of Botswana has the mandate to manage the reserves.

⁶Details can be found at the following website: <http://www.imf.org/external/np/mae/mft/index.htm>.

50. In other countries where the central bank has the sole mandate to manage and hold the reserves, the role and responsibility is prescribed in the central bank law or the constitution. In Norway, the Norges Bank has been given authority under the law to invest official foreign exchange reserves with a view to maintain the foreign exchange policy that has been established.⁷ The King in council may issue rules concerning the investment of the official foreign exchange reserves. In practice, however, Norges Bank's executive board has laid down guidelines for the investment of reserves. In Botswana, Brazil, Chile, Colombia, the Czech Republic, Hungary, India, Korea,⁸ Latvia, Mexico, Oman, Tunisia, and Turkey, the authority of the central bank to manage reserves is incorporated in the law or the constitution.

51. In New Zealand, while the Minister of Finance has an important role in setting the range within which the bank must maintain foreign reserves and can direct the bank to intervene in the foreign exchange markets, the Reserve Bank of New Zealand is the entity responsible for foreign reserve management. The Bank's independence from the government also means that the management of foreign reserves is undertaken at arm's length from the political process. In Australia, the authority to the Reserve Bank of Australia is given through broad legislative powers that allow it to buy, sell, and otherwise deal in foreign exchange to achieve monetary policy objectives. Responsibility is not shared with other agencies.

52. Broad objectives of reserve management are disclosed in the law in some countries, such as Botswana, Colombia, and Turkey. Furthermore, in a number of countries, the law also specifies the assets in which the reserve management entity may invest, signifying the importance of the safety objective.

Public availability of information on foreign exchange reserves and reserve management policies

53. Two prime means by which reserve management entities make data publicly available are (i) subscription to the IMF's SDDS and (ii) annual reports and financial disclosures. The SDDS reserves data template is aimed at achieving timely public disclosure of information on foreign reserves and other activities of potential relevance. It provides a comprehensive benchmark standard for the content and timing of public disclosure on reserves. The template covers the traditional balance sheet information on international reserves and other selected external assets and liabilities of the authorities. It also takes account of their off-balance-sheet activities (such as forwards, futures, and other financial derivatives, undrawn credit lines, and loan guarantees), identifies assets pledged and otherwise encumbered. Seventeen countries surveyed subscribe to the IMF's SDDS and provide information in the associated data template on international reserves.⁹ Many countries also disclose information on reserves on a weekly basis, usually through their individual websites. In addition, a number of countries disclose important aspects of their reserve management operations and information on their performance in the annual reports of the respective reserve management entities.

54. The nature of information provided in the annual reports differs among reserve management entities. Some reserve management entities furnish information on the policies, benchmarks, and absolute and relative performance. The Bank of Israel as part of its annual reports publishes a separate report on investment of the foreign exchange reserves that provides information on the objectives of holding reserves, desired level, investment policy, and details of performance, both absolute

⁷In addition, the Norges Bank also manages the government's Petroleum Fund as a separate portfolio to Norway's official international reserves.

⁸The government has also entrusted the management of the foreign exchange equalization fund to the central bank.

⁹Specific details for SDDS subscribing countries can be found on the IMF website: <http://dsbb.imf.org/Applications/web/sddscontrylist>. For countries that have their template data redisseminated by the IMF, the data, in a common format and in a common currency, are accessible on the IMF's website at <http://www.imf.org/external/np/sta/ir/index.htm>. The website also provides links to subscribing countries' websites.

and relative to the benchmark. Norges Bank furnishes information on the guidelines for the investment of foreign reserves issued by the executive board as well as supplementary guidelines set by the governor. On a quarterly basis, it also publishes the size and return of the different subportfolios (and relative return compared to benchmark), as well as actual asset class and currency composition, and portfolio risk exposure compared with limits. The Reserve Bank of Australia has provided an overview of reserve management operations and return relative to the benchmark in its annual reports since 1992. In more recent years, this has also included an outline of the composition of the benchmark portfolios and a discussion of the bank's approach to risk management.

55. In Canada, the Ministry of Finance provides an annual report to parliament on the operations of the EFA. It contains governance arrangements, key principles of management, and recent developments. In Colombia, the constitution requires the central bank to inform Congress periodically on its performance of its different responsibilities, including reserve management. The central bank's detailed semiannual report to Congress includes a summary of the level and composition of reserves, investment criteria, and performance of reserve management. The Czech National Bank also provides in its annual report to the Parliament a report on its reserve management performance. In 2001, it changed the structure of the published information on reserve management to contain information on the risk profile of reserves, including credit, interest, and currency risks and the absolute and relative performance achieved in reserve management.

56. In Chile, new paragraphs have been added in the Central Bank of Chile's annual report on how the bank achieves its liquidity goal. The report lists the different types of financial instruments in which the reserves are invested and the composition of reserves at year-end classified into bank deposits and fixed income instruments. The risk management policy is also disclosed. Brazil publicly discloses reserve management parameters and procedures. In Latvia, the central bank's annual report contains information on currency position and credit quality.

57. In New Zealand, the Reserve Bank of New Zealand's annual report lays out governance arrangements and reports on the key performance indicators in respect of its functions, including reserve management.

58. In the U.K., reserves are managed in accordance with the criteria set by the government in an annual remit, which appears in the debt and reserves management report published by the government at the time of the budget. Furthermore, the government has published a Service Delivery Agreement (SDA) target to minimize the cost of holding reserves while reducing risk. The performance relative to this target is reported in the annual report on the expenditure plans of the chancellor of the exchequer's departments.

59. The objectives and the overall approach to reserve management are disclosed in the Reserve Bank of India's annual report, its monetary policy statements, and speeches of its senior officials. In Korea, the general investment philosophy and direction are disclosed through the Bank of Korea's annual reports.

60. In Hong Kong SAR, the annual report of the Exchange Fund provides information on objectives of the fund, investment policy, currency mix, and the performance of the fund. Information sensitivity and commercial considerations are, however, issues for some countries in determining to what extent certain types of information can be disclosed. Hong Kong SAR, for instance, has indicated that considerations such as market sensitivity, commercial confidentiality, need to maintain flexibility to deal with a sudden crisis, and statutory restrictions on disclosure of confidential information place some limits on the amount of material that can be made public. Similarly, Korea is of the view that disclosure of certain aspects of reserve management practices may adversely affect its reserve management capacity.

Accountability and assurances of integrity by agencies responsible for reserve management

61. In almost all the countries participating in the case studies, reserve management activities are audited annually by an independent external auditor as part of the annual audit of the reserve man-

agement entity's financial statements, to ensure compliance with appropriate accounting standards.

62. In some countries, such as Australia, Canada, and the U.K., the audit of financial statements is done by a separate government auditing agency. In some others, such as Latvia and Brazil, both the government audit office and an independent external auditor audit the statements of the reserve management entity. In Brazil, there are three separate external audits—one done by an external independent auditing firm, the other by the Ministry of Finance, and the third by the court of accounts. In Korea, the external audit of the reserve management entity is performed at least once a year by the Board of Audit and Inspection, which is directly responsible to the President. Its purpose is to review both the accounting procedures and foreign reserve management. The national assembly also audits foreign reserve management annually through the national audit.

63. In Botswana, Chile, Colombia, the Czech Republic, India, Hungary, Mexico, New Zealand, Oman, and Turkey, the external audit is conducted by independent external auditing firms.

64. In a number of countries, the financial statements disclose accounting policies and performance in domestic currency terms. In a few countries, in addition to information provided in the annual reports of reserve management entities, some aspects of reserve management activities are disclosed as part of the financial statements audited by external auditors, in accordance with the requirements of national or international accounting standards.

65. In New Zealand, the audited financial statements of the Reserve Bank of New Zealand provide a range of relevant financial risk disclosures as required by New Zealand accounting standards, which are at least as rigorous as International Accounting Standards (IAS).¹⁰ Extensive disclosures are provided in the notes to the accounts on

a range of reserve management matters, including risk management policies, quantitative risk exposures such as credit risk and market risk from extreme events, and net reserve management income. Income from active management performance and passive risk neutral performance are separately identified.

Institutional Framework

Overview

66. The Guidelines in this section address the importance of sound governance and good management of operational risk through a legislative framework that clearly establishes the reserve management entity's responsibilities and authority. They also stress the importance of a clear separation of responsibilities and authority. In order to reduce operational risk, they highlight the need for qualified and well-trained staff following sound business practices, effective monitoring of internal operations and related risks supported by reliable information and reporting systems, and an independent audit function. The development of accurate and comprehensive management information systems, code of conduct and conflict of interest guidelines, and effective recovery procedures have also been encouraged.

67. The reserve management entities in all of the countries surveyed have a well-defined mandate to manage the foreign exchange reserves solely, or jointly with the government. The authority to set the guidelines and policies on reserve management is vested with the government, or the central bank's board or governor, by law. In all the countries surveyed, the internal governance structure clearly spells out the roles and responsibilities at each level of decision making down to the portfolio managers. There is also a separation of duties between the central bank's front and back office functions. An increasing number of reserve management entities have established a "middle office" for risk measurement, monitoring, and performance evaluation. Similarly, more advanced management information systems are being implemented to reduce operational risks, enhance timely reporting, and facilitate continuous moni-

¹⁰The International Accounting Standards Board (IASB) publishes its standards in a series of pronouncements called International Financial Reporting Standards (IFRS). It has also adopted the body of standards previously issued by the International Accounting Standards Committee. Those pronouncements continue to be designated "International Accounting Standards" (IAS).

toring. Attracting and retaining highly skilled and motivated staff is a challenge many reserve managers face, which is generally addressed by offering financial and nonfinancial incentives.

Country application

Legal foundation

68. In all the countries surveyed, institutional arrangements have been established through a legislative framework that establishes responsibilities and authority of the reserve management entity. The law in some countries, while providing the central bank with the authority to manage reserves, also addresses the types of foreign currency assets that the reserve management entity may hold. The legislative specification of institutional arrangements, however, differs among countries.¹¹

Internal governance

69. All countries surveyed demonstrate a well-defined organizational structure that establishes a clear separation of responsibilities and authority from the top to operational levels of the reserve management entity. As noted by some participants, this structure has evolved from a decade ago when the roles at various levels in the decision-making process were unclear and almost every transaction had to be approved by higher management.

70. A common governance structure that applies across most reserve management entities is a formal three-tier hierarchical arrangement with either the central bank board or the governor setting the overall objectives and strategy for reserve management. Typical issues that the highest level of management addresses are broad currency composition of reserves, permissible instruments, acceptable credit quality, and overall interest rate exposure position. The second level of management, or a committee, is responsible for translating the strategy to operational guidelines by laying down benchmarks; approving permissible devia-

tions from benchmarks, markets, and instruments; and allocation of funds between the portfolios. At the third level, portfolio managers are responsible for actually implementing the strategy within the limits allowed by the second level of management.

71. In Botswana, Brazil, Chile, Colombia, the Czech Republic, Hungary, Latvia, Norway, Oman, and Turkey, the central bank board is the highest decision-making body that sets forth the broad strategy for management of reserves. The nature and scope of decisions taken by the Board may differ slightly among the countries.

72. In Australia, Israel, Korea, New Zealand, and Tunisia, the central bank governor is responsible for reserve management policy. In Tunisia, the Governor sets the strategy and principles for reserve management policy on proposals made by the department concerned.

73. In Canada, the Minister of Finance approves policies for managing the EFA, and in India, strategic decisions on currency composition and asset allocation are decided by the central bank in consultation with the government. In the U.K., the strategy is agreed upon between Her Majesty's Treasury (HMT) and senior management of the central bank. In Hong Kong SAR, the long-term strategic decisions are controlled by the Exchange Fund Advisory Committee.

74. Decisions concerning implementation of central bank board strategies are usually the responsibility of a committee known as an investment committee, risk management committee, or internal reserves committee. In some countries, the governor, the assistant governor, or executive director sets the more detailed guidelines within parameters set by the central bank board or the governor. In Norway, for example, the Governor of the Norges Bank has been authorized to issue supplementary guidelines on the reserves, with a separate unit within his staff assuming responsibility for advising the Governor on the strategic guidelines and benchmark portfolios of the reserves and the Petroleum Fund.¹² In Hong Kong SAR, the medium-term mar-

¹¹See paragraphs 47 to 52 on allocation of roles and responsibilities for reserve management for additional information on the laws governing institutional arrangements in the participating countries.

¹²For reserves, the guidelines prepared by Governor's staff are set by the Executive Board or the Governor. For the Petroleum Fund, the guidelines are given by the Ministry of Finance, except supplementary guidelines for credit risk, which are set by the Governor.

ket decisions are delegated to the central bank's senior management as well as the Executive Director level. In the Czech Republic, the Executive Director for risk management sets the credit limits, benchmarks, operational risk rules, and permissible deviations from benchmarks within the overall strategy approved by the central bank's board.

75. In Australia, senior managers overseeing front office operations of the central bank are delegated responsibility for day-to-day management of currency and asset allocation, and interest rate risk. In Canada, the director of the Financial Markets Division at the Ministry of Finance and the chief of the Financial Markets Department at the Bank of Canada are responsible for the ongoing management of the fund. In the U.K., the Foreign Exchange Division of the Bank of England is responsible for implementing the investment strategy approved at the highest level. Decisions on specific investments, the degree of latitude for individual portfolio managers, and general staffing and budget issues are taken by local management. The delegation of responsibilities and decision making is captured within the formal benchmark process. Higher levels of management shape the benchmark for the next level down, which enables the attribution of overall returns to the decisions taken at each level and provides a direct and visible link between decisions taken and profits earned.

76. Separation of duties is a fundamental requirement in all trading and investment operations, which is achieved through a clear separation of front and back office functions. In all countries surveyed, there is a strict separation of front and back office functions. Furthermore, risk and performance monitoring functions are fully independent of operational functions. Increasingly, the functions are organized so that they report to different members of senior management. Seventeen countries reported that they have a separate middle office or risk management unit. The main functions of the middle office are to ensure that transactions done by the front office are within predetermined risk limits, and to assess the performance of the front office's trading relative to the benchmark. In some countries, there are separate departments for handling the front and back office functions. In some others, even if the functions are

performed in one department, there are firewalls between the front and back office functions. A sharp line exists between departments, divisions, or teams that make decisions regarding investment and investment support departments that take charge of transaction settlement, risk measurement, return measurement, and accounts.

77. In general, reserve management entities document the delegation of powers and responsibilities. For instance, in Norway, a clear division of responsibilities is reflected in the organizational setup of the central bank and well documented in written guidelines, mandates, and job instructions. Australia has stated that a key element in the control of operational risk has been the development of manuals detailing investment and risk management procedures. In Oman, a document within the central bank clearly delineates powers and responsibilities of officials at various levels connected with decision making. Similarly, Israel has indicated that standard working procedures are documented and enforced, including routine verification and authorization procedures. Botswana also has formally documented procedures and manuals for reserve management operations.

Management of internal operations

78. Effective monitoring of internal operations and related risks should be supported by a reliable information and reporting system and an independent audit function. Country case studies highlight that a management information system is an important control and monitoring mechanism. Generally, the central bank board monitors the reserve management operations by requiring regular reports and review of investment activity and performance. Quarterly reports, or at a minimum, annual reports, are submitted to the board. More frequent reporting—at least monthly—occurs at the next level, such as the board member in charge of reserve management operations or the investment committees. Senior level officials receive daily reports. Latvia has reported that monthly performance reports are given to the executive board. Management has access to daily accounting reports on the bank's intranet, which is being further upgraded with a new system. Important elements

in the use of management information systems in Norway are: (i) daily updated information on holdings and prices in both internal and external portfolios; (ii) daily measurement of performance relative to benchmark; and (iii) daily/weekly monitoring of risk. Information on all internally and externally managed portfolios is updated daily in the central data warehouse.

79. The case studies also indicate steps taken by countries to manage other operational risks, such as settlement risk, custodial risk, and legal risk. Settlement and custodial risks are generally managed by a process of review and approval of the counterparties and custodians. An important aspect of controlling custodial risk is monitoring performance through daily reconciliation of portfolios with the reserve management entity and, where applicable, external managers.

80. Participants at the outreach meeting stressed the importance of properly assessing legal risk. Some key legal issues that reserve management entities must be aware of are ensuring: (i) that contracts are adequately documented and are enforceable in all relevant jurisdictions; (ii) the counterparty has the legal capacity and authority to enter into the transaction; (iii) the entity has clear enforceability rights over the collateral or margins received from counterparty; (iv) that standard netting agreements are also valid and enforceable with respect to any third party rights; and (v) funds entrusted to external managers and custodians are adequately protected in the event of an insolvency. Some country case studies illustrate how legal risk is managed. For example, the Banco Central do Brasil's legal department analyzes and approves contracts and, together with audit entities, ensures that each transaction has the necessary legal support. In Canada, the government's Department of Justice has the responsibility of advising on legal risk, and the preparation of an annual legal risk report for the Risk Management Committee and senior management. The report identifies any potential legal risk issues with respect to existing documentation.

81. In Colombia, the legal risk assessment process focuses on the administration of contracts and legal documents associated with the reserves operations. These contracts specify each party's rights

and obligations, fees, investment guidelines, warranties, the sovereign immunity of the reserves, and the applicable legislation and jurisdiction. It also involves the establishment of new contracts, as well as the maintenance of current contracts, in accordance with internal and international market regulations. The Czech Republic has expressed concerns about legal jurisdictions and the lack of relevant legal experience. Authorities have noted the concern over the possible uncertainty that may arise in the event of a legal dispute, since Czech law is different from international laws, in particular, the U.S. and the U.K. laws, which govern most agreements.

82. Reserve management operations must be subjected to an internal audit in order to check that the appropriate risk management framework and operational controls have been developed and that they are operating effectively within the reserve management function. Internal audit usually reports to an audit committee that consists of non-executive board members.

83. All countries covered by the case studies conduct internal audit of reserve management operations. Continuous monitoring of operations by internal auditors is possible if the transaction processing and information systems are automated and integrated. In Chile, while programmed internal audit is conducted at least three times a year by independent auditors, there is also continuous monitoring by the internal auditors. They check for compliance with the investment guidelines and the nature of accounting profits and losses. These auditors form an independent unit, which reports directly to the board of the central bank, and are responsible for monitoring the reserve management area on a remote basis. In Colombia, the internal control department and the audit department evaluate the procedures to control operational risk. Recommendations are based on their own independent risk analyses, which are supported by international standard methodologies of audit and control.

84. In Korea, internal audit is performed by the risk management team and the audit department. The risk management team reviews reserve management details on a daily basis to check for any breach of the investment guidelines or excess

of risk limit and ensures that the accounting is done properly. The audit department reviews the management details daily through the bank's internal network and performs an audit annually.

85. In Australia, reserve management operations are audited internally each year in accordance with recommended control frameworks published by the BIS and requirements set out by the Australian Financial Markets Association. The results are reported to the central bank's audit committee and reviewed by an external auditor. In India, in addition to annual inspection by the internal inspection department and external statutory audit, there is concurrent audit of the reserve management operations. There is also a system of appointing on an annual basis an external auditor to conduct special audit of dealing room transactions. In Mexico, too, the audit department monitors operations on a daily basis to verify if the bank norms are being met. In the U.K., the head of the internal audit team provides a quarterly report on the adequacy and effectiveness of the system of internal and financial control to the Bank's Executive Director.

86. The trend toward complex reserve management and the consequent need for more sophisticated risk management analysis tools both have led central banks to put significant emphasis on information technology (IT) systems. In terms of functions, IT systems integrate risk management and analysis with transactions, settlements, and accounting systems. For example, Latvia's specialized system covers position management, risk analysis, exception reporting, performance attribution, and accounting needs for all reserve management operations. Colombia has eight principal application systems covering all functions: trading, performance measurement and attribution, investment guidance compliance and portfolio analysis, payment system, and information services. Norway's integrated risk measurement system is used to assess and monitor relative and absolute risk. Brazil's system software for portfolio management provides tools for risk management, technical documentation, performance measurement, simulation, compliance, back office operations, SWIFT communication, accounting, and trade desk support. Tunisia has implemented an integrated com-

puter system to improve the reserves management operational efficiency (at the processing and monitoring levels).

87. IT systems for reserve management are complex and expensive, and sufficient resources need to be devoted toward their construction and ongoing maintenance. Some countries reported a dilemma on whether to develop the software system for portfolio management in-house or outsource it. Countries that have developed the system internally include Brazil, Chile, the Czech Republic, and Turkey. On the other hand, in Israel, an "off-the-shelf" software package proved adaptable to the bank's needs. In Australia, systems have been developed using both external and internal resources.

88. At the outreach meeting, all participants commented on the challenges posed in implementing IT systems and the preoccupation of management in dealing with IT issues. IT systems are crucial for risk management and effectively determine the sophistication of the reserve management operations and the nature of instruments that can be traded. In addition, IT costs are significant and can range from 50 to 70 percent of the total reserve management costs. This can therefore be a serious constraint for smaller central banks in developing risk management capacity. Several participants noted that more information sharing among central banks in this area would be very useful.

89. Participants at the outreach meeting also referred to the challenges faced by central banks in designing and implementing business continuity plans (BCP). A good BCP must factor in all the risks inherent in a reserve management system, and be able to ensure continued availability, reliability, and recoverability of all resources in the event of any emergency. BCP has acquired greater significance after the terrorist attacks of September 11, 2001, since reserve management activities are dependent on IT infrastructure. Business recovery procedures are in place in 16 countries.

90. In the U.K., the Bank of England maintains an external facility equipped to allow reserves management operations to continue largely unaffected in the event of disruption of the main Head Office site. Business continuity plans are regularly tested—for example, this year in several live tests that involved front, middle, and back office per-

sonnel working from contingency sites. The central bank is also developing an alternate dealing capability within the Head Office to provide more immediate cover, particularly for situations where the staff is prevented from leaving the main building but the usual dealing room is unavailable. The facilities are more restricted than those at the external contingency site, but it is expected that such an “invacuation” would be for a limited period, with evacuation to the external contingency site if the problem persisted.

91. In Colombia, based on the methodology documented by the Disaster Recovery Institute International, contingency plans have been established to guarantee the continuity of reserves operations at different levels of contingency. Important aspects of the contingency plan include a daily backup system with an updated copy of all vital information and an off-site contingency location that fulfills all trading and system requirements. In Hong Kong SAR, contingency plans for crucial modules and backup systems outside the main office of the central bank are established to control and mitigate system failure risks, due to unexpected system breakdown, power failure, or any disaster situation. A regular and firm-wide checking on communication networks, including internal e-mail systems, is conducted to avoid the risk of any communications failure. Tunisia has indicated that the data backup is processed on a daily basis into the general specified server, and periodically on separate magnetic supports. Turkey has recently set up a “Disaster Recovery Site” that could become operational in a very short time in case the current systems cannot be used for any reason.

92. Reserve managers face significant challenges attracting and retaining staff owing to intense competition for such skilled employees from the private sector. Considerable resources are devoted to training of staff by reserve managers. Many reserve managers have reported that they provide incentives such as internal and external training, as well as depute staff abroad for post-graduate programs. In Latvia and Colombia, all staff have to enroll and complete the Chartered Financial Analyst program of the Association for Investment Management and Research (AIMR). Colombia has also developed a detailed human

resource management strategy that includes training and remuneration policies.

93. Australia has indicated that it found considerable benefits in specialization of professional staff in operational areas. Over the past ten years, efforts have been made to maintain a core of experience at senior levels within the operational areas, while at the same time allowing rotation at junior levels in order to build a foundation of experience. Israel offers permanent employment as portfolio managers to staff who show exceptional ability at the end of a five-year period of work. The Czech Republic has noted successfully implementing a program together with the World Bank to attract and train staff for treasury operations.

94. A number of reserve managers have indicated that there is no difference in compensation of portfolio managers as compared with other staff. A challenging work environment and an increased level of responsibility help in attracting and retaining staff. However, Norway does determine part of one’s salary based on performance. Latvia offers competitive salaries and Hungary has a performance-linked bonus scheme.

95. Botswana has benefited from the services of a number of technical advisors. In the past four years, Chile has reported success with engaging senior consultants who were staff members from prestigious institutions (international institutions and central banks) to ensure soundness of actual procedures within reserve management and identify areas where improvements could be made.

96. Fifteen countries surveyed have code of conduct and conflict of interest guidelines for reserve management staff. In India, the central bank prescribes a code of conduct that all dealers must follow so as to adhere to a high degree of integrity and obtains an annual undertaking from each of them on compliance with the code. In Israel, all employees of the foreign currency department are subject to the central bank’s rules of conduct, which include special rules regarding conflict-of-interest situations for staff with any contact with the market. Such staff members are also required to be familiar with, and to follow, the ethical codes of the markets in which they trade. Latvia also has indicated that by virtue of its portfolio managers being members of AIMR, they are

required to adhere to a code of conduct regarding conflicts of interest in asset management and analysis, and also sign professional conduct statements annually. In Oman, staff involved in reserve management are subject to a code of conduct and guidelines regarding conflicts of interest involving management of their personal affairs. In the U.K., the rules governing insider dealing and the declaration of personal financial transactions are circulated, and all staff employed in the management and control of the reserves are required to sign on a frequent basis that they understand and comply with such rules.

Risk Management

Overview

97. The Guidelines in this section stress the importance of having a framework that identifies and assesses the risks of reserve management operations and that allows the management of risks within acceptable parameters and levels. It also emphasizes that the risk management framework should apply the same principles and measures for externally managed funds as it does to those managed internally. Furthermore, the risk exposures should be monitored continuously to determine whether exposures have been extended beyond acceptable limits. The framework should also address risks associated with derivative financial instruments and other foreign currency operations not directly related to reserve holdings. The Guidelines recommend that to assess the risk and vulnerability of the reserve portfolio, the reserve management entity should regularly conduct stress tests to ascertain the potential effects of macroeconomic and financial variables or shocks.

98. A key observation from the country case studies is the high level of awareness of the importance of risk management. Almost all countries surveyed have defined the risk-return trade-off in the form of benchmark portfolios and permissible deviations from the benchmark portfolio. While some use VaR for controlling market risk of the portfolio, some use it for controlling deviations from benchmark. A few countries have started using VaR as a useful tool for conveying informa-

tion about the overall portfolio exposure. A majority of countries use external managers for upgrading staff skills and accessing markets where they do not have expertise or resources. However, in most cases, external managers are given only a small proportion of the portfolio. Use of derivatives is mainly for risk management. Stress tests play an important role in reserve management, and countries use both quantitative and intuitive methods for this purpose.

Country application

Risk management framework

99. All countries participating in the case studies have developed a framework and capacity to assess and manage risks involved in reserve management operations based on country circumstances. The main risks facing reserve managers are market risks, namely, currency risk and interest rate risk; liquidity risk; and credit risk. The benchmark expresses the risk preferences and objectives of the board, and represents the market-neutral position and the target to be met by the portfolio managers. The dominant risk is, therefore, in the benchmark portfolio and is determined by the currency distribution, asset classes, and duration of the portfolio. Benchmarks are reviewed periodically, at least on an annual basis. Risk is also affected by the maximum allowable deviations from the benchmark. This is addressed by specifying limits for currency and market distribution, duration, asset classes, and minimum level of ratings. The system of defining benchmarks with clear guidelines has promoted transparency and accountability within the reserve management entity.

100. Case study responses indicate that countries adopt various approaches, including quantitative techniques supplemented by judgmental factors, to manage risks. Some countries use VaR for controlling market risk of the portfolio or to set risk limits on deviations from the benchmark portfolio. This method provides a common denominator for different kinds of risk, while helping to communicate the amount of risk (under normal conditions) to senior management. However, some countries use it as a tool for evaluation and calibra-

tion of risk in benchmarks and positions but not for defining actual limits because of the high model risk.

101. Management of foreign reserves is continually evolving so that a number of strategic issues are reviewed periodically. Participants at the outreach meeting noted that the current environment for reserve managers is more uncertain than might have been anticipated 18 months ago. A major challenge confronting reserve managers now is not so much one of maximizing or enhancing return, as it is of avoiding an actual negative return. A few participants observed that there is now a need for greater focus on the benchmark risk and total returns.

Currency risk

102. Deciding on the optimal currency distribution is a critical decision in reserve management since currency risk is the area where reserve management entities confront the greatest market risk. It is also a difficult decision because, in many countries, reserves are net long positions on the books of the reserve management entities. The result is that countries adopt various approaches to define currency composition that is unique to their situation.

103. In Canada, the eligible currencies are the U.S. dollar, euro, and the Japanese yen, but no currency risk is actually taken, since assets and liabilities are matched by currency. The EFA portfolio must be composed of a minimum of 50 percent U.S. dollars with the rest allocated in euro and yen, according to the funding and investment opportunities in each currency. Turkey has also adopted an asset-liability matching strategy because of the nature of its balance sheet. Currency distribution and duration target are matched with the currency distribution and maturity structure of its on-balance-sheet liabilities and expected external cash flows within the next year. In Brazil, the reserves are denominated in three base currencies, the U.S. dollar, euro, and Japanese yen, since they represent almost its entire external debt. Tunisia sets the currency structure in accordance with the structure of its settlement balances and the liabilities of the central bank and the government. In the U.K., the cur-

rency benchmark for the unhedged reserves is set taking into account past patterns of risk and return as well as other macroeconomic factors such as trade flows and the likely currencies used in any intervention.

104. Some countries take into account several other factors for determining currency composition of their reserves. For instance, Chile considers the composition of the foreign debt of the central bank, including foreign-currency-linked debt, currency composition of liabilities due within a year, the currency composition of trade imbalances, and financial considerations derived from the use of financial optimization models for determining currency composition. The currency composition in Colombia reflects a moving average of three years of currency composition of outflows of balance of payments based on an in-house model in order to maintain the capacity of reserves to respond to external pressures. In Hungary, foreign currency assets match foreign currency liabilities that are on the central bank's balance sheet. The currency composition of net reserves takes into consideration macro level asset-liability considerations, orientation of external trade, and the domestic currency basket. India considers the need to maintain a large portion of reserves in the intervention currency, external trade profile, and potential strengths and weaknesses of the four major currencies for diversification benefits. Israel defines currency composition based on geographical distribution of imports and external debt service using reserve currencies only. In Korea, the liquidity tranche is composed entirely of U.S. dollars but the composition of the investment tranche is based on the currency composition of government debt, currency composition of current account payments, and the size of the global sovereign bond market.

105. Other countries have taken these positions in regard to determining the currency composition of their reserves. In New Zealand, the U.S. dollar is the intervention currency, with the majority of liquid assets being held in that currency. The proportion of reserves held in other currencies depends on prevailing risk conditions and net borrowing costs. In the Czech Republic, the reserve currencies are the U.S. dollar and euro. The ratio is based on historical time series of yields in the two

markets, the exchange rate, and other factors, such as the nature of the domestic market where the euro/koruna is the more traded currency pair. The neutral currency composition in Latvia consists of the components of the SDR currency basket weighted as in SDR. Oman has a multi-currency portfolio with a major proportion in dollars, to which its currency is pegged.

106. Botswana has adopted an approach that combines SDR-based currency allocation, market capitalization, and optimal currency allocation, while Norway maintains four different sub-portfolios, with separate guidelines for each portfolio. The liquidity portfolio is used in connection with the conduct of monetary policy and therefore consists of liquid currencies with 50 percent in euros, which is the most relevant intervention currency. The wealth motive of the long-term portfolio means that more emphasis is laid on global diversification, with eight currencies in the fixed income benchmark and 12 currencies in the equity benchmark.

107. In Australia, the currency and asset composition for the foreign currency portfolios is spread across the three major reserve currencies to provide a diversified portfolio. This has also meant that assets would be invested in capital markets that are liquid and highly rated. From early on, mean variance analysis, in addition to judgmental factors, has played a major role in deciding on the weights assigned to the three currencies in the benchmark. In Hong Kong SAR, overall currency exposure takes into account the long-term return and risk profile of the currency and the need to maintain adequate U.S. dollar assets under a currency board arrangement. It uses an optimization model to construct the optimal mix of asset allocation. The U.K. employs an asset allocation model that explicitly trades off liquidity and return in setting asset benchmarks. In Mexico, the foreign exchange benchmark is modified on a yearly basis and is composed of U.S. dollars and other G-7 currencies, with a high proportion in dollars (historic average of 90 percent).

Interest rate risk

108. Interest rate risk is managed in most countries by defining target duration that depends on

the risk-return preference of the reserve management entity. A marginal extension in duration from the short end of the yield curve usually generates greater expected return but also carries with it higher volatility of returns. Reserve management entities are typically concerned about negative returns and the duration target is set to minimize the probability of capital loss over the entity's investment horizon. Another way to incorporate this objective is to plot the "95 percent confidence return," defined as the return that the market should provide as a minimum with 95 percent confidence over a time horizon. Some participants at the outreach meeting were of the view that the constraint of not having a negative return over a short-term horizon may need to be reviewed by senior management, depending on the level of reserves and the risk appetite of individual countries. One participant suggested that to meet the constraint of dealing with negative returns, central banks should build adequate capital reserves.

109. The benchmark in Australia represents the acceptable risk-return trade-off over the long term, given its management objectives and its primary objective for holding reserves. Choice of a duration benchmark is based on the central bank's objectives for managing reserves and an analysis of risk and return for each asset. This duration represents the maximum price risk that the central bank is prepared to accept to minimize the probability of capital loss over its investment horizon. Israel determines duration for each currency by using a modified shortfall approach that, at a certain confidence level, gives an ex ante probability of earning no less than a certain proportion of the risk-free rate. The Czech Republic targets portfolio duration for each currency with the requirement that the portfolio should not record a loss in any three-month period. Tunisia has a duration limit on the global portfolio of reserves and also on the bond portfolio. Botswana, Chile, India, Korea, Latvia, and Oman also use duration as the primary indicator of interest rate risk. Brazil has chosen as a benchmark an index that, on the basis of risk/return trade-off, has a small probability of negative quarterly results.

110. The interest rate exposure of the benchmark in Colombia is limited to a 95 percent confi-

dence level that the benchmark will not register negative returns in any year. The exposure of the benchmark to various risk factors is determined using an exponentially time-weighted VaR associated with these factors, and a variance-covariance matrix to estimate the correlation between different index components. New Zealand uses a parametric VaR methodology to measure and control both currency and interest rate risk. Actual daily profit and loss results are compared with estimated gains and losses from the VaR model each month. The results of the “backtesting” analysis are reported to the Reserves Oversight Committee quarterly. VaR models are also used by Brazil, Chile, and Korea to track and monitor the expected loss at a certain confidence level.

111. Hong Kong SAR uses a market-based risk management model to produce a weekly report to evaluate both absolute and relative (to benchmark) VaR at 95 percent confidence level for a one-month horizon. The calculation of the expected market risk loss takes into account the price volatility of all asset classes, market segments, and correlation across markets given a specified time horizon and decay factor. In addition, VaR in both U.S. dollar and percentage terms is monitored to ensure that the Exchange Fund is not unduly exposed to market risk at any point in time. Mexico uses VaR methodology to estimate on a daily basis the portfolio exposure to market risk. U.K. monitors and controls market risk using a VaR model. To supplement the VaR measure, it also calculates the delta exposure at the same frequency.

Liquidity risk

112. Liquidity management is the ability to provide large amounts of cash out of reserves at short notice and at acceptable cost. Reserve managers pay special attention to liquidity because of all the different risks that a reserve management entity faces as an investor, that arising from inadequate liquidity is the most important because reserves are held precisely to meet unexpected needs. The reserve management entity has to decide how much liquidity to hold and in what form, which is complex and involves an assessment of likely future intervention and future calls on the

reserves. Potential requirements in crisis conditions are extremely difficult to anticipate. Reserve managers, therefore, analyze potential liquidity needs in normal and crisis times based on past interventions and stress tests of worst-case scenarios. Ten countries conduct stress tests for liquidity assessment.

113. A number of reserve management entities have subdivided their reserves into portfolio tranches based on expected liquidity needs over different time horizons. Such portfolio tranching allows reserve management entities to define objectives and benchmarks for each portfolio, such as transactions or working capital portfolio, liquidity portfolio, and investment portfolio. The transactions and liquidity portfolios usually consist of currencies required for transactions and interventions, and the investment tranche consists of diversified currency portfolios based on other considerations or optimization models. Countries that do not formally subdivide the portfolios typically incorporate their liquidity requirements directly into their investment decisions.

114. Recent developments in markets provide a wider range of funding options, such as repurchase agreements (repos) and swaps. A policy for the use of repos to meet crisis conditions may provide liquidity before disinvesting the tranche composed of less liquid assets. However, use of repos or swaps may result in higher costs or larger margins/haircuts, depending on the credit rating of the reserve management entity, during crisis periods. The determinants of liquidity during stress are different from those in normal times, as concerns with counterparty risk, including those arising from the management of collateral, become more acute than in tranquil times.

115. Among the case study countries, Botswana, Brazil, Canada, Chile, Colombia, Hong Kong SAR, Hungary, Korea, Mexico, Norway, Oman, and Turkey subdivide the reserves into two or more tranches. Botswana, Hong Kong SAR, and Norway also allow limited investments in equity markets from their investment portfolio. In Norway, the expected risk and return for the total reserves are not quantified. Instead, the central bank’s risk/return objectives are reflected in the way reserves are divided into different sub-portfolios

and the way separate guidelines are designed. The investment tier in Canada consists of high-quality assets, with key goals being asset liability matching, cost-of-carry minimization, and prudent risk and investment management.

116. Australia, the Czech Republic, India, Israel, Latvia, New Zealand, and Tunisia do not divide the reserves into separate tranches but incorporate liquidity considerations in their investment policies. Latvia is of the view that in the long run, maintaining separate portfolios may be sub-optimal. Although India and Israel have not divided the reserves portfolio into tranches, each currency benchmark portfolio is divided into two components; one has a short duration and the other a longer duration.

117. Estimating liquidity needs is a challenge for reserve managers. Colombia, which has divided reserves into three liquidity buckets,¹³ estimates the level of liquidity required for covering one year's liquidity needs as equivalent to the annual volatility of historical percentage changes in foreign exchange reserves with a 99 percent confidence level. It is at present working on a dynamic stress test model for the balance of payments in order to determine more precisely its liquidity requirements over a one-year period in the background of the floating exchange rate regime. In Botswana, to determine the adequate level of the liquidity portfolio, the Bank of Botswana undertook a comprehensive analysis of factors that affect foreign exchange reserves, and based on these factors a framework for determining an appropriate level of liquid assets was derived. The factors include import cover as well as the "Greenspan rule," which takes into account short-term capital flows in the whole economy. Korea determines the optimal size of the liquidity tranche quarterly based on the statistical analysis of the foreign reserves cash flow.

118. All countries manage liquidity risk by ensuring that assets include a large proportion of

highly liquid assets in reserve currencies with deep and liquid markets.¹⁴ In many cases reserve management entities prescribe constraints such as: (i) maximum holdings for individual issues of debt securities to avoid issue concentration; and (ii) maximum exposure in each sector. Besides these, countries also make an assessment of an asset's class liquidity through analysis of quantitative and qualitative factors in order to determine the asset class composition of reserves or of each tranche. Australia limits its benchmark investments to government securities and cash instruments. In Canada, policies require that securities issued by any one counterparty cannot exceed 10 percent of EFA liquid assets, except for bonds issued by sovereign governments and their direct agencies in their "home" currency, and that no more than 15 percent of liquid assets be in investments that cannot be sold or redeemed prior to maturity.

119. In New Zealand, the base level of reserves must be invested in specified classes of liquid assets in the U.S. and German markets. In Tunisia, the liquidity objective is met by targeting appropriate investment instruments and currency structure. Turkey has included only liquid government securities and very short-term bank deposits in its global benchmark.

120. Latvia has indicated that it has several liquidity constraints in its reserve management guidelines that result in the purchase of instruments that can be realized in times of market stress. In Brazil, the central bank board has approved additional constraints related to the permitted range of investment instruments and maximum exposure in each asset. Mexico uses G-7 currencies and assets with deep secondary markets and high credit quality for its benchmark.

121. Hong Kong SAR has liquidity control measures to ensure efficient liquidation without disrupting the markets. The U.K. employs an asset allocation model that explicitly trades off liquidity and return.

¹³The working capital bucket covers immediate requirements, the intermediate liquidity bucket covers one year's requirements, and the stable liquidity bucket is composed of reserves that have the least probability of being drawn.

¹⁴For more discussion on efficient liquidation of assets, refer to paragraphs 150–151.

Credit risk

122. Reserve management entities are exposed to credit risk on all deposits, investments, and off-balance-sheet transactions. The survey indicates that credit risk management involves several factors: (i) assessment of country risk; (ii) establishing the minimum acceptable credit quality for counterparties and issuers of debt instruments; (iii) fixing the limits for each institution and setting portfolio limits among sectors and countries, as well as determining limits on maturity of bank deposits; and (iv) capturing all forms of credit risk arising from delivered positions, settlement risk, and pending positions. Some countries use netting agreements and collateral support for mitigating credit risk. From a credit risk perspective, a primary motivation for executing such contractual documentation is to protect the interests of the reserve management entity in the event of a counterparty insolvency, and, in particular, to activate the close-out netting provisions in these agreements. All countries closely monitor credit risk in order to respond quickly to any changes in credit quality or ratings.

123. Reserve management entities are increasingly implementing collateral frameworks to reduce credit risk. Seventeen reserve managers undertake repurchase agreements. In Canada the government has put in place a collateral framework for the cross-currency swap program used to raise foreign exchange reserves and collateralized repos will soon be used to manage credit risk associated with short-term U.S. dollar deposits.

124. All countries surveyed are very sensitive to credit risk and therefore invest the bulk of their assets in securities or deposits of highly rated sovereigns, rated international banks, international financial institutions, and the BIS. Some reserve management entities have marginally widened the credit net by allowing investment of a small portion of reserves in highly rated spread products such as mortgage-backed securities, asset-backed securities, and corporate bonds. This development was a response to the shrinking stock of U.S. treasuries, fiscal consolidation in other highly rated sovereigns, and risk diversification considerations. Latvia has noted that greater long-term-risk-adjusted expected return (with high rating and

prudent limits) could be gained by moving down the credit curve than by adding duration or active currency positions. Reserve managers have implemented additional risk measures to contain the risks arising from spread products and developed their back office and trading capacities in these asset classes.

125. All reserve management entities specify the minimum credit quality of international banks, including investment banks, with which they trade. For instance, the minimum ratings for commercial banks vary from long-term A- to AA and short-term A1/P1. Reserve managers also prescribe maximum maturity of deposits, per institution limits as well as global limits to the sector. The limit on each institution is based on external credit ratings and other considerations such as capital and size of assets as well as maturity of deposits. Similarly, minimum credit ratings are prescribed for other issuers, with limits also on spread products, on a global basis and also by issuer. Credit rating is assigned a significant weight in determining choice of counterparties and the magnitude of the credit risk allowed.

126. Brazil manages credit risk by using two distinct approaches for the money market portfolio. The first one is for the portfolio as a whole. In this case a proprietary model was developed, which uses expected and unexpected default probabilities, with the central bank board establishing limits for the two variables. The main objective of this approach is to impose geographical and institutional diversification and not to calculate VaR exposure. The second approach is transaction oriented, in which the board of the central bank approves defined minimum counterparty ratings (short-term and long-term), maximum volume, and maturity exposure based on the counterparty's total assets and ratings. Canada provides an example of the use of an approach based on the 1988 Basel Accord and subsequent amendments, whereby all exposures are risk-weighted according to entity type. Canada has also adopted the Accord's "add on" approach to calculating potential exposure on derivative transactions.

127. Colombia manages credit risk by placing limits on individual asset classes, credit ratings within each asset class, and issuers at each rating category/asset class. The limits imposed on each

asset class and rating category are determined by quantitative techniques. Issuer-specific risk is estimated as a function of the number of issuers required to replicate index returns. New Zealand takes into account the strategic tolerance for loss and specifies that the extent of a loss from default of a non-sovereign counterparty should not exceed the capital of the Reserve Bank of New Zealand.

128. Some participants at the outreach meeting raised the issue of credit risk, particularly counterparty risk, in the over-the-counter derivatives market, which has led to some reserve managers adopting a cautious approach in taking higher credit risks. Although counterparty risks are mitigated by collateral agreements, recent ratings downgrades could affect collateral thresholds.

129. Securities lending, which involves lending bonds against collateral consisting of either bonds or cash, is undertaken by 15 reserve management entities. This activity is also subject to various safeguards. In the U.K. and Mexico, investment of the cash collateral is subject to credit limits determined by the central banks, and any maturity mismatch between the cash collateral held and the corresponding investments is strictly limited. Daily reports ensure compliance with investment constraints. Hungary, Canada, and Chile use external securities lending managers to manage a securities lending program. Canada reported that external managers must follow the policies and guidelines provided by the government. To manage the risks, there are restrictions as to the securities allowed to be lent, the types of borrowers, eligible collateral, and investment of cash collateral.

Externally managed funds

130. Countries that use external managers apply the same principles and measures of risk control to externally managed funds as they do to those managed internally, although the investment guidelines may differ. The external managers are given a clear mandate for management of funds, which includes daily reports on operations and a performance report at least on a monthly basis. A participant at the outreach meeting stressed the need to draw up detailed guidelines for external managers to ensure that they do not make risky investments.

131. Chile and Latvia apply the same guidelines to externally managed funds as the ones used for internal managers since that provides a benchmark for measuring performance of internal managers. In Mexico, too, external managers act independently based on the same guidelines placed by the board for internal operations. Brazil allows a slightly different VaR limit for externally managed funds since they are restricted to fixed income investments (with no money market tranche) and Oman allows for a longer duration. In Chile, a small percentage of the reserves are held under the management of external asset managers as a means to have an additional and real benchmark for comparison purposes.

132. Guidelines for externally managed funds differ from internal guidelines when the capabilities of external managers are used to access new markets or instruments or for implementing new investment strategies to enhance returns. Chile proposes to create an externally managed portfolio composed of mortgage-backed securities (MBS). Colombia has enhanced its risk control capabilities and delegated the management of the stable liquidity bucket to external managers. These funds are allowed to be invested in non-government asset classes, in non-benchmark currencies, and in active duration strategies through a combination of global and U.S. asset rotation mandates with specific benchmarks and guidelines. India gives a small portion of the portfolio to external managers to have access to and derive benefits from the information system and market research of a widely diversified group of external asset managers. The relationship is also used to train portfolio managers. Korea has allocated a tranche to external managers for the purpose of transferring investment knowledge or know-how, as well as enhancing returns. Norway uses external managers for about 10 and 50 percent of the long-term fixed income portfolio and equity portfolios, respectively.

133. A cardinal feature of Botswana's strategy is the use of external managers for nearly 50 percent of the portfolio. External management of reserves provides an alternative, or a fall-back position, in the absence of specific relevant skills in the bank (e.g., equity management) and in case of a depletion of skilled talent. It is also a means of compar-

ing performance. The intention is to manage a higher proportion of fixed income portfolios internally in line with the development of relevant skills.

134. A number of participants at the outreach meeting were of the view that the experience with external managers has been mixed. The Czech Republic had a negative experience with external managers with respect to performance, know-how transfer, and reporting. New Zealand does not use external managers. It does not consider the use of external managers to be cost-effective and believes they would compromise the objectives of increasing the Reserve Bank of New Zealand's knowledge of instruments and market practice and maintaining market contacts. However, the authorities say that external fund managers would be considered if there were markets or instruments in which it wished to participate but did not have the expertise to do so directly and if it results in enhanced risk-adjusted return. A participant at the outreach meeting also warned against the illusion that riskier asset classes can be outsourced because the reserve management entities are ultimately accountable for the benchmark.

Monitoring of portfolio exposures

135. A benchmark portfolio is used to manage and monitor risk exposure, and also serves as a reference point for evaluating the actual return earned on the reserves. The dominant risk of the portfolio is in the benchmark, and passive management involves replicating the benchmark portfolio characteristics in terms of the currency, duration, and curve risk, as well as asset classes. A number of countries allow portfolio managers to deviate from the benchmark portfolio by laying down tactical trading limits. Risk budgeting is gaining momentum particularly for reducing cost-of-carry of reserves. Sixteen countries among the survey respondents allow active management of reserve portfolio. Country practices in this regard vary, but in all cases these limits are closely monitored.

136. Active management generally involves taking positions in currency, duration, or credit risk. Botswana, Chile, Hungary, India, Israel, Korea, Norway, Oman, and Turkey allow deviations from

benchmarks within limits or ranges prescribed separately for currency and duration. Israel and Botswana also allow deviations within limits on credit or spread products not included in the benchmark. In Norway, the main measure for controlling deviations from benchmark is expected tracking error. Colombia prescribes tracking error of 1 percent per external mandate, permitting duration, currency, asset class, and credit risk strategies, which are also individually constrained. The Czech Republic does not allow deviation from the currency benchmark. Australia allows limited active management. Risk measurement and trading discretion around the duration benchmark for each asset are based on the concept of "dollars at risk." Latvia allows active position taking by portfolio managers in instruments in a range around the tactical benchmark set by the investment committee. In Brazil, there is a daily VaR limit for deviations from the benchmark to address market risk, and it is enforced for the entire reserves' active strategies. For liquidity and credit risk, regarding money market exposure, the board has established maximum expected and unexpected default probabilities for the actual portfolio deviation from the benchmark.

137. Hong Kong SAR uses a risk-based approach (essentially a VaR approach) within the established overall tracking error to calculate the permissible tactical deviations for short-to-medium trading for currency composition, allocation by asset class, allocation by market within each asset class, and duration of each bond. Mexico has VaR limits on the permissible deviations from the fixed income benchmark and the foreign exchange benchmark. In addition, if the maximum cumulative underperformance in any calendar year, or any part of a calendar year, exceeds a certain limit, the portfolio will be managed passively thereafter. The borrowed and net reserves are actively managed in the U.K. in order to increase returns relative to benchmark. In the U.K., deviations from benchmarks are capped by VaR and delta limits set for each portfolio.

138. In Hungary, in line with the tactical portfolio benchmarks, a separate Risk Management Department maintains internal model portfolios that serve as operational guidelines for portfolio

managers. Portfolio managers may deviate from the benchmark within predefined ranges so as to take advantage of favorable market conditions. Model portfolios are updated and investment portfolios are evaluated against the appropriate benchmarks and model portfolios on a monthly basis.

139. Countries that allow tactical deviations from benchmarks closely monitor the performance of portfolio managers. Performance evaluation and attribution are an important element in the risk management framework in these reserve management entities. Both absolute and relative returns are measured and submitted to top management. A performance attribution system decomposes total active return into various return attributes relative to the benchmark return. Brazil, Chile, Colombia, Hong Kong SAR, Korea, Latvia, Norway, and Oman have furnished information on performance evaluation and attribution. In addition, in many cases, information and other ratios are used to calculate risk-adjusted returns.

Derivatives and other foreign currency operations

140. As noted earlier, a number of reserve management entities use derivatives mainly for market risk management, and where trading is allowed it is subject to limits. The underlying risks associated with derivatives are similar to other financial instruments, that is, credit, market, and liquidity risks (also legal and operational risks). The process of risk management is therefore integrated into the entity's overall risk management system. However, derivatives can repackage risks in complex ways, making measurement and control of these risks more difficult. Furthermore, the use of derivatives requires more advanced risk management and IT system development to support the transactional processing, accounting, and overall portfolio risk assessment. Most commonly used derivatives are forwards and swaps. A limited number of respondents use options.

141. A distinction needs to be made between derivatives that involve domestic currency and those used for managing cross-currency risks and interest rate risk of foreign currency instruments. There have been instances of certain central banks carrying large short positions against the domestic cur-

rency due to derivatives operations. Such short positions are risky as they can lead to heavy losses besides increasing a country's vulnerability during a crisis. The discussion here relates mainly to derivatives for managing cross-currency and interest rate risks in the foreign currency reserves portfolio.

142. Country case studies indicate the nature and purpose for which derivatives are used. In Norway, derivatives may be used to the extent that the ensuing financial exposure does not exceed the exposure that would have resulted from investing directly in the underlying instruments. Both interest rate and equity derivatives are used extensively to attain desired positions in a cost-effective manner. Interest rate derivatives include bond futures and LIBOR futures, options on futures, and interest rate swaps.

143. Australia uses interest rate futures contracts to improve management of market risk and, in particular, to provide a liquid hedging instrument to minimize the risk of capital losses when interest rates are rising. No over-the-counter or exchange-traded options are allowed. In Brazil, currency forwards and futures and interest rates futures and swaps are allowed, but not options. In Colombia, the portfolio manager is allowed to invest in interest rate futures and in currency forwards/futures. Hungary permits interest rate futures, options on futures, and interest rate and currency swaps. The primary condition for derivative deals is the existence of International Swaps and Derivatives Association (ISDA) Master Agreement and mark-to-market agreement with its counterparties.

144. Israel allows use of derivatives provided the underlying asset is an eligible asset for investment, and the counterparty is a bank or is an exchange-traded contract; in the latter case, a bank should serve as a clearing broker. Derivatives cannot be used to leverage the portfolio. Latvia uses futures, options, swaps, and other derivatives in the management of currency, interest rate, and credit risk since they can be used for hedging purposes to quickly and efficiently restructure the risk parameters of the portfolio and for taking active positions. Leverage limits are set in the investment guidelines. Mexico uses forwards and options in its foreign currency diversification and hedging activities

since they provide liquid hedging products, which lower operational costs. New Zealand uses only futures and swaps and does not invest in options. The U.K. uses foreign currency forwards, interest rate and currency swaps, and bond and interest rate futures. Options are not permissible. Tunisia allows derivatives only for hedging and no short position taking is allowed. Oman uses only forward transactions.

145. Management of foreign currency-denominated assets and liabilities, which do not fall within the definition of reserves, also involves risks, which reserve management entities need to manage in a coordinated and consistent manner. Turkey, for example, takes liabilities to its nonresident workers into account when determining reserve management strategies. Latvia has indicated that any non-reserve foreign exchange in its balance sheet is run on a matched book basis to minimize any adverse effects on the central bank's income statement. While this complicates the foreign exchange management process at the bank by requiring the management of several portfolios with different investment characteristics, this arrangement allows for a very clear understanding of every risk taken on the balance sheet from foreign exchange operations.

Stress tests

146. To assess the risk and vulnerability of the reserve portfolio, the reserve management entity should regularly conduct stress tests to ascertain the potential effects of macroeconomic and financial variables or shocks. One objective typically is to determine the exposure of the portfolio to changes in market factors such as changes in exchange rates or interest rates. Fifteen countries conduct stress tests for market risk.

147. Australia stress tests the portfolio by simulating and evaluating the impact of extreme market movements on the value of the portfolio. Canada conducts two types of forward-looking techniques, namely "stress test scenario analysis" and "sensitivity stress testing." Stress test scenario analysis is based on a potential market event, such as a stock market crash. Sensitivity stress testing is based on standardized moves in closely linked market risk factors, such

as a parallel yield curve shift. These scenarios are explicitly defined and reported on a monthly basis.

148. Other country respondents also reported use of stress tests. Colombia conducts stress tests to evaluate the consistency of the model and determine worst-case scenarios. Korea conducts stress tests and measures the changes in asset value of the foreign reserves daily using scenarios in which historical events that had significant impact on the market recur, or hypothetical scenarios in which market conditions change dramatically. The results are submitted to top management regularly through risk reports. Hong Kong SAR uses stress testing to assess the impact of a simultaneous recurrence of the worst equity, bond, and currency markets crashes in the last 20 years on total Exchange Fund assets. These are submitted to higher management for review. In New Zealand, the risk management committee reviews underlying assumptions about extreme market conditions, intervention strategy under those conditions, and the financial cost of liquidating reserves. The U.K. conducts regular stress tests to explore the vulnerability of EEA to hypothetical severe market movements, and to estimate the potential losses in these extreme market conditions.

149. A qualitatively different stress test is assessing the possible impact on the level of official foreign exchange reserves of external shocks, contingent obligations that might materialize with such shocks, and sudden calls on reserves that may result from a reversal of short-term capital flows. India has been undertaking exercises based on intuition and stochastic models in order to estimate "Liquidity at Risk" of the reserves. Hungary performs stress tests to see how external or internal shocks can affect the size of reserves on a three- to six-month horizon. It monitors nonresident holdings of government securities and equities, the open foreign exchange positions of the domestic commercial banks, the liquidity of the domestic interbank foreign exchange market, and other factors. Using its own and international historical evidence during currency crises, it estimates the potential outflow in a three to six-month period, a period during which internal policy adjustments can be made, or after which foreign capital markets can be accessed again.

Operations in Efficient Markets

Overview

150. The Guidelines state that reserve management and any related policy operations should be conducted in markets that have sufficient depth and liquidity and can process transactions in a sound and efficient manner. Undertaking relevant investment transactions in deep and liquid markets serves to ensure that they can be easily absorbed by these markets without undue impact on investment prices received or paid by the reserve manager.

151. Reserve management entities are very sensitive to liquidity risk and generally deal in reserve currencies that are traded in deep and liquid markets. As can be seen from country practices, reserve management entities assess the liquidity of markets in normal and crisis times, and incorporate these considerations while determining asset allocation.

Country application

152. Colombia limits its reserve management activities to markets that have sufficient liquidity measured through qualitative and quantitative factors that are reviewed periodically. Furthermore, it sets limits on its exposure to a specific market, asset class, individual issue, and issuer in accordance with the quality of the liquidity of each investment alternative in order not to affect the market through its own operations. Hong Kong SAR assesses the liquidity of each market and instrument by examining the bid/offer spread in normal and crisis conditions, dealing size in both normal and crisis situations, total portfolio holdings as a percentage of daily market turnover, and availability of repo market for each instrument type. In Israel, the middle office regularly assesses the liquidity of various markets based on the width of the “bid-ask” spread and the ability to transact in large volumes without affecting the market price. Based

on these criteria, it classifies the assets of the reserves portfolio into highly liquid, liquid, short maturity, and other tradable assets.

153. Korea trades only in markets where large-sized transactions can be executed without severe price distortions. Trades are conducted in regional markets located in the same time zones and in some European markets that have time zones that overlap with Korea. Norway has stated that the part of reserves that is the first to be drawn upon in interventions—the liquidity portfolio—is invested only in very liquid currencies/markets, that is, euros, pounds sterling, U.S. dollars, and Japanese yen. The 50 percent weight in euros in the benchmark portfolio is split equally between the liquid bond markets of Germany and France.

154. Undertaking transactions in deep and well-established markets ensures that reserve-related transactions can be easily absorbed at market-determined prices without undue distortions or adverse impacts on the level and availability of foreign exchange reserves. Countries that have efficient domestic markets are, in addition, able to operate in the domestic markets for undertaking transactions related to reserve management.

155. Development of efficient and deep domestic foreign exchange markets can be important for transactions in the domestic market for reserve management purposes (see Table 1). Hungary has reported limitations on reserve level adjustments posed by the lack of an efficient foreign exchange market for domestic currency. It was only in 2001, after full foreign exchange liberalization, that the liquidity of the forint spot market reached a level where foreign currency could be purchased for reserve management purposes—in this case, to cover interest payments on foreign state debt—without affecting the forint market exchange rates. To minimize the impact on the exchange rate, the transaction was executed in a transparent way, in equal, market-conforming, pre-announced amounts.

Table 1. Country Examples of Key Reserve Management Practices

1. Reserve Management Objectives, Scope, and Coordination	Country Examples
Objectives	
Safety and liquidity	All countries.
Preservation of long-term or real purchasing power	Hong Kong SAR, India, Israel, and Tunisia.
Minimizing cost of reserves	Canada, New Zealand, and the U.K.
Management of national wealth or fund for future generations	Botswana, Norway, and Hong Kong SAR.
Strategy and Coordination	
<i>Factors influencing reserve management strategy</i>	
Maintaining a capacity to intervene in exceptional circumstances under a floating rate arrangement	Brazil, Colombia, the Czech Republic, Korea, Turkey, and the U.K.
Maintaining liquidity to prevent destabilizing speculation or to avoid sharp adjustments in the exchange rate	India and Tunisia.
Maintaining liquidity to support currency board or fixed exchange rate regimes	Hong Kong SAR, Latvia, and Oman.
Supporting monetary policy	Australia, Brazil, Chile, and Hungary.
Managing reserves funded by sovereign liabilities	Canada, New Zealand, and the U.K.
Hedging foreign currency liabilities of the central bank	Hungary, Latvia, and Turkey.
Sovereign obligations or short-term external debt	Brazil, Chile, the Czech Republic, Hungary, India, Israel, Korea, and Turkey.
Maximizing returns subject to acceptable credit and liquidity risks	Botswana, Chile, Hungary, Hong Kong SAR, Korea, Latvia, Mexico, and Norway.
2. Transparency and Accountability	
Clarity of roles and responsibilities	
Central banks hold and manage reserves independently	Australia, Botswana, Brazil, Chile, Colombia, the Czech Republic, Hungary, India (with government consultation), Israel, Korea, Latvia, Mexico, New Zealand, Oman, Turkey, and Tunisia.
Central banks manage reserves on behalf of government or jointly with government	Canada, Hong Kong SAR, and the U.K.
Public availability of information	
Disclosure of foreign exchange reserves information on weekly/biweekly basis	Canada, Chile, Colombia, India, Mexico, and Turkey.
Disclosure on monthly basis	Australia, Brazil, Canada, Chile, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, Mexico, New Zealand, Norway, Turkey, Tunisia, and the U.K.
Disclosure of parameters and procedures, reserve management policy and approach, or risk management	Brazil, Canada, Chile, India, Korea, Latvia, and the U.K.
Disclosure of reserve management policy and performance, both absolute and relative to benchmarks	Australia, Colombia, the Czech Republic, Hong Kong SAR, Israel, New Zealand, and Norway.
Accountability and assurances of integrity	
<i>External audit</i>	
By independent external audit firms	Botswana, Colombia, the Czech Republic, Hungary, India, Mexico, New Zealand, Oman, and Turkey.
By national audit office	Australia, Canada, Korea, and the U.K.
By both external auditor and national audit office	Brazil and Latvia.

Table 1 (continued)

3. Institutional Framework	
Legal foundation	
Authority of central bank to manage reserves derived from central bank law/constitution	Botswana, Brazil, Chile, Colombia, the Czech Republic, Hungary, India, Korea, Latvia, Mexico, Oman, Tunisia, and Turkey.
Ownership and management of reserves governed by separate legislation	Canada, Hong Kong SAR, and the U.K.
Internal governance	
<i>Highest decision-making level</i>	
Board/Governor	Australia, Botswana, Brazil, Chile, Colombia, the Czech Republic, Hungary, India (in consultation with government), Israel, Korea, Latvia, Mexico, New Zealand, Norway, Oman, Tunisia, and Turkey.
Ministry of Finance or Ministry and central bank jointly	Canada, Hong Kong SAR, and the U.K.
<i>Separation of responsibilities</i>	
Separate front and back offices	All countries.
Separate middle office (risk management unit)	Australia, Botswana, Brazil, Canada, Chile, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, Mexico, Norway, Turkey, and the U.K.
<i>Code of conduct</i>	
Code-of-conduct and conflict-of-interest guidelines for reserve management staff	Australia, Botswana, Brazil, Canada, Colombia, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, New Zealand, Norway, Oman, and the U.K.
<i>Business recovery procedures</i>	
Business recovery procedures in place	Australia, Botswana, Brazil, Canada, Chile, Colombia, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, Mexico, New Zealand, Norway, and the U.K.
4. Risk Management Framework	
<i>Determining currency benchmarks/approaches</i>	
Currencies of assets and liabilities matched	Canada, Hungary, Latvia, New Zealand, Turkey, and the U.K.
Multitude of factors, such as composition of external debt, particularly sovereign debt, trade, domestic currency basket, intervention currency, and financial considerations	Chile, Hungary, India, Israel, and Korea.
Intervention currency important or one of the factors	Hong Kong SAR, India, and New Zealand.
Composition of outflows of balance of payments	Colombia.
SDR basket	Botswana (for Pula Fund) and Latvia.
Long-term risk profile of currency, risk return considerations through use of optimization models	Australia, Hong Kong SAR, Mexico, New Zealand, Norway, and the U.K.
<i>Interest rate risk management</i>	
Minimizing the probability of capital loss over a certain time horizon	Australia, Brazil, Colombia, and the Czech Republic.
Modified duration to determine acceptable interest rate risk	Botswana, Chile, India, Israel, Korea, Latvia, Tunisia, and Turkey.
VaR to monitor or limit market risk	Australia, Brazil, Chile, Colombia, Hong Kong SAR, Korea, Mexico, New Zealand, and the U.K.
<i>Liquidity risk management and portfolio tranching</i>	
Portfolio tranches to reflect liquidity, and other objectives and risk constraints	Botswana, Brazil, Canada, Colombia, Hong Kong SAR, Hungary, Korea, Mexico, Norway, Oman, and Turkey.
Incorporating liquidity considerations within the portfolio	Australia, the Czech Republic, India, Israel, Latvia, New Zealand, Tunisia, and the U.K.

Table 1 (concluded)

<i>Permissible deviations from benchmark</i>	
Currency benchmark (where limits are prescribed, the range is plus/minus 5 percent to 10 percent with varying degrees for each currency)	Botswana, Chile, Colombia, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, Mexico, New Zealand, Norway, Oman, Turkey, and the U.K.
Duration benchmark (duration limits where applied are around plus/minus 6 months for liquidity tranche and plus/minus 1.5 years for investment tranche)	Australia, Botswana, Chile, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, New Zealand, Norway, Oman, and the U.K.
Asset benchmark (securities selection)	Botswana, Brazil, the Czech Republic, Hong Kong SAR, Hungary, Israel, Latvia, Norway, and the U.K.
VaR limit for controlling market risk on active management	Brazil, Hong Kong SAR, Mexico, New Zealand, and the U.K.
Limits on tracking error	Colombia and Norway.
<i>Credit risk—Permissible instruments (minimum ratings)</i>	
Sovereign bonds (A+/A1 to AAA)	All countries.
BIS	All countries.
Supranationals	All countries except Australia.
Commercial banks (long-term A- to AA/A2 and short-term P2/P1)	All countries.
Agencies/Pfandbriefe	Australia, Botswana, Brazil, Canada, Chile, Colombia, the Czech Republic, Hong Kong SAR, Hungary, Korea, Latvia, Mexico, New Zealand, Norway, and the U.K.
Corporate bonds (AA)	Botswana, Colombia, Hungary, Latvia, and New Zealand.
Equities	Botswana, Hong Kong SAR, and Norway.
Repurchase agreements (A to AA)	Australia, Brazil, Canada, Chile, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, Mexico, New Zealand, Norway, Oman, and the U.K.
Asset-backed securities (A to AAA)	Colombia, Latvia, and Mexico (credit card).
Mortgage-backed securities	Colombia, Israel, and Latvia.
<i>Derivatives</i>	
Interest rate futures contracts	Australia, Brazil, Colombia, Hungary (also options on futures), Israel, Latvia, New Zealand, Norway, and the U.K.
Interest rate and currency swaps	Brazil, Canada, Hong Kong SAR, Hungary, Israel, Latvia, Mexico, New Zealand, Norway, Tunisia, and the U.K.
Currency forwards and futures	Australia, Brazil, Colombia, Hungary, Israel, Mexico, Oman (only forwards), and U.K. (only forwards).
Equity derivatives	Hong Kong SAR and Norway.
<i>Stress testing</i>	
Stress test for liquidity assessment	Colombia, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, New Zealand, Oman, and Turkey.
Stress test for market risk exposures	Australia, Brazil, Canada, Chile, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Israel, Korea, Latvia, New Zealand, Oman, Turkey, and the U.K.
<i>Externally managed funds</i>	
Application of same guidelines to externally managed funds	Brazil (allows slightly different VaR limit as they are restricted to fixed income investments), Chile, Latvia, Mexico, and Oman (allows longer duration).
External managers used for accessing new instruments, for active management to enhance returns, or for transfer of know-how	Botswana, Colombia, India, Korea, and Norway.