

PART II: COUNTRY CASE STUDIES

I. AUSTRALIA

A. Governance and Institutional Framework

Objectives of reserves management

156. Australia's foreign currency reserves are managed by the Reserve Bank of Australia (RBA). At the end of June 2002, the gross value of the reserves portfolio was US\$20 billion, representing around half of the central bank's assets. The primary role of the reserves portfolio is to fund foreign exchange market operations that arise as part of the Bank's broader monetary policy function. Reflecting this, the reserves are managed in a manner that gives priority to low levels of credit risk, limited exposure to market risk, and to maintaining a high degree of liquidity. Subject to these objectives, the Bank also seeks to earn a positive return on the portfolio.

157. In 1990, the Bank undertook a formal review of its approach to foreign exchange reserves management. The outcome of the review was the establishment of a rigorously defined operational framework for managing risk and return. The centerpiece of the framework was the development and implementation of benchmark portfolios for currency and asset allocation, and for the duration of the asset portfolios. The benchmarks are intended to represent the optimal mix of risk and return for the RBA given its management objectives. The review also provided a greater role for active management to take advantage of expected movements in exchange rates, relative returns in bond markets, and changes in the level and slope of yield curves. These changes were set in place in 1991.

158. Experience with active management was reviewed in 2000 after nine years of operation. The review highlighted the fact that short-term investment decisions designed to take advantage of market anomalies had consistently made positive returns, albeit small. In contrast, investment positions taken in anticipation of medium-term macroeconomic developments had made positive returns of reasonable size in some years, but these had been largely offset by negative returns in other years, leaving only a small positive return from this activity overall. The RBA decided that the low average, and high variability, of returns did not warrant taking investment positions of the same size and frequency as in the past. As a result, management discretion was curtailed, significantly reducing the importance of discretionary management as a source of return for the reserves portfolio.

Institutional framework

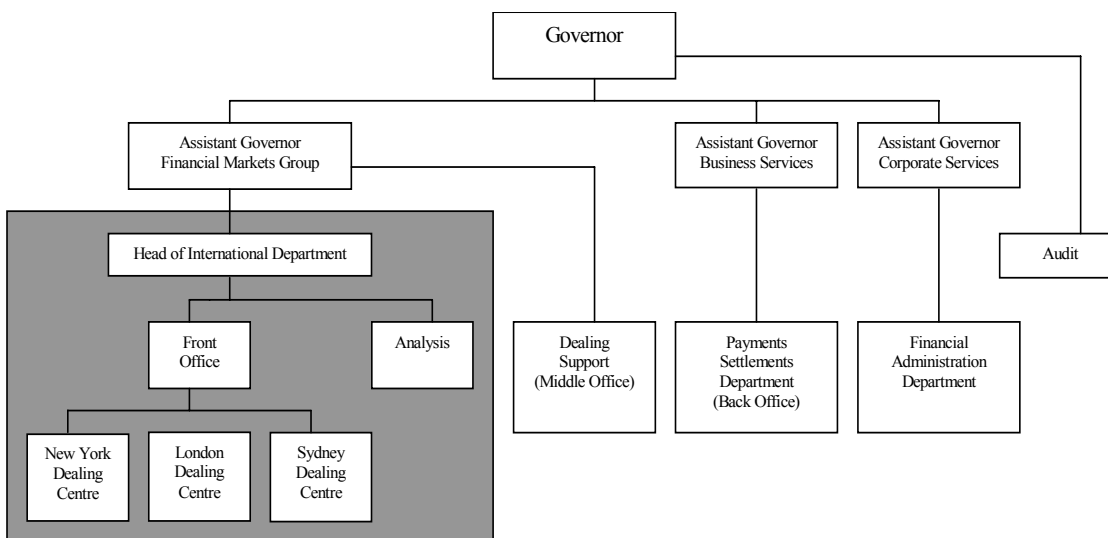
159. The RBA's responsibility to manage Australia's foreign exchange reserves is given through broad legislative powers that allow the Bank to buy, sell, and otherwise deal in foreign exchange (amongst other things) to achieve monetary policy objectives. Responsibility is not shared with other government agencies, reflecting the role of reserves as a source of intervention capital. The RBA acts independently in its management decisions.

Organizational and decision-making structure

160. The organizational structure of reserves management at the RBA is summarized in Figure 1. Responsibility for management of reserves is delegated by the Governor of the Bank to the Financial Markets Group (FMG). This group comprises two departments, International and Domestic Markets. International Department is responsible for the Bank's front office operations in markets for foreign exchange, gold, and offshore assets.

161. The International Department front office manages the currency and asset allocation positions of the portfolio, and directs policy issues regarding investment of reserves, such as assessing instruments and the structure of the benchmarks. It is supported by three dealing centers; one each in New York, London, and the Bank's Head Office in Sydney. These centers execute trades and have small discretion for position taking. The RBA has found considerable informational benefit in locating dealing staff in major offshore centers. The front office is also supported by an analytical group with responsibility to provide in-depth analysis of international financial and macro-economic developments that may impact on the value of the reserves portfolio.

Figure 1. Organizational Structure



162. Also part of the Financial Markets Group, but not within the International Department, is a middle office function, known as Dealing Support. This unit is responsible for measuring risk and return and for maintaining front office systems. Valuation, performance, and risk information is provided to the front office operation and to senior management on a daily basis. The middle office reports directly to the Assistant Governor overseeing the Financial Markets Group.

163. There are several other areas outside of the Financial Markets Group that provide services to, or scrutinize the actions of, the front office reserve management operation. These include the back office (Payments Settlements), and accounting (Financial Administration)

functions. The back office provides standard settlement and communication services to the reserves management front office and is responsible for the final approval of all transactions—dealers in the front office cannot confirm trades. There are back office operations in each of the dealing centers with Sydney having overall responsibility. Audit Department is also outside of the Financial Markets Group. This Department has a direct reporting line to the Governor.

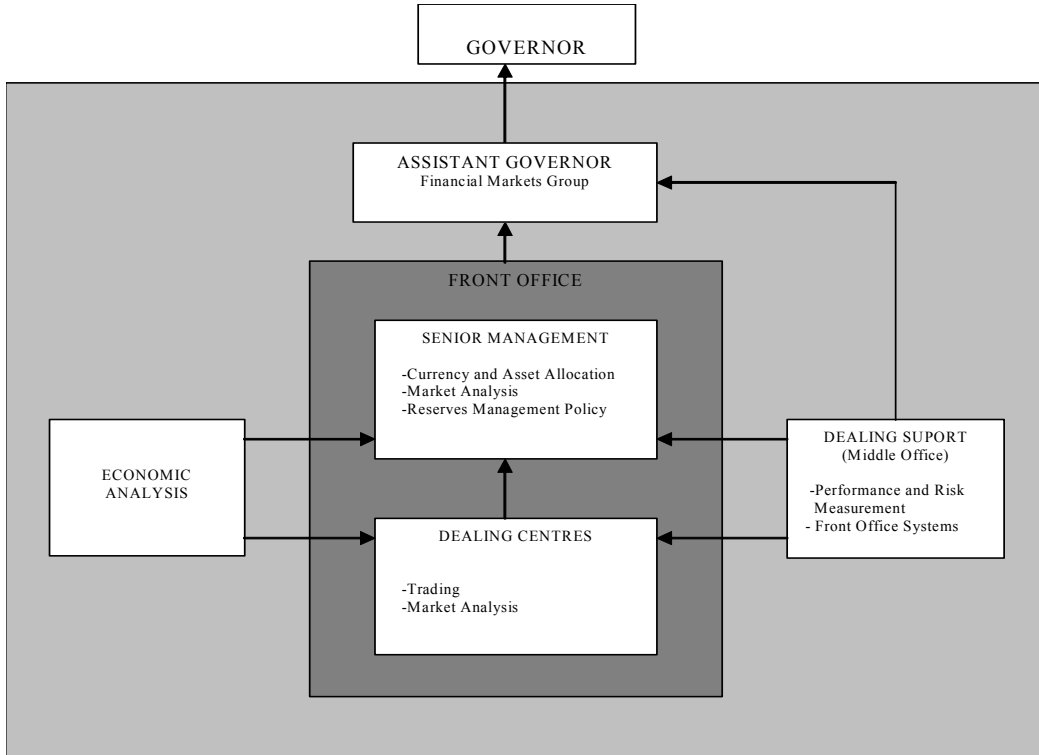
164. The structure and delineation of responsibilities in reserves management have evolved over time as the nature of, and the RBA's approach to, reserves management has changed. Until the late 1980s, International Department was responsible for both middle and front office functions. Indeed, front office staff performed many of the middle office responsibilities. Importantly, the back office was also located in the International Department, albeit with separate reporting lines to the Assistant Governor, Financial Markets Group, from those of the front office. This seemed to be a reasonable structure, given the conservative limits on risk and the lack of flexibility in the RBA's investment operations at the time. However, as the approach to reserves management changed in the early 1990s and the scale of the operation increased, the Bank set in place a number of changes to reduce operational risk and reflect best-practice in funds management.

165. Establishment of a middle office within Financial Markets Group, which reports independently to the corresponding Assistant Governor, was a major change that occurred in the mid-1990s. Separation of the back office function was completed in 1998 when the back office was physically relocated to a different floor of the RBA's Head Office building and put under control of the Assistant Governor, Business Services.

166. Decision-making processes have also evolved. In the early 1980s, almost every transaction in reserves management had to be approved by higher management. While this maximized control over the management process, it made decision-making unwieldy and, therefore, poorly suited to a more active risk management framework. It also constrained initiative at manager levels. With the move to more active management in the early 1990s, the Governor's discretion for day-to-day management of reserves was delegated to an Investment Committee within the Financial Markets Group. The Committee, made up of senior managers from units involved in reserves management, had discretion to take sizable positions in currency and asset allocation subject to limits approved by the Governor. The Investment Committee met regularly and took positions largely based on assessments of the medium-term macro economic outlook of countries in which the reserves were invested. A small and qualified amount of trading discretion was delegated to managers in the trading centers.

167. The Investment Committee's structure and its discretion to take positions changed following the review in 2000. Senior managers overseeing front office operations are now responsible for day-to-day management of currency and asset allocation, maintaining the portfolio close to benchmark. They report directly to the Assistant Governor of the Financial Markets Group. An outline of the decision making structure is shown in Figure 2.

Figure 2. Decision Making Structure



168. Reflecting the more passive trading environment, there are no longer any formal meetings to discuss investment strategy. In contrast, managers in the dealing centers have retained their small amount of discretion to set short-term tactical positions. These centers are also responsible for lending stock from the portfolio.

Transparency and accountability

169. With the introduction of a more rigorous approach to reserves management, where decision-making was delegated to a large extent, the RBA needed to be confident that an adequate level of control was being maintained and that its actions were properly accounted for in line with market best practice. This required a system where individuals and operational units were fully aware of their delegated authorities, the risks, and of the value added from their decisions.

170. A key element in the control of operational risk has been the development of manuals detailing investment and risk management procedures. The manuals specify the kinds of instruments in which investments can be made, the risk parameters for each portfolio, and the responsibilities of various positions associated with reserves management. They also specify

how risks and returns are calculated and how office systems should be used in specific circumstances. Procedures manuals also exist for middle and back office staff.

171. Staffing Policy is another key element. The RBA has found considerable benefit in specialization of professional staff in operational areas. Frequently rotating staff in and out of these areas in order to provide a breadth of experience was felt to be a significant constraint on maintaining adequate levels of experience and knowledge. 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. Compensation is reviewed regularly to ensure competitiveness with other organizations and staff are encouraged to participate in a range of courses, both internal and external, relevant to their work. These measures have contributed to an average tenure over the operational areas of four years.

172. The Governor requires that reserves are accounted for in line with best practice and that the level of transparency is consistent with that in other parts of the RBA's monetary policy operations. To this end, the RBA publishes statistical information on its reserves and foreign currency transactions in its monthly Bulletin. Also, since 1992, the Bank has provided an overview of reserves management operations and return relative to benchmark in its Annual Report. This has included in recent years an outline of the composition of the benchmark portfolios and a discussion of the RBA's approach to risk management.

173. The RBA's annual financial statements are prepared in accordance with Australian Accounting Standards and other mandatory reporting requirements contained in the Commonwealth Authorities and Companies Act. The statements are scrutinized by an external auditor, the Australian National Audit Office, to ensure that they comply with relevant standards.

174. Reserves management functions are audited internally each year in accordance with recommended control frameworks published by the Bank for International Settlements and requirements set out by the Australian Financial Markets Association. The internal audit reports on compliance with controls and seeks to strengthen management processes where it sees potential for loss through inadequate control. It reports to an Audit Committee which is chaired by the Deputy Governor of the RBA and consists of a non-executive member of the RBA's Board and an external appointee.

B. Capacity to Assess and Manage Risk¹⁵

Benchmark portfolios

175. The composition of the currency and asset benchmarks, and the duration benchmark for each asset portfolio, are shown in Table 2. The benchmarks represent the risk-return trade

¹⁵ An account of the RBA's approach to risk management is detailed in the Bank's 2000/01 Annual Report.

off acceptable to the RBA over the long term, given its management objectives and its primary objective for holding reserves. Statistical, practical, and judgmental factors relevant to the RBA are important in deciding the appropriate composition.

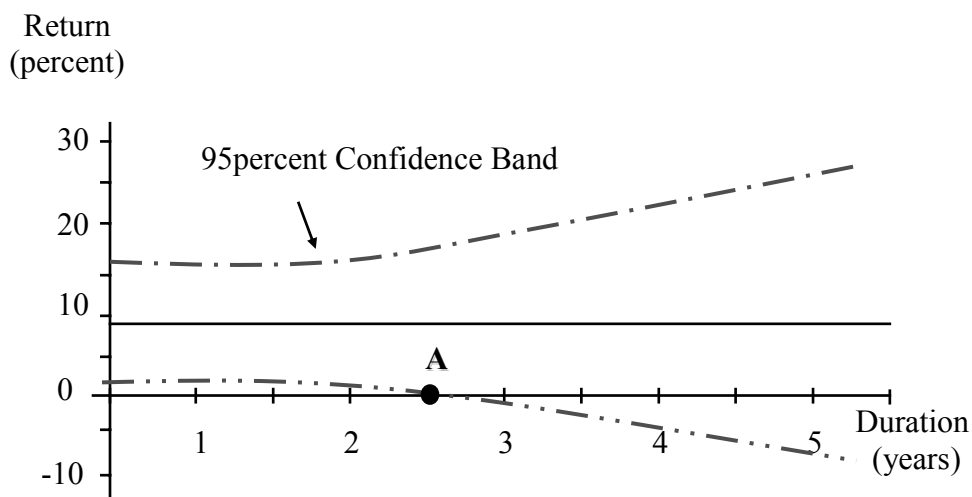
Table 2. Currency, Asset, and Duration Benchmarks

	U.S.	Europe	Japan
Currency allocation (%)	45	45	10
Asset allocation (%)	45	45	10
Duration (months)	30	30	30

176. With the aim of maximizing the Bank’s capacity to intervene, it was decided that a trade-weighted basket of currencies would be an appropriate currency and asset composition for the foreign currency portfolios. The decision was taken to spread the composition across the three major reserve currencies—the U.S. dollar, Deutschemark (later the euro), and Japanese yen. This also provided a diversified portfolio and meant, too, that the RBA’s assets would be invested in capital markets that are liquid and highly rated. From very 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 portfolio.

177. The choice of a duration benchmark of 30-months for each of the asset portfolios was made on the basis of factors specific to the RBA in its responsibility for managing reserves and analysis of risk and return for each asset. This duration represents the maximum price risk that the RBA will allow itself while keeping the probability of capital loss to an acceptable level over the Bank’s investment horizon. An example of this analysis is given in Figure 3.

Figure 3. Horizon Analysis



178. The RBA’s investment horizon is twelve months. This is based on the Bank’s investment objectives and the period in which it reports on its operations to the Australian Parliament. Over a twelve-month period, the RBA expects the return on the portfolio to fall within a 95 percent confidence band around the mean return, and will accept a negative return on only 2.5 percent of occasions. On this basis, return is maximized at point A in Figure 3 where the lower boundary of the confidence band crosses the horizontal axis.

179. In addition to the currency and asset benchmarks, the RBA has established benchmarks for the composition of each of the three asset portfolios. These benchmarks are set out in Table 3. Like the other benchmarks, practical and judgmental factors, combined with the liquidity characteristics in each market, are important in deciding the appropriate asset structure of the portfolios.

Table 3. Composition of Individual Portfolio Benchmarks

U.S.		Europe		Japan	
Asset Class	% of total	Asset Class	% of total	Asset Class	% of total
RPs/Deposits	22	RPs/Deposits	30	RPs/Deposits	22
Treasury Bills	21	Treasury Bills	15	Treasury Bills	33
Treasury Notes	57	Bonds	55	Bonds	45

180. The desire to maintain a liquid and secure portfolio led the RBA to limit its benchmark investments to government securities and cash instruments. Typically, some 75 to 80 percent of the RBA’s benchmark foreign investment portfolios are held in government paper. This comprises Treasury bills and notes in the U.S. portfolio, and Japanese government bills and bonds in the Yen portfolio. For the European portfolio, the RBA has decided on a combination of French and German government securities as the best structure to satisfy requirements for credit risk and liquidity. In order to limit exposure to price risk, the maximum maturity of securities holdings is restricted to 10½ years in each portfolio.

181. Cash invested under repurchase agreements (repo) and deposits with highly rated banks make up the balance of the asset benchmarks. Historically, the RBA has found the short duration offered by deposits to be attractive in markets where access to short-term government debt was limited. They have also been a good, immediate source of liquid funds during episodes of currency intervention. That said, the proportion of foreign exchange reserves invested in deposits has declined in recent years, reflecting tighter credit constraints and changes in cash management practices. The RBA now makes greater use of cash repo, which has the security advantage of being collateralized with government securities.

182. The benchmarks are reviewed periodically to ensure that they continue to reflect the RBA’s long-term management objectives. There have been relatively few changes. They have been made to take account of structural changes to markets or changes in the nature of the Bank’s operations.

Instruments

183. In addition to the assets held in the benchmark portfolios, the RBA's dealing centers have discretion to hold a small range of other highly-rated instruments. These include the U.K. Gilts, Dutch and Swiss government paper, and deposits and medium term notes issued by the Bank for International Settlements. With the exception of BIS deposits, these investments have accounted for a negligible share of total holdings. Discretion to hold U.K., Dutch and Swiss paper is remnant of a period in the 1980s when the composition of Australia's official foreign currency liabilities influenced the composition of the reserves portfolio. Discretion also exists to hold U.S. Federal Agency debt in the U.S. portfolio as a source of return enhancement. However, total holdings are restricted to a maximum of US\$500 million.

184. In 1994, the Bank began trading interest rate futures contracts. This decision was driven by a desire to improve our management of market risk, and, in particular, to provide a liquid hedging instrument to minimize the risk of capital losses when interest rates were rising. An additional attraction of using futures was the greater liquidity and flexibility they provide in some markets when implementing investment strategies. Some futures markets are more liquid than their underlying physical bond markets in that the bid-offer spread is usually much narrower. Futures trading has been concentrated in the European and Japanese portfolios. The RBA does not use any over-the-counter or exchange-traded options in its reserves management activities.

185. Stock lending is also an activity undertaken by the dealing centers. Over the past few years, stock lending, particularly from the U.S. portfolio, has risen to be a major component of return enhancement. Though the back office workload associated with this activity can be large, the RBA sees this activity as relatively low risk.

Risk and performance measurement

186. Market risk and return enhancement are measured relative to the benchmark portfolios. For currency and asset allocation, senior management in the operational areas of the RBA's International Department may allow the portfolio to vary by 1 percent either side of the benchmark weights.¹⁶ Currency and asset positions are managed separately within the discretionary band through the use of foreign currency swaps. The cost/benefit of these swaps is taken into account when measuring the performance of the asset and currency positions relative to benchmark. Foreign exchange dealers in each of the three dealing centers have a small amount of discretion (set in terms of a maximum open position) which falls within the ± 1 percent discretionary limit on currency allocation.

¹⁶ Prior to the performance review in 2000, management had discretion to vary the portfolio as much as 20 percentage points either side of the benchmark.

187. Risk measurement and trading discretion around the duration benchmark for each asset portfolio is based on the concept of “dollars-at-risk”. This is the change in portfolio value arising from a one basis point change in yield. Within each of the portfolios, the dealing centers are required to maintain dollars-at-risk to within US\$70,000 per basis point at all times. This limit applies to the aggregate position of the portfolio and to the position undertaken in each maturity bucket of the portfolio in order to control the amount of curve risk. Breaches of the limit are reported to Assistant Governor on the day they occur. The dealing centers are also required to report daily losses that exceed US\$1 million to senior management in the Financial Markets Group.

188. The “dollars-at-risk” measure also forms the basis of the Value at Risk (VaR) methodology which the RBA has used since 1995 to estimate the consolidated exposure of the Bank’s foreign currency reserves to market risk. Though the overall limits to control market risk—i.e., the discretionary trading bands around the benchmark—are not defined in terms of VaR, the RBA has found that it nonetheless provides a useful tool for conveying information about the overall portfolio exposure to senior management and staff involved in reserves management.

189. The VaR number represents the portfolio loss which the RBA could incur once every 20 business days in normal market conditions. Two VaR measures are calculated each day—one based on the correlation method and the other based on historical simulation methodology. The assumptions underlying these VaR methodologies are reviewed periodically and their performance is tested regularly. In accordance with best practice, the RBA also stress tests the portfolio. This involves simulating and evaluating the impact of extreme market movements on the value of the portfolio.

Information system

190. All international transactions entered into by the RBA are processed through a main-frame electronic Global Trading and Settlement System (GTS). This system has been developed by an external software provider to our specifications, with functionality expanded as new products are introduced. All stages of a transaction—from deal entry to confirmation of settlement from nostro banks and custodians—are handled by the system which has an interface to SWIFT. The segregation of front and back office duties is achieved through the control of user security levels by the Dealing Support section which is also responsible for ensuring the system’s operation.

II. BOTSWANA

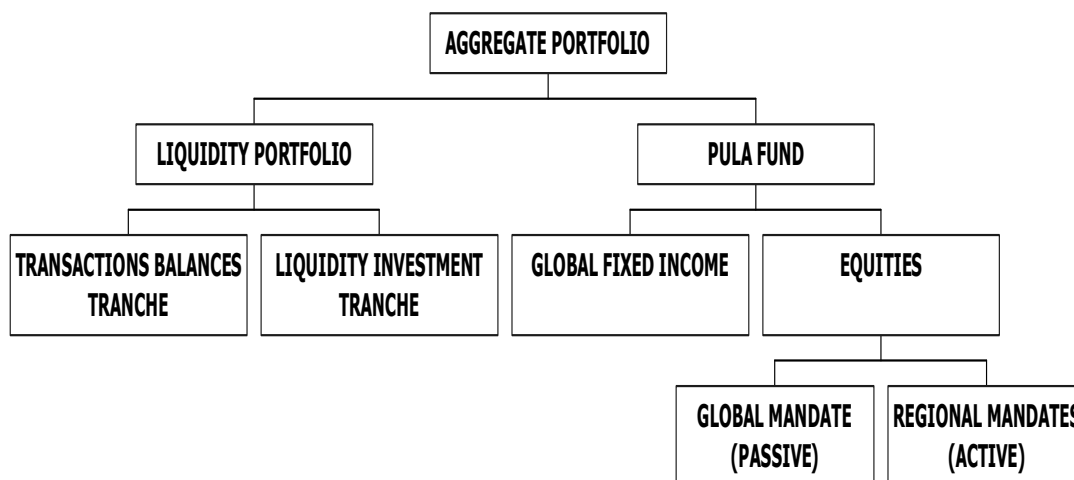
A. Governance and Institutional Framework

Reserve management objectives and coordination

191. The major responsibilities of the Bank include the management of foreign exchange reserves on behalf of the Government. The Bank ensures their safety and return by diversifying investments within a framework of acceptable risks. A major feature of the reserves management practice is to divide the reserves into sub-portfolios, namely, Pula Fund (long-term) and Liquidity Portfolio (short-term). The Bank's policies for the management of the foreign exchange reserves can be summarized in terms of three main principles. In order of importance, these are safety, liquidity and return. With respect to the long-term portfolio, Pula Fund, return takes priority over liquidity, while safety continues to have the highest priority for both the Liquidity Portfolio and the Pula Fund. As of the end of 2001, the split between the Pula Fund and Liquidity Portfolio was 80 percent and 20 percent, respectively.

192. The appropriate level for the Liquidity Portfolio is determined such that the portfolio acts as a buffer against short-term trade and capital account fluctuations, and as a cushion to finance unforeseen developments in the external payments situation. The Liquidity Portfolio is further subdivided into two tranches: the Transactions Balances Tranche (TBT) and the Liquidity Investment Tranche (LIT). The TBT functions as a current/checking account to take care of inflows and outflows. The rest of the reserves are invested in the long-term Pula Fund. It is relevant to note that the Government has not experienced a need to issue government securities for funding purposes as budgetary surpluses have been a feature of the Botswana economy for a long time (Figure 4).

Figure 4. Portfolio Structure



193. Relative to many other central banks in the region, the Bank of Botswana has for many years had a high level of external reserves, approximately 39 months of import cover as at December 31, 2001. As such, the maintenance of a minimum level of reserves has not been a concern to the Bank. Furthermore, the high level of reserves has permitted the Bank to create the long-term fund (Pula Fund).

194. One of the objectives of establishing the Pula Fund is to take advantage of the high level of the reserves and invest part of them in assets such as long-term bonds and equities, with the expectation of earning a higher return than could be achieved on conventionally managed foreign exchange reserves, thereby developing a long-term earner of foreign exchange for the country. Such earnings would allow sustained long-term income even if export revenues were to be adversely affected by factors over which Botswana has no control. Based on historical data and financial theory, long-term bonds and equities are expected to outperform short-term assets, such as cash and short-term bonds, which comprise the bulk of investments in the Liquidity Portfolio. Returns on long-term assets are, however, more volatile than returns on short-term assets. Therefore, it became necessary to have a longer investment horizon for the Pula Fund in order to benefit from the expected higher returns.

Coordination with monetary policy and external debt management

195. To date, the external reserves have not been used as a mechanism for supporting the exchange rate in the context of the Bank's monetary policy objectives. The Bank of Botswana does not intervene in the foreign exchange market.

196. With regard to coordination with external debt management policy, the Bank had a Matched Asset Liquidity Portfolio (MALP) which was established for the purpose of separating a portion of the reserves and investing them in fixed income instruments which had the same maturity profile as external debt. It was considered that combined asset/liability management would lead to better risk management than when assets and liabilities are managed separately. While the reason behind establishing MALP was considered to have merit, matched asset/liability management was later considered to be more useful for countries with more debt or very low reserves in terms of import cover and, accordingly, the assets held in MALP were transferred to the potentially higher yielding Pula Fund in the mid-1990s.

197. In Botswana, one of the key features of reserve management is the contribution that the income earned from the reserves makes to Government funding. In this regard, over the past five years, income from external reserves has been the third most important constituent of budgetary revenues.

Institutional framework

198. The Bank of Botswana Act, 1996, outlines the primary functions of the Bank, which include, inter alia, the management of the foreign exchange reserves. In particular, the Act

provides that the Bank shall be responsible for establishing and maintaining a Primary International Reserve (Liquidity Portfolio) which shall in general, consist of liquid short-term assets. Furthermore, the Act provides for the establishment of the long-term investment fund (Pula Fund), subject to meeting the requirements of the primary reserve.

199. Within this enabling legislation, other parties in the reserve management process are the Board, Investment Committee, Financial Markets Department and external fund managers.

Board

200. The Board is composed of members from the public and private sector as well as academia. The Board is responsible for governance and ultimately the investment results; it enunciates the mission, goals and policies, as well as design the structure with appropriate accountability. Consequently, the Board sets the overall strategy for the management of reserves by approving investment guidelines, size of portfolios, asset allocation, strategic benchmarks and exposure limits.

Investment Committee

201. The Investment Committee is responsible for strategic decisions against the benchmarks as well as the rebalancing of the portfolios. In doing this, the Investment Committee receives and acts on the recommendations of in-house analysts, who maintain close contacts with the Bank's counterparties in major markets. The Investment Committee meets periodically about 12 times a year to discuss developments in the international financial and capital markets, based on background papers prepared by the implementing Department. At the Investment Committee meetings, broad decisions are made for the Bank-managed portfolios on currency composition and modified duration within each market. The decisions made by the Investment Committee are subsequently implemented by the Department responsible for reserve management. The Investment Committee comprises of the Governor as Chairman, Deputy Governor responsible for the Financial Markets Department, Director of that department, analysts for respective markets (including the Chief Dealer) and the Director of Research Department.

Financial Markets Department

202. The Financial Markets Department is responsible for the implementation of the decisions of the Investment Committee. In addition, the Financial Markets Department is responsible for monitoring external fund managers and other external relationships. The Department is structured as follows:

Dealing and Strategy Unit

203. The Dealing and Strategy Unit is responsible for research and analysis of various financial and capital markets and for the compilation of the background paper for the

Investment Committee. The Unit implements the decisions of the Investment Committee by trading in bonds and foreign exchange.

Risk Management Unit

204. The Risk Management Unit focuses on the risk associated with all the investment portfolios. The Unit coordinates the risk management process and advises on all aspects of risk, performance and compliance with the investment guidelines for the externally and internally managed portfolios.

Open Market Operations Unit

205. The Open Market Operations Unit is not directly involved in the management of the foreign exchange reserves; it is complementary to that function. The Unit is responsible for the provision of foreign exchange to the Bank's customers, dealing in Bank of Botswana Certificates (BoBCs) and the management of daily liquidity in the domestic money market.

Settlement Unit

206. The Settlement Unit's primary responsibility is to ensure that the Bank meets its obligations to pay and receive correct value for transactions as contracted with counterparties, and to execute foreign currency payments for the Government and other customers.

Verification Unit

207. The Verification Unit provides the necessary "checks and balances" to ensure that the Settlement Unit pays out and receives the correct amount of funds on due dates and at the right places. In the event that any of these factors are incorrect, the necessary steps are immediately taken to restore the position and this includes, in the main, communication with foreign counterparties and banks. The Verification Unit is also responsible for following up on issues raised by the Reconciliation Unit of the Accounting Department.

Fund managers

208. A cardinal feature of the Bank's operational strategy for managing the reserves is the use of external fund managers. The Bank has had contractual arrangements with overseas fund managers since 1981. 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 possible brain drain of the Bank's scarce manpower resources. Furthermore, the incremental benefits that accrue to the Bank in terms of the training provided by the fund managers to Bank staff over the years have made a positive impact. The fund managers also provide the Bank with a means of performance comparison, given that both the fund managers and the Bank's performance is measured against common benchmarks.

209. The Bank manages approximately 50 percent of the foreign exchange reserves internally. The intention is for the Bank to eventually manage a higher proportion of the fixed income portfolios internally in line with development of relevant skills. A small proportion of reserves would be managed externally for the purpose of performance comparison. In pursuing this objective, the Bank would obviously have to be cognizant of local manpower constraints in reserve management.

Specialist advisory support

210. Since its establishment, the Department responsible for managing the reserves has benefited from the services of a number of advisors. At present, there is one advisor for the reserve management function. Consistent with past practice, the advisor is also engaged in in-house training of citizen staff. Furthermore, the Bank has retained the services of an off-shore investment consulting firm which advises the Bank in three main areas, namely, asset allocation, manager search and performance measurement.

Transparency and accountability

211. The Bank of Botswana has recognized that accountability and transparency must be built into the reserves management process. The Board has given decision rights and delegated authority to the Governor, with the actions of the latter being measurable in terms of performance against the Board-issued benchmarks. The following are other mechanisms which are built into the reserve management process:

Investment guidelines

212. These are a strategic set of rules that defines the means of achieving the Board's investment policy. They address issues such as currency risk, equity risk, interest rate risk, credit risk, and instruments and liquidity.

Procedures manuals

213. The front, middle, and back offices operations are guided by operations manuals, which are specific to respective functions. The responsibilities and functions are defined such that there is clear separation of duties between the front and back office. The middle office acts as a policeman to ensure the proper implementation of the written procedures.

Auditing

214. The reserves management procedures and processes are subject to regular audits by both the internal and external auditors.

Regular reporting

215. Regular reports to the Board and Audit Committee are produced outlining the reserves levels, trends, and performance as measured against the benchmarks. The reserves are also marked to market with currency and market gains and/or losses disclosed to the Board and Audit Committee as part of the financial statements.

B. Capacity to Assess and Manage Risk

Risk management

216. The objective of tranching the foreign exchange reserves is to reflect the different roles of reserves in the Botswana economy. The Liquidity Portfolio is maintained at the equivalent of nine months of import cover and is invested in short-term money and bond market instruments. On the other hand, the Pula Fund is invested in long-term instruments, such as long-term bonds and equities. The Liquidity Investment Tranche (LIT) serves to insulate the Pula Fund from frequent drawdowns which could undermine the latter's investment objectives.

217. In determining the adequate level of the Liquidity Portfolio, the Bank undertook a comprehensive analysis of factors which impact on the foreign exchange reserves. Based on these factors, a framework for the determination of an appropriate level of liquid assets was derived. For each factor, an estimate of monthly import cover is used to arrive at a total of an equivalent of nine months of import cover.

218. Risk is controlled at various levels of the reserve management process by different entities in accordance with the broad strategy of risk management, investment guidelines, and procedures manuals.

Asset allocation

219. This is a key decision in the investment process as it seeks to balance return with risk as well as recognize correlation of asset classes. With regard to the Pula Fund, 40 percent of assets are allocated to equities and 60 percent to long-term fixed income assets. The appropriate asset classes for the Liquidity Portfolio are a combination of short-term income and money market instruments. The underlying objective in asset allocation is to diversify across the main asset classes and geographic regions in order to achieve a low correlation coefficient.

220. Using the currently allowed asset classes, a portfolio optimization process is undertaken every three to four years to determine the Pula Fund asset mix. This process is complemented by "what if" scenario analysis to assure the Management and Board about the risk/reward profile at the aggregate portfolio level.

Currency risk

221. The Bank follows conventional policies in establishing an appropriate currency mix. Eligible currencies must be convertible, relatively less susceptible to frequent and sharp exchange rate fluctuations, generally free from restrictions on their use, and products of well developed financial markets. Accordingly, the Bank has established a minimum credit rating of a country's sovereign debt to be Aa2/AA for its currency to be eligible, except for the G-7 member countries whose minimum rating is Baa3/BBB-.

Currency benchmarks

222. The underlying philosophy for currency exposure is that it is not appropriate to modify currency weights in response to short-term exchange rate fluctuations. The Bank mainly invests in the U.S. dollar, euro, pound sterling and yen. The other eligible currencies are for purposes of diversification. In determining the appropriate currency weights, the following approaches were considered: the SDR based currency allocation, relative size of the economy, relative use of the currency, market capitalization, equal weighting, and optimal currency allocation. The Bank has adopted a combination of the "SDR-based currency allocation," the "optimal currency allocation," and a market capitalization approach.

223. The TBT currency benchmark is constructed in such a way that it matches the international trade flows affecting the domestic currency.

224. The Pula Fund fixed income currency benchmark replicates the SDR weights. The rationale for this choice is the neutral and unbiased character of the SDR currency basket as a representation of the world economic activity and the SDR use as a reserve currency. The currency benchmark for LIT is SDR-based and the portfolio is invested in fixed income instruments with a shorter duration (currently around 1.5 years).

Interest rate risk

225. Modified duration is used to control interest rate risk. Overall interest rate risk is a function of three factors—the size of the portfolio, modified duration, and the actual or expected change in bond yields. The Bank has adopted mainstream and market based benchmarks to facilitate risk management and attribution of performance to various decision levels. Customized versions of the JP Morgan and Salomon Smith-Barney Government Bond Indices have been adopted for Pula Fund and Liquidity Investment Tranche, respectively.

226. Liquidity and the safety of the funds are paramount in the TBT. For this reason, no specific duration benchmark is specified other than a maximum maturity period of four months.

Credit risk

227. The Bank is exposed mainly to three kinds of credit risk, that is, bank risk, sovereign/supranational risk, and corporate risk. Additional risks relating to the use of counterparties, fund managers, and the global custodian are also addressed. The Bank subscribes to Fitch/IBCA in order to monitor bank risk and utilizes rating reports of Standard and Poor's and Moody's Investor Services to monitor sovereign/supranational and corporate risk.

228. Credit risk is low for the TBT because of the strict limit on counterparties' credit rating. In the Pula Fund, corporate risk is allowed but constrained to top quality issuers and to a small portion of the portfolio.

Fund management styles

229. A combination of active and passive fund management styles is adopted for diversification purposes. In addition, the award of a management contract takes into consideration the firm's technical expertise with regard to global or regional mandate. Fund management styles are also diversified, for instance, U.S. equity value, growth, or broad market styles.

Global/regional equity mandates

230. Specialist fund managers are appointed to manage various equity components. The portion allocated to each equity market is determined by MSCI country weights. Generally accepted restrictions are detailed in the investment guidelines.

Risk management at portfolio level

231. Once the portfolio is constructed, the actual portfolio management brings a different level of risk, as the portfolios are allowed to deviate from the neutral position in order to outperform the benchmark. The main risks incurred in portfolio management are of three types—operational, liquidity and market risk.

232. The Bank manages operational risk by using generally accepted practices including segregation of duties. The internal and external audit work adds a level of oversight to the initial strong emphasis on control risk self-assessment. Straight-through-processing will be achieved shortly, thus reducing manual intervention and its inherent risk.

233. The liquidity risk is addressed mainly by the layering¹⁷ of the portfolio into different tranches which take into account the recognized norm of three months of import cover as

¹⁷ First, the TBT is virtually all cash. Then LIT invests only in short-term bonds and money market. Finally, the Pula Fund is fully diversified.

well as the “Greenspan rule”—the importance of taking into account capital flows in the whole economy.

234. Market risk includes currency risk, interest rate risk and credit risk. The currency risk is controlled in a more traditional way by defining ranges around the neutral positions. For example, the US\$ exposure can be in the range of 35–55 percent of the portfolio—plus/minus 10 percent deviation from the benchmark.

235. The interest rate risk is monitored in a similar way to the currency risk. A range of plus/minus 1.5 years is allowed around the aggregate portfolio duration. This currently translates into allowing duration to fluctuate between zero to three years for the LIT portfolio.

236. As mentioned earlier, the fixed income benchmark is 100 percent government bonds. It is, nonetheless, allowed to hold spread products in the actively managed portfolios. The permitted risk taking is offset by the need to diversify by country, industry and issuer as well as a very high minimum credit rating.

237. The Bank of Botswana is gradually evolving toward quantitative risk management methodologies which will allow the portfolio risk to be managed at an aggregate level.

III. BRAZIL

A. Governance and Institutional Framework

Reserve management objectives and coordination

238. The objectives of reserves management are subordinated to Banco Central do Brasil's monetary and foreign exchange policies. Brazil has a floating currency regime and interventions are infrequent with no sizable changes in reserve holdings.

239. The main objectives in holding external reserves are to:

- Support monetary policy.
- Control excessive volatility of the foreign exchange market.
- Guarantee payment of foreign exchange debt.

240. Based on these objectives, reserves are managed to ensure safety, liquidity and profitability.

Institutional framework and decision making structure

241. Banco Central do Brasil (BCB) is the sole authority empowered by the Constitution to manage Brazilian foreign exchange reserves. No other government agency can hold foreign currencies. Regarding the allocation of roles, BCB Board of Governors is responsible for the reserves strategic allocation and defining the investment policies. Therefore, they have established a detailed benchmark and guidelines and opted for an active management of the reserves. The Vice Governor responsible for the monetary policy—Dipom—is responsible for the active management, as decided by the Board. International Reserves Operations Department—Depin executes the necessary transactions to follow up the benchmark and Dipom's active strategies. Depin is also responsible for suggesting modifications in the benchmark according to changes in long-term market conditions and/or other factors, and for providing Dipom with market updates and strategy proposals. An Investment Policy Committee for active management meets monthly to analyze the market scenarios and to propose active strategies.

242. The Investment Policy Committee was created by a board decision, while the investment process was defined by a formal document signed by the Vice Governor of Monetary Policy. The following officers participate at the meetings as voting members:

- Vice Governor responsible for Monetary Policy (detains veto power);
- Head of International Reserves Department;
- Deputy Head of International Reserves Department;
- Head of International Reserves Investment Division;
- Head of Foreign Exchange Division;
- Interest Rate Portfolio Managers (1 joint vote);

- Foreign Exchange Portfolio Manager;
- Interest Rate Strategists (1 joint vote); and
- Foreign Exchange Strategist.

243. Active management positions may be taken in strategic and tactical levels. Strategic positions have an investment horizon of 1–3 months and are subject of discussion and decision at the Investment Policy Committee.

244. Depin is organized in three distinct areas: front office (trade desks), middle office (compliance, risk management, performance evaluation, pricing and IT) and back office (accounting and settlement).

245. In the middle office, a compliance area checks all guidelines defined by the Board on a daily basis and is responsible for standardizing procedure manuals. This area is also responsible for checking transactions prices against market prices in order to identify any kind of mismatching. A new area was recently created to assure correct asset pricing and to verify data integrity and correctness by performing checks of other numerical variables like VaR, returns etc.

246. An Ethics Code, which outlines standards for the conduct of civil servants, was implemented in 2001. In addition to this, all civil servants must present their annual income tax returns.

247. The BCB Board of Governors defined that the investment strategy should match reserves with sovereign external liabilities in terms of currency exposure. In this way, we have an integrated Asset/Liability Management (ALM) in terms of foreign exchange exposure. The main benefit of this strategy is to prevent a short-term loss of reserves caused by a mismatch in currencies between reserves and short-term obligations.

248. An improper tracking of external liabilities and a lack of a formal ALM long-term strategy may cause inefficiencies. Efforts are being made in the direction of unifying strategies and coordinating all sovereign external debt with reserves management.

Transparency and accountability

249. In recent years, Banco Central do Brasil has promoted increased transparency and accountability in managing reserves and reporting results. The main procedures taken to follow these objectives were:

- Definition of a detailed and replicable benchmark with clear guidelines and unambiguous sharing of responsibilities within Banco Central do Brasil's hierarchy;
- Public disclosure of reserve management parameters and procedures;
- Quarterly performance reports to the Board of Governors;
- Hiring of an independent auditing firm;
- Adherence to the IMF's SDDS—Special Data Dissemination Standard.

250. In terms of auditing, there are four separate inspections, which are conducted by the Internal Auditing Department of BCB (Deaud), an external independent auditing firm, the Ministry of Finance and the Brazilian Court of Accounts (TCU). All these auditing inspections are periodic and have the objective of verifying compliance procedures, accounting system, IT system, limits controls etc.

251. Banco Central do Brasil's training program for the reserves management area is made up basically of courses offered by the external managers¹⁸ and periodic visits to other central banks and premier commercial banks. In order to obtain qualified staff, the International Reserve Operations Department of BCB—Depin selects personnel, within the Bank, based on their market experience/skills and quantitative background. In some cases, a deep knowledge of computer systems is required. To retain the staff, Banco Central do Brasil has a defined professional career track and incentives for employees to pursue graduate degrees in Brazil or abroad. However, there is no specific wage/bonus incentive related to market operations or to performance.

252. Banco Central do Brasil has made huge investments in system information resources updating. In fact, technical areas have access to the most sophisticated mathematical and statistical engines available in the market. This policy has been very important to allow financial model improvements and also to maintain research-oriented employees.

B. Capacity to Assess and Manage Risk

Risk management

253. Banco Central do Brasil investment policy for foreign exchange reserves is based on three pillars—the reference portfolio, investment guidelines and performance measurement. The first one, a.k.a., the benchmark, is replicable and details unmistakably the included assets. This portfolio reflects the Board of Governors' risk/return preferences for the international reserves. The second pillar is the list of guidelines that define operational limits, allowed investment instruments, risk methodologies and deviation limits for the active management.

254. The third pillar is a quarterly performance measurement report for the Board, which states the results of passive (reference portfolio) and active management. The Association for Investment Management and Research (AIMR) standards, when applicable, are followed for presenting results of benchmark and active strategies policies.

255. The complexity of the benchmark framework imposed the use of information technology tools. Considering the existence of appropriate human and IT resources for the

¹⁸ The External Asset Management Program was implemented in October of 2000 with two main objectives: keep Depin's team updated with the best investment practices available in the market and to be used as a reference for the performance evaluation of the internal active portfolio.

development of a software system, Depin opted for an in-house software solution. The system includes several management tools like market risk (VaR), credit risk (expected and unexpected default), performance evaluation, performance attribution, reference and active portfolios management, operational risk and compliance. Besides that, the system gives the possibility of executing stress tests for active strategies. These tests can be based on historical data or stress scenarios defined by the user. Depin is now beginning to perform stress tests for the reserves as a whole on a regular basis.

256. Banco Central do Brasil takes into account market, credit, liquidity, operational and legal risks. In terms of market risk, the Board has defined a VaR limit for the active management relative to the benchmark, i.e., a differential VaR. This limit is calculated on a daily basis, using RiskMetrics' methodology with 95 percent confidence level and one-day time horizon. The VaR is back-tested and the results of the methodology adequacy are presented in the quarterly performance reports. The Board defined a VaR limit for the active management, and it is up to the Investment Policy Committee to approve a risk budget among its subportfolios, as suggested by portfolio strategists. The VaR limit can be considered small in the sense that returns come basically from the reference portfolio, with active management giving a marginal result.

257. Credit risk is managed 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 based on Creditmetrics and Merton model. This model uses expected and unexpected default probabilities, and the Board stated limits for these two variables. The main objective of this approach is to impose geographical and counterpart diversification, and not to calculate VaR exposure. The second approach is transaction oriented, for which the Board has approved minimum counterpart ratings (short-term and long-term), maximum volume and maturity exposure based on the counterpart total assets and ratings. For the fixed income portfolio, BCB accepts only federal government, agencies and supranationals issues restricted to minimum rating. In terms of liquidity risk, the Board approved additional constraints related to the permitted range of investment instruments and maximum exposure in each asset.

258. Operational risk losses in reserves management are tracked with the objective of getting statistics about internal procedures and the relationship with counterparts.

259. The BCB's legal department analyzes and approves contracts, and together with audit entities ensures that each transaction has the necessary legal support.

260. Regarding external managers portfolios, the operational guidelines are basically the same as the one defined for the self-managed portfolio, except for the VaR limit. Since external managers are restricted to fixed income investments and do not have a money market tranche, they have a larger VaR limit. Banco Central do Brasil receives daily transaction reports, monthly performance reports from the external managers and from the global custody agent and has periodic portfolio reviews with the managers.

Reference portfolio

261. The reference portfolio, as approved by the Board, is divided in three tranches: gold, emerging markets and core reserves. The core reserves tranche represents the large majority of the reserves, as the position in gold and emerging markets debt is less than 3 percent of total reserves. This tranche is denominated in three base currencies: the U.S.dollar, euro and Japanese yen and is divided between money market and fixed income portfolios. Allocation is 60 percent in the fixed income market and 40 percent in the money market.

262. The gold portfolio is divided in two portfolios: one located in Brazil and the other invested in short-term gold deposits in the international market.

263. The emerging markets portfolio is managed using “EMBI Brazil +” index as reference. Banco Central do Brasil is restricted to invest in Brazilian sovereign external debt bonds.

264. The money market portfolio has four tranches. A small one denominated working capital is fully invested in U.S. dollar overnight deposits. It has the purpose of controlling excessive volatility and providing liquidity for a sustainable domestic foreign exchange regime eventually. The other three portfolios are for each one of our benchmark currencies (U.S. dollar, euro and Japanese yen). The term of the deposits can go as long as 6 months, but the total duration of the money market portfolio is about 1 month. Eurodeposit is the reference instrument and LIBID is used as the reference index.

265. The fixed income portfolio is divided in two subportfolios, one based in U.S. dollar and the other in euro. The JPMorgan’s “1–3 years Government Bond Index” is the reference for each respective currency. Minimizing the probability of capital loss over a certain time horizon was one important aspect considered when choosing the 1–3 years index. The fixed income portfolio denominated in Japanese yen is, in fact, allocated in the euro and U.S. dollar portfolios, with currency hedge to Japanese yen.

266. Six external asset managers manage a small part of the reserves, about 3 percent. They have the same benchmark as our fixed income portfolio and similar guidelines. The main purpose of the program is know-how transfer.

267. Market indexes were chosen as references because they represent the industry standard, are replicable and have considerably liquid assets. In terms of performance, they make the comparison with other managers possible. Regarding maturity, the decision of using the 1–3 years index was made taking into account the risk/return trade-off, since it has a small probability of quarterly negative return.

268. All portfolios, except money market, are closed portfolios, that is, they have no inflows or outflows, except for coupon and amortization payments. In a normal situation, the money market portfolio absorbs all changes in the size of the external reserves. Portfolios are rebalanced on an annual basis to maintain the proportion between the fixed income and the money market portfolios and also the size of the emerging market portfolio.

269. Regarding the currency hedge, the core reserve replicates the currency distribution of the short-term sovereign external debt up to the amount of the core reserves. In order to implement this strategy, Banco Central do Brasil follows up the external debt currency composition on a daily basis. However, to avoid excessive turnover, the benchmark is rebalanced every time the external debt currency proportion differs by more than 2 percent from the reference portfolio.

Investment guidelines

270. Investment guidelines have been established for each aspect of risk management. To control market risk, a daily VaR limit is in place for deviations from the benchmark. It is enforced for the active strategies of the whole reserves. Intraday VaR calculation has not been implemented yet. Banco Central do Brasil does not use automatic stop loss techniques in monitoring market risk limits. In case of any breach of VaR limit, the Investment Policy Committee will meet to decide whether the positions should be kept or not. If the decision is that it is in order to maintain the positions, it must be submitted to the Board of Governors for approval.

271. In terms of liquidity and credit risk, there are different approaches to money market and fixed income portfolios. For the money market portfolio, the Board of Governors has established the following investment guidelines:

- Maximum expected and unexpected default probabilities for the actual portfolio deviation from the benchmark;
- Minimum rating limits of “A” and “P-1” for each counterpart, according to Moody’s;
- Maximum allocation per counterpart calculated as a percentage of the counterpart’s total assets, limited to a certain maximum amount per counterpart; and
- Three to six months maximum maturity depending on the institution’s rating.

272. For the fixed income portfolio, the restrictions are:

- List of permissible countries for investment in terms of sovereign debt. All of them must have a minimum rating of “A” according to Moody’s.
- Bonds issued by any country in a currency other than its own are submitted to additional restrictions in terms of rating; and
- Investments in “AAA” government sponsored agencies and in supranational debt are restricted to a maximum percentage of the fixed income portfolio.

273. There are also the following asset concentration limits:

- Maximum percentage of the total outstanding amount of any issue; and
- Maximum percentage of a single asset contribution to the total fixed income portfolio.

274. There are other limits like:

- Permissible financial instruments;
- Breakdown of gold reserves in Brazil and abroad;
- Size of the gold portfolio; and
- Size of the emerging market portfolio.

275. Options investments are not allowed, but, currency forwards and futures, interest rates and gold futures and swaps, commercial papers issued by financial institutions, CDs, CPs, repos and reverse repos can be used.

276. Risk and compliance areas are independent from the front office but not independent from active management decisions in the hierarchical structure; we overcome this problem by using a software function that automatically informs the Board of Governors of any breach of limit, at the same time that the compliance area receives the alarm. Afterwards a confirmation is delivered to guarantee that it was not a system or a human failure. On the same day, the portfolio managers have to explain the reasons for the occurrence to the Board.

Information system

277. Banco Central do Brasil uses a mainframe and a pc-based network system based on Windows NT/2000. The software was entirely developed in-house, except database management software. The mathematical and financial models were developed based on publicly available technical documentation, so there is no use of financial “turnkey systems”. The only inputs of the system are price data from data providers and transactions put into the system by traders. The software provides tools for:

- Risk management;
- Technical documentation;
- Performance measurement (including performance attribution models);
- Simulations;
- Compliance (comprising automatic limit controls);
- Back-office operations;
- SWIFT communication;
- Accounting; and
- Trade desk support.

278. The software was developed considering operational and research purposes using both the actual transactions database and the historical database to test new models. A large quantity of documentation, like BIS and IMF papers, research papers in general, system technical documents etc, is available on line. The software was also designed with audit in mind, having a full revisions control, auditable numbering sequences and a back-up procedure.

Implementing a new approach in reserves management

279. Reserves management in Banco Central do Brasil has changed dramatically over the past five years. Before 2000, the head of Depin and the trade desks could decide the overall profile of the reserves, since guidelines established by the Board were much generic, with no specific rules for performance measurement and an unclear role of each player in the decision-making process.

280. With the incidence of international financial scandals in the nineties, central banks in general became more aware of some risks that they were incurring and so, in 1997, Banco Central do Brasil introduced market risk calculations of the reserves based on the VaR concept (US\$). However, there was no type of operational limits. In the following years, the importance of risk management and a detailed benchmark to manage the reserves became increasingly clearer to Banco Central do Brasil. Studies were made considering common market management procedures and, as a consequence, a proposal was developed for a new framework in the time span of about one year.

281. In 2000, Banco Central do Brasil's Board of Governors approved a benchmark with clear guidelines and performance measurement procedures.

282. The main problems faced during the design and the implementation of the new reserves management concept and their solutions were:

- Natural resistance to changes in policy;
 - Time to absorb new concepts and to understand the advantages that would come from the new environment, like a clear performance evaluation procedure. From initial ideas to final development, the process took about five years. The main factors that contributed to this delay were international crisis and changes of the Banco Central do Brasil executive direction.
- Understanding the new roles in each part of the hierarchical structure;
 - It took several months of meetings, discussions and presentations to explain the role of each part of the hierarchy to overcome this problem.
- Steep learning curve for the staff to understand risk management, performance and performance attribution models;
 - Well-structured and intensive training program. The program is continuous and started back in 1996.
- Lack of an integrated computer platform;
 - Acquisition of a new networked hardware and basic software system (operational systems and other support software).
- Modifications of the compliance system with the new guidelines;
 - Adapt procedures to the new environment.
- Changes in accounting system related to the new kind of instruments allowed;
 - Adapt accounting system to the new instruments.
- Authorization and support to develop a software solution in-house;
 - Develop a sound design environment and full documentation of the proposal.

- Difficulties on getting a consistent asset pricing data, which is fundamental for the robustness of VaR calculations and performance measurement.
 - Creation of a new workgroup (area) to check and guarantee asset pricing consistency and new data providers.

283. However, there were some aspects that were essential for the successful design and implementation of the new framework for reserves management:

- Human resources with deep knowledge of finance, mathematics and computer science and previous experience in developing and managing software with large databases;
- Existence of an IT area in the International Operations Department—Depin;
- Necessary infrastructure resources to implement the system, such as computers, communication lines, data sources, etc; and
- Emphasis on training, including periodic visits to premier financial institutions and other central banks. In this case, our external asset management program was an invaluable tool.

284. The software architecture was structured in independent modules and it is fully upgradeable. This approach allowed a modular based development, i.e., each application module (e.g., market risk, credit risk, reference portfolio, performance attribution, etc.) was developed independently and connected to the system in a later phase. The kernel that was developed initially, supported basic portfolio management and had the main software functions encapsulated in a procedural environment.

285. The kernel and the modules of market risk, credit risk, reference portfolios and compliance were designed and developed in nine months, and another three months period was necessary for tests. The operations began in July 2001. Afterwards, other modules like operational risk, documentation and stress testing were included.

286. Improving the software system and the reserves management framework is an endless and continuous task as market practice keeps evolving in time.

287. Nowadays, Depin is focusing on improving stress tests procedures, performance attribution models, operational risks statistics and reference portfolio.

IV. CANADA

A. Introduction

288. In Canada, foreign reserves are owned by the government and managed by both the Bank of Canada and the Department of Finance. As of December 31, 2001, Canada held about US\$34 billion in total international reserves. Of that amount, about US\$30 billion (89 percent of total reserves) was held in liquid assets.¹⁹

289. These liquid reserves are held in a special account called the Exchange Fund Account (EFA) under the Minister of Finance's name at the Bank of Canada. The EFA is financed with foreign currency denominated liabilities issued by the Government of Canada. Liquid reserves and gold are actively managed by the Bank unlike other components of the reserves such as Special Drawing Rights (SDRs) and the reserve position at the IMF. This report will focus on the liquid assets of the reserves.

B. Governance and Institutional Framework

Reserve management objectives and scope

290. The objectives of reserve management are:

- to provide general foreign-currency liquidity for the government; and
- to provide funds to help promote orderly conditions in the Canadian dollar in the foreign exchange market.

291. The management of reserves has changed over the past 25 years, reflecting developments in financial markets. The government has increased the level of foreign reserves in recent years to reflect increased flows in foreign exchange markets and to bring its level of reserves more in line with other comparable sovereigns. This increase in turn has required the reserve managers to focus on asset-liability and risk management, and on reducing the cost-of-carry of these reserves while maintaining a high degree of liquidity and capital safety.

292. In order to meet these objectives, the liquid reserves are subdivided:

- A proportion of reserves is held in highly-liquid U.S. dollar-denominated assets to fund immediate foreign currency liquidity requirements and intervention activity.
- The remainder is held in a diversified portfolio of high-quality assets, denominated in U.S. dollars, euro and yen.

¹⁹ Liquid reserves consists of marketable securities and deposits denominated in U.S. dollar, Euro, and Yen.

293. Reserve management activities consist of the management of foreign currency assets and liabilities which includes the use of derivative financial instruments. Reserve management follows a well-coordinated Asset-Liability Management framework described later in the paper, while at the same time focusing on cost-of-carry minimization.

Institutional framework

Legal foundation

294. Canada's reserve assets are governed by the Currency Act, which serves as the legal framework for EFA asset management and investment operations. The Minister of Finance approves policies for managing the EFA, mainly through a set of investment guidelines. The liabilities that fund the EFA are governed by the Financial Administration Act.

Internal governance

295. The responsibility for the management of the EFA is jointly shared by the Department of Finance and the Bank of Canada while the management policies are set by the Minister of Finance. The Bank of Canada, acting as a fiscal agent, administers and effects transactions for the Account on behalf of the Minister of Finance.

296. The Director of the Financial Markets Division at the Department of Finance and the Chief of the Financial Markets Department at the Bank of Canada are responsible for the ongoing management of the EFA. A Policy Committee, which is composed of senior officials from the Department of Finance and the Bank of Canada, meets semi-annually to review developments and major policy initiatives, and provide guidance and accountability on the management of the Account. The Risk Management Committee (RMC), which consists of managers from the Department of Finance and the Bank of Canada including two members with no connection to the operations of the EFA, meets quarterly to advise on the management of risk related to the government's debt program, including the foreign exchange reserves.

297. The responsibilities for the day-to-day portfolio management and strategy implementation of the EFA rests with the staff of the Foreign Reserves Management Team at the Bank. The Risk Management Unit (RMU) at the Bank oversees and manages the risks associated with the EFA.

Transparency and accountability of reserve management and benchmarking

298. *Reporting* in a regular and timely manner is a key element of Canada's reserve management policy. The Minister of Finance provides an Annual Report²⁰ to Parliament on

²⁰ In addition, the Department of Finance publishes an annual Debt Management Report and Debt Management Strategy Report which provide an overview of foreign reserve management operations.

the operations of the EFA for each calendar year within five months after the expiration of that calendar year, and this report is available publicly (see bibliography). The EFA Annual Report also includes the result of *annual audit* of the EFA conducted by the Auditor General of Canada. In addition, periodic review by external third party experts is undertaken, and the results of such reviews are shared with the government.

299. The EFA's current asset management *benchmark*, in the context of *asset-liability management* detailed later in the paper, is the government's foreign currency liabilities. The cost-of-carry is currently used as a performance measure for the EFA, and is disclosed in the EFA Annual Report. Additional benchmarking approaches are also currently under study.

300. Internally, the RMU provides daily reports on the EFA risk position to trading staff, and monthly and quarterly reports to the RMC and the Bank's senior management.

301. Since July 1999, Canada has reported its disaggregated reserves position on a weekly basis.²¹ This *disclosure* of reserve positions is achieved by means of the Bank's web site on the first business day following the 8th, 15th and 23rd of each month. On the third business day following month-end, a more comprehensive breakdown of Canada's reserve position is published by the Department of Finance.

302. In addition, *documentation* of the chain of authority, decision making and delegation in reserve management has been made public through Bank of Canada Review articles.²²

C. Establishing a Capacity to Assess and Manage Risk

Risk management

303. The goal of risk management is to balance risk and return. In 1997, the Bank and the Department of Finance jointly established a RMU to oversee the risk position of the government of Canada.

Strategy for managing risks

304. The EFA is exposed to various types of risk such as credit risk, market risk, liquidity risk, operational risk and legal risk. The government's risk management strategy is to recognize, measure and manage each type of risk individually as well as collectively.

305. The RMU manages EFA risk in three steps:

²¹ Canada was one of the first countries to fully meet the requirements of the IMF's and G-10's new format for presentation of international reserves data.

²² See De Leon, J. 2000-2001, and Rochette, M. 2001-2002.

- Identifies, analyses, evaluates and models the risks;
- Advises on guidelines to limit the risks; and
- Ensures day-to-day adherence to the guidelines, while periodically proposing new risk control mechanisms.

Credit Risk

306. To control credit risk, the RMU currently uses an approach based on the BIS 1988 Basel Accord and subsequent amendments, whereby all exposures are risk-weighted according to entity type. In addition, the RMU has adopted the BIS Accord “add on” approach to calculating potential exposure on derivative transactions. Credit risk is managed through diversification of the EFA asset portfolio, with appropriate use of credit ratings, counterparty limits, netting agreements and collateral support.

Market Risk

307. To limit market risk, the government follows an asset-liability management framework whereby foreign reserves are managed so that assets match liabilities in currency and duration. Over the long run, EFA assets and liabilities are expected to be held in approximately equal market values, thus keeping the Account balanced. Assets match liabilities for the euro and Japanese yen-denominated reserves. At present, U.S. dollar liabilities exceed U.S. dollar assets, largely due to foreign exchange intervention and commitments made to the IMF in 1998. This imbalance has been reduced through a program of U.S. dollar acquisition in foreign exchange markets, and the plan is to eliminate the mismatch over the next year. In order to minimize the impact of any mismatches, the “excess” U.S. dollar liabilities are concentrated at the short end of the yield curve.

308. In addition, two types of forward-looking techniques, namely “*stress test scenario analysis*” and “*sensitivity stress testing*”, are conducted. 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.²³ These scenarios are explicitly defined and reported on a monthly basis.

Liquidity risk

309. Various policies are implemented to limit liquidity risks. These policies require that no more than 10 percent of any single issue be held in the EFA, and that the issue size be a minimum of US\$500 million. Furthermore, the securities of any one issuer cannot exceed 10 percent of EFA liquid assets, except for “home currency” bonds issued by AAA sovereigns and their directly guaranteed agencies. As well, no more than 15 percent of the

²³ Bank for International Settlements, 2001, *A survey of stress tests and current practice at major financial institutions* (April).

EFA's liquid assets can be in investments that cannot be sold or redeemed prior to maturity (i.e., non-marketable securities and fixed-term deposits).

310. In addition, to limit rollover risk, EFA liabilities which mature within any 12-month period cannot exceed one-third of EFA assets. Finally, other means of raising liquidity include a short-term U.S. dollar commercial paper program (Canada Bills), and holdings of highly liquid U.S. dollar, euro and yen securities.

Operational risk

311. To control operational risk, the RMU uses a "bottom-up" method which is consistent with the concept of total quality management. It starts from examining the different aspects of operations performed by the organization and then maps the process.

312. Sound operational risk management also requires *qualified staff* and *adequate management information systems*. In the case of EFA, the RMU analyses operational processes and establishes controls that are regularly reviewed. Although the RMU is not directly involved in personnel management, the bank has a human resources strategy to maintain a competitive compensation structure with abundant training and learning opportunities. It also offers various flexible working hour agreements. The Bank is also currently improving its operational processes and implementing relevant technological applications such as a new integrated straight-through processing system.

Legal risk

313. 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.

Currency composition and eligible investment instruments

314. There are restrictions on the *EFA's currency composition* and the *types of eligible investment instruments* to control overall risk. The EFA's eligible currencies are the U.S. dollar, euro, and yen. The EFA portfolio must be composed of a minimum of 50 percent U.S. dollars with the rest allocated in euro and Japanese yen according to the funding and investment opportunities in each currency. This currency composition reflects the important role of the U.S. dollar as a reserve currency, and the fact that intervention in support of the Canadian dollar has been historically undertaken through the U.S. dollar.

315. The Currency Act allows the EFA to transact in foreign exchange on a spot and forward basis, and to invest in deposits of supranational organizations and financial institutions, and securities issued by sovereigns and their agencies. It also allows the EFA to lend any of the eligible instruments, and enter into derivative transactions based on any of the eligible instruments. In addition, the government is moving toward more extensive use of

collateral in its reserve management operations to protect against current and potential credit exposure.

Use of Derivatives

316. Among the eligible derivatives mentioned earlier, the government of Canada has made extensive use of long-term interest rate and currency swaps since 1984–85. The government uses these swap agreements to obtain cost-effective financing, to fund the foreign exchange reserves, and to permit flexibility in managing liabilities. For example, cross currency swaps are currently used to convert Canadian-dollar-denominated fixed-rate debt into euro and U.S. dollar fixed-rate liabilities. In addition, short-term currency forwards and gold options have been used by the EFA.

External managers

317. The government uses external securities lending managers to manage a securities lending program for a portion of its U.S. dollar-denominated securities. Formal agreements are signed between Canada and the external managers. The 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 type of borrowers, eligible collateral, and investment of cash collateral. The external managers are required to submit reports, on a monthly basis and upon request, describing details of the loans and investments. Currently, there are two external managers.

Recent trend with respect to reserve management

318. Consistent with best practices in risk management in recent years, the government has been moving toward making more extensive use of collateral to reduce credit risk exposure in its foreign reserve operations.

319. This year, the government has put in place a collateral management framework for the government's derivative counterparties. Canada's collateral management system requires counterparties to put up collateral to the government when credit exposure on swaps and forwards exceeds given levels. An external firm is being used to manage securities posted as collateral to the government. In 2002, the government will also be moving a large proportion of its uncollateralized short-term U.S. dollar deposit investments to collateralized repurchase agreements.

D. Reserve Management Operations in Deep and Liquid Markets

320. Canada's reserve management operations are undertaken in the most efficient and liquid markets in the world, i.e., the U.S., Japanese and European markets. Foreign currency borrowing that finances the EFA's reserves is also conducted so as to maintain Canada's reputation as a "successful borrower" in international capital markets.

321. Continued access to these capital markets is facilitated by ensuring that Canada has the necessary legal documentation in place to allow reserve managers to raise funds in a variety of markets and jurisdictions.

V. CHILE

A. Developing a Sound Governance and Institutional Framework

Reserve management objectives and coordination

322. The mission of the Central Bank of Chile (CBCh) is to safeguard the stability of the local currency and the normal functioning of internal and external payments. International reserves provide the CBCh with one of the policy instruments that it has in order to attain its mission. Within the monetary policy framework based on inflation targeting and a floating exchange rate that it has embraced, the CBCh intervenes in the foreign exchange market in exceptional and qualified circumstances. In addition, the Treasury and private banks are allowed to maintain foreign currency deposits at the central bank.

323. In this context, the basic goals of reserve management are to maintain an appropriate level of liquidity in foreign currency and to protect the value and safety of investments. Subject to constraints derived from the above goals, reserves are managed to obtain maximum return.

324. For liquidity purposes, the CBCh holds a Cash Portfolio in order to meet any intervention needs and also to handle deposits and withdrawals from foreign currency accounts held by the Government Treasury, other public institutions (like Codelco and Banco Estado de Chile), and private banks at the central bank. Regarding foreign exchange interventions, on September 2, 1999, the CBCh announced a free float of its currency.

325. For the remaining balance of reserves not directly devoted to meeting liquidity needs, the following factors are taken into account in determining the way they are managed:

- The CBCh's foreign debt composition. The CBCh aims to replicate the currency composition and duration of its debt. In this category, any debt denominated in local currency but linked to a foreign currency is also considered.
- The currency composition of liabilities (private and public), in order to back the payment of capital and interest of debt due within twelve months.
- The currency composition of trade imbalances, in order to finance any trade deficits in the event that access to the international credit markets is limited.
- Risks and financial considerations.

326. In considering all of the above aspects, the reserves of the CBCh from an asset management perspective, can be defined as a multi-currency portfolio invested in products ranging from overnight deposits to bullet bonds with maturities up to thirty years, issued by prime rated countries, agencies and financial institutions.

327. A small percentage of the reserves are held under the management of external asset managers. This program was started in 1996 as a way to have an additional and real

benchmark for comparison and to gain further knowledge of markets and instruments. The asset management program will probably be extended during 2003 to create an externally-managed portfolio of mortgage-backed securities.

328. The CBCh manages its international reserves and foreign exchange rate policy, and does not take responsibility for the management of other public funds. Other public institutions are able, nevertheless, to establish time deposits with the CBCh and to maintain current accounts with the Bank as previously mentioned. No special coordination efforts between the CBCh and such public institutions are needed to service said accounts. In fact they are treated as normal liabilities of the CBCh, just as the ones held by commercial banks.

The institutional framework

329. The Constitutional Organic Act of The Central Bank of Chile; Law N^o 18,840 of October 10, 1989, establishes that the Central Bank of Chile is an autonomous entity, in terms of the decisions it takes and in terms of the ownership of its capital. The Law establishes explicitly its ability to manage, hold, and dispose of its international reserves.

330. At the central bank, there is a clear setup and separation of responsibilities, which is reflected in the organizational chart attached in Annex I.

331. The decision-making process at different levels of the organization is also clearly defined.

Board level

332. The CBCh's Board defines the main reserve management objectives and approves the investment parameters articulated in the investment policy guidelines of the central bank.

Division level

333. Acting on behalf of the CBCh's Board, and under a scheme of delegated responsibilities, the Director of the International Division reviews and approves the quarterly investment strategies with a medium to long-term perspective, and monitors tactical and strategic decisions made at lower levels of the organization.

Management level

334. The Investment Manager reviews the strategies designed by the Front Desk and proposes, to the Director of the International Division, the optimal way to implement them. Additionally, the Investment Manager and the Front Desk may develop and implement tactics that could deviate from the original plan and/or the benchmark, in order to extract value with short-term views on market developments.

Operational level

335. The International Money Desk Department; (The Front Desk): Here the Head of the Money Desk and Portfolio Managers design the quarterly investment strategies and implement the decisions approved at the upper levels of the organization. Using financial tools and techniques, they decide the timing and the security selection in order to achieve the strategic, and at times, tactical allocations.

336. International Treasury Department; (The Back Office): The Treasury Department completes and processes the transactions made by the portfolio managers. This department interacts with the internal accounting systems and sends confirmation messages to all the parties involved. It should be noted that no single transaction can be completed without the authorized signatures of both a portfolio manager and a senior member of the Treasury Department. This department, among other things, also ensures that the Front Desk's operations comply with internal investment guidelines. This task is carried out by the Operation and Control Unit of the department.

337. Performance and Risk Measurement Department; (Middle Office): This department reports directly to the Director of the International Division. The Middle Office calculates risk parameters and measures the performance of the portfolio absolute terms and relative to the benchmark.

Transparency and accountability

338. The Law clearly states the CBCh's mandate, powers and accountability. At least three times a year, the CBCh's Board meets with the Finance Committee of the Senate, and once a year with the plenary of the Senate, to present the state and prospects of the economy and the actions taken by the CBCh to achieve its main objectives. It also prepares audited annual reports, which are available to the public.

339. The CBCh releases periodic disclosures of the reserves' accounting value on a by-weekly basis. It also adheres to the Special Data Dissemination Standard of the IMF. Therefore on a monthly basis (with a time lag), the central bank reports the level of international reserves and foreign currency liquidity, and discloses the end-of-year value of the reserves in its annual report. In the annual report, an accounting measure of the absolute return of the investments is presented and measured in local currency terms. There is also analysis of the composition of returns, i.e., those derived from interest and capital gains and those attributed to variations in the value of the local currency vis-à-vis foreign currencies.

340. The information disclosed about reserve management, such as internal governance procedures and specific investment policies, is regularly under review. In the 2001 Annual Report, new paragraphs were added that describe the way the CBCh achieves the liquidity goal of reserve management. These paragraphs list the types of financial instruments

in which reserves are invested and the composition of reserves at year-end (showing the percentage of reserves allocated to two broad categories: bank (time deposits) and fixed income instruments). In the same section of the Report, there is also a discussion of how the CBCh controls credit, market and operational risks and protects the value and safety of the investments. In order to control credit risk, minimum credit ratings for countries and counterparties are specified. Market risk is managed by diversifying the portfolio of investments among different currencies, instruments and terms to maturity. Market risk is also measured and controlled by calculating the duration and Value-at-Risk (VaR) of the reserves (the year-end duration and VaR are presented), and operational risks are controlled by a clear separation of functions, responsibilities and internal controls.

341. The central bank also fully discloses reserve management goals and counterparty transaction rules to market participants. The selection criteria, for both the countries and the counterparties, are objective:

- Country Criteria: Long-term credit risk rating, debt level of the country and the relative size of the country measured by its Gross Domestic Product.
- Commercial Banks: Long-term credit risk rating and size of the institution measured by its equity.
- Counterparties: Primary dealers and brokerage houses that have their own credit rating within the ranges required by the central bank, or those that are at least 90 percent owned by approved commercial banks.

Internal reporting

342. There are different levels of reporting at the CBCh:

- On a monthly basis, the International Division reports to the Board the absolute and relative performance of the internally- and externally-managed portfolios compared to their benchmark. These reports also contain different risk measurements, such as duration and Value-at-Risk.
- On a semi-annual basis, the International Division reports to the Board the list of issuers and counterparties used in the management of reserves during the reporting period.
- Annually, the International Division reviews the soundness of the current benchmark, and proposes changes if deemed appropriate.
- The Front Desk and the Investment Manager report their operations to the Division Manager in a weekly meeting. This meeting is also used to report credit risk news that may affect margins and eligibility of either countries and/or counterparties (reported by the middle office) and to decide on specific issues related to the implementation of the investment strategies. For example, there may be a decision to change the timing for a certain investment allocation, or if there are new market developments, there may be a decision to make a tactical deviation from the original plan and/or benchmark.

Auditing

343. Different agents constantly audit the management of the reserves:

- On an annual basis, there is an audit by an established independent auditing company, whose observations are included in the central bank's annual report.
- Internal independent auditors, who do not report to the Director of the International Division, conduct internal audits at least three times a year. The audit process covers all aspects of reserve management, from compliance with the guidelines to broad recommendations about different aspects of the investment process and operations, such as the auditing of the securities lending programs, the physical security inside the dealing room and the treasury department, etc.
- Independent internal auditors, who report directly to the central bank's Board, also continuously monitor compliance with investment guidelines and the nature of accounting profits and losses. This monitoring process is done on a remote basis through the use of the central bank's accounting system, which is managed by a separate group, the Management and Development Division.

344. The Operation and Control Unit is part of the Treasury Department and reports to the Head of the Department and to the Investment Manager. This unit is responsible for checking the portfolio managers' daily compliance with investment guidelines. These checks look for compliance on standard procedures related to financial transactions (such as ensuring that the obtained prices were in line with market levels), issuers, counterparts, and margins. This unit is also responsible for monitoring external asset managers, the securities lending programs and custodian services.

B. Establishing a Capacity to Assess and Manage Risks

Policy guidelines

345. Risk management forms an integral part of the CBCh's broad policy guidelines for investments. For instance, one of the main objectives of the policy guidelines is to first define the playing field for the investment decisions. The central bank's Board defines these guidelines and then delegates the responsibility for implementing them to the International Division. These guidelines implicitly incorporate the main objectives of the reserve management and therefore represent the investment philosophy of the fund. This overriding philosophy takes form in the ranges and limits imposed on different types of investments.

346. The policy guidelines can be categorized into the following groups:

Foreign currency exposure/composition

347. There are guidelines governing which foreign currencies can be held, their amounts (expressed as a percent of the total portfolio), and margins of deviation from these amounts. The criteria for choosing the currency composition, which was previously presented, takes into account the hedging needs for covering the liabilities of the CBCh, the country's trade deficit, any short-term external debt servicing needs and financial considerations derived from the use of financial optimization models. The reserve portfolio has four main currency blocs (U.S. dollar, euro, pound sterling, and Japanese yen) and minor currencies, subject to additional holding restrictions i.e., exposure limits, which are associated with the main currencies. The process of association of the minor currencies to the main ones rests on the correlation of the historical returns.

Credit exposure

348. We define three main sources of credit exposure:

Bank Risk

349. Bank exposure, which takes the form of time deposits, current accounts, certificates of deposits, and foreign exchange operations, is managed in two ways:

- The maximum authorized amount of global bank risk is limited to a specific percent of total reserve assets.
- There are also limits on the time-to-maturity and amount of investment exposure the Bank can have with any single banking institution. To meet the criteria for counterparty eligibility, banks also must comply with minimum size requirements (measured by its equity) and have a certain long-term debt credit rating.

Sovereign and Supranational

350. As previously mentioned, the country risk eligibility depends on the relative size of the country, the level of public debt and its long-term debt credit rating. Individual maximum exposures are assigned to each country. The supranational exposure is subject to a global maximum limit, while the individual amounts depend on the credit rating of each agency and its size measured by its equity.

Counterparty Risk

351. The eligibility of counterparties is also subject to objective parameters. Primary dealers as well as brokerage houses with approved credit ratings, and 90 percent owned subsidiaries of eligible banking institutions. are eligible to be the central bank's counterparties,

Definition of sub-portfolios

352. According to the degree of immediacy that the funds may be needed, i.e., depending on how transitory or permanent the funds are²⁴ we have defined three sub-portfolios:

- **The Cash Management or Liquidity Portfolio:** It consists of over-night and week-end deposits, and is the preferred source of liquidity to face daily demand stemming from withdrawals from accounts held by public and/or commercial banks. The liquidity portfolio can receive/transfer funds from and to a second portfolio (short-term investment portfolio) when its balance is too low or too high.
- **The Short-Term Investment Portfolio (Buffer Portfolio):** Acting as a buffer for liquidity purposes, this portfolio may receive/transfer funds from and to the liquidity portfolio. It is invested in bank deposits and money market instruments, ranging from a week- to twelve month maturity.
- **The Long-Term Investment Portfolio:** Invested in medium to long-term instruments, including nominal bullet bonds and inflation protected securities (US TIP's) with maturities ranging from one year to thirty years. Transfers of funds from the long-term portfolio to the short-term one (and vice versa) are mainly due to financial considerations, although at times it has to absorb excess liquidity or meet liquidity shortages.

353. In general, the strategic investments in and between short- and long-term portfolios are subject to an investment review, which is done at least on a quarterly basis. The resulting investment strategy is based on external forecasts and our expectations of future domestic and foreign financial market developments. The general macroeconomic scenario is provided by the International Analysis Department while the International Money Desk (front desk) forecasts future yield curves and rates of return (the financial scenario). These scenarios and expected values are presented and discussed at meetings chaired by the Director of the International Division and attended by senior staff of the area, in order to achieve a consensus view at the Division level.

354. The expected rates of returns for three- and twelve- month horizons are fed into an optimization model, the results are analyzed and then adjusted according to the market experience of our officials. That is particularly the case when using standard, although imperfect, mathematical models that do not take into account the costs of adjustments, and

²⁴ Jennifer Johnson-Calari. "Risk Management at The World Bank: Global Liquidity Portfolios", Risk Management for Central Bankers. Central Banking Publications. Defines the liquidity requirements as stable, discretionary and operational.

may recommend allocations that are too aggressive or too concentrated in a limited number of assets.

355. The composition of the benchmark for comparison purposes comes from the output of a historical standard mean-variance optimization model, which is subject to a number of ad hoc constraints reflecting the risk-return profile of the central bank. For example, there is a constraint limiting the percentage of assets allocated to maturities greater than three years. This constraint is designed to limit the duration or the market sensitivity of the overall portfolio, thereby preserving the capital of the fund.

356. The reserve benchmark is a tailor made combination of internationally-known indices. For example, we use BIS' six month Fix Bis index for the short-term portfolio associated with the short-term sovereign and supranational investments, a Libid index for the banking investments, and sector indices of the JPMorgan Chase global index for the bond portfolios. There is a similar index for each main currency of the portfolio.

357. As mentioned, investment and allocation strategies for the portfolio are reviewed at least on a quarterly basis, but sudden market moves can make the portfolio managers take a position that goes in a different direction than the one recommended by the current strategy. These actions are previously approved by the Investment Manager and communicated to the Director of the Division. By how much can portfolio managers deviate, and what is the net effect of those particular actions are issues that the Division is currently addressing. The Division is also making efforts to better identify the attribution and composition of returns of the overall portfolio.

Risk management framework

358. Risk management is approached in four different ways or instances:

Financial Risks (Ex-ante Measurement)

359. The primary indicator of financial risk is the portfolio's duration. For the short- and long-term portfolios, as well as for the overall portfolio (excluding the liquidity portfolio), there are duration benchmarks and pre-defined margins of deviation from these benchmarks. On an ex-ante basis and as unofficial calculations, the portfolio managers calculate the duration, VaR and tracking errors associated with the strategy for the investment of the reserves. All day-to-day operations and reports of the front and back office are prepared using internally developed systems that are able to interact with the general accounting system of the central bank and with the Swift system for international messages. From the moment a portfolio manager closes a trade, approximately 90 percent of the steps needed to complete the transaction are automated. There are still some activities that can be automated. For example, the manual entering of each transaction by back office personnel could be replaced by an automated system, where the portfolio managers directly enter trades into the system. This system upgrade would save time and lower the risk of clerical mistakes. The financial calculations are done using mainly Bloomberg and RiskMetrics.

Financial Risks (Ex-post Measurement)

360. The official calculation of different portfolios' durations is the responsibility of the middle office. This calculation is presented to the investment officials twice a month, at the time of the weekly meetings chaired by the Division Manager. As a recent development, the middle office is also calculating the VaR (absolute and relative) of the portfolio, which is analyzed every week at the weekly meetings. An internally developed system is used for the calculation of the duration of the portfolio, and RiskMetrics is used to compute the VaR parameter.

Credit risk

361. The middle office is responsible for monitoring this type of risk. This unit monitors changes in credit ratings and names due to the ever-evolving processes of mergers and acquisitions of banks. According to the changes, the list of approved banking institutions varies, either incorporating new names, taking out others, and by changing the maximum individual amounts and maturity of investments with each bank.

Operational risks

362. The Operation and Control Unit, which is part of the International Treasury Department, monitors operational risk by checking compliance with the guidelines, in terms of exposure to institutions, approved names and locations of subsidiaries, margins and internal operational procedures established for financial transactions. The control conducted by this unit is mainly manual and done on a spot check basis over a random sample of operations. Because no software system has been developed yet and because these activities also apply to the external asset managers, there is a considerable workload in regard to the management of operational risk, and a related need for automated processes.

Performance evaluation

363. The official performance calculation done for internal purposes is the responsibility of the middle office. They issue a monthly report with a time lag that contains the accounting and marked-to-market returns of the investment portfolios managed internally and externally. An extensive effort has been made to reduce the time lag between the reporting date and the month that is being reported. The performance report includes the monthly return and rolling twelve-month returns for all the portfolios and managers (internal and external asset managers), and ranks managers by their performance. There is also a discussion of other topics such as the duration of the portfolio, VaR, and financial developments during the reporting period.

Recent developments

364. In this section we highlight the most relevant developments and actions taken by the area:

Range of Products

365. In an effort to increase the returns on reserves, the CBCh is about to expand the range of products eligible for investment. This project specifically is considering the incorporation of U.S. Agencies (GSE's), German Pfandbriefs and mortgage-backed securities.

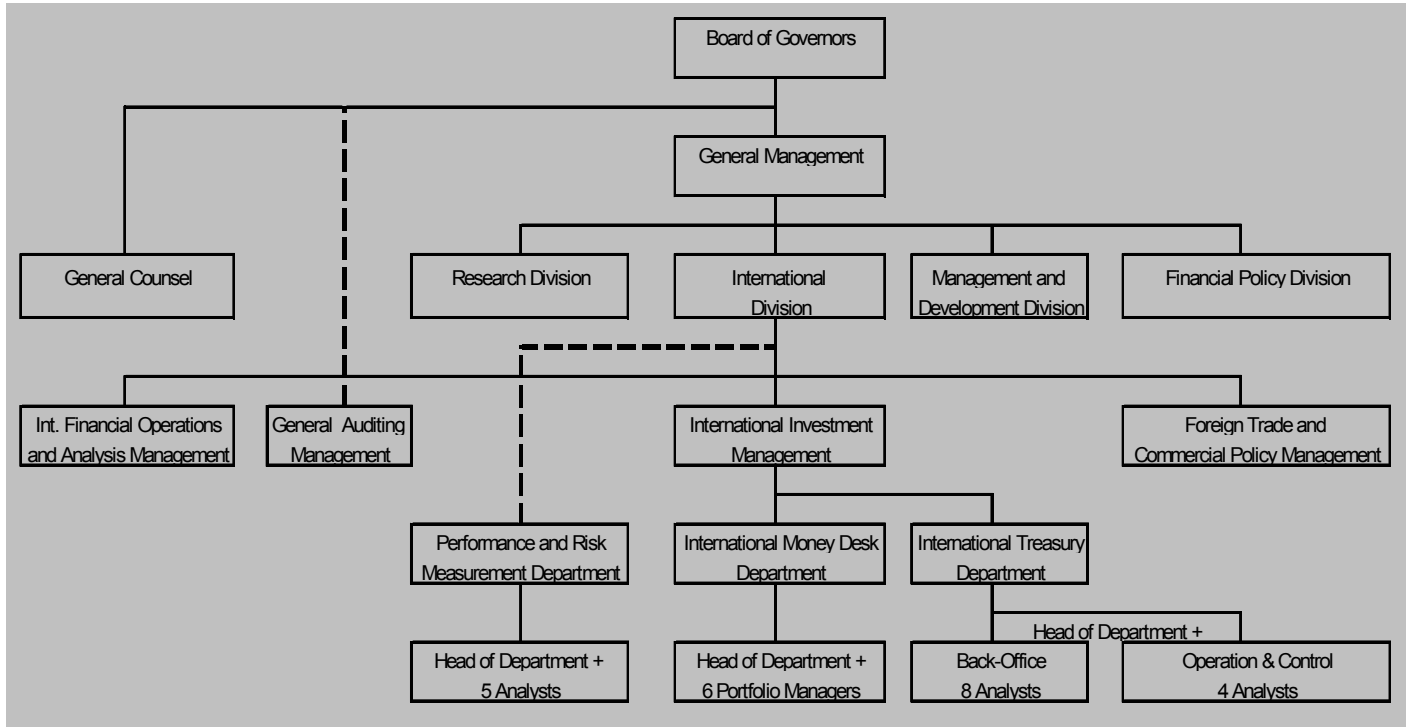
Securities Lending

366. Yield enhancing activities such as a U.S. dollar securities lending program have been in place since July 20, 1998. The program was subsequently extended to euro-denominated notes and bonds on May 10, 2000, to the portfolios held by the external asset managers on April 9, 2001 and to the portfolio of assets held in pound sterling on October 26, 2001.

External Consulting

367. Another interesting initiative that we recently began was to rely on external consultants for advice and recommendations to the entire investment area. This is a requirement of the CBCh's Board, and so far, two external consultancies have been used in the last four years. They have been helpful in ensuring soundness of actual procedures within the area and to identify areas where improvements could be made. The creation of the Operation and Control Unit in 1999 is one of the results of these external consultancies, as well as some of the current observations to our area that are actually included in this document. The external consultants were senior staff members of prestigious institutions in the reserve management arena. Through these exchanges the investment area has the opportunity to learn from the experience of more developed operations, and from central banks partners (or supranational institutions) that do not view consulting as a business, but rather as a collaborating effort aimed at developing institutions with similar goals and levels of capacity.

**Annex I: Organizational Chart;
The Central Bank of Chile and the International Division Area.**



VI. COLOMBIA

A. Introduction

368. In 1997 the Banco de la República (BR), Colombia's central bank developed a long-term strategic project designed to manage the international foreign exchange reserves of the country in the most efficient manner given the stated objectives for holding reserves in line with the highest international standards and practices. This ambitious project, which is reviewed periodically, has led to significant changes in the organizational structure, the decision making process, the human resource policy, the technological platform, the risk control procedures, as well as the reserve management policies.

B. Governance and Institutional Framework

Reserve management objectives, scope, and coordination

Objectives

369. Reserve management seeks to maintain an adequate level of assets denominated in convertible foreign currencies readily available to meet a defined range of objectives for holding reserves in the most efficient manner. In order to understand reserve management policy in the case of the BR, it is important then to first identify its objectives for holding reserves.

370. There are three reasons for holding reserves: (i) for transactional purposes, to support trade in an open economy; (ii) for precautionary motives, associated with potential balance of payments crises; and (iii) as collateral, to improve a country's access to the international capital markets via maintaining sound foreign exchange liquidity policies. The first two motives have traditionally had strong theoretical support, whereas the last motive has been referred to in the literature only recently.

371. Before the 1990s, the main objective of reserves used to be the transactional motive, for which reserve adequacy was set in terms of the months of imports required to support its trade related operations. The reserve adequacy objective also took into account the fact that the country was under a crawling peg foreign exchange system and had a low exposure to capital outflows due to restrictive regulation. During recent years, the BR has reviewed its reserve adequacy objective in the light of the following: (i) the deregulation that has taken place during the last decade; (ii) empirical evidence of the growing impact of contagion in developing nations; and (iii) a review of the relative importance of sound liquidity policies in the country's overall credit worthiness.

372. On the domestic front, three main developments had an important impact on the reserve adequacy objective. In 1991, Congress approved Law 09 by which the foreign exchange market was deregulated in order to encourage foreign direct investment and facilitate trade-related operations. In the same year, the crawling peg was gradually replaced

by a currency band system, and in 1999, a free float exchange regime was introduced.²⁵ Finally, the traditional sources of funding for public debt in the international markets via syndicated loans were replaced by the issuance of bonds in the international capital markets, and the private sector's exposure to external indebtedness increased.

373. During the same time period, the Mexican, Asian and the Russian/LTCM crises highlighted the vulnerability of developing countries to contagion. Based on empirical evidence of the impact of such crises in developing nations with sufficient but limited access to the international capital markets, Bussiere and Mulder (1999) concluded that countries that maintained during this period a ratio of at least 1 in the reserves/short-term debt indicator were less vulnerable to contagion, even in conditions of slight misalignments in their current account and real exchange rates.²⁶ For larger misalignments in these variables, the authors recommended a higher reserve adequacy objective to a point where basically the level of reserves alone would be insufficient to deter a crisis.

374. Furthermore, the motive for holding reserves as a collateral is emphasized by the fact that the international capital markets use the Bussiere and Mulder indicator as a yardstick to measure appropriate liquidity levels, an important variable in the country risk models that determine a country's credit worthiness and the cost of its access to international capital markets.

375. As a result of this evaluation, the central bank adopted as the minimum reserve adequacy objective the expected value of one year's public and private residual debt payments and amortizations due, plus a provision for current account deficits that can range from zero to the standard deviation of the long-term component of the current account, given that the country has a tendency to run current account deficits.²⁷ The inclusion in the reserve adequacy objective of real exchange rate misalignments is under study.

Implications on reserve management

376. The changes that took place in the determination of the reserve adequacy objective of the BR had three important implications on reserve management policy.

377. The amount of reserves invested to cover immediate liquidity requirements in a Working Capital liquidity bucket was significantly lowered from almost 90 percent of total

²⁵ In 1991, the central bank defined target zones within which the market determined the exchange rate, at first through the issuance of exchange certificates until 1994.

²⁶ Matthieu Bussiere and Christian Mulder, "External Vulnerability in Emerging Market Economies: How High Liquidity Can Offset Weak Fundamentals and the Effects of Contagion", IMF Working Paper, WP/99/88, July 1999.

²⁷ The Economic Research Department using the Hodrick-Prescott methodology estimated long-term component of the current account and volatility.

reserves before 1994 to 5 percent, given that under a free float exchange rate regime the probability of recurrent intervention decreased.

378. In order to lower the opportunity cost of maintaining reserves for precautionary and collateral purposes, two additional liquidity buckets were defined with investment guidelines that are consistent with their expected investment horizon. These were the Intermediate Liquidity bucket to cover potential intervention requirements over a one-year period and the Stable Liquidity bucket for such funds with the lowest probability of being used over a one year period.

379. As the higher return objectives for the new liquidity buckets implied additional risks, the central bank committed resources for the enhancement of its risk control capabilities and delegated the management of the Stable Liquidity bucket to specialized asset managers.

380. A more detailed description of the criteria used by the BR to determine the size of each liquidity bucket, its liquidity policies, its investment guidelines and its risk management capabilities is provided in Section D.

Scope

381. The scope of reserve management is limited to those assets denominated in convertible currencies that are readily available and are under the control of the central bank to meet its objectives, including claims in the derivatives market used to hedge currency and interest rate exposures. The BR also manages the liabilities it acquires for the sole purpose of supporting the liquidity of reserves. However, it does not manage the liabilities of the central government, which are under the control of the Ministry of Finance (MOF).

Coordination and strategy

382. The key elements that influence current reserve management policy are the country's transition to a free float exchange system, characterized by a rapid process of deregulation in its exchange/capital controls, and its increasing dependency on the international capital markets for financing. The maintenance of a high level of foreign exchange reserves in order to reduce the impact on the country to contagion is also deemed to be a very important element in setting reserve management policy.

383. The BR does not use the purchase or sale of reserve assets against domestic currency as an instrument of monetary policy. It determines the value of reserves in accordance with the desired reserve adequacy level, for which monetary effects that are derived from changes in the level of reserves are sterilized, if necessary through open market operations in order to keep the monetary base within the ranges defined by the BR's Board of Governors.

384. On exchange rate policy, the central bank is committed not to influence the exchange rate, unless it is to maintain an orderly market in extreme volatility conditions for which it auctions volatility options to the market whenever the exchange rate is above or below 4 percent of its 20-day moving average. The BR at its discretion may also tender options to

accumulate or sell reserves to adjust its reserve adequacy objectives. Any changes in the policy of intervention triggers a review of the central bank's liquidity and investment policies.

385. On the fiscal front, there is no clear link between reserve management and debt management as each pursues different investment objectives. Nevertheless, at a macro level there is a close coordination between the MOF and the central bank Board of Governors in order to ensure the sustainability of fiscal policy and the maintenance of adequate liquidity levels.

Transparency and accountability

386. The BR's mandate that supports its management of the country's foreign exchange reserves is defined in the political constitution of Colombia and in Law 31 of 1992.

387. Chapter 6, Article 371, of the political constitution of Colombia determines that the central bank "...will be organized as a public legal body with administrative, patrimonial and technical autonomy, subject to its own legal regime". Among the functions that the Constitution assigns to the central bank is the administration of the foreign exchange reserves and the requirement that it should inform Congress periodically on the performance of its different responsibilities, including reserve management.

388. The Law 31 of 1992 Chapter IV further elaborates on the mandate the central bank has in the management of the foreign exchange reserves in the following way: "The Board of Directors of Banco de la República will administer the foreign exchange reserves in conformity with public interest, to benefit the national economy and with the objective of facilitating the external payments of the country. Its administration involves the management, investment, custody and disposition of reserve assets. Reserve assets will be invested subject to criteria of security, liquidity and return in assets denominated in freely convertible currencies or gold". Furthermore, the Law permits the BR to constitute capital subscriptions with international multilateral institutions, so long as such subscriptions can also be considered reserve assets; it cannot grant loans on account of the international reserves; it is allowed to open margin accounts to enable it to execute operations in the derivatives markets for hedging purposes; and it allows it to contract credits to support the balance of payments as long as the product does not affect the monetary base. The law establishes the immunity of the foreign exchange reserves against seizure.

389. In so far as the IMF Code of Good Practices on Transparency in Monetary and Financial Policies section 2.1 refers to operations of the central bank in the domestic markets, the BR has defined rules and procedures for the implementation of its monetary and exchange rate policy. These rules and procedures clearly define the conditions, obligations and rights a counterparty should meet in order to participate in open market and foreign exchange operations with the central bank. The rules and procedures are publicly disclosed in regulation that is easily accessible to the public, for example, at the BR's web site.

390. For the management of the foreign exchange reserves, in which the BR does not act as a market maker, it selects its trading counterparties through internal formal processes of selection where the relevant criteria is established at the highest levels of decision making hierarchy depending on the type of service required, restricted to counterparties that are members of well established trading associations such as the Bond Market Association (BMA), the International Securities Market Association (ISMA), or the Commodities Futures Trading Commission (CFTC). In certain cases, standard legal contracts are entered into with counterparties to strengthen the procedures of trading in addition to market practices established by the relevant trading association.

391. The BR is fully compliant with the Special Data Dissemination Standard (SDDS), and its associated data template on international reserves and foreign currency liquidity position, which is published according to specified schedules. Additional information on foreign exchange reserves is disclosed to the public on a pre-announced schedule through the central bank's web site as follows:

- Position and foreign exchange liquidity on a weekly basis.
- Monthly and quarterly audited accounting balances are delivered to the Superintendence of Banks and The General Public Accounting Office of Colombia. At the beginning of every year, the annual balance sheet as of December 31 of the previous year is published in a widely distributed national financial newspaper.

392. The semi-annual report to the Congress provides an overview of the Central Bank's activities and includes a summary of the level, composition, investment criteria, and performance on reserve management during the previous period.

Auditing

393. The political constitution of Colombia establishes that the President of the Republic exercises the control of the central bank. Law 31 of 1992 establishes that the President delegates the function of control of the central bank to an external auditor, appointed by him, for the purpose of "certifying the Bank's financial statements, comply with the functions that the code of Commerce of Colombia assigns to the agent responsible for fiscal supervision, and exercise the control over the activities and performance of the entity", including its management of the foreign exchange reserves. As such, the auditing process has an autonomous budget from any other department within the BR and is conducted by an auditor who is independent of the central bank.

394. The auditor's notes on the central bank's financial statements which constitute the end result of its functions, include commentaries on the management and performance of the international reserves that are publicly available at the Bank's web site and widely disseminated through national news papers. The auditor certifies that the accounting of reserve assets is conducted in conformity with accounting principles determined by the Superintendence of Banks of Colombia and presents quarterly evaluations on the different

aspects of the management of the foreign exchange reserves to the President, the Superintendence of Banks and the Board of Governors.

395. From this year, apart from the external auditor appointed by the President of Colombia, the BR engaged the services of an international auditing firm, Deloitte & Touche to audit its financial statements.

Accounting

396. The accounting procedures for reserve management follow the guidelines set by the Financial Accounting Standards Board (FASB), in so far that they are not in conflict with the accounting regulations of the Superintendence of Banks of Colombia.²⁸ The reserve's portfolio is marked to market on a daily basis, with the P/L affected by both realized and unrealized profits and losses. However, it must be highlighted that there are distinctive characteristics to the distribution of P/L results over a financial year. In the case of profits due to interest rate exposure, including hedging, these are distributed to the government within the first three months after the end of each financial year. Profits on the foreign exchange exposure to non-U.S. currencies in terms of the U.S. dollar may be registered in a special reserve to cover future losses. Finally, the results of the valuation of the reserves in local currency terms do not affect the P/L but are accounted as equity in the balance sheet of the institution.

Institutional framework

Legal foundation

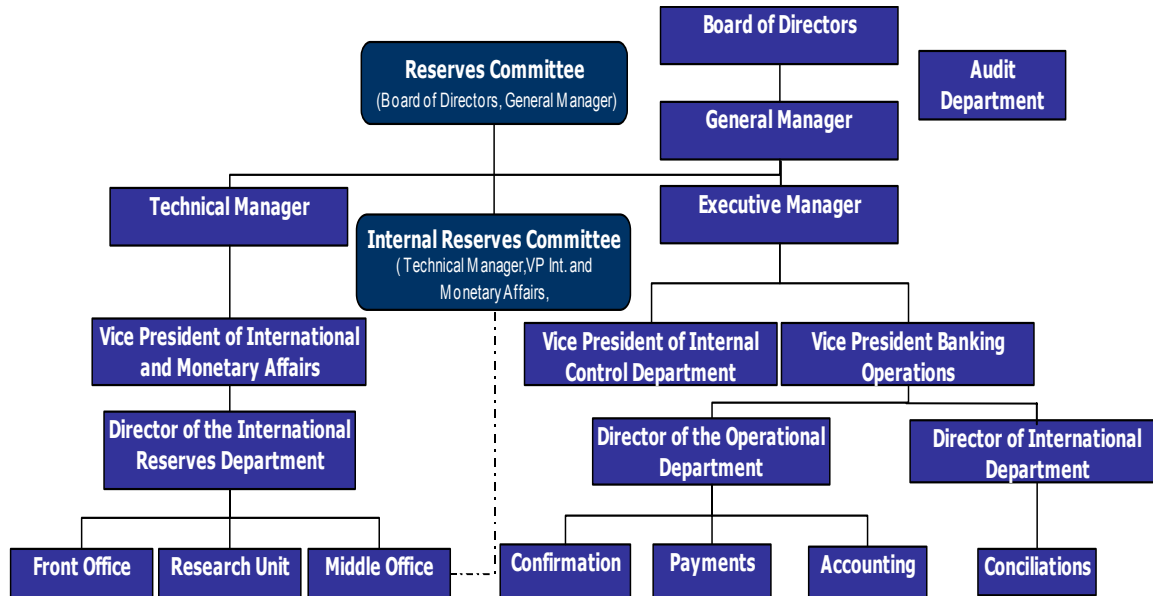
397. As mentioned earlier, the BR's mandate to manage the international foreign exchange reserve of the country is established in the political constitution of Colombia and Law 31 of 1992.

Internal governance

398. The organizational structure of reserve management is described in Figure 5.

²⁸ The main difference between FASB rules and the Colombian Superintendence of Banks has to do with the procedure involved with the valuation of derivative products, resulting in marginal differences.

Figure 5. Organizational Structure



399. The Reserves Committee and the Internal Reserves Committee were created by an internal resolution approved by the Board of Directors which establishes the objectives, functions, and responsibilities of each Committee, updated last year in accordance with the recommendations contained in the “Guidelines for Foreign Exchange Reserve Management” approved by the Executive Board of the IMF on September 2001.

400. The Reserves Committee meets every two months, and is presided over by the Governor of the central bank and integrated by the Board of Directors. It is responsible for the determination of the objectives, principles, and general policies for reserve management.

401. The Internal Reserves Committee was created last year in order to define the operational procedures for reserve management, in accordance to the objectives, principles and general policies determined by the Reserves Committee. It meets monthly, and it is presided over by the Technical Manager of the central bank (not a member of the Board of Directors) and integrated by the Executive Vice President of the Monetary Affairs and Foreign Reserves and the Director of the Reserves Department.

402. The Director of the Reserves Department is responsible for ensuring that the investment policies set by both the Reserves Committee and the Internal Reserves Committee are observed. Within the Reserves Department, the Front Office is responsible for the trades of the portfolio managed internally. The Middle Office is in charge of compliance, risk management, and performance attribution for both the internally and externally managed portfolios, reporting directly to the Internal Reserves Committee to guarantee transparency

and independence. A Research Unit was created to support the Department's training, development, and research requirements.

403. The Operational Department is in charge of accounting, confirmation, and settlement of operations carried out by the Reserves Department through a highly automated environment. Additionally, it keeps track of operational issues with the custodians, counterparties, correspondent banks and the asset managers. Reserve assets are reconciled on a daily basis by a separate Department.

404. The Internal Control Department was created in accordance to Law 87 of 1993, by which the procedures that regulate the exercise of internal controls of public entities were stipulated, in order to evaluate independently from the areas in charge of implementing reserve management policy, their procedures and practices on a recurrent basis.

Human Resource Policy

405. The Bank's human resource management strategy includes specialized selection, training, remuneration, evaluation, and promotion policies. Selection of the staff involves recruiting the top 10 percent graduates in different disciplines from the top tier universities in the country, out of which personnel is selected on the basis of an evaluation process that includes their level of technical expertise, their proficiency in English/computer skills, and an evaluation of their personal characteristics.

406. The training program is structured in three levels, as described in Table 4.

Table 4. Training Programs

Level	Objectives and Activities
Basic	Learning specific procedures/manuals of the area and an overall knowledge of the Bank, reserve management theory and basic financial and economic concepts.
Intermediate	Sponsorship of three levels of Chartered Financial Analyst (CFA) certificates to all Front and Middle Office personnel.(as from this year in replacement of the ISMA General Certification Program). Internships with external managers. Management skills programs are given to senior members of the group to ensure the continuity of the department's development
Advanced	This level includes the sponsorship of postgraduate studies at top international universities in fields such as financial engineering, international economics and MBA's with a strong emphasis in finance; this step implies a long-term commitment between the employee and the Bank.

407. In order to reduce the risk of staff's rotation, a special remuneration scheme is used based on the HAY GROUP methodology. Under this system a salary/benefit curve is established for the bank based on a comparison with that of its peer group within the country

for each area.²⁹ Each position is evaluated and graded according to the required know-how, responsibility and problem solving skills, for which the attainment of each level of CFA by the employee is crucial, in order to establish the salary and benefits within the overall Bank's salary curve.

408. In 1999, a five-year human resource management plan was deployed with the support of external specialized consultants. This plan included the definition of technical and personal competencies required for the bank's employees, annual performance indicators, and development plans to promote these competencies. The Reserves Department uses this framework to determine the different type of training and salary base for employees with basic, intermediate, and advanced proficiency levels.

409. All employees are subject to both Colombia's Disciplinary Code for public servants established by Law 200 of 1995 (later modified by Law 734 of 2000) and the Bank's general code of employment conditions that establishes their rights and obligations, including the appropriate code of conduct that every employee must observe. Employees of the Reserves Department are also subject to a special internal code of conduct that concerns the nature of the operations on reserve management. The institution that regulates Public Service in Colombia requires that every year, all employees declare their assets and liabilities for the period.

C. Establishing a Capacity to Assess and Manage Risk

Risk management

410. The overall framework for risk management at the BR seeks to enable it to comply with its reserve management objective at all times, that is, to ensure that an adequate level of foreign exchange reserves is maintained readily available to meet intervention requirements in the most efficient manner. It must be highlighted, however, that some of the policies described below are in a transition phase due to be fully implemented at the end of this year.

Liquidity risk

411. The financial risk management framework of the central bank is based initially on the assessment of its liquidity requirements that are determined largely by the fact that under a floating exchange rate regime the probability of recurrent intervention has fallen and, at the same time, the level of reserve adequacy has increased. As such, in order to cover intervention requirements in the most efficient manner, total reserves have been segregated into three liquidity buckets as follows:

²⁹ After five years the employee receives a salary increase that gradually reaches a level equivalent to 20 percent of the average salary paid by the industry.

- **Working capital** to cover immediate liquidity requirements, and is composed mostly of overnight investments at the Federal Reserve Bank. This bucket may fluctuate within a range defined by the Reserves Committee, according to current intervention policy and is managed internally by the Bank.
- **Intermediate Liquidity Bucket** to cover up to one year's liquidity requirements, which are estimated to be equivalent to the annual volatility of historical percentage changes in foreign exchange reserves with a 99 percent confidence level.³⁰ These funds are managed internally by the BR under an indexation mandate to a benchmark that reflects the currency composition of the balance of payments consisting of a combination of money market instruments referenced to LIBID and highly liquid government bonds with a modified duration of 1.45 years. As such, its main source of added value over the Working Capital is its higher exposure to short-term credit risk, duration exposure, and currency diversification.
- **Stable Liquidity Bucket** composed of the excess of reserves over the value of the first two buckets, which by definition have the lowest probability of being used for intervention purposes over a one year period. At a benchmark level these funds reflect the currency composition of the balance of payments, invested in a combination of money market instruments referenced to LIBID and highly liquid government bonds with a modified duration of 2. Furthermore, this bucket is delegated almost in its entirety to specialized external managers under non-indexation mandates that permit the possibility to invest in a range of non-government asset classes, credit risk, non-benchmark currencies and in active duration strategies.

412. The rationale behind the construction of such liquidity buckets is to allow the central bank sufficient time to liquidate the Stable Liquidity Bucket to cover unexpected intervention requirements under extreme market conditions, in order to minimize the risk of either assuming higher than normal transactions costs in liquidating less liquid non-government asset classes or being unable to meet such needs in a timely manner. As such, a formal liquidity policy was devised in order to reduce further this risk.

413. The value of the Working Capital and the Intermediate Liquidity Bucket together can fluctuate within a sufficiently ample range (the equivalent of the historical volatility of reserve's changes with a 90 percent, minimum, and 99 percent, maximum, confidence level) before liquidating the Stable Liquidity Bucket.

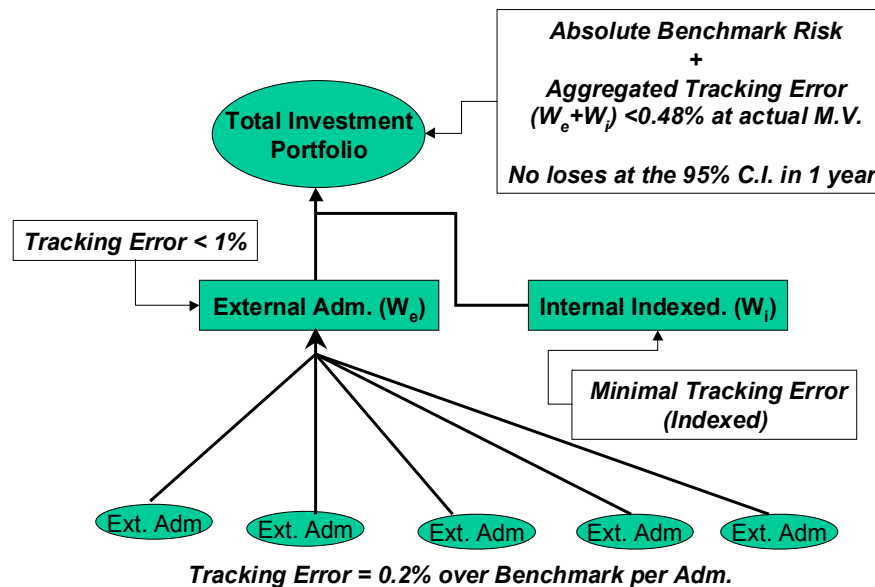
³⁰ The central bank is at present working on a dynamic stress test model for the balance of payments in order to determine more precisely its liquidity requirements over a one year period. Under the current procedure liquidity requirements over a one year period may be overestimated given that the historical volatility of the reserves reflects the prolonged period in which the country was under a crawling peg and a managed float exchange regime.

- A policy on the use of repos to attend unexpected liquidity requirements on a temporary basis when the cost of such arrangements, collateralized by securities traded as “specials” which are part of the Intermediate Liquidity Bucket, is lower than the cost of liquidating a particular security in the Stable Liquidity Bucket in abnormal market conditions.
- A policy on the use of contingency lines available through multilateral institutions.

414. Furthermore, periodically the Internal Reserves Committee reviews the liquidity requirements in the light of changes in the intervention policy or/and changes in the underlying assumptions that support the value of each bucket.

415. To determine the investment guidelines and risk management policies of the Intermediate and Stable liquidity buckets, the Reserves Committee drew on the international standards and practices documented by the IMF, the Bank for International Settlements (BIS), the Group of Thirty and the Colombian Superintendence of Banks. As a result, the bank defined a risk management policy framed in a five step dynamic process: identification, measurement, monitoring, limits/control and validation, to be fully implemented by December 31, 2002. The overall risk management framework is depicted in Figure 6.

Figure 6. Overall Framework for Risk Management



Benchmark risk

416. The benchmark approved by the Reserves Committee represents the most efficient long-term strategy to accomplish the reserve management objectives of the BR for its investment portfolio (both the Intermediate and Stable liquidity buckets), constrained to assets with the highest liquidity characteristics. The benchmark embodies the following two objectives:

- The currency composition of the benchmark of the total investment tranche, both the Intermediate and Stable Liquidity Buckets, must reflect the moving average of three years of the currency composition of the outflows of the balance of payments, in order to maintain the capacity of reserves to respond to external pressures.³¹ As such, in order to measure this risk, an in-house model was developed in order to determine the currency composition of the outflows of the balance of payments.
- The interest rate exposure of the benchmark of the total investment tranche, both the Intermediate and Stable Liquidity Buckets, is limited to a 95 percent confidence level that it will not register negative returns in any given year. This limit is set so as not to hinder the desired reserve adequacy level with adverse price movements and/or to expose the central bank to criticism for its handling of reserve management. The exposure of the benchmark to interest rate risk is determined by its sensitivity to parallel, twist and curvatures changes in the term structure of interest rates for a given modified duration/convexity, using an exponentially time-weighted VaR associated with these factors and a variance-covariance matrix to estimate the correlation between different index components. In addition, historical stress tests are conducted to evaluate the consistency of the model and determine worst case scenarios

417. In Section D, the composition of the Benchmark that complies with these two objectives is described. At the end of each financial year the Reserve Committee reviews both the currency composition and interest rate exposure of the benchmark in the light of changes in the underlying assumptions in the models that support these decisions to determine adjustments, if any, in its currency composition and modified duration to comply with these investment objectives over the next financial year. Normally, such adjustments on the total investment tranche are applied to the Intermediate Liquidity Bucket only, in order not to incur unnecessary transaction costs implicit in the type of assets in which external managers invest the Stable Liquidity Bucket.

³¹ Since this is a reserve adequacy objective, a reserve account was created in the balance sheet of the institution composed of the foreign exchange profits resulting from the non-U.S. dollar exposure of the portfolio in terms of the U.S. dollar. In the case of losses this reserve account is used.

Portfolio risk

418. The overall annual tracking error the portfolio managers may take against the benchmark is limited to 0.50 percent of the total value of the investment portfolio (both Intermediate and Stable Buckets). The Intermediate Bucket is managed internally under an indexation mandate to the benchmark, as a result of which its contribution to overall tracking error is minimum. Most of the authorized tracking error is allotted to the Stable Bucket that is managed exclusively by external asset managers. The allowed tracking error currently around 1 percent available for external managers is as a result higher than for the overall portfolio, depending on the weight of the Intermediate Bucket with respect to the Stable Bucket at any given moment of time. The Reserves Committee also limits the amount of tracking error allotted to any individual mandate to a tracking error of around 1 percent, so long it does not exceed 0.125 percent of the value of the total investment portfolio, to ensure manager type diversification.

419. The measurement of the concurrent tracking error of the portfolios is based on a multi-factor model based on two regressions. In the first regression, it determines the exposure of the portfolios with respect to the benchmark to parallel, twist, and curvature changes in the term structure of interest rates. In the second regression, it estimates three additional sources of risk: economic sector risk, issuer credit risk, and prepayment risk. Foreign exchange risk is calculated as a separate component. Overall tracking error is estimated using a variance covariance matrix.

420. At the beginning of each financial year the Reserves Committee reviews the limits on tracking error in order to maintain a 95 percent confidence level that in addition to benchmark risk, portfolio risk is not inconsistent with either the currency or the interest rate objectives.

421. In addition to the constraints on tracking error, the Reserves Committee also limits exposure to the different specific types of risks that can be taken by the portfolio managers as presented in Table 5. The investment guidelines of the portfolio are presented in section D.

Table 5. Decomposition of Portfolio Risk

ID	Measurement	Monitoring/Validation	Limits	
Asset Class Liquidity Risk	Inclusion in global indices	Review of asset classes included in global indices.	Eligible asset classes must be part of at least two published global indices	
		Heterogeneity of investor's base	Eligible asset classes must maintain a broad investor base	
	Market Micro Structure	Number of market makers.	Periodic Market survey	Eligible asset classes must be traded by at least five recognized market makers.
		Standardized market practices	Review of trading associations and regulators.	Practices must be regulated by at least one recognized entity.
	Security specific structure	Outstanding issue size	Average outstanding issue size according to global indices	Minimum issue size of eligible securities is \$500 million, maximum exposure per issue is limited to 10 percent.
		Ease of hedge	Existence of future contracts/substitutions.	Availability of liquid futures markets or substitute instruments for hedging
		Age	Issue date of each security	Recently issued are preferred
	Quantitative drivers of Liquidity	Tightness	Periodic surveys to principal market makers for each asset class.	Average spread against governments must cover average transaction costs within 4 months.
		Depth	Transaction Sizes that do not affect bid/offer spreads or market prices.	Limits on maximum transaction size according to asset class
		Resiliency	Recovery time to normal market conditions after an external shock	Eligible asset classes' accumulative total return must exceed that of the risk free asset within six months after a crisis
Derivative Risk	Estimated VaR resultant of difference in key rate duration of underlying asset and hedging instrument calculated daily to minimize basis risk.	In-house model back tested for ex-post return mismatch	Maximum net key rate duration in each node of underlying and hedging derivative is limited.	
Credit Risk	Systematic Risk	Historical return/risk profile of representative indices for each rating category against a duration matched government index.	The quantification of degree/type of non-linearity of historical return distribution of index returns for each rating category determines eligibility. Exposure to each eligible credit rating is limited so that the maximum shortfall against government bonds complies with an annual cap of 50 b.p. with a 99 percent confidence level.	
	Systematic Control	Spread duration* historical volatility of spreads at each rating category/economic sector	Maximum percentage exposure to each credit rating within each asset class and economic sector.	

Table 5. Decomposition of Portfolio Risk

ID	Measurement		Monitoring/Validation	Limits
	Non-Systematic Risk	Average and worst case transition matrices/recovery rates coupled with simulations.		
Interest Rate Risk	Issuer risk	Issuer selection risk is delegated to external managers with outstanding capabilities for specific issuer credit risk analysis.	Review of transition events that affect securities held by each manager	N.A
	Duration	Duration to parallel (D1), twist (D2) and curvature movements (D3) of the term structure of interest rates* historical volatility of each factor with respect to index. Scenario analysis and historical stress tests are applied.	Multi-factor model.-Back tested	Limits to portfolio's effective and spread duration against the index, and maximum exposure to mortgages.
Mortgage Risk		Effective spread and duration calculated based on a prepayment model	Pre-payment model –Back tested	
F/X Risk		Tracking error based on historical volatilities and correlations against benchmark positions. Scenario analyses and stress tests are applied.	Currency risk model –Back tested	Maximum 5percent of unhedged currency positions against the benchmark in eligible currencies.

Operational risk

422. Operational risk arises from inadequacies, failures, or non-observance of internal controls and procedures, which threaten the reliability and operation of business systems. The Director of the Reserves Department is responsible for identifying and establishing the controls or procedures to mitigate these risks. In addition, the Internal Control Department and the Audit Department evaluate the procedures to control this risk, and make recommendations in this respect, based on their own independent risk analyses that are supported by international standard methodologies of audit and control like the Committee of Sponsoring Organizations of the Treadway Commission (COSO) and the AS/NZS 4360:1999 (Australian and New Zealand Risk Management Standards).

423. The key operational risks identified in reserves management are the following: fraud risk, dealing risk, settlement risk, custodial risk, financial error, or misstatement risk, loss of potential income, information technology risk, contingency events, and legal risk. The Reserves Department and Operations Department relies upon a series of tools to mitigate these risks of which the most important is a well established culture of auto-control, where the personnel is aware of the importance of the management of operational risk and is encouraged to verify every task and process. The specific approach to control each of the operational risks is as follows:

424. **Fraud risk:** frauds or thefts are prevented through strict control of the reserves operations through its manuals of procedures, the assignment of key responsibilities according to levels of hierarchy and an appropriate segregation of duties within the organization.

425. **Information technology risk:** the assessment of this risk responds to the failure of the information systems and guarantees the security and maintenance of critical information. The network infrastructure, distributed in two nodes, uses a cluster architecture that allows load balancing and redundancy for disaster recovery of the most critical services on just one node. Disaster recovery is possible using on line mirroring of data on top of a fiber optic interconnection. From a security perspective, passwords and access controls are required to access computers and applications, and all data transmissions of sensitive information over the extranet and Internet use regular security features, and the portal, Servicios Electronicos del Banco de la Republica (SEBRA) handles authentication, encryption and firewall functions. The management of the international reserves is based on eight principal applications systems that are described in Table 6.

Table 6. Information Systems

Application	Platform	Function	Vendor
Bloomberg, Reuters and Datastream	Workstation NT	Information Services for news, prices, exchange rates and analytics.	Bloomberg Monitor Trading and Thompson Financial
DEALING 2000	Proprietary	Front end trading system for Forex and time deposits trades.	Monitor Trading
OPICS	Client/Server NT/NT Oracle 8i.	Back Office Application, Trade Entry System, Settlement (SWIFT), Credit Risk, Pricing, Cash flows and Accounting.	Frustum
ABACUS	Client/Server NT/W2000 DB2	Performance Measurement System.	Wilshire Associates
AXIOM	Client/Server NT/W2000 C-tree	Multi-factor risk and performance attribution system, investment guideline compliance and portfolio analysis.	Wilshire Associates
SWIFT	Client/Server: NT/UNIX	Payment System	SWIFT

426. **Dealing risk:** OPICS is a straight through processing system with a one point of entry of trade operations restricted to authorized traders, limited by the system to the type of operations each trader is allowed to enter; limits on transaction size; authorized counterparties; the observance of credit risk limits; and a price tolerance check of the operations to ascertain that trades were transacted at current market levels. Once entered, the system generates a confirmation message of each trade that matches automatically to the trade details of the confirmation received from the counterpart, including a verification of the standard settlement instructions that a counterpart must provide as a requisite to be allowed to trade with the Bank, after which it generates the appropriate payment instruction via SWIFT.

427. **Settlement risk:** trading counterparties are reviewed and approved by the Internal Reserves Committee. Standard settlement instructions are required for each counterpart and, in the case of disputes such as late settlement claims, these are conducted based on the laws, rules and recommendations of ISMA or any other internationally recognized trading association.

428. **Custodial risk:** the prevention of a possible failure by the custodian is done at the selection process, which focuses on selecting professional and globally recognized entities for its custodial operations. Specific requirements include: experience, size (measured by the volume of asset under custody), the maintenance of sound technological resources to carry out its operations, the robustness of its contingency plans, its sub-custodian network, its reporting capabilities, and its management of fail trades. Once the custodian has been selected, its responsibilities are defined in a contract, and its performance is monitored through the daily reconciliation of portfolios with the central bank and external managers.

429. **Financial error or misstatement risk:** the definition of reserve assets or liabilities follows the Balance of Payments methodology from the International Monetary Fund. All components of reserves must be registered in the balance sheet, and the International Exchange Department calculates the total value of reserves on a daily basis, with the support of the Accounting and Economic Information Departments, to evaluate the consistency of this information.

430. **Loss of potential income:** The control of the ledger accounts of the BR is executed through the Cash Management Systems provided by its correspondents, which control in real time, both debits/credits on the account, represent an alternative to SWIFT to execute payments in a contingency, and permits investment of excess funds through out the day in different overnight alternatives. In addition to the above, the BR is in the process of contracting with its correspondents overnight repo facilities to generate liquidity collateralized by government bonds as part of its general liquidity policy. The cash flow module in the OPICS processing system is used in addition to the Cash Management System to determine the required balances of the ledger accounts, a process that the Bank intends to automate via an interface between the two systems, and a separate Department from the Reserves Department which is in charge of the control of treasury operations conduct daily reconciliation of the ledger accounts using the nostro conciliation system provided by SWIFT.

431. **Contingency events:** based on the methodology documented by the Disaster Recovery Institute International, the Reserves and the IT Department have established contingency plans 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.

432. **Legal risk:** the management of Legal Risk is under the responsibility of the Reserves Department and the Legal Department of the BR, with the support of an external advisory firm. The process focuses on the administration of contracts and legal documents associated with the reserves operations, that is, external management, securities lending, futures trading, custody, etc; These contracts specify each party's right and obligations, fees, investment guidelines, warranties, the sovereign immunity of the reserves and the applicable legislation and jurisdiction. They also involve the establishment of new contracts, as well as the maintenance of the current contracts in accordance with the central bank's internal regulations and international market regulations.

External management program

433. The objective of the external management program is to add value to the benchmark through the specialized management of risks that the Bank cannot manage internally. The framework for the external asset management program includes:

- Program size: The Stable Investment Bucket is allocated to external managers, with the exception of a small portfolio managed internally under a non-indexation mandate.
- Tracking error: 0.50 percent of the value of the total investment portfolio (which equates currently to 1 percent of the value of the Stable Liquidity Bucket), of which a 0.125 percent can be allocated to one single external manager to ensure manager type diversification.(currently around 1 percent per mandate)
- Benchmark and Investment guidelines: The total program shares the benchmark and investment Guidelines described in Section D.
- Type of managers: manager diversification is promoted through the selection of global managers and U.S. sector rotation managers, with appropriate benchmarks and specialized investment guidelines for each that together reflect the overall desired exposure to the different specific types of risk.
- Selection process: the selection of the managers is based on a Request for Proposal (RFP) which evaluates the company, organization, investment philosophy, historical performance, risk management capabilities, back-office processes/reporting and additional services provided such as research facilities. Finalists of the RFP process are visited on-site and asked to provide an economic offer.
- Fee structure: A performance fee structure based on percentages of the normal fixed fee charged by each manager for a given market value of the mandate, tailored in such a manner that at the expected long-term excess return of each type of mandate (Global or U.S. Asset Rotation) the normal fixed fee and the performance fee are equal.
- Performance evaluation: a three-year horizon is used to measure the performance of each mandate.

434. Managers for each mandate are classified as outstanding, when excess return is above the long-term expected average, acceptable when it is in a range between the normal fixed fee of the manager and the long-term expected average, and low when performance is below the normal fixed fee.

435. Each category is reclassified according to the information ratio obtained by each manager.

436. Guideline compliance and operative errors are also evaluated in terms of both the numbers of errors and potential cost.

437. On the basis of this evaluation the Reserves Committee adjusts the mandates of external managers. The internal Reserves Committee reviews the performance of the asset managers on a monthly basis, as well as any breaches of the guidelines or operative errors. The Middle Office in the Reserves Department is responsible for the day-to-day control of

the asset managers who have to report their operations daily to both the OPICS processing system for accounting purposes and Axiom for risk, performance and compliance control.

Performance measurement and attribution

438. Performance measurement is based on a daily mark to market valuation of the portfolios calculated by the Abacus system from Wilshire Associates Inc. which complies with the AIMR (Association for Investment Management and Research) and GIPS (Global Investment Performance) Standards. A daily time-weighted rate of return which is geometrically linked is used to calculate a monthly figure. Performance is measured for time horizons such as monthly, year to date, yearly, rolling three years, and since inception, using U.S. dollars as the base currency. This is applied to both the benchmark and the portfolios and therefore returns can be measured on an absolute and a relative basis. Both gross and net returns are calculated for the portfolios, deducting operating costs such as fees, custody, and administrative expenses. In addition, risk adjusted returns are also calculated through the use of the following measures.³²

- The information ratio that measures average excess return over the benchmark per unit of observed risk. This indicator evaluates the efficiency with which the managers have utilized risk.
- The risk ratio that measures average excess return over the benchmark per unit of tracking error ex-ante. This indicator evaluates the success of the managers to utilize allowed tracking error.
- The efficiency ratio measures the consistency of the risk models used by the managers by comparing observed tracking error with ex-ante tracking error.

439. Attribution analysis is performed by Axiom using its multi-factor model for each of the risk factors at the following levels: security, asset classes, countries, currencies, portfolio and composites. This model offers an attribution measurement that goes beyond the traditional approach³³ since it allows an integrated analysis of return and risk factors which determines the efficiency of the overall investment strategy.

The role of efficient markets

440. As explained in section D, the BR is extremely sensitive to liquidity risk. On the one hand, it constrains its reserve management activities to markets that have sufficient liquidity as measured thorough qualitative and quantitative factors that determine the quality of the

³² These risk-adjusted measures are implemented following the RiskMetrics methodology.

³³ The Brinson-Fachler model measures attribution in terms of asset allocation, security selection and an interaction effect.

liquidity of a particular market, factors that are reviewed periodically. Furthermore, the central bank sets limits on its exposure to an specific market, asset class and individual issuer/issue in accordance to the quality of the liquidity of each investment alternative in order not to affect the relevant market thorough its own operations. Finally, the BR is also sensitive to trading in abnormal market conditions for which its has set rules to buy time to liquidate less liquid assets at such times. It also must be highlighted that the central bank delegates to external managers the management of non-government assets classes since they have the necessary capabilities to liquidate them more efficiently in any market environment.

D. General Investment Guidelines

Working Capital

Reference rate: Fed funds

Size: Range from US\$390 to US\$750 million.

Currency denomination: U.S. dollar-denominated assets.

Investment Guidelines: Up to \$390 million may be invested in overnight facilities provided by the Federal Reserve Bank of New York, of which up to \$180 million may be invested in the overnight facilities provided by other treasury correspondents. No limit is imposed to U.S. Treasury Bills and Fixbis. A limit of \$80 million each is imposed on money market instruments issued by the World Bank, Fannie Mae, Freddie Mac and Federal Home Loan Banks.

Maximum maturity of investments: Three months.

Investment portfolio

441. The Investment portfolio is segregated into two Liquidity Buckets: the Intermediate Liquidity Bucket and the Stable Liquidity Bucket.

442. The size of the Intermediate Liquidity Bucket, including investments in Working Capital, can range between \$2,120 million, (the volatility of the percentage changes in the foreign exchange reserves with a 90 percent confidence level) and \$4,378 million (the volatility of the percentage changes in the foreign exchange reserves with a 99 percent confidence level).

443. Excess Funds over \$4,378 million may be invested in the Stable Liquidity Bucket.

444. In the case of a reduction in the foreign exchange reserves, the Working Capital Bucket and then the Intermediate Liquidity Bucket will be used until the sum of the two buckets reaches the minimum authorized level. After such level is reached, reserve reductions will be covered proportionally by the Intermediate and Stable Liquidity Buckets.

In order to delay further the liquidation of the Stable Liquidity Bucket repos and contingency lines may be used.

1. Aggregate Benchmark

445. The Money Market portion (MM) is referenced to the iMoneyNet First Tier Institutional index and the bond portion is referenced to the Salomon Smith Barney Government bond index weighted by country and sector as described in Table 7.

Table 7. Benchmark Composition
(in percent)

Sector	Intermediate Liquidity Bucket			Stable Liquidity Bucket		
	USD	Market		USD	Market	
		EUR	JPY		EUR	JPY
MM	40	0	0	15	0	0
1-5 years	46	11	3	71	11	3
Total	86	11	3	86	11	3

Benchmark weights in each currency must be adjusted over time to reflect the three year rolling average composition of the outflows of the Balance of Payments of Colombia. The overall average effective duration of the aggregate benchmark (Intermediate and Stable Liquidity Bucket) must be consistent with a 95 percent probability that its exposure to interest rate risk will not register negative returns over any given year.

2. Investment Guidelines for the Money Market portion of the Benchmark (applicable to both Intermediate and Stable Liquidity Buckets)

Table 8. Investment Guidelines for the Money Market Portion of the Benchmark

Strategy	Guideline
Duration	The maximum weighted average maturity (WAM) of the money market portion of the benchmark is 90 days.
Exchange Risk	100% US dollars. Investments are also allowed in the following currencies with their respective currency hedge against U.S. dollars: Canadian dollar, Japanese yen, euro, British pound, Swiss franc, Swedish krona, Danish krone, Norwegian krone, Australian dollar and New Zealand dollar.
Credit Risk	<ul style="list-style-type: none"> • 100% of the value of the money market portion of the benchmark may be invested in U.S. Federal Government explicitly guaranteed assets or in issuers/issues with a minimum credit rating of P-1 by Moody's Investor Services, A1+/A1 by Standard and Poor's and F1 by Fitch Ratings. • At the time of purchase the issuer of an eligible asset or the eligible asset itself must be rated by at least two of the following rating agencies as: P-1 by Moody's Investor Service, A1+/A-1 by Standard and Poor's and F-1 by Fitch Ratings. The ratings by two agencies can be used if and only if the third agency does not issue an opinion about the rating status of the issuer and/or issue. The lowest of the available ratings applied by any of the agencies to an issuer or issue at the time of purchase will prevail over the others. Exception is made for U.S. Government securities. • Downgrades after purchase to P-3/A-3/F-3 by any of the rating agencies mentioned above must be sold within the 10 Trading Days following this event. These rules also apply to downgrades to P-2/A-2/F-2 in excess of 5% of the money market portion of the benchmark. • The maximum non-U.S. Federal Government sector exposure as a percentage of the money market portion of the benchmark is: 100% in U.S. Agencies, sovereigns in eligible currencies and supranationals in eligible currencies; 75% in banks, 50% in corporates and 50% in asset backed commercial paper (ABCP). • The maximum non-U.S. Federal Government exposure (current face*price/100 as determined on the date of purchase) allowed per issuer as a percentage of the money market portion of the benchmark is 5%. In the case of ABCP, when an entity guarantees more than 10% of an issue, such amount guaranteed must be added to the credit exposure of the entity. • Eligible issuers of corporate/bank debt must have a minimum book equity of \$5,000 million.
Liquidity Risk	<ul style="list-style-type: none"> • Any type of negotiable instruments issued by eligible issuers in eligible currencies with a maximum maturity of 397 days. • Investments are also allowed in term deposits with a maximum maturity of 1 month and up to 10% of the value of the money market portion of the benchmark.

3. Investment Guidelines Intermediate Liquidity Bucket

446. The objective of the mandate is to replicate the risk/return characteristics of the benchmark of the Intermediate Liquidity Bucket depicted in paragraph 445, with the lowest possible tracking error following the Investment Guidelines for the Money Market Portion described in Table 8 and matching the composition of the bond portion of the benchmark.

4. Investment Guidelines Stable Bucket: U.S. Asset rotation mandates

447. Of the total value of the Stable Liquidity Bucket, 50 percent is allotted to U.S. Asset Rotation mandates with the following Investment Guidelines:

Objective

448. The objective of the Mandate is to generate returns over the performance of the benchmark (as described below) in excess of 30 basis points per annum over three-year rolling periods, within a maximum ex-ante expected tracking error objective of 100 basis points per annum and in compliance with the investment guidelines set forth below.

Benchmark

449. The benchmark composition is as presented in the following table:

Table 9. The Benchmark

Sector	Currency	Weight*	Reference
Money Market	U.S. dollar	15%	ImoneyNet First Tier Institutional (Gross of fees and taxes)
Bonds	U.S. dollar	85%	1 – 5 yr. Salomon Smith Barney U.S. Government Bond Index Component of the World Government Bond Index

*These weights are not final and will be adjusted to achieve an effective duration of 2 near the date of funding of the Account

Risk limits

(i) Currency risk

The Mandate may invest up to 50 percent in eligible assets (as described below) denominated in eligible currencies provided that they are fully hedged to the U.S. dollar within a tolerance limit of ± 0.25 percent of the value of the Mandate in unhedged exposure to non-U.S. dollar currencies. The following are the eligible currencies: U.S. dollar, euro, Japanese yen, Swiss

franc, British pound, Canadian dollar, Australian dollar, Swedish krona, Danish krone, Norwegian krone and New Zealand dollar.

(ii) Interest rate risk

450. The effective duration of the Mandate may vary in a range between ± 1 with respect to that of the benchmark, its convexity may not be below -1 in absolute terms and spread duration may not exceed ± 2.85 .

(iii) Money market investment guidelines

- In addition to the Investment Guidelines described in Section 2 for the Money Market portion of the benchmark, the mandate may invest up to 100 percent of its value in U.S. Federal Government securities and up to 15 percent in First Tier Short-Term Investment Funds (STIF) available with the Custodian.
- The restriction in Section 2 on the maximum WAM of 90 days for the Money Market portion of the benchmark is replaced by the overall restrictions on interest rate risk in Section 2.3.ii applied to the value of the overall mandate.

(iv) Bond investment guidelines

- Eligible assets: bonds and debentures without attached options in eligible currencies, Bonds and debentures with embedded options denominated in U.S. dollars only, Fixed-Coupon Mortgage-Backed Pass-Through Securities (MBS) denominated in U.S. dollars only, Asset Backed Securities (ABS) denominated in U.S. dollars only collateralized by credit card receivables and auto loans, Collateralized Mortgage Obligations (CMO's) denominated in U.S. dollars only restricted to first or currently paying tranches of sequential bonds, planned amortization classes (PAC), targeted amortization class bonds (TAC) and floating rate bonds that are not support tranches. Private placements, including 144a securities, are not considered an eligible asset class.
- Eligible investments must have a debt seniority of guaranteed, or Senior secured, or Senior.
- At the time of purchase the issuer of an eligible asset or the eligible asset itself must be rated by at least two of the following rating agencies as: A3 by Moody's Investor Service, A- by Standard and Poor's and A3 by Fitch Ratings. The ratings by two agencies can be used if and only if the third agency does not issue an opinion about the rating status of the issuer and/or issue. The lowest of the available ratings applied by any of the agencies to an issuer or issue at the time of purchase will prevail over the others. Exception is made for U.S. Government securities.

- In the case of a downgrade after purchase below the minimum acceptable level by any of the rating agencies mentioned above, the investment must be sold within ten trading days following this event.
- Sector limits as a percentage of the total value of the mandate: 100 percent in U.S. Federal Government securities, 100 percent in Sovereign securities issued in local eligible currencies including fully guaranteed agencies, 8.2 percent in Sovereign/Supranational securities issued in non-local eligible currencies including fully guaranteed agencies of which 4.1 percent may be invested in Supranationals, 11 percent in U.S. Agencies without explicit guarantee from the U.S. Federal Government, 45 percent in Ginnie Mae, 8.2 percent in U.S. corporates and 8.2 percent in U.S. Asset Backed Securities guaranteed by credit card receivables and auto loans. Sector limits described in this Section are exclusive of the sector limits described in Section 2 for the Money Market.
- Issuer limits as a percentage of the total value of the mandate (Current Face*price/100 as determined on the date of purchase) are presented in the following table:

Table 10. Issuer Limits

Issuer limits		%
United States Government	US Government	No Limit
Sovereign in local currency (includes agencies fully guaranteed)	AAA	35.4
	AA	21.2
	A	10.6
Sovereign in non-local currency (includes agencies fully guaranteed)	AAA	4.1
	AA	1.4
	A	0.3
Supranationals	AAA	2.0
	AA	0.7
	A	0.1
U.S. Agencies without explicit guarantee – GSEs	Federal Home Loan Banks	10.6
	Fannie Mae	5.3
	Freddie Mac	3.5
U.S. Agencies explicitly guaranteed	Ginnie Mae	44.7
U.S. Corporates	AAA	0.8
	AA	0.8
	A	0.2
US dollar-denominated ABS (restriction per individual program)	AAA	0.8

- Investments must have a minimum issue size of \$500 million in accordance to the index inclusion criterion established by the Salomon Smith Barney indices, with the exception of MBS, CMO's and ABS where this limit does not apply.
- The maximum holding of any specific issue is restricted to 10 percent of the issue size of any security, with the exception of MBS, CMO's and ABS where this limit does not apply.

(v) Investment Guidelines for instruments with embedded options

- The Mandate may invest in assets with embedded options other than MBS or its derivatives and ABS up to 8 percent of the total value of the mandate. This provision does not apply to Treasury Inflation Protected Securities (TIPS).
- For MBS a limit is set at 45 percent of the market value of the Mandate, of which 7.5 percent can be allocated to eligible CMO's. For CMO's the notional amount of any security purchased will be added to the exposure of the issuer of the security, not to the exposure of the issuer of the underlying asset, and they are to be issued and collateralized by an eligible GSE.
- For Asset-Backed Securities, the limit is set at 8.2 percent of the market value of the Mandate.

Other restrictions

(i) Restriction on eligible financial markets

451. Eligible issuers may not be located in the offshore financial markets described in Table 11.

Table 11. Noneligible Off-Shore Financial Centers

Africa	Middle East	Western Hemisphere
Seychelles	Bahrain	Anguilla
		Antigua and Barbuda
Asia and the Pacific	Europe	Aruba
Cook Islands	Andorra	Belize
Macao SAR	Cyprus	Bermuda
Malaysia (Labuan)	Gibraltar	British Virgin Islands
Marshall Islands	Guernsey	Cayman Islands
Nauru	Isle of Man	Dominica
Niue	Jersey	Grenada
Palau	Liechtenstein	Montserrat
Samoa	Monaco	Netherlands Antilles
Vanuatu		Panama
		St. Kitts and Nevis
		St. Lucia
		St. Vincent and the Grenadines
		The Bahamas
		Turks and Caicos Islands

(ii) Restrictions on managers

452. Managers may not invest in securities issued by itself, its parent company or any of its affiliates (or any special purpose subsidiary for which it serves as incorporator, manager, trustee or in which it is an investor).

Derivatives

(i) Over-the-counter (OTC) currency forwards

- Foreign exchange forward transactions can be executed for hedging purposes only
- The maximum maturity of foreign exchange forward transactions cannot exceed four (4) months as from the date of transaction.
- Eligible counterparties for forward and spot foreign exchange transactions must have a minimum credit rating of A-1 by Standard & Poor's, P-1 by Moody's Investor Service and F-1 by Fitch IBCA by at least two of these agencies.
- If any eligible counterparty with which there is an open position is downgraded below the minimum permitted credit rating by any of the credit agencies, the position must be closed with such counterparty during the ten (10) trading days following such

event so long as the Adviser maintains an enforceable netting agreement with such counterparty.

- The net exposure in open foreign exchange forward and spot operations with any eligible counterparty cannot exceed 10 percent of the value of the Mandate at any given moment of time.
- The maximum amount of foreign exchange operations to be settled on the same date with any eligible counterparty cannot exceed 5 percent of the value of the Mandate. For counterparties with which the manager does not have an enforceable netting agreement in place, the limit shall be 2.5 percent.
- The notional amount of all open foreign exchange forward operations may not exceed 50 percent of the value of the Mandate.

(ii) MBS to-be-announced (TBA) trades

- TBA trades are authorized restricted to a settlement date not exceeding three months from trade date.
- The underlying pools for TBA trades must come from an eligible MBS.

(iii) Exchange Traded Futures contracts

- The futures contracts and corresponding Exchanges that are shown in Table 12 are authorized:

Table 12. Eligible Exchanges and Future Contracts

Exchange	Contract
Chicago Board of Trade	U.S. Treasury Bond; U.S. 10-year Treasury Note; U.S. 5-year Treasury Note; U.S. 2-year Treasury Note
Chicago Mercantile Exchange	5-year and 10-year interest rate swap futures contracts
Eurex	Eurodollar
London Financial Futures and Options Exchange	Schatz; Bobl and Bund contracts
Tokyo Stock Exchange	Euribor
Bourse de Montréal	Long Gilt
Stockholmsbörsen	JGBs
Sydney Futures Exchange	Canadian Government Bond
Københavns Fondsbørs	Swedish Government Bond
	Australian Government Bond; New Zealand Government Bond
	Danish Government Bond

- The maximum expiration or delivery date of any contract cannot exceed six (6) months from trade date.
- Eligible counterparties for futures contracts: broker-dealers designated as futures commission merchants by an appropriately designated self-regulatory organization or government body as required by applicable laws and regulations. Eligible broker-dealers must be members of the clearing houses associated with the following exchanges: Chicago Board of Trade, Chicago Mercantile Exchange, Eurex and London Financial Futures and Options Exchange.

(iv) Restrictions on leverage

453. The notional amount of all long futures and MBS TBA positions shall not exceed the market value of all assets with a final maturity of less than 397 days.

5. Investment Guidelines Stable Liquidity Bucket: Global Mandates

454. Of the total value of the Stable Liquidity Bucket, 50 percent is allotted to Global Mandates with the following Investment Guidelines:

Objective

455. The objective of the Mandate is to generate returns over the performance of the benchmark in excess of 30 basis points per annum over three year rolling periods, within a maximum ex-ante expected tracking error objective of 100 basis points per annum and in compliance with the investment guidelines set forth below.

The Benchmark

456. The benchmark composition is as presented in Table 13.

Table 13. The Benchmark

Sector	Currency	Weight	Reference
Money Market	USD	15%	iMoneyNet First Tier Institutional (Gross of fees and taxes)
Bonds	USD	57%	1 – 5 yr. Salomon Smith Barney U.S. Government Bond Index
	EUR	22%	1 – 5 yr. Salomon Smith Barney German Government Bond Index
	JPY	6%	1 – 5 yr. Salomon Smith Barney Japanese Government Bond Index

Risk limits

(i) Currency risk

- The Mandate may invest up to 50 percent of the value of the account in eligible assets (as described below) denominated in eligible currencies, in addition to the eligible

assets of the benchmark, provided that they are fully hedged in such a way that the Account maintains the currency composition of the benchmark. The following are the eligible currencies: U.S. dollar, euro, Japanese yen, Swiss franc, British pound, Canadian dollar, Australian dollar, Swedish krona, Danish krone, Norwegian krone and New Zealand dollar.

- The Mandate may deviate up to ± 10 percent in unhedged currency exposure in any of the eligible currencies with respect to its participation in the benchmark; subject to the constraint that the maximum aggregate currency exposure is 10 percent of the value of the portfolio. The aggregate currency exposure shall be calculated as the sum of all net long positions in each individual eligible currency against the benchmark

(ii) Interest rate risk

457. The effective duration of the Mandate may be in a range between ± 1 with respect to that of the benchmark.

(iii) Money market investment guidelines

- In addition to the Investment Guidelines described in Section 2 for the Money Market portion of the benchmark, the Mandate may invest up to 100 percent of its value in U.S. Federal Government securities and up to 15 percent in First Tier Short-Term Investment Funds (STIF) available with the Custodian.
- The restriction in Section 2 on the maximum WAM of 90 days for the Money Market portion of the benchmark is replaced by the overall restrictions on interest rate risk in Section 4.3.ii applied to the value of the overall Mandate.

(iv) Bond investment guidelines

- Bonds and debentures without attached options in eligible currencies. Floating rate Notes with a maximum final maturity of five years and a maximum reset period of up to one year. 144a securities, including private placements, are not considered an eligible asset class.
- Eligible investments must have a debt seniority of guaranteed, or Senior secured or Senior.
- At the time of purchase the issuer of an eligible asset or the eligible asset itself must be rated by at least two of the following rating agencies as: A3 by Moody's Investors Service, A- by Standard & Poor's and A3 by Fitch Ratings. The ratings by two agencies can be used if and only if the third agency does not issue an opinion about the rating status of the issuer and/or issue. The lowest of the available ratings applied by any of the agencies to an issuer or issue at the time of purchase will prevail over the others. Exception to this stipulation is made in the case of U.S. Federal Government securities.

- In the case of a downgrade after purchase below the minimum acceptable level by any of the rating agencies mentioned above, the Adviser must sell the investment within the 10 Trading Days following this event.
- Sector limits as a percentage of the total value of the Mandate: U.S. Federal Government Securities 100 percent, Sovereign in eligible local currencies including fully guaranteed agencies 100 percent, Sovereign/Supranational in eligible non-local currencies 36 percent of which 18 percent can be invested in Supranationals, U.S. Agencies (GSE's) without explicit guarantee from the U.S. Federal Government 11 percent.
- Issuer limits as a percentage of the total value of the Mandate (current face*price/100 as determined on the date of purchase) are depicted in Table 14.
- Investments must have a minimum issue size of \$500 million in accordance to the index inclusion criterion established by the Salomon Smith Barney indices.
- Investments in any security may not no exceed 10 percent of its issue size.

Table 14. Issuer Limits

Issuer	%
United States Government	
US Government	No Limit
Sovereign in local currency (includes fully-guaranteed agencies)	
AAA	35.4
AA	21.2
A	10.6
Sovereign in non-local currency (includes agencies fully-guaranteed)	
AAA	17.9
AA	6.0
A	1.2
Supranationals	
AAA	8.9
AA	3.0
A	0.6
US Agencies without explicit guarantee – GSEs (Non-callable debentures only)	
Federal Home Loan Banks	10.6
Fannie Mae	5.3
Freddie Mac	3.5

Other considerations

(i) Restrictions on eligible financial markets

458. Eligible issuers may not be located in the following financial offshore centers described in Table 15.

Table 15. Non-Eligible Off Shore Financial Centers

Africa	Middle East	Western Hemisphere
Seychelles	Bahrain	Anguilla
		Antigua and Barbuda
Asia and the Pacific	Europe	Aruba
Cook Islands	Andorra	Belize
Macao SAR	Cyprus	Bermuda
Malaysia (Labuan)	Gibraltar	British Virgin Islands
Marshall Islands	Guernsey	Cayman Islands
Nauru /	Isle of Man	Dominica
Niue	Jersey	Grenada
Palau	Liechtenstein	Montserrat
Samoa	Monaco	Netherlands Antilles
Vanuatu		Panama
		St. Kitts and Nevis
		St. Lucia
		St. Vincent and the Grenadines
		The Bahamas
		Turks and Caicos Islands

(ii) Restrictions on managers

459. Managers may not invest in securities issued by itself, its parent company or any of its affiliates (or any special purpose subsidiary for which it serves as incorporator, manager trustee or in which it is an investor).

Derivatives

(i) “Over-the-counter (OTC) currency forwards

- The maximum maturity of foreign exchange forward transactions cannot exceed four (4) months as from the date of transaction.

- Eligible counterparties for forward and spot foreign exchange transactions must have a minimum credit rating of A-1 by Standard & Poor's, P-1 by Moody's Investor Service and F-1 by Fitch IBCA by at least two of these agencies.
- If any eligible counterparty with which there is an open position is downgraded below the minimum permitted credit rating by any of the credit agencies, the position must be closed with such counterparty during the ten (10) trading days following such event so long as the manager holds an enforceable netting agreement with such counterparty.
- The net exposure in open foreign exchange forward and spot operations with any eligible counterparty cannot exceed 10 percent of the value of the Mandate at any given moment of time.
- The maximum amount of foreign exchange operations to be settled on the same date with each eligible counterparty cannot exceed 5 percent of the value of the Mandate. For counterparties with which the manager does not have an enforceable Netting Agreement in place, the limit shall be 2.5 percent.
- The notional amount of all open foreign exchange forward operations may not exceed 50 percent of the value of the Account.

(ii) Exchange traded futures contracts:

460. The authorized futures contracts and corresponding Exchanges are depicted in Table 16.

Table 16. Eligible Exchanges and Future Contracts

Exchange	Contract
Chicago Board of Trade	U.S. Treasury Bond; U.S. 10-year Treasury Note; U.S. 5-year Treasury Note; U.S. 2-year Treasury Note
Chicago Mercantile Exchange	Eurodollar
Eurex	Schatz; Bobl and Bund contracts
London Financial Futures and Options Exchange	Euribor, JGBs and U.S. Treasury contracts
Tokyo Stock Exchange	Long Gilt
Bourse de Montréal	JGBs
Stockholmsbörsen	Canadian Government Bond
Sydney Futures Exchange	Swedish Government Bond
Københavns Fondsbørs	Australian Government Bond; New Zealand Government Bond
	Danish Government Bond

- The maximum expiration or delivery date cannot exceed six (6) months from trade date.
- Eligible counterparties for futures contracts: broker-dealers designated as futures commission merchants by an appropriately designated self-regulatory organization or Government body as required by applicable laws and regulations. Eligible broker-dealers must be members of the clearing houses associated with the following exchanges: Chicago Board of Trade, Chicago Mercantile Exchange, Eurex and London Financial Futures and Options Exchange.

(iii) Restrictions on leverage

461. The notional amount of all long futures positions shall not exceed the market value of all assets with a final maturity of less than 397 days.

VII. THE CZECH REPUBLIC

A. Developing a Sound Governance and Institutional Framework

Reserve management objectives and coordination

462. The functions and objectives of holding reserves determine the reserve management strategy of the Czech National Bank (CNB). There are two main functions of reserves. The first is to serve as a source of liquid funds for meeting known and potential foreign liabilities and obligations of the central bank. In a wider sense, the obligations of the CNB are (i) to meet foreign exchange intervention requirements; (ii) to meet foreign exchange payments of CNB's clients (of which the government is the most dominant one); and (iii) as a "back up" for meeting balance of payments crises. The second function is, to serve as a form of national wealth, although, it is only the central bank which has access to reserves. Foreign exchange reserves are a by-product of the monetary and exchange rate policy of the central bank. Due to the exchange rate regime and other developments since 1993, foreign exchange inflows are being absorbed into reserves. The foreign exchange inflows in the form of foreign direct investment (FDI) or speculative capital put pressure on the domestic currency, and by reverse interventions, the foreign exchange is accumulated in foreign exchange reserves of CNB.

463. The general objective of reserve management is to ensure that reserves are positive, stable and readily available for use. Positiveness and stability represent the risk limits and availability for use ensures liquidity. This is a widely defined objective, and more detailed and concrete objectives are defined by the management of CNB depending on the conditions in the markets. However, even clear objectives are not easy to transform into measures of risk management such as investment horizon, duration or the best currency composition.

464. From the inception of Czech koruna in 1993 until 1997, it was pegged to basket of two currencies namely, the deutschemark and the U.S. dollar. It was easy to define the currency allocation in terms of the basket while at the same time avoid accounting losses. On a daily basis, the central bank bought (rarely sold) hard currencies. Each reserve currency was divided into two portfolios. One was the investment portfolio which was fixed in size and the other was the liquidity portfolio that absorbed all inflows. The risks in each portfolio were managed separately with separate benchmarks primarily for duration and instruments. During the first three years of its existence, the central bank had accumulated substantial reserves with the level increasing by almost nine times. These inflows reduced the overall duration of the reserve to zero thereby affecting returns when the yield curve was upward sloping. This situation arose because the focus was too much on the individual portfolios instead of on the entire reserves. There were no automatic procedures that would properly adjust the risk profile of reserves (the overall duration to development of balance of payment). This policy was changed in 1999 and today all the limits are set up first at the overall level and the limits of individual portfolios are derived from the overall limits. Furthermore, the limits are expressed in relative terms (i.e., their absolute level is function of the size of reserve) and the future development of reserve size is taken into consideration.

465. It is important to note that except for the central bank's obligations and liabilities the foreign reserves do not reflect the liabilities of any other entity. Even the central government's position in foreign exchange is treated separately from the position of the central bank. If the government would like to either eliminate or hedge its foreign exchange position it must deal with CNB. The central bank does not consider the government's foreign exchange position while structuring its reserves. The reason is that it would be hard to differentiate between the position of the central government and positions of other institutions and companies financed from the central budget. For example in the Czech Republic, the government owned a company dealing with gas. The company was buying gas from abroad and distributing it here meaning that this company's assets were in Czech koruna while its liabilities were in U.S. dollars. This was exactly the opposite of the central bank balance sheet. If the dollar strengthened against koruna, the central bank booked a profit and the company booked loss. This loss had to be covered from the central budget. The profit of central bank is by law transferred to central budget. Both the central bank and the company have separate budget and it could happen that both have the same position (if the company decides to hedge its foreign exchange position). The question is whether such a set up is enough to i) have foreign reserves in the same structure like the company's liabilities, and ii) to allow the company to avoid hedging its liabilities against foreign exchange risk just because the loss is compensated by the central bank's profit. We believed that this is not a manageable situation.

Institutional framework

466. The CNB since its inception after the fall of the old central planned economy, has performed all the functions including reserve management. In the Law of the CNB, international reserves management is defined as one of the main activities of the central bank. When carrying out this activity, the CNB acts independently of the government. The reserves are part of the balance sheet of CNB. However, by the same law, all the property of CNB including the reserves is the state property which the CNB is mandated to manage. Therefore it is sometimes difficult to point out the legal owner of reserves. CNB can freely deal with the reserves and the return on reserves is part of the CNB's total performance. The bank's net profit, after appropriation to certain funds is transferred to the central government budget. The performance report that provides the details of CNB's profits and losses is submitted every year to the Lower House of the Czech parliament. The above description confirms the central bank's independence from the government and parliament, but also points out that its operations are under certain supervision of the government and Parliament. This kind of supervision creates pressure on providing positive and stable return, indirectly influencing the risk profile of reserves.

467. The CNB Board, which is the highest decision making level in the CNB, approves the basic strategy of reserve management and the permissible instruments. The strategy is defined by setting the currency allocation and maximum duration, and stipulating rules for credit and operational risk management and rules for portfolio management. The executive director for risk management sets the credit limits and the benchmarks (currency benchmark within 5 percent from the strategic currency allocation). The portfolio managers cannot

deviate from currency benchmark but can deviate from the duration benchmark up to ± 20 percent only. The portfolio management rules permit deviation from the benchmark on credit quality, that is investment in securities issued by issuers other than those included in the benchmark. Two separate departments—the Risk Management and Transactions Support Department and the Financial Markets Department provide for execution and control of reserves management independently of each other.

Transparency and accountability

468. The CNB is not required under any regulation, including an internal one, to publish details on reserve management. However, it regularly publishes the level of reserves in the “Statistics” section of its website and in addition, in response to published standards of IMF, it decided to change the structure of the published information on reserve management in its Annual Report for 2001. The new structure provides more information on the results achieved in reserve management rather than on the market conditions as was the case until now. The chapter on reserve management now consists of absolute and relative performance and risk profile of reserves including credit, interest and currency risks. CNB subscribes to the SDDS of IMF and has been publishing its balance sheet since the last decade. Information on the basic structure of reserves and foreign liabilities of CNB can therefore be accessed.

469. The foreign reserves management as a whole including results, trading and settlement procedures, control and check system, information system and distribution of responsibility are audited every year as part of the overall external audit of the CNB. The central bank does not carry out special audit of only the reserve management function. The auditor is selected by public tender, its term is five years and both the CNB Board and the Minister of Finance must approve the selected auditor. The performance of CNB is not audited by the highest auditing office but as mentioned above, the performance is submitted to the Parliament. The Parliament can either agree or disagree with the report. If Parliament disagrees with the report, the central bank is requested to provide additional information and data.

Information systems

470. There are two major information systems in use in the area of reserve management—one for the front office and the other for the back office. Both the systems have been developed internally. The decision to use internal capacity was made in 1996. Until that time the portfolio managers, the risk managers and the settlement staff used PC-based applications like the Excel or the Lotus. It was a dilemma to choose between externally and internally built systems. The rationale for choosing the latter was that CNB did not want to lose the option to incorporate in future its procedures and methods for dealing, settlement, risk management, and accounting that it would probably have to do in case of choosing the external system. Some financial limits also existed and influenced the final decision. Working with an external adviser the basic content and structure of the system was designed in such a way that it is flexible to future internal changes in terms of organization structure, new products and instruments, new risk methods, changes of the accounting standards, and

similar demands. Until now we have been successful in implementing functions like real time distribution, deal entry, a database of historical prices and a database of approved instruments. Within next two years, we plan to implement the position keeping and some of the risk measurement calculations, and connect the front office with the back office system. The advantages of an internal system are that it is flexible and friendly to changes, it is built under a controllable budget and that other aspects like back up or emergency installation are less difficult to do from the operational point of view. It is, however, unclear if these advantages are not offset by the fact, that the system is still to be completed and the delay of four years limits the implementation of new risk measurement methods and introduction of new instruments. Because the project is in a very advanced stage, it was agreed that it should be finalized. But the planning and budgeting process and mainly the control of the time schedule and budget are based on the limited capacity of the CNB which suffers a major handicap in IT projects compared to external and specialized firms.

Human resources

471. In the field of the human resources, the position of CNB does not differ a great deal from other central banks. On the position of portfolio manager, of which we have six positions, 24 men have changed during the last 11 years. A very similar situation exists in the area of risk management, IT support and open market operation. The limited financial capacity of CNB to pay competitive salaries has resulted in most of our staff being fresh graduates from universities. We would like to share an interesting and useful experiment that was organized by CNB together with the World Bank in 1991. Through the public tender, 25 men were selected according to their knowledge of mathematics, statistics and English. These individuals were offered work in some commercial banks and in the central bank, mostly in treasury areas. They had to undergo a three-year course on financial markets, instruments and banking, several short seminars and affiliations in commercial banks abroad. The course was financed by the central bank and the commercial banks. The participants of the course agreed to return the loan, in the event they left the course before completion or if they left the banks they had joined. Currently, many of the successful participants have reached the highest levels of management in the central bank, the commercial banks and financial institutions in Czech Republic (e.g., vice governor of the CNB, executive director of risk management of the CNB, board member in Komerční banka and GE Capital Bank, etc.).

B. Establishing a Capacity to Assess and Manage Risk

Risk management

472. CNB started active reserve management in 1991. At that time bank deposits were the only instrument used for investment. Foreign exchange trading was used as an additional source of return. Risk management was “operated” by both the front office and back office. The back office provided the liquidity structure and the dealers managed liquidity. There also was a book of limits for deposits with approved banks but limits were “impressionistic” rather than based on any strict formula or rule. The interest rate risk, the foreign exchange

risk and the operational risk were not monitored. The reporting consisted of the gains and losses from foreign exchange trading and did not include mark to market valuation of term trades like forwards. Six dealers and four back office operators performed the entire reserve management function. In 1992, the central bank bought its first security, the U.S. Treasury bill and thereafter the risk management department was established. The main task of the department was liability management, credit risk management and benchmarking. With the help of the World Bank and neighboring central banks (the Austrian central bank mainly) the new book of limits was created that were based on the financial strength of the banks. The formula calculating the limits was a function of the banks rating, capital and their assets. The approach is currently more sophisticated and the term of the investment is considered as also a distinction is made between the trading counterpart and the debtor.

Benchmarking process

Interest rate risk

473. The benchmarking process started in 1993 with simple benchmarks applied on each of the portfolios. They were combinations of general maturities like one week and three months LIBOR index for the liquidity portfolios, and two-, three-, and five-year benchmark government notes and bonds for the investment portfolios. The overall duration, calculated ex post, was around 1.5 years in the very beginning though the rationale for choosing this duration is difficult to find out. This approach was changed in 1999 when the new benchmark representing the entire reserve and two sub-benchmarks for each reserve currency were set up. The benchmark is a composite of general maturities index for money market part and the external Merrill Lynch government index for the medium and longer-term part of the yield curve. The most important fact is that the overall duration is derived from the objectives and targets of reserve management. Duration is established based on the requirement that the portfolio should not record a loss in any three-month period. For setting the target duration, historical time series of yields on the relevant financial markets are used. In addition to historical data, the methodology for setting duration takes into account the current situation on the financial markets. If short-term interest rates are higher, the higher is the interest rate risk that can be accepted. By historical statistic data, it is proved that by using this approach the benchmark performs better by 5–10 basis points. This type of reset of the benchmark is done quarterly and therefore has marginal impact on transaction costs. It is our experience that neither the internal nor the external (public) benchmark would help to decide what duration and currency composition is ideal.

Currency risk

474. The currency risk was until May 1997 relatively easy to manage. The koruna was fixed to basket of U.S. dollar and deutschemarks, and the currency allocation of reserves was identical to the basket. U.S. dollar and deutschemark offered the two most liquid markets and absence of yield diversification was compensated by the fact that there was no risk of accounting losses when the reserves were valued in domestic currency. In May 1997, CNB decided to float the koruna and the basket as an anchor for reserve currency allocation ceased

to exist. The deutschemark was declared as the intervention currency and thus emerged large foreign exchange risk because reserves were in both U.S. dollar and deutschemark whereas the koruna was floating. Taking into consideration, the currency of intervention, benefits of diversification, and the need to operate in liquid and efficient markets, it was decided to hold reserves only in U.S. dollar, deutschemark and yen and the currency allocation decision was based on the structure of the balance of payments, that is 65 percent in deutschemark, 30 percent in U.S. dollar and 5 percent in Japanese yen. After three years, due to problems with rating of Japan and its banking system, it was decided to hold reserves in U.S. dollar and euro. The allocation of reserves into these currencies takes into account various factors, an important one being investment diversification. The aim is to attain the most stable income possible given the exchange rate between the reserve currencies. When setting the ratio between the two currencies in the international reserves, the CNB analyzes the historical time series of the yields on U.S. and European markets and the EUR/US\$ exchange rate. Other factors taken into consideration include the nature of the domestic foreign exchange market, where EUR/CZK is the most important and most traded currency pair. Based on these considerations, the currency composition was set at 73.4 percent for euros and 26.6 percent for U.S. dollars.

Credit risk

475. Credit risk issues can be divided into two groups: issues relating to the selection of the issuers of the financial instruments used for reserves management, and issues relating to the selection of business partners for the execution of reserves management transactions. The sole acceptable issuers are the governments and central banks of OECD countries as well as certain governments and international organizations (e.g., the World Bank) and selected banks from those countries. Moreover, maximum maturity is limited to 10 years for government bonds and 3–6 months for claims on banks (depending on the bank's rating). The credit risk management is based on two sets of limits—one for bank and financial institutions as the CNB's counterparties, and the other for banks and financial institutions as debtors of CNB. In both the cases, the limits are calculated by using a formula that is a function of rating, capital and size of assets. The minimum rating of banks as debtors is individual C, long term A-, and minimum assets of US\$10 billion. Any exception can be made only by the Board of the central bank in writing with a fixed termination.

Operational risk

476. Operational risk control is based on the split between responsibilities for execution and for the benchmarking and settlement at the highest managerial level. There are two departments covering the reserve management and their executive directors report directly to the board. One is responsible for trading and execution, the second is responsible for risk management, settlement, nostro accounts management and for IT support. The data regarding the execution are passed on from the front office to both risk management and back office. The back office also provides data about the settlements to the risk management. Within the risk management department, all the data is compared and the final position of the bank is created every day. The back office monitors the credit limits before the trades are settled

while the risk management monitors limits at the end of the day. The director of risk management has the right to stop the settlement if unauthorized trades are submitted to back office. Since the executive directors in charge of execution and control are different, it is difficult to manipulate with the results.

Experience with external managers

477. The CNB has had quite a long experience with the external managers. The experience has been expensive and rather negative. During last six years there were six mandates. The first two were signed in 1996. The goals at that time were to test if the internal benchmarks were realistic and to benefit from transfer of know how. However, the external managers performance was worse than those of the internal managers and the activity of external managers was almost five times lower than that of the internal manager. The mandates were, therefore, terminated in 1999. In 2000, another three mandates were signed. This time the target was to test new instruments and ways of foreign exchange risk management. One mandate was supposed to test Pfandbriefs with a maturity of up to five years; the second one U.S. agencies global notes; and the third one's role was to replicate our benchmark's basket of currencies of 35 percent in US dollar and 65 percent euro and to invest on hedged basis in 12 other major government markets. All managers ranked among the biggest firms and except for one (FFTW) all managers were chosen by tender. The same reporting requirements were applied and the amounts under management were around US\$100 million. Even here the experience was negative since all managers had sizable problems with reporting (in one case two CNB's experts had to visit the manager and help with the reporting system) and their activity was in general, much lower than the activity of the internal managers and therefore know-how transfer was very limited. Finally, the fees paid to the managers were higher than the relative performance. The benefits of having external managers were that it helped build contact with the asset management industry, provided the results of the tests, and confirmed the right approach to reporting. Despite the negative experience, we are preparing another set of mandates that would test for U.S. corporate bond portfolio management, mortgage-backed securities (MBS) or foreign exchange trading. These are the areas of limited capacity of CNB.

478. The external managers portfolios are subject to the same performance measurement rules and are used to verify and assess certain procedures that could potentially also be used for internal reserves management. These externally managed portfolios constitute approximately 2.3 percent of the reserves.

Operations in efficient markets

479. CNB currently invests its reserves in only euro- and U.S. dollar-denominated deposits and government bonds. Almost by definition these markets are considered as the most liquid and efficient. That is why we do not test and analyze the depth of these markets.

480. It is important to note that one of the weak points of reserve management is that the Czech law is different from the international one, mainly the U.S. and the U.K. law,

according to which most of the agreements are governed. The difference means that there are not enough lawyers familiar with the international laws and there have been very few events where these two different types of law have been tested in the court. In the event of some legal dispute, the uncertainty is high.

C. Dilemmas in Reserve Management

481. Finally the following is a list of dilemmas that must be solved generally and that CNB is currently working on. The first dilemma is currency allocation versus the fact that the reserve's biggest foreign exchange risk comes from the definition of reserves (i.e., the reserves are in currency other than the domestic and accounting currency). The foreign currency risk in a floating exchange rate regime (meaning unhedgeable position) is so large and hopefully the horizon so long that it is not clear if it makes sense to deal with currency allocation of reserve unless one takes the market view on the reserve currencies' exchange rates against each other.

482. The second dilemma is how to treat the ratings. Once the ratings express the probability of companies to default and once the central bank bases the credit limits on rating, the question is should the central bank differentiate between ratings of the banks and corporates. Why is that no central bank has problem with depositing funds in a AA bank, while only few central banks would purchase AAA corporate debt?

483. The other dilemma is the link between the benchmarks and their traditional functions. The benchmark usually serves as the set of risk constraints expressed in assets that can be bought in the market (portfolio of real bonds, index, etc.). Managing the portfolio against the benchmark can mean the effort to beat the benchmark or the effort to beat the market within the limits. Beating the benchmark means that even a wrong investment decision may be considered in a relative sense as a value addition, even if the "benchmark's" investment performs worse. Beating the market, means that the portfolio manager is able to exploit the market opportunity and by definition would perform better than the benchmark. Our external managers tried predicting the yields within certain horizons, they went short or long and took maximum duration positions, while our internal managers focused primarily on replicating the benchmark. The comparison of these two approaches applied on our benchmarks during last six years is by far in favor of internal managers. So the question is at what level the asset managers should take the market view—when setting up the benchmark or when managing the portfolio?

484. There is also another dilemma linked to the benchmark. Today it becomes standard to measure the risks by statistical methods. We can either compare the duration of two "portfolios"—where one is the real portfolio and the second is the benchmark, or we can compare two VaRs—where one is the value at risk of the real portfolio and the second is just the limit number meaning how much we are prepared to lose. However, apart from the risk, benchmarks are used for performance measurement despite the fact that the benchmark may not provide the best investment alternative. Therefore one can eliminate the benchmark portfolio for risk measurement purposes and measure the performance against "ex post"

calculated number. The proposal is that every day we can for certain market and certain instruments (like U.S. Treasuries market), calculate the best investment opportunity. And this best investment opportunity would be declared as the benchmarked performance for the previous day. To avoid the situation where the benchmark consists of one bond some minimum holdings would have to be applied. Also calculating the best investment out of several hundreds of bonds might be technically difficult. Therefore the best investment calculation would be done on narrow set of bonds (instruments) that would the best represent the market moves.

485. If the above methods are put together the new benchmark would consist of VaR limit and return of the best overnight (alternatively over certain period) investment alternative and no “benchmark as portfolio” would be needed.

VIII. HONG KONG SAR

486. This paper discusses the principles and practices of reserve management in the Hong Kong Monetary Authority (HKMA). It further outlines the framework of our risk management system which helps to achieve our statutory roles and our long-term investment objectives on a risk controlled manner.

A. Developing a Sound Governance and Institutional Framework

The Exchange Fund of Hong Kong

487. Hong Kong's Exchange Fund was established in 1935 by the Currency Ordinance (later renamed as the Exchange Fund Ordinance). Since its inception, the Exchange Fund has held the backing to the note issues of Hong Kong. In 1976, the role of the Exchange Fund was expanded. The assets of the Coinage Security Fund, which held the backing for coins issued by the government, and the bulk of foreign currency assets held in the government's General Revenue Account were transferred to the Exchange Fund to enhance its ability to regulate the exchange value of Hong Kong dollar.

488. On April 1, 1993, the HKMA was established by merging the Office of the Exchange Fund with the Office of the Commissioner of Banking. This was done to ensure that the central banking functions of maintaining monetary and banking stability can be performed with a higher degree of professionalism and continuity, in the lead up to 1997 and beyond, to command the confidence of the people of Hong Kong and the international financial community.

Statutory role of the Exchange Fund

489. The Exchange Fund's statutory role, as defined in the Exchange Fund Ordinance, is primarily to safeguard the exchange value of the currency of Hong Kong. Its functions were extended with the enactment of the Exchange Fund (Amendment) Ordinance 1992 by introducing a secondary and subsidiary role of promoting the stability and integrity of the monetary and financial systems, and maintaining Hong Kong as an international financial centre.

Objectives of reserve management

490. The investment strategies for the Exchange Fund should at all times be consistent with the objectives of the Exchange Fund. With the primary statutory purpose to safeguard the exchange value of the Hong Kong dollar coupled with the need to repay the fiscal reserves money deposited with the Fund on demand, there is a need to maintain a high degree of liquidity of the Exchange Fund assets. As the reserves represent a store of value for the future, a secondary objective is to maintain the long-term purchasing power of these reserve assets. The four key objectives for the management of the Exchange Fund are:

- to preserve capital;
- to ensure that the entire monetary base will be at all times fully backed by highly liquid short-term U.S. dollar denominated securities;
- to ensure sufficient liquidity for the purpose of maintaining monetary and financial stability; and
- subject to (i)–(iii) above, to achieve an investment return that will preserve the long-term purchasing power of the assets.

Institutional framework

491. The authority for the investments held by the Exchange Fund rests with the Financial Secretary, who consults with the Exchange Fund Advisory Committee (EFAC) to establish the long-term strategic investment direction of the Exchange Fund.

492. While the long-term strategic investment strategy is set by the EFAC, the day-to-day management of the Exchange Fund is carried out by the Reserves Management Department of the HKMA. In carrying out its responsibilities, the Reserves Management Department operates under the delegated authority from the Financial Secretary and within investment policy approved by the EFAC.

The management of the Exchange Fund

Portfolio segregation before October 1998

493. Prior to October 1998, HKMA identified three main operational functions of the assets held in the Exchange Fund. The three operational portfolios were:

- a portfolio of assets to act as a ***hedge*** against the interest-bearing liabilities of the Exchange Fund (i.e., deposit placements from the Hong Kong Government), to ensure that the Exchange Fund can at all times meet all of the claims upon it;
- a portfolio of ***liquidity*** reserves to be available whenever required to meet market operational needs; and
- an ***investment*** portfolio to preserve the value of the Exchange Fund for future generations of the people of Hong Kong.

494. The investment management styles for these three portfolios were different. For the hedge portfolio, a mix of money market and fixed income securities denominated mainly in U.S. dollars was held to match the maturity profile of the liabilities. The prime consideration in choosing the investments for this portfolio was the credit standing of the issuers; this was to provide maximum security for the assets and ensured that holders of the Exchange Fund's

liabilities (i.e., Exchange Fund Bills and Notes) have the greatest protection and assurance that those liabilities will at all times be honored.

495. For the liquidity tranche, the Exchange Fund held prime liquid U.S. dollar denominated money market securities. The choice of U.S. dollars is partly because the U.S. dollar remains the base currency for the foreign exchange markets of the world and for the HKMA's market operations, and partly because the U.S. market is the largest and most liquid in the world, enabling a very large sum of fund to be mobilized, if required, without disrupting the global financial market.

496. The investment portfolio was a multi-currency portfolio invested in the major money markets and fixed income markets of the world, with a small holding in foreign equities. The majority of the assets was denominated in U.S. dollar, reflecting the fact that our base currency is linked to the U.S. dollar.

Portfolio segregation after October 1998

497. In September 1998, the Monetary Base was redefined to include *Exchange Fund Bills* and *Notes* in addition to *Certificates of Indebtedness*, *coins in circulation* and the *aggregate clearing balance* maintained by banks with the HKMA. In order to enhance the transparency of the operation of the currency board arrangements, a Backing Portfolio was created by designating certain asset and liability items in the Exchange Fund as those specifically related to currency board operation.

498. From October 1998 to date, the Exchange Fund is managed in only two distinct portfolios, namely Backing Portfolio and Investment Portfolio. The Backing Portfolio was established such that the monetary base is at all times fully backed by foreign reserves and that the changes in the aggregate size of the monetary base correspond to the inflows and outflows of funds. Assets in the Backing Portfolio are therefore short-term highly liquid U.S. dollar-denominated interest-bearing securities to fully back the monetary base.

499. The balance of the assets of the Exchange Fund that constitutes the Investment Portfolio is invested in OECD bond and equity markets to preserve the long-term purchasing power of the Fund's value for future generations of Hong Kong.

Re-defining investment benchmark

500. In 1998, three events led us to conduct, at the end of the year, a major revision of the investment strategy of the Exchange Fund.

- First, the decision was taken to allow the fiscal reserves, from April 1998, to earn a return that is the same as that for the Exchange Fund as a whole.
- Secondly, the HKMA purchased a large amount of Hong Kong stock in August 1998 through market operations.

- Thirdly, the assets of the ex-Land Fund were merged into the Exchange Fund in November 1998.

501. Having regard to the above considerations, a new investment benchmark was constructed for the Exchange Fund in 1999. This investment benchmark has been in use since then. The principles and methodology to construct this investment benchmark are described in further details in paragraphs 538–542. The new investment benchmark defined in January 1999 and before are presented in the Table 17 below in simple terms:

Table 17. Investment Benchmark of the Exchange Fund

	Investment Benchmark From 1999	Investment Benchmark Before 1999
Bonds	80%	90%
Equities	20% (Hong Kong: 5%)	10% (Hong Kong: 0%)
Currencies	80% U.S dollar bloc 15% European-bloc 5% Japanese yen	70% U.S.dollar bloc 20% European-bloc 10% Japanese yen

502. Over the years, the Exchange Fund has embarked a greater use of the long-term capital markets by diversifying into new markets and instruments. As shown in the Table 18 below, the current strategic investment benchmarks permit the Exchange Fund to invest in greater number of bond, equity as well as currency markets than previously allowed in 1995.

Table 18. Permissible Markets for the Investment of Exchange Fund

	2002	1995
Bond Markets	26	19
Equity Markets	23	1
Currency Markets	21	13

The adequacy of Hong Kong's foreign currency reserves

503. As of March-end 2002, the foreign currency reserve assets stood at US\$110.2 billion, which placed the Hong Kong SAR Government's foreign reserves as the fourth largest in the world after Japan, Mainland China and Taiwan. These reserve assets represent over seven times the currency in circulation or 43 percent of Hong Kong dollar M3, one of the highest ratios in the world. Hong Kong's substantial official reserves provide backing for the Hong Kong dollar and offer a valuable—and growing—source of security for future generations.

504. Experience suggests that Hong Kong needs considerably more in foreign reserves than the bare theoretical minimum to maintain currency stability. Despite the fact that we have probably the most robust exchange rate system—by design and as a result of our continuous efforts to strengthen it ever since its establishment in October 1983, it is also true that our exchange rate system, characterized by Currency Board Arrangements, only requires

our monetary base, currently at HK\$233 billion, to be fully backed by foreign reserves of about US\$30 billion at the exchange rate of 7.8. It is however, incorrect to take the view to consider this theoretical minimum as all we need in foreign reserves.

505. The crucial lessons from the Asian financial turmoil in July 1997 and the excessive volatility that rocked the financial markets in 1998 highlighted the importance of strong reserves, prudent management of the Fund and the critical role of risk management in the investment process.

506. During the initial attack on our currency in October 1997, the robustness of our exchange rate system, automatically transferred the pressure on the exchange rate on to our interest rates, without the need to use foreign reserves in the Exchange Fund other than those dedicated for the purpose of backing the monetary base. Reflecting the severity of the currency attack, our overnight interest rate went up for a short while to over 200 percent, and interest rates for long-term money also rose sharply. This caused a lot of pain, to the community and the speculators alike.

507. In August 1998, the attack on the currency came again and was many times more severe than in 1997. In that incident, we sold foreign reserves of about US\$10 billion for Hong Kong dollars, in anticipation of the draw down of fiscal reserves deposited with the Exchange Fund, and relieved some of the pressure on the exchange rate and obviated the need for a repeat of the very sharp interest rate hike of 1997. We also sold large sum of foreign reserves for Hong Kong dollars for the purchase of Hong Kong stocks equivalent to US\$15 billion. Thirdly, we made the monetary base much bigger in order to reduce the sensitivity of interest rates to inflows and outflows of funds. This involved committing another US\$13 billion as additional backing.

508. It should be noted that, we had, in fact, mobilized the foreign reserves amounting to a few times the then theoretical minimum requirement of US\$12 billion in the foreign reserves for the provision of 100 percent backing to the monetary base. We were able to do so without causing a breakdown of confidence in monetary and financial management in Hong Kong on the part of the international financial community, to a large extent, because we had significantly more foreign reserves in the Exchange Fund than the sums mobilized and we have no liabilities other than the fiscal reserves deposited there.

509. A strong position of foreign reserves can safeguard the ability of the HKMA to deliver, when necessary, the statutory purpose of the Exchange Fund, which is to defend the exchange value of the Hong Kong dollar and to maintain the stability and integrity of Hong Kong's monetary and financial systems. This also supports our role as the lender of last resort. In order to maintain the stability of HK\$ under the Currency Board System, the size of foreign reserves we need is probably "the more the better". This foreign currency reserve involves a natural build-up process through inflow of capital, investment gains, or increase in fiscal placements.

Transparency and accountability

510. The Hong Kong's Legislative Council defines and limits the HKMA's powers and responsibilities, or by setting out the Monetary Authority's accountability, through the Financial Secretary and the Hong Kong SAR government, to the Legislative Council under Article 64 of the Basic Law. But the HKMA also recognizes a broader responsibility to the community of Hong Kong SAR, and a duty to promote an understanding of our role and objectives, and to keep ourselves informed of community concerns and open to public debate.

511. To this end, the HKMA pursues a policy of transparency and accessibility. This policy has two main objectives:

- to keep the financial industry and the general public as fully informed of the HKMA's work as possible; and
- to ensure that the HKMA is in touch with, and responsive to, the community that it serves.

Measures to increase transparency of disclosure

512. Prior to 1992, the accounts of the Exchange Fund were confidential. However, in keeping with the commitment to greater transparency in disclosure, the government started publishing the accounts of the Exchange Fund annually in 1992. Bi-annual accounts have been published since June 1995, and headline figures for the foreign exchange reserves have also been released monthly since January 1997.

513. Over the past years, we have done a great deal to advance the policy of transparency and accessibility. The major milestones to enhance the transparency of disclosure are displayed in the Table 19 below. This applies to technical matters such as the increased transparency of the currency board system, the daily publication of the size and composition of the Monetary Base, and the virtually real-time publication of the Aggregate Balance of the Banking System. In addition, we extend the information available for general public consumption, whether in print, through the press, on the Internet, or in our programs of educational briefings, seminars and large scale exhibitions.

Table 19. Major Milestones to Enhance the Transparency of Disclosure

<i>Year</i>	<i>Measures</i>
1992	▪ Started publishing the accounts of the Exchange Fund annually
June 1995	▪ Started publishing the accounts of the Exchange Fund bi-annually
Sept 1995	▪ Started publishing quarterly figures on foreign currency assets
Jan 1997	▪ Started monthly disclosure of foreign exchange reserves
Jan 1999	▪ Started publishing monthly International Reserves in accordance with IMF's SDDS ▪ Started publishing monthly data on Analytical Accounts of the Central Bank in accordance

<i>Year</i>	<i>Measures</i>
Apr 2000	<ul style="list-style-type: none">with IMF's SDDS▪ Started publishing monthly Abridged Exchange Fund Balance Sheet and Currency Board Accounts▪ Started publishing Template on International Reserves and Foreign Currency Liquidity in accordance with IMF's SDDS

514. The considerations of market sensitivity, commercial confidentiality, and statutory restrictions on disclosure of confidential information will, of course, place some limits on the amount of material we can make public. Given the increasing transparency and the extremely limited discretion over the currency board arrangements, which draws its credibility from a strict rule-based system, a certain constructive ambiguity is also necessary if we are to have the flexibility to deal decisively with sudden crises. Within these limits, we are committed to developing our policy of transparency, and to increasing the quality and comprehensibility of the materials we put out for public consumption.

B. Establishing a Capacity to Assess and Manage Risk

Delegation and control of investment management of the exchange fund assets

515. The delegation of investment authority for managing the Exchange Fund assets is achieved through a 3-level framework, covering three basic types of investment decisions:

- Long-term strategic decisions controlled by EFAC;
- Medium-term market decisions delegated to the senior management down to the Executive Director level; and
- Short-term trading and anomaly trading decisions delegated to portfolio manager levels.

516. This 3-level framework of investment decision is reviewed every year to reflect any required change or amendment to the control and delegation structure.

Risk management framework

517. In developing the risk management framework, the HKMA draws upon the best market practices of asset management in the private sector and apply these practices in determining the parameters for managing risks. The risk management framework serves to achieve two main objectives:

- identify and assess the financial and operational risks; and
- allow the management of risks within acceptable parameters and levels.

518. Risk Management & Compliance Division is responsible for day-to-day monitoring and control of six major types of financial and operational risks, namely:

- (i) Market Risk;
- (ii) Credit Risk;
- (iii) Liquidity Risk;
- (iv) Currency Risk;
- (v) Settlement Risk; and
- (vi) Operational Risk.

Market risk control

519. The overall market exposure is defined by Exchange Fund's Preferred Neutral Position ("PNP") and tactical deviation limits for each asset class, market segment and currency type. A weekly Asset Allocation Meeting participated by senior executives and reserves management staff is held to review investment strategies for the overall Exchange Fund and the allocations to both internal and external managers as well.

520. The overall EF assets will be consistently tested by value-at-risk ("VaR") and scenario stress testing, which are used to quantify the market risks inherent in the portfolios under normal and extreme adverse market conditions as well. The extreme adverse market events include stock crash and drastic bond yield shift in 1987 and currency crisis in 1994.

521. Using a market based risk management model, a weekly report to evaluate both absolute and relative (to benchmark) VaR is made at 95 percent confidence level for 1-month horizon. The calculation of 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 are monitored to ensure that the Exchange Fund is not unduly exposed to market risk at any point in time.

522. Stress-test is employed to test the impact of a simultaneous recurrence of the worst equity, bond and currency market crashes in the past 20 years on the total Exchange Fund assets.

523. Both VaR and scenario stress test reports are submitted to the EFAC meeting for review.

Credit risk control

524. With the delegation by EFAC, the Credit Review Committee ("CRC") is established to be responsible for the following objectives:

- Monitor credit risks within parameters set by credit policy

- Review credit policy to meet the new investment policy requirements and to control counterparty or issuer credit risks
- Evaluate and set the credit limits for issuer, bank, counterparty and country

525. Risk Management & Compliance Division supports the credit analysis and assessment based on market accessible information. The control mechanism is segregated into 2 major areas:

- Centralize credit assessment approach by standardizing analytical framework in terms of economic and financial performance, debt ratio, liquidity, capital, asset size and rating assessment by international credit agencies; and
- Centralize credit line allocation for internal and external managers via CRC.

526. The day-to-day credit exposure control on individual issuer, group level and country level is conducted through pre-deal checking process for internally managed assets. For external managers, we appoint the custodian managers to perform the investment and credit compliance checking functions on behalf of the HKMA based upon the limits that we segregate for external managers. At day end, it is required to perform overall compliance checking on investment activities against the credit and investment limits defined in Exchange Fund Credit Policy and Investment Policy as well.

Liquidity risk control

527. The Backing Portfolio was established in October 1998 to ensure that the monetary base is at all times fully backed by U.S. dollar assets. The assets held in this portfolio should be the most liquid and high credit quality securities, and at all times be ready to meet the obligation under convertibility undertaking (i.e., HKMA sells US\$1 for 7.80 HKD) for all authorized institutions which maintain an account with the HKMA and have access to the local Real Time Gross Settlement system.

528. In addition, liquidity control measures include the following major limits:

- (i) Set percent limit of foreign currency assets to be converted into cash within 2 and 5 working days.
- (ii) Set percent limits of overall Exchange Fund assets for deposit and for term deposits over 1-month horizon.
- (iii) Set bond issue or program size limits to ensure efficient liquidation without disrupting the markets.

Currency risk control

529. The overall currency risk for the Exchange Fund can be determined with the combination of the benchmark currency mix and corresponding deviation limits. The PNP of

currency mix strategically dictates the long-term currency exposure for the overall Exchange Fund assets. This has taken into account the long-term return and risk profile of currency as an independent asset class together with all investment constraints such as the maintenance of adequate U.S. dollar assets to back the monetary base under the Currency Board System.

530. A list of authorized currencies is determined on the basis of underlying investment markets and liquidity condition of each currency. At portfolio levels, we restrict the currency mix in accordance with their respective investment requirements and constraints. In the case of Backing Portfolio, it is restricted to hold U.S. dollar assets. Meanwhile, the currency exposures at other externally and internally managed investment portfolios are subject to their underlying investment benchmark and deviation limits.

Settlement risk control

531. In order to mitigate settlement risks, we standardize settlement instructions together with using delivery versus payment (for bond and equities), and payment versus payment methods to reduce the potential loss due from settlement failure.

532. For the externally managed assets, we use reliable and reputable master custodians to centralize and control the settlement workflow of externally managed assets by portfolio types in order to gain the operational efficiencies.

Operational risk control

533. A separation of reporting line to senior management between settlement and dealing functions can achieve a better control purpose by avoiding potential outright fraud or collusion of official reserve assets amongst front desk dealing staff.

534. Straight-through processing starts from deal input, trade instruction, reconciliation of deal confirmation, and finally to dispatch of standardized settlement instruction (e.g., SWIFT messages). After the deal is input into the system, operational processing requirements including report generation, account entry posting, and settlement are electronically conducted on an automatic and uninterrupted workflow process.

535. Money market or repo facility is established at every nostro account with corresponding foreign commercial banks or central banks to re-invest the residual idle cash balance accumulated at the cut-off time of domestic market. This is to ensure even the unexpected account balances due from unsettled trades are fully invested.

536. Contingency plans for crucial modules and off-site backup systems outside the main office are established to control and mitigate system failure risks due to unexpected system breakdown or power failure or any disaster situation.

537. A regular and firm wide checking on communication network including internal email system is conducted to avoid communication failure risk.

Determination of investment benchmark and tactical deviation limits

538. The investment benchmark, which directed the long-term strategic investment, is expected to meet the following investment objectives of the Exchange Fund.

- (i) to preserve capital;
- (ii) to ensure that the entire monetary based will be at all times fully backed by highly liquid short-term U.S. dollar denominated securities;
- (iii) to ensure sufficient liquidity for the purpose of maintaining monetary and financial stability; and
- (iv) subject to (i) - (iii) above, to achieve an investment return that will preserve the long-term purchasing power of the assets

To Quantify Investment Objectives and Constraints

539. The investment objectives and constraints require to be quantified for the optimization process:

- (i) to preserve capital, it is required to set a high probability level that returns in the short, medium and long-term will not be negative.
- (ii) to ensure that entire monetary base is at all times fully backed by liquid US\$ assets, it is required to set a minimum percentage of total portfolio holdings in liquid US\$ asset.
- (iii) to preserve the long-term purchasing power of the assets, it is required to set a reasonably high probability that the expected benchmark portfolio return shall exceed the long-term domestic inflation rate.
- (iv) To measure the downside risk below the long-term domestic inflation level, it is required to set the annualized shortfall in return against the long-term domestic inflation rate at an acceptably low probability level.

To Determine the Permissible Markets and Instruments

540. The investment management of Exchange Fund assets is expected to be conducted in well-established markets that have sufficient breadth and depth to ensure that transactions can be efficiently absorbed in the market without undue effects on liquidity and the availability of funds. This is particularly the case for central banks including the HKMA as most transactions are typically in decent size. We assess the liquidity of each market and instrument by the following factors:

- (i) bid/offer spread at both normal and crisis conditions.
- (ii) dealing size at both normal and crisis situations.
- (iii) total portfolio holdings as a percent of daily market turnover.
- (iv) availability of repo market for each instrument type.

541. Since the monetary base requires sufficient backing by U.S. dollar assets under the currency board system, we maintain a minimum percentage of total Exchange Fund (EF) asset holdings in U.S. Treasury products to ensure adequate liquidity. This prudent policy has proven to be essential based on the international crisis situations experienced in the past several years.

542. In summary, the Exchange Fund investment objectives are quantified into expected return, risk and parameters of capital preservation and liquidity requirements. These parameters form the critical investment performance criteria in establishing the optimal new PNP, which is therefore expected to achieve the Fund's risk/return objectives and other trade-offs within the framework of a long-term passive investment policy.

Key features of optimization model to derive our investment benchmark

543. A market well-tested optimization model is used to construct the optimal mix of asset allocation. Such model overcomes the traditional mean-variance optimization method, which suffers from a tendency to create unbalanced portfolios for closely correlated assets such as bonds.

544. Due to stringent liquidity requirements for all the securities, only the more liquid and developed markets are included in the list of permissible asset markets. All permissible asset classes and currencies are included to conduct the optimization process. Historical returns and correlation across all market segments are applied to find the risk matrix, and such risk structure is assumed to hold constant to derive expected portfolio volatility. No expected return for individual asset class is projected. We apply long-term equilibrium returns, which are consistent with market clearing levels for the global market-cap weighted portfolio.

545. Institutional investors will typically set a target portfolio risk for the investment benchmark. Instead of using a specific portfolio risk target, we test the optimal asset allocation against a set of critical investment performance criteria, which effectively reflects the control of overall portfolio risk level.

546. With the calculation of total portfolio risk of investment benchmark, it is required to analyze the risk contribution of each asset class and market type. This process serves the following 3 purposes:

- (i) identify principal sources of risks by asset classes and market segments.
- (ii) ascertain that the risk exposures in the optimal portfolio correspond to positions where we would like to take risk.
- (ii) ensure that the portfolio risk is as much evenly balanced as possible across different major international markets including currency types.

547. The risk decomposition of investment benchmark is based on risk contribution framework.³⁴

548. Although the investment benchmark represents an optimal asset mix for long-term investment, re-optimization is required due to the following scenarios:

- (i) change of investment objectives and constraints.
- (ii) failure to meet the critical investment performance criteria arising from structural change of market performance and volatility structure.

Derivation of tactical deviation limits

549. The evaluation and selection of investment benchmark is based on the framework of critical performance criteria with return, volatility and capital preservation parameters. We use the same framework to stress test the tolerance of the Exchange Fund PNP to additional volatility. Through incremental additional annual volatility, we establish that the PNP is able to tolerate an additional level of annualized volatility, and still be able to produce an acceptable performance when compared to the critical performance criteria.

550. With the established overall tracking error, a risk-based approach is used to calculate the permissible tactical deviations for short- to medium-term trading for currency composition, allocation by asset class, allocation by market within each asset class and duration of each bond market. This method is essentially a VaR approach used by institutional investors to control the risks arising from trading positions. This is also consistent with the risk/return optimization method used to construct the Exchange Fund PNP.

551. All things being equal, the most volatile asset would logically be given the least permissible deviation. In calculating the deviations, we adopt a conservative approach and apply the permissible deviation for the most volatile market segment as the maximum permissible deviation for the asset class containing such market segment.

³⁴

$$\text{Risk Contribution of nth asset} = \frac{h(n) * \text{Vector of Marginal Volatility}}{\sigma}$$

,where h(n) is the nth element of the position vector

$$\text{vector of Marginal Volatility} = \frac{\Sigma h}{\sigma}$$

(Σ : Covariance matrix)

(h : Portfolio position vector)

Performance measurement framework of the exchange fund

552. The monthly performance attribution analysis identifies the out-/under-performance of a portfolio compared to its investment benchmark. It decomposes total active return into various return attributes relative to the benchmark return. Based on our current setting, attribution analysis is divided into 2 levels: (a) fund allocation effect, (b) portfolio management effect. Each of them is further divided into various active return attributes according to the style of management, selection, manager skill, and other factors.

Fund allocation effect (i.e., overall asset allocation effect)

553. Fund allocation effect is the contribution to return due to the management's withdrawal from or increased allocation to different (external or internal) portfolios or investment types of portfolios. At the moment, we have over 10 types of portfolios in different investment benchmarks. Under the fund allocation effect, there are 4 contribution factors, namely:

- (i) Asset allocation effect
- (ii) Country weighting effect
- (iii) Currency effect
- (iv) Benchmark adjustment effect

Portfolio management effect (i.e., portfolio active return)

554. This is the active return at portfolio levels relative to their benchmarks. From end of 1999, we began to use market based multi-factor model to analyze the active returns of bond portfolios by factors of duration, curve steepness, curvature, selection effect.

555. In the near term, another market based multi-factor model is used to identify the sources of active returns from active equity mandates. The risk factors of equity analytical model are as follows:

- (i) U.S. equity model—Market cap, EPS ratio, BP ratio, net earnings revision, EPS torpedo, historical beta, price reversal
- (ii) Global equity model—Market cap, EPS ratio, BP ratio, earnings growth, average dividend yield, long-term debt/asset ratio, volatility of ROE, volatility of EPS.

556. In addition, we internally maintain return-based attribution for investment managers with the following framework:

- (i) Alpha [α]: residual return component, i.e., to measure the ability of manager in the selection of security
- (ii) Down-market Beta [β]: to measure portfolio exposure to benchmark in a down-market.

- (iii) Gamma [γ]: to identify a manager's skill in managing market exposure against benchmark at times of down-market and up-market.
- (iv) Information Ratio (IR): Measurement of risk-reward trade-off given investment manager's added value and excess volatility over benchmark.

557. We apply some quantitative methods such as Sharpe ratio and information ratio to respectively measure the portfolio risk-adjusted return and to assess the effectiveness of use of information by managers.

Challenges of reserves management in the HKMA

Increased Mobility of International Capital Flows

558. The world economy becomes increasingly more integrated. This is evidenced by global synchronization in financial markets and increased capital flows amongst countries, particularly from industrialized into emerging economies. Most central banks, if not all, are therefore facing potentially large and abrupt inflows and outflows of capital, especially portfolio flows. Extreme care is needed in managing their reserves, and in some cases, to tighten the liquidity criteria to quickly respond to external shocks. This has disturbed the management of foreign exchange reserves and appeared to be contradictory to the diversification requirement suggested by the portfolio management theory.

Global Financial Market Synchronization

559. The value-at-risk approach used by the HKMA to measure the expected market risk is based on assumptions of a normally distributed return series and a stable risk structure, i.e., stable return correlation across asset classes and markets over time. These notions tend to underestimate the actual market loss due to a breakdown of "normal" price behavior across market segments at times of stress events. With global market synchronization and increased complexity of investment instruments, such risk has become even more evident. Stress risk management can be considered to address the above issue. This is to determine risk capital based on a pre-set high standard deviation event and a covariance matrix with the assumption of perfect correlation across all market segments. The accumulated risk capital allocation should then be limited to a percentage of total capital size of a fund to avoid undue market exposure.

Use of Derivatives to Implement Reserve Management Strategies

560. In the long-term, the supply shrinkage of government securities due to improving budget positions will cause central banks to keenly look for viable investment alternatives. While many central banks remain very cautious, some central banks have made use of derivatives to better manage the market risk and liquidity risk. On the asset side, through the use of futures, it is possible to achieve duration strategy while maintaining a better liquidity profile. On liability management side, central banks responsible for this have made extensive use of interest rate and currency swap for issuing debt to adjust the risk characteristics of

their portfolios. The use of derivatives requires more advanced risk management and IT system development to support the transactional processing, account posting and overall portfolio risk assessment.

IX. HUNGARY

A. Reserve Management Objectives and Coordination

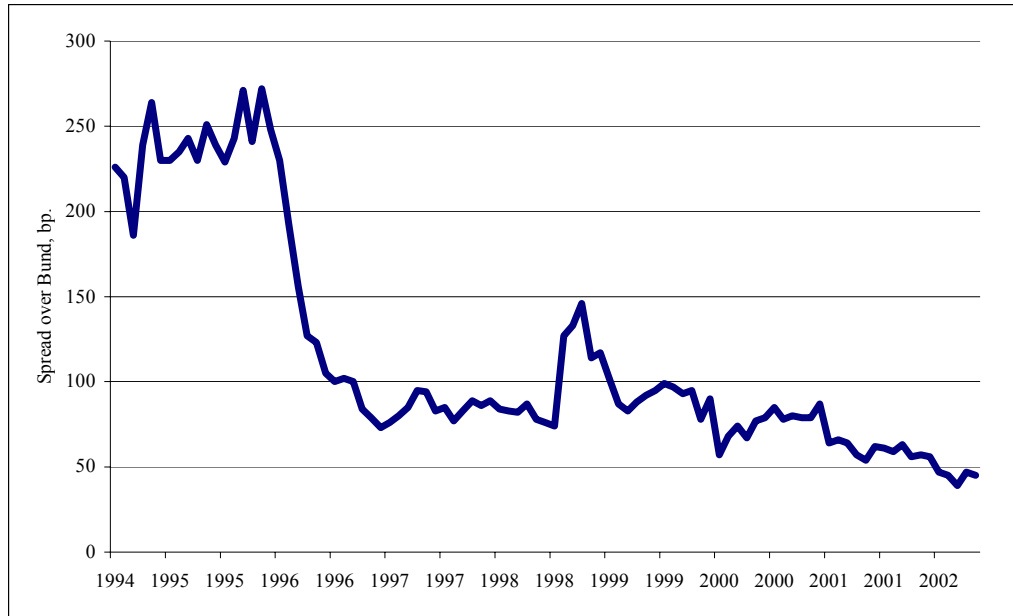
Reserve management objectives

561. According to the Central Bank Act, one of the basic responsibilities of the National Bank of Hungary (NBH) is the management of foreign exchange reserves. The primary purposes of managing foreign exchange reserves, as for every central bank, are the following:

- support for the monetary policy (intervention),
- transactional purposes (supporting debt management, controlling crisis situations),
- wealth management objective.

562. In the past couple of years, with the economic development of the country and with the improvement of credit ratings and debt service ratios, the direct transaction objectives—like supporting the repayment of debt—have been gradually losing their weight. At the same time, support of the monetary policy has become the principal reserve management objective. One way to ensure the credibility of the exchange rate system is to hold an adequate level of reserves that can support the inflation targeting system in the form of intervention, if needed. Although the cost of holding reserves has significantly decreased with the country's improving credit ratings, the NBH still would not like to build reserves for the pure purpose of wealth accumulation. As stated above, the NBH aspires to manages reserves so as to help achieve the goals of monetary policy efficiently, meet the requirements of debt service, and at the same time, try to optimize the return on the reserves without jeopardizing the above mentioned goals.

Figure 7. Hungary's Five-year Credit Spread over Bund, 1994-2002



Source: secondary market quotations

Institutional framework

563. The reserve management policy of the NBH is defined by the Monetary Council (MC). The MC decides on the currency composition of foreign reserves, and interest and credit risk exposure. It approves the applied investment instruments and the list of business partners. Furthermore, according to the investment guidelines and the return requirements, the MC determines the benchmark portfolio. The MC monitors the results of the reserve management activity on a quarterly basis.

564. While the MC is a strategic decision-making body, the Asset and Liability Committee (ALCO) is responsible for tactical decisions related to reserve management. The ALCO holds a meeting at least once a month. The ALCO makes decisions on the deviation from the strategic benchmark and on the modification of operational limits. The ALCO also monitors closely the activity of the reserve management unit in charge of the implementation of daily investment and liquidity management operations.

565. An independent risk management unit is responsible for the evaluation of daily business activities and monitors the compliance with the operational limits. This unit is in charge of the elaboration of the risk management policy and the reporting system toward the senior management. The unit also sets up and maintains the benchmark indices for the portfolio managers.

Determinants of reserve management policy

566. There are four special country characteristics that guide Hungary's reserve management policy:

- small open economy
- emerging/converging country
- relatively high foreign currency debt
- quasi ERM-II exchange rate regime with no capital controls

567. Hungary is a small open economy with the export/GDP ratio above 60 percent. This means that the exchange rate developments have substantial influence on inflation. Hence, to run a successful exchange rate policy, Hungary must have sufficient foreign exchange reserves.

568. Hungary is an emerging/converging country, with fast developing but still less liquid domestic financial markets. This means that the central bank cannot easily build up and down reserves via foreign exchange market operations. In addition, the costs of holding foreign exchange reserves (spread between borrowing and investment rates) are, albeit decreasing, still negative. These facts must be taken into consideration when determining the adequate size of reserves.

569. Around 30 percent of the state debt is in foreign currency. The primary source of the annual EUR 2–3 billion debt service is the NBH's foreign exchange reserves. Hence, the size and currency structure of the debt service are an important input to set the reserves management policy.

570. The country's primary objective is to join the European Union and then the Economic and Monetary Union. The NBH is already running a quasi ERM-II exchange rate regime with no capital controls. The currency is pegged to the euro with a plus/minus 15 percent fluctuation band. In order to give credibility to the band, the NBH must have adequate reserves size in the current "quasi" and later in the real ERM-II system.

Optimal currency structure

571. Prior to 1999, the NBH was responsible for the foreign currency borrowing of the country. So taking the gross currency structure first, we match the foreign currency liabilities of our balance sheet. This means we hold EUR, US\$ and JPY in our foreign exchange reserves.

572. In taking the net open currency position against the domestic currency, the Hungarian Forint, we take into consideration the following factors:

- currency of intervention;
- HUF basket;

- orientation of external trade; and
- macro level asset-liability considerations.

573. As stated above, Hungary is running a quasi-ERM-II system, where the central parity of the HUF is 100 percent pegged to the euro. As a consequence, more than 80 percent of the interbank HUF/foreign currency spot market turnover is against the euro. This means that the natural intervention currency is the euro.

574. Hungary is becoming increasingly integrated into the European Union. Hence, the currency structure of external trade, especially in the *competitive* sector, is more dominated in euros. This is also true for foreign direct investments and portfolio investments.

575. The currency benchmark for foreign currency debt of the government, managed by the State Debt Management Office, is 100 percent euro. To provide a hedge on a macro level, we take this fact into consideration when determining the optimal net currency structure to the extent it does not conflict with other objectives of holding reserves.

576. To summarize, the euro has a dominant part in the foreign exchange reserves. The dominance of euro is justified by the fact that the Hungarian forint is 100 percent pegged to euro, the objective of the country is to join EU as soon as possible, by the currency composition of government debt denominated in foreign exchange, and the fact that the intervention currency in the domestic market is the euro.

Adequate size of reserves

577. In setting the adequate size of reserves, we take the following into consideration:

- nature of present and future foreign exchange regime;
- Guidotti rule;
- ratios to monetary aggregates;
- foreseeable and potential future cash flows;
- hot money potentially leaving the currency in 3–6 months;
- access to foreign exchange markets;
- access to foreign capital markets ;
- cost of holding reserves; and
- international comparison.

578. The level of reserves should be sufficiently high to support the current quasi ERM-II, and the future real ERM-II foreign exchange regime. To perform this task, the reserves must meet the Guidotti rule, i.e., the reserves should cover the one-year liabilities of the whole country. Also, the level of reserves must be at least as high as the monetary base. Behind this, one can find the argument that to defend the currency, the system could be at any time *theoretically* converted into a currency board.

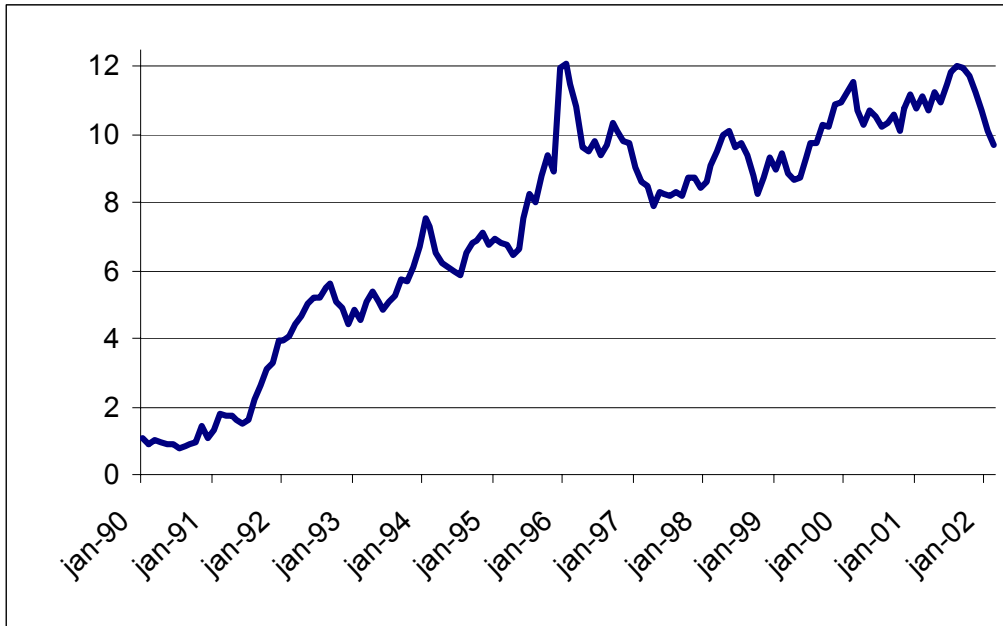
579. To keep the level of reserves in a desirable range, we try to quantify the foreseeable and potential cash flows. Debt principal and interest payments account for the biggest part of foreseeable outflows, amounting to \$2–3 billion in the first part of this decade, falling sharply in later years. The government's foreign currency borrowings are the biggest potential inflows. The NBH coordinates closely with the authorities responsible for debt management in order to harmonize policies. Privatization revenues are another possible source of inflows. These were considerable in the 1990s, but looking ahead, NBH does not expect huge amounts from this source.

580. Stress tests are performed to see how external or internal shocks can affect the size of reserves in a three- to six-month horizon. We monitor the non-residents' 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, etc. Using our own and international historical evidence during currency crises (like the 1998 Russian crisis, the 2001 Argentine crises) we estimate the potential outflow in a three- to six-month period, a period during which internal policy adjustments can be executed, or after which foreign capital markets can be accessed again.

581. Rarely is the central bank entirely free in setting the exact level of reserves. Even in the case of an efficient foreign exchange market of the domestic currency, the central bank can purchase or sell domestic currency for reserve level adjustment purposes under normal market conditions. In case of Hungary, it was only in 2001, after full foreign exchange liberalization, that the liquidity of the HUF spot market reached a level where the NBH could purchase foreign currency purely for foreign exchange reserve management purposes (to cover interest payments on the foreign state debt), without effectively affecting HUF market exchange rates. To minimize the impact on the exchange rate, it was executed in a transparent way, in equal, market-conform pre-announced amounts (EUR 2.9 million a day, total EUR 374 million). Independent of this positive experience, when planning the future course of reserve levels, we conservatively do not count with foreign market sales or purchases.

582. As the rating of the country is improving, access to international capital markets is getting relatively easier and easier. It means the necessary size of reserves can be lower than before, since the NBH does not have to build high precautionary buffers. The NBH has a formal agreement with the Ministry of Finance that for reserve replenishment purposes, the government is ready to execute borrowing transactions any time the central bank requests it. Moreover, in the future, other sources like automatic borrowing facilities in the ERM-II system will be available.

Figure 8. Size of Official Foreign Exchange Reserves
(1990-2002, US\$ billion)



583. Looking at the cost of holding reserves (see Figure 8. where, as a proxy, we used the relevant credit spread), there is a clear tendency toward lower costs. Nevertheless, it is still negative; so, as in the past, the NBH does not intend to hold higher reserves than necessary. Cheaper cost of holding only means that NBH can tolerate bigger swings in the size of reserves. Going forward till the prospective EMU-entry, we expect the cost of holding to approach zero.

584. Finally, to verify actual level of reserves we regularly carry out international comparisons. Taking a longer period we look at figures like import coverage, ratios to monetary aggregates, reserves to GDP, etc. Concentrating mainly on countries with similar features as Hungary, we examine how successfully different countries run monetary and exchange rate policies with different level of reserves.

Investment policy

585. In respect of the classical investment triad (return-liquidity-safety), the investment philosophy of the NBH is to achieve maximum return on reserves while maintaining the highest attainable liquidity and safety. Appropriate safety in this case relates to the obligation of the central bank to preserve the value of reserves held on behalf of the country. Concerning this special responsibility, reserve management is supposed to consider the appropriate risk level which allows a minimum probability of loss of capital in a certain given year. Liquidity requirement means the ability to provide an adequate amount of funds for a possible immediate foreign exchange market intervention. The adequate amount of

funds has to be available with the lowest attainable cost and capital loss. The objective of maximizing returns ought to be considered only if all the liquidity and safety requirements are met. Developing this approach in the investment policy allows us to favor active against passive portfolio management.

586. In the process of developing the investment guidelines, the main objective of the NBH has been to adopt the best practices of central banks of developed countries. Like all central banks in the world, NBH has conservative guidelines which tries to avoid instruments with high volatility and not permit the investment in equities. The maximum time to maturity of bonds in the portfolio is ten years and the required rating is AA-AAA (by the big rating agencies). Our liquidity requirements with the mentioned maturity and rating considerations determine the available instrument in the bond market. Therefore, NBH holds mainly government, supranational and government agency issues of developed countries. The sufficiently high level of reserves and the development of bond markets in the last ten years allow us to gradually increase the size of AA rated securities with excellent liquidity features in the bond portfolio. This part of the portfolio bears higher yield without adding significant risk.

Transparency and accountability

587. In the year 1999 and 2000, IMF addressed these issues in several proposals. The NBH joined the Fund's Special Data Dissemination Standard among the first central banks. According to the current practice, the NBH discloses the size and internal structure of its reserves monthly with a 20-day lag using IMF's Data Template on International Reserves and Foreign Currency Liquidity.

588. The management of our bank participated in meetings in Basle and Washington, D.C. where the framework of Guidelines for Foreign Exchange Reserve Management was negotiated. Together with other central banks, we considered the proposed Guidelines in full detail and provided our bank's 10–15 years of experience concerning this issue. Since the approval of these proposals, the National Bank of Hungary has adopted most parts of it.

B. Establishing a Capacity to Assess and Manage Risk

Risks incurred by the NBH

589. Risks incurred by the NBH in managing foreign exchange reserves are primarily of a *credit, liquidity* and *market* nature. Within credit risks, we can distinguish counterparty and spread risks. Concerning market risks, we put the emphasis on the *currency* and the *interest rate (yield curve)* exposures. There is a framework in place for identifying and managing these risks on an integrated and centralized basis in line with best homologue³⁵ and market practices, building on four key elements:

³⁵ With special attention to the ECB and the connected European NCBs.

- system of partner and issuer *ratings*;
- system of partner, issuer and sectorial *limits*;
- restrictions concerning *eligible assets and transactions*; and
- internal two-stage *benchmark procedure*—allowing for certain range of permitted deviation—concerning sectorial allocation, duration and currency composition.

Investment instruments

590. Authorized investment instruments are

- bonds (authorized embedded options: put, call, cap, floor);
- minimum AA rated sovereign;
- supranationals (incl. BIS);
- AAA agency papers;
- AAA Pfandbrief;
- min. AA corporate bonds;
- min. AA commercial papers;
- min. AA or tri-party repos, buy-sell-back and sell-buy-back agreements;
- AAA unsubordinated tranches of asset-backed securities;
- “plain vanilla” OTC bond options (put/call, long/short);
- interest rate futures and IRF options;
- interest rate swaps, currency swaps; and
- money market depos, rating: min. AA with certain exemptions

591. Among the derivative instruments, only plain vanilla structures are permitted. (The minimum criteria to be a plain vanilla instrument is that we can price and analyze them in our internal position keeping and risk management system.) The primary condition for derivative deals is the existence of ISDA Master Agreement and mark-to-market agreement with our counterparties.

Portfolio structure

592. Similar to the practice of other central banks, the NBH distinguishes a liquidity and an investment portfolio. The liquidity part is held to satisfy daily foreign exchange cashflow needs, like interest and principal payments of government debt, interventions, special transactions and transfers. The term structure of these cash flows are partly predetermined (by interest and principal payments), and partly uncertain (foreign exchange intervention needs). Since the investment horizon of this portfolio is very short, the NBH avoids the risk of interest rate movements in this segment. The other stable part of our portfolio has longer investment horizons and higher return requirements. The fact that the probability of liquidation of this part of the portfolio is low allows our bank to hold bonds with longer time to maturity characteristics as long as the market movements and the shape of the yield curve justify this. According to the result of our optimization process, we hold around 20 percent of

the whole amount of reserves in the liquidity portfolio and the rest in the investment portfolio.

Benchmarking

593. NBH implemented a two-stage benchmarking system. The benchmarking policy, the actual *strategic benchmarks* concerning currency, interest rate and credit structure of the investment portfolio, as well as the permitted deviations from these benchmarks, are set by the Monetary Policy Committee (MPC) in the annual Risk Management Policy Guidelines.

594. *Tactical benchmarks*, set by the ALCO, may deviate from the strategic ones within predefined ranges. Empirical evidence shows that ALCO deviated from the strategic benchmark only in case of major trend reversals (i.e., 1–2 times a year) This means the ALCO does not alter the benchmark in periods of normal business conditions.

595. 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 the 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. The bonus of portfolio managers is linked to the performance vis-à-vis the benchmark.

Use of external managers

596. In the second part of the 1980s and the first part of the 1990s, the NBH used external portfolio managers. The altogether rather mixed experience showed that the services of external managers are most useful when building up reserve management activity (i.e., to learn) or when they can provide facilities a central bank cannot easily establish. Currently, the NBH uses external portfolio managers only for its securities lending programs.

X. INDIA

A. Introduction

597. The Indian approach to determining adequacy of foreign exchange reserves has been evolved over the past few years. Various factors ranging from the pioneering Report of the High Level Committee on Balance of Payments (Chairman: Dr. C. Rangarajan) to Governor Jalan's exposition of the combination of global uncertainties, domestic economy and national security considerations in determining liquidity at risk and thus assessing reserve adequacy (Paragraphs 23 and 24 of Statement on Monetary and Credit Policy, April 29, 2002) have contributed toward the process of development of such an approach.

598. The three components of India's foreign exchange reserves include Gold, Special Drawing Rights (SDRs) and Foreign Currency Assets (FCAs). The last item, however accounts for the major portion. As of September 6, 2002, out of the US\$62.1 billion of total reserves, India's FCAs stood at \$58.8 billion and gold accounted for about \$3.2 billion, the rest being SDRs. In July 1991, as a part of reserve management policy, and as a means of raising resources, the RBI temporarily pledged gold to raise loans. The gold holdings, thus played a crucial role in reserve management at a time of external crisis. Since then, gold has played a passive role.

599. In quantitative terms, the level of foreign exchange reserves has steadily increased from \$5.8 billion as of end-March, 1991 to \$54.1 billion as of end-March 2002 and further to \$62.1 billion as of September 6, 2002.

B. Developing a sound governance and institutional framework

Reserve management objectives

600. India's objectives of holding reserves, in broader terms are:

- maintaining confidence in monetary and exchange rate policies;
- enhancing capacity to intervene in foreign exchange markets;
- limiting external vulnerability by maintaining foreign currency liquidity to absorb shocks during times of crisis;
- providing confidence to the markets especially credit rating agencies to the effect that external obligations can always be met, thus reducing the overall costs to the economy or the market participants; and
- adding to the comfort of the market participants, by demonstrating the backing of domestic currency by external assets.

601. At a formal level, the objective of reserve management in India could be found in the Reserve Bank of India (RBI) Act, where the relevant part of the Preamble reads as 'to use the currency system to the country's advantage and with a view to securing monetary stability'. Monetary stability, in this statement may be interpreted as internal as well as external

stability, implying stable exchange rate as one of the overall objectives of the reserve management policy. While internal stability implies that reserve management cannot be isolated from domestic macroeconomic stability and economic growth, the phrase ‘to use the currency system to the country’s advantage’ implies that maximum gains for the country as a whole or the economy in general, could be derived in the process of reserve management. This warrants the need for taking a very dynamic view on the country’s requirements of reserves and how best to meet such requirements.

Legal framework

602. In India, the RBI Act, 1934 contains the enabling provisions for the RBI to act as the custodian of foreign exchange reserves, and manage reserves within the defined objectives. The powers available to RBI as custodian of foreign exchange reserves are enshrined in the Preamble to the Act. The ‘reserves’ refer to both foreign exchange reserves in the form of gold and foreign securities and domestic reserves in the form of ‘bank reserves’. The RBI Act also broadly indicates the desirable composition of reserves, minimum reserve requirements and the instruments in which the country’s reserves could be deployed.

603. Specifically, sub-sections 17(12), 17(12A), 17(13) and 33(1) of the RBI Act, 1934 define the scope of investment of foreign exchange reserves. The provisions by way of severe restrictions on the credit quality of counterparties/securities in the Act reflect RBI’s utmost concern about the safety of foreign exchange reserves.

604. In brief, the law broadly permits the following investment categories:

- (i) Deposits with other central banks and Bank for International Settlements (BIS).
- (ii) Deposits with foreign commercial banks.
- (iii) Debt instruments representing sovereign/sovereign-guaranteed liability (with residual maturity not exceeding 10 years).
- (iv) Other instruments/institutions as approved by the Central Board of Directors of the central bank.

Institutional framework

605. The decisions on currency composition and asset allocations are taken by Reserve Bank in consultation with Government of India. Within the RBI, while the major decisions relating to currency/investment are made by a Strategy Committee headed by the Governor/Deputy Governor in-charge of foreign exchange reserve management, the Department of External Investments and Operations is given some flexibility with regard to currency composition to take advantage of market trends. Further, within the RBI, a “Financial Markets Committee”, comprising heads of departments responsible for domestic debt management, reserve management and monetary policies facilitates day-to-day coordinated administering of policies.

Transparency and accountability

606. On public disclosure, RBI has been constantly endeavoring to ensure compliance with best standards of transparency, in line with major international central banks/reserve management authorities. Within the broader framework of monetary, fiscal and financial polices, areas relating to transparency and disclosure constitute important aspects of reserve management. The policy on reserve management as well as all relevant information are articulated through a variety of means from time to time, the most significant being the half yearly Monetary and Credit Policy Statements by Governor of RBI. The speeches of Governor and Deputy Governors are important sources of policy analysis, actions and intentions. The Annual Reports of RBI provide authentic version of RBI's perspective as approved by its Board. Periodical publications, Press Releases and Discussion Papers of RBI provide additional important sources of information.

607. BI has also been providing, on a regular basis, appropriate data relating to foreign exchange market operations. RBI publishes daily data on exchange rates, forward premia, and foreign exchange turnover and on weekly basis the movement in foreign exchange reserves, in the Weekly Statistical Supplement (WSS) of the RBI Bulletin. Data on nominal effective exchange rate (NEER) and real effective exchange rate (REER), RBI's purchases and sales in the foreign exchange market along with outstanding forward position are published in RBI Bulletin with a time lag of one month.

608. RBI has all along been ahead of central banks of many developing and industrial countries in regard to publishing details on the size of its gross foreign exchange market intervention (purchase and sale) and its net forward position. The daily reference rate of U.S. dollar and Euro as well as the middle rates for four major currencies, viz., U.S. dollar, GBP, euro and Japanese yen are made available by the RBI website.

609. As a part of the Special Data Dissemination Standards (SDDS), IMF has prescribed a data template for disclosure of international reserves and foreign currency liquidity in respect of countries which have subscribed to SDDS. India is among the 49 countries, which have adopted the SDDS template for publication of detailed data on foreign exchange reserves. The data template provides information on a number of parameters including currency composition (SDR and other currencies), deployment of foreign exchange reserves and forward position. These data are made available on monthly basis, from October 2001, both through RBI and IMF (SDDS) websites.

C. Principles, Policies, and Practices of Reserve Management

Reserve management operations

610. Currently, accretion to foreign currency reserves arises mainly out of purchases by RBI from the Authorized Dealers. In addition there is income from deployment of foreign exchange assets held in the portfolio of RBI. Besides, aid receipts on government account also flow into reserves. Outflow of reserves arises mainly on account of sale of foreign

currency to Authorized Dealers. There are occasions when foreign exchange is made available from reserves for identified users, as part of strategy of meeting lumpy demand for foreign exchange. The net effect of purchases and sales of foreign currency is the major determinant of the level of foreign exchange reserves. The sales or purchases also include those in forward markets although such transactions are of a very small magnitude.

611. Decisions involving currency composition and maturity pattern of the investments are driven by broad parameters of safety, liquidity and profitability. The choice of the highest possible quality investment instruments and explicit constraints on critical portfolio variables, such as limits on various securities, currencies, counter-parties and sovereigns form the basic elements of reserve management. Transactions are put through with counter-parties, approved for the purpose. Counterparties could be banks, subsidiaries of banks or security houses. Such counter parties are approved by the RBI taking into account their international reputation and track record apart from factors such as size, capital, rating, financial position and service provided by them. While investments in securities are restricted to sovereign and sovereign guaranteed instruments, the residual maturity of these instruments cannot exceed 10 years. A good percentage of reserves is invested in money-market including deposits with top-notch international commercial banks. Investments in new products/markets are deliberated upon within the Department of External Investments and Operations, by its “Investment Committee” that meets at the start of every week before appropriate approvals are sought.

612. In practice, holdings of gold have been virtually unchanged and gold reserves are managed passively.

Evolution of reserve management policy in India

613. India’s approach to reserve management, until the balance of payments crisis of 1991 was essentially based on the traditional approach, i.e., to maintain an appropriate level of import cover defined in terms of number of months of imports equivalent to reserves. For example, the RBI’s Annual Report 1990–91 stated that the import cover of reserves shrank to 3 weeks of imports by the end of December 1990. Thus, the emphasis on import cover constituted the primary concern say, till 1993–94.

614. The approach to reserve management, as part of exchange rate management, and indeed external sector policy underwent changes with the adoption of the recommendations of the High Level Committee on Balance of Payments (Chairman: Dr. C. Rangarajan) in 1992. The focus in deciding on the level of reserves was in fact shifted to ensuring a reasonable level of confidence in the international financial and trading communities in general and a plethora of factors which contribute toward such confidence in particular. The extract given below provides evidence to this shift in the approach.

“It has traditionally been the practice to view the level of desirable reserves as a percentage of the annual imports-say reserves to meet three months imports or four months imports. However, this approach would be inadequate when a

large number of transactions and payment liabilities arise in areas other than import of commodities. Thus, liabilities may arise either for discharging short-term debt obligations or servicing of medium-term debt, both interest and principal. The Committee recommends that while determining the target level of reserve, due attention should be paid to the payment obligations in addition to the level of imports. The Committee, recommends that the foreign exchange reserves targets be fixed in such a way that they are generally in a position to accommodate imports of three months. (Paragraph 6.3)

615. In the view of the Committee:

“ The factors that are to be taken into consideration in determining the desirable level of reserves are the need to ensure a reasonable level of confidence in the international financial and trading communities about the capacity of the country to honor its obligations and maintain trade and financial flows; the need to take care of the seasonal factors in any balance of payments transaction with reference to the possible uncertainties in the monsoon conditions of India; the amount of foreign currency reserves required to counter speculative tendencies or anticipatory actions amongst players in the foreign exchange market; and the capacity to maintain the reserves so that the cost of carrying liquidity is minimal.” (Paragraph 6.4)

616. As mentioned in the RBI’s Annual Report, 1995–96, with the introduction of the market determined exchange rate, a further change in the approach to reserve management was warranted and the emphasis on import cover was supplemented by the objective of smoothening out the volatility in the exchange rate.

617. Against the backdrop of currency crises in East-Asian countries in 1997 and in the light of country experiences of volatile cross-border capital flows, it was felt that there was need to take into consideration a host of factors including the shift in the pattern of leads and lags in payments/receipts during exchange market uncertainties. The RBI Annual Report, 1997–98 emphasized that besides the size of reserves, the quality of reserves also assumed importance. Thus, unencumbered reserve assets (defined as reserve assets net of encumbrances such as forward commitments, lines of credit to domestic entities, guarantees and other contingent liabilities) were required to be available at any point of time to the authorities for fulfilling various objectives assigned to reserves.

618. As regards management of external liabilities, the policy of the RBI to keep forward liabilities at a relatively low level as a proportion of gross reserves and the emphasis on prudent reserve management were highlighted in the RBI’s Annual Report, 1998–99.

619. The overall approach to management of India’s foreign exchange reserves had undergone a further change during 1999–2000 reflecting the changing composition of balance of payments and liquidity risks associated with different types of flows as elaborated in the RBI Annual Report, 1999–2000. This is evident from the extract as under:

“The policy for reserve management is built upon a host of identifiable factors and other contingencies, including, *inter alia*, the size of the current account deficit and short-term liabilities (including current repayment obligations on long-term loans), the possible variability in portfolio investment, and other types of capital flows, the unanticipated pressures on the balance of payments arising out of external shocks and movements in repatriable foreign currency deposits of non-resident Indians.” (Paragraph 6.30)

620. In the recent years, while focusing on prudent management of foreign exchange reserves there has been an emphasis on ‘liquidity risk’ associated with different types of flows. In this context, the traditional approach of assessing adequacy of reserves in terms of import cover has been broadened to include a number of parameters which take into account the size, composition, and risk profiles of various types of capital flows as well as external shocks to which the economy is vulnerable.

621. Governor Jalan’s statement on Monetary and Credit Policy (April 29, 2002) provides, an up-to-date and comprehensive view on the approach to reserve management and it is as under:

“A sufficiently high level of reserves is necessary to ensure that even if there is prolonged uncertainty, reserves can cover the “liquidity at risk” on all accounts over a fairly long period. Taking these considerations into account, India’s foreign exchange reserves are now very comfortable.” (Paragraph 23)...”the prevalent national security environment further underscores the need for strong reserves. We must continue to ensure that, leaving aside short-term variations in reserves level, the quantum of reserves in the long-run is in line with the growth of the economy, the size of risk-adjusted capital flows and national security requirements. This will provide us with greater security against unfavorable or unanticipated developments, which can occur quite suddenly.” (Paragraph 24).

622. The above discussion points to evolving considerations and indeed a paradigm shift in India’s approach to reserve management. The shift has occurred from a single indicator to a multiple indicators approach.³⁶

623. Adequacy of India’s foreign exchange reserves at present could, however, be broadly assessed in terms of various indicators as described below:

- In terms the traditional measure of **trade based indicator** of reserve adequacy, i.e., the import cover (defined in terms of reserves in months of imports), while India’s

³⁶ For a subsequent substantive discussion on the issue refer to Mid-Term Review of Monetary and Credit Policy for 2002-2003 (paragraphs 30-34) RBI Bulletin, November 2002 available on RBI website www.rbi.org.in.

foreign exchange reserves could cover only 3 weeks' of imports as of end-December 1990, the position improved to about 11.5 months as of end-March 2002;

- In terms of **money-based indicators**, the proportion of net foreign exchange assets of RBI to currency with the public sharply increased from 15 percent in 1991 to 109 percent as of end-March 2002 and the proportion of net foreign assets (NFA) to broad money(M3) increased by more than six fold, from 3 percent to 18 percent during the same period;
- **Debt-based indicators** of reserve adequacy showed remarkable improvement in the 1990s and the proportion of short-term debt (i.e., debt obligations with an original maturity up to one year) to foreign exchange reserves substantially declined from 147 percent as of end-March 1991 to 8 percent as of end-March 2001 whereas the proportion of volatile capital flows (defined to include cumulative portfolio inflows and short-term debt) to reserves decreased from 147 percent in 1991 to 58.5 percent as of end-March 2001. Further, as part of sustainable external debt position, the short-term debt component decreased from 10 percent as of end-March 1991 to 3 percent as of end-March 2001. Similarly, the size of debt service payments relative to current receipts, decreased from 35 percent in 1991 to 16 percent in 2001.

D. Establishing a Capacity to Assess and Manage Risk

Risk management

624. The RBI has in place sound systems to identify, measure, monitor and control various types of risk involved in reserve management. Broadly, risk management involves establishing parameters for:

- (i) desirable currency mix and limits to facilitate availability of convertible currencies;
- (ii) permissible range of investment instruments that meet liquidity and safety requirements; and
- (iii) maturity or duration requirements to address interest rate or price risks.

625. The risks attendant on deployment of reserves, *viz.*, credit risk, market risk, liquidity risk and operational risk are detailed in the following paragraphs.

Credit risk: Credit risk refers to risk arising out of default or delay in payment of obligations. Credit risk is addressed by putting in place a framework under which investment is made in financial instruments issued by sovereigns, banks and supranationals conforming to a minimum rating. For example, investments are invariably made in papers issued by AAA rated sovereigns and supranationals apart from those with BIS. As stated earlier a

careful process of selection of counterparties and fixation of limits for each category of transactions is also in place. Ratings given by international rating agencies as also various other financial parameters are considered before grading and fixing limits in respect of each counterparty. The day-to-day developments in respect of the counterparties are closely monitored.

Market risk: Market risk comprises currency risk and interest rate risk.

(a) Currency risk: Currency risk arises due to uncertainty in exchange rates. Foreign currency reserves are invested in multi-currency multi-market portfolios. In tune with international trends, RBI follows the practice of expressing foreign exchange reserves in U.S. dollar terms. The senior management is kept informed of the currency composition of reserves through weekly Management Information System (MIS) report.

(b) Interest Rate Risk: The central aspect of the management of interest rate risk for a central bank is to protect the value of the investments as much as possible from the adverse impact of the interest rate movements. The interest rate sensitivity of the reserves portfolio is measured and managed in terms of benchmark duration and permitted leeway from the benchmark. The emphasis is to keep the duration short, which is in tune with the approach to remain risk averse and keep a liquid portfolio. The benchmark duration as also the leeway are suitably altered keeping in view the market dynamics.

Liquidity risk: The choice of instruments determines the liquidity of the portfolio. While bonds and treasury bills of AAA rated sovereigns are highly liquid, BIS Fixbis/ Discount fixbis can be liquidated at any time to meet the liquidity needs. With the increasing focus of central banks, academics and the market participants worldwide on the adequacy of reserves, the Department of External Investments and Operations has been undertaking exercises based on stochastic models in order to estimate "Liquidity at Risk (LaR)" of reserves.

Operational risk: Internally there is a total separation of the front and back office functions. The internal control systems ensure several checks at the stages of deal capture, deal processing and settlement. The middle office is responsible for risk measurement and monitoring, performance evaluation and concurrent audit. The deal processing and settlement system is also subject to internal control guidelines based on the principle of one point data entry and powers are delegated to officers at various levels for generation of payment instructions. To subject the dealers to a high degree of integrity, a code of conduct has been prescribed for them and an annual undertaking is obtained from each of them to ensure that they abide by the code of conduct.

Custodial Risk: A major portion of the securities are custodized with the central banks. While all U.S. Government securities are held with Federal

Reserve, all gilts, and Japanese Government Bonds (JGBs) are with Bank of England and Bank of Japan, respectively. All primary cash accounts are with the central banks in respective countries. BIS provides both custodial and investment services and accordingly they are also the custodians for investments with them. A small portion of other Euro securities and assets managed by external asset managers are custodized with carefully selected global custodians. The custodial arrangements are reviewed from time to time and the developments relating to the custodians are tracked regularly to ensure that the risk is kept to the minimum.

Audit and Management Information System (MIS)

626. There is a system of concurrent audit in the Department of External Investments and Operations for monitoring compliance in respect of all the internal control guidelines, independent of the process flows. Reconciliation of nostro accounts is done on a daily basis in respect of major currencies.

627. In addition to the annual inspection by the Inspection Department of the RBI and statutory audit by external auditors, there is a system of appointing a special external auditor to audit dealing room operations. The main objective of the special audit is to ensure that risk management systems and internal control guidelines are adhered to, by the Department.

628. A sound management information system (MIS) exists in the Department of External Investments and Operations for comprehensive reporting to the senior management covering all significant areas of activity. Reports are provided to the senior management, with their frequency depending on the type and sensitivity of information.

Division of reserves into tranches

629. The guidelines for foreign exchange reserve management developed by IMF indicate that a number of reserve management entities subdivide their reserves portfolio into “tranches”, viz., liquidity tranche and investment tranche according to liquidity and investment objectives and policy requirements. In the case of RBI, a system which creates an explicit division of the reserves of this kind is not in place. However, RBI has two broad portfolios with independent risk parameters, viz., the money market portfolio and the bonds portfolio. The money market portfolio comprises instruments with maturity of less than one year and it is predominantly guided by transaction and intervention needs. By its very nature (because of low duration), the money market portfolio runs a lower market risk (in relation to interest rate movements). In contrast, the bonds portfolio consists of long-term holdings (up to a maximum of 10-year residual maturity) of triple-A rated sovereigns and supranationals.

External asset managers

630. A small portion of the reserves has been assigned to external asset managers with the objectives of gaining access to and deriving benefit from their market research. It also helps to take advantage of the technology available with asset managers while utilizing the relationship to have the required training/exposure to the central bank's personnel dealing with foreign exchange reserve management. The asset managers are carefully selected from among the internationally reputed asset management companies. They have been given clear investment guidelines and benchmarks and their performance is evaluated at periodic intervals by a separate unit within the middle office. External asset managers' views and outlook on international bond and currency markets are examined and taken as input by operational personnel.