11
Israel

Background

631. Israel's foreign-exchange reserves are owned and controlled by the central bank, Bank of Israel (the Bank), which is therefore the "reserve management entity," as defined by *Guidelines*. Within the Bank, the Foreign Currency Department (Department) is responsible for performing the reserve management function, under the direction of the Governor of the Bank.

632. The size and role of Israel's foreign-exchange reserves have evolved over the 17 years since the 1985 Stabilization Program, which marked a watershed in the country's economic history. The early years of this period were characterized by a fixed exchange rate, which served as a nominal anchor for the price-level and a target for monetary policy, accompanied by a strict currency-control regime and the absence of significant interbank trading in foreign currency. In this environment, the reserves portfolio served as a "buffer" for capital flows, with the Bank intervening in the market on a daily basis.

633. Over the last decade or so, the focus of monetary policy moved from exchange-rate targeting to inflation-targeting, the exchange-rate regime was gradually liberalized, foreign-currency controls were all but eliminated (with the last restrictions due to be lifted at the end of 2002), and an active interbank foreign-exchange market, in which the Bank has not intervened for several years, developed. The exchange-rate regime is now defined by a band for the value of the sheqel against a basket of currencies, with the lower bound fixed, while the upper bound increases by 6 percent per year. As of early 2002, the width of the band, relative to its midpoint, was around 45 percent. The Bank has declared a policy of nonintervention within the band, but is committed to defending the band's limits until such time as it is formally abolished. The past decade was also witness to a substantial increase in the size of the reserves, which tripled in dollar value from 1994 to 1998, while the ratios of the reserves to various other aggregates increased by lesser degrees. This increase was primarily due to intervention by the Bank in the local foreign exchange market, to defend the limit on sheqel appreciation set by the band.

Governance and Institutional Framework

Objectives, scope, and coordination of Israel's reserves management

Objectives

634. In conjunction with the evolution of economic policies and circumstances described above, the Bank's understanding of the purposes served by the foreign-exchange reserves has changed and developed, a process that remains ongoing. Based on the experience of other countries and the rele-

vant academic literature, the Bank has identified four principal goals that are served by holding the reserves portfolio:

- **Reducing the probability of a crisis in the local foreign-exchange market**. Although, as noted, the Bank's stated policy is not to intervene within the limits of the band, the knowledge that it has access to substantial reserves of foreign currency serves to reassure both residents and foreign investors, on the one hand, while deterring speculative attacks on the other. However, it should be emphasized that the importance of the reserves in this regard is secondary to that of sound and credible macroeconomic policies that support economic and financial stability.
- **Providing a strategic reserve of liquidity**, for use in a market crisis—should one nevertheless develop—together with other tools, such as the interest rate, or for use in a national emergency. In such situations, a high level of reserves improves the resilience of the economy and expands the range of options available to policymakers.
- **Improving the standing of the country in international capital markets**, where many of the players view the level of a country's foreign-exchange reserves as an important indicator of its financial stability.
- **Providing the government with a degree of flexibility in managing the composition of public-sector debt**. Since the government can buy foreign currency from the Bank at will, it could choose to fund part of its foreign-currency expenditures (debt service or other expenses) from local-currency sources (taxes or borrowing) rather than from income or new borrowing in foreign currency. However, excessive use of this option could impair the ability of the reserves to serve the other goals listed.

635. In contrast with the evolving state of the Bank's purposes for *holding* reserves, the Bank's objectives in *managing* the reserves have remained fairly stable over the years, although the means of achieving them have been refined and adapted to changing circumstances. Though not formally adopted in this language, the Bank's investment policy has been developed on the basis of the following objectives for reserves portfolio management:

- **Preserving the real foreign purchasing power of the reserves**. This goal finds expression in the currency composition of the reserves, the management of their interest-rate risk, and the limitations on credit risk.
- **Maintaining a high degree of liquidity**. This goal is met mainly via limits on the types of assets that may be included in the reserves portfolio.
- **Subject to meeting the first two objectives, earning a reasonable rate of return on the portfolio**. This goal has influence on the choice of portfolio duration, the level of credit risk accepted, and the decision to employ active management.

636. A further objective of the reserves management process, though one clearly subordinate to the three listed above, is the accumulation of information and expertise that can be of value to other core functions of the Bank, such as the formulation of monetary policy or exchange-rate policy (as noted in *Guidelines*, Sec. I, Par. 2.).

Scope and coordination

637. Management of the foreign-exchange reserves is closely linked with the formulation and conduct of exchange-rate intervention policy, with a number of individuals at various levels having involvement in both.[37] As noted above, the reserves management process also provides valuable information resources to the makers of domestic monetary policy.

638. Under current policy, the Bank is not involved in liability management,[38] nor are the reserves managed with a view to hedging the inter-

[37]However, under the Bank's current policy of nonintervention, "conduct" of intervention policy is limited to information-gathering activities, so long as the exchange rate is within the band.

[38]Other than the use of short-term repurchase agreements for tactical liquidity management.

est-rate exposure of Israel's foreign-currency liabilities. Israel's foreign-currency borrowing is managed by the Ministry of Finance. Traditionally, the maintenance of a "Chinese wall" between the reserve manager and the liability manager has been seen as an important safeguard for the reserves' unencumbered status, the value of which outweighed any advantages that might be obtained from coordination between the Bank and the Finance Ministry. (This issue is currently being reexamined.) However, the currency composition of Israel's short-term debt service is a factor in setting the currency composition of the reserves (see paragraph 649 below).

Institutional framework

Legal foundation and structure of internal governance

639. The Bank of Israel's authority to own and manage the foreign-exchange reserves of the country is based on The Bank of Israel Law, 5714–1954, and on the legal interpretations that have been developed around it over the course of the years. It should be noted that the law and its interpretations primarily address the types of foreign-currency assets that the Bank may own and the counterparties with whom it may transact.[39] Thus, many aspects of the Bank's investment policy and governance framework for the reserves are matters of internal Bank policy.

640. The main directives regarding management of the reserves portfolio in its various aspects, and the degree of leeway allowed to the Department in each aspect, are set by the Foreign Currency Committee, which is chaired by the Governor and includes senior managers from various departments of the Bank. The Department reports to the Foreign Currency Committee on current developments in international markets, on the performance of the portfolio and the various investment decisions made by the Department, and on any alterations in the parameters of the Bank's investment policy that the Department wishes to propose.

641. Investment decisions of the Department, within the boundaries set by the Foreign Currency Committee but beyond the leeway allowed to individual portfolio managers, are discussed in the Investments Committee, which is chaired by the Director of the Department and attended by staff members of the front and middle offices and by back-office managerial staff. The Investments Committee meets weekly to review market developments and front-office positions, as well as to consider investment decisions within its purview and recommendations to the Foreign Currency Committee. *It should be noted that the role of both the Investments Committee and the Foreign Currency Committee is advisory, rather than authoritative, since responsibility for their decisions is ultimately borne by the officers chairing them (the Director of the Department and the Governor, respectively).*

642. Investment decisions within the boundaries set by the Investments Committee are made by portfolio managers, with the approval of the head of the front office (which is normally always given). Senior portfolio managers are responsible for one or more nonoverlapping portfolios, typically defined by currency and range of maturities. They are assisted in this by junior portfolio managers, who may be given responsibility for part of a portfolio, and by trader-analysts (see below). No organizational separation is made between trading and portfolio management activities. The application of the above principles to active management of the reserve portfolio is discussed further in paragraph 662, below.

Staff

643. As stated in the *Guidelines* (Sec. IV, Par. 36), "appropriately qualified and well-trained staff, following sound business practices" are an essential element of the framework for reserve management. The Department's personnel policy in recent years has been based on the following principles:

- The Department's goal is to employ tenured, long-term employees who become known well. Thus, staff members of the front, middle, and back offices are regular employees

[39]In brief, the Bank is permitted—within the framework of the reserves—to own gold, foreign currency, and securities that are issued or fully guaranteed by a foreign government, to invest in bank deposits and CDs, and to utilize derivatives such as futures and options, provided the underlying asset is of a type that the Bank is permitted to own.

of the Bank, governed by the same collective-bargaining agreements as staff members of other departments.

- When vacancies occur in the front office, they are normally filled by probationary employees who are recent MA-level honors graduates in economics or finance, *without* prior financial market experience. Practical training as a trader-analyst thus takes place on a *tabula rasa*, and is oriented toward the specific needs of the Bank. A combination of internal and external training is employed. Needless to say, all employees must be eligible for appropriate security clearances.
- At the end of a four- to five-year probationary period, trader-analysts who show exceptional ability are offered permanent employment as portfolio managers. Those who are not offered permanent appointments typically find that the experience gained in reserve management is well respected by potential employers in the private financial-services industry. A similar employment cycle applies to the middle office.
- Compensation is on the same pay scales as professional staff with graduate training in other departments of the Bank. As a matter of policy, there are no direct incentives to employees based on trade performance.
- Front and middle office staff members with permanent appointments generally remain in their positions on the order of a decade (with quite substantial variation around this mean). Rotation to posts in other departments of the Bank (including managerial positions) is an option for those who come to desire a change or suffer professional burnout. In past years, front and middle office "alumni" have also moved on to senior economic posts in other branches of the public sector.

Transparency and accountability in the reserves management process

Operational risk management

644. As a manager of public funds, the Bank is particularly sensitive to issues of security and operational risk, and it strives constantly to maintain high standards of practice in this area, consistent with the norms of the financial services industry in the developed world and with reasonable cost-benefit trade-offs. Among the most important aspects of the Bank's control procedures are the following:

- **The organization of the Foreign Currency Department and its established work practices**. These have been designed to reduce the possibility of loss due either to human error or to intentional misconduct. Standard working procedures, which are documented and enforced, include routine verification and authorization procedures. The use of computer systems, which include automated controls procedures, is extensive. And there is an almost absolute division of authority and responsibility, on both an organizational and personal level, in the Department's primary tasks—transacting trades, processing trades, sending payment instructions, accounting, and auditing—so that a single individual does not have the ability to process a trade, send payment instructions, or alter records.
- **Control functions carried out by various units within the Department**. In addition to the back office, which performs a number of checks in the regular course of processing trades, and the Department's auditing section, which reconciles all transactions after settlement, there is a staff member—the System Controller—who follows all transactions processing on a real-time basis, and who reports directly to Department management.
- **Monitoring by authorities outside the Department**. These include the Comptroller's Department, which prepares the Bank's daily financial statements, checks accounts, and authorizes the proper accounting scheme in the general ledger; the Bank's Internal Auditor, who performs regular comprehensive examinations of specific topics within the Foreign Currency Department, reporting to management of the Department and the Bank; and the public accounting firm employed as External Auditor by the Bank,

which audits the Department's activities once a year and reports its findings in writing to the Governor of the Bank.

- **Management's follow-up**. Every irregular occurrence in the operational process is documented, with instructions for corrective action to prevent a recurrence. Once a year, a general overview of control procedures is undertaken. Needless to say, any recommendations of the external and internal auditors are also given the most serious consideration.
- **Codes of conduct**. All Foreign Currency Department employees are subject to the Bank's rules of conduct, which include special rules on conflict-of-interest for staff with market contact. Such staff members are also required to be familiar with, and to follow, the ethical codes of the markets in which they trade. The Department is currently studying this issue, with a view to drawing up a Departmental Code that would incorporate all the existing rules and possibly extend them.

Disclosure

645. For many years it was the Bank's practice for the Department to prepare an Annual Report for use within the Bank, which was submitted to the Governor and members of the Foreign Currency Committee (see paragraph 640), with a very brief summary included in the Bank's Annual Report. In 2001, the Department's Annual Report was published separately, and in 2002 it was included in full in the Bank's Annual Report. These documents provide the public with extensive information on the Bank's objectives, investment policy (not including precise currency composition), and investment performance in absolute terms and relative to benchmark. They can be viewed on the Bank's website, at http://www.bankisrael.gov.il/publeng/publeng.htm. Up-to-date monthly data on the foreign-exchange reserves, in the form prescribed by the IMF Template, can also be found there, at http://www.bankisrael.gov.il/deptdata/mth/imf/imfdata.htm.

Assessing and Managing Risk

Investment policy and benchmark portfolio

646. The Bank of Israel's investment policy comprises the standards and procedures adopted by the Foreign Currency Committee, which ensure that management of the reserves is in accord with the Bank's long-term preferences, objectives, and strategies. It provides for conservative limits on the portfolio's exposure to various financial risks, the main ones being currency risk, interest-rate risk, and credit risk. (There are additional risks, such as liquidity risk (paragraphs 667–669) and operational risk (paragraph 644).) The Bank's investment policy defines a risk-neutral **benchmark portfolio** for the reserves, and limits the deviations of the actual portfolio from the benchmark in terms of the various financial risk factors. These deviations may be the result of **active management,** or may be due to the operational limitations of transacting in financial markets. The limits on each risk factor are applied independently; synergistic risk measures such as Value at Risk (VaR) are monitored, but currently have no formal role in the investment policy. The Department investigates new risk measures as they are developed; measures examined in recent years include partial duration and spread duration (not adopted) and option-adjusted duration (adopted for mortgage-backed securities).

647. The sections that follow give a brief introduction to some aspects of the Bank's investment policy. More complete information may be found by consulting the sources listed above in paragraph 645.

Neutral currency composition

648. The neutral currency composition of the reserves is known as the *numeraire*. It is defined by fixed percentages of various currencies, with the number of units of each one allowed to vary as exchange rates change (in contrast to a currency basket, such as the SDR, in which the number of units is constant from day to day while the percentages vary). The composition of the numeraire is reviewed at least once a year.

649. When first adopted, the composition of the numeraire was based on the geographical dis-

tribution of goods and services imports. This composition was considered to preserve the real foreign purchasing power of the reserves, since imports constitute the foreign currency component of Israel's total final uses of funds.[40] A few years later, another element was added to the composition of the numeraire, namely, the currency composition of external debt service for the coming year. A further consideration in determining the currencies included in the numeraire has been that they are "reserve currencies," that is, those of countries with a tradition of economic stability and responsible policies in various fields.

650. The currency composition of the numeraire described here has changed over time only moderately, and it bears a reasonable resemblance to the currency composition of the total reserves held by official institutions. Nevertheless, over the past several years the Bank has reexamined the definition of the numeraire from time to time. To date, there has been no change in it, *inter alia* because the other systems reviewed yielded currency compositions that could change radically from year to year, making them very difficult and expensive to implement.

Neutral duration

651. The interest-rate risk of a portfolio in a particular currency is defined by its duration, and by the distribution of that duration along the yield curve. The Bank of Israel has defined a neutral duration for each currency in the numeraire by using a modified shortfall approach.

652. Under the shortfall method, a portfolio manager sets a minimum threshold for acceptable holding-period yields. Since the future course of yields-to-maturity in the market is uncertain, it is impossible to rule out capital losses with absolute certainty (unless one invests in zero-duration assets such as cash), but only with a certain probability, known as the confidence level. The minimum threshold and confidence level set by the portfolio manager, on the basis of his inclinations and risk aversion, together with the assumed distribution of yields to maturity in the market, determine the maximum allowable portfolio duration, or shortfall duration.

653. Unfortunately, for a given threshold and confidence level, the shortfall duration can vary significantly from month to month, as the yield curve shifts. In order to find a duration that would have acceptable characteristics in various financial climates, staff of the middle office conducted the following study: For each month of the period from January 1984, to June 1998, the shortfall duration was calculated, using a confidence level of 95 percent and a minimum threshold equal to one-half the yield on a risk-free asset. For U.S. dollars, this was defined as a three-month Treasury bill and for other currencies as the one-month LIBID interest rate. The resulting series of monthly shortfall durations was then examined, and a value selected that is lower than 95 percent of them. This gives a duration that, 95 percent of the time, would have given an *ex ante* probability of *at least* 95 percent of earning no less than one-half the risk-free rate.

654. After doing this calculation separately in each currency, and after further minor technical adjustments, a single neutral duration was set for the currency portfolios comprising the reserves. This duration is 16 months.

Formulation of neutral benchmarks

655. The core element of the Bank's investment policy is the neutral benchmark of the reserves portfolio. Control of currency risk and interest-rate risk (and, to a limited extent, credit risk) is exercised via limits on the allowable deviations of the actual portfolio from its neutral benchmark (see paragraph 662), and it constitutes a risk-free portfolio for the Department, when it does not wish to have open positions, and provides a criterion for assessment of the Department's performance (paragraphs 664–666).

656. The overall neutral benchmark is constructed on the basis of benchmark portfolios in the various currencies of the numeraire, each one being represented in proportion to its numeraire

[40]This system was based on the 1979 study by A. Ben-Bassat, *The Management of Foreign Exchange Reserves, Israel's Experience*, Research Department, Bank of Israel (Hebrew), an abridged English version of which was published in the May 1981 *Bank of Israel Economic Review*.

weighting. Each of these component currency benchmark portfolios has a neutral duration (see above), and is composed of assets that are characterized by low risk and high liquidity, features that reflect the Bank's long-term investment strategy. Each currency benchmark portfolio is based on two components: the first, having a short duration, includes assets of up to one year to maturity, while the second, which has a longer duration, includes assets of between one and five years to maturity. The weights of the two components are then set such that the total duration of the currency benchmark portfolio is neutral. The assets included in the currency benchmark portfolio are government bonds of the currency's country. However, in currencies where the market for government securities maturing up to one year is not liquid, the short-term component contains indices that reflect the interest paid by the Bank for International Settlements (BIS).

657. Although the Bank's use of active management (paragraph 662) implies that there is usually a gap between the yield of the reserves portfolio and that of the benchmark, this difference is generally small. This means that the expected profit on the reserves portfolio is determined primarily by the composition of the benchmark portfolio, rather than by the quality of the Bank's active management. Therefore, periodic adjustment of the benchmark portfolio to ongoing changes in the global financial environment is a necessary process, and is one of the major challenges confronting the Bank.

Limitation of credit risk

658. As is true of many official institutions, the Bank of Israel's sensitivity to credit risk is greater than its sensitivity to other financial risks. This is primarily due to the judgment that its ability to use diversification to limit the scope of losses is more limited in this area than it is *vis-à-vis* other types of risk, such as interest-rate risk. Additional reasons for heightened sensitivity would include: the possibility of correlation between losses due to credit risk in the portfolio and the need to make use of the reserves (e.g., in a global financial crisis), the limitations of currently available tools for quantifying credit risk, the desire to avoid having to seek legal redress in the courts of a foreign country, and the fact that credit risk is "optional" (in that it could be almost completely eliminated by investing only in the securities of sovereign states in their local currencies), while other risk factors are not.

659. Investment of the reserves portfolio causes it to be exposed to the credit risk of various types of institutions—governments, international organizations, clearing systems, commercial banks, and broker-dealers. Investment in the securities of a foreign government creates exposure to the issuing country, while investments in bank deposits, time differentials in the settlement process, and trades involving delayed settlement (e.g., currency forwards) create exposure both to private firms and to the countries in which they operate. The Bank's willingness to assume exposure falls as the risk of experiencing a loss increases (i.e., as credit quality declines), as the time over which the risk extends increases, and as the type of entity to which the exposure pertains is thought to be less resilient (e.g., banks vs. governments).

660. The Bank uses a variety of tools to manage the credit risk of the reserves portfolio. Of these, the most important is the **System of Limits and Quotas**, which defines for each institution (bank, country, etc.) the maximum quantity of various types of credit exposure that may be assumed. It sets the minimum levels of credit quality for individual institutions of various types and also ensures appropriate diversification across firms and countries, in line with their relative size and credit quality. Additional tools for control of credit risk include: a ceiling on the total exposure of the reserves portfolio to the world banking system, limits on the permitted quantity of investment in "spread assets," such as Eurobonds, and limits on the maximum time for which certain types of exposure can be assumed (e.g., on the term-to-maturity of bank deposits).

661. Once a year, the System of Limits and Quotas is updated by the Department and submitted to the Foreign Currency Committee for approval. If an institution's quota is added or enlarged during the course of the year, the change must be approved by the Foreign Currency Committee. However, the Department may cancel

or reduce a quota on its own initiative at any time, if changes in the institution's status warrant doing so. It should also be noted that the Bank's relations with financial institutions are anchored in legal agreements, most of which have been signed in the past few years.

Scope for active management[41]

662. In investing the foreign exchange reserves, the Department is authorized to use **active management** or **position-taking**, that is, to decide to depart from the overall benchmark portfolio, in terms of currency composition, duration, kinds of assets, and their distribution along the yield curve, with the goal of earning a higher yield than that of the benchmark portfolio. The leeway allowed for active management is defined separately for each type of exposure, and is based on the principle of limited delegation of authority and responsibility in the investment decision-making process from each level to the level below. In managing any type of position, it is customary to impose a maximum potential loss ("stop-loss"), with the position being closed if the cumulative loss on it reaches the limit. In recent years, the main focus of active management has been on asset allocation and security selection, which have formed an important part of the total contribution from active management.

- In the area of **currency risk**, the numeraire is viewed as a risk-free portfolio, and any deviation from it is defined as a position. Currency positions of more than limited scope must be authorized by the Foreign Currency Committee; however, the Foreign Currency Committee has not utilized this authority in recent years. The Department may decide on limited positions around the currency composition determined by the Foreign Currency Committee; within this boundary, the front office is permitted very limited positions around the currency composition set by the Investments Committee.
- The neutral **duration** for all currencies is set by the Foreign Currency Committee, and a deviation from it by the Department is considered a position. The Department is authorized to open positions of limited scope *vis-à-vis* the neutral duration in the various currency portfolios. The range of permitted durations is asymmetrical, as the Department is allowed greater leeway in reducing duration than in increasing it. Within this boundary, the front office is permitted very limited positions around the duration set by the Investments Committee.
- The **distribution of assets along the yield curve** is also a source of interest-rate risk, together with duration. The neutral distribution is that of the benchmark portfolio, while differences from it in the reserves portfolio represent positions. This type of position is normally decided on by the front office and monitored by the Investments Committee.
- Decisions on **asset allocation** may also create positions, as part of the reserves may be invested in types of assets that are not represented in the benchmark portfolio, such as Eurobonds, bank deposits, mortgage-backed securities, etc. Asset allocation decisions are normally made by the front office. However, in the case of asset allocation positions that are of unusually large scope, or that are of a long-term nature, responsibility for the position may be taken by the Investments Committee.
- Finally, decisions on **security selection—**the actual choice from among several alternative debt instruments to fulfill a specific role in the portfolio—of course are made throughout each workday by the staff of the front office, constituting an important component of active management.

663. The decision to employ active management is based on a number of considerations. First, and most importantly, the cumulative experience of the past fifteen years or so suggests that the Bank's use of active management has made a modest but statistically significant positive contribution to over-

[41]This section should be read in conjunction with paragraphs 639–642, above.

all portfolio return. In addition, active management requires those involved in it to be constantly up-to-date as regards market developments. This incentive helps to ensure that the Department's focus does not, over time, become too narrow, and it hones the skills needed for periodic adjustment of the benchmark portfolio and for other tasks, such as the formulation of intervention policy. Finally, the use of active management helps the Department to create an interesting and challenging work environment for front- and middle-office staff, assisting it to attract and retain highly qualified professionals.

Performance attribution

664. The contribution of various investment decisions to the overall difference in yield between the reserves portfolio and the neutral benchmark over a given period is measured by the middle office, using the capabilities of the recently acquired portfolio management information system (paragraphs 670–677) together with a data-warehouse system developed in-house. (For a description of how performance attribution was done before the implementation of this system, see Box 1.6 of the Department's Annual Report for 2000, at the address given in paragraph 645.) The system is used to maintain portfolios that reflect the components of the neutral benchmark and portfolios that match the Bank's actual holdings, classified by maturity and asset type, including "leverage" portfolios, which are used to track the profit or loss of certain types of positions. Portfolios can be aggregated in hierarchies, so that the aggregate of actual holdings can be compared with the aggregate benchmark.

665. Leverage portfolios include long and short positions (though in its actual holdings the Bank never sells short a security). For example, the profit and loss on a currency position would typically be tracked using a leverage portfolio that includes a short position in cash in one of the currencies of the numeraire and a long position in cash in another currency (which may or may not be in the numeraire). By contrast, the performance of a particular asset class (e.g., inflation-linked securities) would be calculated by comparing the yield on a portfolio including all the Bank's holdings in that asset class with a component portfolio of the benchmark.

666. The returns on portfolios are normally available to management and to the front and middle offices on command. An exception to the rule outlined above is the excess return on certain types of spread assets (e.g., bank deposits). Due to technical limitations, this is calculated only after the fact; however, the principles by which it is calculated are similar. Certain elements of yield curve positioning and security selection are necessarily calculated as the residual of other contributing factors and the total difference in return, but the middle office seeks to minimize the scope of this factor as far as possible.

The role of efficient markets

667. As noted, an important goal of the Bank in managing the foreign exchange reserves is that they should have a high overall level of **liquidity**, defined as the ability to realize assets without delay and without diminishing their value. The liquidity of the various markets in which the assets comprising the reserves are traded is regularly assessed by the middle office, based on two criteria. The first is the width of the "bid-ask" spread between buying and selling prices; a narrow spread implies low transaction costs, relative to the midpoint price. The second is the ability to transact in large volumes without affecting the market price. In an illiquid market, an investor's attempt to buy or sell in large volumes will cause the spread to widen and the midpoint price to move in a direction unfavorable for the investor; thus, assets can only be sold in quantity at an average price lower than the one that prevailed before the investor began to sell.

668. Based on these criteria, the Bank classifies the assets of the reserves portfolio into four groups:

1. **Highly liquid**, including securities with a spread of 0–2 basis points or 0–2 cents and various demand deposits.
2. **Liquid**, including securities with a spread of 3–5 basis points or 4–6 cents.
3. **Short maturity**, including securities, deposits, and repurchase agreements with terms of less than a month.

4. **All others**, most of which are tradable and can be realized, however. This group has included, among others, GNMA mortgage-backed securities, TIPS (U.S. inflation-linked securities), and some types of Eurobonds.

669. During the years 1999–2001, the first group has typically accounted for no less than 20 percent of the reserves, and the first three groups together for 75–90 percent of the reserves.

Portfolio management information system

670. Without doubt, the Bank's most significant move in recent years to enhance the quality of its reserve management and to improve transparency and accountability was its decision to acquire a new portfolio management information system. Although space limitations do not allow a full description of this project, which extended over more than three years and involved direct and indirect costs of well over US$1 million, the main aspects of it can be briefly sketched.

671. **Recognizing the existence of a problem** was the first task, and probably the hardest. Even in ideal conditions, computer systems are often in flux, as front, middle, and back offices adapt to changing financial-market conditions. How, then, does one identify the transition point from routine imperfection to a fundamental problem requiring a more radical solution? One important warning sign was the proliferation of ad hoc solutions, often developed by end-users, to track risk measures and the profit and loss of positions. When the staff assigned to examine this problem formally mapped the Department's workflow, and counted between *five and ten distinct manual entries* to these independently maintained programs that were required *for a single trade*, it was clear that the risks had become unacceptably large. Among them,

- Substantial increase in the probability of human error, which could remain undiscovered for a considerable time.
- Inconsistency in the meaning of data across multiple systems, which sometimes were based on different concepts.
- Variation in the quality and maintenance of systems developed by end-users without professional IT training and responsibility.
- Blurring appropriate separation of responsibility, as, for example, when front-office staff, who were the only people with the expertise and access to data feeds required, built ad hoc systems to implement new compliance rules.

672. One bright spot was that the problems were found to be concentrated in the front and middle offices, with the situation of the back office judged quite acceptable.

673. **Defining the needs of the Department**, in a very detailed way, based on the gap between the current state of affairs and the desired one, was the next stage. This was done by an interdepartmental team chaired by the head of the front office and including senior people from the front and middle offices and the IT Department. The high professional level of this team proved essential to the success of the project. The team's analysis served as a guide for the general RFI (Request For Information) and the more detailed RFP (Request For Proposal), which were written at a later stage.

674. **Buy or build** was the next decision to be made, and it was not an easy one. Building a complex customized system "in-house" would have meant recruiting or contracting for substantial additional personnel in the IT area for a very lengthy project, with no guarantee that it would result in an ideal solution. On the other hand, experience to date suggested that most of the "off the shelf" systems in the market would not meet the Bank's needs. In the end, the team recommended that the possibility of purchasing a system should first be thoroughly explored, and only if a detailed examination of the available systems showed they were inadequate should the option of building in-house be revisited.

675. **Searching for systems, sending out the Request For Information (RFI) letter,** and **composing a short list based on the responses** were the subsequent stages of the project. The project team identified possible candidates through discussions with market participants and companies, and by searching the Internet and industry publications.

The RFI letter included a general description of the Bank's needs and the framework of reserve management, the layout of the IT systems in use, and a list of 12 questions that summarized the requirements of end-users and IT staff. Vendors were strongly encouraged not to limit themselves to just answering the questions, but rather to send publications, documentation, or other written material regarding the relevant modules of their systems, as well as information on pricing, training, and support. During this period, the Bank did not honor vendor requests to demonstrate their systems, and also found it necessary to decline various offers by companies to serve as consultants or implementation subcontractors. Based on the written responses to the RFI, a short list of candidate firms was drawn up. **Interviews** with two current clients of each short listed candidate were then conducted by conference call, based on a list of questions faxed to them in advance, *without* the participation of the vendors' firms.

676. Following these interviews, each candidate was invited to demonstrate its system, using a detailed **simulation** of initial portfolios, benchmarks, and a (fictional) day of trading activities provided by the Bank. Throughout the simulated day, cash flow, holdings, risks, and performance were measured. The simulations took place at the Bank's premises, with each vendor receiving three days in which to conduct its presentation. The program of three days was divided into carefully defined sessions, with each session relating to one of the main issues (e.g., markets, compliance, performance measurement, etc.). Each vendor was required to install its system at the bank for the occasion, so that the entire simulation was performed and demonstrated on each system. The simulation was of critical importance to the process. It gave the vendors greatly improved insight into our needs and the suitability of their systems to meet them. As a result, two companies realized that their systems were unable to perform the simulation, thereby reducing the short list. The simulation also enabled the project team and management to have the closest look possible at the suitability of each system to the Bank's requirements.

677. The **competitive tender** or **Request for Proposal (RFP)**, required by Israeli law for purchase of goods or services by public sector bodies such as the Bank, was issued to the three candidates that participated in the simulation. The tender was very detailed with regard to the contractual terms of purchase (including warranty and maintenance issues), as well as the criteria for choosing a system and the future milestones of project implementation. An integral and important part of the tender was the Specification Matrix, consisting of about 500 specification line items regarding the quality and functionality of the system. In their replies, the vendors were expected to define the extent of their systems' capabilities by entering predefined codes for each line item (Supported, Not Supported, etc.). Where relevant, they could also add free-form comments. This detailed list helped to rank the proposals, and served as the basis for the implementation of the chosen system later on. The final choice of system was made based on considerations defined in the tender documents, with the weight of each component set prior to the review of the proposals. These included, among others, the quality of the system and its suitability for the Bank's intended uses, its price, warranty terms, and reputation.

Conclusion

678. The preceding sections have not attempted to provide a comprehensive description of the Bank of Israel's reserve management process, but only to throw light on a few aspects of it that may be of particular interest to other official institutions. The Bank continues to explore numerous issues influencing reserve management. Some of these have been noted in the text; others include aspects of **legal risk, operational risk,** definition of the **universe of permissible assets**, and the **process of benchmark specification**. It should be emphasized that the Bank's approach to reserve management was not established in its present form all at once, but is the result of a long-term process of growth and development. In this regard, and bearing in mind that every institution's needs are unique to it, leading to various approaches, it is worthwhile to mention some of the fundamental conditions that underlay the development of reserves management at the Bank of Israel:

- An absolute commitment, at all levels of the organization, to maintaining the highest standards of integrity and professionalism.
- An organizational culture that encourages creativity and does not penalize those who question the "conventional wisdom."
- A collegial working environment, encouraging full discussion of major decisions before their implementation.
- A commitment on the part of both staff and management to the professional development and continuing education of members of the organization.

679. An institution that is able to nurture these values will most likely enjoy excellent prospects for successful fulfillment of its responsibilities, whether or not the specific solutions it arrives at are similar to those described above.