

## Chapter 1

# *Investment of the Foreign Exchange Reserves<sup>1</sup>*

The average level of the Bank of Israel's foreign exchange reserves during 2004 was about \$26 billion.<sup>2</sup> The reserves are managed in accordance with the Bank of Israel Law - 1954 and the legal interpretations of the Law, as well as a set of rules which reflect the character of the Bank and the functions of the foreign exchange reserves. Accordingly, the reserves are invested in foreign currency denominated bonds either issued or fully guaranteed by foreign governments and in foreign currency deposits with foreign banks abroad.<sup>3</sup> As part of the management of its reserves, the Bank is permitted to carry out transactions with commercial and investment banks outside of Israel and to use financial derivatives, such as futures contracts, on the condition that the underlying asset is one that the Bank is permitted to hold. The Bank is also permitted to carry out transactions in foreign currency with a limited number of local entities such as the government and banking institutions.

The functions of the foreign exchange reserves have changed over the years as a result of changes in the macroeconomic environment, which includes monetary and exchange rate policy. Currently, there are two categories of functions: (1) Potential uses of the reserves, i.e. the possibility of selling them (in exchange for NIS) or lending them, with the main use being the sale of foreign exchange to the government for the servicing of its debt; and (2) Benefits to the economy arising from the fact that the State

<sup>1</sup> A glossary of terms used in this chapter can be found in Appendix 1.1. The first use of a glossary term in the main text is marked in italics. Various aspects of the management of foreign exchange reserves are discussed in the first chapters of previous issues of the Annual Report of the Foreign Currency Department. These reports can be found on the Bank of Israel site: [www.bankisrael.gov.il](http://www.bankisrael.gov.il).

<sup>2</sup> The average level of reserves in this report is calculated on the basis of the daily balances of reserves assessed at their full market value. All the holding period yields in this report are expressed in terms of the numeraire unless otherwise specified.

<sup>3</sup> According to the Law, it is permissible for the Bank to hold gold as foreign reserves but this has not been done for several years since it is not considered economically worthwhile.

of Israel possesses a particular quantity of foreign exchange reserves. The primary benefits are the reduction of the probability of a crisis in Israel's foreign exchange market and the improvement in Israel's international financial standing. The functions of the reserves serve as a basis both for determining their desired size and for defining the investment policy according to which they are managed.

The management of the reserves portfolio, in accordance with the investment policy derived from the functions of the reserves, is evaluated according to a hypothetical benchmark portfolio. The composition of the benchmark portfolio is determined by rules which govern its currency composition, its duration in each currency, the types of assets included within it and the dispersion of these assets along the yield curve. The management of the reserves portfolio relative to a benchmark fulfills three functions: the benchmark portfolio serves as a "risk-free portfolio;" the yield on the benchmark portfolio provides a basis for evaluating the yield on the invested reserves; and the restrictions on permitted deviations from the benchmark define the degrees of freedom for the active management of the reserves portfolio (which relate primarily to currency risk and the interest rate risk measured by duration).

The holding period rate of return of the reserves in terms of the numeraire was 1.7 percent in 2004 as compared to 2.2 percent in the previous year. This yield reflects low yields-to-maturity during 2004 in the capital markets in which the reserves are invested, in addition to capital losses as a result of the increase in yields-to-maturity during the year. The holding period rate of return in NIS terms was 1.8 percent for the year in comparison to 1.3 percent in 2003. This reflected the weakening of the NIS against the non-dollar currencies in which the reserves are invested which was approximately offset by its strengthening against the dollar.

This year the holding period rate of return on the reserves was higher than the benchmark yield by 3 basis points, a difference which reflects the contribution of the management of the portfolio. The yield on the reserves is determined to a large extent by the composition of the benchmark in view of the relatively small magnitude of deviations from it, which account for the managed risk of the portfolio. In recent years, a significant amount of effort has been invested in choosing an allocation of assets in the portfolio different from that of the benchmark and in selecting assets not included in the benchmark reserves portfolio. In contrast, the extent of the positions in duration and currency management has been reduced in accordance with the policy of limiting exposure in these areas.

The contribution of the decisions regarding asset selection, which accounts for part of the yield spread against the benchmark, was 9 basis points this year. Most of this contribution was a result of the investment in

Eurobonds (about 6 basis points) and GNMA mortgage-backed securities (about one basis point) and securities lending (about 2 basis points). The contribution of currency management was about 2 basis points while that of interest rate risk management (duration and dispersion) was a negative 6 basis points.

The exposure of the reserves to the banking system averaged 19 percent of the total reserves in 2004. A large proportion of the exposure was utilized in securities lending, an activity with a very short investment horizon. Some of the exposure reflects the investment in fixed-term deposits in order to benefit from higher yields relative to government bonds with the same maturity (the TED spread). This exposure was managed according to a set of rules and quotas which play a central role in the credit risk management of the portfolio.

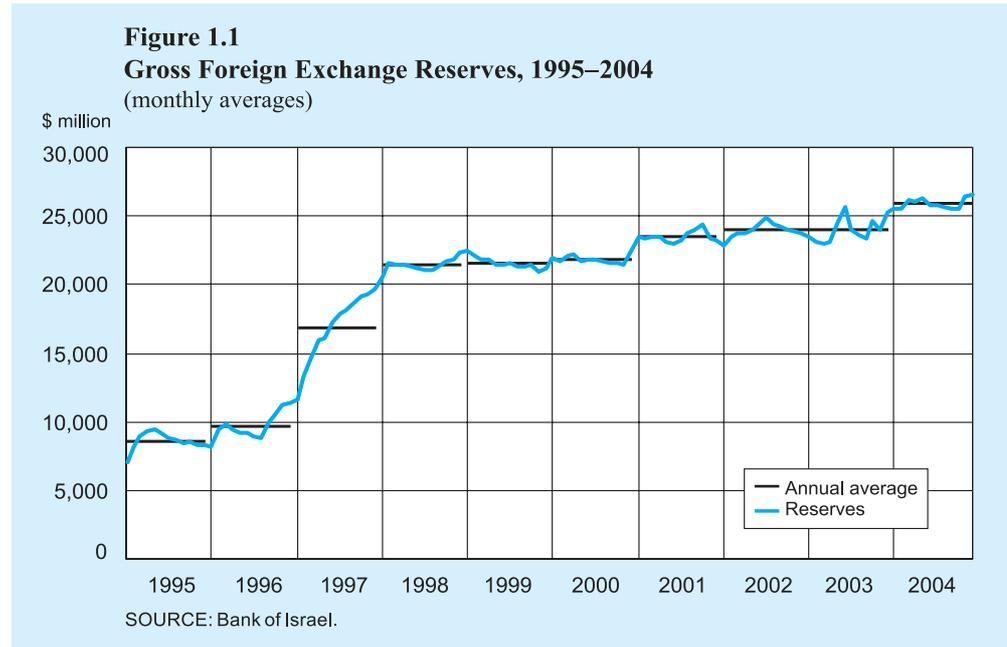
The reserves have a high level of liquidity, which is a measure of that portion of the portfolio which can be quickly realized without a loss in value. About 85 percent of the reserves portfolio is invested in highly liquid investments while the rest is invested in assets with lower liquidity. In view of the objectives of holding reserves, this level of liquidity appears to be adequate. The high level of liquidity is dictated by the Bank of Israel Law and the investment policy derived from the spirit of that law, which call for a conservative approach to the management of financial risk, and by considerations of profitability, which have led in recent years to only partial exploitation of the degrees of freedom to invest in less liquid assets.

## 1. THE LEVEL OF RESERVES AND THEIR MANAGEMENT FRAMEWORK

Israel's *foreign exchange reserves* are managed in accordance with the **Bank of Israel Law – 1954** and legal interpretations of the Law that have been added over the years. These define the Bank of Israel's methods of operation in foreign exchange and specify restrictions on the types of assets which it can invest in.

In those areas in which the Bank is not constrained by the language of the Law, it tends to adopt a conservative policy in accordance with the spirit of the Law. In order to manage the reserves in a manner appropriate to the changing macroeconomic and financial environments, a set of rules has been developed over the years which reflect the characteristics of the Bank and which place restrictions on the risks the reserves portfolio can be exposed to. The main financial risks are: *credit risk* which is regulated by a set of rules and quotas; *interest rate risk* which is regulated through the establishment of a target for the average *duration* of each currency portfolio; and *currency risk* which is regulated by defining a neutral currency composition, i.e. the *numeraire*, that also serves as the standard of measurement for the performance of the portfolio. The set of rules also deals with non-financial risks such as *operational and legal risk*.

Israel's foreign exchange reserves are managed in accordance with the Bank of Israel Law, 5714–1954 and its legal interpretations, and according to a conservative policy dictated by the spirit of the Law which restricts the exposure of the reserves to financial risks.



#### a. The level of reserves

##### (1) *The actual level of reserves*

The level of reserves averaged about \$26 billion during 2004 about \$2 billion higher than their level in the previous three years.

The foreign exchange reserves totaled \$26,631 million at the end of 2004, representing an increase of \$843 million since the end of the previous year. The level of reserves averaged about \$26 billion during 2004 which represents an increase of \$2 billion over the previous three years (Figure 1.1). This increase was primarily the result of the raising of capital by the government but was also due to the strengthening of the non-dollar currencies which part of the reserves are invested in and to the revenues from the management of the reserves. The increase was partly offset by the reduction in the deposits of the banks at the Bank of Israel. Although the reserves grew in absolute terms, there was no significant increase in the ratio of reserves to other economic aggregates to which the level of reserves is generally compared, such as imports, external debt, unindexed NIS-denominated assets held by the public (M2) and GDP (Table 1.1). The rate of increase in Israel's reserves during 2004 was a moderate 3.3 percent in dollar terms in comparison to the reserves (not including gold) of IMF members which grew by 15.6 percent during the first 10 months of the year.

##### (2) *The desired level of reserves*<sup>4</sup>

The Bank of Israel holds foreign exchange reserves in order that they be available for use (in other words, to be transferred to another entity in exchange for NIS or a

<sup>4</sup> A detailed discussion of the Bank of Israel's objectives in holding foreign exchange reserves and the desired level of reserves derived from those objectives can be found in Chapter 1.1 of the 2003 Report of the Foreign Currency Department.

**Table 1.1**  
**The Level of the Reserves Relative to Other Aggregates, 1994–2004**

	Average level of reserves <sup>a</sup> (\$ million)	Imports (months)	Gross external debt	Short-term external debt	Unindexed local-currency assets (M2)	Gross Domestic Product
<i>Reserves as percent of aggregate</i>						
1994	6,151	2.17	14	31	35	8
1995	8,594	2.59	17	39	37	10
1996	9,665	2.71	18	43	35	10
1997	16,797	4.66	29	73	52	16
1998	21,392	6.03	35	86	61	21
1999	21,718	5.42	33	82	55	21
2000	21,854	4.58	32	77	46	19
2001	23,523	5.66	34	81	43	21
2002	23,943	5.72	34	79	48	23
2003	24,002	5.66	33	79	46	22
2004	25,908	5.33	34	86	47	22

<sup>a</sup> Based on estimated daily valuations.

SOURCE: Bank of Israel, The Central Bureau of Statistics, and returns from the banks.

financial commitment) when needed and to achieve the benefits to the economy that are derived from the fact that the State maintains a certain level of foreign exchange reserves. The level of reserves required to achieve these benefits does not constitute an addition to the reserves required for uses but rather overlaps it.

The uses of the reserves can be divided between the needs of the government, which are met by the Bank of Israel's sale to it of foreign currency, and special uses by the Bank. The government's primary uses are the servicing of its foreign-currency denominated debt and extraordinary expenses for the import of goods and services during an emergency. The desired level of reserves for these purposes is determined by the total servicing of government debt in foreign currency (undiscounted principle and interest) over the next five years and an additional sum held for extraordinary situations equal to 5 percent of annual imports. At the beginning of 2005, these amounts were \$18.5 billion and \$2.8 billion respectively. Special uses by the Bank of Israel include: (1) Activity during a financial crisis such as a crisis in Israel's foreign exchange market serious enough to lead to a collapse of the market mechanism or a threat to the financial stability of the Israeli banking system as the result of temporary liquidity difficulties in foreign currency among the banking institutions; and (2) Management of monetary policy through the addition of liquidity to the monetary system (or withdrawal of liquidity from it) by means of non-sterilized intervention in foreign exchange trade, without the intention of moving the foreign exchange rate to some specified level. The desired level of reserves for this type of activity is determined as a function of the volume of trade in the foreign currency market and the total liabilities of the Israeli banking system in foreign currency. At the beginning of 2005, this amount was estimated at \$12.9 billion. Thus, the level required in order that

The Bank of Israel holds foreign exchange reserves in order that they be available for use when needed, and to achieve the benefits to the economy that derive from the fact that the State maintains them at a certain level.

The government's primary uses for which it might sell foreign currency include debt servicing and extraordinary expenses for imports during an emergency.

Uses by the Bank of Israel include activity during a financial crisis and the management of monetary policy.

reserves be available for use is about \$34 billion, which is considerably higher than the current level of reserves. Therefore it follows that an increase in reserves would be welcomed. Nonetheless, it is important to mention that the Bank of Israel will not approach the desired level of reserves through the net purchase of foreign currency in the market unless this policy is consistent with the needs of a monetary policy committed to maintaining price stability. It should also be mentioned that the Bank of Israel has not intervened in the foreign currency market since July 1997 (apart from a few days close to the end of 1997).

The benefits to the economy from holding foreign exchange reserves include the reduction in the probability of a crisis in Israel's foreign currency market and an improvement in Israel's international financial standing.

The benefits to the economy from holding foreign exchange reserves, which can be identified on the basis of global developments during the last decade, include the reduction in the probability of a crisis in Israel's foreign currency market and an improvement in Israel's international financial standing. There is no economic method of directly determining the amount required to achieve these benefits; however, indirect indications can be obtained in various ways. According to research carried out by the Foreign Currency Department in recent years, the level of reserves required to achieve these benefits to the economy is smaller than that required for uses. Therefore, an increase in the level of reserves is not required, beyond the level required for uses, in order to bring it into line with the level of benefits.

#### b. Management of the reserves

The investment policy regarding the reserves portfolio is set by the Foreign Currency Committee headed by the Governor of the Bank.

In those areas which are not subject to the restriction of the Bank of Israel Law, the Bank operates according to a set of rules that have evolved over the years. The main rules that regulate the management of the exposure of the reserves portfolio to various risks and determine the degrees of freedom in the operations of the Foreign Currency Department (henceforth the "*investment policy*") are set by the Foreign Currency Committee headed by the Governor of the Bank. The Foreign Currency Department brings proposals to the Committee for discussion and reports to the Committee on the performance of the portfolio and various investment decisions that it has made. The Committee also discusses developments in the international markets.

The investment policy is based on three principles:

The investment policy is based on three principles: preserving the value of the reserves in terms of their uses, a high level of liquidity, and achieving a reasonable yield subject to the previous two principles.

- **Preserving the value of the reserves in terms of their uses:** In other words, to preserve the ability of the Bank to provide foreign currency for the intended uses of the reserves, as described above. This principle is applied in the determination of the currency composition of the reserves, in the restrictions on their exposure to credit risk and to some extent in the management of interest rate risk.

- **Management of the reserves at a high level of liquidity:** In other words, most of the reserves are invested in assets which can be realized in large amounts and at short notice without reducing their sale price. This principle is manifested primarily in the restrictions on the types of assets in which the reserves can be invested. (Most of these restrictions are specified in the Bank of Israel Law and its interpretations while others are the result of internal decisions made at the Bank in accordance with the spirit of the Law.)

- **Achieving a reasonable yield on the reserves portfolio** subject to the previous two principles. This principle is applied in the decisions regarding the duration of the reserves portfolio, the level of permissible exposure to credit risk and the active management of the portfolio.

The control of most of the financial risk characteristics of the reserves portfolio is achieved through management of the reserves portfolio relative to a *benchmark*. The benchmark is a virtual portfolio composed of assets available for investment chosen in accordance with explicit rules specified as part of the investment policy of the reserves. These rules determine the currency composition of the benchmark, its duration in each currency, the types of assets within it and the dispersion of these assets along the *yield curve*. The management of the reserves portfolio relative to the benchmark fulfills three important functions: the benchmark serves as a *risk-free portfolio* for the Foreign Currency Department when holding positions does not appear worthwhile; the *holding period rate of return* of the benchmark provides the management of the Bank and the public with a basis of comparison for evaluating the yield achieved by the Department on the investment of the reserves; and the specification of quantitative restrictions on permissible deviations from the benchmark enables Bank management to control the financial risks involved in managing the reserves. These restrictions, which define the degrees of freedom for active management of the reserves portfolio, primarily apply to currency risk and that part of the interest rate risk which is measured by duration. Comparison to the benchmark portfolio also makes it possible to monitor other financial risks which do not have quantitative restrictions applied to them, such as that part of interest rate risk which results from dispersion along the yield curve.

The overall reserves portfolio benchmark is composed of several individual benchmarks, each denominated in a different currency, whose share in the overall benchmark equals the weight of its currency in the currency numeraire. The composition of the currency numeraire is determined according to the breakdown of the designated uses of the reserves. With regard to the reserves designated for the government's uses, the relevant factors are the currency breakdown of debt service during the next five years and the geographical distribution of imports. With regard to the reserves designated for the central bank's uses, the composition is determined according to various economic criteria with the goal of preserving their value in terms of their long term designated uses. (This issue requires further clarification.) Since the beginning of 2004, the numeraire has been defined on the basis of fixed quantities of currencies, rather than on the basis of fixed percentages as previously. The background to this decision is discussed in Box 1.1 of the Department's report for 2003.

In contrast to the currency numeraire, the structure of the benchmark's exposure to interest rate risk in each currency, i.e. its duration and dispersion along the yield curve, is not derived from the structure of exposure of the reserve uses in that currency to interest risk, but rather from the goal of achieving maximum yield, subject to a restriction on the probability of achieving a yield lower than a specified threshold. This concept, known as the shortfall approach, is discussed in the Department's annual reports for the years 2000 to 2003 and in Box 1.2 below. The decision not to

The control of most of the financial risk characteristics of the reserves portfolio is achieved through management of the reserves portfolio relative to a benchmark.

The benchmark fulfills three functions: it serves as a risk-free portfolio; its rate of return provides a basis for evaluating the yield achieved on the reserves portfolio; and restrictions on permissible deviations from it define the degrees of freedom for active management of the portfolio.

The composition of the currency numeraire is determined according to the currency breakdown of the designated uses of the reserves.

The structure of the benchmark's exposure to interest rate risk is derived from the goal of achieving maximum yield, subject to a restriction on the probability of achieving a yield lower than a specified threshold. This is called the shortfall approach.

base the interest rate risk exposure of the reserves on the uses of the reserves but rather on the shortfall approach derives from the desire to avoid significantly lengthening the reserves' duration which would be liable to significantly increase the volatility of the level of reserves (which could hinder the achievement of benefits from holding reserves) and the volatility of their revenue stream (which is an important component of the profits of the Bank that are transferred to the government).

Credit risk is managed primarily through a set of rules and quotas.

In contrast to currency and interest rate risk, which are controlled by the management of the reserves relative to the benchmark, credit risk is managed primarily through a set of rules and quotas which limit exposure to the institutional risks of financial institutions and countries. This system determines a minimum threshold for the credit quality of the individual institution and ensures an appropriate distribution among institutions and countries, according to their size and credit quality. There are additional tools used in the management of credit risk such as quantitative restrictions on the general exposure of the reserves portfolio to the global banking system and on the investment of reserves in spread assets, which are not included in the benchmark and some of which may involve a small amount of credit risk.

The Bank of Israel uses active management in managing the reserves.

The Bank of Israel manages the reserves using active management (position-taking) rather than passive management (exact imitation of the benchmark). Therefore, the reserves portfolio generally differs from the benchmark in the extent of exposure to the various risk factors, such as currency and interest rate risk. The extent of deviation of the portfolio from the benchmark is constrained, as mentioned earlier, by the set of rules which is part of the reserves investment policy. The added value of active management is manifested in the difference in yields and risk between the reserves portfolio and its benchmark, which is analyzed by component in Section 3 below. The decision of the Bank to adopt an approach of controlled active management of the reserves is primarily justified by its contribution to the yield on the portfolio during the last decade which amounted to 9 *basis points* annually (Figure 1.2). Active management has the following additional advantages: it requires all levels of the Department to closely monitor developments in the international financial markets, which in any case is highly desirable for the responsible management of reserves, and which is difficult to maintain over the years without the impetus of active management; it strengthens the business relationships between the Bank and financial institutions abroad, which contributes both to the quality of the Bank's management in normal times and to its ability to deal with crisis situations of various kinds; and it may also improve the ability of the Department to compete with the private financial sector in recruiting quality professional staff.

#### **Box 1.1**

##### **The Use of Futures Contracts in Reserves Management**

A forward is an agreement to buy or sell an asset of a certain kind, called the "underlying asset," at a specific price and date in the future. When such an agreement is entered into in a standard form through a futures

exchange located in one of the international financial centers, it is called a futures contract. In general, a futures contract traded on an exchange has clear advantages, such as high liquidity and a particularly low level of operational and legal risk, over a forward which is entered into in a different way.

As part of the management of its reserves, the Bank of Israel is permitted to use futures, as well as other types of derivative assets, on the condition that the underlying asset is one which it is permitted to hold, i.e. gold, foreign currency, foreign government bonds (or bonds fully guaranteed by a foreign government) and bank deposits in foreign currency. Accordingly, exchange-traded futures contracts for the purchase or sale of any of these assets have been used in the management of the reserves for many years.

Futures are not included in the composition of the benchmark. Therefore, a transaction completed using futures is intended to open or close positions. The positions which are managed using futures are generally related to the interest rate risk of the reserves portfolio, such as a change in the duration of the portfolio in a certain currency or the expectation of a change in yield spread between various points on the yield curve or between yield curves in different currencies. In some cases, positions in futures are used in the context of asset selection, such as when a futures position is connected to a different asset in order to change its characteristics (for example, in order to shorten the duration of a bond), thus creating a new synthetic asset.

There are a number of motives for managing positions via futures: the market in which the futures contract is traded may be more liquid and accessible than the market of the underlying asset; monitoring the profitability of a position can be simpler and more transparent when it is managed through futures; and the use of futures in managing positions makes it possible for the rest of the reserves portfolio to better imitate the benchmark and also reduces transaction costs. The involvement of the Department in futures markets also has side benefits, such as adding to its sources of information and professional skill, which allow it to provide better advice in inter-departmental discussions on issues related to other functions of the Bank. The decision of the Bank to use futures as an additional tool for reserves management reflects its commitment to achieving maximum possible efficiency within the boundaries of a conservative investment policy which conforms to both the letter and the spirit of the law.

## 2. EXPOSURE OF THE RESERVES TO YIELD AND RISK FACTORS

### a. Holding period rate of return on the reserves portfolio

The total holding period rate of return on the reserves in terms of the numeraire was 1.7 percent in 2004 as compared to 2.2 percent in 2003 and 4.9 percent on average during

The holding period rate of return on the reserves in terms of the numeraire was 1.7 percent in 2004 as compared to 2.2 percent in 2003 and 4.9 percent on average during the period 1995-2004.

**Table 1.2**  
**The Performance of the Actual Portfolio vis-à-vis the Neutral Benchmark Portfolio, 1995–2004**

(percent, in annual terms)

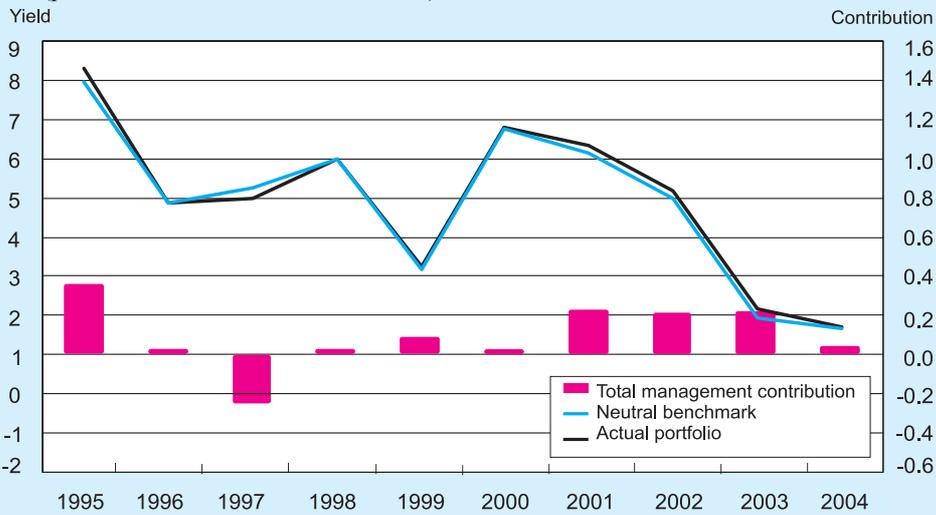
	Portfolio performance		Incremental yield							
	Actual portfolio	Neutral benchmark	Total	Currency management	Intermarket positions	Decision to invest in GNMA	Duration Management	Asset selection		Dispersion positions and other contributions
								Spread effect	Dispersion effect	
1995										
Yield	8.31	7.94	0.35	0.35		-0.10	0.26			
Standard deviation	0.56	0.56	0.24	0.10		0.05	0.19			
1996										
Yield	4.87	4.86	0.01	-0.01		0.03	-0.11	0.20		-0.09
Standard deviation	0.70	0.59	0.23	0.10		0.05	0.16	0.08		0.03
1997										
Yield	4.99	5.24	-0.24	-0.26		0.03	-0.17	0.18		-0.01
Standard deviation	0.44	0.49	0.16	0.08		0.02	0.09	0.07		0.02
1998										
Yield	6.00	5.99	0.01	-0.00		-0.03	0.01	0.10		-0.07
Standard deviation	0.63	0.69	0.08	0.03		0.06	0.02	0.05		0.02
1999										
Yield	3.26	3.17	0.08	0.02		0.03	-0.06	0.05		0.05
Standard deviation	0.66	0.60	0.13	0.02		0.05	0.08			
2000										
Yield	6.79	6.78	0.01	-0.15		-0.04	0.00	0.19		0.01
Standard deviation	0.89	0.86	0.11	0.06		0.03	0.02			
2001										
Yield	6.35	6.13	0.22 <sup>a</sup>	0.00		-0.05	-0.01	0.23		-0.01
Standard deviation	1.44	1.36	0.20	0.03		0.04	0.04	0.09		0.00
2002										
Yield	5.18	4.98	0.20	0.03		-0.00	-0.02	0.20		-0.01
Standard deviation	1.32	1.41	0.18	0.04			0.05			
2003										
Yield	2.15	1.94	0.21	0.04		-0.01	-0.02	0.19	0.02	-0.00
Standard deviation	0.81	0.79	0.09							
2004										
Yield	1.70	1.67	0.03	0.02	-0.01		-0.05	0.11	-0.02	-0.02
Standard deviation	0.73	0.73	0.06							
1994–2003										
Yield	4.94	4.85	0.09	0.00		-0.01	-0.02	0.14		-0.02

<sup>a</sup> 5.5 basis points of total incremental yield not attributed to any listed component in this year.

SOURCE: Bank of Israel.

the period 1995-2004 (Table 1.2 and Figure 1.2). The holding period rate of return on the foreign exchange reserves is generally calculated in terms of the currency-neutral composition – the numeraire – which is calculated according to the designated uses of the reserves, as described above.

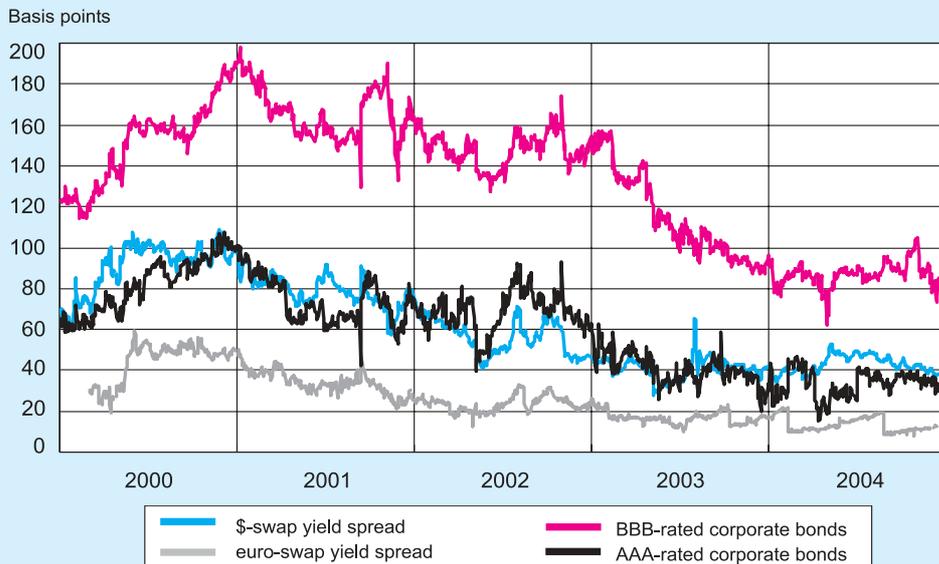
**Figure 1.2**  
**Yield and the Total Management Contribution, 1995–2004**  
 (percent, in annual numeraire terms)



SOURCE: Bank of Israel.

The holding period rate of return on the portfolio in NIS terms totaled 1.8 percent in 2004 as compared to -1.3 percent in 2003 and 17.8 percent in 2002. The yield in NIS terms in 2004 reflects the strengthening of the NIS against the US dollar, a continuation of the trend which began in 2002, which was approximately offset by the

**Figure 1.3**  
**Yield Spreads vis-à-vis 5-Year Treasuries, 2000–04**



SOURCE: Bank of Israel.

weakening of the NIS against the reserves' other investment currencies. During the past decade, the annual holding period rate of return in NIS terms was 8.9 percent and when deflated by domestic price increases was 4.5 percent.

### b. The factors influencing the holding period rate of return

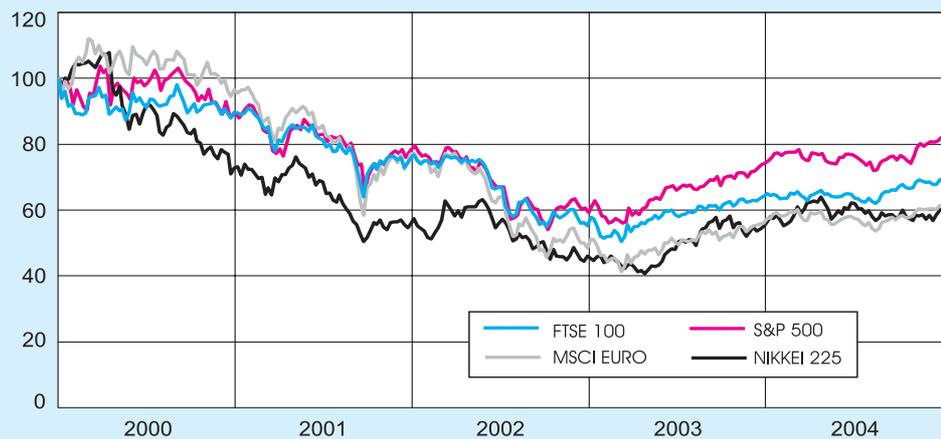
The holding period rate of return on the reserves portfolio is influenced by three main factors: developments in the financial markets; long term investment decisions regarding currency composition, and the ongoing management of the portfolio including active management.

The holding period rate of return on the reserves portfolio is influenced by three main factors: developments in the financial markets; the long term investment decision regarding allocation among currencies, duration, choice of assets and dispersion along the yield curve, as manifested in the structure of the benchmark portfolio; and the ongoing management of the portfolio including active management (deviations from the benchmark). Given the developments in the markets, the composition of the benchmark is the dominant factor in determining the holding period rate of return on the portfolio since the deviations in the composition of the reserves portfolio from that of the benchmark are relatively small.

#### (1) Developments in the world economy and the financial markets

In 2004, the growth rate of the main industrialized countries exceeded that seen in the previous two years. Growth was particularly high in North America, the UK and Japan. In the eurozone, it was lower than in the rest of the developed countries but nonetheless higher than in the previous two years. At the same time, the level of inflation remained low and stable in most of the industrialized countries. In the US, inflation increased somewhat, though it remained within the region of price stability. This was in spite of the price increases in the commodity markets, including oil and gold, which signaled the possibility of inflationary pressure in the future. There were a number of factors behind these developments:

**Figure 1.4**  
Share-Price Indices, 2000–04



SOURCE: Bloomberg.

- Expansionary monetary policy in most of the countries. In the US, the Federal Reserve left the short run interest rate at a level of 1.00 percent during the first half of the year while raising it during the second half, through a series of quarter percent increases, to 2.25 percent by the end of the year. During this same period inflation ranged from 2.5 to 3.0 percent in annual terms. However, the Fed had already managed to raise bond yields and interest rates on fixed term deposits through market expectations, which were influenced by its official announcements regarding monetary policy. In this way, the Fed achieved a limited contractionary effect even before it began raising the short term interest rate. In the eurozone and Japan, short term interest rates remained stable at a level similar to local inflation rates, i.e. about 2 percent in the eurozone and about 0 percent in Japan. In contrast, Britain's monetary policy was more contractionary. Monetary policy in these various countries was also reflected in the trend of interest rates on fixed term deposits (Figure 1.7a).
- Continuing expansionary fiscal policy which was manifested in significant government deficits. Deficits equaled or exceeded 3 percent of GDP in all the G7 countries except Canada.
- An increase in disposable income and private consumption in the US. In addition, there were upward trends in the asset markets (shares and real estate) which tended to increase household consumption through the wealth effect and which were accompanied by increased borrowing in the private sector. In contrast, there were low levels of private demand in most of Europe.
- An unprecedented deficit in the US current account which apparently reflected the high level of domestic demand relative to other industrialized countries and the preference for dollar-denominated assets among investors abroad.
- A continuation of strong growth in the emerging economies, including China, which contributed to growth in the industrialized countries, especially in Europe.
- An improvement in corporate profits, vis-à-vis 2003.

In 2004, the weakening of the dollar, which began in early 2002, continued against the other major currencies. During 2004, the dollar weakened by 7 percent relative to the euro, by 4 percent relative to the Japanese yen and by 7 percent relative to the pound sterling. During the past three years, the dollar has weakened by 35 percent against the euro, 22 percent against the Japanese yen and 24 percent against the pound sterling (Figure 1.5).

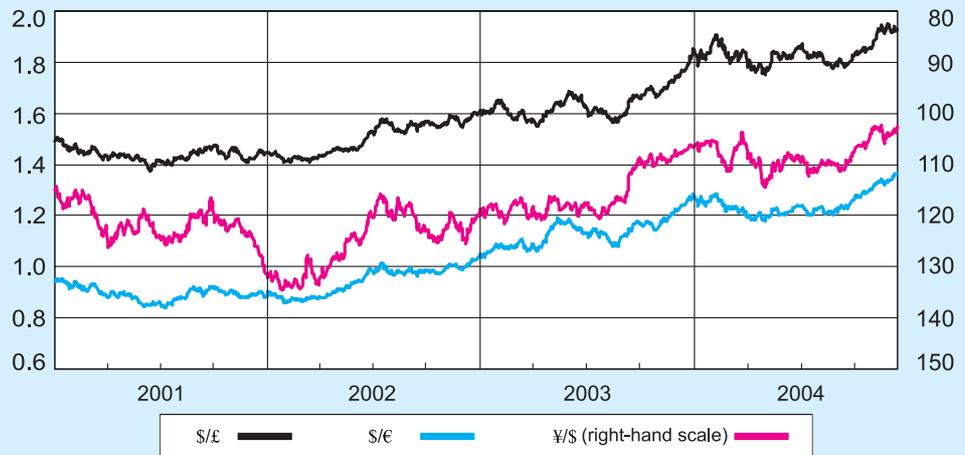
In financial markets in the US, Europe and Japan, *yields-to-maturity* rose during the first half of 2004 (until mid-June). During the second half of 2004, yields-to-maturity on long term bonds fell in all the markets. In contrast, the downward trend in yields-to-maturity on bonds with a term of two years continued only among British government bonds while yields were stable in other markets. In the US, there was even a renewal of the upward trend towards the end of the year. In the US and the eurozone, yield curves flattened during the year, i.e. the spread between short term and long term yields declined. In the US, this was the result of an upward shift in the short term end of the curve while in Europe it was the result of a downward shift in the long term end (Figure 1.6 and 1.7).

The rate of growth in the main markets was affected by several factors, including expansionary monetary and fiscal policy, the deficit in the current account of the US, growth in the emerging markets, and rises in share indices and real estate prices.

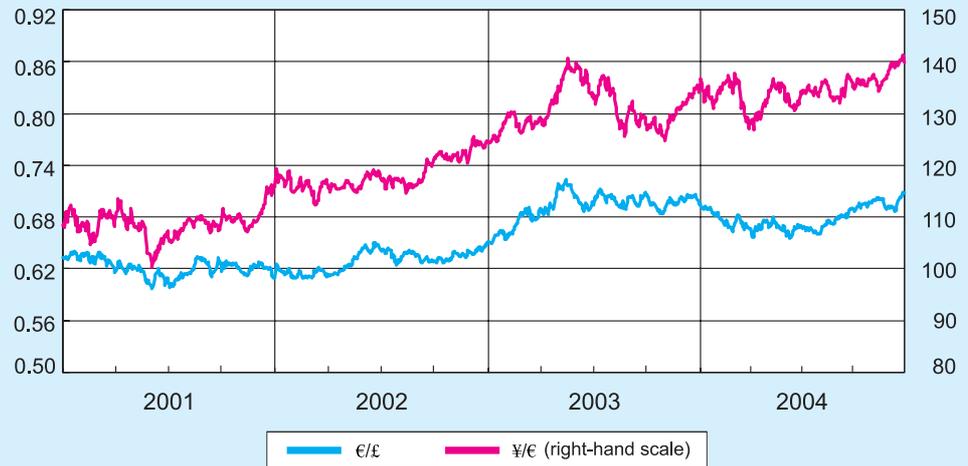
In 2004 the weakening of the dollar against the other major currencies continued.

Figure 1.5

## a. Exchange Rates against the US\$, 2000–04

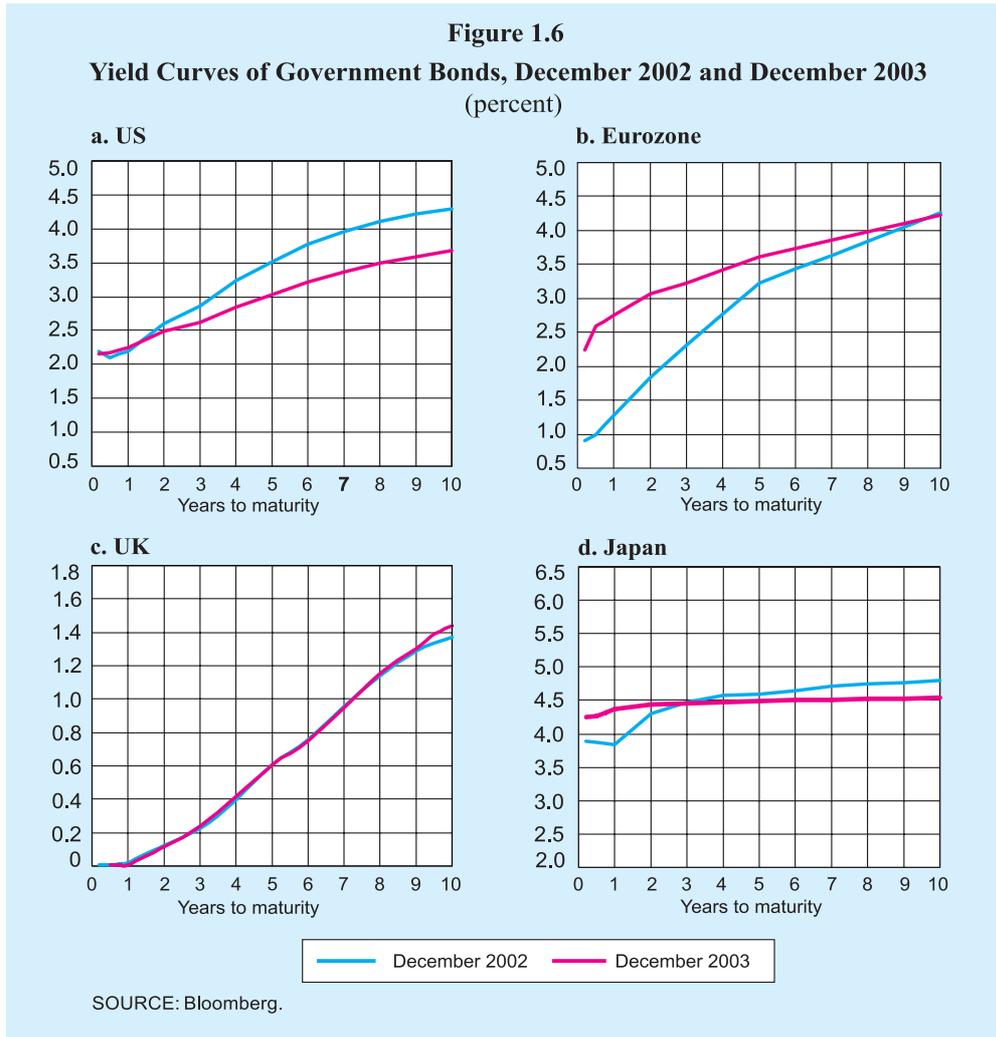


## b. Exchange Rates against the Euro, 2000–04



SOURCE: Bloomberg.

As is well known, a decline in the yield-to-maturity of bonds reflects an increase in their prices while an increase in yield-to-maturity reflects a decrease in prices. Therefore, the effect of the changes in yields during the year on holding period rates of return was negative during the first half of the year and positive or negligible during the second half. The level of the holding period rate of return was also influenced by the level of yields-to-maturity and not just by changes in their level. Expansionary monetary policy in the US, which began in 2001 and continued until the first half of 2004, led to very low levels of yield-to-maturity in the US market already in early 2004. A low level of yield-to-maturity reduces the current income component (the carry) of holding period rates of return and therefore the total return.



(2) *The selected benchmark – yield and risk*

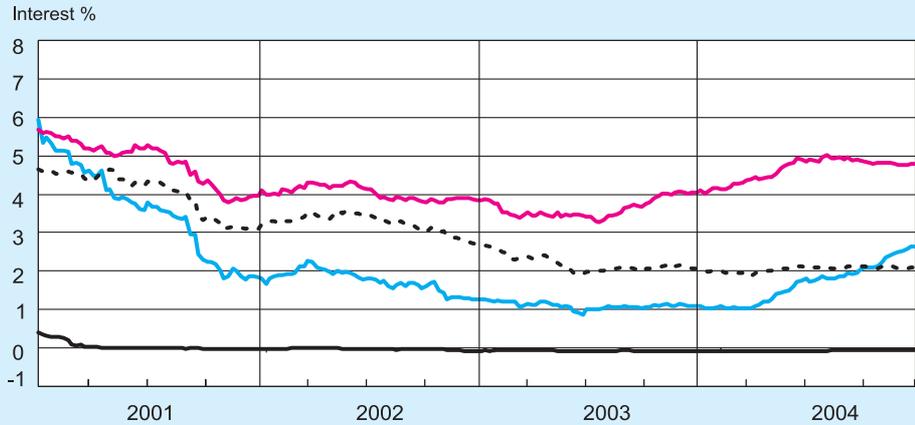
The holding period rate of return of the benchmark was 1.67 percent this year while its *volatility* was 0.73 percent. Given the developments in the markets, the benchmark was the dominant factor in determining the holding period rate of return on the portfolio in view of the relatively small magnitude of managed risk inherent in the portfolio as a result of deviations from the composition of the benchmark.

Figure 1.8 presents holding period rates of return and volatilities for the benchmark and the reserves portfolio since 1995 which show that in each year the yield and volatility of the portfolio are very similar to those of the benchmark. The figure also clearly shows the fluctuations in the annual holding period rates of return on the benchmark and the reserves portfolio which were largely determined by developments in the markets in each year. In contrast to the fluctuations in the holding period rates of return over the years, there was relative stability in their volatility within each year. Nonetheless, in 2004, as in 2003, the developments in the markets led to a particularly

The holding period rate of return of the benchmark in 2004 was 1.67 percent and its volatility 0.73 percent.

**Figure 1.7**

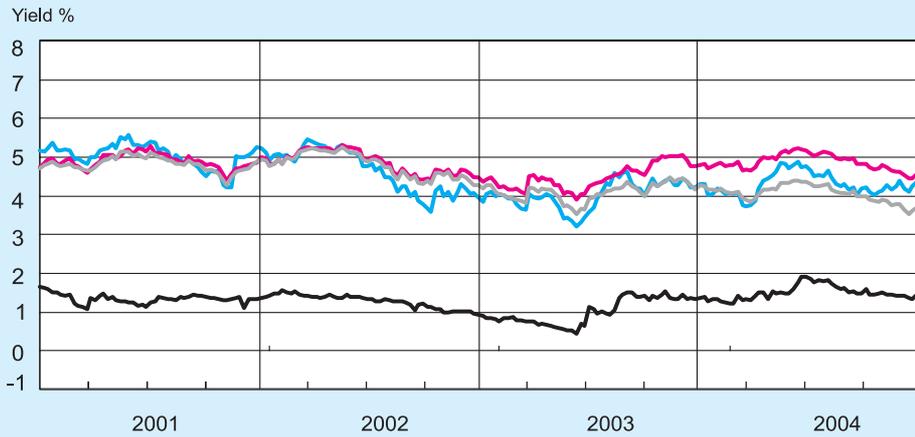
**a. Interest Rates on 6-Month Eurodeposits, 2001–04**



**b. Yields on 2-Year Government Bonds, 2001–04**

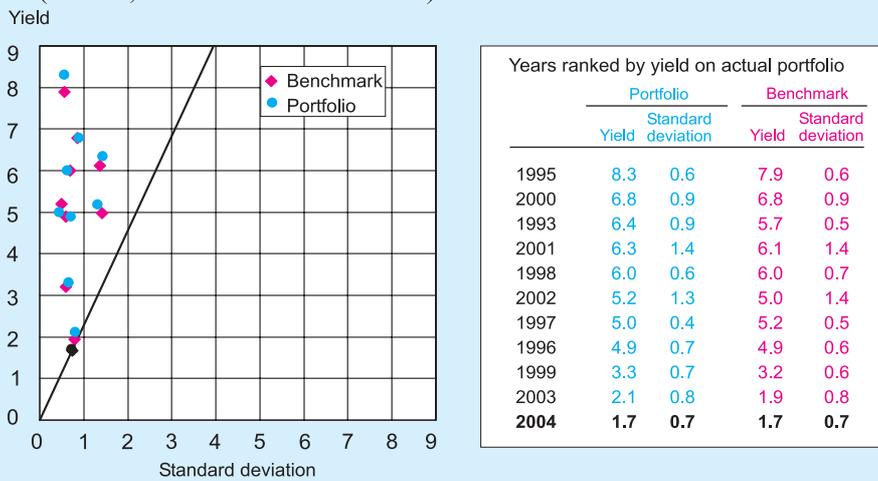


**c. Yields on 10-Year Government Bonds, 2001–04**



SOURCE: Bloomberg.

**Figure 1.8**  
**Distribution of Yields of the Portfolio and the Benchmark, 1995–2004**  
 (Percent, in annual numeraire terms)



SOURCE: Bank of Israel.

low holding period rate of return simultaneous with a level of volatility which was close to the average for the previous years. Therefore the ratio of the yield on the benchmark to its risk was lower than in previous years which reflects a certain rise in the level of risk in the markets during the last two years relative to previous years. This phenomenon can be seen in Figure 1.8 in which the observations for all previous years are above a line drawn from the observation for 2004 to the origin.

In 2004, as in 2003, holding period rate of return was particularly low simultaneous with a level of volatility which was close to the average for the previous years, indicating a certain rise in the level of risk in the markets.

**Box 1.2**

**Results of the Decision to Shorten the Duration of the Benchmark of the Dollar-Denominated Portfolio**

The target duration of the benchmark for each currency was determined in 1999 at a fixed level of 16 months for all currencies. This was based on research which indicated that benchmarks of this duration were expected to provide annual holding period rates of return which were higher than the desired minimum threshold with a probability of 95 percent (the shortfall approach). The minimum desired threshold was defined as half of the yield on a 3-month Treasury Bill in the US market and as half of the yield on a one-month bank deposit in the other markets.

Towards the end of 2002, it was decided to shorten the duration of the benchmark of the dollar-denominated portfolio from 16 to 11 months in view of the low yields-to-maturity in the US bond market. This decision was based on the fact that when yields are so low, even a relatively small

increase will create capital losses that may exceed interest revenues, therefore increasing the danger that the total holding period rate of return on the reserves portfolio will be negative. Along with shortening the duration of the benchmark, it was decided to shorten the maximum time to maturity for assets included in it from five to three years in order to prevent a situation in which the weight of long term assets in the new benchmark would be too small. Decisions regarding the structure of the benchmark should be judged only after a sufficiently long period of time has passed, since the benchmark reflects a long term investment strategy. Nonetheless, it is worthwhile reviewing the results of the decision to shorten the dollar-denominated benchmark at more frequent intervals since the decision was a reaction to extraordinary conditions, i.e. very low yields-to-maturity, which were expected to be temporary.

In 2004, the actual dollar-denominated benchmark with 11-month duration produced a holding period rate of return of 1.11 percent while the dollar-denominated benchmark which would have been used were it not for the decision to change it, with 16-month duration, produced a holding period rate of return of 1.31 percent. Therefore, it appears that, in retrospect, the expectations that led to the change in the benchmark were not realized, and both the chosen benchmark and the alternative benchmark (which reflects the Bank's decision for the long run), produced positive holding period rates of return. Apart from this, the two benchmarks fulfilled the criteria of the minimum threshold – defined in the US market as half of the holding period rate of return on three-month Treasury Bills—which was only 0.56 percent in 2004.

The cost, in terms of a reduction in yield, of the decision to shorten duration and change the dispersion of the benchmark along the yield curve totaled 33 basis points (13 points in 2003 and 20 in 2004) from the time the decision was made until the end of 2004. The loss is not insignificant and demonstrates the dangers in managing an investment portfolio according to opposing targets: in this case, producing a satisfactory yield according to the shortfall approach on the one hand and achieving a very low probability of a negative yield on the other. It is worth mentioning that, in contrast to 2003, when the decision to shorten the maximum time to maturity on assets in the benchmark reduced to some extent the overall cost of the change in the benchmark, the same decision was responsible in 2004 for almost all the cost. This decision, which was meant to ensure a sufficient quantity of long term assets in the benchmark, was made on the basis of operational considerations.

The increase in yields on the short term end of the yield curve in the US during the second half of 2004, a development which led to the flattening

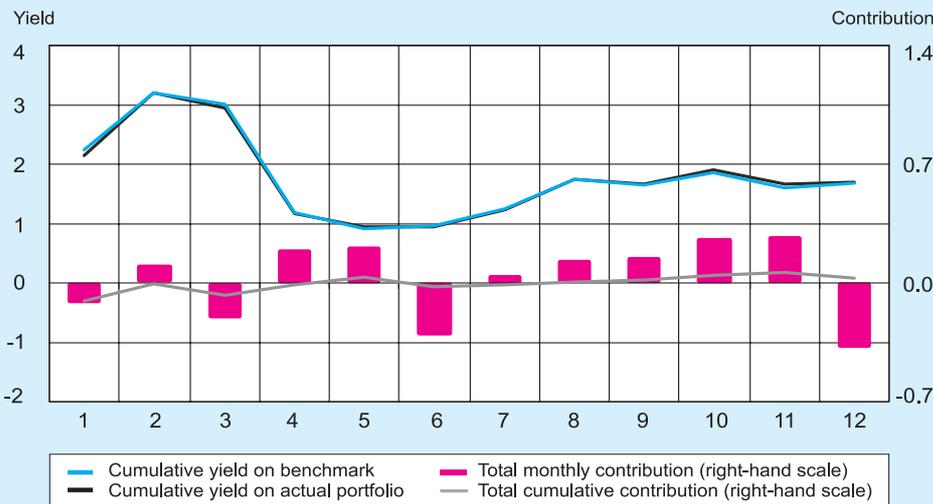
of the curve, again changed the trade-off between the “permanent” benchmark of 16-month duration and the “temporary” benchmark of 11-month duration, and therefore it is expected that the Bank will reconsider the situation in 2005.

*(3) Deviations from the benchmark*

The ongoing management of the portfolio contributed 3 basis points to its yield in 2004 and 6 basis points to its volatility (Table 1.2 and Figure 1.2 and 1.9). The contribution of ongoing management is the difference between the yield on the benchmark and the yield on the actual reserves portfolio. This difference reflects the impact of the decisions regarding currency composition, duration and the choice of assets and their dispersion along the yield curve, which constitute the parameters that can be used to either imitate or deviate from the benchmark subject to the degrees of freedom dictated by the investment policy. The contribution of ongoing management can also be affected by operational factors which influence the Bank’s ability to reach and carry out the required decisions. A prime example is the work slowdown in the Foreign Currency Department that occurred in 2004 as a result of the labor dispute at the Bank of Israel. The quantifiable damage as a result of the slowdown is estimated as the loss of one basis point in the yield on the portfolio (and the spread relative to the benchmark). This is in addition to indirect damage whose magnitude was significant but is difficult to estimate.

The ongoing management of the portfolio contributed 3 basis points to its yield in 2004 and 6 basis points to its volatility.

**Figure 1.9**  
**The Cumulative Yields of the Actual Portfolio and the Benchmark**  
**and the Monthly and Cumulative Contribution of Active**  
**Management, 2004**  
 (percent, annual numeraire terms)

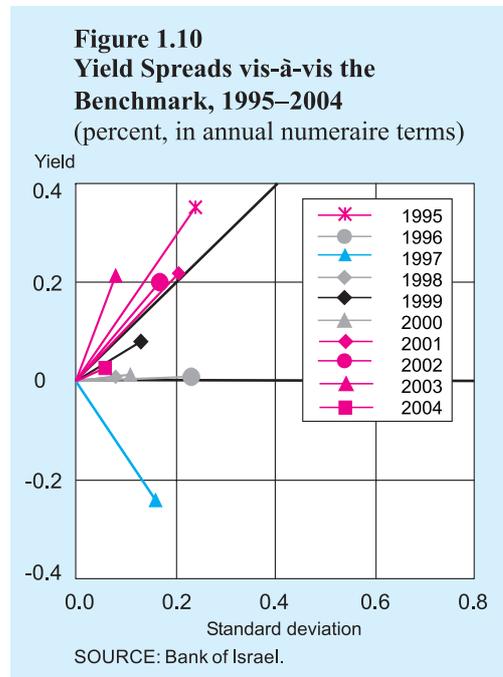


SOURCE: Bank of Israel.

The yield spread relative to the benchmark and its volatility can provide an indication of the level of skill of the portfolio management. Ideally, management of the portfolio should achieve a positive yield spread with relatively low volatility.

Analysis of the yield spread relative to the benchmark and its volatility can provide an indication of the level of skill of the portfolio management. Ideally, management of the portfolio should achieve a positive yield spread with relatively low volatility. Figure 1.10 (and Table 1.2) present the average yield relative to the benchmark and its volatility in each of the years from 1995 to 2004. The ratio between incremental yield and its volatility (the information ratio) can be seen in Figure 1.10 as the slope of the line for each of the years. The slope of the line will ideally be greater than one, in which case the incremental yield more than compensates for the incremental risk. It can be seen that the information ratio was in fact greater than one in the years 1995, 2001, 2002 and 2003 (since the slope of the lines for those years is steeper than the dotted line which has a slope of one), between zero and one in 1999 and 2004, close to zero in 1996, 1998 and 2000 and negative only in 1997.

The increase in the information ratio from 2001 onward was apparently the result of a change in policy at the beginning of the period. Table 1.2 reveals that during the last five years (2000 to 2004), the average contribution of asset selection and dispersion along the yield curve totaled 18 basis points as compared to an average of 5 basis points during the period 1995 to 1999. This increase can be attributed to the decision to increase the resources devoted to asset selection. At the same time, the extent of exposure resulting from duration management (from 2000 onward) and currency management (from 2001 onward) was reduced. These two areas of activity contributed significantly to the yield on the portfolio during the early 90s but were less profitable subsequently. The results of this change in approach were an increase in the yield spread between the reserves portfolio and the benchmark and the simultaneous reduction in the volatility of the spread.



Comparing the performance of different portfolios is problematic. Nonetheless, something can be learned from a comparison of portfolios with similar characteristics.

**c. The yield on the reserves portfolio relative to other managed portfolios**

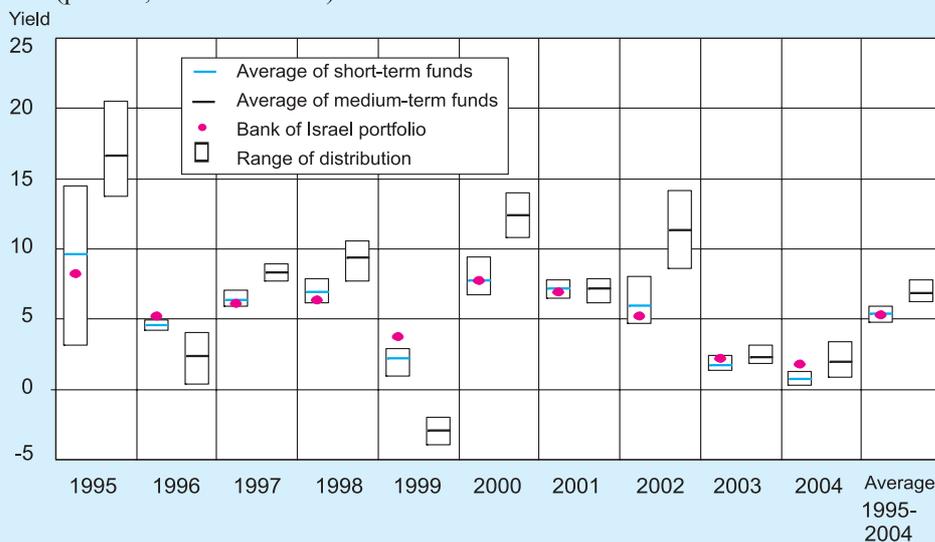
The comparison of performance between portfolios is problematic both because they are generally managed relative to different benchmarks and because of the differences in the rules applying to them. Nonetheless, something can be learned from a comparison of portfolios with similar characteristics.

The performance of eight mutual funds which operated in the American market during the period 1995 to 2004 will be used for the comparison. These funds were

primarily invested in US government bonds. Some of the funds are classified as “investors in short-term Treasuries” while the rest are “investors in medium-term Treasuries.” The funds invested no more than a small proportion of their portfolios in indexed US government bonds (*TIPS* – Treasury Inflation-Protected Securities) or in assets with a low rating (less than AA).<sup>5</sup> These traits make it possible to make a rough comparison between the performance of the Bank of Israel’s dollar-denominated portfolio and the performance of these funds in spite of the differences between them. However, it should be remembered that the performance of the funds is net of commissions which reflect the cost of ongoing operations while the performance of the dollar-denominated reserves portfolio is reported without subtracting this cost.

Figure 1.11 presents the range of annual holding period rates of return on the funds since 1995 for each type of fund – short term and medium term. For each period, Figure 1.11 shows the lowest and highest yields from among the group of portfolios, the average yield for the group and the performance of the dollar-denominated portfolio. An examination of the range of the yields indicates that the performance of the dollar-denominated portfolio during the period was within, or above, the range of fund yields. The years during which the dollar-denominated portfolio outperformed the funds, i.e. 1996 and 1999, were years in which the yield-to-maturity of Treasury securities increased. The superior performance of the dollar-denominated portfolio during these periods implies that its duration was shorter than that of the funds

**Figure 1.11**  
**Performance Distribution of Managers of Short- and Medium-Term Funds**  
**in US Market, 1995–2004**  
 (percent, in annual terms)



<sup>5</sup> It is possible that there was a component of corporate bonds among these assets which the Bank of Israel is not permitted to hold.

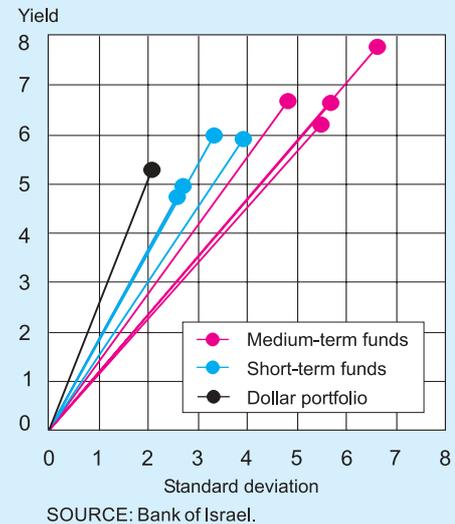
which also explains its lower ranking during the years 2000 to 2002 when yields-to-maturity declined. In 2004, the holding period rate of return on the dollar-denominated portfolio was within the range of yields of all the funds and higher than the yields on any of the short run funds. This result apparently reflects the combination of the relatively short duration of the dollar-denominated portfolio relative to the short run funds and the differences in asset management policy between the managers of the funds and the managers of the dollar-denominated reserves portfolio. The explanation of the difference between the relatively good performance of the medium term funds in 2004 and their performance in 1996 and 1999 lies in the fact that yields rose during 2004 primarily on the short run end of the curve and as a result the curve flattened while in 1996 and 1999 the increase in yields was accompanied by a steepening of the curve.

The ratio of yield to risk for the dollar-denominated portfolio is significantly higher than those of the other funds. Also evident is the higher yield to risk ratio for the short term funds relative to the medium term funds.

The data also demonstrate the wide variation of yields among the funds which implies differing investment allocations and the large magnitude of volatility of the yields on the medium term funds relative to the short term funds. The latter apparently reflects the longer duration of the medium term funds. Nonetheless, the range of the cumulative yields of each of the two groups of funds is very limited and is also similar between the two groups.<sup>6</sup> It appears therefore that the return on the added duration of the medium term funds is relatively limited. This finding is even more apparent when the average yield of each fund is compared to its volatility during the period 1996 to 2004. These are presented in Figure 1.12. Also presented is the average yield for the dollar-denominated portfolio and its volatility during that period. The ratio of yield to risk for the dollar-denominated portfolio is significantly higher than those of the other funds as can be seen in the diagram from the slope of the line joining the observations to the origin. Also evident is the higher yield to risk ratio for the short run funds relative to the medium term funds. The differences in the yield to risk ratios between the dollar-denominated portfolio and the various funds is the result of the narrow range of variation among the yields relative to the wide range of variation in volatility.

<sup>6</sup> The cumulative yields were calculated for the period 1996 to 2004 since data was unavailable for the yields of two of the funds in 1994 and 1995.

**Figure 1.12**  
**Yield and Risk: the Dollar Portfolio vis-à-vis Funds in the US Market, 1995–2004**  
(percent, in annual terms)



### 3. ONGOING MANAGEMENT OF THE RESERVES AND ITS CONTRIBUTION TO YIELD

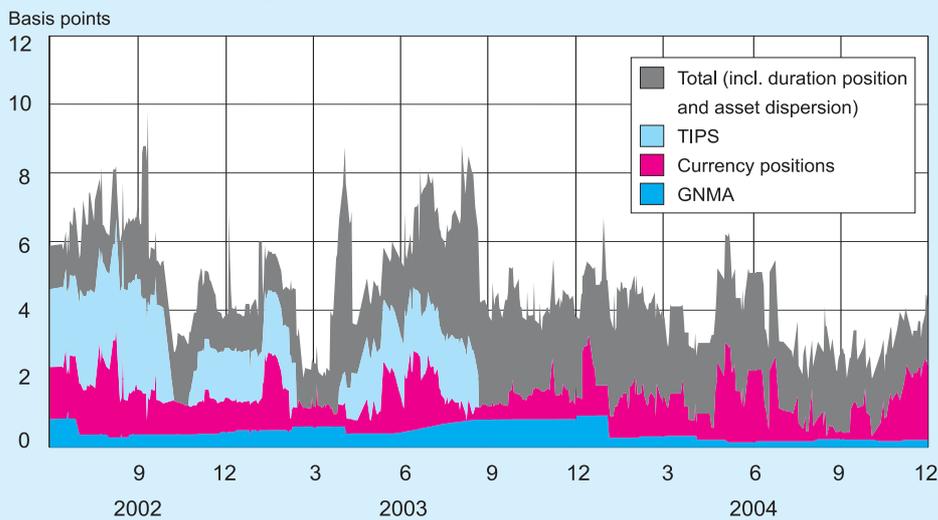
As part of the ongoing management of the portfolio, decisions are made to deviate from the composition of the benchmark (positions). A deviation from the composition of the benchmark constitutes an addition of risk relative to the benchmark which may be rewarded by incremental yield. As part of the management of a position, a ceiling is generally put on the potential loss; the position is closed if the cumulative loss reaches the ceiling. The scope of actual positions is much smaller than the maximum permitted.

The additional yield from management of the various types of positions is presented in Tables 1.3 and 1.4. The incremental risk involved in the management of positions in a particular period can be measured after the fact by the volatility of the incremental yield, the same approach which served as the basis of the discussion of the information ratio. Another measure used in evaluating the risk of holding positions relative to the benchmark, which can be measured *ex ante*, is the *VaR* (Value-at-Risk) of the positions or in other words the VaR of the spread between the actual portfolio and the benchmark. VaR is an estimate of the maximum capital loss which can occur during a certain period of time and with a certain probability. The VaRs of the positions and of the whole portfolio, which are calculated according to various assumptions, are actively monitored by the Department but do not play a role in the formal investment policy of the reserves. Figure 1.13 presents the breakdown of VaR due to the various types of positions that were held in the portfolio from June 2002 to the end of

As part of the ongoing management of the portfolio, decisions are made to deviate from the composition of the benchmark, constituting an addition of risk relative to the benchmark, in exchange for a potential incremental yield.

The incremental risk involved in the management of positions in a particular period can be estimated from the volatility of the incremental yield and from the VaR.

**Figure 1.13**  
**VaR of the Positions, June 2002–December 2004**  
 (one-week horizon, parametric method, 95% confidence level)



SOURCE: Bank of Israel.

**Table 1.3**  
**Contribution of Management Decisions to the Yield Spread vis-à-vis the Neutral Benchmark, 2004**

(basis points, in annual terms)

	Total contribution	Duration	Asset selection		Dispersion positions	Intermarket positions	Currency Management	Other contributions
			Spread effect	Dispersion effect				
Total	3.0	-5.4	11.3	-2.0	-0.5	-0.6	1.6	-1.3
Currency portfolios								
Total	3.3	-5.4	11.3	-2.0	-0.5			
Dollar portfolio	4.9	-4.9	11.7	-1.4	-0.6			
Euro portfolio	-2.4	-0.8	-1.7	0.1	0.1			
Other portfolios	0.8	0.2	1.3	-0.7	-0.0			
Intermarket positions	-0.6					-0.6		
Currency positions	1.6						1.6	
Other contributions	-1.3							-1.3

SOURCE: Bank of Israel.

2004. VaR is defined here as the largest possible loss expected within a week with a probability of 95%. During this period the ratio between the incremental yield due to active management and the VaR of the positions was only about 7. In contrast, the average ratio of profits to VaR which was achieved by ten commercial and investment banks on their activity in the fixed-income and foreign currency markets was about 17 during the second and third quarters of 2004.<sup>7</sup> The superior ratio which they achieved probably reflects a number of factors: differences in the character of activity (market making as opposed to portfolio management), the work environment (private versus public sector) and the advantages of geographical location (reserve of professional manpower, proximity to markets, etc.).

#### a. Contribution of currency management

The decisions relating to currency management determine the difference between the currency composition of the portfolio and that of the neutral currency composition, i.e. the numeraire. This difference is defined as a currency position. The contribution of currency management, including exchange rate differences, interest and capital gains on the currency positions, totaled 1.6 basis points in 2004 (Tables 1.2 and 1.3).

During the course of the year, a number of currency positions were managed on the basis of tactical considerations and the analysis of economic variables. Additional currency positions were managed with the aid of models, a tool for the management of short term currency positions which the Department has been using since mid-2000.

<sup>7</sup> According to data published by the Boston Consulting Group (BCG) on their Internet site. For purposes of comparison, the VaR of the positions was calculated according to the parameters of BCG, i.e. a horizon of one day and a probability of 99%.

The contribution of currency management totaled 1.6 basis points in 2004. In the course of the year a number of currency positions were managed on the basis of tactical and economic considerations. Additional currency positions were managed with the aid of models.

The amount invested according to the recommendation of each model is fixed and relatively small. In addition, there is a ceiling on the cumulative loss from their use that was determined when they were introduced; the use of the models would cease if the cumulative loss reached the ceiling. During the period since the models were introduced, they have been used to manage numerous positions which were held for various periods of time.

The risk involved in holding currency positions is greater than that of other positions managed within the portfolio. Figure 1.13 indicates that despite the small volume of the currency positions managed in 2004 relative to the total positions managed in the portfolio during that period, their VaR was, on average, almost a third of the VaR of the total positions. Nonetheless, the ratio between the incremental yield due to these positions and their VaR was similar to that for the total managed positions.

#### **b. The contribution of management of duration and dispersion along the yield curve**

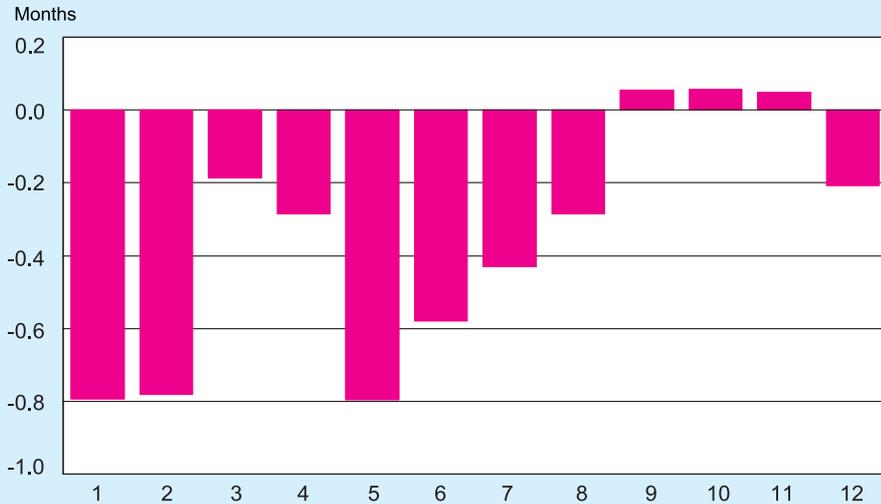
During 2004, duration positions managed in the various currency portfolios made a negative contribution of 5.4 basis points to the yield spread relative to the benchmark. The total contribution of dispersion relative to the benchmark was also negative, in the amount of 2.5 basis points, of which 0.5 was due to dispersion positions and 2.0 was due to the influence of dispersion that resulted from the asset selection positions (Table 1.3 and Figure 1.14). The duration positions are manifested in the difference between the duration of the currency portfolio and the neutral duration determined for it (which was 11 months for the dollar portfolio and 16 months for the rest of the currency portfolios). The positions involving the dispersion of assets are created by purchasing assets in one area of the yield curve and selling assets in another while minimizing the impact of an upward or downward shift (without a change in slope) on the profitability of the positions. The main impact of these two types of positions on yield resulted from the activity in the dollar portfolio which has the largest weight in the overall reserves portfolio. In recent years, the volume of these two types of positions has been significantly reduced.

During the year a number of duration and asset dispersion positions were managed in the reserves portfolio. The various positions were adopted on the basis of the Department's assessment of future developments in the yield curve, an assessment which changed over the course of the year. The management of duration and asset dispersion in the dollar-denominated portfolio resulted in a loss of 6.9 basis points on the reserves portfolio yield, of which 4.9 basis points were due to duration positions and 2.0 basis points to the dispersion of assets different from that of the benchmark. The contribution of the management of duration and asset dispersion in the euro and other portfolios to the yield spread was also negative in the amount of 1.1 basis points, of which 0.6 basis points was the result of duration positions and 0.5 basis points was the result of asset dispersion different from that of the benchmark.

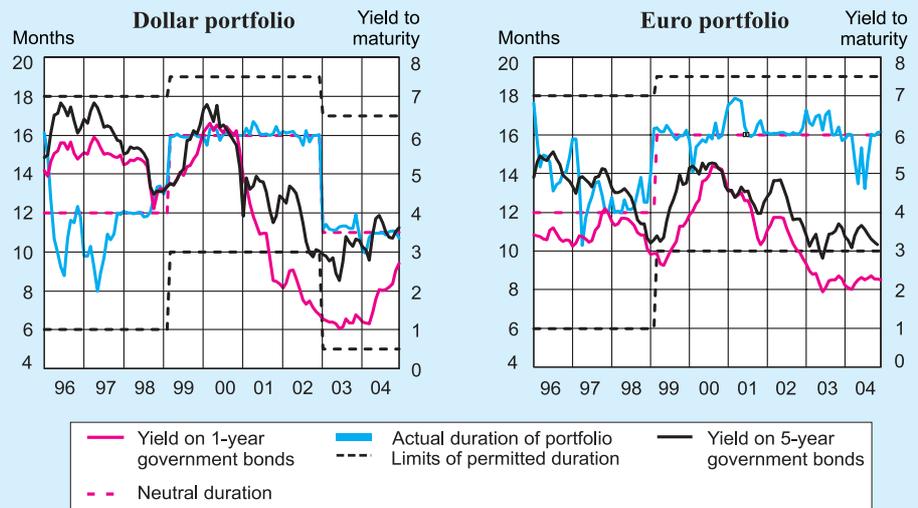
During 2004 duration positions made a negative contribution of 5.4 basis points to the yield spread relative to the benchmark. The total contribution of dispersion relative to the benchmark was also a negative one of 2.5 basis points.

**Figure 1.14**

**a. Duration of the Total Portfolio, Weighted by the Weights of the Numeraire, 2004**  
(monthly averages)



**b. Duration of the Main Currency Portfolios, and Yields to Maturity in Bond Markets, 1996–2004**



SOURCE: Bloomberg.

**c. Intermarket Positions**

These positions are created in such a way that their profitability depends on the development of the yield spread between two debt instruments. The instruments are denominated in different currencies and the resulting currency exposure is neutralized

using a *currency forward*. In 2004, the management of this type of position led to a loss of yield amounting to 0.6 basis points.

#### d. Contribution of asset selection

Decisions regarding asset selection contributed 11.3 basis points to the yield on the reserves portfolio. The contribution of the selection of *spread assets* (assets

which are not included in the benchmark) is measured by the spread between their holding period rate of return and that of assets with identical duration included in the benchmark while taking into account their weight in the portfolio. It is appropriate to subtract the cost of differences in asset dispersion along the yield curve, which are due to the decision on the choice of spread assets, amounting to 2.0 basis points, which is included in the calculation of the contribution of dispersion discussed in Section 3.b above. The main contribution was from asset selection in the dollar portfolio, which is the largest among the currency portfolios, and in particular from the investment in *Eurobonds* and *GNMA* mortgage-backed securities. Securities lending and the change in the composition of the portfolio following changes in the *TED spread* also increased the yield of the portfolio (Table 1.4 and Figure 1.15). The relatively large weight of the asset selection positions in the total positions within the portfolio and in the total increments to yield from ongoing management can also be seen in their large weight in the incremental risk from the management of positions. This risk, in terms of VaR, is presented in Figure 1.13.

As is the case with many other central banks, the Bank of Israel's sensitivity to the credit risk resulting from investment in spread assets is higher than its sensitivity to other risks, such as interest rate risk. The control and management of credit risk therefore plays a significant role in the management of risk in the reserves portfolio. The control and management of this risk is achieved through internal restrictions of the Bank, which include ceilings on the extent of the various exposures, a set of investment rules (described above in the discussion of the management framework of the reserves) and the cost accounting of the risk from tradable spread assets through their valuation.

The contribution of the investment in **Eurobonds** totaled 5.8 basis points in 2004. The superior performance of this type of security relative to the assets within the benchmark was the result of their positive spreads relative to Treasuries and the narrowing of those spreads during the year. A description of the characteristics of this

**Table 1.4**  
**The Contribution of Asset Selection, 2004**

		(basis points, in annual terms)	
		Total reserve portfolio	
Dollar deposits, repo, and reverse repo			5.7
<i>of which</i> : Securities lending	2.3		
Eurobonds			5.8
GNMA			1.1
<i>of which</i> : Internal management	-0.3		
External management	1.3		
Other assets			-1.3
Total contribution of asset selection			11.3
Dispersion deriving from asset selection			-2.0
Total			9.3

SOURCE: Bank of Israel.

Decisions regarding asset selection contributed 11.3 basis points to the yield on the reserves portfolio.

The contribution of the investment in Eurobonds totaled 5.8 basis points in 2004.

market and a discussion of the reduction in spreads in 2004 can be found in Box 1.3. In contrast to previous years, there was no investment in **TIPS – Treasury Inflation-Protected Securities** this year.

The investment in GNMA mortgage-backed securities resulted in an incremental yield of 1.1 basis points.

The investment in **GNMA mortgage-backed securities** resulted in an incremental yield of 1.1 basis points relative to the benchmark. This contribution has two components:

1) The externally managed GNMA portfolio. This portfolio is managed relative to the same benchmark as the long term portion of the dollar portfolio, which is managed internally, but in practice it is almost totally invested in mortgage-backed securities. The spread between the yield on the external manager's benchmark and the yield actually achieved is positive and contributed 1.3 basis points to the yield on the reserves portfolio.

2) GNMA positions. During the course of the year, the volume of positions managed in GNMA was small and was achieved through the buying and selling for future delivery (TBA). The contribution of this activity to the overall yield on the portfolio this year was a negative 0.3 basis points.

It is worth mentioning that up until December 2003, the portfolio of the external manager was managed relative to an index of the GNMA market and in certain years part of the internally managed dollar portfolio was also managed against this benchmark. The spread between the yield on this benchmark and the yield on the benchmark for the long term portion of the dollar portfolio during the period 1995-2003 is attributed in Table 1.2 to the strategic decision to invest a certain part of the reserves portfolio in this asset class, a decision which was made by the Department several years ago and reversed in late 2003.

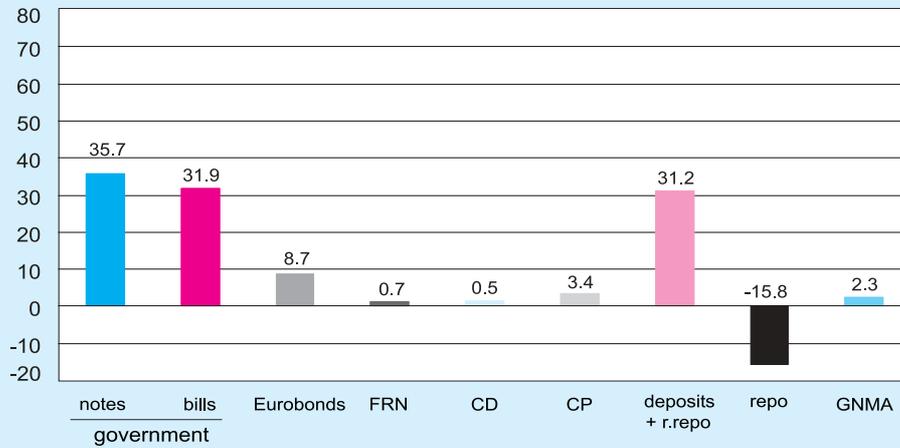
The contribution resulting from securities lending by the Department totaled 2.3 basis points.

The contribution of asset selection also includes the contribution resulting from **securities lending** by the Department which totaled 2.3 basis points this year. This activity, which the Department has managed for the past several years, is carried out primarily with dollar-denominated securities. Lending involves the linking of two transactions – a repo transaction and a reverse repo transaction or a bank deposit. A repo transaction involves lending a security in exchange for cash, which is “deposited” in a reverse repo transaction against another security or invested in a bank deposit. The two transactions are for the same time period and have no effect on the duration of the portfolio. The profit from such a pair of transactions results from the fact that the lent securities in the repo transaction are in demand in the market by parties who are prepared to borrow them and to lend the equivalent value in money to the securities lender at a lower rate of interest than what the lender receives by depositing it elsewhere. When the money received from the repo is invested in a bank deposit, the transaction involves utilizing part of the exposure limit of the reserves to the banking system. Since the investment horizon of lending transactions is very short, the term of the bank exposure is as well.

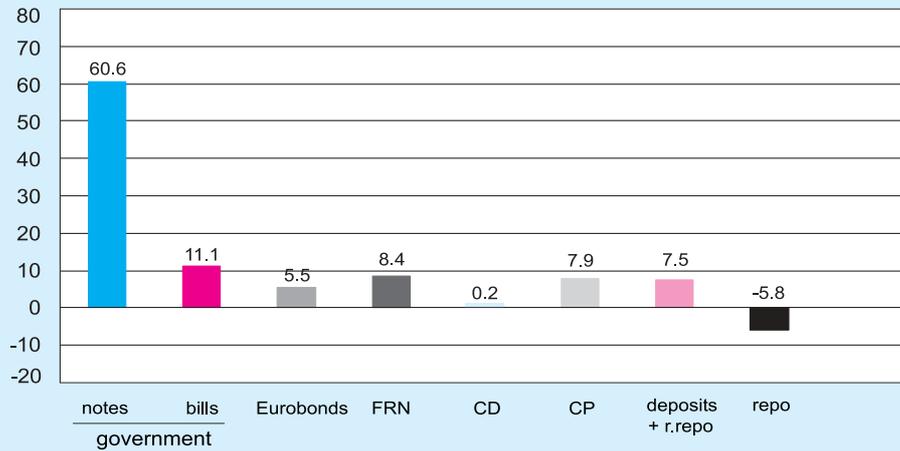
Bank deposits are one of the spread assets in which the Bank is permitted to invest according to the Bank of Israel Law. The exposure of the reserves to the banking

**Figure 1.15**  
**Asset Distribution of the Currency Portfolios, 2004**  
 (annual averages, percent)

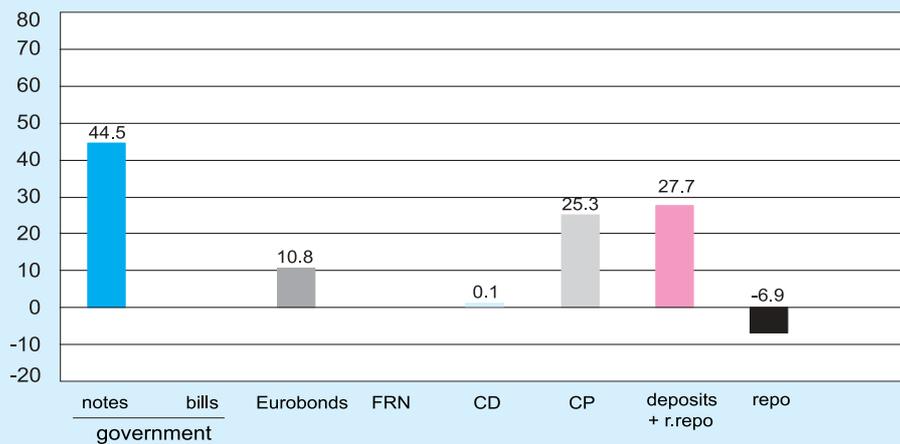
**a. Dollar Portfolio**



**b. Euro Portfolio**

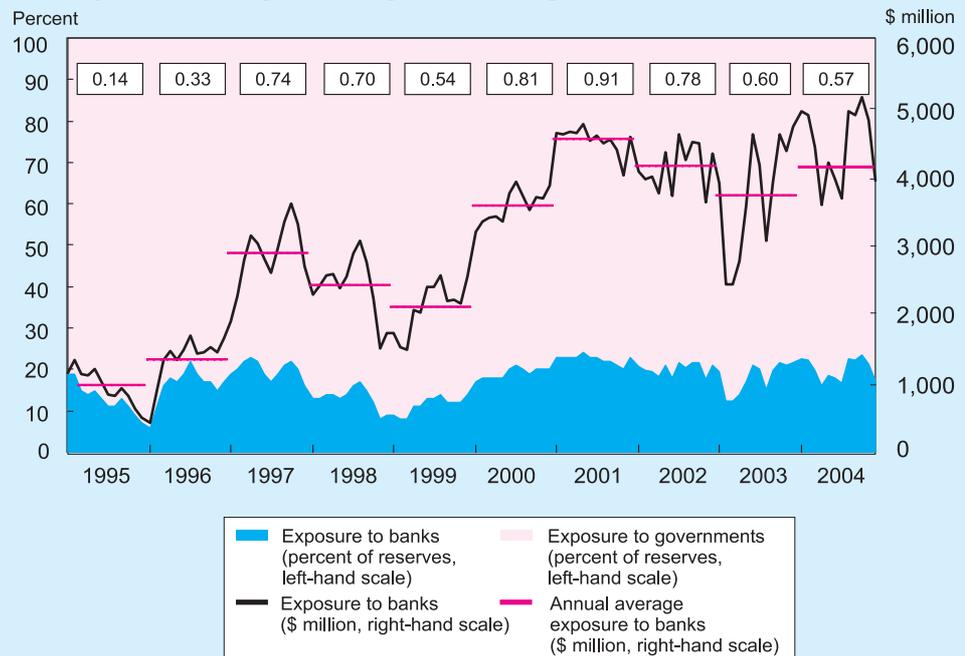


**c. Other Currencies**



SOURCE: Bank of Israel.

**Figure 1.16**  
**Exposure to Banks and Governments, 1995–2004**  
 (figures in boxes: percent of quota banks' capital)



SOURCE: Bank of Israel.

system, including the exposure to the banks as a result of the deposits placed with them and due to other transactions with them, is a significant part of the exposure of the reserves portfolio to credit risk. This exposure was restricted in 2004 by a ceiling of 25 percent of the portfolio.

The exposure of the reserves to the banking system in 2004 was similar in size to its annual average in previous years – 19 percent of reserves as compared to 18 percent in 2003 and 20 percent in 2002 (Figure 1.16). In contrast the rate of exposure, relative to the capital of the banks which the reserves are invested in, was lower in 2004 than in the previous four years. The low level of utilization of bank exposure in recent years can be explained by the very low level of the TED spread in the dollar-denominated market. In such a situation, the incremental yield achieved by increasing the risk resulting from bank exposure is small.

The exposure of the reserves to the banking system in 2004 was similar in size to its annual average in previous years—19 percent of reserves.

### Box 1.3 Eurobonds Issued by Sovereigns and Supranationals

A Eurobond is a bond denominated in the currency of one country which is registered for trade in the markets of another. The source of the name is

historical - the first Eurobonds, issued in the 60s and 70s, were denominated in dollars and issued in the markets of European countries. Today, however, large issues of Eurobonds are registered for trade in a number of countries, not necessarily European, in which the principal financial markets are located.<sup>1</sup> A Eurobond can also be registered for trade in the country whose currency it is denominated in, in addition to other countries, in which case it is called a Global bond. Eurobonds are generally held in safekeeping at designated banks in Europe which were established for that purpose.

Eurobonds are issued primarily by private companies, but also by countries and international financial institutions, in order to raise capital. The Bank of Israel Law allows the Bank to invest foreign exchange reserves in debt instruments issued by governments or guaranteed by them. Therefore, Eurobonds are a permissible investment channel for the reserves when the issuer is a sovereign country or an international institution whose member countries guarantee its debt or when a sovereign country gives its full and explicit guarantee to the issue of a private or semi-public company, such as an airport. This is subject to the fulfillment of the suitability criteria set by the Bank's investment policy and a thorough legal assessment of the existence and quality of the state guarantee, if that is required.

The Eurobonds in which the reserves are invested are part of a larger well known market called the SAS (Sovereigns and Supranationals) Eurobonds market. The most active issuers in this market are international institutions and, following them, countries with a very high credit rating who wish to diversify the sources of financing for their national debt. In contrast to government bonds denominated in local currency, SAS Eurobonds are not issued according to a fixed schedule, but rather according to the needs of the issuer and the existence of opportunities to raise capital in the market at attractive prices. Of course, not every Eurobond which is part of the SAS market meets the criteria for investment of the reserves. Nonetheless, assessments made on the basis of the overall SAS market can be applied to the Eurobonds in which part of the reserves are invested.

A Eurobond is a spread asset and therefore its yield-to-maturity can be divided into two components: 1) The yield-to-maturity expected of a government bond in the same currency and with the same maturity date; and 2) a yield spread which reflects the characteristics of the Eurobond issuer and in general varies moderately and continuously. The yield spreads of SAS Eurobonds with high credit ratings have a greater similarity in magnitude and volatility to yield spreads on the bonds issued by the US Federal Agencies than to corporate bonds with the same rating. Therefore,

<sup>1</sup> There is no connection between the name of this financial instrument and the name chosen in the late 1990s for the common currency of the EU – the euro.

managers of various types of debt instrument portfolios often view the bonds of the Agencies and the SAS Eurobonds as substitutes for one another.

The trade in SAS Eurobonds in 2004 was characterized by an increase in the volume of issuance in comparison to 2003, primarily in the first half of the year, and by a trend of declining yield spreads over the whole year. In the secondary market there was a significant reduction in the level of liquidity which reflected the growing tendency of investors to hold securities until maturity. The following are among the factors behind these developments:

- An increase in the quantity of reserve funds managed by official financial institutions in Asia (see Section 4a, following) and as a result an increase in funds allocated to the SAS Eurobonds market.
- Concerns regarding the future of the Agencies in the US following a critical regulatory report on the quality of financial reporting of one of the Agencies and in view of the widening public debate over the appropriate status for the Agencies. These developments led to a transfer of funds from the Agencies market to the SAS Eurobonds market.
- The desire of institutional investors in certain countries to safekeep their investments, or at least a portion of them, outside the US due to various geopolitical concerns, which has led to a diversion of dollar investment from the Treasury and Agency markets to the SAS Eurobonds market.

The reduction in the yield spreads of Eurobonds in which part of the foreign exchange reserves are invested produced profits on the reserves portfolio, as described above in the body of the report.

#### e. The liquidity of the reserves<sup>8</sup>

The level of liquidity of the reserves portfolio is an estimate of that portion of the portfolio which can be realized quickly and without a loss in value.

The level of liquidity of the reserves portfolio is an estimate of that portion of the portfolio which can be realized quickly and without a loss in value. In order to monitor the general level of liquidity of the reserves portfolio on an ongoing basis, the various assets in the portfolio were divided into four groups according to their level of liquidity i.e., according to the possibility of selling them without the sale itself causing a loss. The criteria employed in classifying securities into different levels of liquidity are the bid-offer spread for tradable assets, and for nontradable assets, their time to maturity. The groups are:

1. Very liquid securities – with a spread of 0-2 basis points or 0-2 cents.
2. Less liquid securities – with a spread of 3-5 basis points or 3-6 cents.

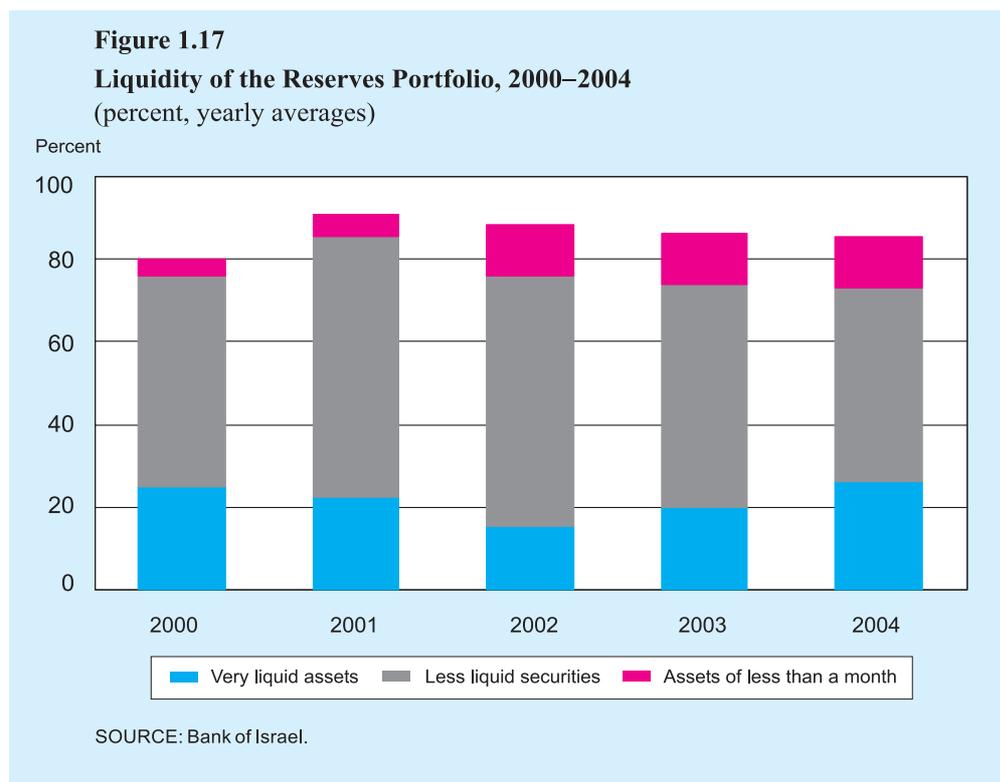
<sup>8</sup> A detailed discussion of the level of liquidity of the reserves and the management of that liquidity can be found in Box 2.1 in the 2002 Annual Report of the Foreign Currency Department.

3. Securities maturing within a month’s time; deposits and repo and reverse repo transactions which are shorter than one month.
4. All remaining assets.

The liquid component of the reserves consists of the first three groups. The differentiation between the levels of liquidity of these three groups is not clear-cut: as liquidity is measured using two different criteria—period to maturity and the bid-offer spread—ranking the liquidity of the third group vis-à-vis that of the first two is a matter of judgment. It is clear, however, that the second group is less liquid than the first.

The liquid component of the reserves in 2004 accounted on average for approximately 85 percent of the total reserves as compared to 88 percent in 2003 (Figure 1.17). Of this amount, some 26 percent was invested in assets with the highest level of liquidity, 47 percent in assets with high liquidity, though less than that of the first group, and 12 percent in assets whose time to maturity was shorter than one month. There was a significant decline, amounting to 7 percent, in the share of the second group (“less liquid” assets) and a parallel increase in that of the first group (“very liquid” assets). This change is a continuation of the long term trend which can partly be attributed to the decline in the yield spreads between spread assets with a short time to maturity (CDs and CPs – see appendix) and Treasury Bills which mature on similar dates. The

The liquid component of the reserves in 2004 accounted on average for approximately 85 percent of the total reserves as compared to 88 percent in 2003.



narrowing of this spread reduces the profitability of investment in short term spread assets which are considered “less liquid” and leads to a diversion of funds to short term government bonds which are considered “very liquid.”

On average, approximately 15 percent of the reserves portfolio was invested in assets which were not classified as being part of the liquid component of the reserves portfolio since they are characterized by a low level of liquidity. There has been a moderate upward trend in the share of this group since 2001, the year in which its share reached a low of 9 percent of the reserves. This group is composed of Eurobonds, funds under external management (which are invested primarily in GNMA securities) and bank deposits with a term of more than one month. In previous years, it also included internally managed GNMA securities and linked securities of the US government (TIPS). The activity in TIPS was gradually reduced out of economic considerations until it was terminated during 2003 which led to an increase in the share of the liquid component of the reserves in 2004.

In the light of the objectives of holding foreign exchange reserves and the ability to sell a large part of them in a short time without thereby depressing their value, it appears that the reserves' liquidity level is high enough.

In the light of the objectives of holding foreign exchange reserves and the ability to sell a large part of them in a short time without thereby depressing their value, it appears that their liquidity level is high enough, despite the gap between their actual level and the desired level. The high liquidity of the reserves derives from two main factors: one is the Bank of Israel Law and the investment policy derived from the spirit of the Law that prescribe a conservative approach to the management of financial risks, and in particular of credit risk. This in effect achieves one of the main objectives of the reserves management process. The second factor consists of economic considerations based mainly on the level of financial spreads of the various spread assets and the paths they are expected to follow relative to their inherent risk. In the light of this second factor, the Bank has made only partial use of the degrees of freedom to invest in spread assets with low liquidity during the last few years.

#### 4. OTHER ISSUES

##### **a. The impact of the management of reserves portfolios by central banks on the financial markets**

In recent years, the growing influence of the management of reserves portfolios on the financial markets has gained increasing attention.

In recent years, the growing influence of the management of reserves portfolios on the financial markets has gained increasing attention. Investors, analysts, observers and financial intermediaries all closely follow the changes in the reserves portfolios in order to assess their possible influence on exchange rates, bond prices, interest rates, etc. The monitoring of the behavior of central banks as investors and portfolio managers has thus been added to the monitoring of the central banks' activities as managers of monetary policy.

The central banks have a long history of explicitly trying to influence exchange rates, interest rates and asset prices in their own local markets. This activity is derived from the very reason for their existence, i.e. to manage monetary policy. Within this

framework, they have attempted to influence the exchange rate of their currencies by directly intervening in foreign exchange markets through the purchase or sale of their own currency in exchange for foreign currency and have tried to influence the interest rate in their economies through activity in local markets (determining the monetary rate of interest, discounting of notes, open market operations, etc.)

Recently, as a result of the rapid increase in foreign exchange reserves and more active management, central banks have had a greater influence on asset prices and exchange rates. In other words, they are having an impact on foreign markets without any relation to local assets or monetary policy. Their objective is to produce profits, reduce risk, etc., just like any other private investor.

The large influence of central banks is first and foremost a result of the size of their reserves. The foreign exchange reserves of all the central banks combined totaled \$3.36 trillion at the end of March 2004 and it is obvious that even a small change in the composition of these reserves is likely to have a large impact on global financial markets. The total world reserves have grown rapidly in recent years, increasing by almost 100 percent since 1998. As a result, central banks have had to constantly invest large amounts of new funds, in addition to “turning over” existing portfolios.

Another reason for the large impact of reserves portfolios on the markets is related to the concentration of reserves in a relatively small number of countries and specific target markets. Almost 200 countries report on their reserves portfolios which implies a relatively small number of managers relative to other types capital such as corporations, pension funds, insurance companies, banks, private investors, funds, etc. In reality, the concentration is even greater since only about 25 countries (including Israel) hold foreign exchange reserves (not including gold) which exceed \$20 billion and the 15 countries with the largest quantities of reserves hold some \$2.7 trillion or in other words 80 percent of the world total. Since a small number of decision makers control such large sums, and in general operate according to similar considerations, they clearly have the ability to influence financial markets.

Furthermore, foreign exchange reserves are generally invested in a small number of markets rather than being dispersed worldwide. Almost all of the reserves are invested in a limited number of currencies which are called, for good reason, the reserve currencies. At the end of 2003, some 64 percent of reserves were invested in US dollars, 20 percent in euros, 5 percent in the pound sterling and 4 percent in the Japanese yen. Central banks also held approximately 918 million ounces of gold which is worth \$385 billion at market prices. It is estimated that this represents about one quarter of the world’s inventory of gold. In addition, they generally invest in very specific types of investments. In most cases, they do not invest in corporate shares or bonds; rather, they prefer bank deposits or securities with a high rating that are issued or backed by the governments of developed countries. Their primary investment destination is the market for US Treasuries. At the end of 2004, the central banks held some \$1.3 trillion of US government securities, one third of the total market. This represents a significant increase since 1999 when the central banks held about \$600 billion dollars in assets representing less than 20 percent of the total market.

The large influence of central banks is first and foremost a result of the size of their reserves. The foreign exchange reserves of all the central banks combined totaled \$3.36 trillion at the end of March 2004.

Another reason for the large impact of reserves portfolios on the markets is related to the concentration of reserves in a relatively small number of countries and specific target markets.

**Table 1.5**  
**Degrees of Transparency regarding Foreign Exchange Reserves Management in Selected Countries**

	Australia	Brazil	Canada	Chile	Czech Rep.	Colombia	Denmark	ECB	Finland	Hong Kong	India	Israel	Latvia	New Zealand	Norway	Russia	South Korea	Thailand	United Kingdom	
Size of reserves	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Desired level and adequacy	p	-	-	p	p	+	p	p	-	-	p	+	-	-	-	-	-	-	-	-
Types of assets and their proportion in the reserves (deposits, US and other Government bonds, GNMMA and securities lending)	p	-	p	p	p	p	p	p	p	-	p	+	p	-	p	p	-	-	-	p
Structure and composition of currency numeraire	+	-	-	-	-	-	-	-	-	-	-	p	-	-	-	-	-	-	-	-
Holding period return and its attribution to various asset classes	p	-	p	-	p	p	-	-	p	p	-	+	-	-	p	-	-	-	-	-
Duration and performance of benchmark	+	-	p	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Components of active management contribution to performance relative to benchmark e.g. currency management, duration, etc.	+	-	-	-	p	p	-	-	-	p	-	+	-	p	p	-	-	-	-	-
Liquidity of the reserves portfolio	+	-	+	p	p	-	p	-	p	-	-	+	-	-	+	-	-	-	-	p
Extent of exposure to the banking system	+	-	+	+	+	+	p	-	-	-	-	+	-	-	p	-	-	-	-	-
Operational risk policy	+	p	+	p	p	-	+	-	-	-	-	+	p	p	p	-	p	-	-	-

+ = full information provided

p = partial coverage

- = no information

SOURCE: Central Bank Annual Reports and official websites.

Given the significant share of the central banks in these markets, it is clear that a decision by a central bank to move from one investment currency to another or to change its asset composition will have a significant impact on the market. In 2004, the markets closely monitored policy decisions made by the central banks of Japan, China, Russia and other countries regarding the currency composition of their reserves. Expectations or even hints that these banks would be transferring part of their reserves from the US dollar to other currencies resulted in large moves in foreign exchange rates. Thus, for example, when a senior official of Russia's central bank stated in a newspaper interview in November 2004 that the Bank was examining the possibility of transferring a portion of its dollar-denominated reserves to the euro, the exchange rate of the euro immediately reacted, reaching record highs. Later that month, a member of the board of China's central bank was responsible for the dollar falling to its lowest rate in four years by hinting that the bank would slow its rate of purchase of dollars. The agitation in the market abated only when a denial was issued.

Notwithstanding the potential of the central banks to influence the market, there are a number of factors which restrict that influence. First, the central banks are characteristically risk averse which leads to the adoption of very conservative policies. The changes, if any, that they decide to make are carried out slowly and over time. In addition, the central banks do not always behave according to considerations of profit and loss and in most cases they also take into consideration other factors, including the stability of the markets and relations with other countries. Finally, it should be remembered that the larger central banks' freedom to act is restricted by their very size. If they attempt to change the allocation of their investments, they are liable to "score an own-goal" in the markets. For example, given the massive scope of their dollar-denominated investments, even a small reduction in these investments would result in a drop in the value of the dollar and thus would cause them substantial losses.

#### **b. Transparency in the management of foreign currency reserves**

Transparency is defined as the maximum disclosure of information to the public regarding policy, operations and results and is considered today to be a central component in the proper management of any organization. The recognition of the importance of transparency has spread both in the private sector – following the cases of fraudulent financial reporting and bankruptcies among several large corporations in 2002 – and in the public sector.

The most significant change among central banks with regard to transparency has taken place in the area of monetary policy. With the move to inflation-targeting policies in many countries, the transparency of monetary policy has become a central part of the effort by central banks to achieve credibility among the public and to influence their expectations and thereby their behavior.

A decision by a central bank to move from one investment currency to another or to change its asset composition will have a significant impact on the market.

There are a number of factors which in practice restrict the influence of central banks: their characteristic risk aversion, the fact that they also take into consideration the stability of the international markets; and the fact that their freedom to act is restricted by their very size.

Many governments and central banks have adopted a policy of transparency in various areas.

The trend towards increased transparency in the management of foreign exchange reserves began relatively late and is relatively restricted.

The trend towards increased transparency in the management of foreign exchange reserves began at a later stage for various reasons and in general has been more restricted. Globalization and the increasing magnitude of international capital flows have resulted in a demand by the international financial community for up-to-date and reliable information on foreign exchange reserves. The numerous financial crises in the developing countries in the late 90s and the fact that some of these countries tried to disguise the real situation of their reserves emphasizes the need for reliable and comparable data on reserves which is accessible in a time of crisis. In addition, the significant increase in the size of reserves has intensified the interest of governments and the public in the quality of their management and the revenues they generate.

There are important factors that constrain the central banks' desire or ability to disclose certain details concerning reserves management.

On the other hand, there are important factors that constrain the central banks' desire or ability to disclose certain details concerning reserves management. First, there is a close connection between reserves management and the exchange rate regime, particularly with regard to intervention in the foreign exchange market – a topic which is often veiled in secrecy. Second, many investment decisions have significant commercial value and cannot be revealed to the public without harming the performance of the portfolio and relations with the financial institutions that provide services to the central bank. Third, a particular decision may be politically sensitive. Finally, there are cases in which it is certainly more convenient for the manager of the reserves not to disclose or explain his decisions or their results.

Against the background of several financial crises, the International Monetary Fund proposed a solution regarding the level and composition of reserves, as part of the Special Data Dissemination Standards (SDDS) project.

These constraints notwithstanding, there has clearly been a gradual move towards transparency in reserves management in recent years. Information on reserves management is of three types: information on the level of reserves and their composition; investment policy and decisions; and management results. Following the financial crises mentioned above, the International Monetary Fund proposed a reporting system for the level and composition of reserves called the Reserves Data Template which was part of the Special Data Dissemination Standards (SDDS) project. This provided a uniform and credible format to be used by each country for the publication of a variety of data on its level of reserves. Some 60 countries, Israel among them, have voluntarily adopted SDDS. Today, data on the level and composition of foreign currency reserves for the majority of countries is characterized by a high degree of transparency and reliability.

The situation regarding investment policy and decisions is quite different. There are no rules or standards regarding investment policy and decisions, and the degree of transparency is relatively low.

The situation regarding investment policy and decisions is quite different. There are no rules or standards in this area and the degree of transparency is relatively low. There are countries which partially disclose their investment policy or their management guidelines but even this is only along general lines. In the absence of standard definitions it is difficult to compare between countries. The level of transparency regarding investment decisions is even lower and essentially hardly even exists. Finally, only a small number of countries, Israel among them, reveal any information on the results of their management, i.e. the rate of return on the investment of reserves. The information disclosed is not sufficient to allow for comparison between countries due to these reasons.

The main sources of information on reserves management, apart from the International Monetary Fund (the SDDS), are the annual reports of the central banks, their one-off publications and their Internet sites, with the last source becoming increasingly important over time.

The trends mentioned above are evident in a survey made of 19 countries (Table 1.5). All the countries in the survey publish full information on the level of their reserves though only Israel and Australia provide information, whether full or partial, in all the ten categories surveyed. Only two countries provide information on the currency composition of reserves and only four on the duration of their reserves portfolio. Overall, the level of transparency is high in more general categories but low in categories involving operational details, practical decisions or results. Finally, the degree of transparency in the industrialized countries is greater than in the developing countries.

Israel is among the leading countries in all aspects of transparency in the management of foreign exchange reserves. As shown in the table, the Bank of Israel publishes full information in nine of the ten categories surveyed and partial information in the tenth. The country following Israel – Australia – provides full information in only seven categories and partial information in three. The other countries provide even less. Surveys carried out by various international bodies have pointed to the Bank of Israel's high level of transparency. It is worth mentioning that while countries such as Australia and Norway, who are considered leaders in the area of transparency, allocate 4-5 pages of their annual reports to reserves management, the Bank of Israel has in recent years published the current report, providing dozens of pages on the management of the foreign exchange reserves. It would appear that currently the Bank of Israel maintains an optimal balance between the public's "right to know" and the operational needs of reserves management.

Israel is among the leading countries in all aspects of transparency in the management of foreign exchange reserves.

### c. Information technology in the management of the reserves

The revolution in information technology in recent years has affected the financial sector as much as, and perhaps more than, any other. It is no surprise then that information technology affects every aspect of foreign currency reserves management. These include the intake of data from numerous and diverse sources; the analysis of this data and decision making based on it; the implementation of decisions through contact with other financial institutions; and monitoring of the results. It is important to mention that the work of the Foreign Currency Department in this area is coordinated with and guided by the Information Technology Department of the Bank of Israel. The Department also allocates resources to inter-departmental projects led by the Information Technology Department, such as the establishment of the Bank's data recovery system.

Information technology affects every aspect of foreign currency reserves management: the intake of data from numerous sources, the analysis of these data and decision making based on them; the implementation of decisions made in the course of transactions with other financial institutions; and monitoring of the results.

Included among the types of information which are required for the efficient management of the portfolio are the following: financial news which is published by

international news agencies; real time and historic prices from all the financial markets in which the reserves are invested and from other markets which indirectly affect the investment markets, such as shares and oil; research, analysis and models provided as a service by commercial and investment banks to their select customers (including the Bank of Israel); specialized information services in the areas of credit risk and market risk which are supplied by private companies for a fee; and instructions from the clients of the Bank of Israel (Government ministries and their budgeted units) to make or receive payments in foreign currency which are received via secure means of communication.

There are three types of instrument used to channel information to the Department, to analyze it, and to support decision making: extensive systems which supply market data and perform analyses; secure Internet sites; and software installed in the Bank's computers.

There are three channels through which information is routed to the Department:

a) Well-known companies, such as Reuters and Bloomberg, provide extensive systems which supply market data (both news and prices) and enable the graphic and mathematical analysis of financial instruments on the basis of actual or hypothetical prices. An essential characteristic of this type of system is the provision of market data in real time since news headlines – new economic data, a statement by a senior official, etc. – can have an immediate and significant impact on market prices.

b) Other tools are supplied to the Bank through secure Internet sites which allow the performance of analysis on the computers of the provider (in general, a financial institution).

c) Software installed at the Bank is used to perform financial, statistical and economic calculations required for the management of the reserves. Worth special mention is a software package which was purchased several years ago for trade input and portfolio management, which plays a central role in the activities of the Department's front and middle offices. The information it provides serves both as an independent basis for decision making and as input for other systems discussed below.

The advances in information technology have led to extensive changes in the way decisions are implemented, both in the front office (the trading room) and the back office.

The implementation of decisions can be divided into the activity of the front office (the trading room) and the back office. There have been extensive changes in both these working environments in recent years as a result of the advances in information technology. A significant portion of the transactions in the front office, which were previously carried out by phone, are now channeled through specialized communications systems, which provide a high level of security, improve the efficiency of the markets, reduce bid-ask spreads and provide full documentation of transactions, thereby reducing operational risk. In the back office, instructions to receive or deliver money and securities are sent through encoded communication channels which were developed for the international banking community and provide a high level of security. This global network has recently been improved and the Bank of Israel was required to keep pace. Thus, in 2004, upgrading of the Bank's systems to conform to this global advance was a focus of the Department's activity in the area of information technology.

Monitoring of the results of decisions made in the middle office and the back office is also supported by the appropriate technological tools.

Monitoring of the results of decisions made is also divided between the tasks of the middle office and the back office. The work of the middle office focuses on the economic analysis required for reserves management, using the same tools as the front office, and the ongoing monitoring of the yield on the reserves portfolio including its breakdown according to the various factors contributing to it. The monitoring of

portfolio yield is accomplished using data warehousing and analysis systems, which draw on information from the trade input and portfolio management package described above. These systems were developed at the Bank of Israel through a joint effort of the Foreign Currency Department and the Information Technology Department. In the back office, the monitoring of the results of decisions is more accounting-oriented than economically oriented and is supported by the appropriate tools. In this context, one can mention, among other things, the quantum leap in the storage of documents and their retrieval which in the past involved hard copy files and microfiche and which is today accomplished through electronic archive software.

## APPENDIX 1.1: GLOSSARY

Annual terms	The yield that would have been obtained if the rate of change in the period reviewed would have prevailed for a year.
Basis point	A 0.01 percent change or one ten thousandth part.
Benchmark portfolio	A hypothetical portfolio built according to pre-set rules that serves as a criterion for assessing the performance of an investment manager and as an anchor for managing the portfolio's risks.
Certificate of deposit	A bank deposit with transferable ownership, which can therefore be traded in the money market.
Commercial paper	A non-coupon-bearing bond sold at a discount, with original maturity of less than 270 days. The Bank may invest the reserves in commercial paper provided it is issued or guaranteed by a foreign government.
Credit risk	Exposure to the possibility of loss as a result of the failure to repay debts on time by an issuer, financial institution, or country, or as a result of changes in the assessment of the probability of such an event by market participants (see Box 1.7 on pp. 33–35 of the 2001 Annual Report of the Foreign Currency Department).
Currency risk	Exposure to the possibility of loss as a result of changes in exchange rates.
Currency terms (e.g., US dollar terms)	The yield obtained when the running values of all assets are multiplied by the running exchange rates into a specific currency or basket of currencies.
Duration	Refers to modified duration, unless noted otherwise. The ratio of a small change in the value of a debt instrument, as a percentage of its previous value, to the accompanying change in its yield to maturity (with a reverse sign). It is measured in units of time. See <i>portfolio duration</i> , <i>partial duration</i> , below.
Eurobonds	Bonds sold in financial markets outside the country in whose currency they are denominated. See Box 1.3 above.
Foreign exchange reserves	Financial assets issued abroad and denominated in foreign currency (including gold) which are owned and controlled solely by the central bank and are not encumbered in any way.
Forward	An agreement to buy or sell an asset of a certain type, such as foreign currency, at a price and on a date known in advance.

GNMA	Mortgage-backed securities issued by the Government National Mortgage Association and fully guaranteed by the US government.
Holding-period rate of return	Rate of change in the value of an asset or portfolio over a defined period.
Interest-rate risk	Exposure to the possibility of loss as a result of changes in interest rates or yields to maturity.
Investment policy	The standards and procedures set by an investor regarding his investments, in accordance with his long-term preferences, objectives, and strategies. With regard to the reserves: the main guidelines for managing the exposure of the reserves portfolio to the various risks and the degrees of freedom set for the day-to-day activity of the Foreign Currency Department.
Legal risk	Exposure to the possibility of a loss as a result of the wording of a contract, in error, to the investor's disadvantage.
Liquidity	The ability to realize assets without delay and without diminishing their value (see Box 1.2 on pp. 32–35 of the 2002 Annual Report of the Foreign Currency Department).
Numeraire	The currency composition set as the benchmark for the reserves portfolio (see Chapter 1.1 above).
Neutral	The value of a specific characteristic of a portfolio when it is <i>risk-free</i> (see below).
Operational risk	Exposure to the possibility of a loss as a result of system failure, human error, and the like.
Portfolio duration, partial duration	The average <i>duration</i> of a portfolio of debt instruments (duration of each asset being weighted by its share in the portfolio) is the accepted index for estimating the interest-rate risk of the portfolio. However, as it is defined, duration measures sensitivity to <i>parallel and small</i> changes in the yield curve. In practice, shifts in the curve are often accompanied by changes in its slope. The <i>partial duration</i> in a specific area of the curve is obtained by multiplying the duration of the assets invested in that area by their weight in the portfolio, and measures the portfolio's exposure to a parallel shift in that area only. The sum of the partial durations over the curve is equal to the duration of the entire portfolio.

Repo, Reverse repo	Abbreviation for Repurchase agreement, i.e., the purchase of a security alongside the undertaking to sell it back at a future date and a known price. In economic terms, the transaction is identical to a collateralized loan. When the Bank of Israel sells a security for future purchase the transaction is known as a repo, and in the opposite case as a Reverse Repo.
Risk-free	A situation in which the investor can incur neither losses nor profits.
Spread asset	An asset whose yield to maturity comprises the yield on another asset (e.g., a government bond) <i>plus</i> a yield spread that changes, usually continuously and moderately, in accordance with changes in the supply of and demand for assets of that type.
Standard deviation	A statistical measure of the spread of a distribution around its mean; often used as a measure of the extent of exposure to uncertainty (see <i>volatility</i> below).
Swap spread	The difference between the yield to maturity on government bonds and the fixed interest that one party pays the other in an interest swap agreement for a similar period.
TED spread	Treasury-Euro-Deposit spread, i.e., the difference between the yield to maturity on short-maturity government debt and the interest rate on a deposit with the same maturity.
TIPS	Acronym for Treasury Inflation-Protected Security—a CPI-indexed US government bond.
Trade	An agreement to transfer or encumber ownership of financial assets, e.g., foreign currency or securities.
VaR	Acronym for Value at Risk, the greatest loss, with a given probability, that is expected to occur within a defined period of time.
Volatility	The size of the <i>standard deviation</i> (see above) of the distribution of the holding-period rates of return on a financial asset, such as a security or portfolio, over a specific period of time (day, week, etc.). It is usually calculated on the basis of the logarithm of the holding-period rate of return, $\log(1 + y)$ , where $y$ is the simple rate of return.
Yield curve	A series of yields to maturity of bonds with different dates to redemption and with characteristics in common (e.g., government bonds of a specific country in its local currency).
Yield spread	The difference between the yields to maturity of two debt instruments.

Yield to maturity      The holding-period rate of return, in annual terms, that would be obtained by keeping a debt instrument until its final redemption date, if it were possible to invest all its cash flows at the same yield until the final redemption date (also called internal rate of return).