Bank of Israel

Market Operations Department

Investment of the

Foreign Exchange

Reserves

Annual Report 2016

Contents

Main developments

1. Israel's foreign exchange reserves totaled $98.4 billion[1] at the end of 2016, an increase of $8 billion over the course of the year. Bank of Israel purchases, totaling $6 billion, were the main factor in the increase.

2. At the end of 2016, the level of reserves—the equivalent of about 30 percent of GDP—was within the range of the appropriate level of reserves as set by the Governor, of $70–110 billion (21–34 percent of GDP). As a share of GDP, the reserves increased this year by one percentage point compared with 2015.

3. In 2016, the holding rate of return on the reserves was 1.56 percent in terms of the numeraire, which is a basket of currencies—primarily comprised of the dollar and euro. The rate of return is similar to the average return since the global crisis, and greater than the average return over the past three years of 1.16 percent.

4. The ability to achieve a relatively high return, despite the negative return on a considerable portion of bonds issued by major European countries, in which about one-third of the reserves are invested, is the result of a long term process, in which the share of reserves invested in risk assets—equities and corporate bonds—was gradually increased.

5. In 2016, the reserves portfolio benefited from the continued strong performance of equities in the countries were the reserves were invested. Due to the strong markets, active management—the investment's actual deviation from the basic benchmark—contributed 135 basis points this year, the largest contribution in the past decade.

6. The percentage of risk assets in the reserves portfolio was increased this year as well: investment in equities increased to 10 percent, from 9.2 percent, and actual investment in corporate bonds increased to 4.8 percent, from 4.6 percent. Despite the increased percentage of risk assets, the reserves portfolio's level of volatility was similar this year to its volatility in the previous year. This was due to a decline of volatility in markets, against the background of excess liquidity in them and due to a negative correlation between the duration premium and the equity premium.

7. The maximum permitted allocations in equities and corporate bonds were revised within the framework of the investment policy guidelines, with the goal of increasing the flexibility to manage the portfolio without changing the maximum permitted risk—the maximum permitted investment in equities was increased from 12 to 15 percent, the maximum permitted investment in corporate bonds was increased from 6 to 15 percent, and the maximum combined investment in equities and corporate bonds was constrained to 25 percent of the reserves.

[1] Throughout the report, the level of the reserves includes allocations of Special Drawing Rights by the International Monetary Fund to member countries (SDR Allocation) and Israel's balance in the Reserve Tranche of the Fund. At the end of 2016 these totaled $1.2 billion. For more on this issue, see the Bank of Israel's Financial Statements for 2016.

Introduction

This report presents the results of the investment of Israel's foreign exchange reserves in 2016 and from a multiyear perspective, and the framework of how they were managed. Israel's foreign exchange reserves were $98.4 billion at the end of 2016 (Table 1). The annual return was 1.56 percent in terms of a basket of currencies—the numeraire[2]—and the active management contribution[3] was 135 basis points. The average return over the past three years was 1.16 percent, and the contribution of active management was 98 basis points. The cumulative contribution of active management was 298 basis points over the past three years and 501 basis points over the past five years.

Table 1 - Foreign Exchange Reserves' Level, 2014–16, and Annual and Multiyear Holding Rates of Return

		FX Reserves Level (millions $)	
		End of year	Average reserve
2014		86,101	85,973
2015		90,575	87,389
2016		98,447	95,777
	1 Year 2016	3 Year 2014-2016	5 Year 2012-2016
	Return's Yearly Averages (%, in numeraire terms)		
Portfolio return	1.56	1.16	1.19
Basic benchmark return	0.21	0.18	0.20
Active management contribution (b.p)	135	98	98
	Cumulative Return (%, in numeraire terms)		
Portfolio return	1.56	3.52	6.08
Basic benchmark return	0.21	0.53	1.02
Active management contribution (b.p)	135	298	501

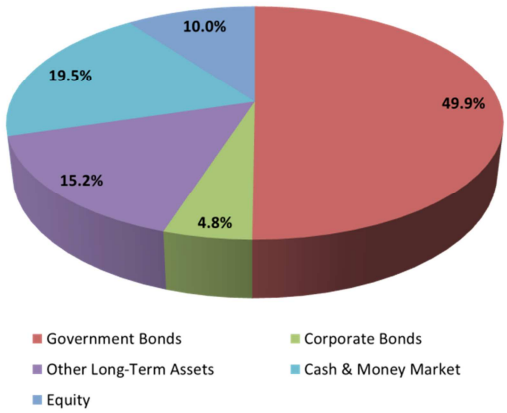
Source: Bank of Israel

Fifty percent of the reserves were invested in government bonds, and 10 percent were invested in equities (Figure 1). The proportion invested in equities was increased by 1 percent this year, and the proportion of investment in corporate bonds was increased by 0.2 percent. Investment in equities and bonds has increased in recent years (Figure 2).

[2] The numeraire is a currency basket in which the foreign exchange reserves are measured. See Chapter B, Section 3 in this report.

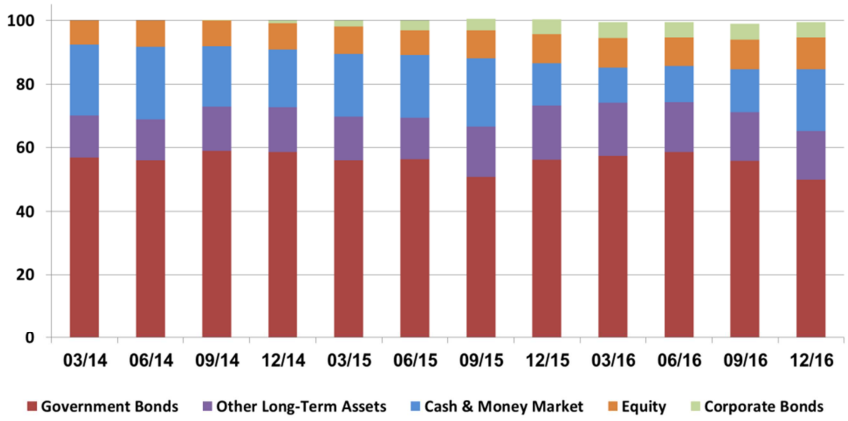
[3] The contribution of active management is the difference between the return on the reserves portfolio and the return on the basic benchmark (the benchmark whose currency composition is identical to the composition of the numeraire). It measures the decisions to invest in additional assets and in additional countries not included in the basic benchmark. For further discussion see Chapter B, Section 3.

Figure 1 – Asset Distribution of Reserves Portfolio, 2016



Source: Bank of Israel

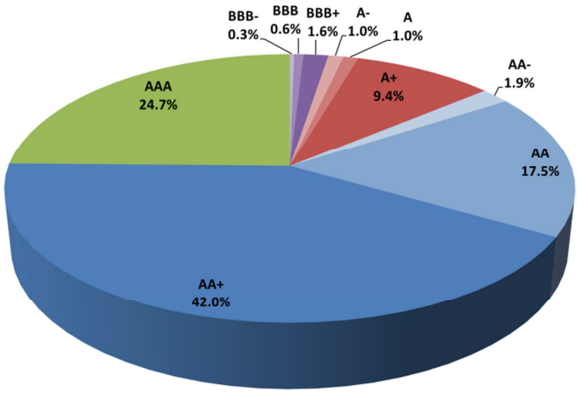
Figure 2 - Asset Distribution of the Reserves Portfolio, 2014–16
(percent, end of quarter)



Source: Bank of Israel

The credit quality of the reserves, which reflects the risk of insolvency by the party issuing the debt, as measured by the credit ratings, is high: 66.7 percent of the bonds in the reserves portfolio are rated in the two highest categories (AAA, AA+) (Fig. 3). The proportion of holdings in the lowest rated group, BBB, is only 2.5 percent. Holdings in bonds that are not investment grade are prohibited.

Figure 3 - Distribution of Bonds in the Foreign Exchange Reserves, by Credit Rating
December 31, 2016



Source: Bank of Israel, S&P

The holding and management of foreign exchange reserves, both in Israel and in most other countries, were designed to provide a source of liquidity in an emergency and at times of financial crises. In recent years, the management of Israel's reserves, as in many countries, has been undergoing changes and adjustment resulting from the size of the reserves and the diversification of the investment by adding risks assets. The motives underlying these changes are the challenging economic and financial background conditions that have prevailed worldwide since the 2008 global crisis—primarily the absence of substantial economic growth as well as monetary accommodation for the purpose of encouraging growth—together with the range of tools used for this purpose. This monetary expansion is reflected in the market in excess liquidity and low or even negative interest rates and yields to maturity, which resulted in low rates of return in the reserves portfolio. The global crisis also highlighted the need for a higher level of reserves than previously assessed in order to cope with the ramifications of crises of this type. The level of reserves was also raised in many countries in order to protect the domestic currency against appreciation and its consequences. Under the influence of these changes, management of Israel's reserves features, more than in the past, investments with a higher expected return alongside higher, though limited, risk.

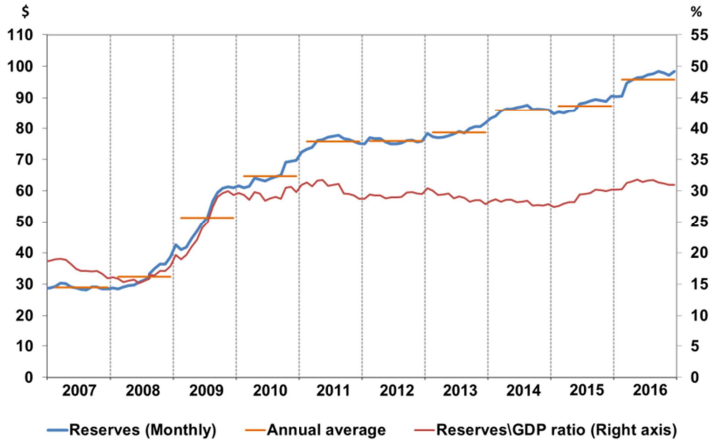
Chapter A presents the reserves' level, its change during the year, and the adequate level for the reserves. Chapter B presents the framework for managing the reserves from the perspective of the investment objectives, the maximum risk level, the benchmark, and the strategic allocation. Chapter C presents the investment performance in 2016 and over multiyear periods; the total contribution of active management broken down by various risk components: equities, duration and diversification, spread assets, including corporate bonds; and various measures for risk and risk-adjusted return. The appendices present the global economic and financial environment for investing the reserves, the principles for determining the adequate level of the reserves, the guidelines for managing the reserves, and a glossary.

A. The Level of the Foreign Exchange Reserves

1. The reserves' level and the changes in it

In 2016, Israel's foreign currency reserves grew by $7.9 billion—from $90.6 billion at the end of 2015 to $98.4 billion at the end of 2016. The increase in the reserves this year was greater than the increase in the three preceding years (Figure 4), and occurred mostly in the first half of the year.

Figure 4 - The Level of Israel's Foreign Exchange Reserves, and the Ratio of the Reserves to GDP, 2007–16
($ billion, monthly and yearly averages)



Source: Bank of Israel

The main contribution to the increase in the reserves consisted of $6 billion in foreign currency purchases by the Bank of Israel (Table 2). The change in Israeli government deposits totaled an additional $1.9 billion, and the contributions of mark to market and the private sector were small. Mark to market is the change in the reserves in dollar terms attributable to income from interest, capital gains, and exchange rate differentials against the dollar in currencies in which the reserves are invested. This year, due to the strengthening of the dollar against the euro and pound sterling, currencies in which approximately 30 percent of the reserves are invested, there were losses of $0.9 billion resulting from exchange rate differentials of these currencies against the dollar. These losses were offset by income from interest and capital gains amounting to $0.8 billion. The total mark to market loss in dollar terms was $93 million. In terms of the numeraire—the basket of currencies in which the return on the foreign currency reserves is measured—there were almost no exchange rate differentials.

Table 2 - Components of the Change in the Reserves, 2016
($ million)

FX Purchase	6,040
Natural Gas Purchace Program	*1,800*
FX Market Intervention policy	*4,240*
Mark To Market	-91
Private Sector	3
Government	1,920
Total Change	**7,872**

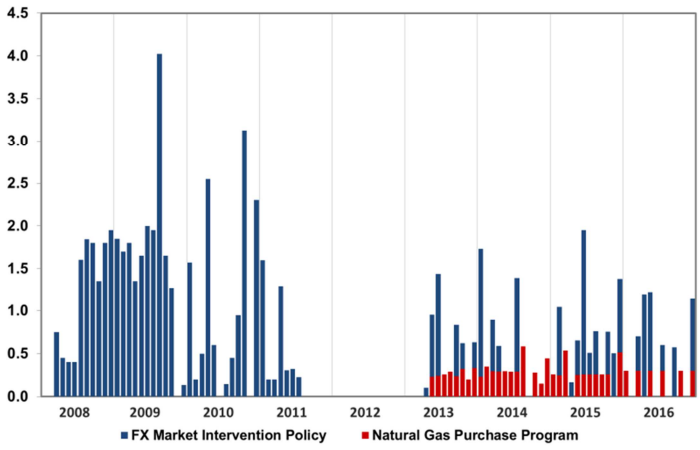
*Mark to Market also includes payments and intakes of the Bank of Israel in foreign currency

Source: Bank of Israel

Purchases by the Bank of Israel this year were lower than in 2015 (see Figure 5). About two-thirds of the purchases were carried out as part of the **Bank of Israel's intervention** in the foreign exchange market, which was designed to moderate sharp fluctuations in the exchange rate that did not correspond with the economy's fundamental conditions.

The remaining purchases—$1.8 billion—were within the framework of **implementing the plan for moderating the effect of natural gas production on the exchange rate**[4] according to a planned and declared amount.[5] Cumulative purchases under this plan since 2013 have totaled $10.5 billion.

Figure 5 - Bank of Israel Foreign Exchange Purchases, January 2008–December 2016
($ billion)



Source: Bank of Israel

[4] The production of gas in Israel causes an improvement in the current account, which is liable to generate appreciation pressure on the exchange rate. This phenomenon is called the "Dutch disease." See press release:
http://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/13052013m.aspx.

[5] http://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/14-11-16offset.aspx.

2. The appropriate level of the reserves

The appropriate level of the reserves is determined by the Governor of the Bank of Israel in accordance with the objectives of holding them, based on the principles approved by the Monetary Committee (see Appendix 2—Principles for Determining the Desired Level of Foreign Exchange Reserves). These principles take into account the international standards and potential uses of the reserves, such as paying for imports, repaying debt, and intervening in the foreign exchange market during emergencies.

The appropriate level of foreign exchange reserves enables the central bank to achieve the objectives of the public policy that were defined for it, and is perceived as a positive sign of the country's economic and financial robustness. The reserves are a source of liquidity in foreign currency, which the bank can utilize when necessary. A suitable level of foreign currency reserves also contributes to improving a country's standing in the international financial environment, because it bolsters confidence in the country's ability to cope with economic shocks. This advantage is reflected in the country's credit rating and the assessments published by the rating agencies, which enables the economy to lower the financing costs of raising debt abroad.

The adequacy of the level of reserves is generally evaluated in terms of various ratios between the level of reserves and other economic variables (Table 3). One of the most important of these is the ratio of the reserves to gross domestic product (GDP). **The appropriate range was set in 2015 by the Governor of the Bank of Israel at $70–110 billion, currently the equivalent of 21–34 percent of GDP. The current level of reserves is in this range (30 percent of GDP)**. The level of reserves as a share of GDP rose by 1 percentage point this year, similar to the rate of increase since 2013 and slightly higher than the average for 2010–16. The other ratios also rose over the past decade as a result of the increase in the reserves since 2008.

Table 3 - The Reserves and Their Average Level Relative to Various Aggregates, 2007–16

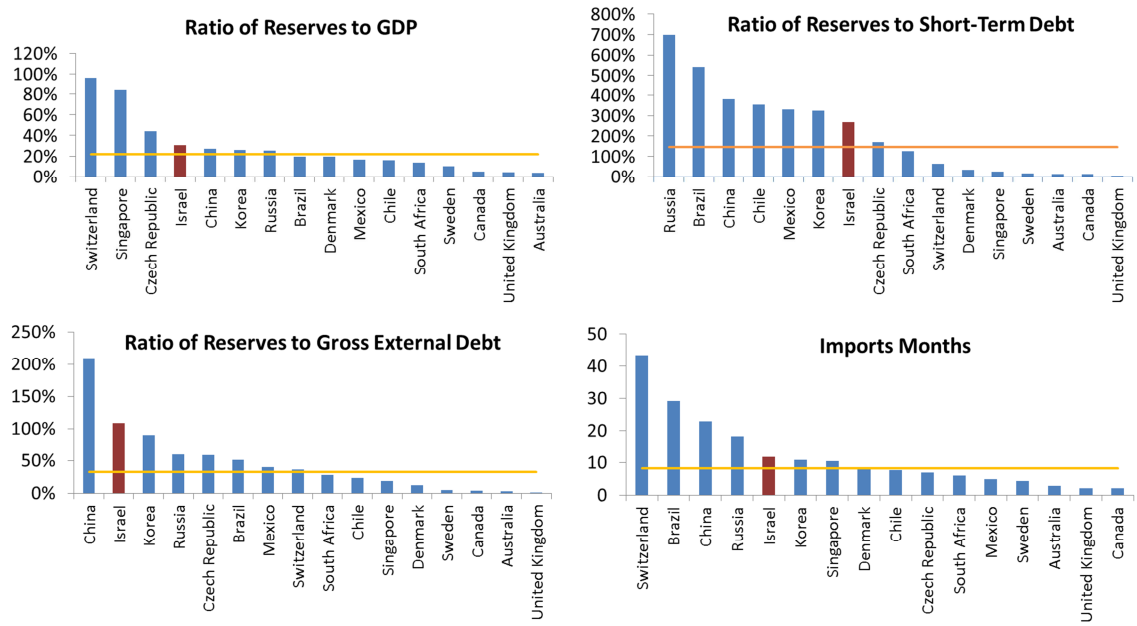
Year	Average level of reserves[1]	Resrves to Capita	Imports	Gross external debt[2]	Short-term external debt[2]	Unindexed local-currency assets (M2)	Gross domestic product
	($ million)	($)	(months)	*Reserves as percent of aggregate*			
2007	28,994	4,003	4.1	32	73	37	16
2008	32,270	4,376	4.0	37	80	33	15
2009	51,310	6,794	8.3	55	121	49	25
2010	64,665	8,403	8.8	60	116	56	28
2011	75,744	9,665	8.7	72	149	58	29
2012	75,930	9,510	8.5	74	174	58	29
2013	78,693	9,674	9.0	78	181	53	27
2014	85,973	10,362	9.6	89	214	53	28
2015	87,389	10,325	10.8	98	244	52	29
2016	95,777	11,097	11.3	106	260	51	30

Source: Bank of Israel, The Central Bureau of Statistics, and returns from the banks.
1) Reserves also include drawing rights in IMF and banks reserves, calculated by revaluation according accountancy.
2) Debt is up to date for the end of Q3 2016.

The various ratios presented below show that the level of Israel's reserves is higher than in the comparison countries (Figure 6). The ratio of the reserves to Israel's GDP is above the median for the comparison countries. The ratio of Israel's reserves to import months and to short-term debt is within the interquartile range of the comparison countries, and the gross debt

ratio is even higher. It should be noted, in this regard, that Israel is in a unique geopolitical situation.

Figure 6 - The Ratio of the Reserves to Economic Aggregates, End of 2016, Israel vs. Selected Countries



Source: Bank of Israel, Central Bureau of Statistics, Bloomberg, World Bank, IMF and S&P

The cost of financing the reserves does not currently constitute a constraint on their size. The cost of financing the reserves, measured by the difference between the yearly return on *makam* (short-term loans) and the yield on the basic benchmark, has been low and stable over the past two years. In the past, the return on *makam* was higher than the yield on the basic benchmark, and the financing was more costly. The selection of the return on one-year *makam* for comparison purposes, compared with a six-month duration for the basic benchmark, is conservative, and also includes a risk premium. It should be noted that one of the objectives of managing the reserves is attaining a return that is higher than the cost of financing them over time.

There can be a situation in which the foreign currency reserves deviate from their appropriate level for a prolonged period. The Bank of Israel's intervention in the foreign exchange market is likely to cause a deviation in the actual level of reserves from the appropriate level. Such a deviation is permitted under the Bank of Israel Law. At the same time, the Bank of Israel will take action to change the level of reserves only when the deviation becomes significant and persistent, and only if these actions are consistent with attaining the objectives for the Bank of Israel listed in the Bank of Israel Law – including price stability, support for other objectives of economic policy, and support for the stability of the financial system.

B. The Framework for Managing the Foreign Exchange Reserves

1. Objectives of holding the reserves and the guidelines for managing them

According to the **Bank of Israel Law, 5770–2010**, one of the Bank's functions is to hold and manage the country's foreign exchange reserves. The Monetary Committee, headed by the Governor, and whose members include representatives of the public, was granted the authority to establish the **guidelines for the investment policy of the reserves** (Appendix 3), in consultation with the Minister of Finance, and to monitor the implementation of this policy. The Committee also approves and revises the allocation of responsibilities for the investment of the reserves between it and the Foreign Currency Committee[6] and the Market Operations Department.

Countries hold foreign exchange reserves for three main purposes:

- To provide the economy with sufficient foreign currency for an emergency situation (such as war or natural disaster). In such instances, it may be necessary to maintain imports or to rapidly increase them in order to deal with the emergency, while exports are liable to be negatively impacted, thus reducing the inflow of foreign currency. In these circumstances, the government and the private sector will find it difficult to raise foreign currency abroad, and the foreign exchange reserves will become the country's main source for financing in foreign currency.
- To enable the central bank to intervene in the foreign exchange market in the following circumstances: (1) the foreign exchange rate has deviated from the range that is consistent with the economy's fundamental equilibrium; or (2) the foreign exchange market is not functioning properly (market failure).
- To enable the central bank to operate in the foreign exchange market in order to moderate the effect of significant capital flows of either nonresidents or domestic residents, which are liable to undermine the stability of the financial markets, thereby negatively impacting the stability of the economy as a whole (a specific case of the previous function).

In order to achieve these goals, the investment of the reserves is carried out according to the following three basic principles:

- Maintaining the purchasing power of the reserves;
- Managing the reserves at a high level of liquidity;
- Achieving a suitable holding rate of return on the reserves portfolio, as long as this does not interfere with achieving the previous objectives (as detailed in Appendix 3—Foreign Exchange Reserves: Investment Policy Guidelines).

The reserves portfolio is managed within a framework of investment rules that are inherently conservative and reflect cautious management of the reserves. The degree to which they correspond to the background conditions, however, is frequently assessed. **During 2016, the Monetary Committee revised the constraints on investments in the guidelines**. The principal changes were an increase in the maximum proportion of investment in equities from 12 percent of the reserves to 15 percent, an increase in the maximum proportion of investment in corporate bonds from 6 percent of the reserves to 15 percent, and constraining the proportion of combined investment in equities and corporate bonds to 25 percent of the reserves. The maximum permitted risk level was not changed.

[6] The Foreign Currency Committee is an internal committee of the Bank, headed by the Governor. Its function is to translate the guidelines for investing the reserves into detailed instructions for their management.

These changes were designed to enhance the flexibility in management of the portfolio by increasing the permitted proportion of investment in instruments with a high expected return alongside greater risk. The objective was to meet the target of preserving the purchasing power of the reserves in an environment of relatively low yields to maturity and achieving a return higher than the cost of financing the reserves.

It should be emphasized that the **guidelines** do not constitute a recommendation for the actual proportion of investment in these assets. The actual proportion of investment is determined in a strategic allocation process, subject to the maximum level of risk set by the Committee, and based on assessments of the expected conditions in the relevant financial markets (see Section 3 of this chapter for further discussion of the allocation process).

2. The maximum level of risk for the reserves

The maximum level of risk in the reserves portfolio (the risk profile) is set by the Monetary Committee according to its assessment of the appropriate risk, and is defined as the maximum loss in the reserves that the Committee is willing to accept, without affecting the attainment of the objectives for which they are held. Its objective is to limit in advance the reserves' exposure to the various financial risks – price risk,[7] spread and credit risk, currency and asset risk, and liquidity risk.

The risk index **CVaRp (Conditional Value at Risk)** is used to quantify the level of risk. It measures the risk in terms of the expected loss on the investment portfolio in a specific time period and given a certain probability (p). It should be noted that **CVaRp** is an ex ante indicator, affected by changes in the portfolio holdings and the volatility of its assets, but is based on the past level of volatility.

The Monetary Committee set the maximum level of risk for the reserves, which is reflected in the policy guidelines, so that given the worst 5 percent of possible outcomes the average loss—the $CVaR_{5\%}$—would not be greater than 400 basis points over a one-year horizon. The Monetary Committee continually evaluates the conditions under which the level of risk was set, and is likely to change this level if material changes occur in these conditions.

At the beginning of every year, the Monetary Committee sets the **level of risk used to determine the strategic allocation for that year**, based on the expected macroeconomic and financial background conditions. At the beginning of 2016, the Committee chose not to change the maximum level of risk for this year, leaving it at 300 basis points, in view of its assessment that the prevailing conditions in the markets were unsuitable for taking additional risk. The Committee selected an annual risk lower than the maximum in order to leave a margin of safety for active management of the reserves and changes in the CVaR level, following a change in the level of volatility in the markets.

3. The basic benchmark and the strategic allocation

The management the Bank of Israel's foreign exchange reserves portfolio, like that of other investors worldwide, uses a **benchmark** as a reference point for measuring returns of investment decisions and risks taken by portfolio managers. A **benchmark** is a hypothetical portfolio composed of various investable assets and formulated according to known and fixed rules.

The **basic benchmark** represents a conservative composition of investable assets, which meets the first two goals of the investment policy for the reserves—maintaining their purchasing

[7] Price risk for bonds is the interest rate risk measured in terms of duration (the average lifespan).

power and managing them with a high level of liquidity. In order to achieve its objectives, the basic benchmark is composed of selected short-duration, high-rated government bonds with a high degree of liquidity and the same currency composition as the numeraire.

The numeraire consists of three currencies, whose weights were distributed over the year, on average, as follows: dollar—68.7 percent, euro—28.6 percent, and pound sterling—2.7 percent. The **numeraire** is a basket of currencies whose composition reflects the possible uses of the reserves, when necessary, and the principles that reflect the objectives of holding those reserves. The holding rate of return on foreign exchange reserves is measured in terms of the numeraire, so that from the point of view of the reserves portfolio manager, its composition is considered to be risk-free. The composition of the numeraire is reviewed at least once a year and revised when necessary with the approval of the Monetary Committee. The numeraire is defined quantitatively (a quantity-based currency basket) so that its composition varies daily in line with changes in the exchange rates of its currencies.

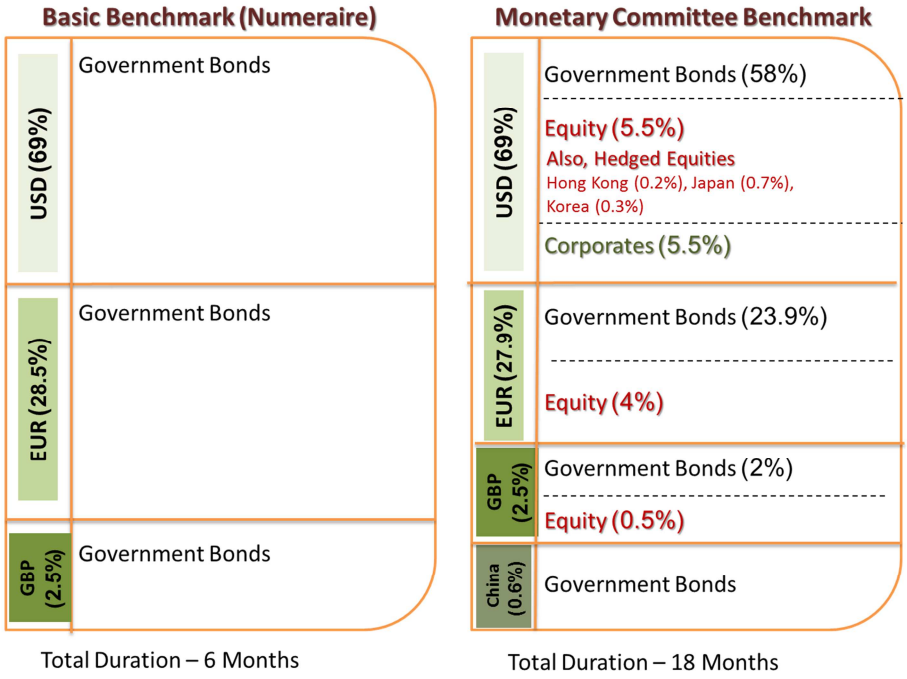
An annual strategic allocation process in the reserves portfolio determines the composition of the portfolio for the coming year. The strategic composition of the reserves portfolio is determined so that the expected return on the portfolio is adequate, within the framework of the desired risk level and the guidelines' constraints. The strategic allocation is a process in which the expected economic and financial environment and its effect on the prices of the assets and on the optimal portfolio composition based on it are assessed. It relies on a broad range of data and on statistical models, and therefore involves a degree of uncertainty.

The strategic allocation determines the main characteristics of the reserves portfolio, including the composition of currencies, the composition of assets, the distribution of equities among markets and the target duration for each currency benchmark. At the same time, it should be noted that **degrees of freedom exist for investment of the reserves**, so that the actual composition is likely to differ to some extent from that which was set in the allocation framework.

In the framework of the strategic allocation for 2016, the Committee decided to increase the investment in equities by 1 percentage point, extend it to the Swiss equities market, increase the investment in corporate bonds by 1 percentage point, and lengthen the duration of the reserves portfolio from 12 months to 18 months (Figure 7).

Figure 7 - The Composition of the Basic Benchmark vs. the Composition of the Strategic Allocation

(December 31, 2016)



Source: Bank of Israel

C. The Holding Rate of Return on the Reserves

1. Economic and financial background conditions

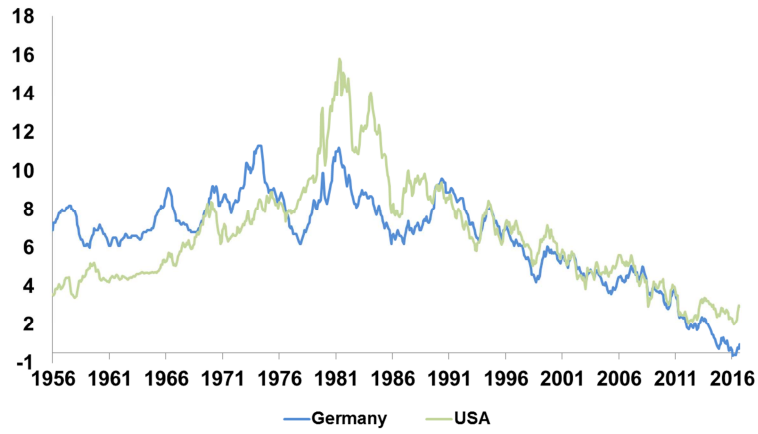
The global economic environment in 2016 featured the **continuation of moderate growth**[8] **and accommodative monetary policy**. In terms of inflation, in contrast, a change took place this year, reflected in some rise in the inflation rates in most major markets, mainly as a result of a 50 percent rise in oil prices on the year.

The moderate worldwide growth and the accommodative monetary policy, especially in Europe and Japan, supported continuation of the **long-term trend of declining yields** (Figure 8) and continuation of the increase **in equity prices**. In assessing the proportion of government debt traded at a negative yield, as of September 2016 (Figure 9), about 80 percent of German government bonds and 70 percent of French government bonds, some of which are held in the reserves portfolio, were traded at negative yields to maturity. Toward the end of the year, following the US presidential elections, government bond yields rose, led by the US, due to expectations that the new US administration would adopt an **expansionary fiscal policy**. Against this background, the dollar also strengthened against most major currencies. Another notable political event with important consequences in the long term was the referendum in the United Kingdom in June, in which the decision was taken to leave the European Union.

Appendix 1 displays a more detailed analysis of the economic and financial environment.

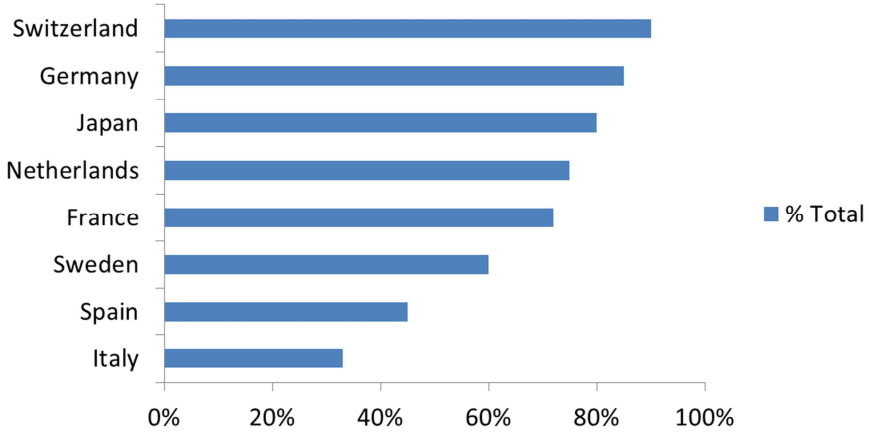
[8] The International Monetary Fund's estimate for global growth in 2016 was 3.1 percent, compared with a 3.7 percent average in 1990–2007.

Figure 8 - Ten-year Government Bond Yields—US and Germany, 1956–2016
(Percent)



Source: Bloomberg

Figure 9 - Share of Government Debt Traded at a Negative Yield in Selected Advanced Economies



Source: OECD, Interim Economic Outlook, 21 September 2016

2. Return on the reserves portfolio

The holding rate of return on the reserves portfolio in 2016 was the highest since 2013. The return was 1.56 percent in numeraire terms, and the return on the basic benchmark was 0.21 percent (see Table 4). The return obtained was similar to the average return since the beginning of the global financial crisis, and was achieved under financial conditions of the lowest level in yields to maturity in countries whose currencies were in the numeraire and an increase in yields in the US.

The volatility of the portfolio was similar to that in the preceding year, even though the proportion of risk assets in the portfolio rose. This came against the background of excess liquidity in the markets, which led to reduced volatility in them and a negative correlation between the duration premium and the equity premium.

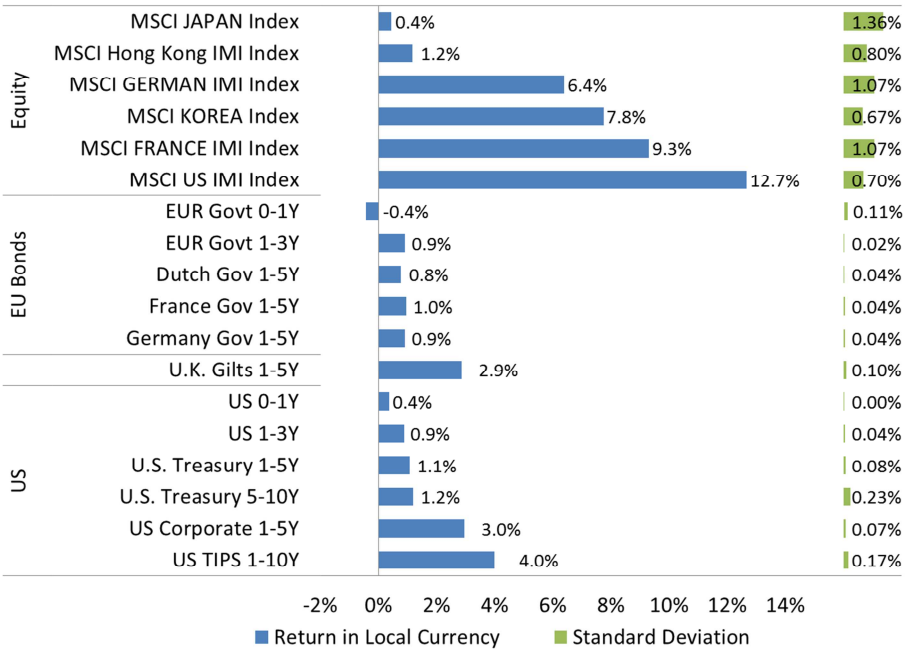
Table 4 - Reserves Portfolio Performance vs. the Basic Benchmark, 2007–16

	Performance		Excess Return
	(1)	(2)	(1)-(2)
	Actual Portfolio	Basic Benchmark	Total
2007	**6.91**	**6.91**	**0.00**
	(1.37)	(1.50)	(0.25)
2008	**5.95**	**6.14**	**-0.19**
	(1.42)	(1.46)	(0.53)
2009	**1.91**	**0.81**	**1.10**
	(0.60)	(0.65)	(0.22)
2010	**1.73**	**1.19**	**0.54**
	(0.57)	(0.36)	(0.53)
2011	**1.28**	**1.07**	**0.21**
	(0.80)	(0.39)	(0.71)
2012	**1.59**	**0.42**	**1.17**
	(0.57)	(0.17)	(0.52)
2013	**0.87**	**0.07**	**0.80**
	(0.80)	(0.16)	(0.74)
2014	**1.28**	**0.22***	**1.06**
	(0.85)	(0.09)	(0.88)
2015	**0.64**	**0.10**	**0.54**
	(1.29)	(0.12)	(1.29)
2016	**1.56**	**0.21**	**1.35**
	(1.33)	(0.13)	(1.33)
2007-2016 Average	**2.35**	**1.68**	**0.66**
***2009-2016 Average**	**1.36**	**0.51**	**0.84**

* On 13.7.2017 the average data for 2009-2016 was corrected from 1.55, 0.58 and 0.97 on the actual portfolio, basic benchmark and total, as published before, accordingly.
In parentheses – the standard deviations of weekly returns in annual terms
In March 2014, the basic benchmark duration was reduced from 10 to 6 months
Source: Bank of Israel

Holding rates of return on most of the investable assets in 2016 were positive (Figure 10). The returns are displayed in **local currency terms**. The assets with the highest returns in 2016 were US Treasury Inflation Protected Securities (TIPS), corporate bonds, equities in the US, and equities in France. Bonds in the UK and long-term euro bonds also had positive yields. In contrast, short-term dollar bonds had low returns on their holding, and short-term euro-denominated bonds had negative yields. As expected, the volatility (standard deviation) of the equities was high, compared with the other assets.

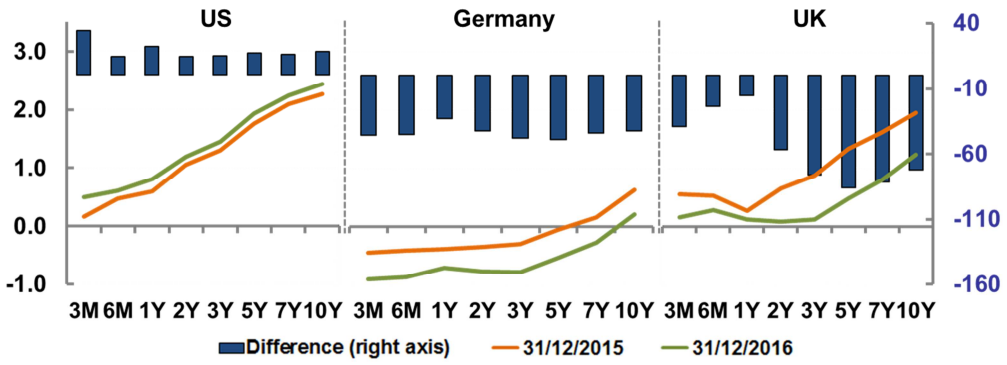
Figure 10 - Holding Rates of Return and Standard Deviation of Assets Permitted for Investment in the Reserves Portfolio, 2016



Source: Bank of Israel, Bloomberg

The return on the portfolio was achieved against the background of the low holding rate of return and low and negative yields to maturity on most of the euro assets, which are a significant component in the reserves. The yield to maturity—obtained when a bond is held until maturity—continued to fall in Europe, while in the US it rose (Figure 11). The holding rate of return, which takes into account the current yield on a bond and the change in its price during the period it is held, continued to benefit this year from the decline in the returns on euro assets, and the longer-term euro assets therefore generated a positive holding rate of return, even though the yield to maturity was negative. For the year overall, in the US the profit from the current return was higher than the loss from the increase in yields to maturity.

Figure 11 - Change in Yield Curves, Government Bonds of US, Germany, and UK, 2016
(basis points)



Source: Bloomberg

3. Multiyear return on the reserves portfolio

The three-year average holding rate of return on the reserves portfolio increased this year, to 1.16 percent in numeraire terms (Table 5). The **active management** return also rose, reaching 98 basis points. The relatively low returns in 2015 dragged down the three-year returns. The three-year **risk level** rose slightly in comparison with the preceding year, but was lower than the one-year level. The higher risk was concentrated mostly in the active management contribution.

Table 5 - Portfolio Return and Active Management Contribution, Annual and 3-year Periods

	Return		Active Management	
	Annual	3-year, annual terms	Annual	3-year, annual terms
2011	**1.28** (0.80)		**0.21** (0.71)	
2012	**1.59** (0.57)		**1.17** (0.52)	
2013	**0.87** (0.80)	**1.25** (0.70)	**0.80** (0.74)	**0.72** (0.60)
2014	**1.28** (0.85)	**1.25** (0.74)	**1.06** (0.88)	**1.01** (0.66)
2015	**0.64** (1.29)	**0.93** (1.04)	**0.54** (1.29)	**0.80** (1.01)
2016	**1.56** (1.33)	**1.16** (1.09)	**1.35** (1.33)	**0.98** (1.09)

In parentheses: return's standard deviation, annual terms

Source: Bank of Israel

The high volatility of the risk assets increased the effect of timing of entry into an investment, and of the date on which the return is measured. A stronger effect is obtained when the return is measured on an annual basis. The increase in the proportion of the investment

in risk elements of the reserves portfolio in recent years heightens these effects, and enhances the benefit of measuring **the multiyear return**, which weakens the importance of the timing of the investment and its measurement.

Risk assets are inherently volatile, and in certain years losses can be expected, especially during a crisis. However, assessments are that the multiyear average return will be positive. A focus on multi-year measurement is likely to moderate the pressure to reduce holdings at such a time.

4. Active management contribution

The contribution of active management is the contribution of the decisions to invest in additional assets and countries not included in the basic benchmark. Active management can be classified into four main risk categories – duration, equities, credit spread assets, and currency and other exposures.

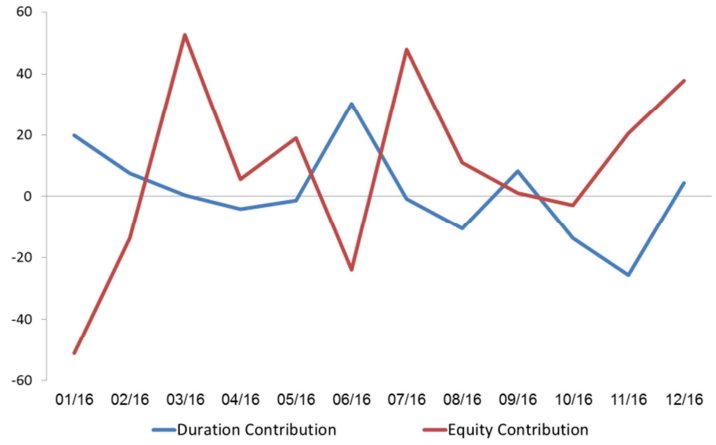
In recent years, the contribution of active management has had a much greater effect on the return on the reserves portfolio, while the return on the basic benchmark has been lower and stable. Increasing the risk elements in the portfolio increases the long-term expected return, as a result of the **risk premium—**the surplus return on risk assets in excess of the risk-free interest rate—inherent in them. At the same time, a potential increase in the volatility of active management is also expected. The volatility is also influenced by the correlations between the assets in the portfolio.

The duration risk-premium stems from the decision to invest the reserves in a duration differing from that of the basic benchmark. The premium derives from the upward sloping structure of the yield curve, and is obtained with certainty only when a bond is held until maturity. During the lifespan of a bond, the holding rate of return is exposed to the risk of capital losses resulting from a rise in yields, and the longer the bonds' duration, the greater this risk. The duration risk has an advantage in the portfolio, because it is usually negatively correlated with the other risk elements, and thereby contributes to diversifying away risk in the portfolio.

The risk premium of equities is obtained when the equities are held for a long period, but with a one-year horizon, the variance in the premium is high. It therefore follows that the investment in equities is a long-term investment featuring high volatility, which is liable to yield losses in the short term.

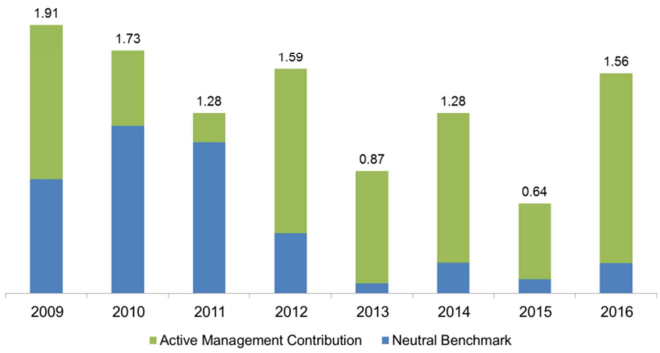
The negative correlation between the duration premium and the equity premium has the effect of reducing the active management risk, and this effect was notable this year. The duration and equities components were increased in the framework of the strategic allocation, based on the assumption that combining them helps moderate the volatility of the return on the reserves portfolio: capital losses in a scenario of an increase in yields to maturity will be offset by profits from equities, and vice versa. Equities prices, and yields to maturity, declined sharply during 2016, due to the turmoil in the financial markets at the beginning of the year (Figure 12). As a result, the contribution of the duration moderated the loss resulting from the negative contribution of equities. In the final months of the year, yields to maturity rose in the US, and their rise led to a negative contribution from duration, which was offset by a strong contribution by the equities.

Figure 12 - Contribution of Equities and of Duration in the Reserves Portfolio during 2016
(basis points)



Source: Bank of Israel

Figure 13 - Rate of Return: Basic Benchmark, Reserves Portfolio and Active Management Contribution, 2009–16
(numeraire terms)



Source: Bank of Israel

Active management contributed 135 basis points above the return on the basic benchmark, compared with 54 basis points in the preceding year (Table 4)—the greatest contribution in the past decade (Figure 13).

Of the risk assets, the equities were responsible for by far the largest contribution to active management, two-thirds (Table 6). The duration and other spread assets contributed an additional third, while the contribution of the currency and other exposures was slightly negative. Of the spread assets, the contribution of investment in short-term assets stood out this year.

Table 6 - Breakdown of Active Management Contribution to its Components, 2014–16
(basis points, in numeraire terms)

	2014	2015	2016
Equity	67	31	94
Duration & Diversification	32	12	19
Spread assets	3	9	29
Currency and asset exposures	5	3	-7
Total	**106**	**54**	**135**

Source: Bank of Israel

a. Equities

The reserves' investment in equities began in 2012. It is managed passively by tracking known equities indices with broad coverage of the equities markets in countries in which it was decided to invest. The investment takes place through external managers. At the beginning of the year, the Monetary Committee decided to increase the proportion of investment in equities, and at the end of the year it was 10 percent, compared with 9.2 percent at the end of 2015 (Table 7). The main equities markets rose significantly this year (Table 7 and Appendix Table 5 in Appendix 1).

The contribution of the investment in equities this year was 94 basis points, the highest contribution among the risk components (Table 7). A large majority of this investment, amounting to 4.4 percent at the end of 2016, was in US equities. During the year, the proportion of the portfolio invested in the US was reduced, while investment in Germany and France was increased. However, in retrospect, US equities increased by a higher rate than those of Germany or France. The high proportion of investment in these markets led to their high contribution: 38 basis points in the US and 31 basis points in Germany (Table 7 and Figure 14).

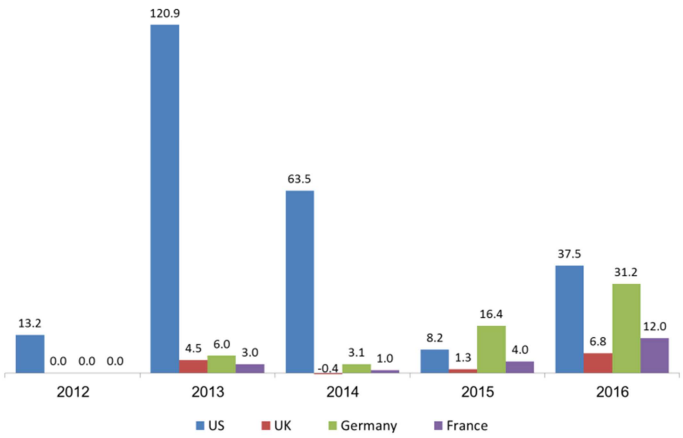
Equity investment was extended to Switzerland this year, an investment that is hedged against the effect of a change in the exchange rate of the dollar against the Swiss franc. The same is true for other investments in currencies not included in the numeraire, in order to avoid the effect of exposure to these currencies.

Table 7[9] - Holding Percentage in Equities by Country, Equity Indices, and the Contribution to the Reserves Portfolio in 2016

	Holding Percentage End of 2015	Holding Percentage End of 2016	Index Return 2016	Equity Investment Contribution (B.P)
US	5.7%	4.4%	12.7%	37.5
UK	0.5%	0.4%	17.5%	6.8
France	0.0%	0.6%	9.3%	12.0
Germany	1.9%	3.0%	6.4%	31.2
Japan	0.6%	0.7%	-0.7%	1.2
Korea	0.3%	0.3%	12.5%	3.1
Hong Kong	0.2%	0.2%	1.1%	0.8
Switzerland	0.0%	0.5%	-1.6%	1.0
Total	**9.2%**	**10.0%**		**93.8**

Source: Bank of Israel, Bloomberg

Figure 14 - The Contribution of Investment in Equities in Major Countries, 2012–16
(basis points)



Source: Bank of Israel

[9] MSCI equity indices for each of the countries.

b. Duration and diversification

The duration of a fixed-income investment portfolio is an accepted measure for estimating the interest rate risk to which the portfolio is exposed. The contribution of duration and asset diversification is attributable to the decision to invest the reserves at a different duration than that of the basic benchmark and the decision to disperse the assets differently on the curve compared with the basic benchmark. In maintaining a longer duration, the portfolio benefits from a higher current return than that of the basic benchmark, generating capital gains when yields are falling and capital losses when yields are rising. The duration is likely to affect the contribution of active management more than in the past, because up until 2014, the duration of the portfolio and the duration of the basic benchmark were similar.

The contribution of duration and diversification was 19 basis points this year. The portfolio's duration averaged 17 months this year, compared with 12 months in the preceding year and compared with the duration of the basic benchmark, which was six months. The contribution derived from the continued decline in the yield curve of the euro and pound sterling, and despite the rise in the dollar yield curve (Figure 11). The contribution of the euro portion was positive (13.6 basis points), due to capital gains from the continued decline in yields.

The yield curve in the US was slightly higher at the end of 2016 than at the end of 2015. The curve declined sharply during 2016, and rose again towards the end of the year. Most of the increase took place after the elections, against the background of investors' assessments that that the president-elect's fiscal measures would widen the deficit and lead to an increase in inflation. In contrast, in Europe and the UK, the curves declined compared with the preceding year. The decline in Europe resulted mainly from the accommodative monetary policy and low inflation. The decline in the UK was mostly due to the measures taken by the Bank of England, given the uncertainty about the effect of Brexit on growth.

c. Spread assets

Spread assets are debt instruments that are not included in the basic benchmark. These assets have a return spread over the government bonds with a similar term to maturity. The spread reflects mainly a credit risk premium higher than that of government bonds, and varies according to changes in the level of the asset's credit risk.

The overall exposure to various spread assets and additional exposures contributed 22 basis points.

The investment in short-term spread assets in the dollar portfolio stood out this year. The investment in spread assets after the widening of the spreads between these assets and the basic benchmark (short-term government bonds) generated an excess return. These assets were mainly floating-rate bonds, synthetic assets (investments in short-term bonds not denominated in dollars, hedged through currency swap transactions), as well as tradable securities. An additional contribution came from investment in CPI-indexed bonds in the US, due to the increase in inflation expectations there.

The exposure to corporate bonds contributed 7 basis points. The main spread risk in the reserves portfolio derives from the investment in US investment-grade corporate bonds. The investment is carried out by means of both internal and external management. It is managed actively, subject to a limitation of degrees of freedom for management, vis-à-vis a known benchmark with broad coverage of the US corporate bond market. The share of the investment

in corporate bonds in the reserves portfolio was increased during 2016 by 0.2 percentage points to 4.8 percent.

The contribution of the corporate bonds to active management was relatively high given the weight of the asset, due to the excess current yield above US Treasury notes of 100 basis points, the growth of the portfolio during the year, and a slight reduction in the level of the spread, compared with the beginning of the year.

In the first part of the year, the yield spread between corporate bonds and government bonds widened from 80 basis points to 150 basis points in mid-year, but then declined to 80 basis points at the end of the year (Figure 15). The background to the increase in the spread at the beginning of the year was concern in the markets about a sharp downturn in growth in China and about a banking crisis in Europe.

Figure 15 - Spreads of Corporate Bonds in the 0–5 Year Benchmark over US Government Bonds, 2015–16
(basis points)

Source: Barclays

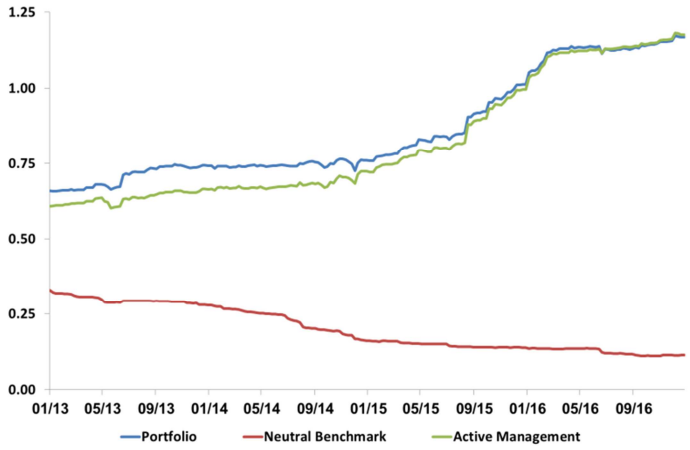
5. Various measures of the risk and the risk-adjusted return

a. Volatility of the reserves portfolio, active management, and the CVaR Index

In recent years, the risk in the reserves portfolio increased, due to the growth in the percentage of risk assets within the framework of active management. At the same time, volatility this year stabilized, following an accelerated rise in 2015 (Figure 16). The risk in the reserves portfolio is derived mainly from the active management contribution and from the low and stable benchmark risk, which has been gradually declining.

Figure 16[10] - Standard Deviation of the Basic Benchmark, the Reserves Portfolio and the Active Management Contribution, 2013–16
(3-year moving average, percent)

[10] The standard deviation of the weekly returns in annual terms.

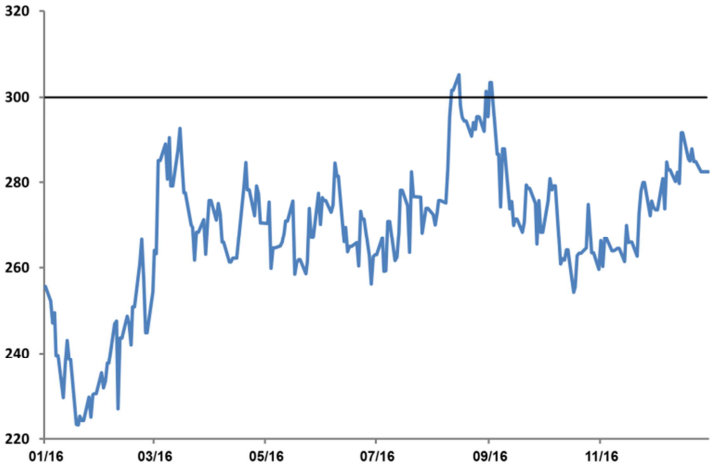


Source: Bank of Israel

The volatility of the reserves portfolio and of active management this year was similar to that of the preceding year (1.3 percent) (Table 4). There were relatively many changes this year in the trends of the returns on the various assets, but this was not reflected in higher volatility. The volatility of the basic benchmark remained low, as in preceding years (0.1 percent), in line with expectations from the conservative composition of its assets.

The $CVaR_{5\%}$ of the portfolio in 2016 was lower than the maximum level determined in the strategic allocation, and was relatively stable around 270 basis points, after rising to this level at the beginning of the year, mainly as a result of increased investment in equities and volatility in the equities market during this period (Figure 17).

Figure 17 - $CVaR_{5\%}$ of the Reserves Portfolio
(basis points)



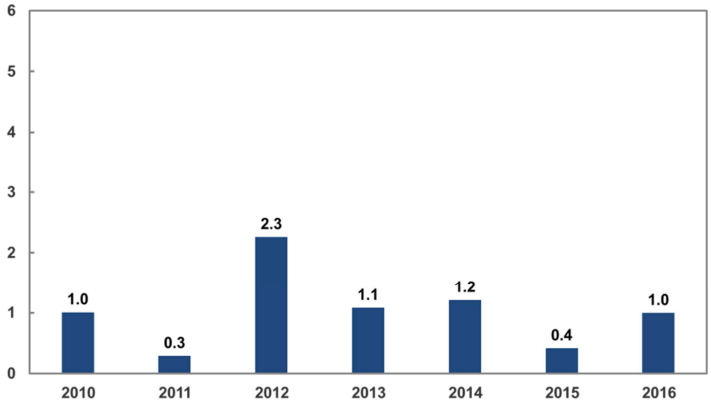
Source: Bank of Israel

b. The risk-adjusted contribution of active management

The **Information Ratio (IR)** measures the **active management** of the portfolio manager, relative to the risk taken. It indicates the degree of consistency in the manager's ability to generate an excess return in exchange for the added risk. The risk is calculated as the ratio of the contribution of active management to its standard deviation. A ratio greater than 0.5 indicates success in active management.

The IR index rose this year, and is the same as the average in 2010–16, following the global financial crisis (Figure 18). This improvement is a result of the improved return on the portfolio, with no increase in its volatility.

Figure 18 - The Ratio of Active Management Contribution to its Standard Deviation—the Information Ratio, 2010–16



Source: Bank of Israel

Appendices

Appendix 1

The Global Economic and Financial Environment

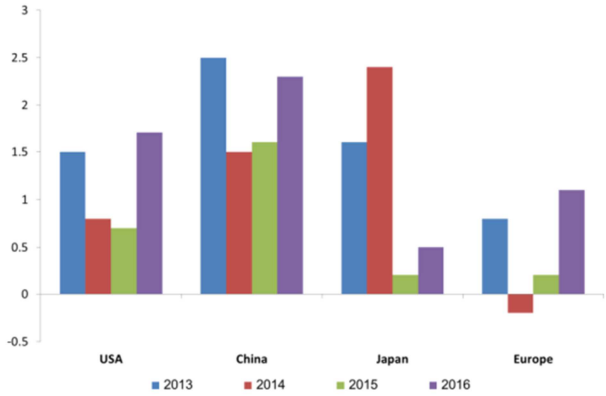
There were several major economic events in 2016. At the beginning of the year, economic instability in China, concern about the banking system in Europe, and a continued drop in oil prices caused steep declines in risk assets worldwide. Afterward, in June, the UK decision to leave the European Union led to further falls and instability, but these were only of short duration. In contrast, the US election results in November led to a rise in equity prices, especially in the US.

Oil prices rose during the year from the low point they reached at its beginning, mainly due to an increase in demand, which significantly reduced the production surpluses, and the decision by the major oil producers to cut back their production towards the end of the year (Appendix Figure 1). The stabilizing of oil prices, including the dissipation of the effect of the 2015 price declines on the calculation of the CPI resulted in a worldwide rise in inflation. In most major economies, however, the core indices remained far from the target (Appendix Figure 2).

Appendix figure 1[11] - Price of a Barrel of Oil, 2014–16
($US)

Source: Bloomberg

Appendix figure 2 - Annual Inflation in Major Countries and Regions, 2014–16
(Percent)

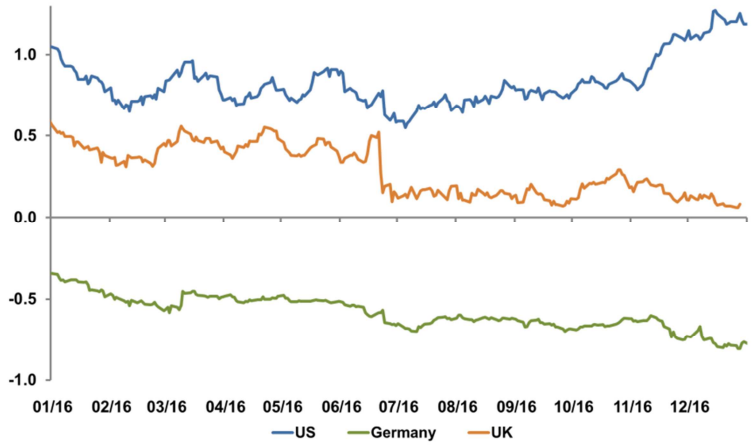


Source: Bloomberg

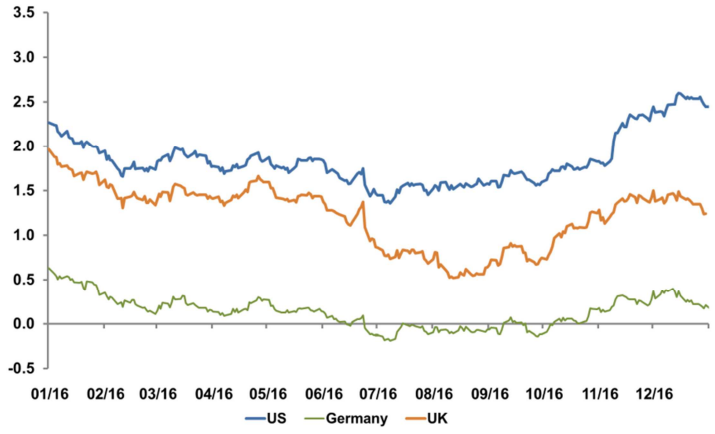
[11] Brent crude.

The trend in US monetary policy changed from expansion to contraction. The Federal Reserve raised the federal funds target rate in December to the 0.5–0.75 percent range, and upwardly revised its forecast for additional tightening measures in 2017. This was due to a substantial rise in core inflation to a level near the target, and later, an improvement in the labor market, with a drop in unemployment to 4.7 percent. Expectations in the markets for an interest rate hike and higher inflation increased, given the US election results and expectations for expansionary fiscal measures by the new administration. These assessments caused a sharp rise in bond yields in the US (Appendix Figures 3 and 4). The growth rate in 2016 was only 1.6 percent, following an acceleration in the second half of the year. This growth was based mainly on personal consumption, which remained stable, while the industrial sector was weak. The US equities market posted higher returns than most major equities markets around the world (Appendix Figure 5), especially from the beginning of November, when the results of the presidential elections became known. Following the election results, the US dollar strengthened sharply against most currencies (Appendix Figure 6).

Appendix figure 3 - Two-year Government Bond Yields—US, Germany and UK, 2016
(Percent)

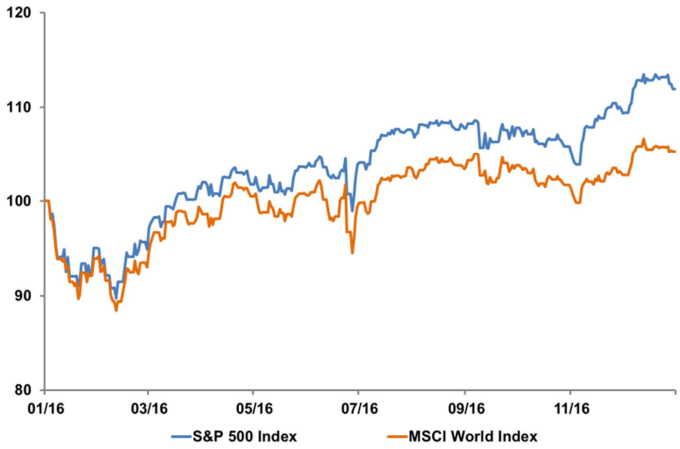


Appendix figure 4 - Ten-year Government Bond Yields—US, Germany and UK, 2016
(Percent)



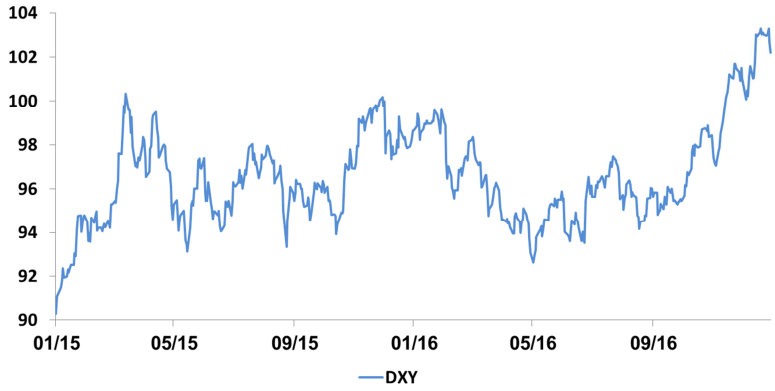
Source: Bloomberg

Appendix figure 5 - S&P 500 and MSCI Developed Markets Indices, 2016



Source: Bloomberg

Appendix figure 6 - Changes in Various Exchange Rates vs. the Dollar Based on the DXY Index, 2015 and 2016
(Percent)



DXY (Dollar Index Spot) -Weighted geometric average of the following currencies vis-a-vis USD: EUR (58.6%), GBP (11.9%), CHF (3.6%), JPY (12.6%), CAD (9.1%), SEK (4.2%)

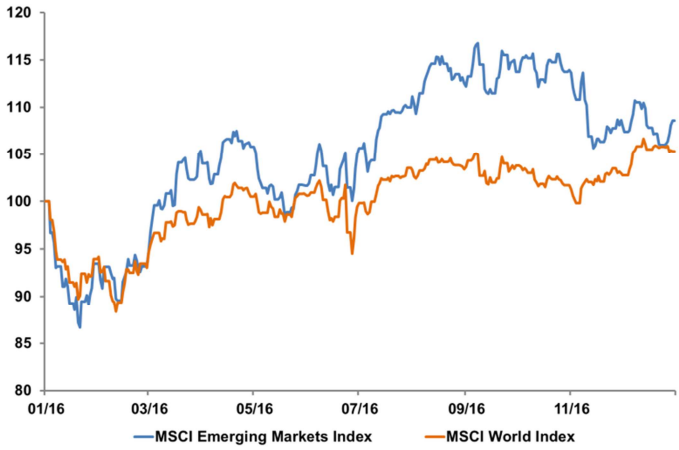
Source: Bloomberg

The UK economy was greatly affected by the referendum and the decision in June to leave the European Union. Before the referendum, the financial markets were influenced by changes in polls' assessments of the results of the referendum. Following the unexpected decision, the pound weakened by 16 percent against the dollar by the end of the year. UK equities prices declined steeply, but regained ground following the weakening of the currency, and were substantially higher for the year as a whole. The growth rate remained relatively high at 2 percent, despite the referendum and its result. Concern about the consequences of the decision led the Bank of England to reduce the monetary interest rate from 0.5 percent to 0.25 percent in August, and to adopt quantitative easing measures. The inflation rate continued to rise, particularly in the second half of the year, when the currency weakened in the wake of the referendum results.

Japan's very accommodative monetary policy continued. The Bank of Japan employed a number of expansionary tools: aggressive bond purchases, a negative interest rate regime for new deposits and a program aimed at anchoring 10-year bond yields "close to 0 percent". Japan's growth rate was 1 percent, due to its monetary and fiscal measures. Inflation remained very low in Japan, despite its aggressive monetary accommodation.

The major emerging markets improved somewhat this year, following a prolonged recession (especially in Russia and Brazil). This improvement was supported by the stabilization of commodity prices and an increased demand in China. The International Monetary Fund predicted that the 2016 growth rate in emerging markets would be 4.1 percent. Equities indices in emerging markets increased by 9 percent this year (Appendix Figure 7). At the beginning of the year, emerging economies outperformed advanced economies. Towards the end of the year, however, the trend reversed, following concern about the strengthening of the dollar and a protectionist trade policy by the new administration in the US.

Appendix figure 7 - Performance of MSCI World Index and Emerging Markets Index in 2016



Source: Bloomberg

Appendix 2
Principles for Determining the Desired Level of the Foreign Exchange Reserves

1. The appropriate level of foreign exchange reserves as an indicator of the economic strength of the country

Countries hold foreign exchange reserves for three main purposes:

A. To enable the central bank to intervene in the foreign exchange market in circumstances in which (1) the exchange rate deviates from the range that is consistent with the economy's fundamental equilibrium; or (2) the foreign exchange market is not functioning adequately (market failure);

B. To enable the central bank to operate in the foreign exchange market in order to moderate the effect of large capital flows from either foreign or local residents, which are liable to undermine the stability of the financial markets, and thus negatively impact the stability of the economy as a whole (a specific case of A);

C. To allow for the provision of sufficient foreign currency to the economy in an emergency situation (such as a war or a strong earthquake). In such circumstances, there will be a need to increase imports rapidly and by a significant amount in order to deal with the emergency, while exports may also be adversely affected and therefore this source of foreign currency will also be reduced. Under such circumstances, the government and the private sector will find it difficult to raise foreign currency abroad and the foreign exchange reserves will be left as the country's main source for financing in foreign currency.

Therefore, holding an appropriate level of foreign exchange reserves is considered by local and foreign financial institutions, companies, households and rating agencies as a main indicator of a country's economic resilience. The larger a country's foreign exchange reserves are, the greater the ability of policy makers to deal with unavoidable economic and political pressures. Furthermore, large foreign exchange reserves tend to reduce the rates of interest paid both by the government and by the private sector for financing from abroad. In short, in the eyes of the financial markets and of individuals, foreign exchange reserves at an appropriate level make an important contribution to the confidence in a country's ability to deal with economic, financial and political shocks to the economy.

2. There are various approaches to the calculation of the appropriate level of foreign exchange reserves:

a. *Relative to import months*: For most of the post-World War II period, the appropriate level of foreign exchange reserves was measured in terms of "import months"—the number of months of imports that the reserves would be able to finance. This approach dominated as long as international capital flows were limited, and the main source of difficulties in foreign exchange was the current account of the balance of payments.

b. *Relative to capital flows*: During the 1990s, it became clear that many financial crises were caused by large-scale capital flows, that is, disruptions in the capital account, rather than by disruptions in the current account of the balance of payments. At the end of the 1990s, wide use was made of the Greenspan-Guidotti rule, according to which a country's foreign exchange reserves should be at least as much as the country's foreign currency liabilities (of both the public and private sectors) during the coming twelve- month period, thus allowing a country to deal

with a complete cutoff from sources of foreign currency for a period of one year. The 100 percent rule (according to which the reserves must be equal to the full amount of foreign currency liabilities for one year) was based on an empirical study—how countries survived the financial crises of the 1990s and early 2000s: it was found that countries which operated according to the 100 percent rule were prone to fewer foreign currency attacks, and were better able to deal with them.
During the global crisis which began in 2007 it became clear that countries which held foreign exchange reserves exceeding 100 percent were better able to deal with the crisis. The main examples are Brazil, Russia, and South Korea. Each of those countries held foreign exchange reserves that exceeded 100 percent of their foreign exchange liabilities, and they used them effectively to stabilize the exchange rate and/or to maintain financial stability. It is currently recognized that foreign exchange reserves of between 100 percent and 200 percent of an economy's foreign currency liabilities are more effective than a reserves level which meets the Greenspan-Guidotti rule precisely.

c. *Relative to potential uses in the future (the eclectic approach)*: In calculating the appropriate level of foreign exchange reserves for Israel, the Bank of Israel adopted the eclectic approach, which is based on the potential uses of the reserves in an emergency. Clearly, in a time of national emergency, Israel will likely require reserves, both to finance imports (according to the import months approach, including imports of goods and services related to the emergency situation) as well as to deal with capital flows – payments of existing debts to foreign residents, with potential capital flows.

Based on the range of factors listed above and in accordance with the current conditions in Israel's economy, the Governor revised the desired level of reserves to a range of $70–110 billion.[12]

Additionally, in setting the level of foreign exchange reserves, the cost of holding the reserves[13] was taken into account. However, in terms of a risk-reward analysis of holding the reserves, it is difficult to measure quantitatively the advantages and benefits of holding them. The contribution of the reserves to the economy cannot be quantified and priced, among other reasons because their contribution may be critical in emergency situations whose nature and severity are difficult to predict.

[12] The Governor updated the range in the beginning of 2015 from the range of $65–90 billion that was set in 2010, and which had remained unchanged since then. The increase in the range of the desired level of reserves is consistent with the changes that occurred in the Israeli economy over the past 5 years.

[13] The accounting cost of the Bank of Israel's activity is recorded in the Bank's general ledger. At the same time, the Bank's accounts do not include the expected profit (in terms of stability of the economy) derived from the expected use of the reserves in various situations in the future, nor that derived from market assessments that larger reserves contribute to the economy, as described above.

3. Israel's actual level of foreign exchange reserves

Implementing the eclectic approach, which takes into account both the need to import goods and services as well as the potential capital flows related to a crisis situation, must take into account Israel's unique geopolitical situation, which requires a higher level of reserves relative to economic variables which are generally taken into account when calculating the appropriate level of foreign exchange reserves.[14]

4. Intervention in the foreign exchange market and the appropriate level

It is important to note that, as explained in Section 53 of the Bank of Israel Law, the intervention of the Bank of Israel in the foreign exchange market, in order to fulfill its functions and attain its objectives, may lead to a deviation in the actual level of the reserves from their desirable level. Government and banking system activity can also lead to such a deviation. In general, the Bank will act to change the level of the reserves only when the deviation is significant and prolonged, and only if such action is in line with attaining the Bank's objectives as established in the Bank of Israel Law, which include maintaining price stability, supporting other economic policy goals, and supporting the stability of the financial system. Thus, the foreign currency reserves could deviate from the desired level for extended periods of time.

[14] For a discussion on the ratios of the actual reserves to economic variables and a comparison with other countries, please see Section 4 of Chapter B of this report.

Appendix 3
Foreign Exchange Reserves: Investment Policy Guidelines

Foreign Exchange Reserves: Investment Policy Guidelines[15]

In effect from September 26, 2016

In accordance with Section 40(b) of the Bank of Israel Law, 5770-2010, the Monetary Committee is to establish the guidelines for the investment policy of the foreign exchange reserves.

1. Basic guidelines derived from the goals of holding the reserves

The investment policy of the reserves portfolio is based on the main goal of achieving the Bank of Israel's objectives and proper fulfillment of its functions as they are detailed in the Bank of Israel Law. Subject to that, the investment policy is also based on the following goals:

a) **Maintaining the purchasing power of the reserves:** This principle is interpreted as preserving the value of the reserves in terms of measurement currency chosen by the Bank—the numeraire (see 3 below).
b) **Managing the reserves with a high level of liquidity:** A large part of the reserves are to be invested in assets that can be liquidated rapidly at short notice and without negatively impacting their value. The precise level of liquidity is to be increased to the extent that the actual level of reserves relative to the desired level is low (5(e) below).
c) **Achieving an appropriate return on the reserves portfolio,** at an acceptable level of risk, to the extent that it does not negatively impact the achievement of the previous goals (see 4 below).

2. The division of work between the Monetary Committee, the Foreign Currency Committee, and the Markets Operations Department

In implementing Section 40(b) of the Bank of Israel Law, the Committee made a distinction between establishing the guidelines and periodic monitoring, and setting the detailed instructions for the day to day management of the portfolio.

The Monetary Committee will set the guidelines, in consultation with the Minister of Finance as established by law, will update the guidelines to the extent necessary, and will monitor the implementation of the investment policy by the Markets Operations Department.

The Foreign Currency Committee Committee—an internal Bank of Israel committee headed by the Governor—will translate the guidelines into the detailed foreign exchange reserves investment policy.

[15] The characteristics of the reserves portfolio are reported to the public in an annual report published on the Bank of Israel website.

The Market Operations Department will implement the investment policy, within the framework of degrees of freedom which will be set periodically by the Monetary Committee and the Foreign Currency Committee, and will report to the Monetary Committee and the Foreign Currency Committee on a quarterly basis on the implementation of the policy: developments in international markets and their impact on the management of the reserves, the investment decisions reached by the Department, the portfolio's rate of return, and the financial and other risks to which the portfolio is exposed.

The Market Operations Department will advise the Monetary Committee and the Foreign Currency Committee on fulfilling their functions, through position papers and suggestions for discussion in the Committees.

The Monetary Committee will approve and update periodically the division of authorities regarding the investment policy of the foreign exchange reserves.

3. The measurement currency for the holding rate of return on the foreign exchange reserves and the principles for its determination

The measurement currency for the holding rate of return on the reserves—hereinafter, the numeraire—is a basket of currencies and its composition allocation[16] is decided by the Monetary Committee. The allocation of the numeraire is set according to principles which reflect the goals of holding the reserves.

The principles according to which the composition of the numeraire is set are:

a) The currency composition of actual imports, and of imports expected in an emergency situation
b) The composition of the short and medium term external debt
c) Assessments regarding the liquidity of the various currencies in which investment is possible.

The composition of the numeraire is also examined from the perspective of the currency composition of foreign exchange reserves portfolios of all central banks of countries that are IMF members, as reported by the IMF.

The composition of the numeraire will be set at the end of each year by the Monetary Committee, on the basis of the Market Operations Department's recommendation, in accordance with changes in domestic and global market conditions. If there are significant changes in one or more of principles (a)–(c), the composition of the numeraire will be brought to discussion by the Monetary Committee.

The reserves portfolio holding rate of return is measured in terms of the numeraire, so that the currency basket which makes up the numeraire is seen by the reserves portfolio managers as a risk-free currency composition.

[16] The numeraire is defined in terms of units of currency (i.e., X dollars, Y euro, and Z pound sterling). The ratio between the currency units (in the above example, X:Y:Z) is determined by the currency composition of the portfolio (in the above example, % of dollars in the portfolio, % euro, and % pound sterling), which is set by the Committee and the exchange rates of the numeraire currencies at the time of the decision.

4. The risk profile

The risk profile determines the maximum level of risk that the Monetary Committee is willing to accept in order to achieve the goals of holding the reserves. In establishing the risk profile, scenario analysis and a range of analytical tools to measure risk, such as VaR, CVaR, and others should be used. The risk profile is to be set by the Committee on a periodic basis in accordance with the changing conditions in the global capital markets.

The risk profile will be set so that given the worst 5 percent of outcomes, the average loss will not be greater than 400 basis points over a 1-year horizon.

5. The rules for managing the financial risks of the reserves

The rules for managing the financial risks to which the reserves are exposed, and their asset allocation, are to be set in accordance with the goals of the investment policy of the reserves (Section 1 above) and subject to the risk profile set by the Monetary Committee (Section 4). The asset allocation of the foreign exchange reserves will be approved at least once a year by the Monetary Committee.

a) The types of assets approved for use in managing the reserves are:

1. Bonds (including bonds with fixed interest, with variable interest, and CPI-indexed bonds)
2. Mortgage-backed securities (MBS) and asset-backed securities (ABS), a maximum of 6 percent of total reserves
3. Tradable Certificates of Deposit (CDs)
4. Fixed term deposits
5. Commercial Paper (CP)
6. Equities, a maximum of 15 percent of total reserves
7. Derivatives whose underlying asset is permitted for investment.

b) Management against a benchmark

Control over most features of the financial risk of the reserves is anchored in their management against a system of benchmarks. The rules for managing the financial risks of the reserves generate the currency allocation of the benchmarks, the features of their price risk (such as duration) in each currency, and the asset types included in it. The investment returns of the portfolio managers are measured against these benchmarks.

c) Currency risk:

The currency exposure of the reserves is set by:

1) The composition of the numeraire.
2) Strategic currency exposures relative to the composition of the numeraire: The extent of the strategic currency exposures is limited to 10 percent of total reserves. The composition and amounts of the exposures will be set by the Monetary Committee.
3) Short and medium term currency exposures relative to the composition of the numeraire: Their amount is limited to 2 percent of the total reserves. The composition and amounts of the exposures will be set by the Market Operations Department.

d) Credit risk:

In order to limit the credit risk inherent in day-to-day management of the reserves portfolio, the Monetary Committee set the following rules:

1) Investment is permitted in the currency of countries whose major credit rating category is at least BBB. Investment in currencies of countries whose credit rating category is BBB is limited to 1 percent of the total reserves and requires the specific authorization of the Monetary Committee.
2) Investment is permitted in bonds and commercial paper issued by governments, or with government guarantees, if their major credit rating category is at least a BBB rating. Investment in the BBB major rating category is limited to 1 percent of total reserves, and requires the specific authorization of the Monetary Committee.
3) Investment in bonds of public sector entities (PSE) is limited to a maximum of 15 percent of total reserves, and only in bonds whose major credit rating category is at least A.
4) Investment in corporate bonds is limited to 15 percent of total reserves, and only in bonds whose major credit rating category is at least BBB.
5) Investment in bonds and deposits of international financial institutions is limited to 15 percent of the reserves.
6) The exposure of the reserves to the international banking system should not be greater than 10 percent of total reserves, and that is only to banks and brokers whose major credit rating category is at least A. Activity with banks and brokers whose major credit rating category is BBB is limited to DVP[17] (delivery versus payment) alone.

e) Liquidity risk:

In order to provide an immediate response to the financial problems which arise during emergencies, a large portion of the reserves should be invested in assets that can be liquidated in large amounts at short notice and without negatively impacting their realization value.

1. The assets in which the reserves are invested are classified into 3 levels of liquidity:
    a. Highly liquid assets that can be realized within a month without negatively impacting their realization value.
    b. Assets that can be realized within three months without negatively impacting their realization value.
    c. Low-liquidity assets that can be realized in a period exceeding three months without negatively impacting their realization value.
2. A minimum level of investment was set for highly liquid assets, and a maximum level was set for low-liquidity assets. Classification of assets into the various liquidity levels can change due to changes in market conditions.
3. At least 45 percent of the total reserves are to be invested in government bonds.

f) Active management and compliance rules:

The reserves portfolio is actively managed within the framework of limited and well defined degrees of freedom, as long as the investment policy adheres to the guidelines.

g) Risk assets:

Total combined investment in equities (Section 5.a.6) and in corporate bonds (Section 5.d.4) shall not exceed 25 percent of the total reserves.

[17] DVP activity is when the payment and the asset are transferred between the sides at the same time and thus the credit risk in such activity is essentially zero.

6. The nonfinancial risks inherent in managing the reserves

In determining the investment policy for the reserves, there must be taken into account the exposure of the Bank and of the portfolio to the various nonfinancial risks inherent in investing the reserves—reputation risk, legal risk, political risk, operational risk, and so forth.

7. Measuring returns and reporting them

The reserves are managed with transparency. The Market Operations Department shall report periodically to the Monetary Committee (see 2 above) on the amount of the reserves and changes in them, the currency composition, changes in currency exposures, the asset allocation, portfolio duration, country exposure, credit risk, liquidity risk, and the return on the portfolio and its various components. The report should include an analysis of the current developments in the financial markets and their effect on the management of the reserves.

8. Handling passive breaches

The Monetary Committee will set the rules for handling passive breaches from the investment policy guidelines.

Appendix 4
Glossary

Active management	An investment management style in which the portfolio manager trues to achieve a return greater than that of a benchmark or market index by deciding to buy or sell securities or by various investment strategies. In this report, the term describes the contributions of decisions to invest in additional assets and countries that are not included in the basic benchmark.
Basic benchmark (numeraire-composition benchmark)	Represents an asset composition that is conservative and investable, which meets the first two objectives of the reserves' investment policy—maintaining the purchasing power of the reserves and managing them with a high degree of liquidity.
Basis point	0.01 percent; one ten-thousandth, or one hundredth of a percentage point.
Benchmark portfolio	A hypothetical portfolio constructed according to agreed-upon rules, which is used as a yardstick for evaluating the performance of an investment portfolio manager and as an anchor for the portfolio risk management.
Commercial paper (CP)	Zero-coupon securities that are sold at a discount, with an original term to maturity of less than one year.
Contribution of active management	The difference between the return on the reserves portfolio and the return on the basic benchmark (a benchmark whose currency composition is the numeraire composition), which measures the decisions to invest in additional assets and countries that are not included in the basic benchmark.
Credit risk	The exposure to the possibility of loss due to failure of timely payment on debt, whether of an issuer, a financial institution or a country, or as a result of changes in the market's evaluation of the probability of such an event.
Currency risk	The exposure to the possibility of a loss as a result of a change in exchange rates.
Currency terms (e.g., US dollar terms)	The rate of return obtained from multiplying the current values of all the assets by the corresponding current rates of exchange of the currency or basket of currencies.
Foreign exchange reserves	Financial assets that are issued by foreign entities and which are denominated in a foreign currency (including gold). They are owned exclusively and managed by a central bank and are not pledged in any way.

Forward	An agreement to buy or sell a particular type of asset, such as foreign currency, at a predetermined price and on a predetermined future date.
Holding rate of return	Rate of change in the value of an asset or portfolio, including interest or dividends, over a defined period.
Interest rate risk	The exposure to the possibility of a loss as a result of an increase in the yield to maturity.
Legal risk	The exposure to the possibility of a loss deriving from the formulation of a contract, to the detriment of the investor.
Liquidity	The ability to realize assets immediately without a loss in value.
Modified duration	An approximation of the sensitivity of a small change in the value of a debt instrument, expressed as a percentage of its original value, to the change in the yield to maturity (with the opposite sign) of the instrument. Measured in units of time.
Neutral portfolio	A portfolio whose composition is identical to that of the basic benchmark.
Numeraire	A currency basket used for measuring the returns on the foreign exchange reserves. See Chapter 2, Section 3 above.
Operational risk	The exposure to the possibility of a loss due to a system failure, human error and the like.
Passive management	An investment management style in which the portfolio manager tracks a benchmark or market index.
Portfolio duration	The average duration of a portfolio of fixed income instruments (where the duration of each asset is weighted according to its proportion of the portfolio); a widely accepted measure used to estimate the portfolio's interest rate risk.
Repo, Reverse Repo	Repurchase agreement; the purchase of a security simultaneously with a commitment to sell it back at a future date and at a fixed price. From an economic viewpoint, this type of transaction is identical to a loan/deposit backed up by a guarantee (the security). When the Bank of Israel sells a security for future repurchase, this is a repo; the opposite transaction is called a reverse repo.
Risk assets	Assets featuring higher risk than government bonds. In this report, the term refers to equities and corporate bonds.
Risk-free portfolio	A portfolio in which the investor is not subject to gains or losses.
Risk premium	The excess return of a risk asset over the risk-free interest rate.

Spread asset	An asset which is not included in the basic benchmark. The yield spread of this asset is measured as the difference between its yield to maturity and that of a government bond with a similar term to maturity.
Standard deviation	A statistical measure used to quantify the dispersion of a distribution around its expected value. Often used as a measure to quantify the exposure to uncertainty. See also volatility.
Strategic position	An intended deviation from investment characteristics of a portfolio vis-à-vis the basic benchmark, managed with a long term horizon.
TIPS	Treasury Inflation-Protected Security; a bond issued by the US government that is indexed to the CPI in the US.
Treasury bill, note or bond	Debt instruments issued by the government.
Volatility	The standard deviation (see definition in this glossary) of the distribution of holding rates of return of a financial asset, such as a security or portfolio, over a defined time period (a day, a week, etc.).
Yield curve	A curve representing the yields to maturity of bonds with similar characteristics (such as the bonds of a particular country in local currency) and different maturities.
Yield spread	The difference between yields to maturity of two debt instruments.
Yield to maturity	The holding rate of return, in annual terms, which would be obtained from holding a debt instrument until its final redemption, if it was possible to invest all of its cash flows at the same rate of return until that date. Synonymous term: internal rate of return.