D. FOREIGN EXCHANGE ACTIVITY OF THE MAIN SECTORS

The trend of the shekel exchange rate changed in 2022 relative to previous years, as the shekel weakened by about 13 percent against the US dollar, in parallel with the strengthening of the dollar worldwide. The shekel also weakened against the euro and against the basket of currencies that make up the nominal effective exchange rate, but by lower rates.

The weakening of the shekel was mostly against the background of declines in equity prices around the world in the first half of the year, which were reflected in significant foreign exchange purchases by the institutional investors. These purchases totaled about $22 billion, and were prominent in view of sales in previous years.

In contrast, nonresidents continued to make net sales of foreign exchange in large quantities in 2022, particularly large business firms.

The business sector, mainly export companies that increased their foreign exchange sales in view of the weakness of the shekel, sold about $9 billion.

The Bank of Israel did not intervene in the foreign exchange market this year, in contrast with previous years.

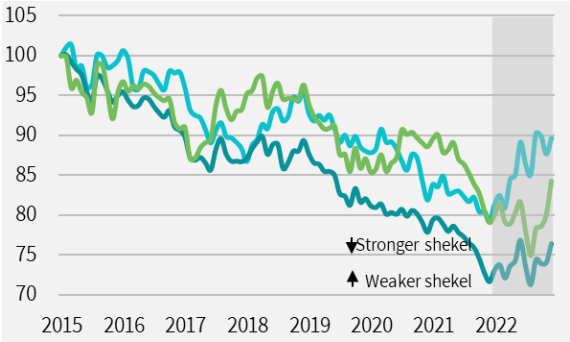
1. Background: Exchange rates and volatility

The shekel weakened in 2022, mainly against the US dollar, in contrast with the trend of a stronger shekel in recent years.

The shekel weakened by about 13 percent against the US dollar in 2022, to a rate of NIS 3.52 to the dollar. This weakening was significant compared to the prolonged strengthening of the shekel in recent years. The trend toward a weaker shekel against the dollar took place against the background of the strengthening dollar worldwide, mainly in the first half of the year (12.5 percent).

The shekel weakened by 6.6 percent against the euro, mainly at the end of the year, and by the same rate in terms of the nominal effective exchange rate[1], which represents the currencies of Israel's main trading partners.

Figure 4.1: NIS/$, NIS/€, and Nominal Effective Exchange Rate Indices



SOURCE: Bank of Israel.

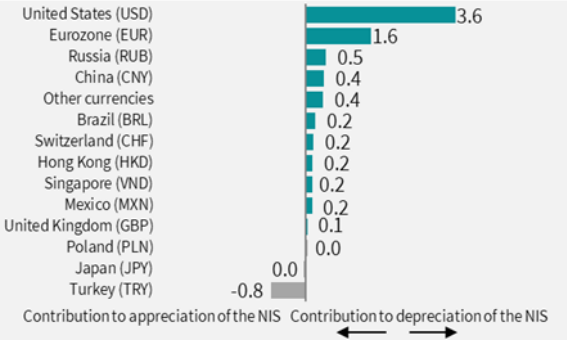
[1] For an explanation of the nominal effective exchange rate, please see "Data Sources and Main Terms" at the end of this section.

The US dollar and the euro were the main factors in the weakening of the shekel in terms of the nominal effective exchange rate.

The shekel weakened against the basket of currencies that make up the nominal effective exchange rate. The most significant contribution to the weakening of the shekel among this group of currencies came from the US dollar (3.6 percentage points) and the euro (1.6 percentage points).

Figure 4.2: Contribution of the Change in Various Currencies to the Change in the Nominal Effective Rate (6.6%), 2022

Percent



The contribution is calculated via the change in the exchange rate of each currency against the shekel, and multiplied by that currency's weight in the nominal effective index.
SOURCE: Bank of Israel.

The shekel weakened against the US dollar in parallel with the dollar's significant strengthening worldwide.

In 2022, the US dollar strengthened against most currencies: by 5.9 percent against the euro, by 12.2 percent against the Japanese yen, and by about 10.6 percent against the British pound.

The dollar's strengthening against the Turkish lira since the beginning of 2022 was particularly prominent—about 29 percent.

Figure 4.3: Rate of Change of the US Dollar Against the Major Currencies*, 2022

percent

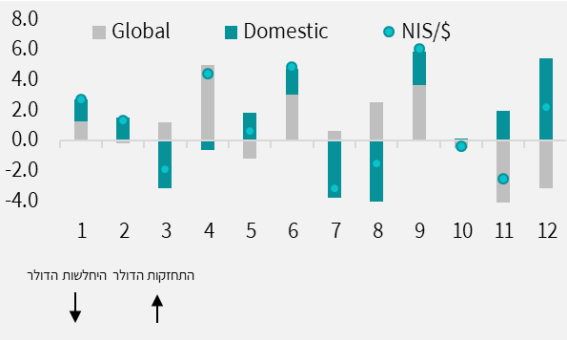
The figures are calculated based on end-of-day data. The change in the shekel/dollar rate is calculated according to the representative rate. SOURCE: Based on Bloomberg data.

The shekel's weakness against the dollar was mainly due to global effects[2].

In 2022, the shekel weakened by about 13 percent due to the strengthening of the dollar worldwide, which contributed about 8.3 percentage points to the weakening of the shekel. Most of the global effect on the weakening of the shekel was in the first half of the year.In contrast, the domestic effect was concentrated in the fourth quarter of the year, during which there were domestic structural pressures for depreciation. By the end of the year, these effects had contributed 4.9 percentage points to the weakening of the shekel.

Figure 4.4: Change in the NIS/$ Exchange Rate by Domestic and Global Effects*, 2020

percent



SOURCE:Bank of Israel

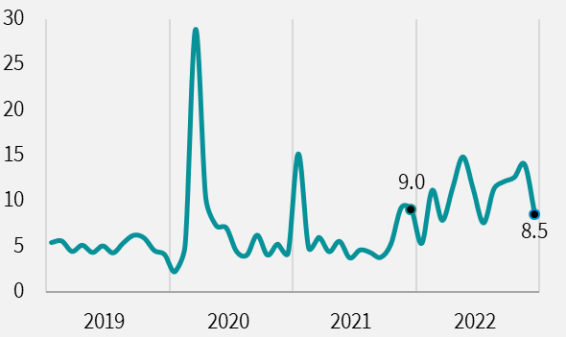
[2] The global effect reflects the relative change of the US dollar against 19 currencies that constitute about 90 percent of overall trading volume against the US dollar, with the weight of each currency set according to its relative trading volume against the dollar. The difference between the global effect and the change in the shekel/dollar rate constitutes the domestic effect.

In view of the strengthening of the US dollar and the declines in the capital markets, actual volatility in the shekel/dollar exchange rate remained high in 2022.

The standard deviation[3] of changes in the shekel/dollar exchange rate, which represents its actual volatility, was not uniform during the year. At the end of the year the standard deviation was 8.5 percent.

Figure 4.5: Standard Deviation* of the Change in the NIS/$ Exchange Rate

percent



Standard deviation in annual terms for the last 20 trading days.

SOURCE: Bank of Israel.

The implied volatility[4] of options on the shekel/dollar exchange rate increased, and reflected expectations of higher volatility than what transpired in 2021.

The implied volatility of the shekel vis-à-vis the US dollar increased in 2022, to around 8.5 percent at the end of the year. This level was lower than the standard deviation of the advanced markets, and of the emerging markets.

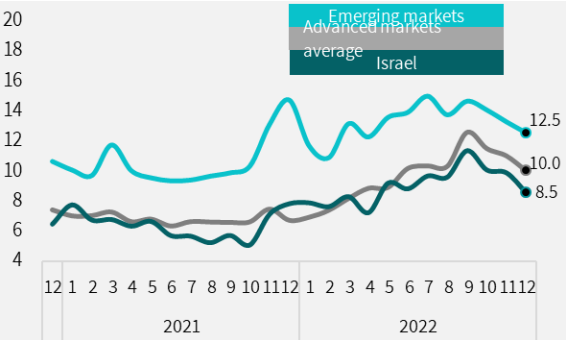
The implied volatility of the emerging markets[5] remained high in view of the weakening of the Turkish lira against the US dollar, ending the year at 12.5 percent.

The implied volatility in the exchange rates of the advanced markets[6] increased by 3.2 percentage points during the year, to 10 percent at the end of the year.

In the fourth quarter of the year, the implied standard deviation of all markets declined.

Figure 4.6: Implied Standard Deviation in Options on the Dollar Exchange Rates, International Comparison

percent



SOURCE: Based on Bloomberg data .

[3] Standard deviation in annual terms for the last 20 trading days.

[4] For an explanation of the implied volatility in options, please see "Data Sources and Main Terms" at the end of this section.

[5] The emerging markets included here are Mexico, South Korea, Philippines, Poland, Chile, South Africa, Thailand, Hungary, Turkey, and Singapore.

[6] The advanced markets included here are Australia, Canada, Japan, the UK, Switzerland, and the eurozone countries.

2. Activity of the main sectors in the foreign exchange market

In foreign exchange activity of the main sectors[7], the institutional investors moved to net foreign exchange purchases compared to large sales in the previous year.

The institutional investors made net purchases of foreign exchange totaling about $22 billion in 2022, compared with net sales of about $28 billion in 2021. Their foreign exchange purchases were concentrated in the first half of the year, in view of the declines in equity prices in foreign markets and the need to increase collateral in respect of futures contracts on equities.

The financial sector was also prominent this year in net foreign exchange purchases, totaling about $7 billion, mainly due to the activity of credit card companies
In contrast, nonresidents continued to make net foreign exchange sales, totaling about $16 billion.

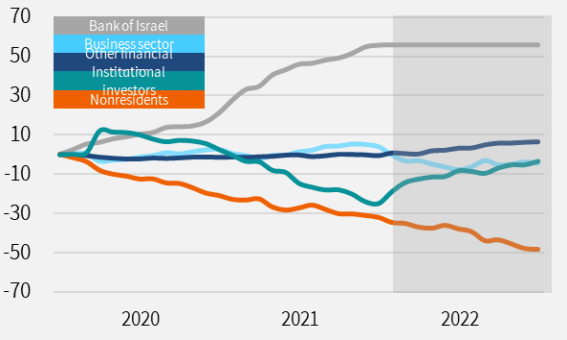
It should be noted that nonresidents' activity was not uniform. The financial sector made net foreign exchange purchases during much of the year, while the nonfinancial sector made net foreign exchange sales.

The business sector made net sales of about $9 billion this year, in view of the increase in Israel's services exports and the strengthening of the US dollar.

It should be noted that the Bank of Israel did not intervene in the foreign exchange market in 2022, in contrast with its activity in previous year.

Figure 4.7a: Estimated Net Cumulative Foreign Exchange Purchases (+) of the Main Sectors

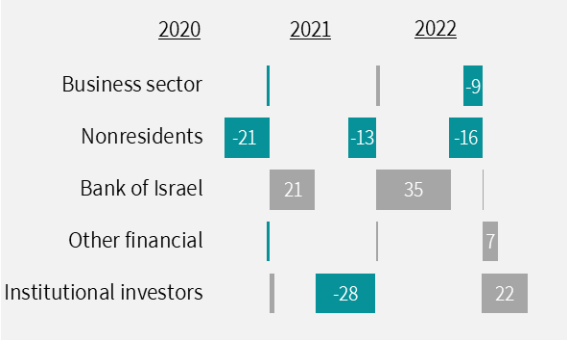
$ billion



SOURCE: Based on reports to the Bank of Israel by financial institutions and business firms.

Figure 4.7b

$ billion



SOURCE: Based on reports to the Bank of Israel by financial institutions and business firms

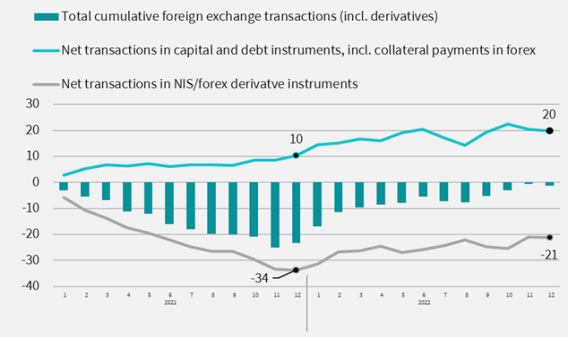
2.1 The institutional investors

Institutional investors' purchases reflected the purchase of assets in foreign currency, a reduction of hedging through derivatives, and collateral payments in respect of declines in equity prices.

In 2022, in contrast with the previous year and in view of declines in equity prices abroad and the decline in their foreign currency asset portfolio, the institutional investors reduced the hedging of their foreign currency assets (making net purchases of foreign exchange) by about $13 billion through futures transactions.
In parallel, the institutional investors made net purchases of foreign currency capital and debt assets, mainly investment funds abroad and collateral payments in respect of equity price declines, totaling about $10 billion

Figure 4.8: Net Cumulative Foreign Exchange Transactions by Institutional Investors

$ billion



SOURCE: Bank of Israel data

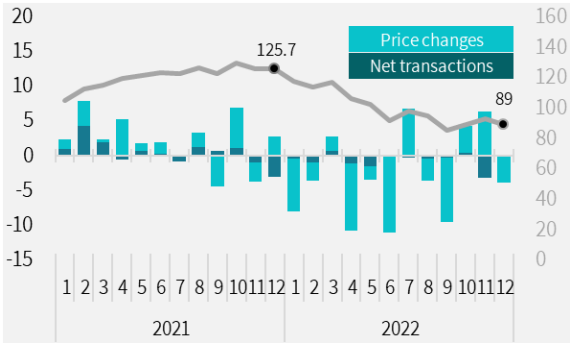
[7] For further details of the sectors, terms, and explanations, please see "Dataset on Foreign Exchange Market Activity" in the second part of the *Statistical Bulletin* for 2018.

Equity price declines led to a marked decline in institutional investors' balance of equities abroad.[8]

Institutional investors' balance of equities abroad declined by about $36 billion during the year, to about $89 billion. Most of the decline, about $30 billion, was due to losses as a result of equity price declines abroad. In addition, the institutional investors realized equities in foreign currency totaling about $6 billion.

Figure 4.9: Equity Balances Abroad - Broken Down by Transactions and Prices

$ billion



SOURCE: Bank of Israel.

The decline in the balance of equities in foreign currency was reflected in a decline in institutional investors' exposure to foreign exchange.

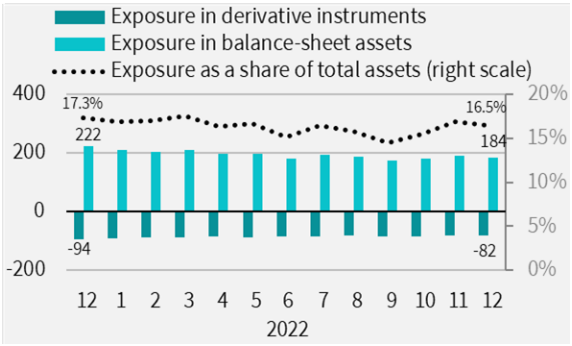
The balance of institutional investors' exposure to foreign exchange in balance-sheet assets declined by about $38 billion in 2022, to about $184 billion at the end of September.

The decline in the balance of equities was reflected in the continued decline of about 1 percentage point in exposure as a share of total assets in the portfolio managed by the institutional investors, to about 16.5 percent.

In contrast, the institutional investors reduced the hedging of their foreign exchange assets

Figure 4.10: Institutional Investors' Exposure to Foreign Exchange Assets

$ billion



SOURCE: Bank of Israel

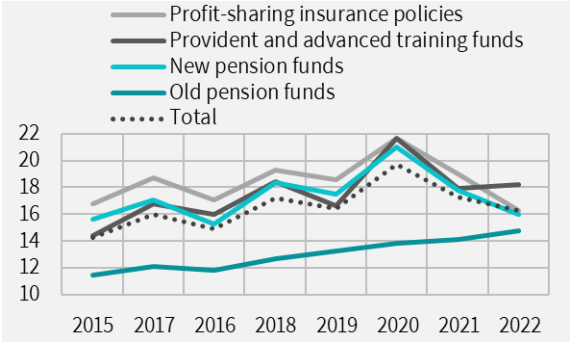
The decline in the rate of exposure to foreign exchange included the new pension funds and the insurance companies.

The insurance companies and the new pension funds reduced the exposure to foreign exchange of their managed portfolios to about 16 percent. In contrast, the exposure rate among the provident funds and the advanced training funds remained stable at about 18 percent.

The old pension funds increased their exposure to foreign exchange, but continued to maintain a low level of exposure at about 15 percent.

Figure 4.11: Institutional Investors' Exposure to Foreign Exchange

Percent



SOURCE: Bank of Israel

[8] The balance of equities abroad includes equities, mutual funds, and ETFs.

2.2 Nonresidents

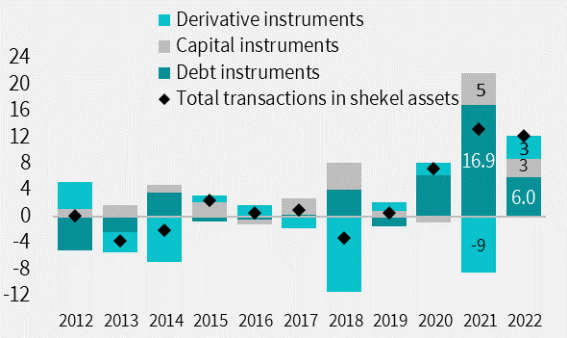
Nonresidents also continued to make net sales of foreign exchange and to invest in shekel-denominated capital and debt instruments.[9]

Nonresidents continued to invest in debt instruments, purchasing about $6 billion word, mainly in *Makam* on the Tel Aviv Stock Exchange.

In parallel, nonresidents invested about $3 billion in equities[10] on the Tel Aviv Stock Exchange in 2022, and purchased shekels through derivative instruments totaling about $3 billion.

Figure 4.12: Nonresidents' Estimated Net Transactions in Debt, Capital, and Derivative Instruments

$ billion



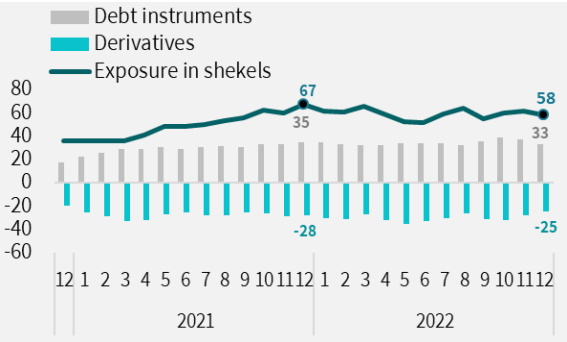
SOURCE: Based on reports to the Bank of Israel by financial institutions and business firms.

Despite foreign exchange sales (purchases of shekels), the balance of nonresidents' exposure to the shekel[11] in capital instruments and derivatives declined.

Nonresidents' exposure to the shekel declined by about $9 billion during the year, to about $58 billion in September. Most of the decline was due to declines in equity prices in Israel.

Figure 4.13: Nonresidents' Exposure to the Shekel in Debt, and Derivative Instruments

$ billion



SOURCE: Based on reports to the Bank of Israel by financial institutions and business firms.

[9] Debt instruments: bonds (excluding those of institutional investors), *Makam*, deposits, and loans that are not from parties at interest.
[10] Investment in equities includes direct investment and financial investment.
[11] See explanation in "Data Sources and Main Terms" at the end of this section.

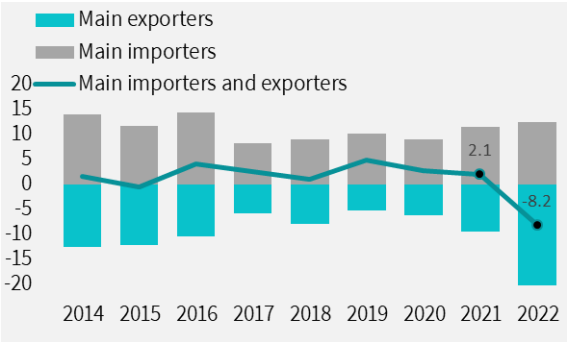
2.3 The business sector[12]

In view of the increase in services exports and the strengthening of the US dollar, the major export companies significantly increased their sales of foreign exchange.

Net foreign exchange sales by the major export companies totaled about $21 billion in 2022, and were partly offset by net foreign exchange purchases by the major import companies, which totaled about $12 billion
In contrast to previous years, the major import and export companies combined moved to total net foreign exchange sales of about $8.2 billion in 2022, as a result of the significant increase in the volume of sales by export companies.

Figure 4.14: Net Foreign Exchange Purchases by the Main Importers and Exporters[13]*

$ billion



SOURCE: Based on reports to the Bank of Israel by financial institutions and business firms.

2.4 The banking system[14][15]

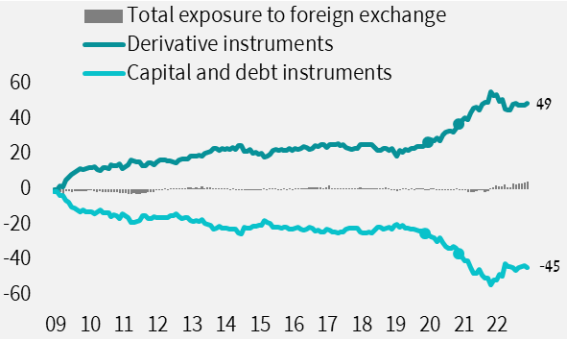
The banking system's liabilities in capital and debt instruments declined, while its assets in derivative instruments also declined. Exposure to foreign exchange totaled about $4 billion.

Since the beginning of 2022, the banks' surplus of liabilities in capital and debt instruments in foreign exchange declined by about $7.2 billion to about $45 billion, due to the decline in the public's foreign currency deposits.

In contrast, the banking system reduced its assets in derivative instruments in foreign exchange by about $4.1 billion, to about $49 billion at the end of the year. The most prominent counterparty opposite the banking system is the institutional investors, which increased their liabilities in derivative instruments in foreign exchange to about $68 billion.

Figure 4.15a: Net Foreign Exchange Assets of the Banking System and Total Exposure to Foreign Excvhange

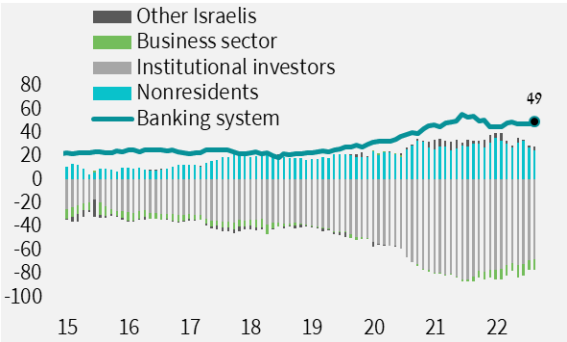
$ billion



SOURCE: Based on reports to the Bank of Israel by the banking system.

Figure 4.15b: The Banking System's Foreign Exchange Derivative Assets vis-à-vis Counterparties

$ billion



SOURCE: Based on reports to the Bank of Israel by the banking

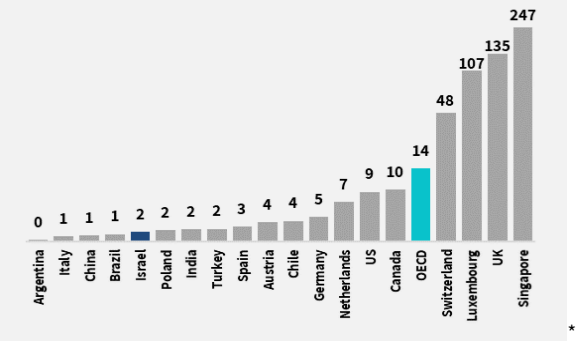
[13] * Including the 200 largest importers and exporters in the country
[14] The business sector includes all nonfinancial companies in Israel, including import and export companies.
[15] The domestic banking corporations.

ZOOM-IN

AN UP-CLOSE LOOK AT THE FOREIGN EXCHANGE TRADING VOLUME BY INTERNATIONAL COMPARISON[16]

Average daily trading volume in 2022 as a share of GDP is lower in Israel than in most OECD countries.[17]

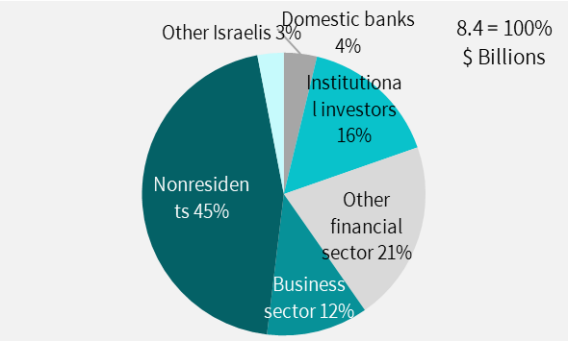
Figure 4.16: Average Daily Trading Volume in the Foreign Exchange Market as a Percentage of GDP, by Country
April 2022 daily average, percent



OECD countries - except Estonia, Iceland, and Slovenia
SOURCE: Based on BIS and reports to the Bank of Israel by the financial institutions and business firms.

The institutional investors account for just 16 percent of trading volume

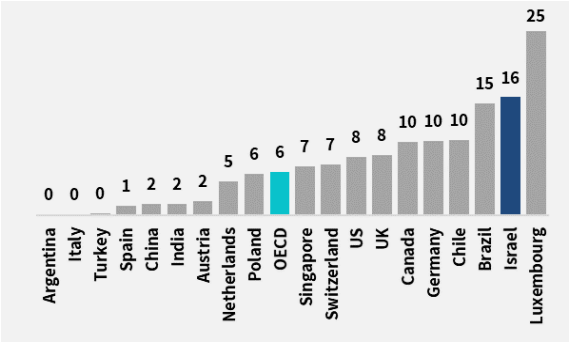
Figure 4.17: Average Daily Trading Volume* in the Foreign Exchange Market by Sector
(1)2022 daily average, percent



* Trading volume vis-à-vis the domestic banking corporations.
SOURCE: Based on BIS and reports to the Bank of Israel by the financial institutions and business firms.

However, the institutional investors'[18] share of trading volume is significantly higher than in the other countries.

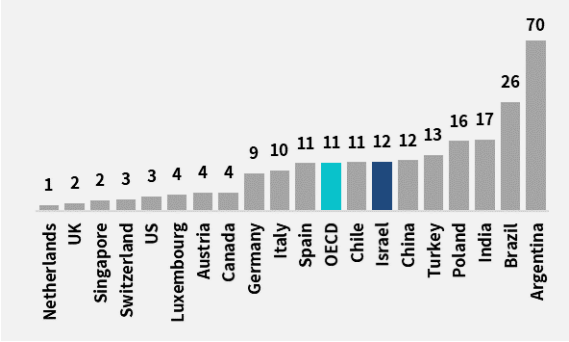
Figure 4.18: Institutional Investors' Share of Total Trading Volume in Foreign Exchange, by Country
April 2022, percent



SOURCE: Based on BIS and reports to the Bank of Israel by the financial institutions and business firms..

The business sector's share of trading volume (12 percent) is similar to the OECD average.

Figure 4.19: Business Sector's Share of Total Trading Volume in Foreign Exchange, by Country



*SOURCE: Based on BIS and reports to the Bank of Israel by the financial institutions and business firms.

[16] Once every three years, the BIS conducts a survey of trading data for April of that year among the world's commercial banks. The data are published as a representative month. The data for Israel are calculated as the monthly average during 2022.
[17] OECD countries, except for Estonia, Iceland, and Slovenia.
[18] Institutional investors such as mutual funds, pension funds, insurance and reinsurance companies, and endowments. Their primary motives for market participation are to trade FX instruments for hedging, investing, and risk management purposes. A common label for this counterparty category is "real money investors".

Main indicators in the foreign exchange market

	level				change			
	2019	2020	2021	2022	2019	2020	2021	2022
Actual volatility of the shekel/dollar exchange rate (moving 20-day average, percent)	4.1%	4.3%	9.0%	8.5%	-0.8	0.2	4.7	-0.5
Implied volatility of shekel/forex OTC options (percent)	5.4%	6.4%	7.8%	8.5%	-0.1	1	1.41	0.72
Shekel/dollar representative exchange rate	3.46	3.22	3.11	3.52	-7.8%	-6.9%	-3.3%	13.2%
Shekel/euro exchange rate	3.88	3.94	3.52	3.75	-9.6%	1.5%	-10.7%	6.6%
Dollar/euro exchange rate	1.12	1.22	1.13	1.07	-1.9%	-8.8%	-7.2%	-5.8%
Yen/dollar exchange rate	108.52	103.08	115.10	131.95	-1.2%	-5.0%	11.7%	14.6%
Nominal effective exchange rate (01.01/2010 = 100)	80.63	76.50	70.44	75.11	-8.1%	-5.1%	-7.9%	6.6%
Average daily trading volume - conversions, swaps and OTC options ($ million)[19]	6854	8145	9601	10418	-2.04%	18.84%	17.88%	8.51%
Nonresidents' share of trading volume	34.4%	40.3%	46.5%	41.4%	1.6	5.9	6.2	-5.1
Nonresidents' surplus of shekel assets ($ billion)	26	36	67	58				
Institutional investors' surplus of foreign exchange assets ($ billion)	86	120	127	102				
The banking system's surplus of foreign exchange assets ($ billion)	-0.3	-0.7	1.1	4.1				
Net foreign exchange purchases by institutional investors ($ billion)					-7	-2	-28	21.5
Net foreign exchange purchases by main exporters ($ billion)					-5.3	-6.2	-9.5	-20.6

[19] [1] The trading volume of the domestic banking corporations, excluding domestic branches of foreign banks.

DATA SOURCES AND MAIN TERMS

The Bank of Israel Information and Statistics Department manages a database of activity in the foreign exchange market. The Department gathers data and information on a daily basis from financial intermediaries in Israel and abroad regarding shekel-forex transactions, and processes them into a detailed a high-quality dataset that provides a broad picture of the foreign exchange market. The data are received from domestic banking corporations, domestic financial institutions, and foreign banks. In addition, this section makes use of reports by the institutional investors to the Ministry of Finance and the Bank of Israel, reports from the banking system to the Banking Supervision Department, and reports from banks and other financial intermediaries to the Bank of Israel.

Exposure to the exchange rate and derivatives

Exposure to the exchange (or exposure to foreign exchange) is the monetary amount at risk in a case of changes in the shekel exchange rate vis-à-vis foreign currencies. In terms of Israelis and the various sectors in the Israeli economy, this amount is estimated in this chapter by the surplus of their foreign exchange assets over foreign exchange liabilities (denominated in and indexed to foreign exchange). In terms of nonresidents, this amount is estimated by calculating the surplus of their shekel assets over shekel liabilities. An Israeli is exposed to appreciation of the shekel when he holds a surplus of foreign exchange assets (positive), and is exposed to a depreciation of the shekel when he holds surplus foreign exchange liabilities (negative asset surplus). Nonresidents' exposure works in the opposite direction.

Foreign exchange assets include: **balance-sheet assets** such as cash and deposits in foreign currency and foreign currency government and corporate bonds (generally foreign), and **off-balance-sheet assets**, meaning the open balance in transactions in **derivative financial instruments** (hereinafter: DFIs) for the purchase of foreign exchange against shekels, such as forward transactions and options (tradable and nontradable). Similarly, foreign exchange liabilities include **balance-sheet liabilities** such as foreign exchange loans, **off-balance-sheet liabilities**, meaning the open balance in DFI transactions for the sale of foreign exchange against shekels. Nonresidents' assets and liabilities in shekels are defined similarly.

Many Israelis, led by institutional investors, hold foreign assets as part of an investment policy of diversification of their asset portfolio and its risks. Such holdings, of foreign assets only, expose them to appreciation of the shekel. In order to minimize this exposure, they sell foreign exchange in DFI transactions (referred to as "**hedging**"). Exporters and importers are exposed to changes in the exchange rate due to their commercial activity—in opposite directions—and protect themselves through DFI transactions. Other Israelis, such as financial companies, may manage exposure to the shekel exchange rate with the intention of profiting from changes in the rate, by purchasing and selling foreign exchange against shekels in the present (spot) and in the future through DFI transactions. The nonresidents sector is comprised of various companies and individuals with
activity in shekels and a similar variety of motives

Implied volatility in foreign exchange options represents the expected volatility in the exchange rate. Assuming that the options market is efficient and that actors in the market price the options based on the Black-Scholes model, the implied volatility should include all the relevant information regarding future volatility of the exchange rate. It therefore serves as a market estimate of exchange rate volatility during the period remaining until the options expire.

The nominal effective exchange rate An index that reflects the relative price of the shekel vis-à-vis a basket of currencies. The weight of each currency in the index reflects its importance in Israel's foreign trade. The index is calculated as the geometric average of the shekel's exchange rate against 26 currencies representing the 33 countries that are Israel's major trading partners.