

Chapter 3

Monetary Policy and Inflation

- In 2017, the Consumer Price Index increased by 0.4 percent. While this rate is lower than the inflation target, annual inflation was positive for the first time since 2014. Inflation accelerated this year due to the market being in a full employment environment, and an increase in oil and commodity prices. The low level of inflation is a result of declines in prices of tradable goods due to the shekel's appreciation against the dollar, and of mainly supply side factors: increased competition and government-initiated price declines.
- One-year inflation expectations from the various sources ranged for most of the year below the lower bound of the inflation target. Forward expectations for the third year are slightly above the lower bound, and longer-term forward expectations are well-anchored within the target range. Even though inflation has deviated from the target for a prolonged period, the inflation target policy has so far remained credible.
- Since inflation is low, and since the economy is in a full employment environment for reasons having to do with financial stability, the Monetary Committee chose to balance various considerations and leave the interest rate unchanged at a low level of 0.1 percent. The Committee continued using two additional tools to meet its targets: intervention in the foreign exchange market, and forward guidance.
- In 2017, the Bank of Israel purchased about \$6.5 billion (\$1.5 billion of which was as part of the program to offset the effects of natural gas production on the current account), the vast majority of which was purchased in the first half of the year. Up-to-date studies have found that interventions in the foreign exchange markets have an effect on the exchange rate in the short and medium terms.
- In April, the Monetary Committee changed the text of its forward guidance. It moved from guidance based on the assessment of the future interest rate path to guidance that links the future interest rate path with developments in the inflation environment. This change was considered neutral by the markets.
- Between 2014 and 2017, a negative gap developed between inflation rates in Israel and those in most of the other OECD countries. This was partly a result of the fact that the Bank of Israel has engaged in less monetary accommodation than the significant accommodation adopted by many other central banks. The shekel's appreciation in those years is consistent with the gap in inflation (both actual and expected).
- In recent years, the volume of online purchases by households has increased, which is intensifying competition in the economy. An examination of the sub-components of the CPI that include goods with high rates of online purchasing shows sharper price declines in those components than in other tradable goods.

THE OBJECTIVE OF MONETARY POLICY

The Bank of Israel's objectives, as listed in the Bank of Israel Law, 5770–2010, are: (1) to maintain price stability over time—its central goal—which is defined by the government as an annual inflation rate of between 1 and 3 percent¹, and when inflation deviates from the target range, the Bank must adopt a policy that, in its assessment, will return it to within the range within a period of not more than 2 years; (2) to support other objectives of the government's economic policy—particularly growth, employment and the reduction of social gaps—provided that this support will not endanger price stability in the long term; and (3) to support the stability and proper functioning of the financial system. As of October 2011, monetary policy is determined by the Monetary Committee.²

The Bank of Israel operates within a flexible inflation target regime: When short-term inflation deviates from the target, policy makers act to gradually return it to the target range.

The generally accepted framework that the central bank has several goals, with the main one being to maintain price stability, is referred to globally as a “flexible inflation targeting” regime. In such a regime, when short-term inflation deviates from the target, policy makers act to gradually return it to the target range. This enables policy makers to achieve the Bank's other goals in parallel to maintaining price stability over the medium and long terms. There are a variety of tools available to the Bank in achieving its objectives, and the Bank enjoys independence in using those tools.

This chapter analyzes the inflation environment in the economy during 2017 and the policy steps adopted by the Monetary Committee in response to it and to other background conditions.

1. THE INFLATION ENVIRONMENT

There are a number of factors that affect the development of prices in a small and open economy such as Israel's, including shocks to aggregate supply that result from changes in the price of oil, commodities, and imported goods; the utilization of means of production (the gap between actual output and potential output and the gap between the unemployment rate and the natural unemployment rate); inflation expectations; and the response of monetary policy makers to these and expected developments.³

¹ This range came into effect in 2003. A target range was first set in 1992, in coordination between the government and the Bank of Israel, and declined gradually during the disinflation process that lasted for about a decade.

² Until October 2011, interest rate decisions were made by the Governor alone. Since October 2011, they are made by the Monetary Committee. The Committee consists of six members, led by the Governor, and its decisions are made by majority vote. In the case of a tie vote, the Governor has an extra vote. Since the interest rate decision in October 2017, the Monetary Committee has been operating with a full complement consisting of six members. Prior to that, from November 2014, the Committee operated with fewer than six members. Box 3.1 of the Bank of Israel Annual Report for 2011 presents a discussion of the composition of the Monetary Committee, its method of decision making, and the advantages and disadvantages of decision making by committee versus a single decision maker.

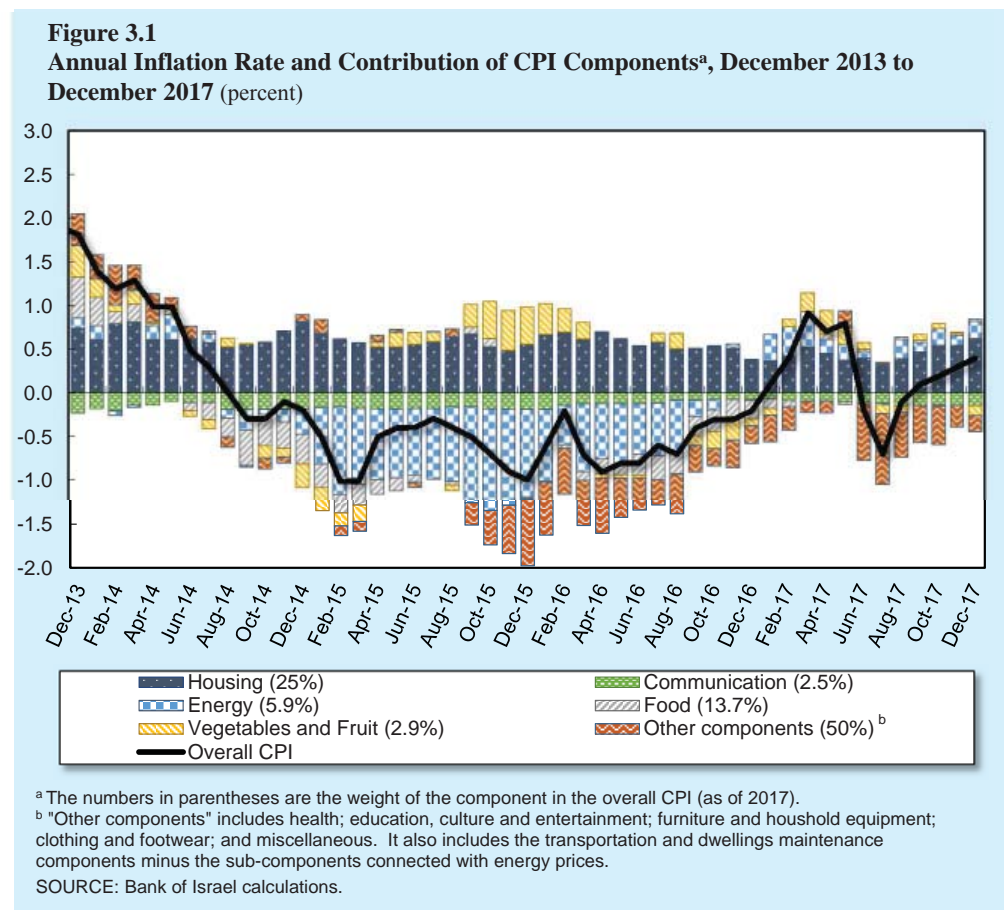
³ The link between inflation and the first three factors is referred to in the literature as the “Phillips Curve”. More discussion appears in Box 3.2 of the Bank of Israel Annual Report for 2016.

Alongside these forces, there are factors with long-term impacts operating in the background, including structural reforms intended to enhance competition and thereby lower prices in the economy; measures initiated by the government to reduce the cost of living; the expansion of the digital economy; and the globalization of the production and supply chains, which increases the global synchronization of prices.⁴ This section outlines the development of inflation in Israel in 2017 and its background factors.

a. The development of inflation

The Consumer Price Index increased by 0.4 percent in 2017 (rate of change, December compared with the previous December), and ended the year in positive territory for the first time since 2014. However, the deviation from the inflation target has continued for close to three-and-a-half years (Figure 3.1). Inflation did not develop uniformly in

In 2017, inflation continued to deviate from the target, although for the first time since 2014, inflation for the year was positive.



⁴ See, for instance: R. Auer, C. Borio, & A. Filardo (2017), "The Globalisation of Inflation: The Growing Importance of Global Value Chains", CEPR Discussion Paper 11905; R. Auer, A. A. Levchenko, & P. Sauré (2017), "International Inflation Spillovers through Input Linkages", CEPR Discussion Paper 11906.

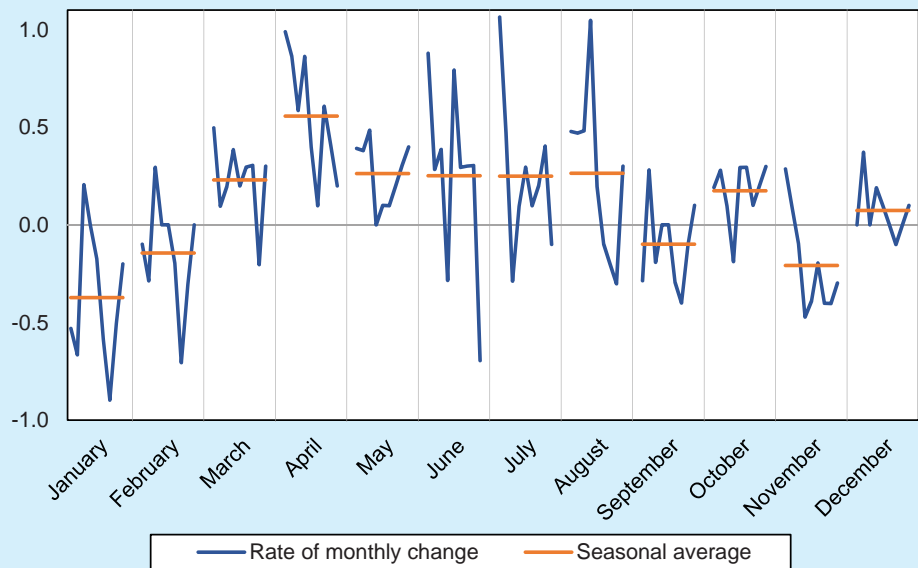
the past year. The upward trend that began in mid-2016 continued until March 2017, during which time inflation increased from about -1 percent in April 2016 to close to 1 percent between March and May 2017. This trend was cut off in June and July, when the inflation rate declined sharply and returned to the negative values observed in 2014–16. In the months therefore, the decline was partly corrected, and 2017 ended with inflation that was positive, but below the lower bound of the target range.

Inflation increased during the year because the housing component (which measures rental prices) accelerated and contributed 0.6 percentage points to the CPI, and because energy prices increased due to an increase in oil prices, contributed 0.2 percentage points. These price increases offset the effect of the shekel’s appreciation on tradable goods and the effect of the communications component, the latter of which subtracted 0.1 percentage points from the CPI.

The volatility of inflation in the past year, particularly the 1.5 percentage point mid-year decline in annual inflation, apparently reflected statistical noise and technical elements. Figure 3.2 details the seasonal path of the monthly rates of change in the CPI between 2009 and 2017, and shows that in the summer months, particularly in June, the Index readings are much more volatile than in other months, and extra caution should be used in considering them as indicators of the inflation environment. This is particularly the case regarding the index for June 2016 and June 2017.

The June 2017 index reading was negative, and significantly lower than the June 2016 reading. As such, when the low index reading (June 2017) enters, and the high index reading (June 2016) exits, yearly inflation drops sharply. However, despite

Figure 3.2
The Seasonal Path of Monthly Inflation, January 2009 to December 2017 (percent)

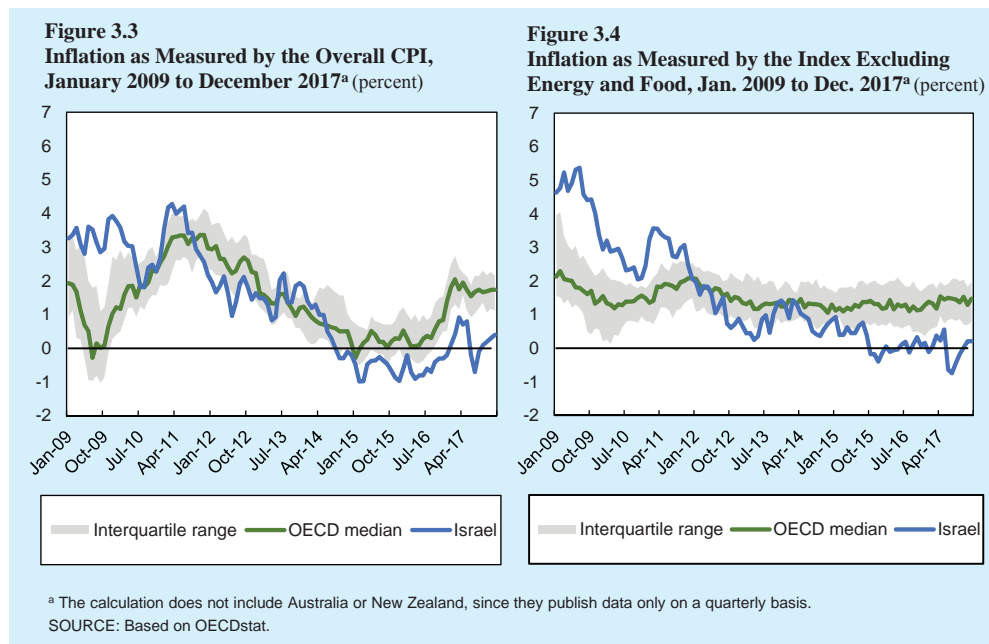


SOURCE: Based on Central Bureau of Statistics.

the decline in inflation, the professional forecasters' projections of the development of inflation in the coming year has remained relatively stable. While expectations derived from the capital market declined temporarily, they returned to their May levels by the end of the year; inflation returned to an upward path; and real economic activity, particularly consumption, remained strong. These developments support the assessment that the decline in inflation in the middle of the year reflected statistical noise and technical elements.

The increase in inflation in Israel between the second half of 2016 and June 2017 was consistent with the increase in most of the other OECD countries (Figure 3.3), which shows that it is in line with global factors, chiefly the increase in global oil, metals and food prices. The correlation is much less prominent when we look at inflation on the index excluding energy and food components (Figure 3.4). The sharp decline in annual inflation in Israel in June and July 2017 stood in contrast with stability in most of the other OECD countries, and led to a negative peak in the gap between Israel and the OECD median in both the overall index and the index excluding the energy and food components.

The increase in inflation was in line with the trend in most OECD countries, with global factors, chiefly the increase in oil prices, acting in the background.



b. External pressure on prices

The Tradable Goods Index (37 percent of the overall CPI) weights the prices of goods that are of a tradable nature, meaning imported goods or import alternatives. The prices of those products are affected by the global prices of raw materials, through their effect on the cost structure of firms, and also by the shekel exchange rate, through its effect on import prices. In recent years, the prices of tradable goods have also been

The appreciation of the shekel contributed significantly to the decline in the tradable goods price index, but in contrast with previous years, energy prices contributed to an increase in that index.

affected by measures taken by the government to increase competition in the field of these products and to lower their prices.

The Tradable Goods Index declined by 1.1 percent in 2017, after declining by 1.7 percent in 2016. The appreciation of the shekel contributed significantly to the decline, but in contrast with the situation in previous years, energy prices made a positive contribution to this index.

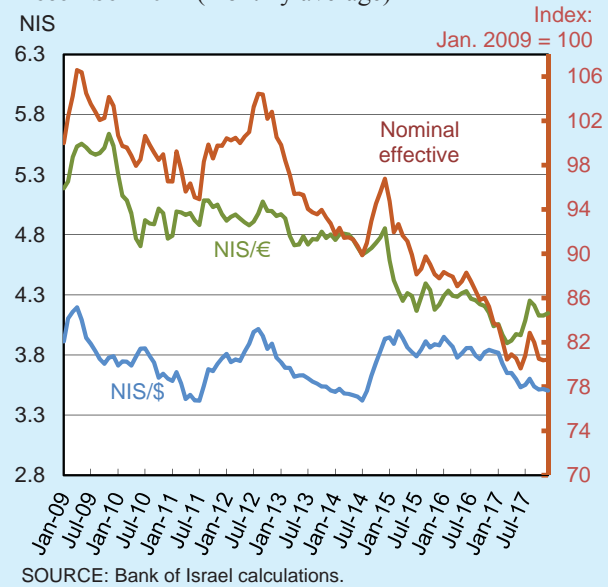
(1) *The exchange rate*

The shekel appreciated by 3.9 percent in terms of the nominal effective exchange rate in 2017, after appreciating by 4.6 percent in 2016 (Figure 3.5). The effective appreciation in 2017 was mainly the result of the shekel's appreciation against the US dollar (8.5 percent), which was slightly offset by the shekel's depreciation against the euro (2.7 percent).

Both in Israel and abroad, it is common to analyze how the exchange rate affects inflation through the nominal effective exchange rate—an average of bilateral exchange rates, weighted according to

the weight of trade between the country and various other countries or currency areas.⁵ However, there is empirical evidence that the dollar is becoming the dominant currency in analyzing the volume and prices of world trade, and this phenomenon is part of the rise of the dominant currency paradigm.⁶ This concept posits that the exchange rate of the local currency vis-à-vis the dollar plays a central role in determining the volume and price of world trade, since most international trade transactions are denoted in dollars whether the parties to the transaction include the United States or not. This leads to a situation where import and export prices are mostly sticky in terms of the

Figure 3.5
NIS/\$ Exchange Rate, NIS/€ Exchange Rate and Nominal Effective Exchange Rate, January 2009 to December 2017 (monthly average)



⁵ The weights were recently recalculated. See L. Gallo and A. Friedman (2015), “The Effective Exchange Rate in Israel”, Bank of Israel Research Department.

⁶ See C. Casas, F. J. Díez, G. Gopinath, & P. O. Gourinchas (2016), “Dominant Currency Paradigm”, National Bureau of Economic Research Working Paper No. w22943.

dominant currency (the dollar) in the short-to-medium term.⁷ In particular, changes in the exchange rate vis-à-vis the dominant currency were found to have a high pass-through in the short-to-medium term to the price and volume of imports and exports, regardless of the destination or source. In contrast, changes in the bilateral exchange rate with the trading counterparty have a low pass-through.⁸

A Bank of Israel Research Department analysis shows that the dominant currency paradigm may also be relevant for the Israeli economy.⁹ The analysis found that the dollar is dominant in explaining the changes in Israel's foreign trade prices, and there is a large gap between it and the other currencies, including the euro.¹⁰ In particular, in regressions that try to explain the contemporaneous changes in Israel's import prices, the dollar coefficient has a high level of statistical significance, and its marginal contribution to explaining the variance of import prices is significantly higher than the contribution of the other currencies, including the euro. Moreover, its coefficient in the regression is higher than the weight given to it in calculating the nominal effective exchange rate—about 70 percent compared with 25 percent (Table 3.3). In contrast, the coefficient of the euro is similar to its weight in the nominal effective exchange rate.¹¹ A study conducted by the Israel Export Institute also shows the relevance of the dominant currency paradigm. The study found that, similar to the situation in many other countries, most of the foreign trade transactions in Israel are denominated

⁷ This is a nominal phenomenon by nature, and it is expected to dissipate in the long term, since by then the prices will align with the new exchange rate and structural factors such as production costs, the pricing power of the exporting country, and so forth. According to the dominant currency paradigm, monetary policy makers are capable of improving the well-being of individuals in the economy by reducing the distortions that price stickiness cause to purchasing power parity in the short-to-medium term.

⁸ Boz et al. (2017) estimate that when the importing country's currency depreciates by 1 percent vis-à-vis the dollar, the import prices of goods in terms of the domestic economy increase by 0.78 percent even if the regression corrects for the bilateral exchange rate with the trading partner. However, when there is a depreciation of 1 percent vis-à-vis the currency of the source country, the import price increases by just 0.16 percent if the regression controls for the exchange rate vis-à-vis the dollar. See E. Boz, G. Gopinath, and M. Plagborg-Møller (2017), "Global Trade and the Dollar," IMF Working Papers, vol. 17(239).

⁹ E. Argov (2017), "Estimating the 'Weighted' Exchange Rate by a Foreign Trade Price Regression", internal memo.

¹⁰ We used the shekel import prices derived from the quarterly National Accounts data, and in this case, the import aggregate includes consumer goods but also investment goods and raw materials. In order to partly neutralize the effect of changes in the prices of raw materials, we included the changes in oil prices in the comparison to import prices. Since these prices are not seasonally adjusted, we included a dummy variable for the quarter in the regression. The estimation period is from the first quarter of 2000 to the fourth quarter of 2016. The results are not sensitive to the replacement of prices derived from the National Accounts with the monthly index of import prices of consumer goods derived from foreign trade data.

¹¹ It should be emphasized that the regression does not include all of the currencies used in calculating the nominal effective exchange rate, and the dollar coefficient therefore apparently represents currencies that are strongly correlated with it or currencies that were indexed to it in the past (such as the Chinese yuan). In general, regressions such as the one we ran focus on the explanatory level of the currency (in terms of statistical significance and R²) and less on the size of the coefficient, inter alia for the reasons mentioned earlier in this note.

Table 3.1
Main indicators of inflation and monetary policy, 2013–17

	2013	2014	2015	2016	2017	2017				
						Q1	Q2	Q3	Q4	
A. Inflation (percent)										
1. Inflation target	1-3	1-3	1-3	1-3	1-3					
2. Actual inflation ^a	1.8	-0.2	-1.0	-0.2	0.4	0.1	-0.1	0.3	0.1	
3. Inflation net of government interventions ^b	1.1	-0.2	0.1	0.0	0.7	0.2	0.0	0.4	0.1	
4. Direct impact of government interventions ^b	0.7	0.0	-1.1	-0.2	-0.3	-0.1	-0.1	-0.1	0.0	
5. Seasonally adjusted quarterly inflation ^c						0.3	-0.9	0.4	0.1	
6. One-year inflation expectations derived from capital market ^d	1.8	1.2	0.6	0.3	0.2	0.0	0.4	0.3	0.3	
7. Ten-year inflation expectations derived from capital market ^d	2.3	2.3	2.1	2.3	2.3	2.3	2.1	2.3	2.4	
8. Forecasters' one-year inflation forecasts ^d	1.8	1.3	0.8	0.6	0.6	0.6	0.6	0.6	0.6	
B. Yields (percent)^d										
1. Bank of Israel declared interest rate	1.4	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
2. One-year real yield to maturity on government bonds ^e	-0.3	-0.7	-0.5	-0.1	-0.1	0.2	-0.3	-0.2	-0.2	
3. Ten-year nominal yield to maturity on government bonds ^f	4.0	3.1	2.2	2.0	2.1	2.4	2.2	1.9	1.9	
4. Ten-year real yield to maturity on government bonds ^f	1.7	1.0	0.5	0.4	0.6	0.8	0.7	0.4	0.4	
C. Change in the shekel exchange rate (percent)^g										
1. Nominal effective	-7.8	4.4	-9.3	-4.6	-3.9	-3.9	-1.0	2.9	-1.9	
2. Vis-à-vis the dollar	-7.2	12.3	-1.4	-1.4	-8.5	-4.7	-3.2	0.2	-1.0	
3. Vis-à-vis the euro	-3.1	1.1	-13.1	-4.3	2.7	-3.5	1.7	6.3	-1.6	
D. Asset prices (percent)										
1. Overall yield on shares (nominal) ^g	15.3	11.5	6.8	-11.0	-1.1	-1.4	2.0	-6.1	4.7	
2. Home prices	7.3	4.3	7.9	5.7	1.2	1.2	1.5	0.4	-1.8	
E. The monetary aggregates (nominal rates of change)^g										
1. M1 money supply	15.2	35.6	40.7	17.2	12.6	2.6	3.6	3.5	2.4	
2. M1 + SRO ^h + unindexed deposits of up to one year (M2)	6.6	8.4	13.6	7.9	8.1	2.9	2.7	2.3	0.0	
F. Other background data (percent, seasonally adjusted quarterly data)										
1. Unemployment rate	6.2	5.9	5.3	4.8	4.2	4.3	4.4	4.1	4.2	
2. GDP growth rate ⁱ	4.2	3.5	2.6	4.0	3.4	1.2	2.9	4.0	3.6	

^a Change in CPI during the period.

^b The index adjusts for the impact of major government measures on the index. In 2017, these measures included lowering the cost of compulsory vehicle insurance, increasing taxi and electricity prices, cancelling customs duties on cellular devices, lowering water prices, lowering phone prices to small suppliers, and lowering the costs of after-school childcare.

^c As calculated by the Bank of Israel Research Department (see article on page 20 of Inflation Report No. 30, January to March 2010).

^d Period average

^e Based on the zero coupon yield curve. Period average.

^f Gross yield, based on the zero coupon yield curve. Period average.

^g Average of last month in period compared with average of last month in previous period. Minus sign refers to appreciation of the shekel.

^h Self-Renewing Overnight Deposit (Current Credit Deposit).

ⁱ Annual average compared with average of previous year

SOURCE: Bank of Israel Research Department and Central Bureau of Statistics.

Table 3.2
Development of prices, by various components^a, 2013–17

Period	Consumer Price Index		Fruit and Vegetables (2.9%)		Food (13.7%)		Housing (25.0%)		Dwellings Maintenance (9.4%)		Furniture and Household Equipment (3.7%)		Clothing and Footwear (3.2%)		Education, Culture and Entertainment (11.9%)		Health (5.8%)		Transport and Communication (19.3%)		Miscellaneous (5.0%)		Energy Index ^b (5.9%)		Index excluding energy, food, and fruit and vegetables (77.5%)		Index excluding energy, food, fruit and vegetables, and net of government-initiated price changes (77.5%)		Tradable component of the index (37%)		Nontradable component of the index (63%)		Seasonally adjusted index ^c					
	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change	Index	Change						
2013	1.8	11.8	3.3	2.9	3.9	-1.8	2.2	0.8	4.5	1.6	1.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8			
2014	-0.2	-9.3	-2.5	3.1	0.0	-3.7	0.4	0.8	-0.5	-3.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
2015	-1.0	13.2	-0.1	2.2	-5.5	-1.7	-0.8	-0.3	0.1	-13.7	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	
2016	-0.2	-2.7	-1.5	1.4	0.5	-2.4	0.7	0.8	0.7	-0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2017	0.4	-3.8	0.2	2.4	1.1	-3.8	0.1	1.0	-0.9	3.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
2017																																						
January	-0.2	-0.1	0.5	-0.5	1.2	-0.3	-0.5	-0.1	-0.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
February	0.0	3.9	0.3	0.3	0.2	0.6	0.0	0.1	-0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
March	0.3	-0.1	0.0	0.8	0.0	-0.3	0.6	0.2	-0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
April	0.2	1.6	0.1	-0.1	0.2	-0.3	0.8	-0.2	0.4	-0.2	-1.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
May	0.4	1.6	-0.3	-0.3	0.2	0.2	10.9	0.1	0.0	0.1	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
June	-0.7	-6.9	-0.1	0.2	-1.1	-1.0	-0.2	0.4	-0.5	-0.1	-0.2	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
July	-0.1	-0.1	-0.2	0.9	-0.1	-0.9	0.0	0.3	0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
August	0.3	1.5	0.2	0.6	0.1	-0.2	1.0	-0.1	0.3	0.1	1.8	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
September	0.1	2.9	0.0	0.4	-0.1	0.5	-0.4	0.2	-0.3	-0.6	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
October	0.3	1.4	0.3	0.0	0.2	-0.6	6.1	0.1	0.2	0.2	0.8	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
November	-0.3	-5.5	-0.1	-0.1	0.1	-0.3	2.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
December	0.1	-3.3	-0.5	0.2	0.2	-1.1	4.3	0.0	-0.6	-0.3	0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

^a The numbers in parentheses in the column headings refer to the weight of the item or of the partial index in the CPI as of 2017.

^b The energy component includes vehicle fuels and oils, and household electricity, natural gas and diesel.

^c As calculated by the Bank of Israel Research Department (see Box 1 in the Inflation Report for the first quarter of 2010).

SOURCE: Based on Central Bureau of Statistics.

Table 3.3

Results of the Regression of Import Prices (Excluding Diamonds) in Israel on the Exchange Rate Against Selected Currencies Compared with Those Currencies in the Nominal Effective Exchange Rate, 2000:Q1 to 2016:Q4

	USD	EUR	GBP	YRT	JPY	Adjusted R ²
Coefficients ^a	68.9	21.5	7.5	-0.4	2.6	0.61
Standard deviation of the coefficients	(10.4)	(10.8)	(11.3)	(3.7)	(7.2)	
Weight in the official effective exchange rate ^b	26.4	26.4	6	4.6	2.3	

^a The sum of the coefficients is limited to 100.

^b The weights do not total 100 because the nominal effective exchange rate includes other currencies in addition to those that appear in the table.

SOURCE: Based on Central Bureau of Statistics.

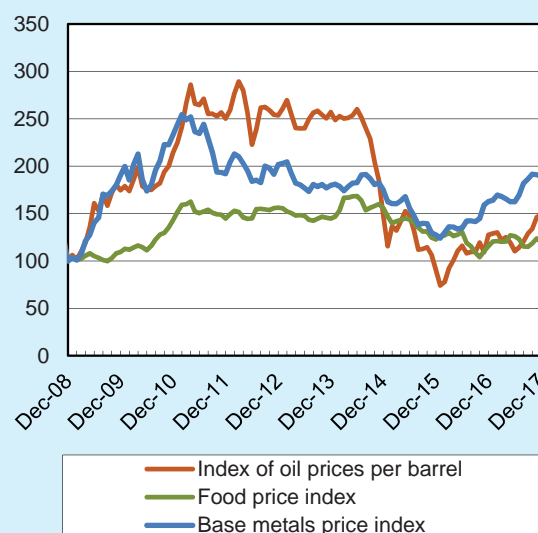
in dollars.¹² About 71 percent of Israel's imports in 2014–16 were denominated in dollars, while just 22 percent were denominated in euros. However, the euro and the dollar are given equal weight in the basket of currencies in the effective exchange rate.

(2) Commodity prices

Commodities are the raw materials for production, and their prices therefore have an effect on the cost of production and, through it, on prices in the economy. In 2017, the price of “Brent” crude oil increased by about 16 percent, to about \$65 per barrel, completing an increase of about 100 percent since the beginning of 2016. Base metal prices also continued to increase—by about 16 percent in 2017, and by about 60 percent since the beginning of 2016.

¹² Israel Export Institute (2017), “Developments and Trends in Israeli Exports – Summary Report for the First Half of 2017”.

Figure 3.6
Global Price Indices of Oil, Food, and Base Metals,
January 2009 to December 2017
(Index: Dec. 08 = 100)

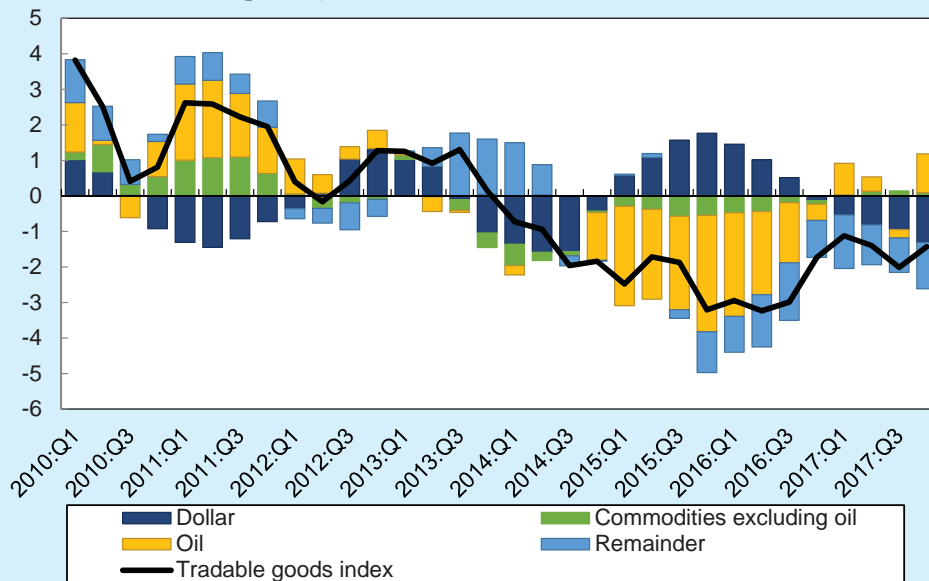


SOURCE: Based on Bloomberg.

(3) *The pass-through to tradable goods prices*

In order to quantify how the appreciation of the shekel and the changes in the prices of raw materials affect inflation of the Tradable Goods Index, we estimated a pass-through equation that relates inflation of the Tradable Goods Index to oil prices, the shekel-dollar exchange rate, and commodity prices. We found that the increase in oil prices added about one percentage point to the inflation recorded in the Tradable Goods Index in 2017, but the appreciation of the shekel offset all of the increase since it subtracted 1.3 percentage points from inflation (Figure 3.7). The contribution of other commodity prices was near zero.

Figure 3.7
Annual Inflation of the Tradable Price Index - Breakdown by Contribution^a,
2010:Q1–2017:Q4 (percent)



^a The contributions are obtained from a regression of the quarterly rate of change in the tradable price index on the intercept, three seasonal coefficients and four lags of the quarterly rate of change in (1) the NIS/\$ exchange rate; (2) the price of oil; and (3) the price of commodities excluding oil.

SOURCE: Bank of Israel calculations.

It should be noted that the factors mentioned here explain only part of the change in tradable goods prices. (The unexplained part is referred to in the figure as the “residual”, and its contribution is -1.3 percentage points.) It is likely that at least some of the unexplained decline reflects the decline in margins in the tradable sector in the local market—for instance in the areas of clothing, and electrical and electronics

products—as a result of changes in consumer behavior, and the effect of measures taken by the government with the aim of lowering the cost of living.¹³

c. Domestic pressures on prices

(1) The labor market

In 2017, the Israeli labor market continued showing strength, which apparently made a positive contribution to inflation. There are a number of indications that the economy is in a full employment environment: The unemployment rate fell to a low of 3.7 percent (the 2017 average among the prime working ages (25–64) population); nominal wages continued to increase, by 3.1 percent per year (the average annual rate of increase in 2017, see Figure 3.8), together with moderation in the rate of increase of salaried positions; and the job vacancy rate continues to increase, both relative to the number of unemployed, and relative to the number of positions in the business sector (for more discussion, see Chapter 2). The unit labor cost also increased, contributing to the increase in prices, and it is expected that it will continue to contribute to it in the future (for more discussion, see Chapter 5).

Figure 3.8
Annual Rate of Growth of Nominal and Real Wages in Israel, January 2011 to December 2017 (percent)



SOURCE: Bank of Israel calculations.

(2) Consumer behavior

In recent years, there has been a significant prolonged increase in the rate and volume of online purchases. The prices of products that are characterized by a relatively high volume of online purchases have shown sharper declines than the prices of other tradable goods (see Box 3.2).

¹³ Chapter 1 presents an analysis in this spirit at the level of the main components of the index. It focuses on the effect of competition and the measures taken by the government to lower the cost of living. Box 3.2 presents an international comparison of changes in the prices of components characterized by a high level of online purchases.

(3) Government measures to lower the cost of living

As stated above, government measures to lower the cost of living also contributed to the low inflation in 2017. Government intervention included, for instance, enhancing competition in compulsory vehicle insurance, lower the cost of water, cancelling import duties on cellular devices, and subsidizing after-school child care. According to Bank of Israel Research Department assessments, these measures lowered the Consumer Price Index by about 0.3 percentage points in 2017, similar to their effect in 2016 (Table 3.1). It should be emphasized that the estimate reflects only the direct effect of the measures. It does not internalize the demand-side response to the measures, and does not include possible indirect effects, such as a decline in inflation expectations due to expectations that the interventions will continue.

Government measures to reduce the cost of living lowered the Consumer Price Index by about 0.3 percentage points this year, similar to their effect in 2016.

d. Core inflation

When monetary policy makers assess the inflation environment, they generally try to look at it “through” price shocks that do not reflect the business cycle. To illustrate, while changes in energy prices affect domestic inflation, they are determined abroad, and policy makers cannot influence them. Similar considerations may apply to other volatile components of the CPI. Food components depend on commodity prices abroad, and fruit and vegetable prices are sensitive to weather conditions. For this reason, many central banks tend to monitor an estimate that neutralizes such effects: core inflation.¹⁴

Even though core inflation is based on a relatively simple idea, there is no agreement regarding how it is to be calculated. The most common approach excludes the energy and food components from inflation.¹⁵ Alongside that, there are approaches of a more statistical nature, which exclude components that have exceptional price changes, or seek the common component that drives price changes in the components of the CPI.

In Israel, there is no commonly accepted definition of core inflation, and the Bank of Israel does not explicitly relate to it in its announcements (although it does relate to several partial indices).¹⁶ Since there is no single accepted method for measuring

¹⁴ There is theoretical justification in the literature for a slightly different definition of core inflation. In a standard neo-Keynesian model with heterogeneity in the level of price stickiness of goods in the economy, it is optimal to stabilize the inflation rate of a price index that puts more weight on products with high price stickiness. See K. Aoki (2001), “Optimal Monetary Policy Responses to Relative-Price Changes”, *Journal of Monetary Economics* 48, 55–80.

¹⁵ In contrast with Israel, many countries include fruit and vegetables in the food component.

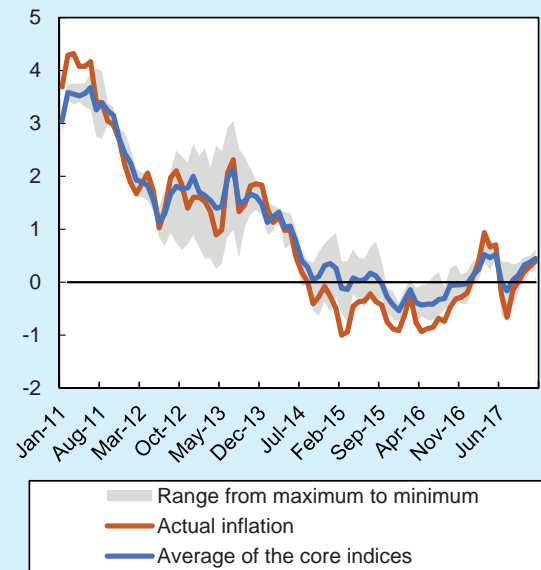
¹⁶ Policy makers in other countries use core inflation. In the US, for instance, inflation of private consumption prices (PCE) excluding energy and food is used. The Bank of Canada publishes three different statistical core indices, through which it estimates the inflation environment.

core inflation, we will use the simple average of a number of indices¹⁷, with the assumption that while each of them provides a noisy estimate on its own, averaging them all together should provide a better overall estimate.

Figure 3.9 shows this average estimate (in blue) alongside the annual inflation rate in Israel (in orange). The gray area denotes the range between the maximum and minimum values that these indices obtain each month, and constitutes an estimate of the uncertainty in measuring core inflation. The Figure shows that beginning in the second half of 2014, core inflation ranged close to zero. Until 2017, actual inflation was

below the average of core inflation, and in the first half of 2017 it surpassed it. This means that actual observed inflation over most of the period apparently reflected an underestimation of core inflation due to the effects of volatile factors. However, at the end of the sample, during 2017, annual inflation is very close to core inflation (and even surpassed it in March–May 2017). The Figure also shows that despite the sharp correction recorded in June, inflation has generally been in an upward trend since the end of 2015. In 2017, core inflation totaled 0.4 percent, similar to actual inflation, and the range of individual estimates ranged between 0.2 percent (inflation of the index excluding energy, food, and fruit and vegetables) and 0.6 percent (the trimmed index¹⁸).

Figure 3.9
Annual Inflation and the Core Indices^a, January 2011 to December 2017 (percent)



^a Details on the core indices appear in footnote 17.
SOURCE: Bank of Israel.

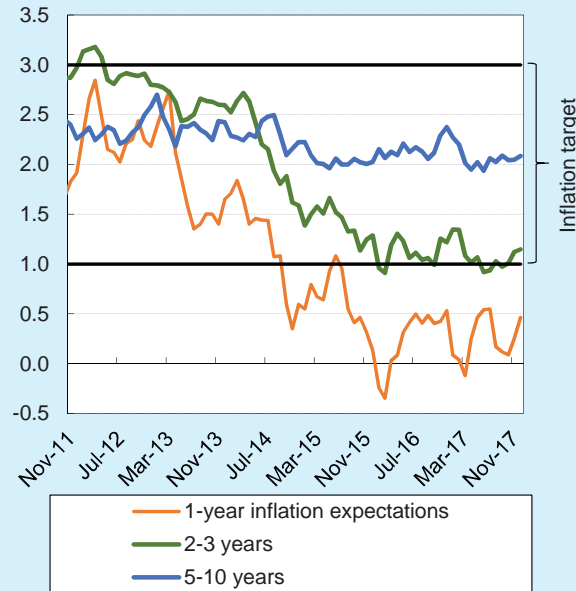
¹⁷ These core indices include: (1) inflation excluding energy, food and fruit and vegetables; (2) inflation with a monthly adjustment for components that have sharp price changes (“the trimmed index”); (3) inflation based on median price changes of the index’s components (“median index”); and (4) inflation based on the first common component estimated through a principal component analysis. Details appear in S. Ribon (2009), “Core Inflation Indices for Israel”, Discussion Papers Series 2009.08, Bank of Israel Research Department.

¹⁸ See note 17.

e. Inflation expectations

One-year inflation expectations derived from the various sources (the capital market, professional forecasters, and the commercial banks' internal interest rates) were positive for most of the year, but ranged below the lower bound of the target—around 0.3 to 0.5 percent. One-year-forward expectations in one year (expectations for 1–2 years) remained below the lower bound of the target during the year, and were 0.8 percent at the end of the year. Forward expectations for terms of three years or more remained anchored within the target range during the year (Figure 3.10).

Figure 3.10
One-Year and Forward Inflation Expectations
from the Capital Market, November 2011 to
December 2017 (percent)



SOURCE: Bank of Israel calculations.

The public's expectations regarding the future development of inflation affect inflation in the present. To illustrate, workers' expectations regarding future inflation affect their wage agreements in the present. In 2014, when inflation in Israel began to decline and even entered negative territory, a concern was raised about deflationary feedback—a process where negative inflation raises real interest rates, which acts to moderate demand and leads to a decline in inflation, and then repeats.¹⁹ It is reasonable to hypothesize that the fact that inflation expectations in Israel and abroad—particularly long-term expectations—remained anchored around the inflation target in the years following the Global Financial Crisis was part of what prevented a deflationary spiral.²⁰

Even though annual inflation in Israel has deviated from its target since mid-2014, inflation expectations for the medium-to-long term have remained anchored around the inflation target, showing that the public has maintained its confidence in the central

Medium-to-long term inflation expectations remained anchored within the target range, showing that the public trusts in the central bank's ability to return inflation to the target.

¹⁹ The risks of deflation are discussed in the Bank of Israel Annual Report for 2015.

²⁰ When expectations are well-anchored around the target, they show that monetary policy enjoys great credibility. This is desirable, since it contributes to reduced short-term volatility. An in-depth discussion of the stability of inflation in the major economies in the years following the Global Financial Crisis, and its connection to the credibility of the central bank, can be found in David Miles, Ugo Panizza, Ricardo Reis and Ángel Ubide (2017), "And Yet it Moves: Inflation and the Great Recession", *Geneva Reports on the World Economy*, CEPR.

bank’s ability to return inflation to within the target. This conclusion is mainly based on the fact that forward expectations derived from the capital market for these time ranges—from the third year onward—are within the target range (Figure 3.10).

Another indication of how anchored inflation expectations are can be found in the level of uncertainty surrounding the forecast. When expectations are anchored, there is relatively low uncertainty surrounding them. One accepted estimate of this uncertainty is the extent of disagreement between forecasters, and is obtained from the level of spread of their forecasts. When expectations are anchored, there is little disagreement (low spread), and when there are sharp turnarounds in inflation, there is general disagreement (high spread). In order to examine the level of disagreement, we used individual inflation forecasts from two sources—the financial forecasters, and the Bank of Israel Companies Survey. We measured the disagreement between the financial forecasters according to the gap between the second-highest forecast and the second-lowest forecast. In order to measure the disagreement in the Companies Survey, we took the distribution of the forecast in the survey and calculated the gap between the forecast of the 75th percentile and that of the 25th percentile.

Figures 3.11 and 3.12 show the results. The Figures show that during the period after the Global Financial Crisis, there was no significant change in the extent of disagreement among the two forecasting sources. The disagreement among the forecasters ranged stably between 0.5 and 1 percent from the end of 2009 until the end of the sample, and the disagreement in the Companies Survey ranged around 1 percent in recent years. To compare, during the years of the crisis (2008–9), there was a significant increase in the extent of disagreement among the forecasters.

Figure 3.11
Extent of the Disagreement on the 1-Year Inflation Forecasts in the Companies Survey^a, March 2007 to September 2017 (percent)

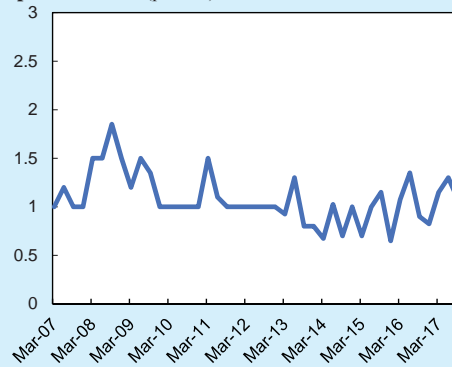
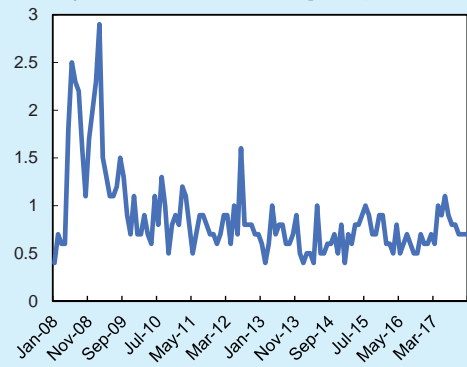


Figure 3.12
Extent of the Disagreement on the Inflation Forecast Among the Financial Forecasters^a, January 2008 to December 2017 (percent)



^a The disagreement among companies – the difference between the 25th and 75 percentiles of the distribution of the 12-month forward forecast. The dispute among the forecasters – the difference between the second-highest forecast and the second-lowest forecast.
SOURCE: The Bank of Israel Companies Survey and the Bank of Israel's survey of financial forecasters.

While annual inflation has been lower than the target for the past three-and-a-half years, expectations for the medium and long terms are anchored within the target range, and there is marked stability in the disagreement indices of the professional forecasters and firms. As such, we can conclude that individuals have understood the sources of the shocks that have hit the domestic economy, and are of the assessment that those shocks will have only a short-term effect on inflation. It seems that the public does not believe that the central bank has lowered the weight that it gives to stabilizing inflation in order to achieve other targets, or that it does not have the ability to return inflation to the target range.

2. MONETARY POLICY

In 2017, the Monetary Committee left the interest rate unchanged and used two other policy tools: foreign exchange purchases, and forward guidance. The mix of tools was chosen with the aim of supporting the return of inflation to the target range and supporting real economic activity, mainly that of the tradable sector, while maintaining the stability of the financial system against the continued increase in home prices and increasing risk in the corporate bond market.

a. Policy measures taken in 2017

Like in previous years, monetary policy makers were required in 2017 to balance the need to strive for the price stability target with the need to manage the risks inherent in accommodative monetary policy, taking into account that the economy is in a full employment environment. The need to return inflation to the target range supported taking additional accommodative measures. However, the risks to financial stability—the low spreads in the corporate bond market and the continued increase in home prices despite the significant moderation in activity²¹—supported monetary tightening.

In order to balance these needs, the Bank of Israel left the interest rate unchanged at the low level of 0.1 percent; continued purchasing foreign exchange, mainly in the first half of the year; and changed the formulation of the forward guidance in the interest rate decisions. The foreign exchange purchases make it possible to engage in monetary accommodation that is focused on the tradable sector, since such purchases moderate the pressure for appreciation of the shekel and should thereby contribute to an increase in inflation without directly affecting asset prices or financial stability. The forward guidance policy affects the yield curve through the channel of expectations.²²

Policy makers must strike a balance between the need to achieve the price stability target and the need to manage the risks inherent in accommodative monetary policy, taking into account that the economy is in a full employment environment.

²¹ In both the number of transactions and the volume of new mortgages taken out.

²² See the broader discussion in Bank of Israel (2014), “Unconventional Monetary Policy—Goals and Means”, *Monetary Policy Report* 40 (July–December 2013); and in Bank of Israel (2015), “Forward Guidance: Experience Accumulated Worldwide”, *Recent Economic Developments*, 138 (April–September 2014).

The Monetary Committee left the monetary interest rate unchanged at its low level this year, while continuing the Bank's foreign exchange purchases and the use of forward guidance.

The Bank of Israel's response to the low inflation has been characterized by moderation relative to the response of many other central banks, mainly in Europe. Those other central banks have taken other unconventional measures, including quantitative easing and negative interest rates.²³ The Bank of Israel's Monetary Committee has enumerated a number of reasons for its moderate response. First, an additional interest rate reduction at this time is not necessary in terms of real activity, since the economy is in a full employment environment, and such a reduction may have a negative impact on financial stability. Second, the low level of inflation partly reflects the welcome contribution of the process intended to lower the cost of living, and it would not be correct to counter a structural change that does not attest to the cyclical state of the economy. In other words, the fact that inflation has deviated from the target for the past three-and-a-half years is consistent with a flexible inflation target regime as long as policy makers believe that it will return to the target within the time frame set out in the law. Moreover, monetary policy is forward-looking, and does not have to correct deviations from the target that have already taken place. Finally, there is still tremendous uncertainty regarding how unconventional measures such as a negative interest rate or quantitative easing affect activity and inflation.

(1) The Bank of Israel interest rate

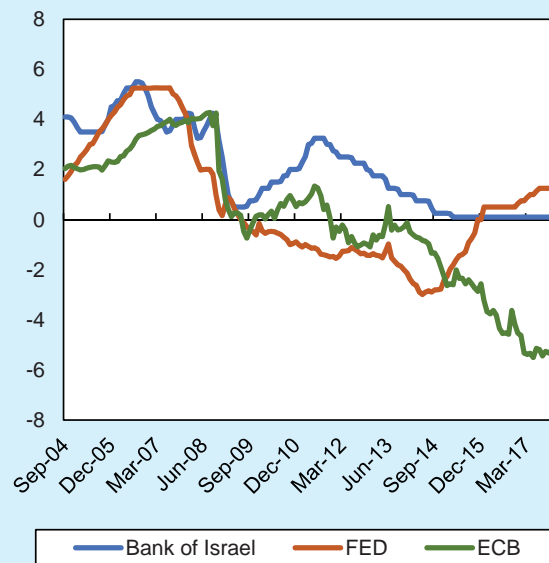
The Bank of Israel interest rate remained unchanged in 2017, at 0.1 percent—the level it has been at since the beginning of 2015. In routine times, when the interest rate environment is positive, the monetary rate can be lowered to encourage activity and increase inflation. However, in the years following the outbreak of the Global Financial Crisis, many of the central banks around the world, chiefly the Federal Reserve and the European Central Bank, encountered a liquidity trap—a situation, in which the monetary interest rate is near the lower bound. Such interest rates lose their efficacy during crisis periods, because it is difficult to lower them, which forces policy makers to use other tools.

When the interest rates remain around the lower bound over time and other tools are used, they cannot be used to show the stance taken by monetary policy or the strength of its action. In order to find the extent of accommodation that policy makers create through the monetary interest rate, an estimate of the shadow rate can be calculated. This tool estimates the yield curves during routine times and during times when there is a restrictive interest rate limitation, and uses them to indirectly derive the hypothetical

²³ The global monetary environment remained very accommodative in 2017 over all, even though some of the major central banks shifted their monetary policy to a less accommodative direction.

(negative) monetary interest rate that matches the short end of the yield curve.^{24,25} Thus, all policy measures intended to affect the yield curve can be “translated” into terms of the synthetic monetary interest rate. Figure 3.13 shows estimations of the shadow interest rates of the Fed and the ECB between 2004 and 2017, alongside the actual Bank of Israel rate. When the monetary interest rate is positive, the shadow interest rate approximates it. However, when the Fed or the ECB are in a liquidity trap, the shadow interest rate represents an estimate of the strength of the unconventional accommodation being used.

Figure 3.13
Bank of Israel Interest Rate and the Shadow Interest Rates of the Federal Reserve and the ECB, September 2004 to December 2017 (percent)



SOURCE: See footnote 24 of this chapter.

The Figure shows that starting at the end of 2014, the gap between the Bank of Israel interest rate and the (shadow) interest rate of the ECB widened, while the gap between it and the (shadow and actual) federal funds rate narrowed. The Bank of Israel also used unconventional policy tools during that period—the foreign exchange purchases and forward guidance were intended to achieve an accommodative effect by influencing the exchange rate and the yield curve, and it is therefore reasonable to assume that the Bank of Israel’s shadow interest rate is lower than the monetary interest rate. However, it is difficult to say whether the measures taken by the Bank of Israel came close in order of size and effect to those of the ECB (and other central banks in Europe) during the same period. Nevertheless, it is reasonable to assume that the

²⁴ The data on the shadow interest rates of the Fed and the ECB were taken from <https://goo.gl/tD3cB2>. For further details on the methodology for calculating the shadow interest rate, see Jing Cynthia Wu & Fan Dora Xia (2016), “Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound”, *Journal of Money, Credit, and Banking* 48(2–3), 253–291; Jing Cynthia Wu & Fan Dora Xia (2017), “Time Varying Lower Bound of Interest Rates in Europe”, Chicago Booth Research Paper no. 17–06; and Jing Cynthia Wu and Ji Zhang (2017), “A Shadow Rate New Keynesian Model”, NBER Working Paper No. 22856.

²⁵ The Bank of Israel Annual Reports for 2015 and 2016 used another definition for the shadow interest rate—the hypothetical (negative) interest rate that would have enabled the Bank of Israel to meet the inflation target. This interest rate was derived from the interest rate rule of the DSGE model used by the Bank of Israel.

gap between the shadow interest rates of the Bank of Israel and the ECB did widen.²⁶ Below, we will try to understand whether this gap also shows that gaps developed between Israel and Europe in terms of the extent of monetary accommodation.

(2) *Forward guidance*

In April 2017, the Monetary Committee changed the text of its forward guidance, and the change was perceived by the markets as a neutral step in terms of its effect on the yield curve.

The central bank can influence the public's expectations, inter alia through forward guidance. In the interest rate decision made in April 2017, the Monetary Committee decided to change the text of the notice concerning continued accommodative policy in the future. Prior to the change, the text related to the Monetary Committee's assessment regarding the period in which monetary policy was expected to remain accommodative ("for a considerable time") and to the reasons for that assessment. But in the April decision, the Committee chose to further clarify the considerations due to which policy would remain accommodative ("The Monetary Committee intends to maintain the accommodative policy as long as necessary in order to entrench the inflation environment within the target range.")

The change in text denotes a transition from guidance based on an assessment regarding the future path of the interest rate to guidance based on a declaration of intent and dependent on developments in the inflation environment.²⁷ We can therefore see in the new guidance text a more accommodative, or at the very least neutral, measure that signals the possibility that the interest rate path will not increase in the intermediate term. This conclusion is reinforced if we take into account that the Monetary Committee changed the formulation of the guidance due to the following background conditions: inflation showed an upward trend though it remained significantly lower than the target, the shekel appreciated, and short-term inflation expectations declined.

The literature examines the effect of the messages transmitted by monetary policy makers, focused on measuring the changes in the yield curve of government bonds, and is based on high-frequency (daily or intra-day) data with a narrow time window

²⁶ The foreign exchange purchases made by the Bank of Israel can be viewed as monetary accommodation that acts through the exchange rate channel. The central bank makes such purchases by increasing its balance sheet—increasing its foreign exchange balances and absorbing excess liquidity by creating deposits and issuing *makam*.

²⁷ There is a distinction in the economic literature between "Odyssean" and "Delphic" forward guidance. In the first case, the central bank commits to a future action, and in the second it only provides assessments or forecasts regarding its actions and regarding future macroeconomic performance. See J. R. Campbell, C. L. Evans, J. D. M. Fisher, and A. Justiniano (2012), "Macroeconomic Effects of Federal Reserve Forward Guidance", *Brookings Papers on Economic Activity*, 2012(1), 1–80.

around the policy announcement.²⁸ These studies are based on the assumption that the changes in the long yields, and in other financial variables, in a narrow window around the guidance announcement are directly attributed to it.²⁹ A similar study carried out at the Bank of Israel did not find that the yield curve changed in a statistically significant way on the day when the new guidance was published. These results make it possible to reach the assessment that the change in text was considered by the markets to be a neutral step from the standpoint of future yields, although it is possible that it will influence the exchange rate.

(3) Intervention in the foreign exchange market

The Bank of Israel continued its foreign exchange market intervention policy of previous years in 2017 as well (Figure 3.14). This intervention is among the tools used by the Bank in order to achieve its goals.

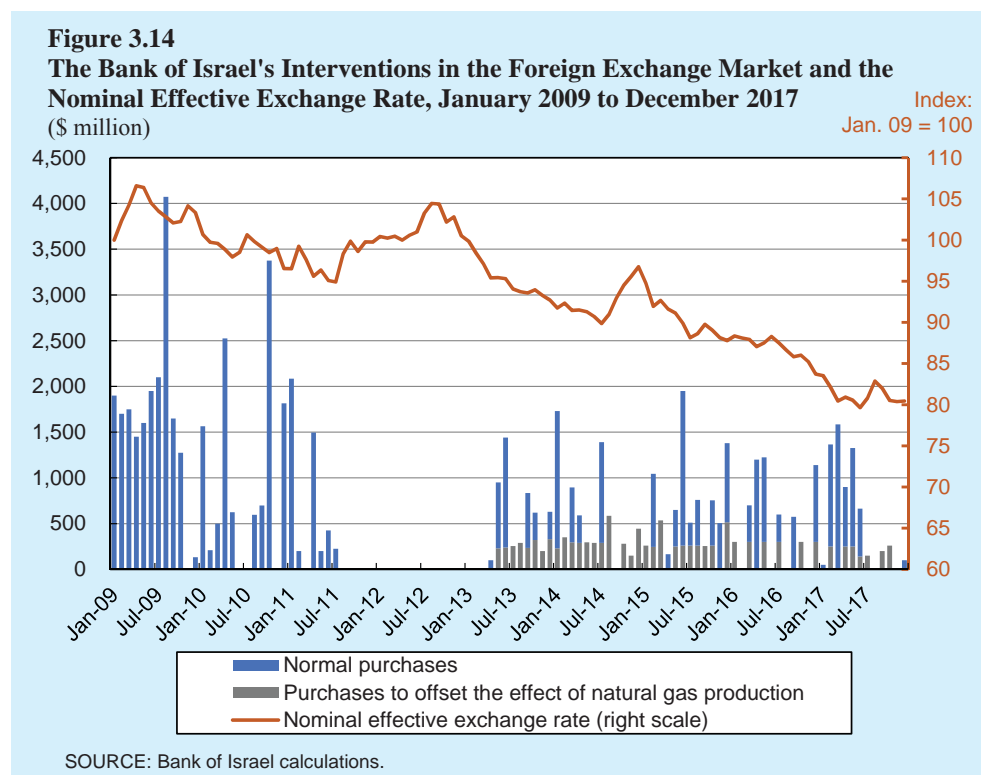
In order to support the achievement of its goals, the Bank of Israel purchased about \$5 billion in 2017, the vast majority of which was in the first half of the year. A further \$1.5 billion was purchased as part of the program to offset the effect of natural gas production on the current account (Figure 3.14). At the beginning of 2018, pressures for appreciation of the shekel increased, and in January the Bank of Israel purchased a significant amount of foreign exchange—about \$1.8 billion.

Recent studies provide empirical evidence that the intervention of central banks in the foreign exchange market have an effect on the exchange rate. These studies use high-frequency (daily or intraday) data, which make it possible to better identify the

The Bank of Israel's foreign exchange purchases have an effect on the exchange rate in the short-to-medium term.

²⁸ Even though the use of guidance measures has become routine, opinions in the literature remain divided as to the extent of their effectiveness. Whole empirical studies find evidence that guidance influences the yield curve, for the most part, the influence is less than what the theoretical models predict—a phenomenon that the literature calls the “forward guidance puzzle”. One of the explanations for this is that in the standard model, the representative individual is not faced with a loan restriction. Adding that restriction to the model makes it difficult for individuals to increase consumption in the present by taking out loans, behavior that became worthwhile as a result of the decline in the yield curve. Therefore, adding this restriction to the model reduces the accommodative effect that guidance has on activity. More information can be found in M. Del Negro, M. P. Giannoni, and C. Patterson (2015), “The Forward Guidance Puzzle” *Federal Reserve Bank of New York Staff Reports* no. 574; and A. McKay, E. Nakamura, and J. Steinsson (2016), “The Power of Forward Guidance Revisited”, *The American Economic Review*, 106(10): 3133–3158.

²⁹ A study was recently conducted using this identification methodology to examine quantitative easing and forward guidance measures adopted by the Federal Reserve. The study found that these measures had a statistically significant effect on long-term yields, share prices, and the exchange rate. See E. T. Swanson (2017), “Measuring the Effects of Federal Reserve Forward Guidance and Asset Purchases on Financial Markets”, National Bureau of Economic Research working paper no. w23311.



effect of the intervention.³⁰ The Bank of Israel recently conducted a similar study, which showed that its interventions were also effective.³¹ The study found that in the immediate range³², unexpected foreign exchange purchases divert the exchange rate in the desired direction about 90 percent of the time, and the effect is persistent for about 40–60 business days (about two calendar months). It was also found that in June 2013 and May 2017, purchases depreciated the nominal effective exchange rate by an average of about 2–3 percent. It is important to note that this study focused only on the surprise element in the purchases, meaning the effect of the purchases that were not expected, and does not show how the exchange rate was affected by the possibility that the Bank of Israel can intervene at any time.

³⁰ The econometric attempt to identify the effect of the interventions using low-frequency (for instance monthly) data generally encountered a problem of endogeneity. For instance, if the bank intervenes in order to moderate pressures for appreciation (leaning against the wind), we would see a positive correlation in the data between total purchases and the appreciation of the currency, since the bank intervenes more in months when there is sharp appreciation (as also shown in Figure 3.14). See C. J. Neely (2005), “An Analysis of Recent Studies on the Effect of Foreign Exchange Intervention”, *Federal Reserve Bank of St. Louis Review*, 87(6): 685–7180. See also M. Fratzscher, O. Gloede, L. Menkoff, L. Sarno, and T. Stöhr, (2015), “When is Foreign Exchange Intervention Effective? Evidence from 33 Countries”, DIW Berlin (German Institute for Economic Research) Discussion Paper no. 1518.

³¹ I. Caspi, A. Friedman, and S. Ribon (2017), “The Immediate Impact and Persistent Effect of Unexpected FX Purchases on the Exchange Rate”, unpublished manuscript.

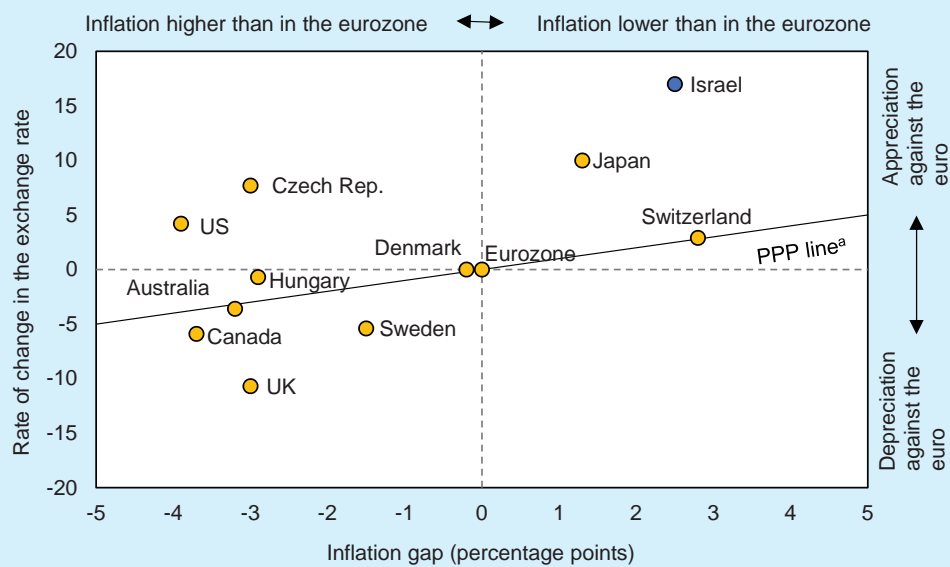
³² The time that elapses between the first purchase transaction and the last during the intraday intervention.

b. Relative purchasing power parity

When a small and open economy like Israel adopts a monetary policy that is different than the policy in the rest of the world, it creates a gap between the inflation rate in that economy and the rate prevailing abroad.³³ To illustrate, if the central bank of one country adopted a less accommodative policy than that of a similar country, inflation in the first country will tend to be lower than in the other country. The mechanism that enables domestic inflation to be separated from global inflation passes through changes in the exchange rate, in accordance with the principle of relative purchasing power parity. This principle holds that a positive (negative) gap between inflation abroad and domestic inflation—meaning a lowering of domestic prices relative to abroad—will be accompanied by appreciation (depreciation) of the domestic currency vis-à-vis abroad, which will offset the lower prices.³⁴

Does the gap that developed after 2014 between the interest rates of the central banks in Europe and Israel reconcile with the theoretical prediction regarding the inflation gap that was created in the following years? Figure 3.15 helps to examine

Figure 3.15
The Link Between a Change in the Exchange Rate and the Inflation Gap with the Eurozone, December 2014 and December 2017



^a The PPP line denotes the group of points for which the rate of change in the exchange rate is equal to the inflation gap.

³³ See, for instance, M. Woodford (2007), “Globalization and Monetary Control”, NBER Working Papers (no. 13329).

³⁴ This link is expected to exist in the medium-to-long term.

the issue.³⁵ Each point in the figure denotes the inflation gap between the eurozone and a particular country (December 2017 compared with December 2014), and the change in the exchange rate of the euro vis-à-vis the currency of that country during the same period (positive values represent appreciation against the euro). The Figure shows that on average, there is a positive connection between the inflation gaps and the appreciation of the currency against the euro: The lower the inflation rate in the comparison country relative to the eurozone, the stronger the appreciation of its currency against the euro.³⁶ However, the spread of the countries in the Figure does not reconcile with the quantitative prediction generated by the principle of purchasing power parity, that the inflation gap and the change in the exchange rate are equal (with equality represented by the PPP line in the Figure). This phenomenon is a result, *inter alia*, of the fact that the examination relates to a relatively short timeframe, about three years, and in such a range, there are other dominant factors that influence the exchange rate.³⁷

The fact that the Bank of Israel adopted a more moderate accommodation than the ECB and others since 2014 may have contributed to the appreciation of the shekel in terms of the nominal effective exchange rate and the creation of a gap between the inflation rates in Israel and in other countries. While it is difficult to determine whether the appreciation led to the inflation gap or whether the low inflation contributed to the appreciation, it seems that both processes took place to some extent. In this context, it is worth emphasizing that the Bank of Israel avoided additional accommodation measures for a variety of reasons, including the need to maintain financial stability and the tight labor market (see Section 2a).

To summarize, inflation in Israel declined beginning in mid-2014, and its rate is on the left tail of the distribution of inflation rates in the advanced economies, after the ECB and other central banks in Europe adopted significant monetary accommodation while the Bank of Israel adopted a less accommodative monetary policy.

3. THE MONETARY BASE AND MONETARY AGGREGATES

Interest is the price of money, meaning it is the alternative cost of holding liquidity. Therefore, changes in the interest rate have an impact on the demand for liquidity. When the nominal interest rate is the main tool of monetary policy, the central bank operates so that the money supply is completely flexible at the interest rate it declares,

³⁵ There is nothing new in the hypothesis that monetary policy is contributing to low inflation. This was raised explicitly in the Bank of Israel Annual Reports for the years 2015 and 2016. However, we can now examine it from a broader point of view, thanks to data that have accumulated over time, particularly the fact that the shekel has continued to appreciate against the effective exchange rate and the inflation rate in Israel has become entrenched on the left tail of the distribution of rates in the OECD.

³⁶ Similar results are obtained if we compare the annual average of the exchange rate and the CPI in 2017 with the average in 2014.

³⁷ Box 3.2 shows that the principle of purchasing power parity is relevant for products that are characterized by a high rate of online purchases.

and the monetary base—meaning the total banknotes and coins in circulation as well as the commercial banks' demand deposits at the Bank of Israel—is determined by the demand for liquidity at the Bank of Israel interest rate.

a. The monetary base

The monetary base is affected by flows that are not under the Bank of Israel's control, such as government accounts³⁸, and by flows that are under its control, such as foreign exchange purchases and makam issuances. The Bank absorbs or injects liquidity in order to provide the demand for the monetary base in accordance with the Bank of Israel interest rate. The Bank adjusts the monetary base to the interest rate that it sets by issuing makam and through interest-bearing deposits of the banks, which are issued to them in tenders and are not included in the monetary base. The Bank takes into account total injections and absorptions, and takes action to adjust the monetary base to demand by the public.

Table 3.4
Rate of change in monetary aggregates, 2013–17

	0	1	2	1+2=3	4	5	6	3+4+5+6=7
	Monetary base ^a	Cash held by the public	Current accounts	M1 ^b	Short-term deposits ^c up to 3 months	Short-term deposits ^c up to one year	SRO ^d	M2 ^e
	(Average in December compared to average the previous December)							
2013	6.5	3.9	22.3	15.2	-1.3	0.3	22.2	6.6
2014	11.6	11.7	48.3	35.6	-8.1	11.6	9.8	8.4
2015	16.3	13.9	51.4	40.7	-16.4	4.6	34.2	13.6
2016	7.5	5.8	20.7	17.2	-10.4	15.0	12.1	7.9
2017	6.4	6.5	14.2	12.6	-3.0	-2.8	16.2	8.1
	(Quarterly average compared with the average of the previous quarter)							
2017								
Q1	1.7	1.2	3.9	3.4	-1.7	4.5	6.9	3.0
Q2	1.9	1.7	3.3	3.0	-0.4	-1.6	3.7	1.9
Q3	1.3	1.3	3.9	3.4	1.0	-2.1	5.1	2.7
Q4	1.5	1.1	1.5	1.4	-2.1	-2.3	0.3	0.0

^a Total banknotes and coins in circulation and current deposits by the commercial banks with the Bank of Israel.

^b M1 = cash and demand deposits.

^c Term deposits.

^d Self-renewing overnight deposit - a liquid daily deposit.

^e M2 = M1+SRO+unindexed deposits of up to one year.

SOURCE: Bank of Israel and Central Bureau of Statistics data.

³⁸ Government activities also affect the monetary base, since the government's accounts are managed at the Bank of Israel (pursuant to the Bank of Israel Law).

Table 3.5
Source of change in the monetary base, 2013–17

	2013	2014	2015	2016	2017	2017			
						Q1	Q2	Q3	Q4
1. Injections from the government	-10.5	1.2	-14.0	3.5	-3.9	-12.9	-7.7	-5.8	22.5
2. Foreign exchange conversions ^a	19.2	24.7	34.0	23.4	24.1	11.1	10.4	1.3	1.3
<i>of which</i> : Bank of Israel	19.0	24.6	33.8	23.1	24.0	11.1	10.4	1.2	1.3
3. Total (1+2)	8.7	25.8	19.9	27.0	20.2	-1.8	2.7	-4.5	23.8
4. Bank of Israel injections	-2.4	-14.2	-11.5	-15.8	-7.8	8.3	-1.8	4.3	-18.6
<i>of which</i> : Monetary loan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Makam</i>	-6.3	-3.2	14.1	11.1	13.1	3.0	4.0	6.0	0.0
Swap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bank term deposits	2.0	-12.3	-26.7	-28.0	-22.0	5.0	-6.0	-2.0	-19.0
Interest ^b	1.2	0.6	0.2	0.1	0.2	0.0	0.0	0.0	0.0
Bond purchases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Total change in the monetary base	6.4	11.7	8.4	10.8	12.2	6.8	0.5	-0.3	5.1

^a This item includes, among other things, receipts (payments) in foreign exchange that the Bank of Israel and the government receive from (transfer to) the private sector, for instance income tax.

^b Excluding *makam*.

SOURCE: Bank of Israel.

The monetary base grew by about NIS 12.2 billion in 2017, after increasing by NIS 10.8 billion in 2016 (Table 3.5). Compared with the previous year, the monetary base increased by 6.4 percent (Table 3.4).³⁹ The Tables show that the foreign exchange conversions carried out by the Bank of Israel—a reflection of its interventions in the foreign exchange market—expanded the monetary base by about NIS 24 billion during the year, similar to the expansion recorded in 2016. Against that, the Bank of Israel absorbed about NIS 9 billion (the net change in *makam* and term deposits)—in order to leave its declared interest rate of 0.1 percent in place.

b. The monetary aggregates

The quantity of money—the M1 aggregate—includes cash held by the public and demand deposits. The demand for money is affected mainly by the level of activity in the economy and by the interest rate: An increase in the level of activity increases demand for money (the engine of transactions), while an increase in the interest rate lowers it (the alternative cost of holding liquidity). In 2014–2015, the quantity of money increased significantly, by about 35–40 percent, due to the decreases in the interest rate. In 2016, the rate of the increase in the quantity of money moderated to 17.2 percent, and in 2017 it moderated further, to 12.6 percent, in line with the stable

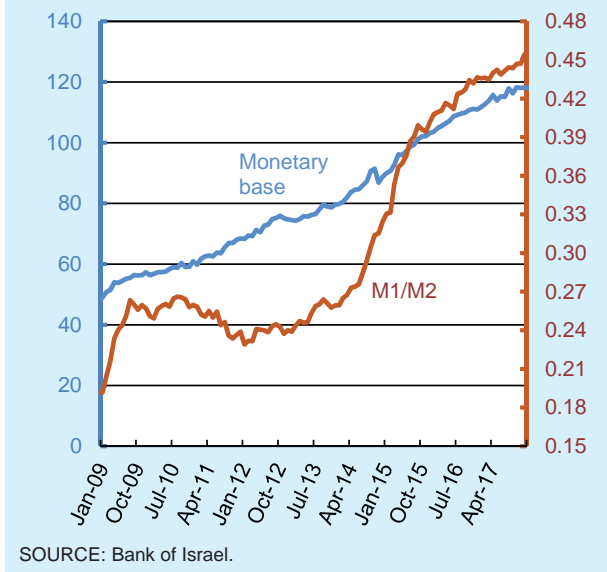
³⁹ December 2017 average compared with December 2016 average.

interest rate. The increase in M1 in 2017 was mainly a result of an increase in demand deposits, which grew by 14.2 percent, while cash held by the public increased by just 6.5 percent.

In parallel with the interest rate decreases in recent years, there was a downward trend in cash as a share of M1, which stood at about 20 percent at the end of 2017, down from 50 percent a decade ago. In parallel, M1 as a share of M2—an aggregate that includes unindexed deposits of up to one year, in addition to M1 (Figure 3.16)—

continued. The increase in this ratio began in 2012, and indicates that the public is replacing interest-bearing deposits with demand deposits because the low interest rate on unindexed deposits does not compensate for the loss of liquidity inherent in those deposits.

Figure 3.16
Monetary Aggregates, Monthly Average, January 2009 to December 2017 (NIS billion)



Box 3.1**Global factors and their contribution to inflation in Israel**

- The global factors that are common to inflation in the OECD countries have, since the Global Financial Crisis, explained more than 70 percent of the variance in inflation in the OECD, and 80 percent of the variance in inflation in Israel. During that period, the correlation between the inflation rates of the OECD countries has increased.
- The global factors properly explain the development of inflation in Israel—both the sharp decline in 2011–2016, and the reversal of the trend that began in early 2016. In the past year and a half, the global factors have made a significant positive contribution to inflation in Israel.

The annual inflation rate of the Consumer Price Index in Israel changed significantly in the years following the Global Financial Crisis. In June 2011, it increased to a peak of about 4 percent, and then began a downward trend during which it reached -1 percent (December 2015). Israel is not exceptional in this regard, since many OECD countries underwent similar changes in recent years, and a considerable portion of them have—like Israel—dealt with negative inflation.¹ This box focuses on the variance of inflation in Israel in the years following the Global Financial Crisis, and examines what part of that variance can be attributed to global phenomena.

Empirical studies from recent years have found a strong link between inflation rates in the advanced economies, even in the years preceding the Crisis.² One possible explanation for this has to do with geographic proximity. Twenty-two of the 35 OECD countries are in Europe (a large portion of which even use the same currency—the euro), and this certainly contributes greatly to the correlation explanation. Another possible explanation has to do with common structural trends and similar policy, for instance the global tendency to increase competition and the similarity of inflation targets to which the various central banks are subject.³ Another explanation involves the strengthening of globalization, particularly the fact that domestic shocks spread more and more to all countries because the chains of production and supply are becoming increasingly global.⁴ There is a similar view that the low inflation in the advanced economies is a result of the rise of the emerging economies. The threat posed by outsourcing puts downward pressure on wages, and the free flow of cheap goods from foreign countries helps maintain the prices of domestic goods at a low level—both directly because import prices are low, and indirectly because domestic producers face competition.⁵

How much of the inflation volatility in Israel can be attributed to global phenomena? This box attempts to answer the question through an econometric model that assumes that common movements in the annual inflation rates in OECD countries are a result of a small number of common but unobserved factors.

¹ In 2014, for instance, there was negative inflation in 15 of the 35 countries in the organization.

² See, for instance, IMF (2016), Ciccarelli and Mojon (2010), Mumtaz and Surico (2012), and Neely and Rapach (2011).

³ See, for instance, Mumtaz and Surico (2009).

⁴ See, for instance, Auer et al. (2017a, 2017b).

⁵ This concept has recently been referred to as the “Internationalist view of inflation”.

Let π_{it} denote the annual inflation rate of country i at time t , where $i=1,\dots,N$, $t=1,\dots,T$. We assume that the development N of series of inflation can be described p by a dynamic factor model with common factors:

$$\pi_{it} = \gamma_i F_t + \varepsilon_{it}$$

where $F_t = (F_{1t}, F_{2t}, \dots, F_{pt})$ is a vector that includes p common factors; $\gamma_i = (\gamma_{i1}, \dots, \gamma_{ip})$ is a vector that includes the loadings that are received by the common factors in determining the inflation of country i , and ε_{it} is the residual, including—among other things—the domestic shocks and/or the shocks common to a small number of countries, and measuring errors regarding country i .⁶ The first component on the right side of Equation (1), the global component, is the weighted amount of common factors, and the second component is the residual.

Since the common factors and their weights are not observed, they must be estimated. For that purpose, we will use a principal component analysis (PCA).⁷ The first common factor is estimated by the principal component that explains most of the covariance of inflation in the OECD countries, the

Table 1

The variance of inflation explained by common factors and other global factors^a, January 2009 to December 2017

	Global component			OECD simple average	OECD weighted average ^b	US	Eurozone
	One factor	Two factors	Three factors				
Inflation in the OECD countries	0.45 [0.37,0.56]	0.71 [0.65,0.78]	0.80 [0.76,0.84]	-	-	-	-
Inflation in Israel	0.39 [0.27,0.52]	0.81 [0.65,0.90]	0.88 [0.73,0.97]	0.40	0.09	0.04	0.25

^a The cumulative explained variance of inflation in the OECD countries was obtained from a primary cause analysis (PCA). The explained variance in Israel was obtained from the R2 value generated by a regression of the inflation rate in Israel on an intercept and on the common factor(s) obtained from the PCA, as well as on additional approximations of global inflation (the last four columns). The numbers in square brackets are a 90% confidence interval.

^b The figure was taken from the OECD. The weighting is based on the size of the respective economies.

SOURCE: Based on Central Bureau of Statistics.

⁶ In addition, the model assumes that ε_{it} and ε_{jt} are contemporaneously uncorrelated for each i, j , but enables a (weak) correlation between the residuals of the countries in the panel, meaning $\text{Cov}(\varepsilon_{it}, \varepsilon_{jt}) > 0$ and where $\text{Cov}(\varepsilon_{it}, \varepsilon_{jt}) < 0$. The assumption concerning the weak correlation means, roughly, that the common dependency on the residuals in the model subsides as the number of countries in the panel increases, meaning $\text{Cov}(\varepsilon_{it}, \varepsilon_{jt}) \rightarrow 0$. In this assumption the residuals of each country cannot be seen as a domestic component.

⁷ A broad survey of the dynamic factors model and the various methods of estimating it appears in Stock and Watson (2016).

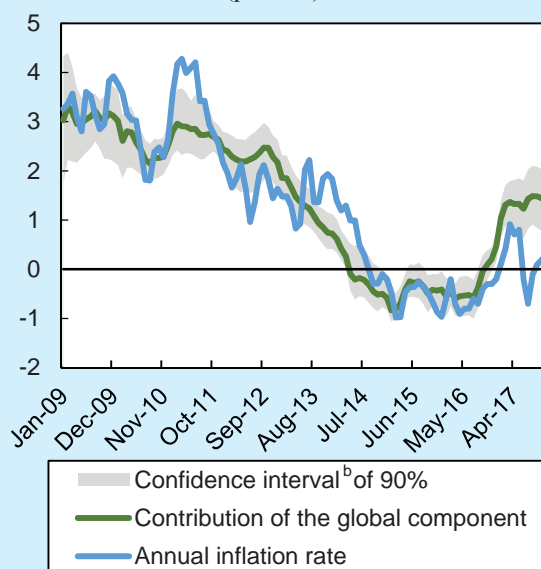
second principal component is estimated by the factor with the second-highest explanatory level, and so on. The estimation of the common factors of inflation in Israel and the OECD countries is based on a panel that includes the monthly data on the annual inflation rate during the period from January 2009 to December 2017. Inflation in each country was standardized by subtracting its average and dividing the difference by the standard deviation.

Table 1 shows the results of the estimation. The upper row relates to inflation in all OECD countries, and presents the variance explained by one common factor, two common factors, and three common factors. As we can see, the first common factor explains slightly less than half of the common variance of the inflation rates in the countries panel, the first two factors explain about 71 percent of it combined, and the first three common factors explain 80 percent. We note that the high explanatory level did not exist as strongly before the Crisis. When we used a sample beginning in January 2000 and ending in December 2007, we found that the first factor explains 32 percent of variance, the first two factors explain 50 percent, and the first three factors explain 61 percent.

The second row in the table relates to inflation in Israel, and shows the explanatory level of the common factors alongside the values obtained from the regression of the inflation rate in Israel on other possible approximations of “global inflation”—a simple average of the OECD countries’ inflation rates, a weighted average of the OECD countries’ inflation rates (with the weights based on the size of the various economies), the inflation rate in the US, and the inflation rate in the eurozone. As we can see, the first common factor explains 39 percent of the variance in the inflation rate in Israel, while the first two factors explain 81 percent combined (meaning the marginal explanation of the second factor is 42 percent).⁸ The third common factor makes a negligible marginal contribution to the explanation of the variance—7 percent. We can also see that the variance explained by the first common factor, and certainly the variance explained by the first two common factors, is higher than the variance explained by the

⁸ If we estimate the common factors in a panel that does not include Israel, the results are not materially different. When we run the inflation rate in Israel on the common factors, the equals 0.42 (0.80) when relating to one common factor (to two common factors).

Figure 1
Inflation in Israel^a and the Contribution of the Global Component, January 2009 to December 2017 (percent)



^a Actual annual inflation (each month compared with the same month in the previous year).
^b The confidence interval reflects the uncertainty regarding the composition of the OECD countries included in the panel used in the estimation.
SOURCE: Based on Central Bureau of Statistics.

other approximations of global inflation, including inflation in the eurozone. However, it should be noted that the variance explained by the first factor is almost identical to the variance explained by the simple average—40 percent.⁹

Figure 1 shows the annual inflation rate in Israel (the blue line) alongside the contribution of the global component estimated through the use of the first two factors (the green line), and with a confidence interval of 90 percent (the gray area). As we can see, during the reviewed period, the inflation rate in Israel is closely aligned with the global component. Both the sharp decline in 2011–16 and the reversal of the trend in early 2016 are consistent with the development of the global component during the same period. We can basically say cautiously that the global component behaves as a trend line that is tracked by inflation in Israel. In other words, it seems that the global component reflects fluctuations at a low frequency, while the residual acts as an error correction.¹⁰

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⁹ Essentially, the first factor is very similar to the simple average of the inflation rates in the OECD countries (the correlation is close to 1).

¹⁰ This finding is consistent with the findings shown in Ciccarelli and Mojon (2010).

Box 3.2**Online purchases made by Israelis and their effect on inflation**

- The rate of Israelis making online purchases increased significantly in the past decade, similar to the global trend. These purchases lower prices, since they lower costs and increase competition, inter alia because trading sites make information accessible regarding the supply of products and their prices.
- Tradable goods that are characterized by an upward trend of expenditure on online purchases have in recent years shown marked price declines relative to general tradable goods. However, since these purchases are focused on goods with a low share of total expenditure, it seems that they have a small direct effect on inflation.
- It also seems that after taking the exchange rate into account, these price declines are not exceptional compared with parallel declines around the world.
- Online purchases may contribute to greater price declines in Israel than in other countries in the next few years, but only as long as the profit margins in Israel are higher than they are abroad. If the entry of large multinational corporations to the Israeli market is accompanied by an increase in concentration as a result of a closure of competing firms, prices may increase in the medium-to-long term.

a. Background

One of the causes of the low inflation in Israel in recent years is the change on the behavior patterns of Israeli consumers, particularly the increase in the volume of consumer goods purchased online via Israeli and foreign websites. This box outlines the characteristics of online purchases, and examines how they are affecting inflation.

Online purchases contribute to lower prices through two main channels. First, they lower costs, since they are based on automation of the purchase process, thereby shortening the supply chain and increasing productivity. Second, they make it difficult for companies to raise prices, moderating them instead because they increase competition. Trading sites make information on the supply of goods and their prices more accessible, thereby making it easier for consumers to compare prices.¹

The volume and rate of online purchases are increasing around the world² because consumers are increasing their use of the Internet and of smartphones, and because dedicated applications and websites simplify payment. This process of expansion has not passed Israel by. According to the Central Bureau of Statistics Social Survey, the rate of Israelis over 20 who reported that they had made online purchases in the past three months increased from 16.7 percent in 2007 to 39.3 percent in 2016.³ The situation is similar if we look at the number of packages arriving from abroad, which expanded at an increasing pace

¹ See Riksbank (2015), “Digitisation and Inflation”, Monetary Policy Report, February, pp. 55–59, available at http://www.riksbank.se/Documents/Rapporter/PPR/2015/150212/rap_ppr_ruta4_150212_eng.pdf

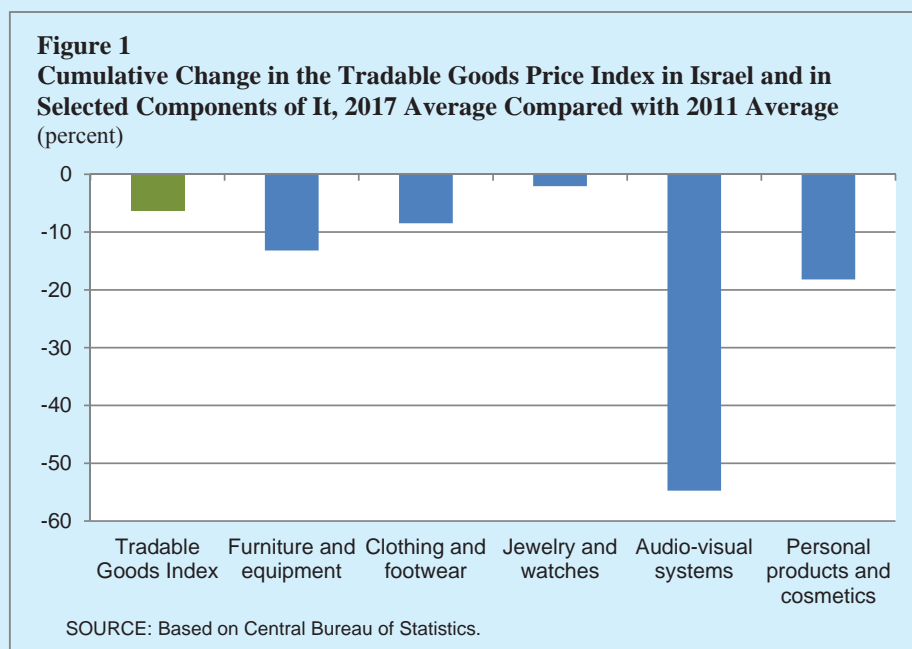
² See “Effects of e-Commerce on Inflation”, *ECB Economic Bulletin* 2/2015, pp. 51–54; J. L. Yellen (2017), “Inflation, Uncertainty, and Monetary Policy”, a speech delivered in “*Prospects for Growth: Reassessing the Fundamentals*”, 59th Annual Meeting of the National Association for Business Economics.

³ See Bank of Israel (2017), Annual Report for 2016, Chapter 3. These findings place Israel at the center of the distribution of 19 European countries.

in recent years, indicating that Israelis have increased the volume of online purchases from international sites.⁴ These purchases are not included in the calculation of the Consumer Price Index, since the CPI measures the change in domestic prices of a representative basket of products. However, since they reduce demand in the domestic market and increase competition, they have an indirect effect on the inflation rate.

Figure 1 provides evidence of this. The Figure relates to the price index of tradable goods that Israelis increasingly bought online in recent years—clothing and footwear, furniture and equipment, jewelry and watches, audio-video systems, and cosmetics and personal products—and shows the change in those items and in the overall Tradable Goods Price Index.⁵ With the exception of the index of jewelry and watch prices, these indices decline more than the overall Tradable Goods Price Index.⁶

Israelis increased their volume of online purchases due to the apparent attractiveness of prices, among other reasons. This conclusion is derived from an online survey commissioned by the Bank of Israel in order to examine the behavior patterns and perceptions of the Israeli consumer in the area of online



⁴ Bank of Israel (2017), Annual Report for 2016, Chapter 3.

⁵ More information on the calculation of tradable goods prices in Israel appears in Bank of Israel (2016), Annual Report for 2015, Chapter 3, note 8.

⁶ It is likely that the decline in the prices of audio-video systems is not only a result of online trading, but also of technological improvement.

purchases, regarding nine different categories of products, some tradable and some nontradable.^{7,8} More than 80 percent of respondents believed that the prices of tradable goods abroad are lower than the prices of parallel (not necessarily the same) goods in Israel, and more than two-thirds believed the same regarding nontradable goods.⁹ About 60 percent of respondents believed that purchases from Israeli sites are less expensive than purchases from regular stores—the main reason for making such purchases. This finding is different from findings around the world, which show that the prices of goods on the Internet are generally similar, and even identical, to in-store prices.¹⁰

b. The effect of online purchases on the change in prices in selected items of the Consumer Price Index

It seems that online purchases have a small direct effect on the decline in inflation, since they are focused on products with a low share of total expenditure. The Central Bureau of Statistics Expenditure Surveys show that while a representative household increased its average monthly expenditure on total online purchases (on both Israeli and international sites) by about 16 percent, this expenditure increased from just NIS 90.1 in 2011 to just NIS 104 in 2015.¹¹

Figure 2 focuses on the main sub-items where there was an increase in recent years in the volume of expenditure on online purchases (on both Israeli and international websites). The Figure shows this expenditure as a share of total expenditure, and shows that the rates are very low (in most cases below 5 percent) even if they increased significantly in the following areas: jewelry and watches (expenditures increased approximately ninefold, to 4.2 percent) ; clothing and footwear (sixfold, to 1.5 percent); home and household maintenance (fivefold, to less than 1 percent); handheld computers (purchases increased by

⁷ The survey was conducted by “Rushinek Market Research and Strategic Consulting” in 2017. It should be noted that the results of the survey may be biased because it was conducted online. This bias is reflected, inter alia, in the fact that about 70 percent (about 60 percent) of the respondents reported that they had made a purchase on international (Israeli) sites during the past month—significantly more than the results of the Central Bureau of Statistics Social Survey.

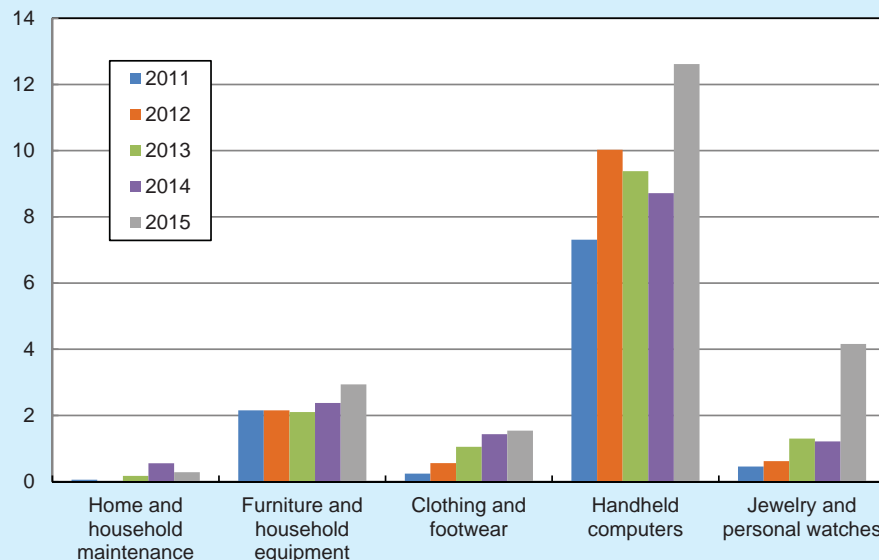
⁸ The tradable categories included: 1. Tourism and vacation; 2. Electrical appliances; 3. Toys and sports equipment; 4. Electronic products; 5. Pharmaceutical products; 6. Clothing and footwear; and 7. Furniture and housewares. The nontradable categories included: 1. Tickets to performances, plays, movies and so forth, and restaurant coupons; and 2. Food (food purchases mainly on the websites of the grocery store chains, as opposed to food additives, which are tradable).

⁹ In most expenditure items, 94–99 percent of surveyed individuals responded that they make online purchases due to attractive prices. In contrast, in the food category, 83 percent responded in that way, while 85 percent responded that they make online purchases because they are more convenient. Only about 40 percent of respondents believed that the online price of food is lower than the in-store price—a rate that is 20 percentage points lower than the rate regarding the other categories.

¹⁰ See, for instance, A. Cavallo (2017), “Online and Offline Prices Similar? Evidence from Large Multi-Channel Retailers”, *American Economic Review*, 107(1), pp. 283–303.

¹¹ This expenditure is significantly lower than the estimate in the online survey, apparently due to the bias resulting from the population included in it (see Note 7), because it includes respondents who did not report online purchases—about 60 percent of those surveyed in 2015.

Figure 2
Online Purchases (from Israeli and International Sites) As A Share of Total Purchases, Selected Components of the Consumer Price Index, 2011–15 (percent)



SOURCE: Based on Central Bureau of Statistics.

70 percent to 12.6 percent); and furniture and household equipment (purchases increased by 30 percent to 2.9 percent). Purchases from international sites create competition, mainly for relatively inexpensive products, since if the price of the product exceeds \$75, the consumer must pay VAT on the purchase, and if it exceeds \$500, customs duties must be paid as well. In other words, there is no great incentive to purchase products with a value higher than those amounts. This partly explains why expenditures on online purchases are only a small part of total household expenditures.

The situation is similar in the eurozone and in the US. In the eurozone, the increase in the volume of online purchases was found to have only a moderate effect on inflation, but it should be noted that there is tremendous uncertainty in the findings, due to limitations in the data. In the US it was found that in 2017, competition from online trading led to a decline of about 0.1 percentage points in core inflation.¹² Competition increased because the market share of online purchases grew due to an expanding supply of products, attractive prices, and inexpensive shipping. This increase made it difficult for the (brick-and-mortar) retail giants in the US to raise prices, which led them to close many branches.

¹² www.bloomberg.com/view/articles/2017-10-16/amazon-might-help-explain-the-inflation-mystery

International comparison

In recent years, inflation in Israel has been lower than in other OECD countries, leading to the question of whether online purchases are affecting inflation in Israel more than in other countries. In order to examine this, we calculated the rates of price declines in Israel in five sub-items of the Consumer Price Index—furniture, clothing and footwear, personal and cosmetic products, audio-video systems, and jewelry—and compared them to the rates of decline in the parallel indices in the US, Germany, France and the UK.

Before discussing the comparison, it is worth remembering that purchases from international sites are not included in the Consumer Price Index in Israel, and therefore do not affect it directly. But they do have an indirect effect, since they create competition for domestic products. It is not simple to decide whether to include these purchases in the Consumer Price Index, and the decision depends on how the index is defined and used in each country. To illustrate, the decision depends on the question of whether the index is used to measure price changes in the local market, or whether it is supposed to reflect the change in the prices the consumer sees, including prices on international sites. Moreover, it is not simple to estimate the change in prices on the Internet, *inter alia* because the supply of goods changes frequently and the pricing sometimes depends on the identity of the purchaser.

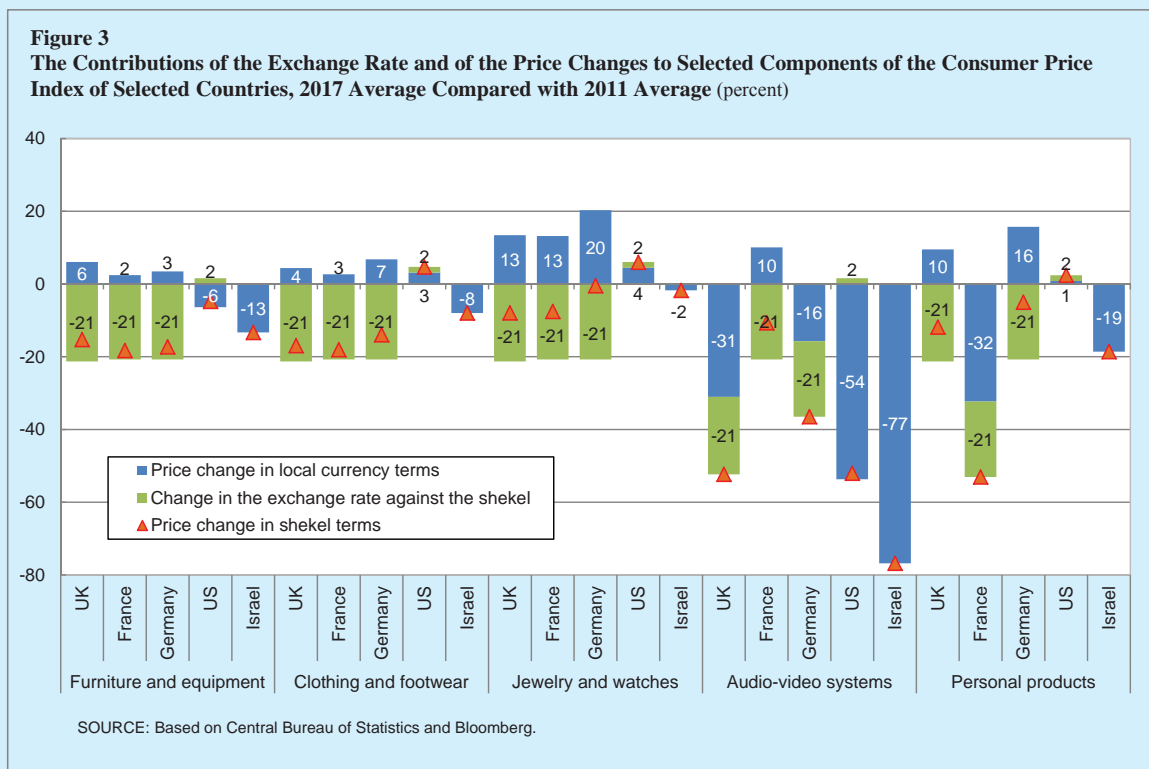
If at the point of departure Israel was characterized by less competition than other countries, and competition in Israel increased due to the increase in online purchases, then we would expect to find that prices in Israel (in shekel terms) declined more than in other countries. However, an initial examination we conducted shows that after taking changes in the exchange rate into account, the declines in the Consumer Price Index in Israel since 2011 are not exceptional relative to the declines recorded abroad. Figure 3 shows the cumulative shekel change in the reviewed price indices between 2011 and September 2017¹³, divided into the cumulative change in terms of the local currency in each country and the contribution to the change made by the development of the exchange rate *vis-à-vis* the shekel.

We can see that in terms of the local currency (the blue columns), prices in Israel decline more than prices in the comparison countries, but the declines in Israel are not exceptional if we examine the change in prices in shekel terms (the red triangles).¹⁴ The difference reflects the strengthening of the shekel against the euro, a continuing process in recent years, and the strengthening of the shekel against the pound sterling, mainly following the Brexit vote.

We can therefore state that online purchases contributed to increased competition and price declines in Israel, but the process is global and Israel is not an exception in terms of either the volume or the effect on prices. In this context it is worth noting that until 2011, the price indices showed different developments in each of these countries, but since 2011, they show greater similarity in their developments—prolonged price declines.

¹³ The average in 2011 compared with the average in the 12 months ending in September 2017.

¹⁴ In some of the product categories (cosmetics and personal products, and audio-video systems), prices in Israel declined more than in other countries, while in other categories (clothing and footwear and furniture and equipment) they declined less than in other countries.



c. A look at the future

Assuming that the price levels in Israel are relatively high, online purchases may contribute in the future to a greater price reduction in Israel than abroad, as long as the domestic profit margins remain higher in Israel than they are abroad, and taking shipping costs, taxes and regulation into account. In recent years, we can identify a decline in the profitability of public Israeli companies in the field of consumer goods, particularly the clothing, footwear and personal equipment chains and wholesale companies in the computer and communications fields (see Chapter 1 of this report). This may be a result of the increased competition created by the increase in the volume of online purchases from abroad.

It is reasonable to assume that the prices of goods will continue to decline in the coming years, since international retailers plan on entering the Israeli market. However, this development may have the reverse effect and increase goods prices in the medium-to-long term. For instance, the expanded market share of online retailers in the US and other countries led some of the large brick-and-mortar retailers in those countries to cut back or even to close. If, in the final analysis, this increases concentration, it may be reflected in an increase in prices. Moreover, there are indicators that the leading online sites are engaging in differential pricing of their products, and adjusting the price to the individual consumer. Such pricing has a deleterious effect on the consumer surplus. It is therefore recommended to monitor developments in the retail market, and if necessary to take regulatory steps to limit concentration in various industries.

