Chapter 3
Monetary Policy and Inflation

- Annual inflation of the Consumer Price Index totaled 0.6 percent in 2019—below the lower bound of the inflation target. The CPI minus energy, fruits and vegetables increased by a similar rate.
- The inflation rate in the second half of the year was significantly more moderate than in the first half of the year and than it was in the previous year. This was in view of the trend of appreciation of the shekel, and volatile factors the contribution of which weakened. The moderation was also in line with a slight slowdown in the pace of wage increases.
- In recent years, other than a period of about a year from mid-2018, the inflation rate has been below the inflation target range. However, there has been a marked increase from the negative values that were prevalent in 2015 and 2016.
- The low inflation rate in recent years is mainly due to the appreciation of the shekel and increased competition against the background of technological improvements. In contrast, the demand side remained strong.
- In parallel with the decline in actual inflation, one-year inflation expectations moderated slightly in the second half of 2019, to around the lower bound of the inflation target. Long-term inflation expectations, which were above 2 percent for a long time, have been in a downward trend for a few years, although their current level of 1.6 percent is still anchored within the target range. Some of the decline may be due to the decline in the inflation risk premium.
- The monetary interest rate did not change during the year, and with the exception of an increase of 15 basis points to 0.25 percent in November 2018, it has not changed for the past 5 years. However, starting in the second half of 2019, the expected interest rate path changed from upward to downward, in view of the worsening global conditions, monetary accommodation in the US and Europe, and the significant decline in annual inflation to below the target range.
- Due to the significant appreciation of the shekel, the Bank of Israel purchased a large volume of foreign exchange in the fourth quarter of the year as an accommodative monetary tool that is complementary to its interest rate policy. In addition to these policy measures, the Bank of Israel also used forward guidance in pursuit of its monetary policy goals.

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 percent[1], 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 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 2019 and the policy steps adopted by the Monetary Committee in response to it and to other background conditions.

1. THE INFLATION ENVIRONMENT

The two main factors explaining the low inflation are the appreciation of the shekel and increased competition.

The inflation rate in 2019 was 0.6 percent—below the lower bound of the inflation target. The two main factors explaining the low inflation are: (a) the significant appreciation of the shekel during the year—continuing the trend of appreciation that has been typical of previous years, and reflecting increased demand for Israeli exports and the decline in imports of energy products, alongside monetary policy abroad that was much more accommodative than in Israel in the second half of the year, among other things; and (b) increased competition—technological improvements, chiefly the expansion of the digital economy, which allows consumers to easily compare prices and even to divert demand to abroad (for tradable goods), a development which

[1] This range came into effect in 2003. Prior to that, a gradually declining inflation target was in place during a 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. 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. For the interest rate decision reached in November 2018, the Committee operated with only five members, due to the replacement of the Governor.

increases competition and increases supply, applying downward pressure to domestic prices. In contrast to these two factors, the demand side remained strong, and therefore was not a contributory factor to the slowdown in inflation.

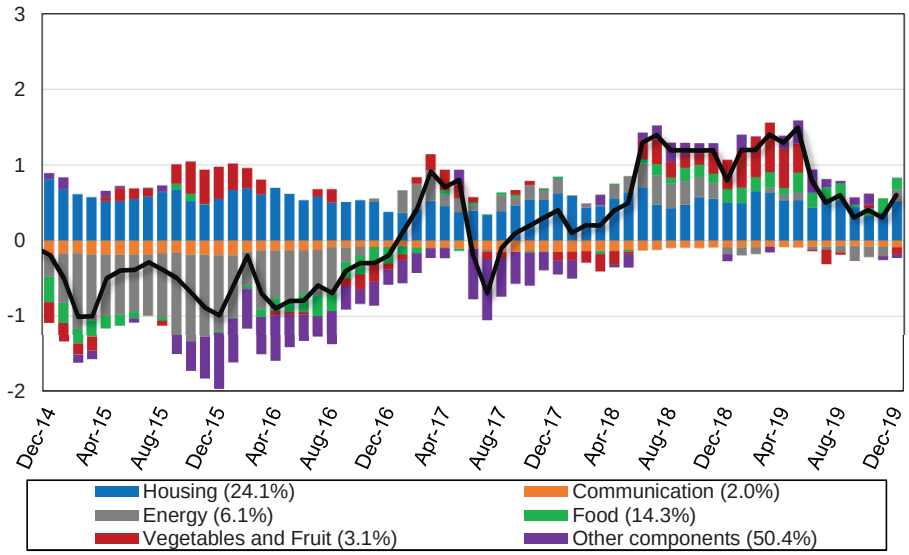
The relatively high rate of wage increases in recent years, in that it is greater than the increase in productivity, has apparently increased the costs of production, as well as consumer demand, thereby contributing to the upward pressure on inflation. Even so, the improvement in the terms of trade, thanks to which the increase in consumer prices is more moderate than the increase in production process, may explain why the inflation rate is lower than expected in view of the tight labor market. The increased competition, which is reflected in increases in production quotas and in demand for workers alongside a decline in prices, also contributes to explaining the moderate inflation.

a. The development of inflation

Annual inflation of the Consumer Price Index[3] totaled 0.6 percent in 2019, but its development over the course of the year was not uniform (Figure 3.1). The relatively high level of inflation that had been prevalent since the second half of 2018 was maintained into the first half of 2019, and annual inflation in May 2019 reached 1.5 percent. At the same time, it seemed that annual inflation had become entrenched

Annual CPI inflation did not develop in a uniform manner during the year. The inflation rate at the end of the year was 0.6 percent—below the lower bound of the target range.

Figure 3.1
Annual Inflation Rate and Contribution of CPI Components[a], December 2014 to December 2019 (percent)



[a] The numbers in parentheses are the weights of the components in the overall CPI (as of 2018).
[b] "Other components" includes health; education, culture and entertainment; furniture and houshold equipment; clothing and footwear; and miscellaneous. It also includes the transportation and dwellings maintenance components minus the sub-components connected with energy prices.
SOURCE: Based on Central Bureau of Statistics.

[3] The monthly rate of change vis-à-vis the same month in the previous year.

within the target range after a downward deviation that lasted for more than four years, since April 2014 (Table 3.1). In contrast, during the second half of the year, inflation declined significantly so that by the end of the year, the inflation rate was below the lower bound of the price stability target range, but still positive. A more long-term look shows that inflation in Israel increased from 2017, to a positive rate between 0.5 and 1.5 percent[4]—compared with negative inflation (as low as -1 percent) in the two years preceding that period.

The increase in the inflation rate as stated (from the second half of 2018 until the end of the first half of 2019, relative to the beginning of 2018) is attributed partly to components that are generally quite volatile—energy (5.9 percent of the CPI), which mainly reflects changes in oil prices and in the exchange rate and made a positive contribution to inflation, and fruits and vegetables (2.9 percent of the CPI), which also made a positive contribution. In the first half of 2019, the contribution of the fruits and vegetables component became negative, as did the contribution of the energy component, which became negative in most months—mainly due to the significant appreciation of the shekel, and less due to changes in oil prices. In contrast, the development of other components was relatively uniform throughout the last year-and-a-half. The contribution of the housing component (which measures rental prices and accounts for about one-quarter of the CPI) remained positive and stable. The food component (13.7 percent of the CPI) also made a positive contribution during the period, following many years of negative or near-zero contributions. The negative contribution of the communications component (2 percent of the CPI) remained stable. Excluding the volatile components that do not represent basic forces in the economy, particularly energy and fruits and vegetables, inflation has been lower than one percent for more than five years, other than a few months (Table 3.2).

In general, the development of inflation in 2019 reflects a combination of a number of factors: the high level of economic activity and continued increases in the nominal wages beyond productivity acted to raise prices, while the appreciation of the shekel, which also reflects structural changes in the economy, and increased competition worked to moderate the increase in prices. In particular, the continued moderate upward trend of nontradable goods prices, which are mainly affected by domestic economic conditions—activity and wages—and the continued decline of tradable goods prices, which are more affected by the exchange rate and increased competition, are noticeable.

When monetary policy makers assess the development of inflation, they generally try to test it net of temporary price changes that do not necessarily reflect the economy's place in the business cycle and are not under control of policy. Shocks to energy prices have an effect on inflation, but are set in a way that is almost impossible to predict, and the effect is generally temporary. Other volatile components in the CPI, such as the prices of fruits and vegetables, which are sensitive to weather conditions,

[4] With temporary declines, particularly in June–July 2017, which corrected themselves. See Chapter 3 of the Bank of Israel Annual Report for 2018.

Table 3.1
Main indicators of inflation and monetary policy, 2015–19

	2015	2016	2017	2018	2019	2019 Q1	Q2	Q3	Q4
A. Inflation (percent)									
1. Inflation target	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3
2. Actual inflation[a]	-1.0	-0.2	0.4	0.8	0.6	0.5	0.4	-0.3	0.0
3. Seasonally adjusted quarterly inflation[b]						2.8	-0.4	-0.8	0.8
4. One-year inflation expectations derived from capital market[c]	0.6	0.3	0.2	1.0	1.1	1.1	1.2	1.1	1.0
5. Ten-year inflation expectations derived from capital market[c]	2.1	2.3	2.3	1.8	1.6	1.8	1.6	1.6	1.5
6. Forecasters' one-year inflation forecasts[c]	0.8	0.6	0.6	1.0	1.2	1.2	1.3	1.2	1.1
B. Yields (percent)[c]									
1. Bank of Israel declared interest rate	0.1	0.1	0.1	0.1	0.25	0.25	0.25	0.25	0.25
2. One-year real yield to maturity on government bonds[d]	-0.5	-0.1	-0.1	-0.8	-0.8	-0.7	-0.9	-0.9	-0.8
3. Ten-year nominal yield to maturity on government bonds[e]	2.2	2.0	2.1	2.2	1.6	2.2	1.9	1.3	1.0
4. Ten-year real yield to maturity on government bonds[e]	0.5	0.4	0.6	0.5	0.0	0.5	0.2	-0.3	-0.5
C. Change in the shekel exchange rate (percent)[f]									
1. Nominal effective	-9.3	-4.6	-3.9	2.3	-8.1	-3.2	-1.4	-3.3	-0.4
2. Vis-à-vis the dollar	-1.4	-1.4	-8.5	7.1	-7.4	-3.6	-0.6	-2.0	-1.4
3. Vis-à-vis the euro	-13.1	-4.3	2.7	3.1	-9.6	-4.3	-0.7	-4.4	-0.5
D. Asset prices (percent)									
1. Overall yield on shares (nominal)[f]	6.8	-11.0	-1.1	-3.9	17.8	6.6	2.6	2.0	5.6
2. Home prices	7.9	5.7	1.4	-0.8	3.7	1.5	0.7	0.8	
E. The monetary aggregates (nominal rates of change)[f]									
1. M1 money supply	40.7	17.2	12.6	12.2	5.1	0.6	1.6	1.1	1.7
2. M1 + SRO[g] + unindexed shekel deposits of up to one year (M2)	13.6	7.9	8.4	2.0	6.4	2.9	1.4	0.4	1.4
F. Other background data (percent, seasonally adjusted quarterly data)									
1. Unemployment rate	5.3	4.8	4.2	4.0	3.8	4.0	3.9	3.7	3.6
2. GDP growth rate[h]	2.3	4.0	3.6	3.4	3.5	4.7	1.3	4.5	4.8

[a] Change in CPI during the period.
[b] As calculated by the Central Bureau of Statistics.
[c] Period average
[d] Based on the zero coupon yield curve. Period average.
[e] Gross yield, based on the zero coupon yield curve. Period average.
[f] Average of last month in period compared with average of last month in previous period. Minus sign refers to appreciation of the shekel.
[g] Self-Renewing Overnight Deposit (Current Credit Deposit) - a liquid daily deposit.
[h] Annual average compared with average of previous year.
SOURCE: Bank of Israel, Ministry of Finance, and Central Bureau of Statistics.

Table 3.2
Development of prices, by various components, 2015–19

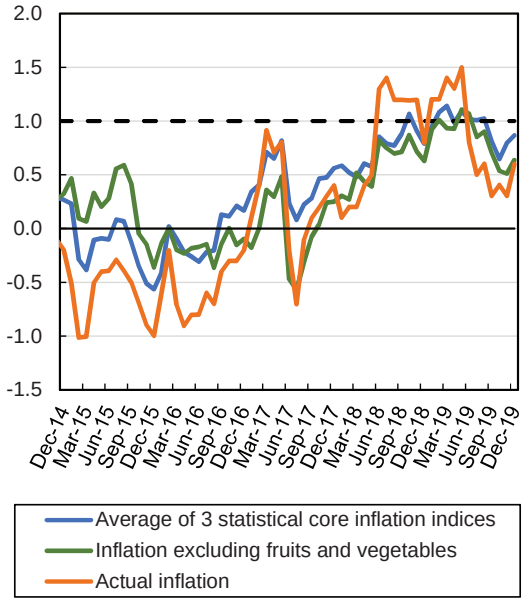
Period	Consumer Price Index	Fruit and Vegetables	Food	Housing	Dwellings Maintenance	Furniture and Household Equipment	Clothing and Footwear	Education, Culture and Entertainment	Health	Transport and Communication	Miscellaneous	Energy Index[a]	Index excluding energy and food	Index excluding energy, food, and fruit and vegetables	Index excluding energy, and net of government-initiated price changes	Nontradable component minus electricity, water, communications, food, and fruit and vegetables	Nontradable component minus electricity, water, communications, and fruit and vegetables	Seasonally adjusted index[b]
										(end of period, rate of change, percent)								
2014	-0.2	-9.3	-2.5	3.1	0.0	-3.6	-3.7	0.4	0.8	-0.9	-0.5							
2015	-1.0	13.2	-0.1	2.2	-5.5	-1.6	-1.7	-0.8	-0.3	-5.4	0.1	-13.7	-0.4	-0.4	0.6	1.6	1.3	
2016	-0.2	-2.7	-1.5	1.4	0.5	-2.4	-1.0	0.7	0.8	-1.9	0.7	-0.2	-0.1	0.2	0.0	1.2	1.0	
2017	0.4	-3.8	0.2	2.4	1.1	-3.8	-4.6	0.1	1.0	-0.9	0.5	3.4	0.2	0.2	0.5	2.0	1.8	
2018	0.8	12.4	1.3	1.9	0.8	-1.2	-2.9	0.2	-0.1	-0.5	0.1	-1.5	0.6	0.5	1.1	1.5	1.5	
2019	0.6	-2.8	1.1	2.1	1.8	-2.5	-5.5	1.3	0.0	-0.2	-0.5	2.5	0.6	0.5	0.3	1.8	1.7	
										(monthly rate of change, percent)								
December 2018	-0.3	-0.4	-0.1	0.0	-0.1	-0.2	3.2	-0.9	0.2	-1.1	-0.2							-0.2
2019																		
January	-0.1	2.7	0.4	-0.4	1.0	0.1	-7.0	-0.1	0.1	-0.2	0.4	-0.4	-0.1	-0.3	-0.1	-0.3	-0.2	0.3
February	0.1	2.5	0.2	0.3	0.1	0.6	-4.3	0.2	-0.2	0.1	0.1	0.8	-0.1	-0.1	0.0	0.2	0.2	0.1
March	0.5	-0.3	-0.2	0.8	0.1	0.1	3.4	0.6	0.0	0.9	-0.3	1.8	0.5	0.7	0.5	0.6	0.5	0.3
April	0.3	0.0	-0.3	-0.1	0.1	-0.4	2.4	0.6	0.0	1.4	-0.4	1.5	0.2	0.3	0.2	0.2	0.1	0.0
May	0.7	3.8	0.6	0.0	0.4	-0.3	7.8	0.4	0.1	0.5	0.6	1.7	0.4	0.4	0.6	0.2	0.2	0.4
June	-0.6	-9.1	0.1	0.1	-0.1	-0.6	-6.2	0.1	0.5	-0.4	-0.2	-1.1	-0.1	-0.2	-0.5	0.1	0.1	-0.5
July	-0.3	-3.6	0.3	0.4	0.2	-0.7	-6.4	-0.1	-0.4	-0.4	0.1	-1.0	-0.1	-0.2	-0.3	0.1	0.2	-0.3
August	0.2	3.1	0.0	0.4	0.1	-0.2	-1.2	1.2	-0.2	-0.3	-0.7	0.1	0.1	0.1	0.2	0.5	0.5	0.2
September	-0.2	2.7	-0.6	0.2	-0.1	0.6	0.1	-0.4	-0.1	-1.0	-0.3	-1.6	-0.2	-0.1	-0.1	0.0	-0.1	-0.1
October	0.4	2.0	0.7	-0.1	0.2	-0.2	6.9	-0.5	0.2	0.3	0.1	1.0	0.3	0.2	0.4	-0.1	0.0	0.1
November	-0.4	-3.0	0.2	0.0	0.0	-0.9	-1.1	0.0	-0.2	-1.1	0.0	-0.5	-0.3	-0.4	-0.4	0.0	0.0	0.0
December	0.0	-3.0	-0.3	0.6	-0.2	-0.5	1.3	-0.7	0.2	0.0	0.1	0.2	0.1	0.2	-0.1	0.2	0.1	0.1

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

may have similar effects. For this reason, many central banks tend to monitor indices net of such effects, which are referred to as indices of "core inflation".[5]

Figure 3.2 shows two indices of core inflation. One is inflation excluding energy, fruits and vegetables, and the other is an index based on the average of three statistical indices: (1) inflation that adjusts monthly for components where there are sharp price changes; (2) inflation based on changes in the median price in the index's components; and (3) inflation based on the first common component analyzed through a principal component analysis.[6] As expected, the figure shows that the core indices are less volatile than the overall index, and that they remained relatively stable, at low rates of between 0.6 percent and 1.1 percent in the past two years, following a moderate upward trend in previous years.

Figure 3.2
Annual Inflation and Average Core Inflation, December 2014 to December 2019 (percent)



SOURCE: Based on Central Bureau of Statistics.

The indices of core inflation remained relatively stable in the past two years, at low rates of between 0.6 percent and 1.1 percent, following a moderate upward trend in previous years.

b. The development of the prices of nontradable goods and of tradable goods

Additional information on the inflation environment comes through an examination of the goods included in the consumption basket by the extent of their tradability. A breakdown of inflation into tradable goods and nontradable goods shows that in general, inflation in the prices of nontradable goods, which are mainly influenced by domestic forces, has been relatively stable in recent years, between 0 and about 1 percent[7], with a moderate upward trend. In contrast, inflation in the prices of tradable goods, which is mainly influenced by global factors, increased competition, and the exchange rate, declined by about 1 percent in 2019, and has generally ranged between -3.5 percent and 1 percent in the past half-decade.

Inflation in the prices of nontradable goods has been relatively stable in recent years, between 0 and 1 percent. In contrast, inflation in the prices of tradable goods ranged between -3.5 percent and 1 percent.

5 For more information, see Chapter 3 of the Bank of Israel Annual Report for 2018.

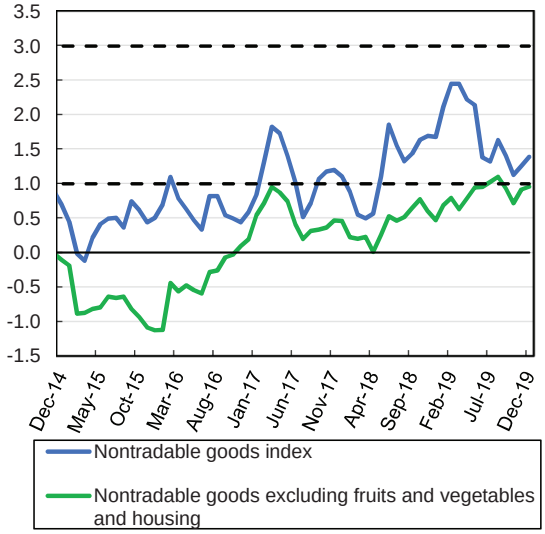
6 The use of an average is based on the assumption that averaging a number of estimations of core inflation should provide a better estimation than relying on a single estimation. For more details about the various core indices, see S. Ribon (2009), "Core Inflation Indices for Israel", Discussion Papers Series 2009.08, Bank of Israel Research Department.

7 Excluding fruits and vegetables and housing.

1. The prices of nontradable goods

The nontradable goods index (62 percent of the overall CPI) mainly measures changes in domestic prices. It weights the prices of goods of a nontradable nature, which are products produced mainly by domestic means of production, and which do not have significant import alternatives. A significant share of this index is comprised of domestic services provided in Israel.[8] Due to its composition, the nontradable goods index helps us to understand the domestic factors behind the volatility of inflation—domestic supply and demand shocks.

Figure 3.3
Annual Inflation Rate - Nontradable Goods Index (62% of the CPI), December 2014 to December 2019 (percent)



SOURCE: Based on Central Bureau of Statistics.

The nontradable goods index has indicated relatively stable annual inflation with a moderate upward trend in the past three years, which has ranged in most months between 1 and 1.5 percent excluding the fruits and vegetables component, and between 0 and 1 percent with a further exclusion of the housing services component, which mainly reflects developments in the housing market (Figure 3.3).

According to economic theory, we should expect that the rate of increase in the nontradable goods index would be impacted by the pace of wage increases beyond the improvement in labor productivity. The development of the nontradable goods index (excluding fruits and vegetables and housing) actually is in line with the positive trend of wage increases, apparently also because the components of the nontradable goods index, chiefly the services industries, are much more labor intensive than the components of the tradable goods index. (In the services industries, the cost of labor rate is about 60 percent of all means of production, compared with about 25 percent in the tradable industries.[9]) Thus, the rate of nominal wage increases in recent years, about 3 percent, is higher than the rate of increase of nontradable goods and services prices excluding fruits and vegetables and housing, which is about 1 percent. This gap is consistent with an increase in labor productivity in the nontradable goods

[8] Housing services are a significant component, but so are personal services such as haircuts at barber shops.

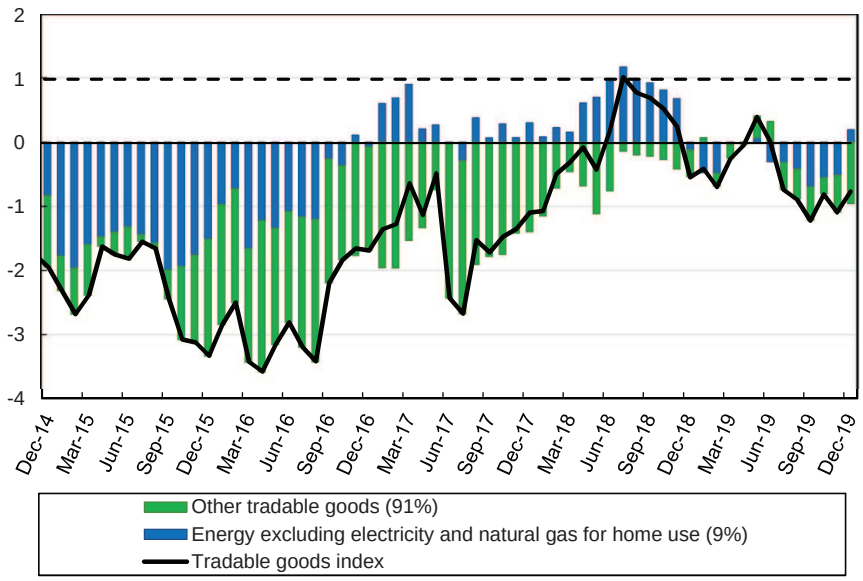
[9] Based on D. Orfaig (2019), "The Link between Wages and Inflation—An Industry View of the Labor Component of the Consumer Price Index", internal memorandum.

industries, which was about 2 percent in 2019 (according to National Accounts data; see Chapter 2).

2. The prices of tradable goods

The tradable goods index (38 percent of the overall CPI) weights the prices of goods of a tradable nature, meaning imported goods or those with import alternatives. The prices of these goods are mainly impacted by their global prices, by the prices of the raw materials used in producing them through their effect on firms' cost structure, and by the exchange rate of the shekel, which affects the shekel price of imports. In recent years, they have also been impacted by government measures aiming to increase competition in the field of these products and to reduce their prices.[10] The tradable goods index declined by 0.8 percent in 2019, after declining by 0.5 percent in 2018. This decline follows the positive inflation rate in the prices of tradable goods in the second half of 2018, which reached a peak of 1 percent (Figure 3.4). The negative inflation rate in this segment in 2019 continues many years of decline in the prices of tradable goods. The volatility in their prices is partly attributed to the energy component, which reflected the sharp changes in the shekel prices of oil during that period, which are mainly due to changes in the shekel-dollar exchange rate.

Figure 3.4
Annual Inflation Rate and Contribution of CPI Components[a], Tradable Goods Index (38% of the CPI), December 2014 to December 2019 (percent)



[a] The numbers in parentheses are the weights of the components in the tradable goods index (as of 2018).
SOURCE: Based on Central Bureau of Statistics.

[10] In 2019, the direct effect of government measures was near-zero. However, the policy previously adopted to increase competition (for example the policy measures in the communications market and in banking) continued to have an effect in 2019.

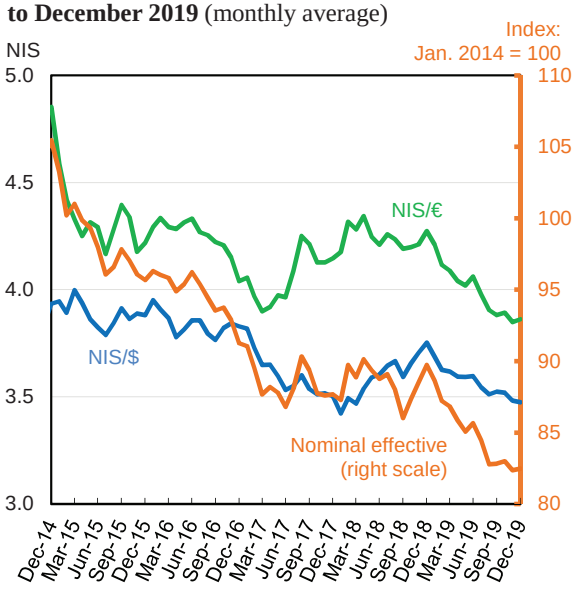
c. Background factors

1. The exchange rate

The shekel appreciated significantly in terms of the nominal effective exchange rate in 2019—by 8.3 percent—which served to moderate price increases.

The shekel appreciated significantly in terms of the nominal effective exchange rate in 2019—by 8.3 percent following a depreciation of 2.3 percent in 2018 and an appreciation of 3.9 percent in 2017 (Figure 3.5). The appreciation in 2019 reflects a sharp appreciation of about 9.7 percent against the euro, alongside an appreciation of about 7.8 percent against the dollar.

Figure 3.5
NIS/$ Exchange Rate, NIS/€ Exchange Rate and Nominal Effective Exchange Rate, December 2014 to December 2019 (monthly average)



SOURCE: Bank of Israel calculations.

Looking more broadly, the development of inflation is in line with the significant appreciation of the shekel, and shows that the exchange rate has been an important factor influencing inflation in Israel in recent years. The relatively low inflation rate in 2015–16 and 2019 can be linked to the appreciation of the shekel during those years, while its stability at relatively high rates can be traced to the stability of the exchange rate in 2017 and 2018.

A paper examining the short-term pass-through level from the shekel-dollar exchange rate to inflation in Israel and the changes that have taken place in it[11] further illustrates the exchange rate's importance as an explanatory factor of inflation in Israel. According to the paper, the exchange rate pass-through to prices increased from the middle of 2017 to about 25 percent. One explanation of this is the increase in competition in recent years, which supports more rapid price adjustments, particularly downward, in view of the shekel's appreciation. An examination conducted by the Bank of Israel Research Department shows that, contrary to the past, the pass-through has not been symmetrical in recent years. The pass-through from appreciation is stronger than the pass-through from depreciation, particularly in the clothing and footwear

[11] M. Kozin (2019). "Exchange Rate Pass-Through to Prices", *Selected Research and Policy Analysis Notes*, 39–53, Bank of Israel Research Department, February.

field.[12] Even according to this examination, the short-term pass-through (about half a year) increased in recent years. An estimation of the pass-through enables us to assess the contribution of appreciation to inflation in the past year. Even with the conservative assumption that the short-term pass-through rate from the exchange rate to short-term inflation is about 10 percent, and given appreciation of around 8 percent in 2019, we expect a significant negative contribution to inflation with a lag of up to half a year.[13]

It is important to note that changes in the exchange rate are a result of macroeconomic processes. The strength of the Israeli economy, the interest rate gaps between Israel and abroad, and other factors make it more worthwhile to invest in Israel. As a result, there are large capital movements in the economy, and when the capital movements leaving the economy are not as large, the shekel strengthens. The Bank of Israel's monetary accommodation in recent years has been significant, as reflected in the low interest rate over a long period. However, in the second half of 2019, the accommodation was more moderate than what was adopted by other central banks, particularly the ECB. This also contributed to the significant appreciation of the shekel in terms of the nominal effective exchange rate.

The Research Department's DSGE model[14] provides a framework for quantitative analysis of the structural factors that explain the development of inflation. According to the model, the main contribution to the downward deviation of inflation from the target in recent years is attributed to structural changes in foreign trade, meaning the composition of the economy's imports and exports (see Figure 3.6). We interpret these changes to reflect the decline in imports of energy products and recently the export of natural gas—as well as changes in the characteristics of human capital, with an increase in high-tech services as a share of economic activity, particularly in exports. The high-tech industry attracts foreign exchange transactions to the economy, both as a result of export activity and as a result of capital movements to finance relevant investments.[15] These contributed to the trend of nominal appreciation and to the decline in inflation.

Structural changes in foreign trade contributed to the appreciation of the shekel—reduced imports of energy products, and recently also gas exports, as well as change in human capital with an increase in high-tech services as a share of economic activity, and particularly of exports.

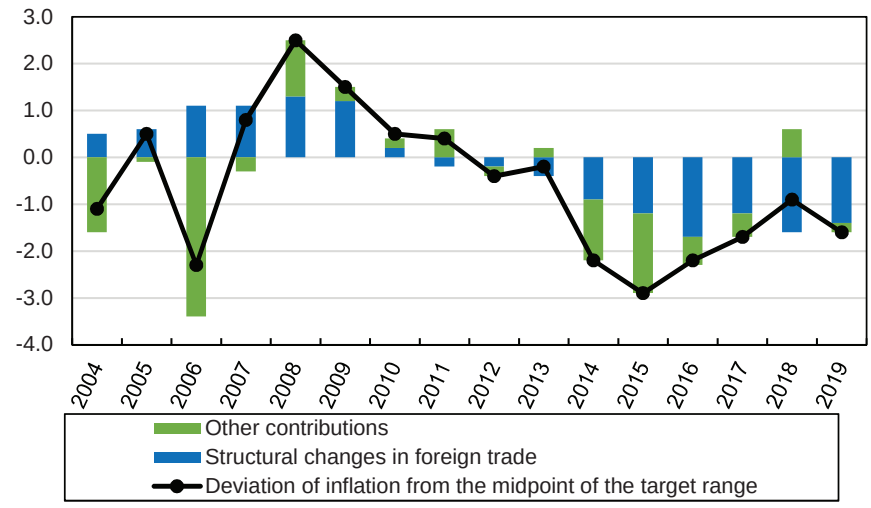
[12] A similar finding is provided in a report by the Taub Center for Social Policy Studies in Israel. See B. Bental and G. Brand (2019), "The Pass-Through from Foreign to Domestic Prices", *State of the Nation Report: Society, Economy and Policy in Israel*, Chapter 1, Spotlight B.

[13] The discussion of the pass-through relates to the shekel/dollar exchange rate since commodities prices, whose shekel equivalents have an impact on inflation, are denominated in dollar terms.

[14] E. Argov, E. Barnea, A. Binyamini, E. Borenstein, D. Elkayam, and I. Rozen (2012). "MOISE: A DSGE Model for the Israeli Economy", Discussion Papers Series 2012.06, Bank of Israel Research Department.

[15] For more information, see Chapters 2 and 4 of this report.

Figure 3.6
Main Contributions to the Deviation of Annual Inflation from the Midpoint of the Target Range (2 percent), According to the Research Department's DSGE Model, December 2014 to December 2019 (percentage points)



SOURCE: Based on Central Bureau of Statistics.

During the second half of 2019, a significant gap opened between Israel's inflation rate and that of other OECD countries.

During the second half of 2019, a significant gap opened between Israel's inflation rate and that of other OECD countries (Figure 3.7). This gap intensifies when the comparison involves the CPI excluding energy and food[16] (Figure 3.8), where the gap had narrowed in the two previous years. These findings are consistent with the assessment that a significant portion of the decline in Israel's inflation rate has to do with the strengthening of the shekel, and less to do with the trickle down of global price declines. Another possible cause of the gap between the inflation rates is that the transition to equilibrium with a higher level of competition is taking place later in Israel than in other OECD economies. In addition, it is reasonable to assume that at the point of departure, the Israeli economy had a lower level of competition than other economies. For instance, it is likely that in countries with open land borders, domestic importers had less power than in Israel.

The factors that made it easier to open the Israeli economy to global competition in recent years include technological improvements that made it possible to more easily and conveniently compare prices; the expansion of online trading (in Israel and abroad); and the increase in direct personal imports—the purchase of goods abroad by consumers, which was made less expensive in part due to lower prices for air travel.

[16] In contrast with the other countries, the food index in Israel does not include fruits and vegetables. As such, we examine the CPI excluding energy, food, and fruits and vegetables.

Figure 3.7
Inflation as Measured by the Overall CPI[a], November 2014 to October 2019 (percent)

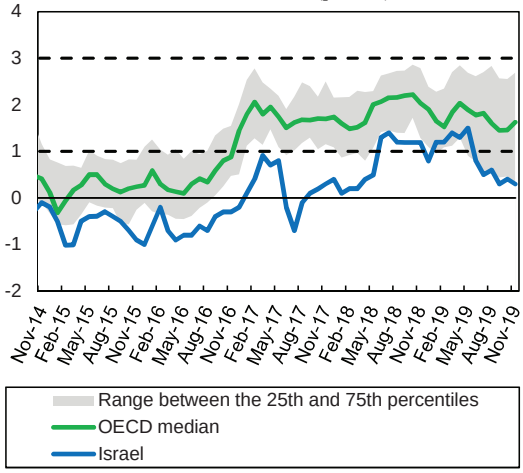
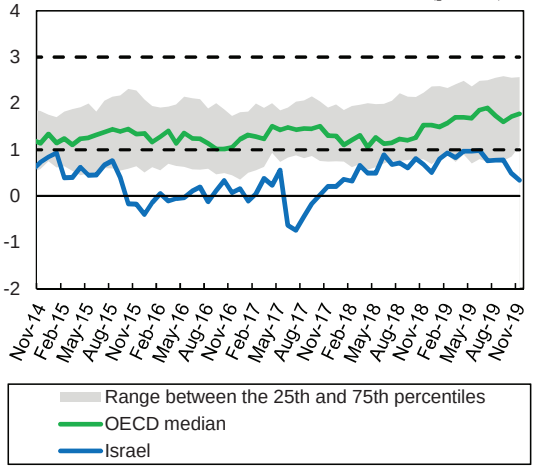
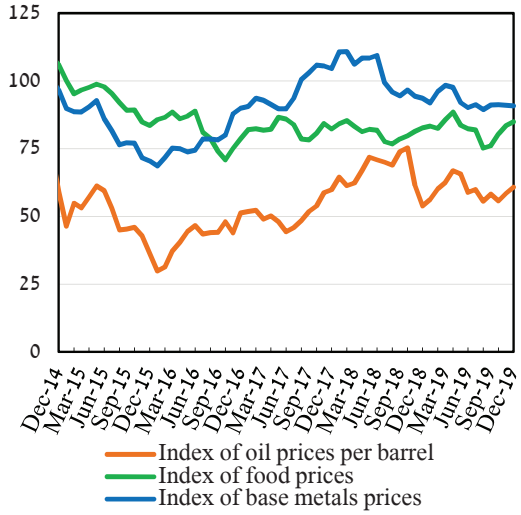


Figure 3.8
Inflation as Measured by the Index Excluding Energy and Food[a], November 2014 to October 2019 (percent)



[a] The calculation does not include Australia or New Zealand, since they publish data only on a quarterly basis.
SOURCE: OECDstat.

Figure 3.9
Global Price Indices of Oil, Food and Base Metals, December 2014 to December 2019
(Monthly average, Index: Jan.



SOURCE: Based on Bloomberg.

Commodities serve as raw materials for production. As such, their prices affect the costs of production, and through them prices in the economy. In 2019, there were no sharp fluctuations in the prices of commodities: "Brent" crude oil, base metals, and agricultural goods. This was contrary to the sharp fluctuations in 2018, when the price of oil reached a peak of about $85 a barrel in October, and fell to a low of about $50 a barrel in December.[17] On average, oil prices were significantly lower in 2019 than in 2018, as were base metal prices, which declined slightly on average from one year to the next (Figure 3.9).

[17] For more information, see Chapter 3 of the Bank of Israel Annual Report for 2018, which presents an examination of the pass-through between changes in oil prices and the various components of the CPI through a linear regression that examines the changes in the CPI components over the 6 and 12 months following the change in the price of oil.

The change in the contribution of the energy component to the Consumer Price Index, which was described at the start of this Chapter and was one of the factors in the decline of actual inflation in the second half of 2019, was mainly due to the change in the shekel price of oil, which mainly reflected the appreciation of the shekel, and less so a sharp fluctuation in the price of oil itself.

2. The labor market

Changes in wages precede changes in inflation.

According to economic theory, when changes in the cost of labor are greater than the change in productivity, they are expected to have an impact on consumer prices.[18] An examination of the dynamic coefficient (the "Granger causality") between wages and consumer prices in the various industries in Israel, in a sample that encompasses that past two decades, shows that changes in nominal wages precede changes in inflation both at the aggregate level and in some of the industries. [19]In particular, wage lags were found to be statistically significant in the inflation equation (at a significance level of 10 percent), and not the opposite.[20] Looking at the major industries as well, it is notable that in the industries in which the effect is significant, wage generally precedes inflation, and not the other way around.[21]

[18] Even so, the empirical findings regarding the intensity of the link in recent years are not unequivocal. For instance, Peneva and Rudd report weakness of the link between wages and inflation in the US, because inflation expectations become more anchored. See E. V. Peneva and J. B. Rudd (2017), "The Passthrough of Labor Costs to Price Inflation", *Journal of Money, Credit and Banking*, 49(8), 1777–1802. In contrast, Bobecia et al. find a strong connection between the cost of labor and inflation in four large economies within the eurozone. This link varies over time, and depends on the state of the economy and the nature of the shocks to the economy—it is stronger when demand shocks are dominant and weaker when supply shocks are dominant. See E. Bobecia, M. Ciccarelli, and I. Vansteenkiste (2019), "The Link Between Labor Cost and Price Inflation in the Euro Area", ECB Working Paper Series No. 2235. Boranova et al find that in many countries, wages increase more than productivity, while the pressures on inflation remain moderate. They also find that the link weakens during periods of increased competitive pressure, which is apparently what happened in Israel. See Vizhdan Boranova, Raju Huidrom, Sylwia Nowak, Petia Topalova, Volodymyr Tulin, and Richard Varghese (2019), "Wage Growth and Inflation in Europe: A Puzzle?" No. 19/280, International Monetary Fund.

[19] This examination ran two separate regressions. The first is the quarterly rate of change of the CPI on independent lags and on lags in the rate of change of the nominal wage, and the second is the opposite. Other than these variables, no other exogenous variables were included. Granger causality is defined as a state in which the lags of one variable are statistically significant in a comparison that tries to explain the other variable. The results were found robust to the use of 1–4 lags of the explanatory variables. A similar examination relating to the unit labor cost (ULC) does not provide clear results regarding the dynamic link between inflation and the cost of labor.

[20] This examination used quarterly wage and inflation data from the Central Bureau of Statistics in each industry from 2000 until the second quarter of 2019 (regarding most data series). Around 2006, the CBS changed the industry classification, and the data are concatenated through the rates of change. The classification of wage and inflation to the industries assumes that the CBS data reporting on wages are congruent in each industry with data reporting on prices. The results are stable over time and over various samples.

[21] Particularly in the business services, construction, and electricity and water industries. The results in the manufacturing industry are less clear when the entire sample is examined, since there is a significant bidirectional effect (as there is regarding the 2009 to 2019 sample).

An analysis of developments in 2019 shows that GDP continued to grow strongly despite some moderation in the growth rate, apparently due to supply-side constraints, and particularly as a result of being close to maximizing the utilization of means of production. In general, there are a few indications that the economy has in recent years been in a full employment environment. The labor market remains "tight"—while nominal wages continued to increase in 2019, the pace of increase—2.8 percent per year—was lower than in the previous year (3.5 percent). The unemployment rate is just 3.3 percent (among the primary working ages, 25–64), and the job vacancy rate stabilized at a high rate, although it has declined slightly in the past two years.[22]

In order to relate to the change in prices as exporters view it, we must examine the GDP price deflator, which measures the price of the added value of products produced in the economy. The GDP price deflator differs from the Consumer Price Index partly in that it includes products that are exported and does not include products produced abroad that are imported (which are included in the Consumer Price Index). The difference in the development of GDP prices and consumer prices is mainly explained by changes in the terms of trade, and particularly by stability in export prices alongside a decline in import prices.

This difference can explain the weakness of the link between wage increases and inflation in Israel. From the manufacturer's standpoint, wage affects the price increases of the products it sells (GDP prices), and should reflect (over time) the worker's marginal output ratio (which reflects labor productivity) in the producer's price. In contrast, from the consumer's standpoint, the wage increase was more rapid than an increase in the price that he pays for his basket of goods and services—the Consumer Price Index—such that his purchasing power increased. (Wages increased by about 3 percent, while inflation increased by about 0.5 percent.) The improvement in the terms of trade in 2019, which created a gap between the increase in GDP prices (2.3 percent) and the increase in consumer prices (about 0.5 percent)[23], alongside an increase of about 1.5 percent in labor productivity, made it possible to increase wages with the acceleration of the CPI. In this context, we note that a shock due to the increase in competition in the economy—which is reflected in an increase in supply and in demand for workers alongside a decline in prices—is consistent with increasing wages alongside low inflation.

In order to try to assess the expected effect of wage on inflation, we examined labor's share of the goods and services that comprise the CPI.[24] We did this through a bottom-up calculation of the CPI components affected by wages from data from

[22] For more information, see Chapter 2 in this report.

[23] The annual rate of increase in the Consumer Price Index is calculated for the fourth quarter of 2019, in order to bring it in line with GDP price data, which are published on a quarterly basis (in annual terms). The calculated change is between the average CPI level in the fourth quarter of 2019 and the average level in the fourth quarter of 2018.

[24] Based on D. Orfaig (2019), "The Link between Wage and Inflation—An Industry View of the Labor Component in the Consumer Price Index", internal memorandum.

159 industries in detailed input-output tables[25], according to the method presented by Orfaig (2015).[26] The analysis takes into account the fact that the price of each product in the final consumer basket is comprised of labor means of production, nonlabor means of production, surplus value added, and taxes.[27]

The analysis found that the resulting rate of the wage component as per its share of CPI costs is 34 percent. Figure 3.10 shows wage's expected contributions to annual inflation. In the Figure, "other components" includes all of the factors that also affect inflation, such as the exchange rate, changes in productivity, and changes in the extent of competition, as well as the deviation of the wage increase from its expected calculated share.

Wage's contribution to inflation in the past three years has been quite uniform, and higher than in previous years.

According to this analysis, wage's contribution to inflation in the past three years has been quite uniform, and higher than in previous years. The moderate increase in the inflation rate since 2015 reflects a weakening of the other factors, although their contribution to inflation remains negative. The Figure shows that in the past six years, the weighted contribution of the "other factors" is negative, but this contribution is shrinking, while in the first four years of the decade, they made a positive contribution. This breakdown is consistent with the assessment that other forces, including global effects and increased competition, are acting in a moderating direction and are (partly) offsetting the positive effects of economic activity and wages on inflation.

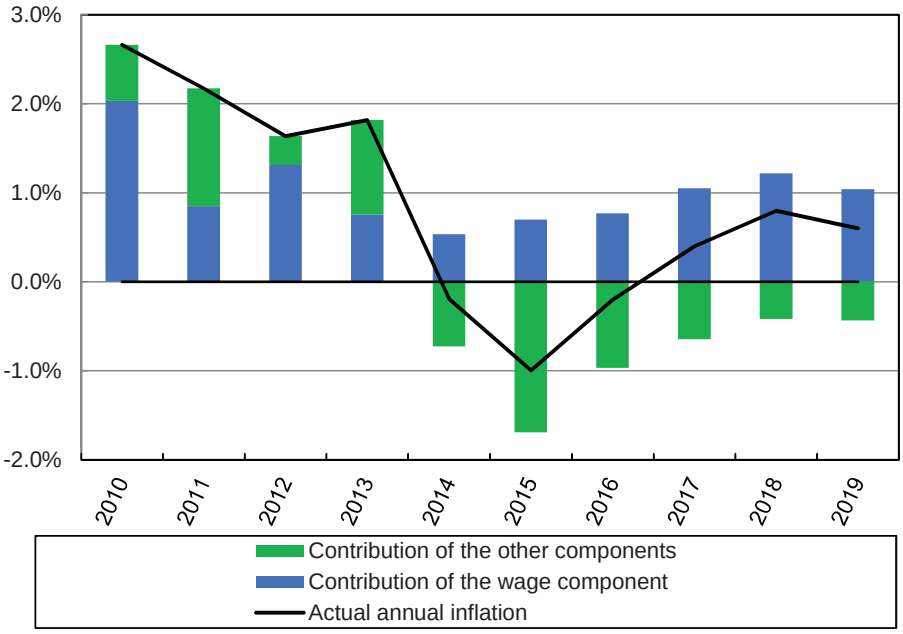
In summation, while we found that changes in the nominal wage lead change in inflation (and not the other way around), the data for recent years indicate a gap between the pace of nominal wage increases adjusted for productivity and the pace of increase of overall inflation. This is because alongside the positive contribution of wages to inflation in recent years, there are other forces, including the exchange rate and increased competition, that have a negative impact on inflation.

[25] Similar to other studies that use input-output tables to draw conclusions about the pass-through to prices, such as O. de Bandt and T. Razafindrabe (2014), "Exchange Rate Pass-Through to Import Prices in the Euro-area: A multi-currency Investigation", *International Economics*, 138: 63–77; R. A. Auer, A. Levchenko, and P. Saure (2019), "International Inflation Spillovers Throung Input Linkages", *Review of Economics and Statistics*, 101(3): 507–521; R. A. Auer and A. Mehotra (2014), "Trade Linkages and the Globalization of Inflation in Asia and the Pacific", *Journal of International Monetary and Finance*, 49, 129–151.

[26] D. Orfaig (2015). "Transmission Channels from the Exchange Rate to the Consumer Price Index: The Tradable Component of the CPI by Industry", Discussion Papers Series No. 2015.04, Bank of Israel Research Department.

[27] The analysis is based on input-output tables for 2006, which are the mostup-to-date tables that exist. There were no significant differences compared to the input-output tables for 1995. The calculation was made for each industry separately, and included the detailed data on the industry's means of production composition (divided into 159 industries). The appropriate rate of wage increase was adjusted for each industry, and the industry results were then weighted into an over-all index.

Figure 3.10
The Effect of Wage Changes on Actual Annual Inflation, December 2010 to December 2019



SOURCE: Based on Bloomberg.

3. Increased competition in the economy

Increased competition in the economy should explain the low inflation, particularly in the prices of tradable goods, and the increase in real wage beyond the increase in productivity. According to economic theory, during the transition to equilibrium with a higher level of competition, an increase is expected in the quantity produced, and a decline is expected in prices. In order to produce the increased quantity, demand for workers increases, and upward pressure is created on wages.

Increased competition in the economy should explain the low inflation, particularly in the prices of tradable goods, and the increase in real wage beyond the increase in productivity.

There are a number of things pointing to an increase in the level of competition in the economy. For instance, according to data from the Israel Postal Company, the number of packages arriving each year from abroad jumped by 370 percent within the decade, reaching about 68 million in 2019, and the total weight of these packages increased by 770 percent during the period. These data follow a number of incentives for the Israeli consumer to purchase abroad: regulatory leniencies in Customs[28], and the entry of large global players into the Israeli market, including special shipment promotions to Israel and making products accessible on websites in Hebrew. All of these factors make it easier for the consumer to import products independently.[29] Even consumers who do not use these sites for purchasing benefit from the platforms, which

[28] As part of the "Net Family" program.

[29] The prices of products purchased by consumers from international sites are not included in the Consumer Price Index.

make it easier to compare prices and thereby affect the prices of products sold in Israel. Accordingly, we have seen a decline in the profitability of firms operating in the manufacturing, importing, and marketing fields, particularly in the clothing and footwear industry.[30]

Further evidence of increased competition is the increase in the pass-through between the exchange rate and inflation, which is presented in a study by the Taub Center. The study found that until 2015, the increase in prices abroad raised the price level in Israel at a relatively rapid pace, and that when prices abroad fell, domestic prices declined in a slower and more prolonged fashion.[31] In contrast, starting in 2015–16, there was a significant change. The reaction of domestic prices to foreign prices was relatively rapid, and there was no evidence of asymmetry. When competition increases, the initially high price level in Israel relative to other countries should make it possible to lower prices more quickly (or increase them more moderately) than in those countries. (This is similar to more rapid growth in countries where the initial GDP level is low.)

Even so, it is difficult to determine the extent to which the increase in competition contributed to the decline in inflation. If we calculate the weight of the components in the Consumer Price Index that are impacted by online purchasing, we find that their weight is relatively small, which does not lend itself to a broad impact on inflation. However, this test measures only the direct effects, and does not take into account improved technological capability, which is reflected in online purchasing as a price comparison tool, or the follow-on effect of price declines on the means of production of nontradable goods that are not included in this estimation.

d. Inflation expectations

The public's expectations regarding the future development of inflation are very important to policy makers at the central bank, since they impact the development of inflation in the present. Thus, workers' expectations regarding inflation in the future have an effect in the present on their wage agreements, and later on the price of firms' consumer goods.

In 2019, inflation expectations for all ranges remained stable, with some decline at the end of the year.

In 2019, inflation expectations for all ranges remained stable, with some decline at the end of the year, in parallel with the decline in actual inflation. This followed peaks in expectations toward the end of 2018. The level of expectations are still significantly higher than the levels in 2015–17, which is consistent with the development of the core indices presented above—an increase followed by stability.

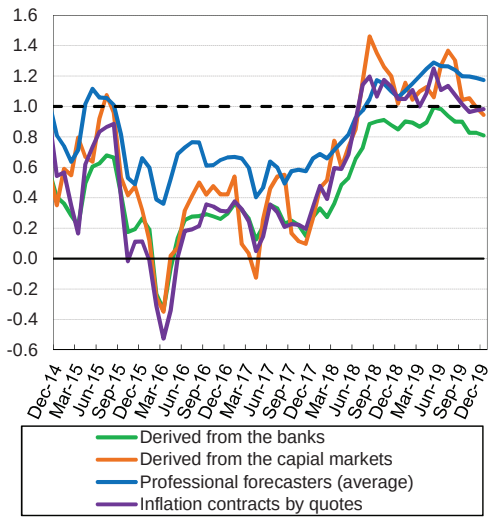
Inflation expectations derived from various sources (the capital market, professional forecasters, the banks' internal interest rates, and inflation contracts by quotes) for the coming 12 months declined slightly in 2019, following an upward trend that

[30] See further discussion in Chapter 1 of the Bank of Israel Annual Reports for 2016 and 2017.

[31] From B. Bental and G. Brand (2019). "The Pass-Through from Foreign to Domestic Prices", *State of the Nation Report: Society, Economy and Policy in Israel*, Chapter 1, Spotlight B.

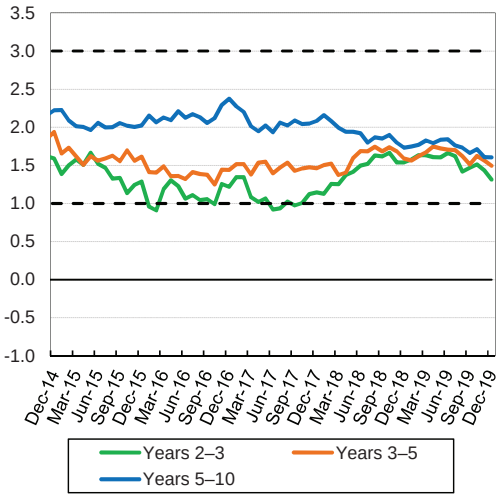
began at the start of 2017, and stabilized around the lower bound of the target range (Figure 3.11). One-year forward expectations in one year (expectations for 1–2 years) remained above the lower bound of the target range throughout 2019, and were 1.2 percent at the end of year. Forward expectations for three years and beyond also declined somewhat, but remained anchored around 1.5 percent throughout the year—lower than the midpoint of the target range (Figure 3.12). However, even though annual inflation in Israel deviated from the target range in the second half of the year, following a prolonged deviation from mid-2014 to mid-2018 (excluding a few isolated months), inflation expectations beyond one year remained within the inflation target range. Moreover, despite the decline at the end of the period, the level of expectations in the second half of 2019 remained high, evidence that the market does not expect a significant change in the inflation trend in the short term.

Figure 3.11
12-Month Inflation Expectations from Various Sources, December 2014 to December 2019 (percent)



SOURCE: Bank of Israel calculations.

Figure 3.12
Forward Inflation Expectations from the Capital Market, December 2014 to December 2019
(monthly averages, percent)



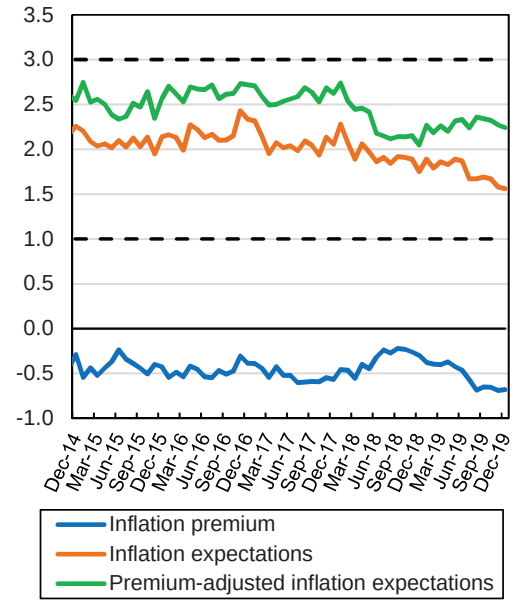
SOURCE: Bank of Israel calculations.

Long-term inflation expectations (5–10 years) serve as an indicator of the credibility of the inflation targeting regime. The decline in these expectations to 1.6 percent, below the midpoint of the target range (2 percent), which they were above for a very long period, may indicate the public's assessment that the central bank is committed to inflation within the target range, but is not necessarily committed to the midpoint of the range. Even so, it is important to remember that these expectations include an inflation risk premium, which compensates nominal bond purchasers for the risk of uncertainty regarding future inflation. This premium is dependent on the correlation

The decline of mid-to long-range expectations to 1.6 percent, below the midpoint of the target range, may indicate the public's assessment that the central bank is committed to inflation within the target range, but not necessarily to the midpoint of the range.

between inflation and economic activity.[32] An estimate of the inflation risk premium, which is shown in Figure 3.13, shows that net of the premium, there is no significant decline in long-term (5–10 year) expectations. In parallel with their decline in the second half of 2019, the premium declined by a similar extent for the same range: Expectations declined from about 1.9 percent to about 1.6 percent, and the premium declined from about -0.5 percent to about -0.7 percent.

Figure 3.13
Inflation Expectations and Long-Term Premia, May 2001 to December 2019
(5–10 years forward, percent)



SOURCE: Bank of Israel calculations.

The picture that emerges from the adjustment for the inflation risk premium should be qualified by stating that this is just one estimation that involves considerable uncertainty. Moreover, the forecasters' projections for the same range, 5–10 years (which do not include the premium), indicate a similar picture to that which emerges from the forward expectations. All the forecasters expect inflation below the midpoint of the inflation target range—2 percent—and some, about 40 percent of them, even expect inflation that is below the lower bound of the range—1 percent.[33]

[32] In a situation in which inflation is procyclical, meaning it is lower during recessionary periods and higher during boom periods, purchasers of nominal bonds will be prepared to pay "insurance" (meaning a negative inflation risk premium), since lower-than-expected inflation during a recession, for instance, will increase their real profits. In a situation in which inflation is anticyclical, purchasers of nominal bonds will demand compensation (a positive inflation risk premium), since lower-than-expected inflation during a recession will erode their real profits. Finally, the lack of correlation between inflation and economic activity would be consistent with a near-zero risk premium. For more information, see the Box in Chapter 3 of the Bank of Israel Annual Report for 2018.

[33] Based on the Bank of Israel's survey of forecasters as of January 2020.

2. MONETARY POLICY

a. Policy measures

The Bank of Israel's interest rate remained unchanged in 2019, but the nature of monetary policy changed during the year, from an expected upward path of the interest rate to an expected downward path. Thus, in the first half of the year, central banks around the world began the process of normalizing the interest rate, in view of the improvement in the economic activity and interest rate environment. It seemed that inflation in Israel had also become entrenched within the target range—it fluctuated within the range for about a year. At that time, the Bank of Israel began to use its forward guidance to communicate its intention to raise the interest rate. At the beginning of the second half of the year, the global and domestic economic conditions changed significantly for the worse, which impacted the nature of monetary policy. The change in policy was reflected in the forward guidance, in the votes of members of the Monetary Committee, and in the Research Department's staff forecast. The change in direction began at the end of July 2019, in the Governor's announcement outside the framework of the interest rate decisions, that the interest rate was not expected to increase for a long time. This followed the decision in November 2018 to increase the interest rate by 15 basis points to 0.25 percent, the first change in the interest rate in three-and-a-half years and the first increase in about seven years. The Governor's announcement came in view of changes in developments following the interest rate decision at the beginning of July: (1) the decline in annual inflation from 1.5 percent to 0.8 percent (following the publication of the June CPI); (2) the acceleration of the appreciation of the shekel in July; (3) changes in the global economic environment within a relatively short time, in view of the intensifying trade war, which created a risk to activity in Israel as a small and open economy; and (4) monetary accommodation worldwide, mainly in the eurozone and in the US. The Fed announced a drop in the interest rate for the first time following a long period, and the markets' assessment was that the interest rate declines would continue in the following months. At the same time, the ECB announced that its interest rate would remain low for a long time.

The Bank of Israel's interest rate remained unchanged in 2019, but the nature of monetary policy changed during the year, from an expected upward path of the interest rate to an expected downward path.

In general, monetary policy in 2019 acted against the background of a changing global and domestic economic environment and the low inflation environment, particularly in the second half of the year, although the inflation environment did not, as stated, signal weakness of demand. The low interest rate, around the zero lower bound (ZLB) that has characterized many advanced economies in recent years, leaves monetary policy makers with very little maneuvering space to lower the interest rate in pursuit of accommodative monetary policy.

While there are countries that have lowered their interest rates to below zero, the effectiveness of such a measure in affecting interest rates for borrowers and savers remains unclear, and the potential risks to the stability of the financial system

are insufficiently known.[34] Taking this difficulty into account, as well as the good state of economic activity and the labor market, the Monetary Committee decided, as stated, not to change the interest rate. However, alongside this, the Committee decided to take complementary measures—forward guidance, which influences the public's expectations regarding the interest rate and inflation, and the purchase of foreign exchange, which acts to moderate the forces for appreciation and thereby has a positive effect on inflation through the import component, and on domestic activity through exports.

(1) The Bank of Israel interest rate

The interest rate remained unchanged in 2019, but the factors that were operating in the background, both in Israel and abroad, sometimes made it difficult to determine the direction and intensity of any necessary change in the interest rate. While the Committee left the interest rate unchanged in 2019, the composition of the vote by Monetary Committee members on the level of the interest rate and on its desired direction changed. A large proportion of the decisions were made without unanimous agreement.[35] The developments in 2019 followed the November 2018 decision to increase the interest rate from 0.1 percent to 0.25 percent with a majority of four members in favor against one member who supported leaving the rate unchanged.[36]

In parallel with these developments, and particularly in the second half of 2019, expectations of the Bank of Israel interest rate in the next 12 months according to the forecasters' average and according to the Telbor rates (9–12 months forward) declined dramatically. After expectations during the first half of the year ranged around 0.5 percent, there was a marked decline beginning in August—with expectations ranging around 0.1 percent. A similar picture emerges from the standpoint of shorter horizon expectations, as shown by the Telbor rates (3–6 months forward). During the second half of 2019, the market expected a greater probability of a decline in the interest rate to about 0.1 percent (during some of the time, the expected probability was 100 percent), which, as stated, did not take place.

(2) Forward Guidance

The central bank can influence the public's expectations in part through forward guidance, an announcement of policymakers' intentions and presentation of their

[34] For more information see the issue in Chapter 1 of this report.

[35] In January and February, the decisions were unanimous. From April to July, four members supported the proposal to leave the interest rate unchanged, and one member supported the proposal to increase it to 0.5 percent. From August until the end of 2019, there was a gradual turnaround in the trend, from a tendency to raise the interest rate to a tendency to lower it. In the decision reached in August, there was a unanimous decision not to change the interest rate, while in October and November, some (a minority) of the members supported the proposal to lower the rate to 0.1 percent.

[36] In this interest rate decision, the Monetary Committee consisted of just five members, due to the absence of the outgoing governor and prior to the official appointment of the incoming governor.

considerations. This is one of the monetary tools that the Bank of Israel, similar to other banks, has been using in recent years to influence the market's expectations regarding the future path of the monetary interest rate. During the reviewed period, in view of developments in Israel and abroad, the Committee lowered its expectation regarding the interest rate that in its assessment is in line with returning inflation to around the midpoint of the target range, in tandem with supporting economic activity.

During the first half of 2019 (in the interest rate announcements from January until July 8, 2019), the Committee announced that its assessment was that the future upward path of the interest rate would be gradual and cautious—it expected a trend of decreasing monetary accommodation, further to the increase in the interest rate in November 2018.

The Governor's announcement in July 2019 that the interest rate was not expected to be increased for a long time signified the start of a "dovish" trend in the Committee's announcements. In the interest rate decision in August, the Monetary Committee repeated the Governor's declaration that the interest rate was not expected to increase for a prolonged time. This came in view of the negative turnaround in the inflation environment in Israel, the increasing monetary accommodation by the major central banks, the moderation of the global economy, and the continued appreciation of the shekel. The Committee even announced that additional measures were possible in order to increase monetary accommodation, while using additional tools if necessary.

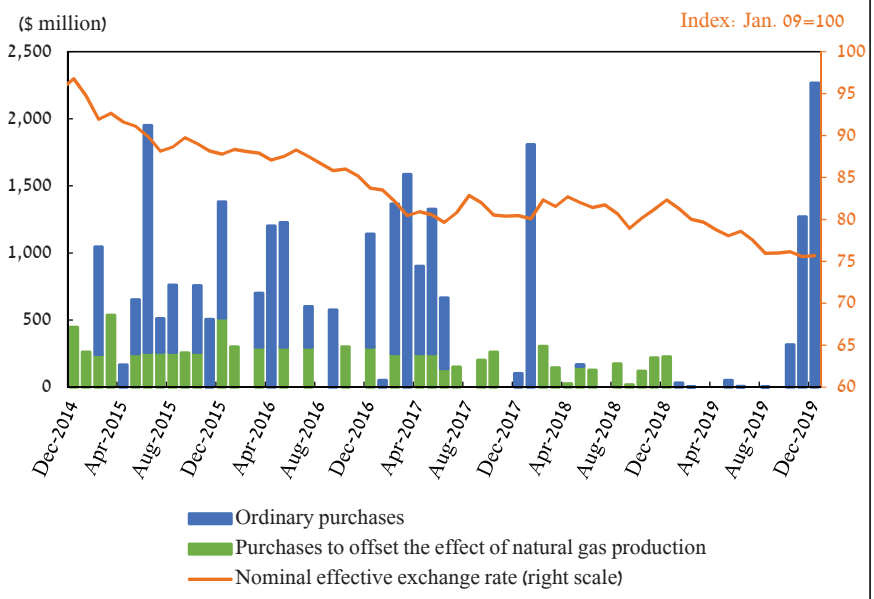
In the interest rate announcement in October, the Committee's announcement was even more "dovish". Its assessment was that the interest rate may even decline in the coming year. The Committee repeated the possibility that it would use additional tools if necessary in order to achieve the Bank's objectives.

(3) Intervention in the foreign exchange market

Due to the significant appreciation of the shekel, the Bank purchased a large volume of foreign exchange in the fourth quarter of the year, as an accommodative monetary tool complementary to the interest rate policy.

For most of 2018, and during the first three quarters of 2019, the Bank of Israel intervened in the foreign exchange market only a few times, and at low volumes, in view of the relative stability of the nominal effective exchange rate. In the interest rate decision in November, the Committee announced that it was already using additional accommodative tools—realizing the guidance that it had announced in the two previous announcements. It thus essentially declared intervention in the foreign exchange market as an additional accommodative tool to achieve the Bank's objectives. In the fourth quarter of 2019, the Bank of Israel purchased $3.8 billion in foreign currency, compared with purchases of $1.8 billion in January 2018 (that were not part of the program to offset the effects of natural gas production on the current account), and purchases of $5.1 billion in 2017. In November 2018, it was announced that the purchasing program to offset the effects of natural gas production would be halted at the end of that year (Figure 3.14). At the end of 2019, the Bank of Israel's foreign exchange reserves total about $126 billion, or about 33 percent of GDP, similar to the ratio in recent years.

Figure 3.14
The Bank of Israel's Interventions in the Foreign Exchange Market and the Nominal Effective Exchange Rate, December 2014 to December 2019



SOURCE: Bank of Israel calculations.

Toward the end of 2018, the Monetary Committee emphasized that even after the natural gas program was halted, intervention in the foreign exchange market remained one of the tools the Bank would use to achieve its objectives, and that the main reason this tool was not used in 2018 was that market conditions did not make it necessary. The sharp change in the economic environment in the second half of the year included the significant appreciation of the shekel in 2019 and the monetary accommodation worldwide, which apparently contributed to further strengthening of the shekel due to the change in the interest rate gap. These led the Bank of Israel to purchase significant amounts of foreign exchange as an accommodative monetary policy tool that was complementary to the interest rate policy, as it had been during the past decade.

b. The extent of monetary accommodation in Israel and abroad

When firms consider whether to invest and households consider whether to save, they examine the real interest rate, meaning the difference between the nominal interest rate and expected inflation. The central bank influences the real interest rate curve through its partial control of the real short-term interest rate, particularly the one-year rate, because it sets the short-term nominal interest rate periodically, and because as part of the inflation targeting regime, it also has an effect on inflation expectations.

According to economic theory, the extent of monetary policy's accommodation is connected with the gap between the real interest rate and the natural real interest rate. The natural real interest rate is the theoretical interest rate that relates to neutral interest,

such as characterizes the price stability equilibrium and activity at the potential level. When the real interest rate is lower than the natural real interest rate, it is common to view policy as accommodative, and when the opposite is the case—as restrictive. The size of the gap between these interest rates indicates the extent of accommodation or restriction. One of the problems with this approach is that the natural interest rate is not observed, so it is necessary to estimate it, and such estimates are generally hampered by tremendous uncertainty.

Examinations made regarding Israel indicate that the natural real interest rate environment has been relatively stable in recent years, after a decline from higher levels.[37] This finding is in line with the findings of similar studies abroad, according to which the natural interest rate has been relatively stable in the past decade, following declines.[38]

The interest rate policy remained accommodative in 2019, although perhaps to a lesser extent than in the previous year.

The short-term real interest rate in Israel (ex-post), which is defined as the difference between the interest rate and actual annual inflation, stabilized in 2019 at a level slightly higher than in the previous year. The increase in the short-term real interest rate mainly reflects a decline in inflation.[39] Assuming that the natural real interest rate remained relatively stable in recent years, the interest rate policy in 2019 remained accommodative, although perhaps less so than in the previous year[40] (Figure 3.15).

Israel is a small and open economy, so the extent of monetary accommodation must also be judged relative to events abroad, particularly the United States and Europe. An international comparison of real interest rates shows that relative to the extent of accommodation adopted in various economies in 2019, particularly the United States, the extent of accommodation in Israel was lower, due to the adoption of significant accommodative measures in the other economies. Many central banks expanded their accommodative policies in the second half of 2019 by lowering their interest rates and using complementary monetary tools in view of the slowdown in global real activity, the significant increase in downward risks to economic activity and inflation, and the low inflation level in some countries. In the first half of the year, the monetary interest rates in the US and Europe did not change, but in the second half, the Fed lowered its interest rate three times—by a total of 0.75 percentage points. The ECB also shifted from restrictive to more accommodative monetary policy. In July it announced that the interest rate would not change at least until the first half of 2020, and in September it lowered the monetary interest rate by 0.1 percentage points, while also announcing

[37] See discussion in Chapter 1 of this report.

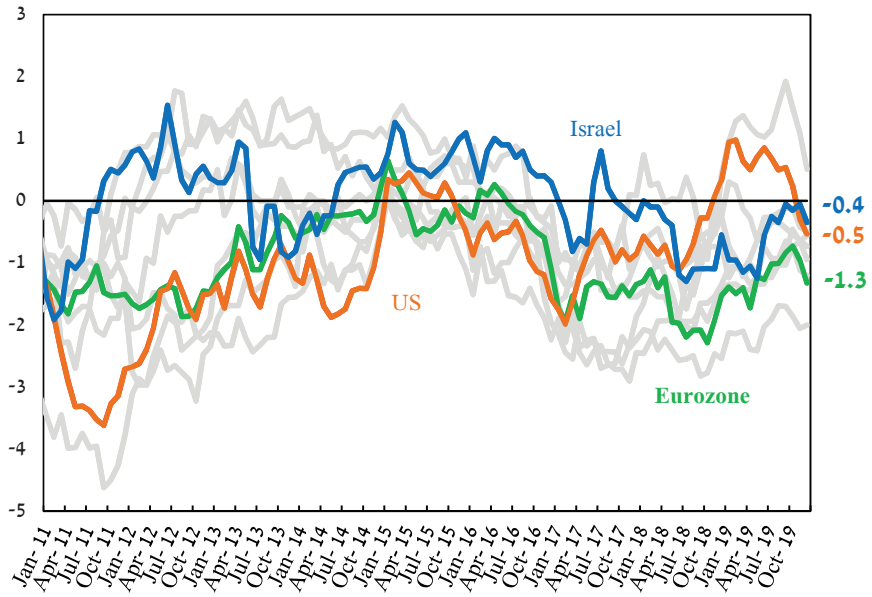
[38] See, for instance, K. Holston, T. Laubach, and J. C. Williams (2017), "Measuring the Natural Rate of Interest: International Trends and Determinants", *Journal of International Economics*, 108, Supplement 1, S59–75.

[39] The calculation of the real interest rate according to inflation expectations derived from the capital market instead of according to actual inflation indicates a similar development, although the real interest rate in this case is lower.

[40] In addition to the interest rate, the Bank of Israel also uses forward guidance and intervention in the foreign exchange market. Other central banks also use additional tools such as quantitative easing or setting a ceiling for long-term yields.

a 20 billion euro purchasing program and that the interest rate was expected to remain unchanged or to decline as long as inflation did not return to around 2 percent.

Figure 3.15
Real 1-Year Interest Rate[1], January 2011 to December 2019 (Percent)



[1] In gray - Various countries (Canada, Czech Republic, Denmark, Hungary, Japan, South Korea, Norway, Sweden, Switzerland, UK and Poland).
SOURCE: Based on Central Bureau and the Bank for International Settlements.

An examination of the development of additional output results that monetary policy is supposed to affect also shows that policy in Israel did not become more accommodative in 2019. Actual inflation and inflation expectations declined, expectations of an interest rate cut as derived from the Telbor rates and professional forecasters did not come to pass, and changes in the interest rate gap vis-à-vis the US, the eurozone and other countries contributed to the strengthening of the shekel.

In the situation that has been prevalent in recent years, in which economic activity is strong and moderate inflation reflects mainly supply shocks, alongside the proximity to the zero lower bound of the interest rate, it is unclear whether and to what extent policy must respond.

Despite the foregoing, it is important to emphasize that the choice to maintain the interest rate at 0.25 percent and to use additional tools—forward guidance and, toward the end of the year, significant intervention in the foreign exchange market—were due to a number of considerations. First, in the situation that has been prevalent in recent years, in which economic activity is strong and moderate inflation reflects mainly supply shocks, some of which reflect structural changes such as increased competition, it is unclear whether and to what extent policy must respond.[41] Second, almost all inflation expectations are constantly within the inflation target range, evidence that the credibility of the inflation targeting regime is being maintained. And finally, even if further accommodation is necessary, the ability to lower the interest

[41] See also Box 1.1 of the Bank of Israel Annual Report for 2018.

rate further is limited, considering the risks in view of the limited global experience with the use of negative interest rates, particularly its impact on financial stability. All of these considerations were finally reflected in the choice to leave the interest rate unchanged and to use forward guidance and intervention in the foreign exchange market, and as a direct result, to adopt a policy that is no more accommodative than that of the previous year.

3. THE MONETARY BASE AND MONETARY AGGREGATES

Interest is the price of money—the alternative cost of holding liquidity. Changes in the interest rate therefore influence demand for liquidity. When the nominal interest rate is used as a policy tool, the Bank sets a completely flexible money supply at the interest rate it declares, and the monetary base—the total of banknotes and coins in circulation plus the commercial banks' current deposits with the Bank of Israel—is determined according to the demand for liquidity at the central bank's interest rate.

a. The monetary base

The monetary base is affected by both flows that are not under the Bank of Israel's control, such as government accounts[42], and by flows that are under its control, such as foreign exchange purchases and makam issues. The Bank of Israel absorbs or injects liquidity to supply the demand for the monetary base at the interest rate that it has set. The bank adjusts the monetary base to the interest rate by issuing makam and through interest-bearing deposits that it offers the banks by tender and which are not included in the monetary base. The Bank takes all injections and absorptions into account, and acts to adjust the monetary base to public demand at the declared interest rate.

In 2019, the monetary base increased by about NIS 4.8 billion, after increasing by about NIS 4.9 billion in 2018 (Table 3.4). The year-over-year increase in 2019 was about 2.9 percent (Table 3.3).[43] The foreign exchange purchases made by the Bank of Israel expanded[44] the monetary base in 2019 by about NIS 13.7 billion, compared with about NIS 11.7 billion in the previous year and about NIS 24 billion in 2017—reflecting less intervention in the foreign exchange market in 2018 and a return to intervention toward the end of 2019. Against this, the Bank of Israel absorbed about NIS 17.6 billion (the net change in makam and short-term deposit balances).

[42] Government actions have an effect on the monetary base, since the government's accounts are managed at the Bank of Israel (pursuant to the Bank of Israel Law).

[43] The average in December 2019 compared with the average in December 2018.

[44] The foreign exchange purchases made by the Bank of Israel are sterilized. This means that the increase in the monetary base as a result of purchases is immediately absorbed by the Bank of Israel so that the total monetary base does not change.

Table 3.3
Source of change in the monetary base, 2015–19

(NIS billion)

	2015	2016	2017	2018	2019	2019 Q1	2019 Q2	2019 Q3	2019 Q4
1. Injections from the government and the Jewish Agency	-14.04	3.54	-3.86	1.81	7.17	-8.29	3.78	-9.65	21.33
of which: the government	-14.04	3.54	-3.86	1.81	7.17	-8.29	3.78	-9.65	21.33
2. Foreign exchange conversions[a]	33.97	23.44	24.09	11.69	13.67	0.12	0.19	0.01	13.36
of which: Bank of Israel	33.84	23.09	24.03	11.67	13.68	0.12	0.19	0.01	13.36
3. Total (1+2)	19.93	26.98	20.22	13.49	20.84	-8.18	3.97	-9.64	34.69
4. Bank of Israel injections	-11.54	-15.81	-7.82	-8.69	-16.33	11.44	-3.57	10.39	-34.59
of which: Monetary loan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Makam	14.14	11.14	13.13	-15.77	-11.63	-5.87	-2.89	-2.92	0.05
Swap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bank term deposits	-26.66	-28.00	-22.00	6.00	-6.00	17.00	-1.00	13.00	-35.00
Interest[b]	0.16	0.14	0.17	0.21	0.44	0.11	0.11	0.11	0.11
Bond purchases	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5. Total change in the monetary base	8.43	10.79	12.18	4.93	4.78	3.33	0.50	0.79	0.16

[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. These payments do not change the monetary base. They appear in the section on government injections, and in this section with the opposite sign.
[b] Excluding *makam*.

SOURCE: Bank of Israel.

Table 3.4
Rate of change in the monetary aggregates, 2015–19

	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]**	**Term deposits up to 3 months**	**Term deposits up to one year**	**SRO[c]**	**M2[d]**
	(Average in December compared to average the previous December)							
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	-2.0	-2.8	16.2	8.4
2018	6.0	6.6	13.6	12.2	-15.6	-4.3	1.1	2.0
2019	2.9	1.8	5.8	5.1	-4.0	33.2	7.0	6.3
	(Quarterly average compared with the average of the previous quarter)							
2019								
Q1	0.8	0.8	1.8	1.6	-1.6	9.7	5.5	2.6
Q2	1.3	1.1	1.3	1.3	-2.6	10.8	1.4	1.5
Q3	0.1	-0.2	1.1	0.9	-2.9	4.1	0.2	0.4
Q4	1.3	1.3	1.5	1.5	-0.3	3.2	-0.1	1.0

[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] Self-renewing overnight deposit - a liquid daily deposit.

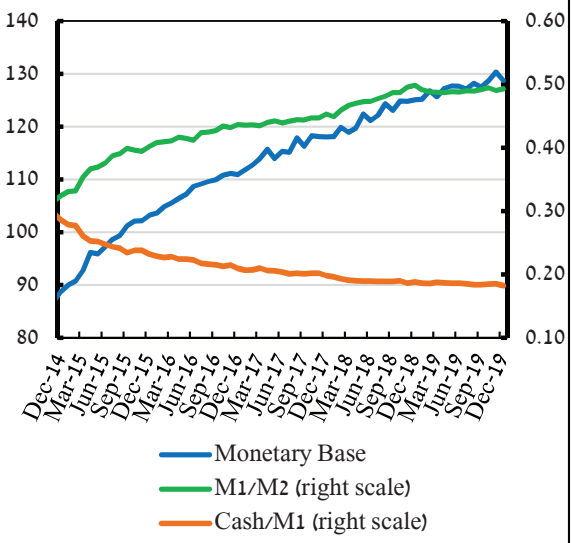
[d] M2 = M1+SRO+unindexed deposits of up to one year.

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

b. The monetary aggregates

The M1 monetary aggregate, the quantity of money, includes cash held by the public and the public's current deposits at banks (demand deposits). The demand for money is mainly influenced by the level of activity in the economy and by the level of the interest rate. An increase in economic activity increases the demand for money (due to the trading motive), and an increase in the interest rate lowers it (due to the alternative cost of holding money).

Figure 3.16
Monetary Aggregates, Monthly Average
December 2014 to December 2019



SOURCE: Bank of Israel

The decline in the growth rate of cash held by the public partly reflects the application of the "Cash Law", which limits the use of cash, and the increasing use of technological tools such as payment applications.

In 2014 and 2015, the quantity of money increased by between 35 and 40 percent, in view of the reduction in the interest rate. Thereafter, the growth moderated to 17.2 percent in 2016 and 12.6 percent in 2017, which is consistent with the stabilization of the interest rate. In 2018, the growth rate of the quantity of money remained close to what it was in 2017, 12.2 percent. In 2019, the rate was just 5.1 percent. M1 increased in 2019 mainly due to the increase in demand deposits, which grew by 5.8 percent, while the quantity of cash held by the public increased by just 1.8 percent compared with more than 6 percent in previous years. The decline in the growth rate of cash held by the public can apparently be explained in part by the implementation of the Cash Law, which limits the use of cash, and by the increasing use of technology such as payment applications.

There was a downward trend in cash as a share of M1, which was about 18 percent in 2019, down from 50 percent a decade ago. At the same time, M1 as a share of M2—the aggregate that includes M1 and unindexed deposits of up to one year—remained stabled at a relatively high level. The increase in this ratio began in 2012, and showed that the public has replaced interest-bearing deposits with demand deposits, because the low interest rate on unindexed deposits up to one year does not compensate for the loss of liquidity such deposits involve (Figure 3.16).

BOX 3.1 The Inflation Target Regime: Experience Thus Far

- The Bank of Israel's main objective is to maintain price stability—an annual inflation rate in a range between 1 and 3 percent.
- Most advanced economies operate within an inflation target regime, which ranges around 2 percent, but they differ in their definition of the target—a single point or a range—and in the symmetry of the response to an upward or downward deviation from the target.
- The data show that in most advanced economies, including Israel, the inflation target regime has achieved its main objective—a low and stable level of inflation—within two decades. Even so, inflation in the past decade has been below the target in many countries, and there is a notable difficulty in returning it to the target range.

1. INTRODUCTION

According to the Bank of Israel Law, 5770–2010, the Bank of Israel's main objective is to maintain price stability. The price stability target in Israel has been defined by the government, since 2003, as an annual inflation rate in a range between 1 and 3 percent.[1] Price stability prevents the distortions that result from the need to constantly adjust prices, and frees up the resources used for such an objective. Maintaining price stability is also important in reducing uncertainty regarding price changes, which harms well-being and makes it difficult for households and firms to plan consumption, savings, and investment. As a direct result, the commitment to price stability provides a nominal anchor that reduces uncertainty and prevents inflation bias (a constant drive for higher inflation with the intention of increasing activity).

Israel was among the first countries to implement an inflation target in the 1990s as a way to manage monetary policy. Today, many countries, particularly the advanced economies, operate within an inflation target regime.[2] In most such countries the inflation target regime achieved its objective—a low and stable inflation rate—within two decades. However, in the years following the crisis, many central banks were forced to deal with relatively new phenomena—inflation rates below the target despite accommodative policy, beginning with the response to the financial crisis, as the monetary interest rate drew close to the effective lower bound (ELB). These phenomena

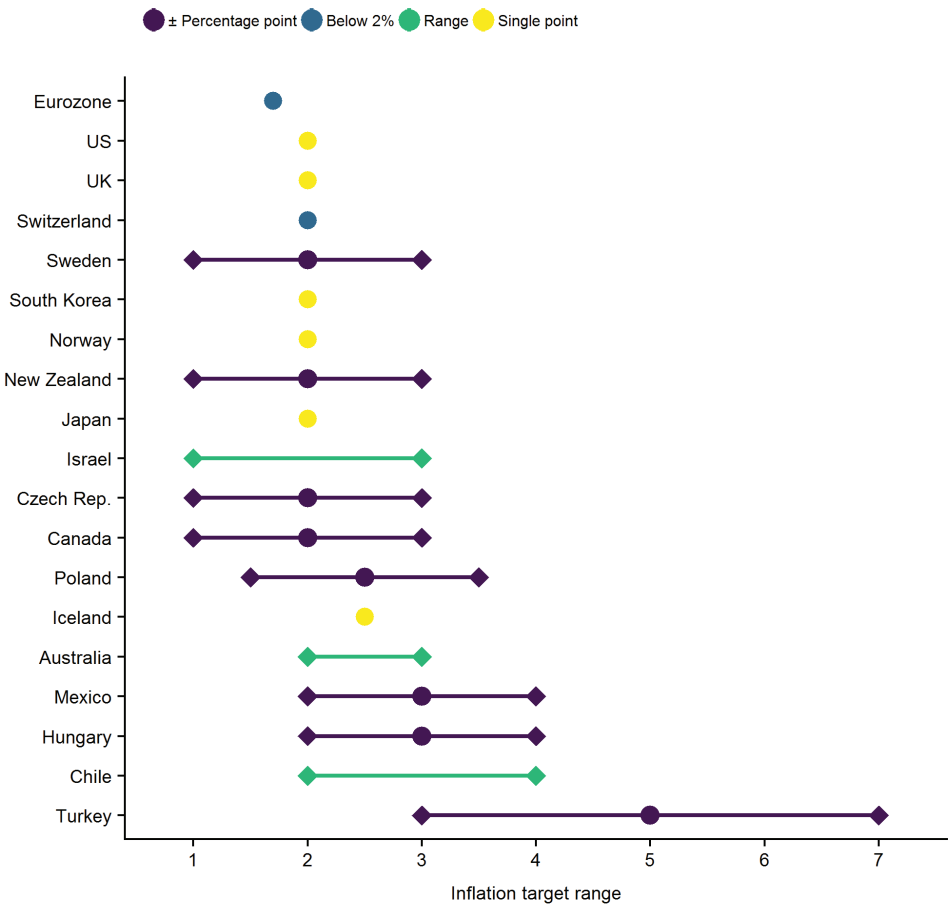
[1] The inflation target in Israel is "flexible". If there is a deviation from the target, policy makers must act to return inflation to the target within a time period of 2 years.

[2] Until the 1980s, the common approach in the advanced economies supported setting a rate of growth of the quantity of money as an interim target for policy, with the idea that maintaining a low and fixed growth rate of the quantity of money would lead to low and stable inflation in the medium term. However, short-term deviations from this target were permitted in order to deal with problems that may occur in economic activity, since changes to the quantity of money lead to changes in the interest rate, thereby affecting activity. This approach failed for two main reasons: First, it was found that the link between the quantity of money and the level of inflation, even in the medium–long term, is not stable. Second, the link between the quantity of money and the level of the nominal short-term interest rate was also found to be unstable, mainly due to the higher-than-expected volatility of the demand for money. These findings eventually led to the transition to a direct inflation target and the use of the interest rate as a policy tool.

contributed to a renewed discussion of the desired price stability target. The discussion globally surrounds the relevance of this target in the current era, and partly deals with the what parameters are desired within the inflation target regime—the level of the target and the question of whether there is room to change it, and how symmetrical policy's response is to deviations above and below the target.[3] This box outlines the experience accumulated on these topics in advanced economies, including Israel, in the years in which policy operated within an inflation target framework.

2. THE TARGET IN ISRAEL AND ABROAD

Figure 1
Definition of the Inflation Target in the OECD Countries, 2019 (percent)



SOURCE: Bank of Israel Calculations.

[3] A broader discussion, which is not dealt with here, is taking place regarding alternative frameworks for managing monetary policy, such as setting a price level target or a nominal GDP target (growth rate or level).

Starting in the early 1990s[4], many central banks around the world operate within a price stability framework in which the target is defined as a positive but low rate of price increases (i.e. inflation) around 2 percent (Figure 1).[5] Accordingly, in most places, maintaining price stability is included as one of the central bank's objectives.[6]

Beyond setting the target inflation level, there are notable differences between countries in the precise definition of the target (see Figure 1). Most set a target of close to 2 percent. However, in some countries it is defined as a range, in some it is defined as a band around a single-point target, and in others it is defined as a single-point target.[7] In a very few countries (Switzerland and the eurozone), the target is defined asymmetrically. In the eurozone, the target is defined as lower than, but close to, 2 percent, and in Switzerland, it is defined as inflation lower than 2 percent. The definition set for the target in Israel beginning in 2003—a range of 1–3 percent with no mention of a midpoint—is not typical of many countries.[8] Below, we will discuss these two characteristics, and the advantages and disadvantages of each method.

a. A single-point target vs. a band

Many countries define a single-point, generally around 2 percent, but there are those who add the possibility of some deviation in both directions. Most countries who have defined the target in terms of a range, including Israel, have set a band that is 2 percentage points wide. A few countries, including Israel, define a range without noting the midpoint. The material difference between a single-point target and a range is in the extent of commitment to the midpoint value. Setting a range, instead of a single point, is generally characteristic of central banks that are committed to a number of objectives. In such a situation, the inflation target must be balanced with the central bank's other objectives, such as the level of economic activity. The existence of a range enables policy makers to accept a deviation from the midpoint of the inflation target, and provides them with greater flexibility in using policy tools while taking into account actual shocks, the state of the business cycle, and the ability to use the tools, for instance when inflation deviates from the target due to supply shocks (such as an increase in oil prices), or when the interest rate is close to the ELB. This is as long as the deviation is consistent with attaining the bank's other objectives. However, setting a range with no single-point value at the midpoint weakens the commitment to a particular value, increases uncertainty regarding the target at which policymakers are aiming, and may make it difficult to anchor long-term expectations at a specific value as the midpoint of the target.

4 New Zealand first set an inflation target in 1989.

5 For the motivation behind, and a summary historical review of, the inflation target regime, see L. E. Svensson (2010), "Inflation Targeting", in *Monetary Economics* (pp. 127–131). Palgrave Macmillan, UK.

6 See a review of the institutional frameworks at central banks in: A. Naudon and A. Perez (2017), "An Overview of Inflation Targeting Frameworks: Institutional Arrangements, Decision-Making, and the Communication of Monetary Policy," Central Bank of Chile, Working Paper no. 811.

7 In a few countries, the target level has changed in the past 20 years, and in most of those, it was higher in earlier years than in later ones. An exception is new Zealand, which raised the midpoint of the target from 1.5 percent to 2 percent.

8 There was also discussion of the parameters of the inflation target in the past. See R. Amir and S. Ribon, "Choosing and Formulating the Inflation Target in Israel—Points for Thought", in L. Leiderman (ed.) *Inflation and Disinflation in Israel*, Bank of Israel, December 1999, and "Rethinking the Inflation Target", Bank of Israel, August 2007.

When a single-point target is not defined, the credibility of policy is measured in terms of the range, such that any inflation rate within the range fulfills the conditions of meeting the target. In other words, a deviation from the target is measured only in relation to the upper or lower bound of the range. In this sense, defining a range without a midpoint increases the credibility of policy. Setting a single-point target without noting the extent of deviation from it that is permitted, for instance as Sweden and the UK do, strengthens policy's commitment to attaining an inflation rate close to it. As long as policy is considered credible, a single-point target makes it easy to anchor short- and long-term expectations.

b. Symmetry of the target

In Switzerland and the eurozone, the inflation target is defined asymmetrically, with a limit on the upper bound but no limit on the lower bound. In the eurozone, the target is defined as "below but close to 2 percent"[9], and in Switzerland it is defined as "less than 2 percent". The definition in the eurozone is very similar to the definition of a single-point target, but it enables slightly more downward flexibility for a lower inflation rate, and essentially narrows the ability to deviate upward. In order to avoid such a deviation, it is reasonable to assume that policy makers will adopt a policy with a "safety margin", meaning that policy will tend to be more restrictive than it would have been in a symmetrical target framework. As Figure 2 shows, the downward deviation of the inflation rate is actually greater than in other countries.

The formulation in Switzerland enables greater flexibility, since any inflation rate lower than 2 percent, including a negative inflation rate, fulfills the terms of the target. This type of target weakens the ability anchor expectations at a particular inflation rate, although it reflects a greater commitment on the part of the central bank to prevent upward deviations from the target. In parallel, this rule provides the central bank with more flexibility not to react to supply shocks that are reflected in a moderation of the inflation rate, and does provides it with the freedom to react to a slowdown in inflation that is derived from the demand side, if it sees fit to do so. Such a target also makes it easier for policy in a situation where there is less room to use policy tools.

A possible disadvantage for setting an asymmetrical target, similar to a situation where a band is set with no midpoint, is that it creates more room for disagreement within the body that decides on policy. This is because the policy objective at any time is open to interpretations, and the policy that is adopted depends partly on the various preferences of the committee members between inflation and economic activity.

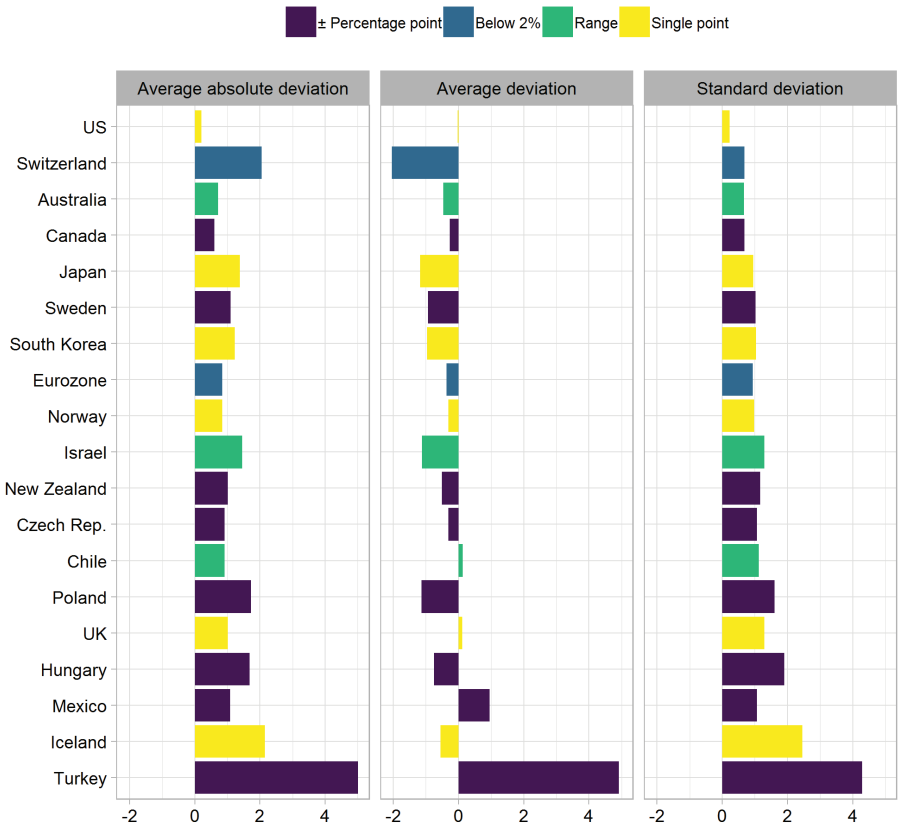
[9] For more discussion on the ECB's price stability target, see https://www.ecb.europa.eu/mopo

3. THE DEVELOPMENT OF ACTUAL INFLATION RELATIVE TO THE TARGET

An examination of the development of inflation rates from 2011 in countries that use an inflation target range (Figure 2) shows that the average deviation from the midpoint of the range is generally negative, meaning that actual inflation is generally lower than the midpoint of the range (the middle column in the figure), and that the average deviation in absolute terms generally ranges between 1 and 2 percentage points. The standard deviation of the annual inflation rate (right column) is around 1 percentage point. This means that for part of the time, the rate of change in prices is more than 1 percentage point away from the midpoint of the target (generally 2 percent). In general, we can say that most countries successfully maintain inflation around the target, but it tends to be below it.

Regarding Israel, we find that in about two-thirds of the months, the actual inflation rate deviated from the target range. Thus, in recent years, there has been a continued downward deviation in the inflation

Figure 2
Deviations from the Inflation Target in the OECD Countries, 2011–2019



SOURCE: Bank of Israel Calculations.