Chapter 3
Monetary Policy and Inflation

- During the course of 2018, inflation returned to within the target range for six months, after having deviated from it for close to four-and-a-half years. Inflation in December was slightly below the target range.
- The inflation rate accelerated this year due to the weakening of some of the downward forces of recent years (the strengthening of the shekel, government-initiated measures to lower the cost of living, and increased competition), and because the volatile components of the CPI—energy, food, and fruits and vegetables—made positive contributions.
- Looking long-term, inflation in Israel is in a continued upward trend, although it is volatile. Inflation increased from -1 percent at the end of 2015 to around the lower bound of the target range in 2018. This is shown much more clearly when the index is adjusted for temporary effects, and is consistent with the high level of real economic activity during those years, particularly the tight labor market.
- Even so, inflation in Israel remains one of the lowest in the OECD, although the gap between it and most OECD member countries has narrowed in recent years.
- In parallel with the increase in actual inflation, one-year expectations from the various sources also increased, and during the second half of the year they stabilized around the lower bound of the target range. Long-term forward expectations remained strongly anchored within the target range throughout the period, which shows that the inflation target is maintaining credibility.
- Since inflation converged with the target range during the second half of the year, and since the economy is in a full employment environment, the Monetary Committee decided in November to increase the interest rate by 15 basis points to 0.25 percent. Market participants expected an interest rate increase, but it took place earlier than expected. Notwithstanding the increase, monetary policy remained accommodative.
- The Monetary Committee left the forward guidance text in place this year, until the decision to increase in the interest rate.
- In view of the relative stability in the nominal effective exchange rate, the Committee's purchases of foreign exchange since February were only within the program to offset the effect of natural gas production on the current account. In the second week of November, the Monetary Committee announced that purchases as part of this program would be halted at the beginning of 2019.
- Inflation expectations derived from the capital market declined in recent years, inter alia due to a decline in the inflation risk premium (the compensation demanded by investors due to uncertainty regarding future inflation).

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

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

This chapter analyzes the inflation environment in the economy during 2018 and the policy steps adopted by the Monetary Committee in response to it and to other background conditions.

1. THE INFLATION ENVIRONMENT

There are a number of factors that affect the development of prices in a small open economy such as Israel's, including shocks to aggregate supply that result from changes in the price of oil, commodities, and imported goods; the utilization of means of production (the gap between actual output and potential output, and the gap between the unemployment rate and the natural unemployment rate); inflation expectations; inflation abroad, since globalization of the production and supply chains

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

[2] Until October 2011, interest rate decisions were made by the Governor alone. Since October 2011, they are made by the Monetary Committee. The Committee consists of six members, led by the Governor, and its decisions are made by majority vote. In the case of a tie vote, the Governor has an extra vote. 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. Since the interest rate decision in October 2017, the Monetary Committee has been operating with a full complement consisting of six members. Prior to that, from November 2014, the Committee operated with fewer than six members. For the interest rate decision reached in November 2018, the Committee operated on a one-time basis with only five members, due to the replacement of the Governor.

increases the synchronization between inflation rates around the world, including the inflation rate in Israel[3]; and the response of monetary policy makers to these and expected developments.[4] Alongside these forces, there are additional factors operating in the background, including structural reforms intended to enhance competition and thereby lower prices in the economy; measures initiated by the government to reduce the cost of living; and technological changes, particularly the expansion of the digital economy. This section outlines the development of inflation in Israel in 2018 and its background factors.

a. The development of inflation

Inflation stabilized around the lower bound of the target range in 2018, and was 0.8 percent at the end of the year.

Annual inflation of the Consumer Price Index (the rate of change each month vs. the same month in the previous year) did not develop uniformly in 2018 (Figure 3.1). At the beginning of the year, inflation continued its upward trend that began in mid-2017 and continued until June 2018. Annual inflation increased from about -0.7 percent in July 2017 to 1.4 percent in July 2018. In essence, annual inflation returned to the target range in 2018 for the first time since April 2014, following a deviation that lasted for close to four-and-a-half years. In the second half of the year, inflation stabilized slightly above the lower bound of the target range, while in December it was slightly below it, at 0.8 percent.

During the year, some of the forces that had contributed in past years to low inflation weakened. First, the shekel depreciated against the dollar, the currency in which most Israel import transactions are denominated. Second, government interventions had almost no impact this year on the CPI, after making a significant downward impact in previous years.[5] Third, and as will be discussed below, inflation abroad increased, and apparently contributed to the increase in domestic inflation through import prices. Finally, the proximity to full employment and the continued wage increases made it more difficult for firms to lower prices, and may have even supported price increases.

Looking longer-term, it seems that inflation in Israel has been in a moderate upward trend since 2015.

Looking longer-term, it seems that inflation in Israel has been in a moderate upward trend since 2015, but since it was volatile, particularly in June–July 2017, it was

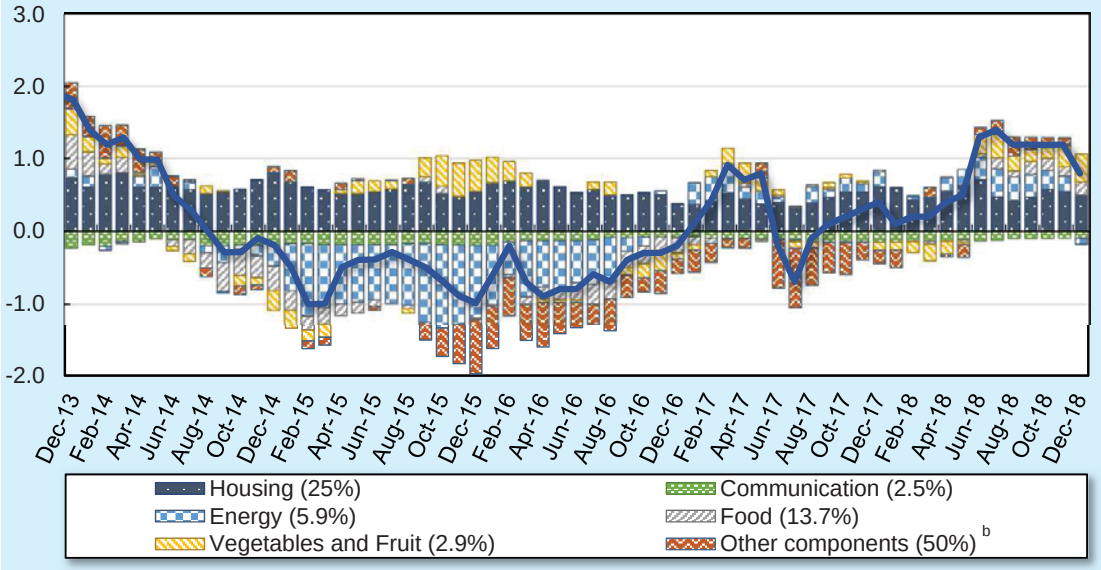
[3] More discussion of the global factors influencing inflation in Israel appears in Box 3.2 of the Bank of Israel *Annual Report* for 2017.

[4] The link between inflation and the first three factors—aggregate supply, utilization of means of production, and inflation expectations—is referred to in the literature as the "Phillips Curve". More discussion appears in Box 3.2 of the Bank of Israel *Annual Report* for 2016.

[5] Government interventions this year included: (1) "Net price reductions", a program that cancelled customs duties on a variety of imported consumer goods (the cumulative negative contribution to the overall CPI totaled about 0.1 percentage points); and (2) lowering electricity prices since the basis for the Electricity Authority's rates is set for the coming five years (the cumulative negative contribution to the overall CPI totaled about 0.05 percentage points). In contrast, there was an increase in taxi fares, but that is mainly connected to the increase in fuel prices during the year (the contribution to the overall CPI is negligible, 0.01 percentage points). The Research Department's assessment is that all of these measures made a negligible contribution to inflation in 2018.

difficult to identify the upward trend in real time.[6] As we will see below, this increase is consistent with real activity during that time, particularly with the tight labor market and the relatively rapid wage increases. However, it is also consistent with the reversal of the trend in the contribution of the energy component as a result of the higher oil prices that made a positive contribution to inflation, after having made a significant negative contribution between 2014 and 2016.[7] A similar trend reversal took place in food prices, which made a positive contribution to inflation this year after having made negative or near-zero contributions for many years previously.

Figure 3.1
Annual Inflation Rate and Contribution of CPI Components[a], December 2013 to December 2018 (percent)



[a] The numbers in parentheses are the weight of the component 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.

[6] The June 2017 CPI reading showed a negative, and significantly lower value than the June 2016 reading, and when that low reading entered the calculation and the high reading exited it, annual inflation dropped sharply. In retrospect, it seems that the sharp decline in the annual inflation rate apparently reflected static noise and technical elements (for more discussion see Chapter 3 of the Bank of Israel *Annual Report* for 2017).

[7] Changes in oil prices affect inflation only after a few months. See the discussion later on in this Chapter.

b. Core inflation

Inflation increased in the second half of 2018, inter alia due to components that are generally very volatile: (1) Energy (5.9 percent of the overall CPI), a component that mainly reflects changes in oil prices, continued to make a positive contribution to inflation this year; (2) Fresh fruit and vegetables (2.9 percent of the overall CPI) made a positive contribution this year after having made a negative contribution the previous year; and (3) the food component (13.7 percent of the overall CPI) made a positive contribution after having made a negligible contribution the previous year. At the same time, the negative contributions of less volatile components (the "other" components in the figure) declined, and the housing component (which measures rental prices) maintained its positive contribution. The positive contributions mentioned here partly offset the effect of the communications component, which maintained its negative contribution.

When monetary policy makers assess the inflation environment, they generally try to observe it "through" temporary price shocks, since these do not necessarily reflect the economy's location in the business cycle and their effect should dissipate within the time period that is relevant for policy makers. As we have seen, shocks in energy prices, for instance, affect inflation, but are determined independently in the global markets, and their effects are generally temporary. Similar considerations may apply to other volatile components of the CPI. Some of the changes in food prices are the result of changes in commodity prices abroad, and fruit and vegetable prices are sensitive to weather conditions. Therefore, many central banks customarily track an estimate that excludes such effects and reveals the "basic" inflation in the economy, referred to as "core inflation".[8]

The most common estimate of core inflation focuses on inflation net of changes in the volatile energy and food components. In addition, there are statistical approaches that exclude components that show exceptional price changes, or that look for a common factor that leads to price changes in the index's components. There is no formal definition of core inflation in Israel, and the Monetary Committee does not explicitly relate to it in its announcements. However, it does relate in its announcements to the index excluding the energy, and fruit and vegetables components and price reductions initiated by the government.[9]

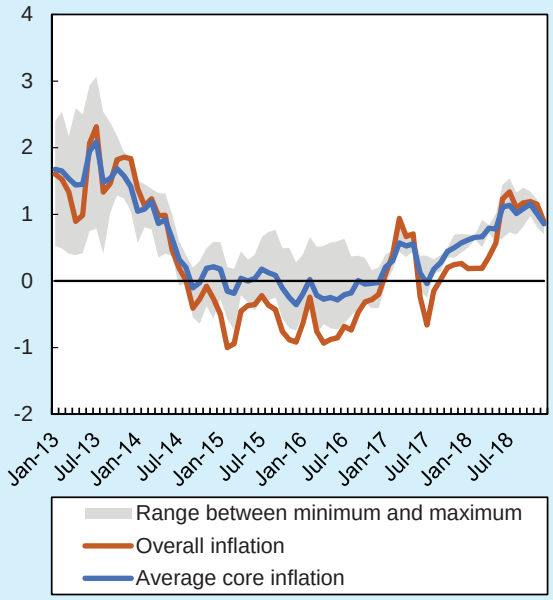
Similar to the previous year, Israel's core inflation in 2018 is estimated by a simple average of four indices: (1) inflation excluding energy, food, fruit and vegetables, and government-initiated price reductions; (2) inflation with monthly adjustments

[8] The literature provides theoretical justification for the use of core inflation, although the definition is slightly different. In particular in a standard new-Keynesian model with heterogeneity in the rigidity of goods prices in the economy, it would be optimal to stabilize a price index with higher weight given to goods with a high level of price rigidity (Aoki, 2011).

[9] In the US, for instance, explicit reference is made to core inflation, which is defined in terms of Personal Consumption Expenditure (PCE) price index excluding energy and food. Another example is the Bank of Canada, which publishes three different statistical core indices, through which it assesses the inflation environment.

for components that exhbit extreme price changes ("the trimmed index"); (3) Inflation based on the change in the median price of index components ("the median index"); and (4) inflation based on the first common factor estimated through a principal component analysis.[10] We use this method assuming that the average of these four indices is more accurate than each individual estimate. Figure 3.2 shows the average core inflation alongside overall annual inflation in Israel. The gray area denotes the range between the maximum and minimum values of the four indices each month, and constitutes an estimate of uncertainty in measuring the average core inflation.

Figure 3.2
Annual Inflation and Average Core Inflation, January 2013 to December 2018 (percent)



SOURCE: Based on Central Bureau of Statistics.

The figure shows that average core inflation has been in an almost continuous increase since 2016, which has been less volatile than overall inflation. Core inflation also featured the volatility that was observed in June–July 2017, but it is far less prominent thanks to the adjustment for excessive and volatile price changes. In the second half of 2018, overall inflation was very close to the average core inflation, and at the end of the year, average core inflation was 0.9 percent, slightly higher than overall inflation, while the range of individual estimates was between 0.7 percent (inflation excluding energy, fruit and vegetables, and government-initiated price reductions) and 1.0 percent (the median index). As such, the gap between overall inflation and average core inflation at the end of the year was negligible. This means that the level of overall inflation truly reflects the economy's base inflation—it does not reflect significant deviations as a result of the effect of exceptional and/or temporary factors.

[10] For more details, see S. Ribon (2009), "Core Inflation Indices for Israel", Bank of Israel Research Department, Discussion Paper 2009.08.

Table 3.1
Main indicators of inflation and monetary policy, 2014–18

	2014	2015	2016	2017	2018	2018 Q1	2018 Q2	2018 Q3	2018 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]	-0.2	-1.0	-0.2	0.4	0.8	-0.1	1.0	0.2	-0.3
3. Seasonally adjusted quarterly inflation[b]						1.6	1.2	0.8	-0.4
4. One-year inflation expectations derived from capital market[c]	1.2	0.6	0.3	0.2	1.0	0.6	0.9	1.4	1.1
5. Ten-year inflation expectations derived from capital market[c]	2.3	2.1	2.3	2.3	1.8	2.1	1.8	1.7	1.8
6. Forecasters' one-year inflation forecasts[c]	1.3	0.8	0.6	0.6	1.0	0.7	0.9	1.1	1.1
B. Yields (percent)[c]									
1. Bank of Israel declared interest rate	0.6	0.1	0.1	0.1	0.1	0.1	0.10	0.1	0.15
2. One-year real yield to maturity on government bonds[d]	-0.7	-0.5	-0.1	-0.1	-0.8	-0.5	-0.7	-1.1	-0.8
3. Ten-year nominal yield to maturity on government bonds[e]	3.1	2.2	2.0	2.1	2.2	1.9	2.1	2.2	2.4
4. Ten-year real yield to maturity on government bonds[e]	1.0	0.5	0.4	0.6	0.5	0.3	0.4	0.5	0.7
C. Change in the shekel exchange rate (percent)[f]									
1. Nominal effective	4.4	-9.3	-4.6	-3.9	2.3	1.4	-0.1	-3.1	4.3
2. Vis-à-vis the dollar	12.3	-1.4	-1.4	-8.5	7.1	-1.0	3.9	-0.3	4.5
3. Vis-à-vis the euro	1.1	-13.1	-4.3	2.7	3.1	3.3	-1.7	-0.5	2.0
D. Asset prices (percent)									
1. Overall yield on shares (nominal)[f]	11.5	6.8	-11.0	-1.1	-3.9	-3.6	4.7	6.7	-10.8
2. Home prices	4.3	7.9	5.7	1.4	-0.7	-0.3	1.0	-0.1	-0.4
E. The monetary aggregates (nominal rates of change)[g]									
1. M1 money supply	35.6	40.7	17.2	12.6	12.4	3.5	3.0	3.3	2.0
2. M1 + SRO[g] + unindexed deposits of up to one year (M2)	8.4	13.6	7.9	8.4	2.2	0.6	1.6	0.3	-0.4
F. Other background data (percent, seasonally adjusted quarterly data)									
1. Unemployment rate	5.9	5.3	4.8	4.2	4.0	3.7	4.0	4.1	4.2
2. GDP growth rate[h]	3.9	2.6	4.0	3.5	3.3	4.0	0.9	2.7	3.0

[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 Research Department and Central Bureau of Statistics.

Table 3.2
Development of prices, by various components[a], 2014–18

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, communication, 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	-3.9	0.6	0.8	0.1	2.2	1.8	
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	0.0	-0.4	0.6	1.6	1.2	
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	0.0	0.2	0.0	1.2	1	
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	0.1	0.2	0.5	1.9	1.7	
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	0.9	0.5	1.1			
								(monthly rate of change, percent)										
2018																		
January	-0.5	-0.2	0.3	-0.6	0.0	0.1	-8.8	-0.5	0.2	0.1	0.2	0.0	-0.7	-0.5	-0.4			0.0
February	0.1	2.3	0.3	-0.3	-0.1	0.4	-4.6	0.2	0.0	0.6	-0.1	0.5	0.0	-0.2	0.0			0.2
March	0.3	-2.9	-0.3	0.9	0.0	0.4	4.9	1.0	-0.2	-0.1	0.1	-1.0	0.5	0.8	0.5			0.2
April	0.4	3.3	0.5	0.3	0.3	-0.4	2.2	-0.3	-0.1	0.5	0.0	1.5	0.3	0.2	0.3			0.0
May	0.5	7.4	-0.6	0.0	0.2	-0.2	7.1	0.6	0.3	0.2	0.5	1.2	0.6	0.4	0.5			0.2
June	0.1	1.9	0.5	0.5	0.1	-0.5	-6.4	-0.3	0.0	0.6	-0.8	1.3	-0.1	-0.2	-0.1			0.1
July	0.0	2.0	0.5	0.0	0.1	-0.2	-6.7	-0.1	-0.5	0.6	0.4	-1.0	0.0	0.0	0.1			-0.1
August	0.1	-2.1	-0.3	0.4	0.2	-0.2	-1.7	1.2	-0.1	0.1	-0.2	0.8	0.1	0.1	0.1			0.1
September	0.1	1.9	0.7	0.6	0.1	0.3	-0.7	-0.6	0.2	-0.8	-0.2	0.2	0.0	-0.1	0.0			0.2
October	0.3	0.5	0.2	0.4	0.1	0.2	8.1	0.5	-0.1	-0.5	0.5	0.1	0.3	0.5	0.4			0.1
November	-0.3	-1.5	-0.4	-0.2	-0.1	-0.8	2.3	-0.6	0.0	-0.7	-0.1	-0.9	-0.2	-0.2	-0.3			0.0
December	-0.3	-0.4	-0.1	0.0	-0.1	-0.2	3.2	-0.9	0.2	-1.1	-0.2	-4.1	0.0	0.0	0.0			-0.2

[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.

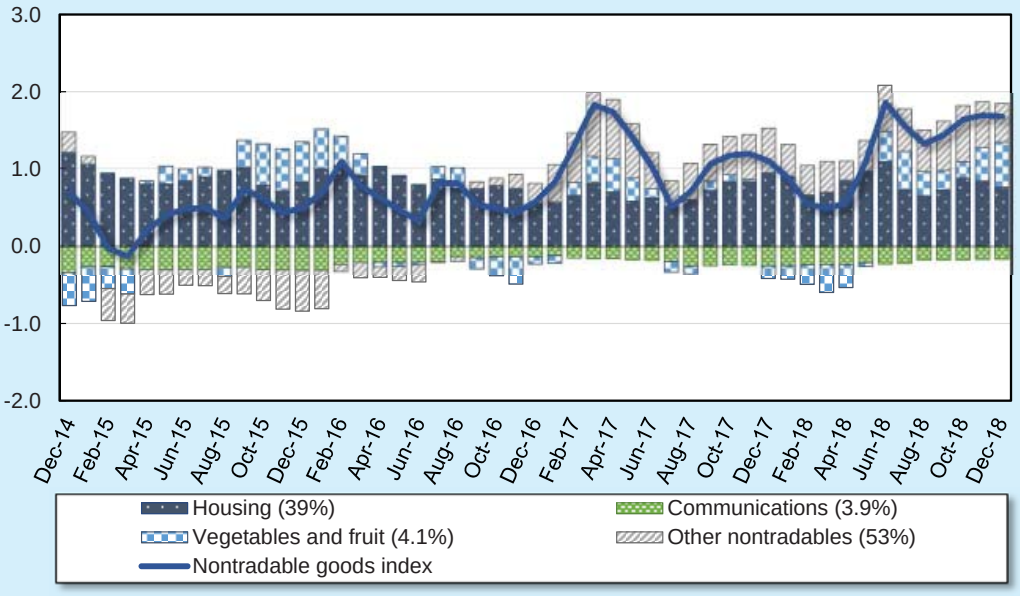
c. The prices of nontradable goods and domestic activity

Additional information regarding the inflation environment comes from the classification of goods and services included in the consumption basket as tradable or nontradable. The nontradable goods index (63 percent of the CPI) mainly measures the change in domestic prices. It weights the prices of goods of a nontradable nature, meaning goods produced mainly by domestic means of production that have no significant import alternatives. The index also includes domestic services provided in Israel.[11] Due to its composition, the nontradable goods index helps us to better understand the domestic factors of behind the fluctuations in inflation—the shocks to domestic supply and demand.

The nontradable goods index indicates, for the second consecutive year, a stable inflation rate within the target range, and even a moderate upward trend. In 2018, it increased by 1.7 percent, following increases of 1.1 percent in 2017 and 0.6 percent in 2016 (Figure 3.3). While some of the increase in 2018 was the result of price increases in the fruit and vegetables component, which is volatile, the inflation rate in the nontradable goods index is within the target range even excluding that component—at 1.1 percent.

The nontradable goods index indicates, for the second consecutive year, a stable inflation rate within the target range, and even a moderate upward trend. This is consistent with the high level of domestic economic activity.

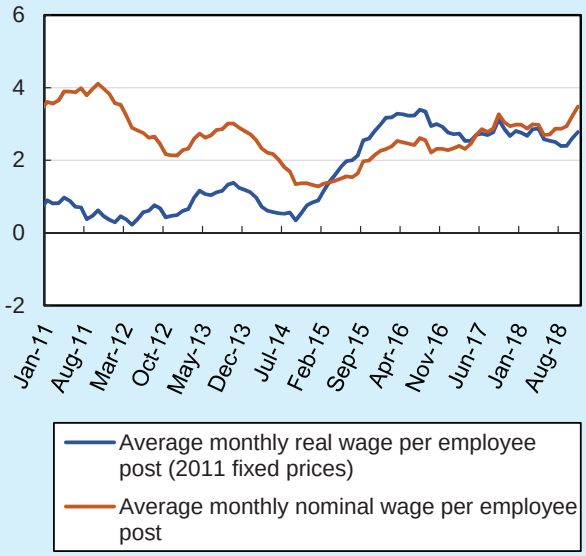
Figure 3.3
Annual Inflation Rate and Contribution of CPI Components[a], Nontradable Goods Index (63% of the CPI), December 2014 to December 2018 (percent)



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

[11] A haircut at a barber shop is a classic example of a nontradable service with a market-determined price.

Figure 3.4
Annual Growth Rate of Nominal and Real Wages in Israel, January 2011 to December 2018
(moving 12-month average percent)



SOURCE: Based on Central Bureau of Statistics.

The upward trend in the prices of nontradables is consistent with what is happening in domestic economic activity. In 2018, the data indicated moderation in the economic growth rate and a rapid increase in wages, apparently in view of supply-side limitations—particularly the nearly maximized utilization of means of production. In particular, there are a number of indications that the economy has in recent years been in a full employment environment (see more information in Chapters 1 and 2): The labor market remains "tight" and it seems that the employment rate has nearly maximized its potential to expand; nominal wages continue to increase—at an average annual rate of 3.5 percent in 2018—and the business sector led the increase with an increase of 4.3 percent in the average wage (Figure 3.4); the unit labor cost also continued to increase, and apparently contributed to the increase in prices, or at the very least made it difficult for firms to lower prices; the unemployment rate is at a low point of 3.5 percent (the 2018 average among the prime working-age population [25–64]); and the job vacancy rate stabilized and even declined slightly toward the end of the year.

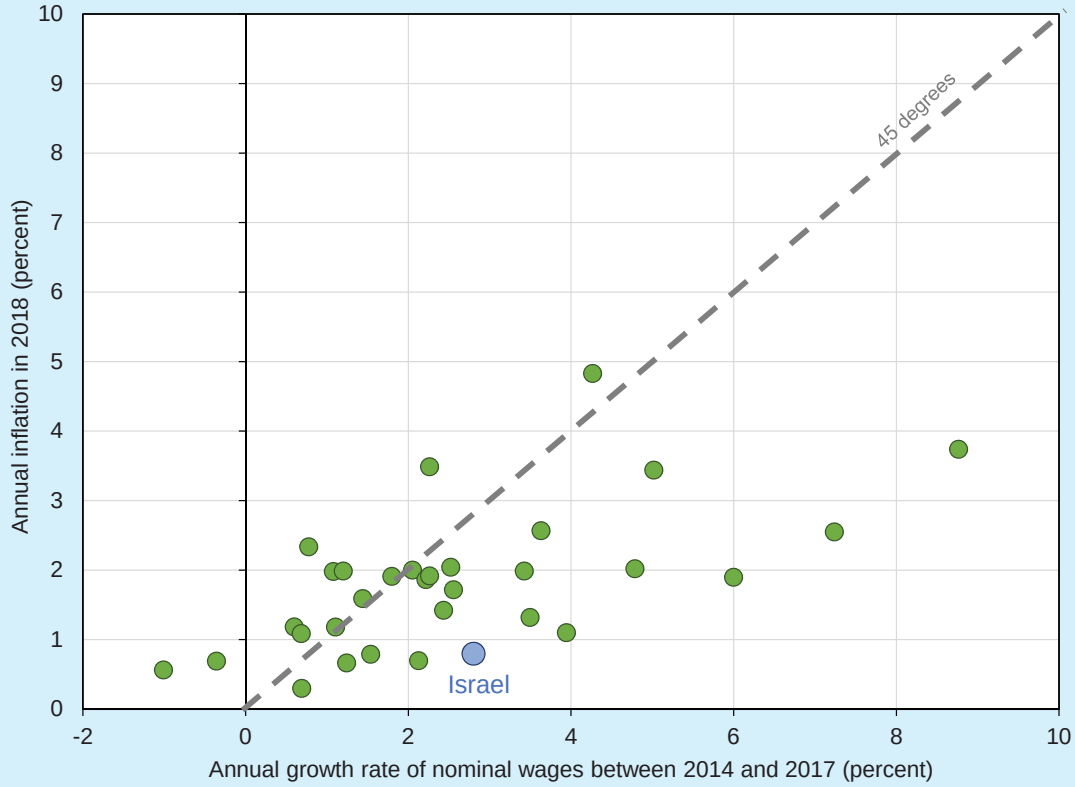
In Israel (as well as in other economies), there has been only a weak link in recent years between the prolonged boom in the business cycle—particularly the tight labor market and the rapid increase in wages—and inflation. This is one of the questions with which economists have been grappling in recent years[12], since we can expect that prolonged wage pressures as a result of proximity to a restriction of sources will in the

[12] In recent years, the link between wages and inflation has been a major focus of central banks around the world. For example, economists at the Federal Reserve (Peneva and Rudd, 2017) found that the link in the United States is week, and they attribute this to the fact that inflation expectations have become more anchored. In contrast, economists at the European Central Bank (Bobecia et al., 2019) found a strong connection between the cost of labor and inflation in the four largest economies in the eurozone, and showed that this link changes over time and depends on the state of the economy and the nature of the shocks affecting it: the connection is strong when demand shocks are dominant, and weak when supply shocks are dominant.

end translate into pressure to raise prices, which will be reflected in an increase in the inflation environment. In Israel, this difficulty is more prominent: inflation is lower than it is in other OECD countries, while the rate of increase in nominal (and even real) wages between 2014 and 2017 is above the OECD median.

Figure 3.5 shows that in the OECD countries, there is a positive and statistically significant correlation between the rate of wage increases between 2014 and 2017 and the inflation rate in 2018. In other words, countries where wages increased rapidly generally have a higher inflation rate. However, consistent with the foregoing, the link is relatively noisy, since there are many additional background factors influencing inflation, making it difficult to derive conclusions from it.[13] Many countries, including Israel, are below the 45-degree line in the Figure (the line where the rate of wage

Figure 3.5
Annual Growth Rate of Nominal Wages between 2014 and 2017, and Annual Inflation Rate in 2018, Israel and the other OECD countries



SOURCE: Based on OECDstat.

[13] When we ran a regression with the annual inflation rate in 2018 as the dependent variable and the average wage increase between 2014 and 2017 as the explanatory variable, we obtained a coefficient of about 0.3, a standard deviation of 0.07 (significant at a 1 percent level), and an R^2 of 0.36. The coefficient means that countries where wages increased by more than 1 percent tend to have inflation that is 0.3 percent higher on average.

While inflation in Israel is lower than in the OECD and the increase in wages is greater, Israel is not an outlier among OECD countries.

increases is equal to the rate of increase in inflation). In those countries, wages increased more rapidly between 2014 and 2017 than the inflation rate did in 2018. The Figure also shows that while inflation in Israel is relatively low and the rate of wage increases is relatively high, Israel is nonetheless not an outlier.

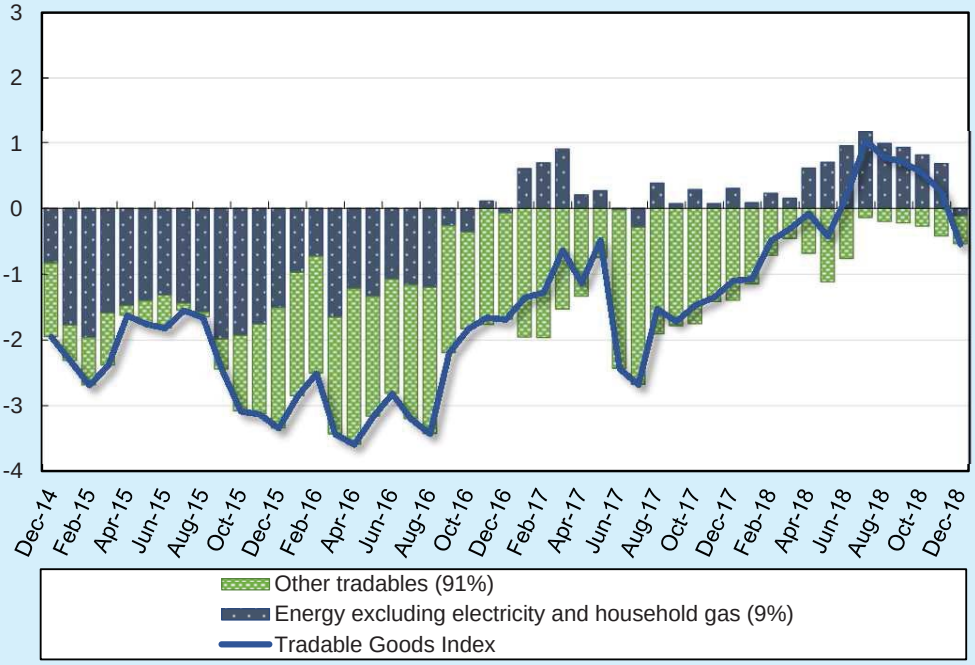
d. The prices of tradable goods

The tradable goods index (37 percent of the CPI) weights the prices of goods of a tradable nature, meaning imported goods or alternatives to imports. The prices of these goods are influenced by their global prices and by the prices of the raw materials used in their production, through their effect on the cost structure of firms. They are also influenced by the exchange rate of the shekel, through its effect on import prices. In recent years, they have also been influenced by government measures to increase competition in the field of these products and to lower their prices.

The volatility in the prices of tradable goods in 2018 was mainly due to the energy component, as a result of the sharp changes in oil prices.

The tradable goods index declined by 0.5 percent in 2018, after declining by 1.1 percent in 2017 (Figure 3.6). This decline followed a positive inflation rate in the prices of tradable goods for a few months, which reached 1 percent at its peak. The reviewed year follows many years in which the prices of tradable goods declined. Most of the volatility in these prices is due to the energy component, which reflected the sharp changes in oil prices during the period (more details are below).

Figure 3.6
Annual Inflation Rate and Contribution of CPI Components[a], Tradable Goods Index (37% of CPI), December 2014 to December 2018 (percent)



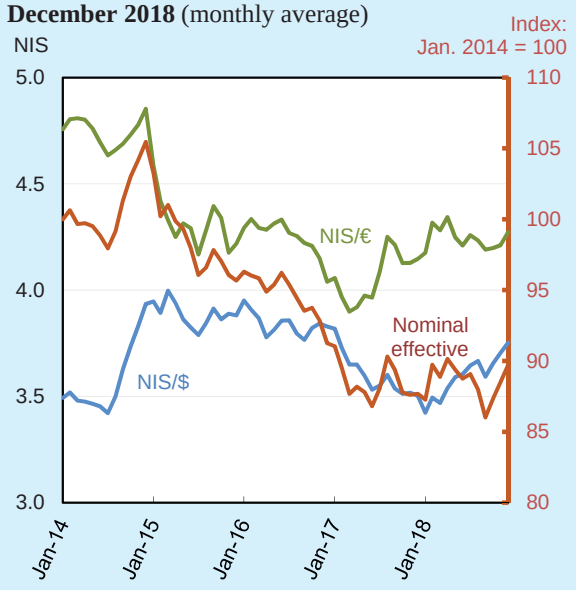
[a] The numbers in parentheses are the weight of the component in the tradable goods index (as of 2018).
SOURCE: Based on Central Bureau of Statistics.

The following is a description of the development of the factors affecting the inflation of tradable goods—particularly global prices, the exchange rate, and oil prices—and attempts to assess their contributions to inflation.

(a) The exchange rate[14]

The shekel depreciated by 2.3 percent in terms of the nominal effective exchange rate in 2018, after having appreciated by 3.9 percent in 2017 (Figure 3.7).[15] The depreciation this year included a depreciation of about 7 percent against the US dollar and a smaller depreciation of about 3 percent against the euro. The sharp depreciation against the dollar in 2018 offset the sharp appreciation from 2017, and the dollar returned to its level from the beginning of that year. As we will see below, the appreciation against the dollar in 2017, together with the dollar's dominance in Israeli international trade[16], apparently contributed to a negative contribution to inflation of tradable goods prices during that year.

Figure 3.7
NIS/$ Exchange Rate, NIS/€ Exchange Rate and Nominal Effective Exchange Rate, January 2014 to December 2018 (monthly average)



SOURCE: Bank of Israel calculations.

(b) Commodity prices and import prices of consumer goods[17]

Commodities are the raw materials for production, and their prices therefore have an impact on the cost of production, and through it on market prices. In 2018, the price of Brent crude oil declined by about 10 percent—from about $64 per barrel at the end of 2017, to about $58 per barrel at the end of 2018—after having increased by

[14] In contrast with oil prices and global prices, the exchange rate is not a purely exogenous factor, since it is affected itself by domestic factors, including domestic inflation. Even so, when estimating the short-term pass-through from the exchange rate to inflation, it is customary to view the exchange rate as an exogenous variable (see, for instance, Burstein and Gopinath, 2014).

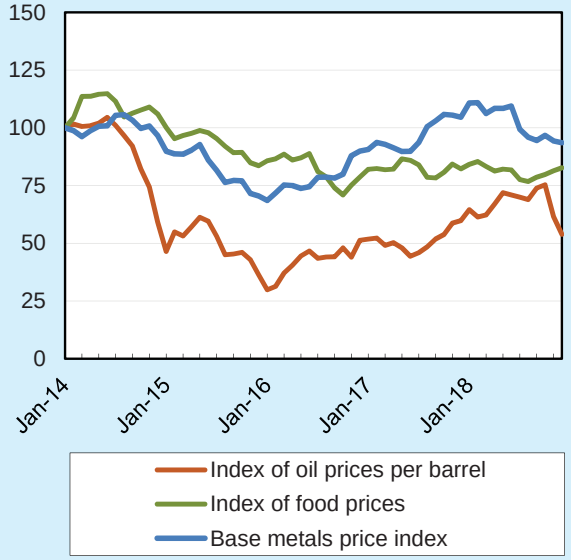
[15] Monthly average, December compared with December of the previous year.

[16] See the discussion in Chapter 3 of the Bank of Israel *Annual Report* for 2017.

[17] In the area of imports of consumer goods, this refers to the quarterly price according to the Paasche Index published by the Central Bureau of Statistics.

17 percent in 2017 (Figure 3.8). However, during the year, the price fluctuated sharply, reaching about $85 per barrel at its peak in October, and then dropping to about $50 per barrel in December. Base metal prices also declined this year, by about 10 percent. In contrast, the prices of agricultural commodities increased by about 3 percent. The import prices of consumer goods increased by 3.2 percent during the year, further to the 4.5 percent increase in 2017.

Figure 3.8
Global Price Indices of Oil, Food, and Base Metals, January 2014 to December 2018
(Monthly average, Index: Jan. 2014 = 100)



SOURCE: Based on Bloomberg.

In view of the high level of volatility in oil prices and its effect on inflation, it is interesting to examine the pass-through from changes in oil prices to the various components of the CPI. In order to quantify this pass-through in various time ranges, we estimated a linear regression that examines the connection between (1) the rate of change in price of an index component over the following 6 or 12 months and (2) a shock to the price of oil, defined as the monthly rate of change in the price of oil (in dollars) in the current month.[18,19] This we try to respond to the question of how much the price of a certain component will change (in percent) as a result of a shock of 1 percent to the price of oil.

[18] This analysis ignores the difference between (1) a shock to oil prices due to changes in global demand for oil, and (2) a shock due to changes in supply as a result of decisions made by the OPEC oil cartel, and (3) a shock as a result of speculative motives. This distinction is discussed in depth in Kilian and Murphy (2014).

[19] This is the equation estimated separately for each of the subcomponents of the Consumer Price Index: $p_{i,t+h} - p_{i,t} = \alpha_i^h + \beta_i^h \Delta oil_t + \boldsymbol{\gamma}_i^h \boldsymbol{X}_t + \varepsilon_{i,t \to t+h}$

where $p_{i,t+h} - p_{i,t}$ is the rate of change in CPI component i during h periods (months), Δoil_t is the monthly rate of change in the price of oil in time t, X_t is the vector of control variables, and $\varepsilon_{i,t \to t+h}$ is the residual. In this model, the estimate for β_i^h measures the effect of a change in the price of the commodity (in percent) in term t on the price level of component i after h months. The coefficients of this equation were estimated by OLS, and the standard deviations of this estimation are robust to heteroskedasticity and to autocorrelation (HAC).

We found that after 6 months, a shock to the price of oil creates an effect that is statistically significant effect a level of 5 percent only in the transportation component (about 17 percent of the CPI) and in the electricity, gas, water, and home heating oil and diesel component (3.6 percent of the CPI). We did not find a statistically significant effect on the components of the CPI excluding energy, fruits and vegetables, and food after 6 or 12 months.[20] If we interpret the estimations and standard deviations we obtained in their simple meaning, we can say that when oil prices increase by 10 percent, the overall CPI is expected to increase by about 0.17 percent after six months (a confidence interval of 0.1 percent to 0.36 percent). After ten months, the coefficients of the components are positive but smaller and not statistically significant (due to the larger estimation range and the additional statistical noise).

(c) Contributions to the prices of tradable goods

In order to quantify how the exchange rate, energy prices and prices abroad affect inflation in the prices of tradable goods, we estimated a pass-through regression that explains the change in quarterly inflation in the prices of tradable goods through contemporaneous changes and changes with a lag in oil prices, the shekel-dollar exchange rate, and import prices of consumer goods.[21],[22] We found that the increase in oil prices in 2017 added about 1 percentage point to inflation of tradable goods prices in 2018 (Figure 3.9). We also found that the appreciation of the shekel against the dollar in 2017, a development that affects the prices of tradable goods with a lag, subtracted 0.5 percentage points (after having made a similar negative contribution in 2017). However, this subtraction offset the contribution of the increase in import prices of consumer goods, which added 0.3 percentage points to inflation (Figure 3.7).[23]

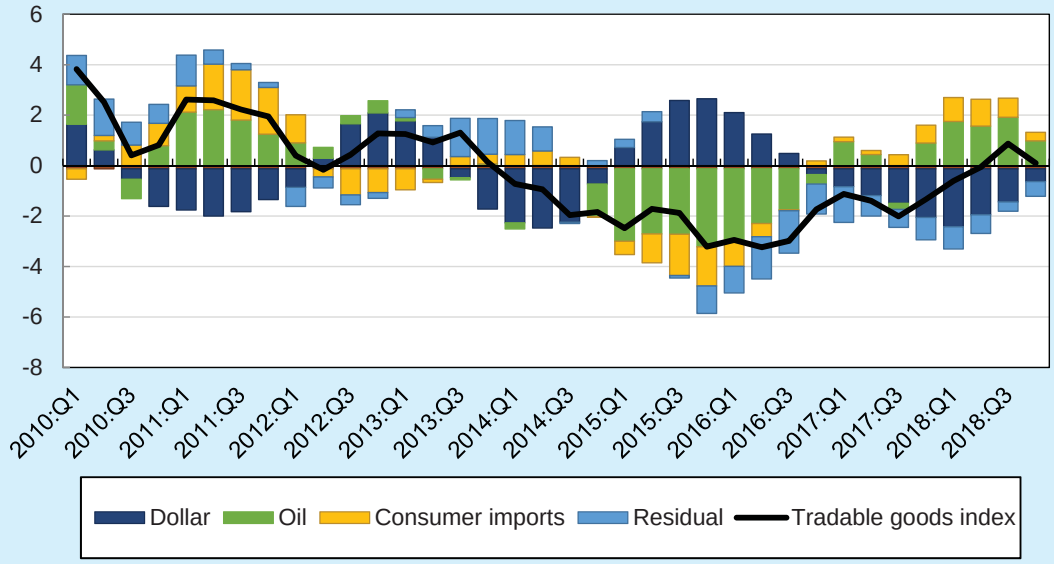
[20] Statistical significance at the 5 percent level. The p-values in all the examinations were adjusted to the examination of the maximum hypothesis in the Benjamini and Yekutieli (2001) approach.

[21] In this estimation, we omitted the variable of commodity prices excluding oil, because we found that when the regression includes the import prices of consumer goods, it makes a negligible negative contribution to the explanatory ability of the equation. However, we emphasize that the results presented are not sensitive to replacing the import prices of consumer goods with commodity prices excluding oil.

[22] Every explanatory variable in the equation that we estimated is affected on its own by exogenous shocks. For example, the price of oil is affected by supply shocks and demand shocks, and each of these shocks may have a different effect on inflation. Basically, the equation that we estimated is not structural, meaning it does not identify the transmission of the exogenous shock, and it is therefore difficult to ascribe causal significance to it. However, a structural model should provide answers, but only on condition that the estimated structure was properly specified. More discussion appears in J. D. Hamilton (2012), "Import Prices and Inflation", *International Journal of Central Banking*, 8(1), 271–279.

[23] The paragraph relates to the change between the third quarter of 2017 and the third quarter of 2018, due to limited data.

Figure 3.9
Annual Inflation of the Tradable Goods Index - Breakdown by Contribution[a], 2010:Q1–2018:Q3 (percent)



[a] The contributions are obtained from a regression of the quarterly rate of change in the tradable goods index on the intercept, three seasonal coefficients, and four lags of the quarterly rate of change in (1) the NIS/$ exchange rate; (2) the price of oil; and (3) the import prices of consumer goods.

SOURCE: Based on Central Bureau of Statistics.

It is important to note that the factors mentioned thus far explain only part of the change in the prices of tradable goods. The unexplained portion is labeled the "residual". Assuming that the coefficients that we estimated are stable throughout the sample period, the regression's residual should reflect the direct and indirect effects of the factors that it is difficult to measure, including the expansion of the digital economy, declining margins in the tradable segment of the domestic market—for instance in clothing, and electrical and electronic products—and the measures taken by the government in recent years to lower the cost of living.[24],[25] If this interpretation holds true, the negative contribution of the residual may hint that at least some of these structural processes made a negative contribution.

[24] Chapter 1 of the Bank of Israel *Annual Report* for 2017 presents an analysis at the primary component level of the CPI, and focuses on the effect of competition and government measures to lower the cost of living. Box 3.2 of the Bank of Israel *Annual Report* for 2017 presents an international comparison of the price changes in components characterized by a high level of online purchases.

[25] An analysis conducted by the Taub Center (2018) also found that, starting in 2014, inflation in Israel was significantly lower than the inflation forecast according to global developments and the state of the domestic labor market. The analysis relates the difference, at least partially, to the government measures to reduce the cost of living.

d. Inflation in Israel compared with inflation in the OECD

The gap between the inflation rates in Israel and the OECD narrowed, particularly regarding inflation excluding energy and food.

Inflation in Israel increased between the second half of 2017 and the end of 2018, while median inflation in the OECD was relatively stable (Figure 3.10). The CPI excluding energy and food (which, as mentioned is one of the indices of core inflation) presents a similar picture (Figure 3.11). Thus, the gap between the inflation rates in Israel and the OECD narrowed. In retrospect, it seems that the significant widening of the gap in mid-2017 was only temporary, and resulted from the sharp decline in annual inflation in Israel in June and July 2017. Excluding this fluctuation, we can see that the gap began to narrow in 2015, particularly regarding inflation excluding energy and food, as a result of the moderate upward trend of inflation in Israel and the relative stability of median inflation in the OECD.

Figure 3.10
Inflation as Measured by the Overall CPI, January 2009 to December 2018[a] (percent)

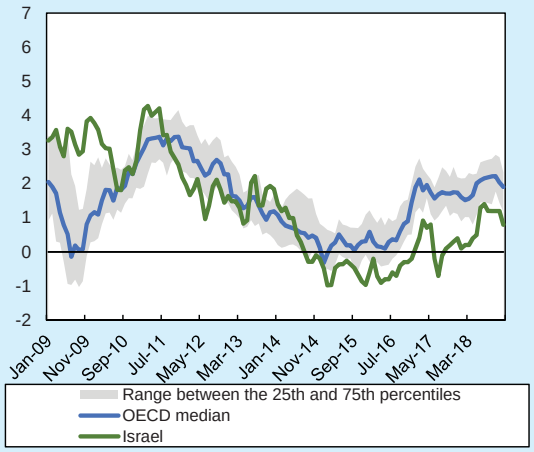
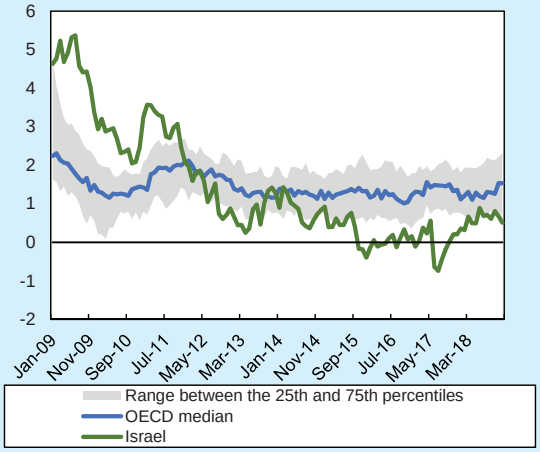


Figure 3.11
Inflation as Measured by the Index Excluding Energy and Food, January 2009 to December 2018[a] (percent)



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

Even so, in December 2018, inflation in Israel remained one of the lowest in the OECD, both as measured by the overall CPI and as measured by the CPI excluding energy and food.[26] One of the reasons for the gap between Israel and the OECD that developed in 2014 is the structural changes that were made in the economy in recent years due to government measures to lower the cost of living, since in recent years, those measures contributed to a decline in the pace of inflation. Another reason is that the Bank of Israel adopted a more moderate monetary accommodation than other central banks, particularly the ECB and other central banks in Europe, for reasons that

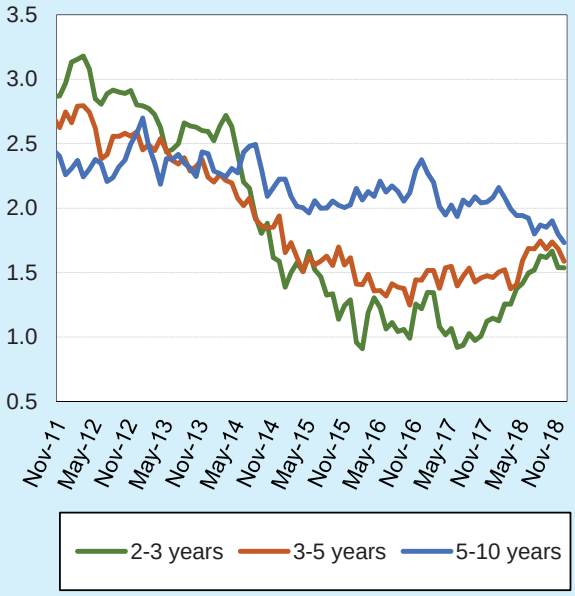
[26] We emphasize that Israel's place in the distribution of inflation rates is not sensitive to how the CPI components are weighted in Israel. Similar results are obtained if we weight the energy and food components and the CPI excluding energy in accordance with their median weights in the OECD.

will be detailed in Section 2a. This section deals with monetary policy from a broad perspective, and examines the period of transition from negative to positive inflation.[27]

e. Inflation expectations

The public's expectations of the future development of inflation carry tremendous importance in the view of central bank policy makers, since they may have an effect on the current development of inflation. For example, employees' expectations of future inflation affect their present wage agreements, which for their part affect how firms price consumer goods. Inflation expectations derived from the various sources (the capital market, professional forecasters, and the banks' internal interest rates) for the coming 12 months continued to show an upward trend in 2018 that began the previous year, and during the second half of the year, they stabilized around the lower bound of the inflation target. One-year forward expectations one year hence (1–2 year forward expectations) remained above the lower bound of the target range during the year, and stood at 1.45 percent at the end of the year. Forward expectations for three years and more remained anchored above the midpoint of the target range throughout the year (Figure 3.12).

Figure 3.12
Forward Inflation Expectations from the Capital Market, November 2011 to December 2018
(monthly averages, percent)



SOURCE: Bank of Israel calculations.

Even though annual inflation in Israel deviated from the target range since mid-2014 (other than a few months in 2018), inflation expectations for the medium-to-long term remained anchored within the target range, showing that the public has maintained its confidence in the central bank's ability to return inflation to within the target. This conclusion is mainly based on the fact that forward expectations derived from the capital market for these time ranges—from the third year onward—were

[27] See more discussion in Chapter 3 of the Bank of Israel's *Annual Report* for 2017.

constantly within the target range (see Figure 3.12). In this context, we note that the Bank of Israel's Research Department conducted an empirical test that showed that inflation expectations derived from the capital market declined in recent years, inter alia due to the decline in the inflation risk premium (the compensation demanded by investors due to uncertainty regarding future inflation). This means that, in recent years, inflation expectations derived from the capital market, minus the premium, exceeded the expectations reflected by breakeven inflation. (See Box 3.1 for more discussion.)

3. MONETARY POLICY

The year 2018 should mark the beginning of the process of raising the interest rate, since it is materially different from its predecessors, particularly at the end of the year, concerning monetary policy. During the year, the Bank of Israel significantly decreased its foreign exchange purchases intended to prevent excessive fluctuations of the exchange rate. In November, the Bank announced that the foreign exchange purchasing program to offset the effect of natural gas production on the current account would come to an end at the end of the year. The text of the Monetary Committee's forward guidance remained unchanged until November, when the Bank raised its interest rate by 15 basis points to 0.25 percent—the first change in almost four years.

The mix of monetary policy tools during the year was selected with the aim of returning inflation to within the target range, and to entrench it within the range, while also supporting real economic activity and maintaining the stability of the financial system. Developments in the two main targets of policy makers—the data reflected an increase in the inflation environment at the time, and real economic activity was around its potential while the labor market remained tight—supported the start of a cautious process to normalize the interest rate. In contrast, the importance of considerations related to the maintenance of financial stability—which for years had supported increasing the interest rate—declined in view of events in the housing market, particularly the halt in price increases and the relatively low risk level that characterized borrowers, inter alia due to macroprudential measures taken by the Bank of Israel (see more information in Chapter 9). The stability of the nominal effective exchange rate of the shekel in 2018 made it significantly less necessary to intervene in the foreign exchange market.

As stated, the Bank of Israel increased in the interest rate after almost four years in which there was no change. The Monetary Committee listed three main reasons over the years for reacting with relative moderation to the decline in inflation. First, from the standpoint of real activity, there was no need to further lower the interest rate since the economy was close to full employment. Second, the decline in inflation was, at least partly, due to supply side factors (including the decline in energy prices and increased competition) and measures taken by the government to lower the cost

The Bank of Israel increased in the interest rate after almost four years in which there was no change. Even after this increase, the real interest rate remains negative.

of living.[28] Third, it was unclear at the time how effective additional accommodative steps, such as a negative inflation rate, would be.[29] In addition, the Monetary Committee is forward looking, and is not required to correct past deviations from the inflation target, particularly in view of the fact that inflation expectations for the medium-to-long term remained anchored within the target range throughout the period.

In the years following the Global Financial Crisis, it became very difficult to identify the structural link between inflation and real economic activity. Empirical studies conducted around the world uncovered tremendous uncertainty regarding the size of the correlation between inflation and the variables representing the labor market (wages and unemployment) and real economic activity (GDP growth).[30,31] The difficulty in identifying these mechanism has a lot to do with the structural changes taking place around the world, such as increased globalization and the rise of the digital economy, but they may also be connected with changes in the mechanisms that determine pricing in the economy and the way in which inflation expectations are created. In the Israeli context, the structural changes taking place in the domestic economy should also be noted—the process of lowering the cost of living in recent years as a result of increased competition and government-initiated measures.

What behavior is called for when there is prevailing uncertainty regarding the parameters of the macroeconomic model? Should monetary policy makers act decisively, or cautiously? There is an economic theory that provides guidelines for an answer, holding that in such a world, policy makers must comply with the rule of caution (the Brainard Principle), meaning that gradual and proportional policy measures are to be preferred over sharp ones.[32] This principal relies on the principle of learning and on the principal of damage control. These hold that during routine times, measured steps enable us to learn slowly about the mechanism that forms the basis for the economy, while limiting the cost of errors resulting from a mistaken assessment of the model. However, it is important to note that there are a number of exceptions

[28] In this context, it is again worth noting that average core inflation was higher than overall inflation throughout the period.

[29] A new study, Eggertsson et al. (2019) is based on the Swedish case, and provides initial evidence that negative interest rates have only limited utility: When the interest rate is negative, lowering it has decreasing marginal benefit—which becomes less the more negative the interest rate is.

[30] Box 3.2 in the Bank of Israel *Annual Report* for 2016 provides a brief survey of the weakness of the link between economic activity and inflation, and presents an examination regarding Israel. In contrast, Coibion et al. (2019) show how the Philips Curve estimated using the inflation expectations of firms and households manages to explain the variance of inflation in a variety of advanced economies, including Israel.

[31] The macroeconomic literature has recently also found it difficult to understand the basic dichotomy between the short term and the long term. For instance, Blanchard (2018) challenges the belief that the natural unemployment rate in the long term does not depend on monetary policy. Borio et al. (2018) challenge the concept that monetary policy does not affect the natural interest rate (the long-term real interest rate).

[32] This is compared to a theoretical situation in which the policy makers know the parameters. The theoretical foundation for such a determination is provided by Brainard (1967). This article, and decision making under conditions of uncertainty were recently mentioned in a speech by Federal Reserve Chairman Jerome Powell at the 2018 Jackson Hole conference.

to this rule, including extreme situations such as financial crises or a weakening of the credibility of the inflation target.[33] In such cases, the opposite is true—sharp and decisive action should be taken to prevent a rapid deterioration of the situation.[34]

In the Monetary Committee's decisions this year, it was required to take into account the uncertainty regarding the factors pushing inflation, as well as two main risks: that it would raise the interest rate too soon, thereby having a negative impact on economic activity and undermining the credibility of its commitment to maintaining the inflation target; or that it would raise the interest rate too late, leading to the overheating of activity (which could create distortions in the allocation of sources in the economy) and inflation, and to the continued accumulation of financial risks. The monetary policy adopted during the year, including the measured increase in the interest rate at the end of the year and the repeated announcements that the interest rate's future path would be gradual and cautious, are consistent with the principle of caution.

The following is a description of recent developments in the tools used by the Monetary Committee: the interest rate, forward guidance, and intervention in the foreign exchange market.

a. The Bank of Israel interest rate

For most of the reviewed year, the Bank of Israel interest rate remained unchanged at 0.1 percent—the level at which it had been since early 2015. In the last interest rate decision of the year, the Monetary Committee decided to raise the interest rate by 15 basis points, to 0.25 percent. Four members of the Committee supported an increase in the interest rate, while one member supported leaving it unchanged.[35] In the previous decision, in October 2018, two out of six members of the Committee supported raising the rate, and in decisions prior to that, just one of the six members supported an increase. In this case, it appears that the disagreement was mainly regarding the timing of the increase, rather than the trend. As will be shown below, transparency regarding the variety of opinions among the Committee members apparently contributed to reducing the element of surprise in the decision to raise the interest rate after such a prolonged period in which it was unchanged.[36]

[33] Söderström (2002) shows that when inflation expectations are no longer anchored and start being adaptive, there is concern over the creation of a deflationary or an inflationary spiral as a result of a significant price shock.

[34] A well-known example of such a measure is the "Whatever it Takes" speech made by ECB President Mario Draghi at the height of the European debt crisis in 2012.

[35] As mentioned, for the November interest rate decision, there were only five members of the Monetary Committee, since the outgoing Governor had already completed her term of office and the incoming Governor had not yet taken up the position.

[36] Studies conducted around the world show that the distribution of votes in Monetary Committee meetings contains information as to the future path of the interest rate, which adds to the existing information available to the markets. See, for instance, A. Riboni and F. Ruge-Murcia (2014), "Dissent in Monetary Policy Decisions", *Journal of Monetary Economics*, 66: 137–154.

Prior to the decision, the capital markets ascribed a low probability to an increase—about 10 percent likelihood.[37] However, an increase in the interest rate in the near future seemed very likely. There were higher assessments regarding an increase in January 2019. The likelihood implied by the Telbor market was about 50 percent[38], and four out of eleven forecasters predicted an increase in the interest rate.

It seems that the last decision of the year did not change the slope of the curve. In other words, there was no change in the market's assessment of the expected pace of interest rate increases. Immediately after the decision, forward yields from the Telbor market to various ranges increased in parallel by 0.13 to 0.15 percentage points.[39] Moreover, the Bank of Israel Research Department examined the appreciation of the shekel in a narrow window around the announcement of the increase, and found that it was not exceptional compared with changes in the exchange rate that occurred in the past due to interest rate surprises that were similar in magnitude.

The overall picture from these findings is consistent with the interpretation that the market players were surprised by the timing of the increase, but not by the change in the forecast path.

b. The short-term real interest rate

When firms consider whether to invest, and households consider whether to save, they take into account the real interest rate—the difference between the nominal interest rate and expected inflation. The central bank influences the expected path of real interest rates through its partial control of the short-term real interest rate—particularly the one-year interest rate—since it determines the short-term nominal interest rate periodically, and since it also partially determines one-year inflation expectations through the expectations channel and the legally defined inflation target. Since the real interest rate is relevant for the domestic demand side (consumption and investments), it serves as an acceptable index to assess the stance of monetary policy makers, particularly concerning questions such as how accommodative or restrictive monetary policy is.[40]

Figure 3.13 shows the short-term real interest rate in Israel—the difference between the central bank's declared interest rate and actual inflation in the past 12 months[41]—alongside the short-term real interest rates in a number of leading developed economies. The Figure boldly shows the interest rates in Israel, the US

[37] According to the Telbor market, the monthly return was 0.116.

[38] The three-month forward yield one month hence was 0.164 on the day of the decision.

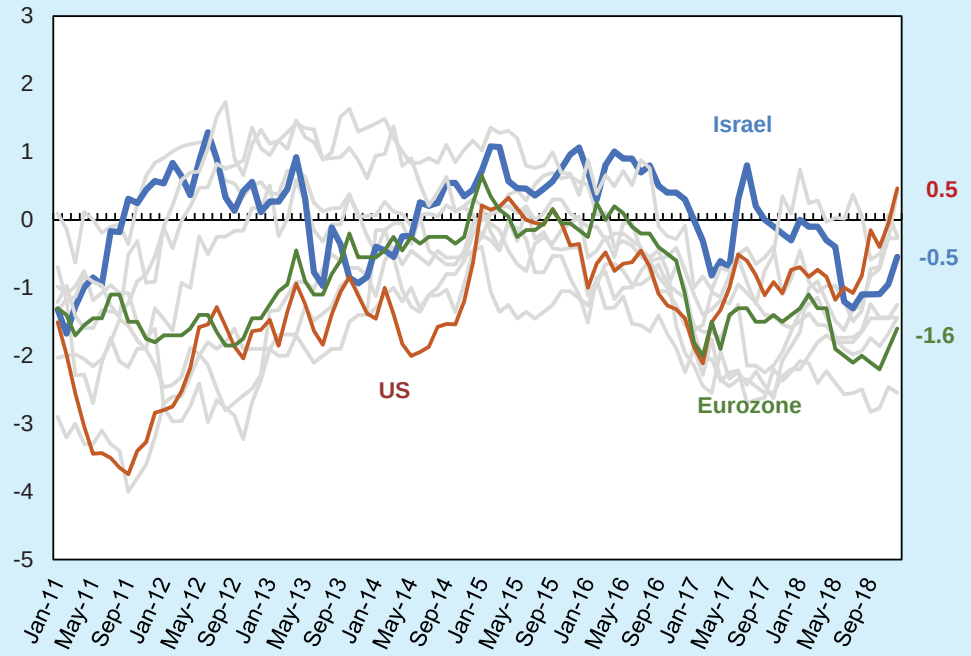
[39] However, as of the date of writing, there is no apparent expectation of another interest rate increase in addition to what was priced in before the increase.

[40] If we view the Bank of Israel interest rate alone, it is difficult to derive the extent of monetary policy's accommodation. For example, when the nominal interest rate is 1 percent and expected inflation is 2 percent, policy is more accommodative than it would be in a situation where the nominal interest rate is 1 percent and expected inflation is near-zero.

[41] We use actual inflation over the past 12 months, and not inflation expectations from the capital market, since the countries presented in the Figure do not have the same definition of inflation expectations from the capital market.

and the eurozone, and presents the interest rates of other countries in gray in order to provide a scale of the interest rate level in Israel relative to the global levels.[42] As the Figure shows, the real interest rate in Israel was higher than the other rates in the Figure for most of the period from 2014 to 2017, because inflation in Israel was low and the Bank of Israel interest rate did not change. This situation changed following a process that began in mid-2017. The short-term real interest rate declined from 0.8 percent in July 2017 to -1.3 percent in July 2018, and was located in at the midpoint of the distribution presented in the Figure. During the second half of 2018, the real interest rate in Israel increased slightly, reaching -0.5 percent in December, but it remained negative and in the center of the distribution in the Figure.[43] It is important to emphasize that even after the Bank of Israel raised the interest rate to 0.25 percent, the real interest rate remained negative, and even close to the rate that prevailed at the end of 2017 (-0.3 percent). This shows that monetary policy remained accommodative despite the increase in the interest rate.[44]

Figure 3.13
Real 1-Year Interest Rate[a], January 2011 to December 2018 (percent)



[a] Various other countries appear in gray.
SOURCE: Based on Central Bureau of Statistics and the Bank for International Settlements.

[42] The other countries are Denmark, Canada, Sweden, Switzerland, the Czech Republic, the UK and South Korea.

[43] The changes in the real interest rate in Israel mainly reflect changes in actual inflation, since during this period, the Bank of Israel interest rate remained unchanged at 0.1 percent.

[44] A similar conclusion is drawn when the calculation of the real interest rate is based on one-year expectations from the capital market instead of actual inflation over the past 12 months.

c. Forward guidance

The central bank can influence the public's expectations, inter alia through forward guidance—a declaration of policy makers' intentions and presentation of their considerations. In 2018, the Monetary Committee continued to use the forward guidance clause that was first instituted in April 2017, according to which "The Monetary Committee intends to maintain the accommodative policy as long as necessary in order to entrench the inflation environment within the target range." The text of the sentence did not change from the time it first appeared until the announcement of the increase in the interest rate in November 2018. However, in the announcements that preceded the increase in the interest rate, the Committee members presented their view of the current inflation level and the expected path. For example, the July 2018 announcement stated: "The inflation environment continues to rise gradually, supported by the accommodative monetary policy, and is drawing close to the price stability target range." This expression, and other similar expressions, can be viewed as signaling an upcoming increase in the interest rate.[45]

The forward guidance clause is conditional by nature, since the Committee conditions the future path of monetary policy on developments in the inflation environment. Its removal from the announcement when the interest rate was raised indicated a change in policy. An in-depth analysis of the clause, and of the economic background to its removal, should improve our understanding of the measures taken by the Monetary Committee. In order to understand the significance of the clause, we must properly understand two of the terms that appear in it—"to entrench", and "accommodative". In the second half of 2018, the Monetary Committee spent a lot of time discussing the meaning of the requirement to entrench inflation within the target range. An analysis of the Committee's discussions and the Monetary Policy Reports shows that the Committee intended that inflation should return to the target range and that such return should not be temporary. It was also argued that there was no intention that the requirement should be for entrenchment at the midpoint of the range. While the Governor expressed reservations, and stated that stability around the lower bound is not considered entrenchment due to the built-in volatility of inflation, she also emphasized that the time frame in which inflation would remain within the target range serves as an important decision-making parameter.[46]

A look at the term "accommodative" gives us a different picture. In neither the forward guidance clause nor the announcements did the Committee define the accommodative monetary policy that would remain in place as long as necessary. Was it the level of the Bank of Israel interest rate, or perhaps a multidimensional definition of the stance taken by policymakers—the interest rate alongside other parameters such as inflation expectations?

[45] See more discussion in the section dealing with monetary policy in the Monetary Policy Report for the second half of 2018.

[46] From remarks by the Bank of Israel Governor on July 9, 2018 at the press briefing regarding monetary policy.

In retrospect, it turns out that we still need to deal with the question of whether actual inflation is actually entrenched within the target range, particularly since it is now around the lower bound. However, in real time, it seemed that its return to the target range was not temporary. Inflation in the past 12 months has been within the target range for five months, and seasonally adjusted inflation over the past six months[47] (in annual terms) has been within the target since December 2017. Moreover, the inflation environment also includes expectations from various sources, which increased at that time. It seems that the consideration concerning the time frame in which inflation was within the target range overcame the fact that its level was around the lower bound, and contributed to the decision to raise the interest rate.

In any case, the short-term real interest rate remained negative even after the Monetary Committee raised the interest rate (as mentioned, by just 15 basis points), suggesting that monetary policy remained accommodative even after the increase in the interest rate.

d. Intervention in the foreign exchange market

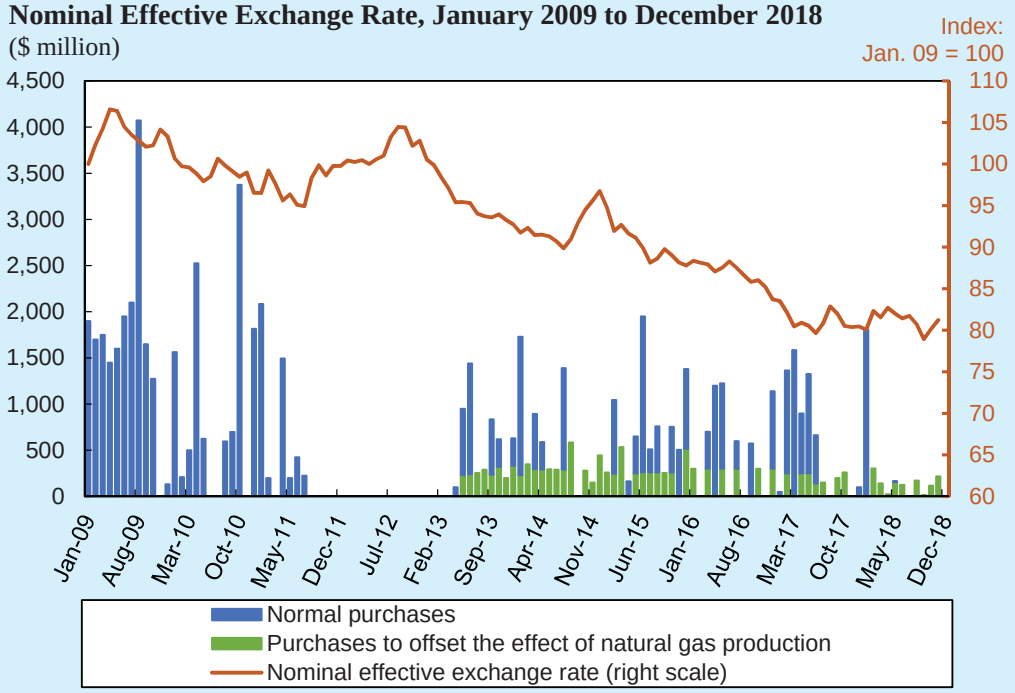
In 2018, the Bank of Israel barely intervened in the foreign exchange market within the policy to prevent excessive fluctuations in the exchange rate.

The Bank of Israel barely intervened in the foreign exchange market in 2018. In January, it purchased $1.8 billion as part of the policy to prevent excessive fluctuations in the exchange rate, and additionally it purchased approximately $1.8 billion as part of the program to offset the effect of natural gas production on the current account (Figure 3.14).[48] In November 2018, the Bank announced that it would halt the natural gas offset program at the end of the year, because the Sovereign Wealth Fund is supposed to begin operating in 2019, and according to updated assessments, it will begin investing the proceeds in 2020. The Monetary Committee emphasized that even after halting the program, intervention in the foreign exchange market will remain one of the tools at its disposal in order to achieve its objectives, and the fact that this tool was barely used in 2018 is mainly due to the fact that market conditions did not make it necessary. The shekel depreciated sharply against the dollar this year, and the nominal effective exchange rate remained relatively stable since the beginning of 2017.

[47] This figure is not affected by the exceptional volatility of inflation in June–July 2017.

[48] As part of the policy intended to prevent excessive fluctuations in the exchange rate, the Bank purchased a very low about—$13 million—in May.

Figure 3.14
The Bank of Israel's Interventions in the Foreign Exchange Market and the Nominal Effective Exchange Rate, January 2009 to December 2018
($ million)



SOURCE: Bank of Israel calculations.

3. THE MONETARY BASE AND MONETARY AGGREGATES

Interest is the price of money, meaning it is the alternative cost of holding liquidity. Therefore, changes in the interest rate have an impact on the demand for liquidity. When the nominal interest rate is the main tool of monetary policy, the central bank operates so that the money supply is completely flexible at the interest rate it declares, and the monetary base—meaning the total banknotes and coins in circulation as well as the commercial banks' demand deposits at the Bank of Israel—is determined by the demand for liquidity at the Bank of Israel interest rate.

a. The monetary base

The monetary base is affected by flows that are not under the Bank of Israel's control, such as government accounts[49], and by flows that are under its control, such as foreign exchange purchases and makam issuances. The Bank absorbs or injects liquidity in order to provide the demand for the monetary base in accordance with the Bank of Israel interest rate. The Bank adjusts the monetary base to the interest rate that it

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

sets by issuing makam and through interest-bearing deposits of the banks, which are issued to them in tenders and are not included in the monetary base. The Bank takes into account total injections and absorptions, and takes action to adjust the monetary base to demand by the public at the rate that it sets.

The monetary base grew by about NIS 4.9 billion in 2018, after increasing by about NIS 12.2 billion in 2017 (Table 3.3). Compared with the previous year, the monetary base increased by about 6 percent (Table 3.4).[50] The Tables show that the foreign exchange conversions carried out by the Bank of Israel expanded the monetary base by about NIS 11.7 billion during the year, after expanding it by about NIS 24 billion in 2017—reflecting a reduction in its interventions in the foreign exchange market. Against that, the Bank of Israel absorbed about NIS 10 billion (the net change in makam and term deposits).

Table 3.3
Source of change in the monetary base, 2014–18

(NIS billion)

						2018			
	2014	2015	2016	2017	2018	Q1	Q2	Q3	Q4
1. Injections from the government	1.2	-14.0	3.5	-3.9	1.8	-14.1	2.4	-0.6	14.1
of which: the government	1.2	-14.0	3.5	-3.9	1.8	-14.1	2.4	-0.6	14.1
2. Foreign exchange conversions[a]	24.7	34.0	23.4	24.1	11.7	7.8	1.1	0.7	2.1
of which: Bank of Israel	24.6	33.8	23.1	24.0	11.7	7.7	1.1	0.7	2.1
3. Total (1+2)	25.8	19.9	27.0	20.2	13.5	-6.3	3.5	0.1	16.2
4. Bank of Israel injections	-14.2	-11.5	-15.8	-7.8	-8.7	6.3	1.3	1.3	-17.6
of which: Monetary loan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Makam	-3.2	14.1	11.1	13.1	-15.8	-3.0	-3.0	-2.9	-6.9
Swap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bank term deposits	-12.3	-26.7	-28.0	-22.0	6.0	9.0	4.0	4.0	-11.0
Interest[b]	0.6	0.2	0.1	0.2	0.2	0.0	0.0	0.0	0.1
Bond purchases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Total change in the monetary base	11.7	8.4	10.8	12.2	4.9	0.0	4.8	1.3	-1.2

[a] This item includes, among other things, receipts (payments) in foreign exchange that the Bank of Israel and the government receive from (transfer to) the private sector, for instance income tax.
[b] Excluding *makam*.
SOURCE: Bank of Israel.

[50] December 2018 average compared with December 2017 average.

Table 3.4
Rate of change in monetary aggregates, 2014–18

	0	1	2	1+2=3	4	5	6	3+4+5+6=7
	Monetary base[a]	Cash held by the public	Current accounts	M1[b]	Short-term deposits[c] up to 3 months	Short-term deposits[c] up to one year	SRO[d]	M2[e]
	(Average in December compared to average the previous December)							
2014	11.6	11.7	48.3	35.6	-8.1	11.6	9.8	8.4
2015	16.3	13.9	51.4	40.7	-16.4	4.6	34.2	13.6
2016	7.5	5.8	20.7	17.2	-10.4	15.0	12.1	7.9
2017	6.4	6.5	14.2	12.6	-2.0	-2.8	16.2	8.4
2018	6.0	6.6	13.8	12.4	-15.5	-4.2	1.3	2.2
	(Quarterly average compared with the average of the previous quarter)							
2018								
Q1	0.7	-0.1	4.6	3.6	-2.6	2.8	1.0	1.5
Q2	1.8	2.1	4.5	4.0	-2.0	-5.4	0.4	1.0
Q3	1.7	2.6	3.1	3.0	-2.8	0.0	0.1	0.9
Q4	1.4	1.3	2.0	1.9	-7.8	-1.4	0.8	-0.5

[a] Total banknotes and coins in circulation and current deposits by the commercial banks with the Bank of Israel.
[b] M1 = cash and demand deposits.
[c] Term deposits.
[d] Self-renewing overnight deposit - a liquid daily deposit.
[e] M2 = M1+SRO+unindexed deposits of up to one year.
SOURCE: Bank of Israel and Central Bureau of Statstics data.

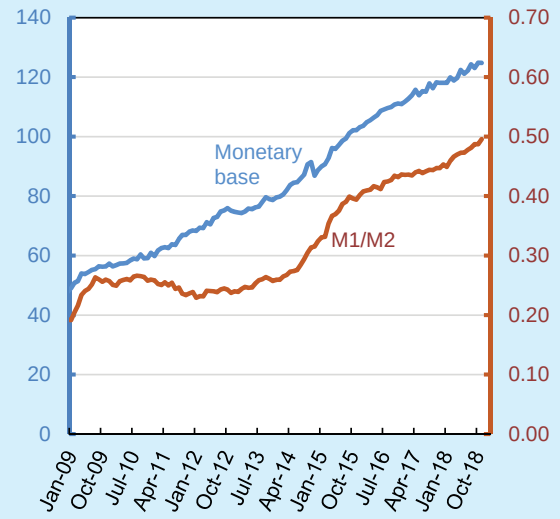
b. The monetary aggregates

The quantity of money—the M1 aggregate—includes cash held by the public and the public's demand deposits with the banks. The demand for money is affected mainly by the level of activity in the economy and by the interest rate: An increase in the level of activity increases demand for money (the engine of transactions), while an increase in the interest rate lowers it (the alternative cost of holding liquidity). In 2014–2015, the quantity of money increased significantly, by about 35–40 percent, due to the decreases in the interest rate. In 2016, the rate of the increase in the quantity of money moderated to 17.2 percent, and in 2017 it moderated further, to 12.6 percent, in line with the stable interest rate (Table 3.4). In 2018, the rate of increase remained similar to that of 2017—12.4 percent. The increase in M1 in 2018 was mainly a result of an increase in demand deposits, which grew by 13.8 percent, while cash held by the public increased by just 6.6 percent.

In parallel with the interest rate decreases in recent years, there was a downward trend in cash as a share of M1, which stood at about 19 percent at the end of 2018, down from 50 percent a decade ago. In parallel, M1 continued to increase as a share

of M2—an aggregate that includes unindexed deposits of up to one year, in addition to M1 (Figure 3.15). The increase in this ratio began in 2012, and indicates that the public replaced interest-bearing deposits with demand deposits because the low interest rate on unindexed deposits does not compensate for the loss of liquidity inherent in those deposits.

Figure 3.15
Monetary Aggregates, Monthly Average, January 2009 to November 2018 (NIS billion)



SOURCE: Bank of Israel.

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Box 3.1
Analysis of the Inflation Risk Premium in the Inflation Expectations Derived from the Capital Market[1]

BACKGROUND

The Bank of Israel monitors the yields of government bonds—particularly breakeven inflation, which is the difference between the nominal and real yield to maturity—in order to discern inflation expectations derived from the capital market.[2] In recent years, in view of the low inflation in Israel and abroad, breakeven inflation in Israel declined in all maturities, including long-term—those that are affected less by temporary factors such as changes in commodity prices (Figure 1). This leads to the question of how to explain this decline.

Economic theory and empirical findings from around the world[3] show that breakeven inflation in any maturity is comprised of the sum of two components[4]: inflation expectations to a given maturity, and the inflation risk premium for that maturity. In other words, given a change in breakeven inflation, it is difficult to identify whether it is a result of a change in the premium demanded by investors and/or a change in inflation expectations. However, the professional literature contains an accepted methodology for decomposing the yield curve into its two components, and many central banks have adopted it,

[1] This box is based on D. Nathan (2018), "Decomposing the Term Structure of Interest Rates: Evidence from a Small Open Economy".

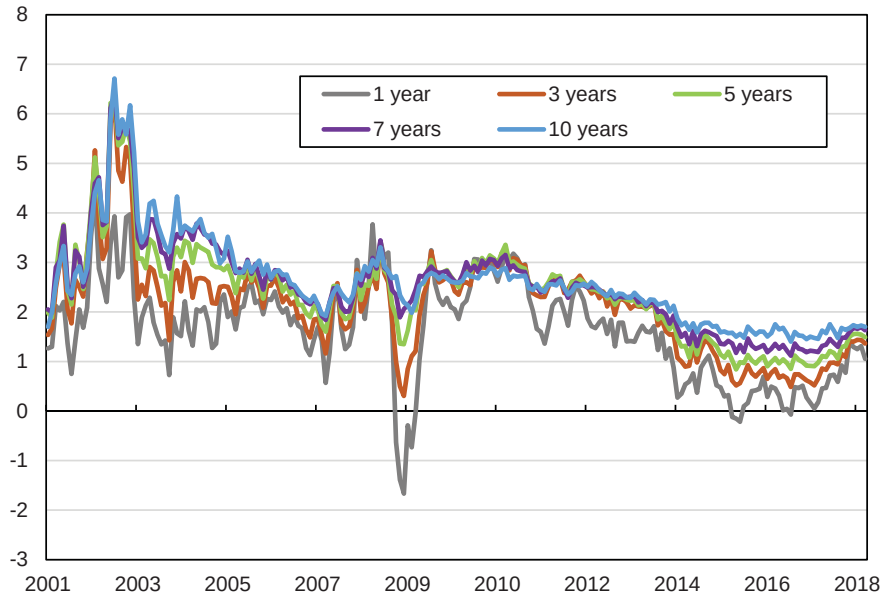
[2] It is customary to look at the difference between nominal and real yield to maturity of zero-coupon government bonds. This yield curve is also called the zero-coupon curve. These bonds are not traded in the market, but the literature contains accepted ways to derive their prices from bond prices. The application of these ways in Israel appears, for instance, in Brodesky and Steinberg (2011).

[3] For instance: D'Amico, Kim and Wei (2018).

[4] See, for instance, Ang, Bekaert and Wei (2008). We note that there also may be components derived from frictions in the financial markets. For example, empirical findings in the US and Europe show that investors demand a higher liquidity premium for indexed bonds than for unindexed bonds (see, for instance, Fleckenstein et al., 2014). In other words, the yield on indexed bonds increases more as a result of a higher liquidity premium, thereby contributing to a decline in breakeven inflation, since the latter is, as mentioned, equal to the difference between nominal and real yield to maturity. However, Nathan (2018) does not find that the gaps in liquidity premium have a significant effect on the Israeli market.

including the US Federal Reserve (the Fed).[5] This box is based on that methodology, and shows the outcome of the breakdown in Israel in recent years.

Figure 1
Breakeven Inflation to Various Ranges, May 2001 to December 2018 (percent)



SOURCE: Bank of Israel calculations.

ASSET PRICING AND RISK PREMIUM

According to economic theory, the risk premium of any asset (the difference between its expected return and the risk-free interest rate in the economy) is set according to the correlation between future returns from that asset and the utility to the investor from future consumption. If the asset is expected to generate high returns and the investor will consume a low amount (or vice-versa)[6], we can expect a negative risk premium, since investors are prepared to pay more today because the asset provides "insurance" against negative situations. In contrast, if the asset is expected to generate high returns and the investor will consume a high amount (or vice-versa), we can expect a positive risk premium, since investors are prepared to pay less today because the asset does not provide "insurance".

[5] The Fed has a number of models of the type presented here (for instance, Kim and Wright (2015) and D'Amico, Kim and Wei, 2018), which differ from each other, inter alia, through their estimation methods. The model presented here is very similar to the method presented by D'Amico, Kim and Wei.

[6] We assume that the individual is risk-averse.

Government bonds are no exception. Since there is no certainty regarding the future price of indexed or unindexed government bonds (the prices change according to the future prevailing interest rate in the economy), investors also demand a risk premium for them. At first glance, it may appear that they should demand the same premium on holding indexed bonds as on unindexed bonds. However, while the payment of indexed bonds in real terms does not change in accordance with the future level of inflation, the payment of unindexed bonds does, and they therefore involve an additional risk due to uncertainty regarding future inflation. The risk premium on holding unindexed bonds for a given term is therefore equal to the sum of (1) the risk premium on holding indexed bonds for that term, and (2) an additional inflation risk premium. In other words, investors require additional compensation for holding unindexed bonds, because their payment is not certain in real terms, since future inflation is unknown. In contrast, the payments from indexed bonds is certain in real terms due to CPI indexation. In other words, this premium is positive or negative in accordance with the correlation between it and the utility from future consumption. For instance, when investors expect a positive correlation between future inflation and future consumption (pro-cyclical inflation), they are prepared to pay more for the unindexed bond than for the indexed bond of the same maturity, since the unindexed bond provides insurance for low-growth situations—a higher real payment.

ESTIMATING THE BREAKEVEN INFLATION CURVE

Within the theories we presented, the investor is assumed to be risk-averse and interested in maximizing the utility of his future consumption. There are studies that estimate the risk premium in the yield curve through a model that takes this into account—that includes assumptions regarding the utility function of individuals—as well as links between the various financial assets, including government yields.[7] The model that we used does not adopt this approach. It is one of a group of models called Affine Term Structure Models (ATSM)[8], and similar to others of this type, including the models used by the Fed, it only makes minimal assumptions regarding asset pricing in the market (for instance, that there is no arbitrage in the market). These minimal assumptions provide it with maximum flexibility in estimating risk premia on the yield curve. The main assumption in the model presented here is that there are four latent factors[9] "driving" the economy, and each of them is an autoregressive process with one lag and a residual that is normally distributed. The methodology also does not assume an economic structure, but rather relies on the four latent factors.[10] We estimate the latent factors and the premia derived from them through a Kalman filter method based on the return to maturity of indexed and unindexed zero-coupon government bonds, and we use data at a monthly frequency from 1985 onward.[11] This model generates estimates for the factors that comprise the government yield curve (both real and nominal)—investors'

[7] See, for instance, Wachter (2006); Piazzesi and Schhneider (2006); Gallmeyer, Hollifield, Palomino and Zin (2007); Eraker (2008); Le and Singleton (2010); Bansal and Shaliastovich (2013); and Song (2017). Ilek and Rozenshtrom (2018) estimate the risk premium on unindexed government bonds in Israel using a DSGE model. Their estimate does not change over time, but remains fixed throughout the estimation period.

[8] The model is presented in detail, for instance, in Dai and Singleton (2002).

[9] The four latent factors are found to be sufficient to reconstruct the government bond prices observed in the market.

[10] Dai and Singleton (2002) present the assumptions in detail.

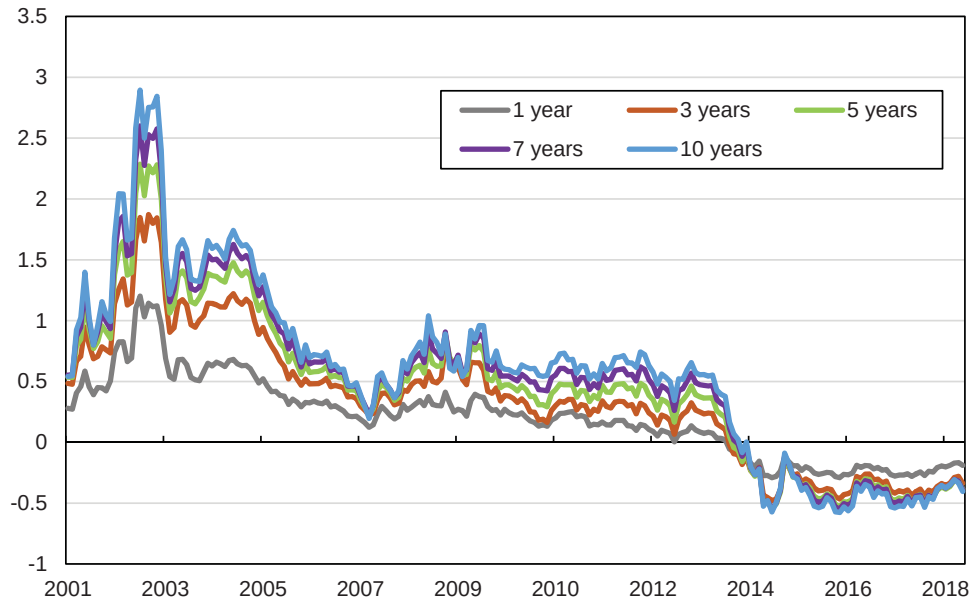
[11] There are data on unindexed government bonds only from 2001 onward, since they only started trading at that time.

expectations regarding future interest rates in the market, and the premium that they require for investing in government yields. In particular, it decomposes the breakeven inflation curve to inflation expectations and the inflation risk premium.

RESULTS

Figure 2 presents the inflation risk premium estimated by the model for each term. It shows that since 2001, there has been a marked consistent decline for all maturities in view of the decline in inflation during that period. It also shows that in recent years, in parallel to the decline in breakeven inflation, the inflation risk premium declined to near-zero, and from mid-2014 until December 2018 (the end of the estimation period) it even declined to negative levels. In other words, the estimate shows that during the period, inflation expectations were higher than breakeven inflation. The model also shows that in 2018, the average inflation risk premium was negative—about -20 basis points for a one-year maturity, and about -40 basis points for a 10-year maturity.[12] In other words, for a maturity of one year, expectations were an average of about 20 basis points higher than breakeven inflation, and for a maturity of 10 years, they were about 40 basis points higher. Since long-term breakeven inflation declined slightly to below the midpoint of the inflation target (an average of 1.7 percent for a term of 10 years), this result supports the

Figure 2
Inflation Risk Premium to Various Ranges, May 2001 to December 2018 (percent)



SOURCE: Bank of Israel calculations.

[12] We note that like in any model, the ATSM model contains uncertainty regarding the level of the estimates. However, Li et al. (2017) review two models used by the Fed, and show that the premia have similar trends in both.

conclusion that inflation expectations among investors (2.1 percent, the difference between 1.7 and -0.4) remained anchored at the midpoint of the target despite the low inflation that has prevailed in recent years.

DISCUSSION OF THE RESULTS

What can explain the consistent decline in the inflation risk premium, and perhaps even the fact that it became negative? As stated, the consistent decline shows that the shocks that cause procyclical inflation have become more dominant. The decline is consistent with similar declines in the US and Europe, as shown by a survey conducted by the BIS[13] using models similar to the one we have used. In other words, there is a global source for at least some of the factors. We suggest a number of factors:

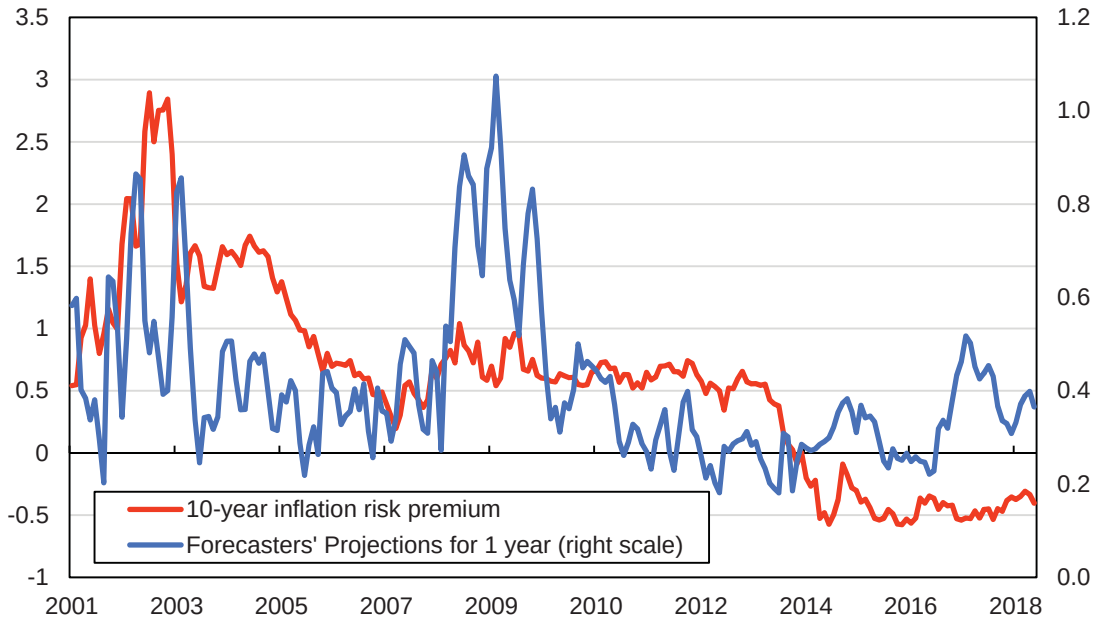
Expectations of low growth rates in the future (secular stagnation).[14] Since the Global Financial Crisis, global growth rates have been lower than the previous rates, global inflation is low, and there has been a decline in real interest rates both in Israel and abroad. If households' assessments are that this situation will continue, meaning that low growth will continue alongside low inflation, it is expected to contribute to a decline in the inflation risk premium.

The sharp decline in oil prices since 2014. Some of the decline was due to improved production technology (fracking), and as Sussman and Zohar (2018) show, investors are apparently aware of the improvement, since there were significantly more articles mentioning it in the press since 2014. The decline in oil prices can lower the inflation risk premium by lowering the likelihood of a scenario in which high oil prices lead to low consumption (since oil is essential for production), thereby increasing the correlation between oil prices and future consumption.

Expectations of a decline in the volatility of inflation. This is expected to reduce the correlation between inflation and future consumption (assuming that all other things remain fixed). Figure 3 shows the inflation risk premium to 10 years, and the monthly standard deviation of the forecasters' estimates regarding inflation one year hence (an approximation of households' assessments regarding future inflation). The correlation between the two series is 0.3. Since the Global Financial Crisis began, there has been a decline in the volatility of forecasters' assessments, similar to the inflation risk premium.

[13] See B. Cohen, P. Hordahl and D. Xia (2018).
[14] See, for instance, Summers (2015).

Figure 3
Ten-Year Inflation Risk Premium, and Standard Deviation of Forecasters' Inflation Projections, May 2001 to December 2018 (percent)



SOURCE: Bank of Israel calculations.

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