Chapter 3
Monetary Policy and Inflation

- Similar to leading central banks around the world, the Bank of Israel used a series of tools intended to deal with the ramifications of the COVID-19 crisis. Some were new and used for the first time, and some, while used in the past, were implemented on unprecedentedly large scales. These tools were intended to prevent a liquidity crunch at the beginning of the crisis and to ease credit conditions in the economy by lowering the medium- and long-term interest rates in the market. Beyond lowering the interest rate to 0.1 percent, these tools included the purchase of government and corporate bonds in the secondary market; repo transactions; shekel-dollar swaps with banking institutions; and the provision of long-term loans to the banking system at 0.1 percent interest, and thereafter at -0.1 percent interest, against low-interest loans that the banks would provide to small and micro businesses. This latter measure was conditioned on lowering the interest rate to borrowers.

- An empirical examination shows that the Bank of Israel's measures, mainly the March 23 announcement itself of the government bond purchasing program, lowered yields on government bonds, provided liquidity to the government bond market, and lowered the liquidity premium.

- The Consumer Price Index declined by 0.7 percent in 2020, reflecting a significant decline in inflation relative to previous years, mainly as a result of the COVID-19 crisis' impact on economic activity in Israel and abroad.

- The main forces working to lower inflation included the declines in global energy and food prices and in activity and demand in the economy—factors that are directly linked to the COVID-19 crisis. Other factors contributing to the decline in inflation were the moderate decline of home rental prices, also in view of the crisis, and the appreciation of the shekel.

- Despite the sharp drop in estimated one- and two-year inflation expectations during the year, estimated five-year forward expectations in five years derived from the capital market remained stable near the center of the target range throughout the year—evidence that the inflation target has maintained its credibility.

- The shekel appreciated by 5.5 percent in terms of the nominal effective exchange rate in 2020. The appreciation was supported by the weakening of the US dollar worldwide, fundamental economic factors including the increase in the current account surplus, and the decline in Israel's risk premium.

- The Bank of Israel signaled to the market at the beginning of 2020 that it would continue intervening in the market if its assessment was that the shekel's appreciation was due to financial factors. During the year, it purchased $21.2 billion in foreign exchange.

- The monetary aggregates increased because of the increase in the public's demand for liquidity.

1. MONETARY POLICY

a. Monetary policy measures adopted in 2020

The COVID-19 crisis generated an economic crisis that threatened to spill over into a financial crisis. In 2020, the Bank of Israel adopted several measures—some of which were utilized for the first time, and some of which, while having been used in the past, were implemented to unprecedented scales[1]—in order to prevent a financial crisis and ease the terms of credit for the public and businesses. The amount is expected to increase due to additional commitments that the Bank of Israel took on, such as continued government bond purchases.

Over the course of 2020, and particularly during the initial weeks of the pandemic, the Bank of Israel worked to maintain the proper functioning of the bond markets. On March 15, the Bank of Israel purchased government bonds in the secondary market, for the first time since 2009, in order to inject liquidity into these markets. The background to the purchases was a rapid increase in yields on the government bond markets, partly as a result of the many withdrawals from mutual funds specializing in government bonds. Contrary to the beginning of the financial crisis in 2008, however, these were joined by a large number of sales of government bonds by the institutional investors in order to obtain liquidity. These sales led to price pressure in the government bond market, which was reflected in an impact on liquidity and sharp price declines in government bonds. As a complementary tool, the Bank of Israel also allowed financial institutions to carry out repo transactions using government bonds as collateral. Further to the measures adopted on March 15, the Bank of Israel announced a further intervention program on March 23—the purchase of government bonds totaling NIS 50 billion in the secondary market. In contrast with the previous program, the Bank this time announced the quantity it was committing to purchase.

The COVID-19 crisis also had an impact on the shekel-dollar exchange rate, as broadly documented in the Financial Stability Report for the second half of 2020. At the beginning of the crisis, there was high demand for dollars on the part of the institutional investors, because they were forced to deposit collateral on foreign stock exchanges (mainly in the US) due to the sharp declines in equity indices. The Bank of Israel therefore supplied them with dollars, on March 16, through swap transactions. On March 18, it expanded this program by enabling longer-term transactions.

At the start of the crisis, the Bank of Israel interest rate was already near zero, at 0.25 percent. The Bank therefore had very little room to maneuver using the monetary interest rate, and as such, it operated through other methods to make it easier for the business sector to obtain credit. First, the government bond purchases in the secondary market, beyond their contribution to financial stability, worked to lower yields, thereby also lowering the interest rates in the economy. In April, the Bank of

> Over the course of 2020, and particularly during the initial weeks of the pandemic, the Bank of Israel worked to maintain the proper functioning of the bond markets. On March 15, the Bank of Israel purchased government bonds in the secondary market, for the first time since 2009, in order to inject liquidity into these markets.

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[1] In particular, dollar-shekel swap transactions (NIS 7.5 billion), repo transactions as collateral (NIS 1.5 billion), government bond purchases (NIS 41.6 billion), corporate bond purchases (NIS 3.5 billion), and loans to the banking system against the provision of credit to small businesses (NIS 16.3 billion).

Israel lowered the monetary interest rate to 0.1 percent, and also announced a program to provide 3-year loans to the banks at an interest rate of 0.1 percent, which would be conditioned on the provision of credit to small and micro businesses according to defined criteria.

The programs easing the terms of credit in the economy continued throughout 2020. On October 22, the Bank of Israel announced that it would purchase another NIS 35 billion in government bonds. It also announced that it would provide the banks with 4-year loans at a fixed interest rate of -0.1 percent against loans that they would provide small and micro businesses, on condition that the interest on those latter loans would not exceed prime +1.3 percent.[2] Moreover, since the beginning of the crisis, the Bank of Israel's Banking Supervision Department created various outlines to enable the deferral of mortgage payments, consumer credit, and credit to businesses. The last of these was announced on December 10. For more information on the various Banking Supervision Department outlines, see Chapter 4 of this Report.

As part of the measures to encourage the provision of credit in the economy and strengthen the transmission from monetary policy to the credit market, in 2020 the Bank of Israel intervened in the corporate bond market for the first time. On July 6, the Bank announced that it would purchase NIS 15 billion worth of bonds of companies rated A- and higher. This step was also intended to support the continued proper functioning of the corporate bond market, and came in addition to the measure adopted on April 6 to enable institutional investors to make repo transactions with the Bank of Israel using corporate bonds as collateral.

In 2020, the Bank of Israel markedly increased its interventions in the foreign exchange market, purchasing about during the year due to the continued appreciation of the shekel in terms of the nominal effective exchange rate. In February, in view of the appreciatory trend of the shekel, the Bank of Israel even brought this policy into sharper focus by signaling to the market that it would continue using foreign exchange purchases, in particular if the appreciation would derive from financial factors. At the beginning of the COVID-19 crisis, there was a sharp depreciation of the shekel due to a dollar liquidity crisis, during which the Bank of Israel enabled the supply of dollars to the institutional investors by allowing them to carry out repo transactions with it. The appreciatory trend then resumed, and at a certain point the Bank of Israel resumed its intervention in the foreign exchange market. In January 2021, following the period analyzed in this report, the Bank of Israel announced that during 2021, it would purchase a total of $30 billion. The real appreciatory trend of the shekel in recent years has been due to fundamental conditions in the economy, such as the increase of the current account surplus by $6.6 billion relative to 2019, and the decline in the CDS. These will be discussed in greater detail later in this chapter.

In 2020, the Bank of Israel markedly increased its interventions in the foreign exchange market, purchasing about $21.2 billion during the year due to the continued appreciation of the shekel in terms of the nominal effective exchange rate.

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[2] It should be noted that in parallel to this program, a government program was activated to provide state-backed loans at prime +1.5 percent, meaning a maximum spread of 1.5 percentage points from the prime rate. Since the Bank lowered the costs of financing to the banks by 0.2 percentage points, it required that the spread be lowered by 0.2 percentage points.

b. The Bank of Israel's intervention in the government and corporate bond markets

(1) The background to the Bank of Israel's intervention in the government bond market during the year

Similar to the Global Financial Crisis of 2008, the COVID-19 crisis led to sharp volatility in the financial markets. However, at the beginning of the crisis in March 2020, a unique phenomenon was observed in the financial markets in Israel (and abroad) that differentiated it from the beginning of the 2008 crisis (following the fall of Lehman Brothers)—a sharp decline in both equity prices and government bond prices at the same time.[3] Crisis periods in the capital markets are generally typified by declines in equity prices and increases in government bond prices, because during a crisis, investors want to rid themselves of risky assets and move to solid assets—a phenomenon that is documented in the literature and referred to as a "flight to safety".[4]

So what is the explanation for the sharp declines in government bond prices in Israel in March in parallel with the decline in equity prices? One of the reasons is the sales of government bonds by institutional investors, particularly mutual funds. In March 2020, as the virus spread in Israel and worldwide, there was a massive departure of money from the mutual funds in all channels.[5] The institutional investors, who are part of the "natural" purchasers of government bonds, also sold those bonds[6], thereby creating pressure on prices that worsened with the decline in prices on the market. This was contrary to the way they acted during the 2008 crisis (Figure 3.1).[7]

Contrary to the 2008 crisis, the reason for sales by institutional investors in this case was their increasing exposure to foreign equities—particularly the increase in their investments in foreign equities through investment in futures contracts. The volume of institutional investors' holdings in foreign equities increased from about 5 percent in 2010 to 32 percent in 2020, and the share of futures contracts in the portfolio increased.[8] Due to their exposure to these contracts, together with the sharp price declines on the stock exchanges around the world, institutional investors had to increase their dollar collateral by large amounts immediately. As such, they were first forced to sell liquid assets such as government bonds, and then immediately convert

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[3] For instance, at the height of the 2008 crisis, following the fall of Lehman Brothers, the unindexed government bond index in Israel declined by about 1 percent (September 15, 2008 to October 6, 2008) compared with a decline of about 5 percent at the height of the crisis in March 2020 (March 8–22, 2020).

[4] See, for instance, Baeke, Bekaert, Inghelbrecht, and Wei (2020) "Flights to Safety", *Review of Financial Studies*, 33(2): 689–746

[5] For more information on this topic, see: https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/3-6-2020A.aspx

[6] Banks and hedge funds, as well as private investors and foreign investors, are also active in this market.

[7] We have data only on net new investments in mutual funds, not on their sales. However, since the mutual funds are very liquid, it is reasonable to assume that the many withdrawals were translated into sales in the market.

[8] For more information on this topic, see the *Financial Stability Report* for the second half of 2020.

Figure 3.1
Ratio of Net Gov't. Bond Purchases by Institutional Investors and Net Change in New Investment in Mutual Funds Specializing in Government Bonds to the Value of the Gov't. Bond Market, 2008 and 2020 (percent)

■October to December 2008   ■February to April 2020
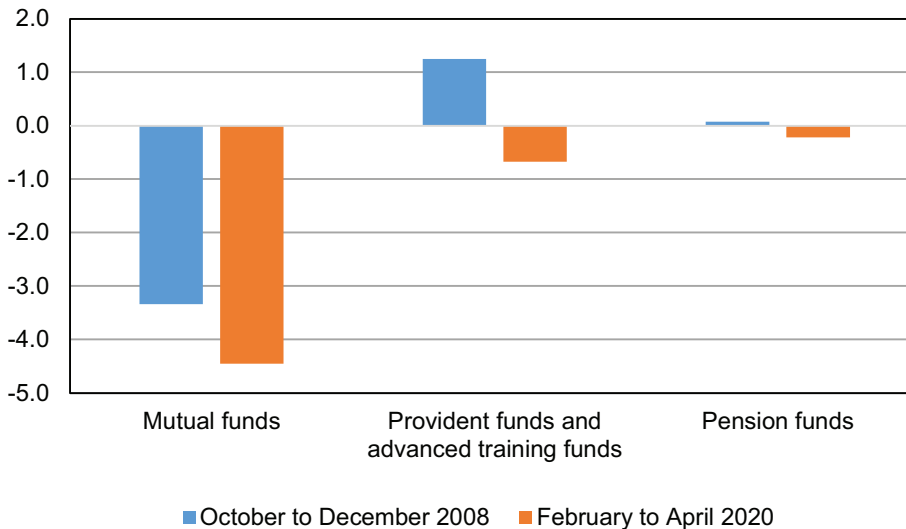
SOURCE: Bank of Israel.

the proceeds into dollars. This mechanism also led to a dollar liquidity crisis in the swap market (which will be discussed further below.)

The price pressure led to an increase in government bond yields in all ranges during March. On average, yields on the nominal curve increased by 0.7 percent from March 8–22, and yields on the real curve increased by 1.5 percent. The increase in yields was accompanied by increases in many indices, such as bid/ask spreads and intraday price volatility, indicating declines in liquidity on the bond markets.
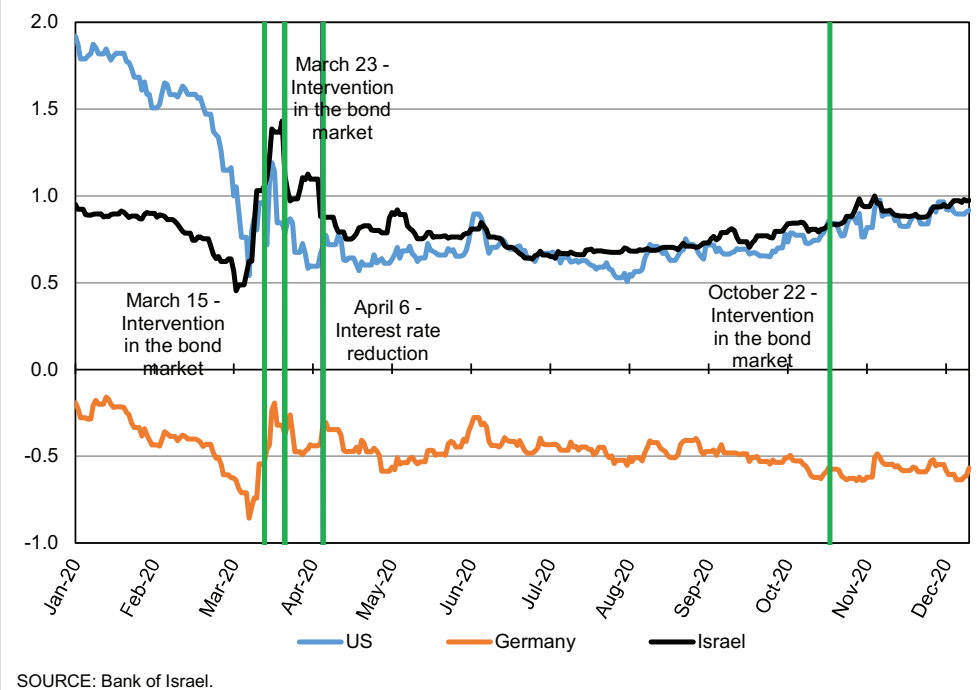
It should be emphasized that we cannot attribute the entire increase in yields in Israel during March only to the price pressure from mutual funds and institutional investors. First, in view of the government discussions regarding the use of assistance programs due to the crisis, there were growing assessments in the markets that the deficit would increase, and as empirical work by Brender and Ribon (2015)[9] shows, increasing the deficit raises yields in the government bond market. Moreover, since Israel is a small and open economy, global yields have a substantial impact on yields in Israel (which is discussed further in Section F). Figure 3.7 shows that yields around

Price pressure by investment houses led to an increase in government bond yields in all ranges during March.

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[9]   Adi Brender and Sigal Ribon (2015). "The Effect of Fiscal and Monetary Policies and the Global Economy on Real Yields of Israel Government Bonds", Bank of Israel Research Department Discussion Papers Series 2015.02.

the world increased during the period (March 15) and contributed to the increase in yields in Israel.

Figure 3.2
10-Year Government Bond Yields–Israel, Germany, and US, January–December 2020 (percent)

March 23 -
Intervention
in the bond
market

March 15 -
Intervention
in the bond
market

April 6 -
Interest rate
reduction

October 22 -
Intervention
in the bond
market

US — Germany — Israel

SOURCE: Bank of Israel.

(2) The Bank of Israel's intervention in the government and corporate bond markets

Following the Global Financial Crisis of 2008, a vast theoretical literature developed, discussing the mechanisms that enable a central bank to influence yields. Box 3.2 of this chapter ("Quantitative Easing – Central Bank Intervention in the Government Bond Market") outlines the mechanisms through which the Bank of Israel's announcement regarding intervention in the government bond market, and their actual purchases, are expected to influence yields. This section provides a detailed description of the Bank of Israel's measures in the bond markets and their results—particularly the effect of its intervention on bond yields. The following section presents a precise examination of the channels through which the Bank of Israel influences bond yields, in view of the theoretical discussion in Box 3.2.

The government bond market was in the midst of a liquidity crisis with an increase in yields in March 2020. Government bonds are an important financial asset, because they serve investors as an indicator of the risk-free interest rate in the pricing of financial assets in the market. (The investors add a risk adjustment to this interest rate.) As such, the affect the prices of all financial assets in the market. This is

The government bond market was in the midst of a liquidity crisis with an increase in yields in March 2020.

one of the reasons why the Bank of Israel intervened in the government bond market on March 15, for the first time since 2009.

In order to provide liquidity to the government bond market, the Bank of Israel took two complementary steps. It purchased government bonds at all terms to maturity, and it made repo transactions with financial institutions allowing them to borrow money from the Bank of Israel using government bonds are collateral.[10] These two steps were intended to provide liquidity to the bond markets. The first was intended to "absorb" the many sales of government bonds by the mutual funds and institutional investors in the secondary market, and the second was intended to provide the institutional investors with an additional channel through which they could raise liquidity so that they would not need to sell government bonds in the secondary market.

The Bank of Israel's intervention on March 15 (Figure 3.2) temporarily halted the increase in yields, and an examination of the liquidity indices in the government bond market (spreads, turnover rate, and so forth) indicated a partial improvement.

As a result, on March 23, the Bank of Israel announced a further intervention program, as part of which it would purchase NIS 50 billion of government bonds. The graphs show that yields declined following the announcement.[11] The declared aim of the program, beyond providing liquidity, was to serve as a complementary tool to the short-term interest rate. In contrast with the March 15 notice, this time yields declined immediately after the announcement, according to an examination of liquidity indices that showed a significant decline in the cost of liquidity. Other than that, as detailed in the Financial Stability Report for the second half of 2020, the March 23 announcement of the Bank of Israel's purchasing program also led to a decline in corporate bond spreads in all sectors and at all ratings.

On October 22, after nearly exhausting the program, the Bank of Israel announced that it would purchase another NIS 35 billion in government bonds.[12] The aim of the program was to influence bond yields in the market throughout the unindexed and indexed curves, and thereby lower the costs of longer-term credit for firms and households, as a complementary tool to the short-term interest rate policy. Similar to the March 15 program, the announcement of the program did not have an apparent immediate impact on government bond yields.

On July 6, the Bank of Israel announced that it would purchase a total of NIS 15 billion in corporate bonds in the secondary market, and by the end of the year, it had purchased about NIS 3.5 billion of such bonds.[13] The declared aim of the Bank's intervention was twofold: to inject liquidity into the corporate bond market, and to lower the yield spreads in order to ease the terms of credit for companies raising money in the market. An examination by the Bank of Israel shows that bond prices rose

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[10] See the announcement at https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/15-03-2020.aspx

[11] https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/22-3-20a.aspx

[12] For the notice, see https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/22-10-20b.aspx

[13] See: https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/6-7-2020.aspx

(meaning their yields declined) immediately after the announcement, and continued to rise the following day.

(3)An empirical examination of the impact of the Bank of Israel's government bond purchases on their yields

The following is an empirical examination of the extent of the Bank of Israel's effect on government bond yields from March 23 until the end of the year. The first channel we examine is the liquidity channel. According to this channel, the Bank of Israel's purchases over the year provided liquidity to the markets, thereby contributing to the moderation of market volatility. It should be emphasized that through this channel, the Bank of Israel acts to moderate supply shocks in the markets on days when it intervenes and not necessarily to affect prices permanently. This is shown by a Bank of Israel Research Department analysis published on June 3.[14] The estimation here was made using a linear regression model, similar to D'Amico and King (2013).[15] The dependent variable in the regression is the daily change in the yields on 1–10-, 15-, and 20-year bonds according to the real and nominal zero curve calculated by the Bank of Israel. The explanatory variable is the total daily interventions during the day on the indexed curve and on the unindexed curve.[16] We begin the estimation period on March 23 in order to mitigate reverse causality concerns.[17,18]

The results show that the purchases had a negative impact on yields. When the Bank of Israel purchases NIS 100 million of nominal and indexed government bonds, it causes an average statistically significant decline of 1 basis point (0.01 percentage points) in nominal yields, and of 1.4 basis points (0.014 percentage points) in the indexed curve, respectively. The Bank of Israel thereby essentially lowers yields on days when it intervenes by providing liquidity in the market. The results also show that in the liquidity channel, the effect on the nominal curve is less than the effect on the real curve.[19] This means that the Bank of Israel's intervention also has an indirect

> When the Bank of Israel purchases NIS 100 million of nominal and indexed government bonds, it causes an average decline of 0.01 percentage points in nominal yields, and of 0.014 percentage points in the indexed curve, respectively.

[14] See: https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/3-6-2020a.aspx. Some of these purchases may also have a permanent impact through the other channels mentioned in the box (similar to the signaling channel)—if market participants wait for the actual intervention because they do not believe that the Bank will actually intervene to the quantities announced.

[15] D'Amico, S. and T. B. King (2013). "Flow and Stock Effects of Large-Scale Treasury Purchases: Evidence on the Importance of Local Supply", *Journal of Financial Economics*, 108(2): 425–448.

[16] Separate panel regressions were run for the nominal and real curves. Since we assume the same coefficient for all yields on the nominal curve, we essentially estimate the average effect. The same is true for the real curve. Another explanatory variable that was included in the regression is the change in parallel yields in the US.

[17] As stated, the Bank of Israel intervened as early as March 15, during the increase in yields in the market. The estimation of the linear regression model during this period causes the intervention coefficient to be positive. In other words, the Bank of Israel's interventions lead to an increase in yields.

[18] However, it should be emphasized that the sample estimation after March 23 does not necessarily completely cancel the reverse causality problem. The Bank of Israel may have acted mainly to moderate the increase in yields during the following period. As such, we assume that our estimation underestimates the Bank of Israel's impact on liquidity in the market.

[19] A statistically significant result.

effect on estimated inflation expectations derived from the capital market, contributing an average of 0.4 basis points along the curve to the increase in expectations measured on days when it intervenes (when it purchases NIS 100 million of unindexed and indexed government bonds), although the result is not statistically significant.

In order to estimate the effect of the announcement of the Bank of Israel intervention program (as opposed to the previous investigation that dealt with the effect of the interventions themselves throughout the year), we take an event study approach. We examine the change in yields the day before the Bank of Israel's announcement and a number of days after it. The latent assumption in this approach is that the permanent effect of the program will be reflected in investors' behavior in the market during the small period examined.[20] Our approach is very similar to that of Gagnon, Raskin, Remache, and Sack (2010)[21], who examined the effect of the Federal Reserve's interventions during the 2008 Global Financial Crisis. We make a number of adjustments to the Israeli market and to the fact that the motivation for the Bank of Israel's intervention in this crisis, beyond increasing monetary accommodation, was also to provide liquidity to the markets.

As a small and open economy, Israel is greatly affected by global interest rates. Many countries adopted government bond purchasing policies. For instance, the Federal Reserve announced a government bond purchasing program one hour before the Bank of Israel's March 23 announcement. In order to calculate the effect of the US interest rate change on the interest rates in Israel, we estimated a linear regression model from 2017 through February 2020, and we also estimated the effect of a change in the daily yield in the US on the parallel yield in Israel during a short period before the crisis. Estimating the link between yields in Israel and those in the US will enable us to understand how much of the decline during the examined period is due to an external change that is not under the Bank of Israel's control.
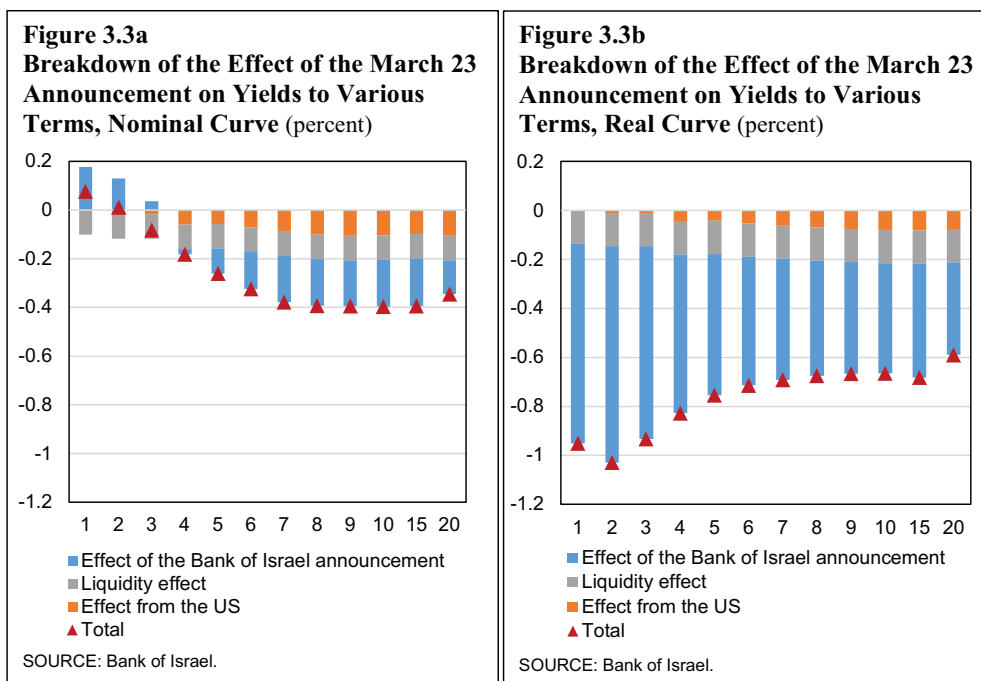
Another factor we would like to control for in estimating the effect of the Bank of Israel's announcements is the quantity of the Bank's intervention during the short period we examine. As stated, beyond the effect of the announcement and the various channels through which it operates, the Bank of Israel also provided liquidity to the markets at the time of its announcements. In order to calculate the effect of the improved liquidity, we use estimations from the linear regression model we estimated in order to examine the liquidity channel.[22]

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[20] The disadvantage of this approach is that a long time may pass until the investors understand the significance of the purchasing program—beyond the small time window that was examined.

[21] See: Gagnon, J., M. Raskin, J. Remache, and B. Sack (2011), "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases", *International Journal of Central Banking*, 7(1): 3–43.

[22] The decline in yields during the period may also have been due to macroeconomic factors and risk premia, such information that the crisis would not be as bad as initially thought, and not necessarily from the intervention itself. We cannot control for this in our examination.

We first examine the March 23 announcement regarding the program to purchase of NIS 50 billion. The results of the effect of the channels on bond yields are presented in Figures 3.3a and 3.3b.[23]

Figure 3.3a
Breakdown of the Effect of the March 23 Announcement on Yields to Various Terms, Nominal Curve (percent)

- Effect of the Bank of Israel announcement
- Liquidity effect
- Effect from the US
- ▲ Total

SOURCE: Bank of Israel.

Figure 3.3b
Breakdown of the Effect of the March 23 Announcement on Yields to Various Terms, Real Curve (percent)

- Effect of the Bank of Israel announcement
- Liquidity effect
- Effect from the US
- ▲ Total

SOURCE: Bank of Israel.

Following the Bank of Israel's March 23 announcement, yields declined by 0.25 percentage points on average across the terms to maturity on the nominal curve.

We first analyze the results obtained from the nominal curve (Figure 3.3a). The yields, other than those for one and two years, declined following the announcement of the Bank of Israel's intervention, by rates of between 0.1 percentage points for a term to maturity of 3 years and 0.4 percentage points for a term to maturity of 20 years. The figure also shows that a small part of the change in nominal yields can be explained by the change in yields in the US during the same period, while another part of the change can be explained by the intervention through the liquidity channel. However, a large part of the change in yields, calculated as the gap between the decline in yields during the examined period and the effect of the liquidity channel and the effect of yields in the US, can be explained by the Bank of Israel's announcement. On average across the terms to maturity on the nominal curve, yields declined by 0.25 percentage points: 0.07 percentage points due to the change in yields in the US during that period; 0.1 percentage points resulted from the Bank of Israel's injection of liquidity; and 0.08 percentage points resulted from the Bank of Israel's announcement.

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[23] The Research Department analysis published on June 3 also examined the effect of the Bank of Israel's announcement at the intraday level. The results there support the daily regression presented here, in which only part of the effect was due to the Federal Reserve's announcement an hour before the Bank of Israel's announcement.

The analysis of the real curve (Figure 3.3b) shows a more dramatic decline in yields following the Bank of Israel's announcement—particularly in the short part of the curve, which declined by 1 percentage point. As with the results regarding the nominal curve, here too we see that part of the effect is due to real yields in the US, as well as the intervention through the liquidity channel. Most of the decline can be explained by the Bank of Israel's interest rate announcement. On average across the terms to maturity on the real curve, yields declined by 0.76 percentage points: 0.05 percentage points due to the change in yields in the US during that period; 0.14 percentage points resulted from the Bank of Israel's injection of liquidity; and 0.57 percentage points resulted from the effect of the announcement.

We now examine the effect of the October 22 announcement regarding continued purchases, using the same empirical framework examined above. Figure 3.2 does not show that the announcement had a similar effect to that of the March 23 announcement. Figures 3.4a and 3.4b show the results of the decomposition presented in Figure 3.3 and confirm this perception. In the model we estimated, we did not find that the Bank of Israel announcement had an effect. The model relates to the Bank of Israel's positive effect on yields, because yields in the market did not decline during those days (but increased by an average of 0.02 percentage points on the nominal curve and 0.05 percentage points on the real curve). We can also see that the purchases had a negative impact on yields through the liquidity channel, in addition to the impact of the decline yields in the US. So why do we not identify any effect on the part of the Bank of Israel's October 22 announcement? First, the market may have expected the Bank of Israel to intervene again, and was therefore not surprised by the announcement. Second,

Yields declined by 0.76 percentage points on average across the terms to maturity on the real curve following the Bank of Israel's March 23 announcement.

Figure 3.4a
Breakdown of the Effect of the October 22 Announcement on Yields to Various Terms, Nominal Curve (percent)
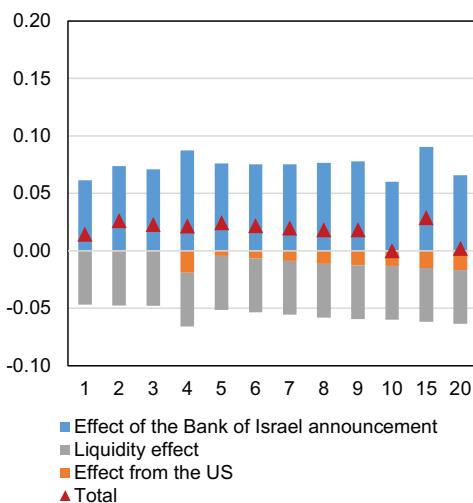
■ Effect of the Bank of Israel announcement
■ Liquidity effect
■ Effect from the US
▲ Total
SOURCE: Bank of Israel.

Figure 3.4b
Breakdown of the Effect of the October 22 Announcement on Yields to Various Terms, Real Curve (percent)
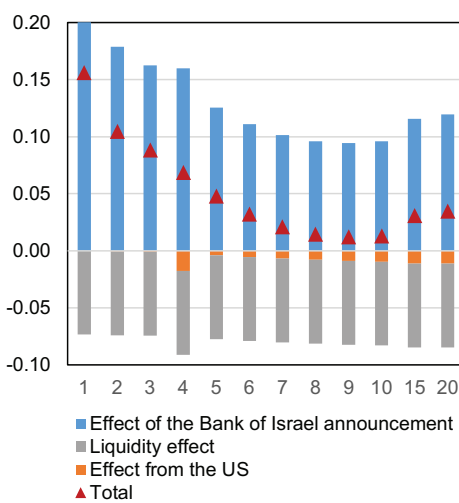
■ Effect of the Bank of Israel announcement
■ Liquidity effect
■ Effect from the US
▲ Total
SOURCE: Bank of Israel.

the announcement of the duration of purchases was made together with the Bank of Israel's interest rate announcement, in which the Bank announced that the interest rate would remain unchanged at 0.1 percent. Some of the professional forecasters had projected a decline of the interest rate. The lack of such a decline may have been a negative surprise for the market, which was somewhat offset by the announcement of the purchasing program.

The Bank of Israel's March 23 announcement was found to have a significant impact on yields in the government bond market. That announcement led to lower yields on both the nominal and real curves. In addition, Figure 3.2 shows that the announcement had a permanent effect on yields, in that during the reviewed period, yields increased back to their precrisis levels. We also found that the Bank of Israel's interventions themselves throughout the period provided liquidity to the government bond market and lowered the liquidity premium on the days on which the Bank intervened.

The same mechanisms mentioned in the discussion on the intervention's effect in the government bond market can be expected to work in the corporate bond market. For more information on the effects of the Bank of Israel's intervention in this market, see Chapter 4 of this Report and the Financial Stability Report for the second half of 2020.

c. The Bank of Israel's intervention in the foreign exchange market

The Bank of Israel intervened in shekel-dollar trading in 2020 by purchasing a record amount of about $21.2 billion (equal in value to the Bank of Israel's total foreign currency interventions from 2016 through 2019).[24] Furthermore, the minutes of the interest rate discussions held on February 24, 2020 (which were published on March 9), show that the Bank uses intervention in the foreign exchange market as an additional tool for managing monetary policy, and that it will intervene in order to prevent an anomalous appreciation of the shekel by purchasing foreign exchange to the extent necessary, particularly if the appreciation is due to factors of a financial nature.[25] The change in the intervention policy came in view of the shekel's 1.35 percent appreciation in terms of the nominal effective exchange rate between the beginning of the year and the end of February, which brought the total appreciation since 2008—when the Bank of Israel began intervening in the foreign exchange market—to 39 percent. This appreciation is one of the factors making it difficult to return inflation to the target range.

One of the factors contributing to the shekel's appreciation in terms of the nominal effective exchange rate in 2020 was the continued decline in Israel's risk premium. Country risk, as reflected in Israel's CDS spread, has declined in recent years. This

The Bank of Israel intervened in shekel-dollar trading in 2020 by purchasing a record amount of about $21.2 billion (equal in value to the Bank of Israel's total foreign currency interventions from 2016 through 2019).

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[24] In addition, on January 14, 2021, following the period reviewed in this Report, the Bank announced that it would purchase $30 billion in 2021. It should be emphasized that the Bank of Israel's purchases are sterilized and do not increase the monetary base.

[25] In the relevant portion of the minutes, it is stated that, "They emphasized that the Bank of Israel is prepared to prevent an excessive appreciation of the shekel by purchasing foreign exchange as necessary, particularly if the appreciation is due to factors of a financial nature."

decline reduced the premium demanded for investing in the shekel, which led to its appreciation. The decline in risk is also reflected in the continued increase of nonresidents' investments in Israel, which also led to a continued increase in the current account surplus, which grew by $6.6 billion in 2020 relative to 2019. (For more information see Chapter 2.) The growth of the current account surplus was due to developments having to do with the COVID-19 crisis abroad, and the continued growth of Israeli high-tech services exports. Another factor contributing to the shekel's appreciation was the weakening of the dollar against most currencies in 2020, partly in view of monetary accommodation measures adopted in the US and the COVID-19 crisis.

Yet another factor supporting the appreciation of the shekel in 2020 was the rate of institutional investors' exposure to investments abroad through futures contracts, as described in depth in the Financial Stability Report for the second half of 2020. Investment in futures contracts enables the leverage of the initial investment. As a result, positive yields abroad (as there were in the past few years) are translated into significant cash flows that the institutional investors convert back into shekels. The institutional investors' foreign exchange cash flows show that they became net sellers of foreign exchange (purchased shekels), thereby supporting the trend of appreciation. Another part of the institutional investors' net purchases of shekels was due to adjustments they make in their portfolio of holdings, such as reducing the volume of exposure to foreign exchange assets (meaning they bought shekels) when their value increases. However, it should be noted that most of the demand for shekels comes from foreign investors.
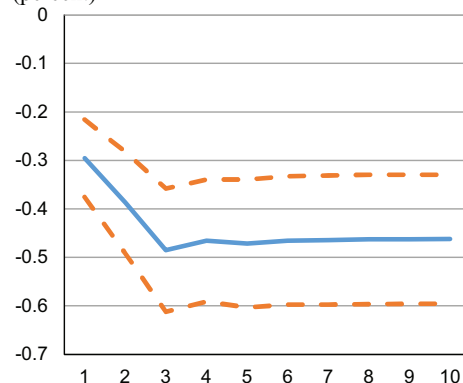
Figure 3.5a
Reaction of Institutional Cash Flows to the Changes in the S&P 500 Index
($ million)
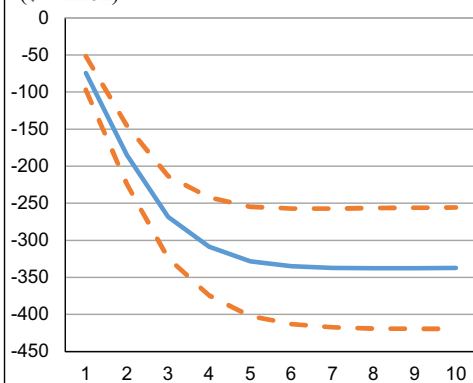
Note: The X-axis represents the number of weeks after the increase, and the Y-axis represents the change in institutional investors' foreign exchange holdings in millions of dollars. The dashed lines show the range of statistical error at a confidence level of 95 percent.
SOURCE: Bank of Israel.

Figure 3.5b
Reaction of the Exchange Rate to the Changes in the S&P 500 Index
(percent)

Note: The X-axis represents the number of weeks after the increase, and the Y-axis represents the change in the shekel-dollar exchange rate. The dashed lines show the range of statistical error at a confidence level of 95 percent.
SOURCE: Bank of Israel.

In order to understand the size and potential effect of these adjustments, we examined the link between an increase in the value of the S&P 500 index (an index of the 500 companies with the highest market capitalization among the companies traded on the US stock exchanges) and the foreign exchange flows of the institutional investors together with the development of the shekel-dollar exchange rate at a weekly frequency[26], using a vector autoregression model.[27]

Figures 3.5a and 3.5b show the cumulative dynamic response of institutional flows and of the shekel-dollar exchange rate in the week following an increase of one standard deviation in the weekly return of the S&P 500 index (a return of 2.6 percent). Figure 3.5a shows that the response to a typical increase in returns on the S&P 500 index (one standard deviation) was to purchase shekels (sell dollars) totaling between $100 million and $350 million in the following 10 weeks. Figure 3.10b shows that the shekel appreciated by about 0.4 percent against the dollar, and that the appreciation continued to accumulate to about 0.6 percent during the following 10 weeks. The fact that the return on the S&P 500 index was positive in recent years (about 9 percent in 2020 and a total of 56 percent between 2017 and 2020) supports the assessment that institutional flows contributed to the trend of appreciation in recent years in general, and in 2020 in particular.

One-off events also contributed to the trend of appreciation of the shekel in 2020. These included Israel's inclusion in the World Government Bond Index (WGBI) in April.[28] The WGBI index tracks the performance of government bonds in about 20 countries. Many bond funds around the world track the index, which means that following Israel's inclusion in the index, demand for the shekel was expected to increase, potentially leading to appreciation.[29] According to Bank of Israel data, foreign holdings of Israeli government bonds did increase, from 5.2 percent in April 2020 to 7.1 percent in July 2020. By a rough estimate, the increase reflects demand of about NIS 13 billion (about $4 billion) during the three months from May to July.[30] To put this number into perspective, it should be noted that during those months, nonfinancial sector demand for foreign exchange, which has been a significant part of

One-off events also contributed to the trend of appreciation of the shekel in 2020, including Israel's inclusion in the World Government Bond Index (WGBI) in April.

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[26] These are weekly data from the beginning of 2008 to the end of December 2020.

[27] We used two lags for each of the variables (the AIC test showed that this is the optimal number of lags). We also used the euro-dollar exchange rate as an additional exogenous variable. The selected order of Cholesky decomposition is: Change in the DS&P 500 index, institutional flows, and shekel-dollar exchange rate. A further examination shows that the results are the same even if we remove March and April 2020 from the sample.

[28] This does not mean that joining the WGBI is not justified. On the contrary, it is expected to improve the liquidity of the government bond market.

[29] It can be argued that Israel joining the WGBI index is good news for the Israeli economy, so it would therefore lead to a strengthening (appreciation) of the shekel. However, the announcement that Israel would join the index was made in September 2019, which means that the good news was already known when the flows came in April 2020. See https://www.ftserussell.com/press/ftse-russell-announces-results-country-classification-review-equities-and-fixed-income

[30] For data on foreign holdings in the government bond market, see https://www.boi.org.il/en/DataAndStatistics/Pages/MainPage.aspx?Level=3&Sid=4&SubjectType=2

demand for foreign exchange in recent years, was about $3 billion. It should also be noted that the Bank of Israel purchased about $3.2 billion during that period.

The COVID-19 crisis also had a tremendous impact on the foreign exchange market, and even contributed to a rapid depreciation during part of the period. The high demand for dollars was not unique to Israel, and developed in many other countries.[31] In Israel, the Bank of Israel was able to provide liquidity on its own thanks to the large foreign exchange reserves it had built up, which provided it with a security buffer. The sharp and rapid depreciation of the shekel forced the institutional investors to purchase dollars at higher prices, which had an adverse impact on the public's savings. Therefore, in order to provide the missing liquidity, it made repo transactions with the domestic banks totaling $7.5 billion.[32] The Bank of Israel's actions were proven to be effective. After the shekel-dollar rate reached a peak of NIS 3.86/$1 on March 17, it fell back to NIS 3.65/$1 the following week.

2. INFLATION

Inflation in 2020 was affected to a great extent by the COVID-19 crisis. First, global energy and food prices declined as a result of falling global demand due to the pandemic. Second, the nature of the pandemic and how it was dealt with were reflected in a significant impact to industries such as tourism and restaurants, both on the side of lower public demand and on the supply side due to restrictions imposed on these industries. With the aim of preventing economic contagion, beyond the direct impact on these industries, the decline in income of those employed in them had an impact on their demand in other industries that were not directly affected, such as manufacturing and high-tech.[33] This effect is intensified since those employed in vulnerable industries are restricted in their ability to smooth their consumption by taking out loans. Some of this effect was offset by fiscal policy (through unemployment payments) and monetary policy (through leniencies in terms of credit) taken during the year. It should be noted that this is only one of the mechanisms that were likely used during the crisis. Lower demand can also be due to other factors, such as precautionary savings—the deferral of consumption today because of uncertainty regarding the future.

The COVID-19 pandemic also created difficulty in measuring inflation this year, for a number of reasons. First, the public changed the composition of its consumption basket, while the Central Bureau of Statistics (CBS) calculates the Consumer Price Index based on a fixed consumption basket. As such, an examination of price changes according to the indices published by the CBS may make it difficult to properly interpret

Inflation in 2020 was affected to a great extent by the COVID-19 crisis.

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[31] For more information regarding the dollar liquidity crisis, see Avdjiev, Eren, and McGuire (2020), "Dollar Funding Costs During the COVID-19 Crisis Through the Lens of the FX Swap Market", BIS Bulletins.

[32] In a swap transaction on the foreign exchange market, one party borrows dollars for a limited period, and gives collateral in shekels. For more information on the Bank of Israel's steps in the swap market, see the Monetary Policy Report for the second half of 2020.

[33] For more information, see Chapters 1, 2, and 5 in this Report.

Table 3.1
Development of prices, by various components, 2016–20

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 net of electricity, water, communications, food, and fruit and vegetables	Nontradable component net of electricity, water, communications, and fruit and vegetables	Seasonally adjusted index[b]
									(end of period, rate of change, percent)									
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	1.0	
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	0.1	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	0.9	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	0.4	0.5	0.3	1.8	1.7	
2020	-0.7	4.4	-0.6	-0.2	-0.6	-0.1	-5.7	0.2	-0.6	-2.1	-0.4	-8.2	-0.1	-0.4	-0.3	0.1	0.1	
									(monthly rate of change, percent)									
January	-0.4	2.5	-0.5	-0.4	-0.1	-0.2	-6.4	-0.5	0.1	-0.1	-0.3	-1.6	-0.3	-0.4	-0.5	-0.2	-0.3	-0.1
February	-0.1	1.6	0.0	0.0	0.0	0.4	-3.1	0.2	-0.1	-0.6	0.2	-1.6	0.0	-0.1	0.0	0.1	0.0	-0.1
March	0.4	-0.5	0.6	0.9	0.1	0.5	3.2	0.3	-0.1	0.2	0.1	-0.7	0.4	0.6	0.5	0.5	0.5	0.2
April	-0.3	4.8	0.7	-0.2	-0.2	0.4	2.4	-0.1	-0.1	-3.0	-0.3	-9.2	0.2	-0.1	0.3	-0.2	0.0	-0.6
May	-0.3	0.9	-0.9	-0.3	0.1	-0.5	0.3	0.0	-0.2	-0.4	0.0	-1.2	-0.1	-0.1	-0.3	-0.1	-0.2	-0.4
June	-0.1	-6.1	-0.2	-0.1	-0.1	-0.2	-0.8	-0.5	-0.2	1.3	0.0	4.3	-0.4	-0.1	-0.3	-0.1	-0.1	0.0
July	0.2	0.6	0.1	0.2	0.0	-0.5	-5.9	0.5	0.3	0.8	0.2	2.2	0.1	-0.1	0.0	0.2	0.2	0.2
August	0.0	-0.1	0.0	-0.1	0.1	0.0	-2.2	0.9	-0.1	0.0	-0.2	0.2	0.0	0.0	0.0	0.2	0.1	0.0
September	-0.1	2.9	-0.7	0.3	-0.1	0.6	-0.3	-0.3	-0.3	-0.1	0.1	0.4	0.0	0.0	-0.1	0.0	-0.1	0.0
October	0.3	2.7	0.4	-0.1	-0.4	0.2	3.6	0.2	0.1	0.0	0.0	-0.4	0.3	0.2	0.3	0.0	0.1	0.0
November	-0.2	-2.3	0.1	-0.4	0.1	-0.9	4.2	-0.2	0.1	-0.3	0.2	-1.1	-0.2	-0.1	-0.1	-0.2	-0.2	0.1
December	-0.1	-2.2	-0.2	0.0	-0.1	0.1	-0.1	-0.3	-0.1	0.1	-0.4	0.9	-0.1	-0.2	-0.2	-0.1	0.0	0.0

[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).
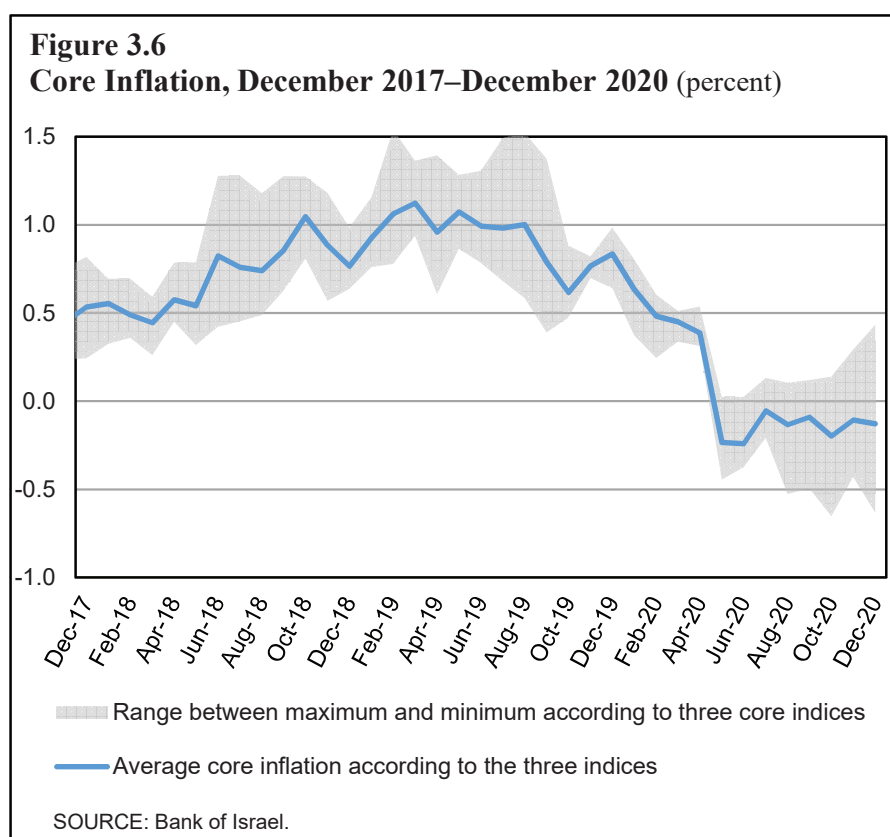SOURCE: Based on Central Bureau of Statistics.

inflation data. For more on this, see Box 3.1. In addition, since some industries were shut down during the lockdowns (such as travel abroad and hospitality), it was not possible to measure price changes in those industries for part of the time. In order to overcome this difficulty, the CBS imputed price changes in those industries according to the change in the overall CPI.[34]

a. The development of inflation

Annual inflation in 2020 was significantly impacted by the COVID-19 crisis. It was negative throughout most of the year, and declined overall by 0.7 percent (Table 3.1). The significant decline in inflation reflects the dominant effect of the demand side including the activity restrictions in certain industries due to the pandemic. Basically, most CPI components showed declines during 2020.
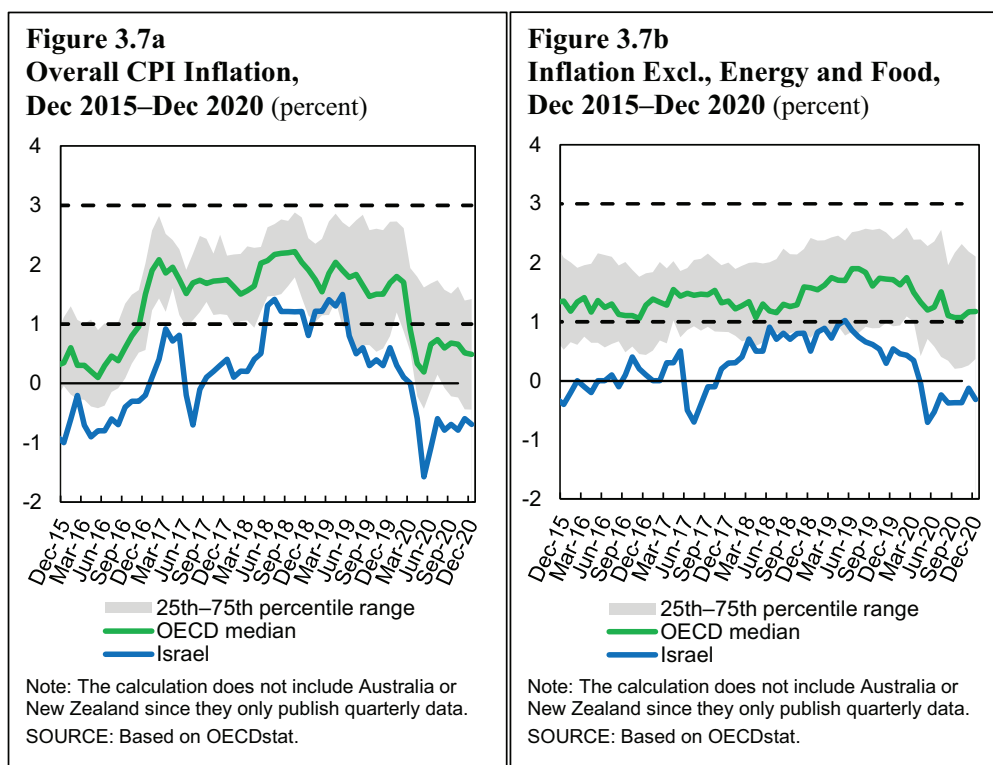
Inflation was negative throughout most of the year, and declined overall by 0.7 percent.

Figure 3.6
Core Inflation, December 2017–December 2020 (percent)

Range between maximum and minimum according to three core indices

Average core inflation according to the three indices

SOURCE: Bank of Israel.

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[34] Another measurement difficulty that was created due to the COVID-19 crisis has to do with declining product quality. For instance, the quality of hospitality at a hotel was likely impacted during the crisis. For more information on the various measurement difficulties, see Box 2 of the Monetary Policy Report for the first half of 2020.

The assessment regarding a negative impact to demand is supported by an unprecedented decline in the weight of private consumption as a share of GDP in the first half of 2020—far beyond the decline during the 2008 Global Financial Crisis, despite the significant accommodative measures that were adopted. Estimates of core inflation, which are adjusted for factors external to the economy, also show a significant decline following the beginning of the COVID-19 crisis (Figure 3.1).[35] In addition, an analysis of prices and quantities in the main components of the CPI shows that between one-third and half of the components that were directly impacted by the crisis showed declines in both quantities and prices. (For more information, see Section 4 in this chapter.)

The development of inflation in Israel was in line with the inflation development trends in the OECD countries. However, the price declines in Israel were sharper than in most of the OECD countries. Figure 3.2a shows that annual inflation in Israel was below the 25th percentile of OECD countries in 2020, similar to previous years. In order to make sure that this result is not due to externalities of the Israeli economy, which differ from those of other economies in the OECD, Figure 3.2b shows inflation

Figure 3.7a
Overall CPI Inflation,
Dec 2015–Dec 2020 (percent)

25th–75th percentile range
OECD median
Israel

Note: The calculation does not include Australia or New Zealand since they only publish quarterly data.
SOURCE: Based on OECDstat.

Figure 3.7b
Inflation Excl., Energy and Food,
Dec 2015–Dec 2020 (percent)

25th–75th percentile range
OECD median
Israel

Note: The calculation does not include Australia or New Zealand since they only publish quarterly data.
SOURCE: Based on OECDstat.

[35] The core inflation presented in the figure is the index based on the average of three statistical indices: 1. Inflation adjusted monthly for components with sharp price changes; 2. Inflation based on the median price change in the CPI components; and 3. Inflation based on the component that best explains all of the components of inflation (the first component estimated through a principal component analysis).

excluding energy and food—the components most affected by external factors. The picture that emerges from Figure 3.2b is similar to that of Figure 3.2a, which includes these components. The reasons for the differences in recent years, as well as in 2020, have partly to do with the significant appreciation of the shekel, as will be shown in Section 2b.

b. The dominant factors moderating inflation

1. Lower domestic demand due to the COVID-19 pandemic

Due to the many lockdowns and closures as well as health concerns, some industries (such as hotels) experienced low demand throughout the year. The impact to activity was reflected in a sharp increase in broad unemployment.[36] Until the beginning of 2020, the labor market showed a continued decline in unemployment with wage increases in recent years. (For more information, see Chapter 5 of the Bank of Israel Annual Report for 2019.) Due to the COVID-19 crisis, the labor market picture reversed in 2020. The number of unemployed under the broad definition increased significantly, mainly due to the large number of employees being placed on unpaid leave or being dismissed. (See Chapter 2 of this Report.) The sharp increase in unemployment (and with it the decline in income) filtered through to industries that were not directly impacted by the crisis, thereby leading to increased unemployment in additional industries. An analysis of the number of unemployed indicates an increase in unemployment in all industries (relative to February 2020), and not just in the industries that were directly impacted. The decline in employment, and the resulting impact to the income of those employed in such industries, alongside the decline in demand for workers that reduced the pressure on wages, acted to moderate price increases.

Moderating activity and the decline in energy prices contributed to the decline in inflation.

2. Energy and commodity prices

Imported commodities are used as raw materials for production, and their prices therefore have an impact on the costs of production both abroad and in Israel. The pandemic affected economic activity in a great number of countries around the world, and global demand for commodities declined. Table 3.1 shows that domestic energy and food prices declined during 2020, mainly in April and May, due to the effect of the COVID-19 crisis.[37] The assessment is that the energy and food items contributed

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[36] Unemployment in its broad definition includes, in addition to the unemployed, employees who were temporarily absent from their jobs for reasons that have to do with the pandemic, as well as those who stopped working due to being dismissed or the closure of their workplace since March 2020 and are therefore no longer counted among labor force participants.

[37] The sharp declines in global energy and food prices took place in March. However, they are reflected in the CPI with a lag. The effect on domestic prices also includes the change in the exchange rate.

about -0.6 percentage points to the CPI in 2020.[38] It should be noted that toward the end of the year, there was some recovery in global commodity prices.

3. The exchange rate

The exchange rate has an effect on inflation in Israel through import prices. The appreciation of the shekel, which works to lower the prices of imported goods, has made it more difficult to return inflation to the target range in recent years. From 2013 to the end of 2020, the shekel appreciated by about 32 percent in terms of the nominal effective exchange rate. (For more on the factors affecting the exchange rate, see Section 1 of this chapter.)

In 2020 as well, appreciatory pressures contributed to the decline in the Consumer Price Index. The shekel appreciated during the year by 5.5 percent in terms of the nominal effective exchange rate. We have shown that inflation in Israel during the year was below the 25th percentile among the OECD countries. If the appreciation was truly a significant factor explaining the inflation gap between Israel and the other OECD countries in recent years and in 2020, we would expect that other OECD countries where there was a significant appreciation would on average have inflation rates among the lower percentiles, as well as the opposite. In order to test this, we examined the link between the cumulative change in inflation excluding food and fruit and vegetables against the cumulative change in the nominal effective exchange rate of each of the OECD countries (including Israel) from 2015 through 2020.[39]

The results are presented in Figure 3.8. Each point in the figure represents a combination of the cumulate rate of change in inflation and the change in the nominal effective exchange rate (a positive change indicates depreciation) for each country. The figure shows that there is a positive correlation between the change in the exchange rate and annual inflation.[40] On average, the countries that had low inflation also had greater appreciation of their currency. The opposite is also true. As such, the change in the nominal effective exchange rate can explain a significant portion of the variance in inflation in recent years in OECD countries in general and in Israel in particular. The figure supports the argument that the appreciation of the shekel was a significant factor in moderating inflation in 2020.

Another reason for the low inflation in Israel in recent years, although perhaps to a lesser extent this year, is the increase in competition in the economy, as discussed in depth in the Bank of Israel Annual Report for 2016. However, due to the COVID-19 crisis, the explanation for the increased competition differs from previous years.

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[38] It should be noted that part of the decline is also due to the appreciation of the shekel, and not just to the decline in dollar-denominated energy and food prices.

[39] As of 2020, there are 37 member states in the OECD. Turkey was omitted from the calculation because of the extreme changes in its exchange rate and inflation, and Hungary was omitted due to a lack of inflation data for December 2020. The source for the inflation data is the OECD, and the source of exchange rate data is the BIS.

[40] The results are statistically significant. The R2 of the regression is 49, and the regression coefficient is 0.46. It is clear that there are other factors explaining the heterogeneity between countries.

Figure 3.8
The Link Between Cumulative Inflation (excl. food and fruits and vegetables) and the Cumulative Change in the Nominal Effective Exchange Rate, 2015–2020 (percent)

SOURCE: Bank of Israel.
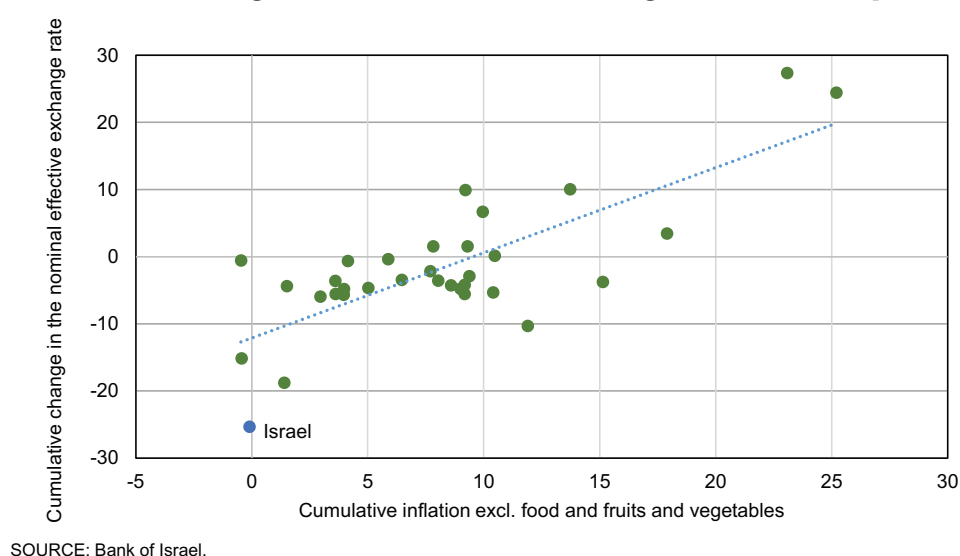
According to a survey the Bank of Israel conducts among the professional inflation forecasters regarding the factors that are expected to have an impact on inflation in the coming year, expectations at both the beginning of the year (prior to the start of the COVID-19 crisis) and at the end of the year were that increased competition would moderate inflation. A possible hypothesis is that each time the economy reopened (mainly in the summer), firms tended to lower prices in order to avoid being left with inventory in view of the uncertainty surrounding the development of morbidity and concern over further lockdowns as a result.

In addition, the Bank of Israel's policy measures were mainly focused on stabilizing the markets and moderating the crisis's impact on businesses and households, and—naturally at the peak of the crisis—placed less emphasis on accelerating inflation.

4. The housing market

In recent years, rent has been one of the factors supporting inflation (Table 3.1), in parallel with the increase in home prices, which was partly due to the shortage in supply of dwellings. However, in 2020, the annual rate of increase in rental prices slowed, and even declined slightly over the year as a whole. Over all, the housing item of the CPI (rents) contributed a total of -0.05 percentage points to inflation, after having contributed 0.5 percentage points at the beginning of the year.

One factor that moderated the increase in rents in 2020 is the COVID-19 crisis. Due to the crisis and its impact on the income of many households, discounts were given to tenants on existing contracts, which apparently had a moderating effect on new and renewing rental contracts as well. In addition, some of the decline may have been due to lower demand as tenants left high-demand areas (such as students returning to live with their parents), and as tourist demand for rental units dropped due to COVID-19 restrictions, although this was mainly a factor in Tel Aviv.

Another factor that moderated the increase in rents in 2020 is the stock of dwellings. According to an internal Research Department paper that will soon be published as a discussion paper, the shortage in the stock of dwellings that had been typical in recent years, and which had been among the causes of the increase in housing prices, eased in 2019. This may have been a factor in easing the increase in rents in 2020.

c. Inflation expectations derived from the capital market

The public's inflation expectations have an effect on the development of inflation in the present. For instance, if the public expects low inflation in the future, it may defer its consumption to the future. Deferring consumption may slow the pace of inflation and growth in the economy even now. The expectations also affect the determination of prices and of wages in the present. This mechanism clarifies why policy-makers at the central bank attribute great importance to inflation expectations.
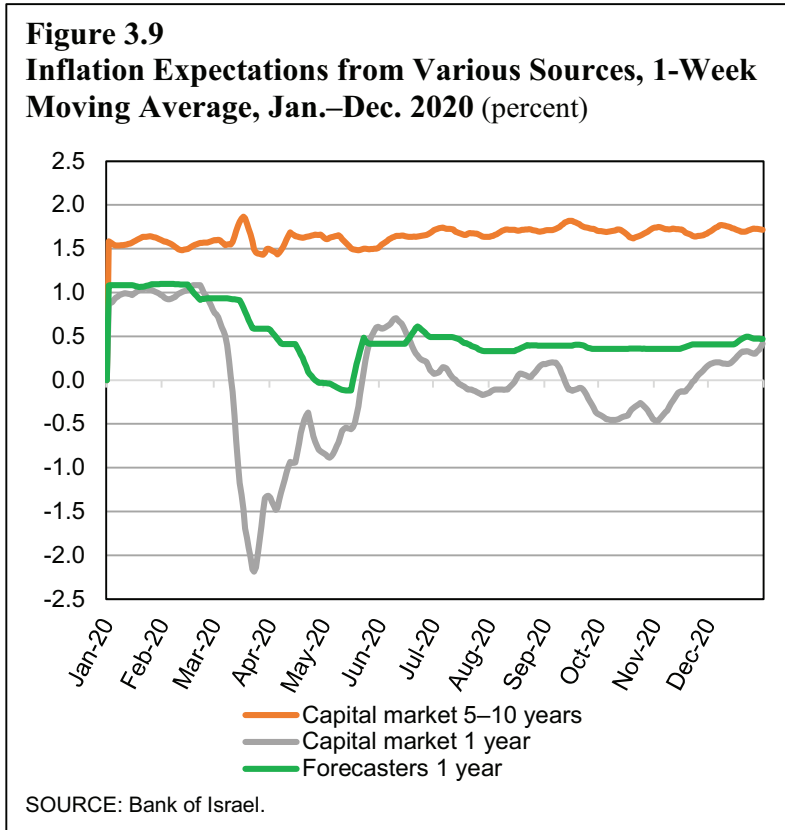
One-year inflation expectations derived from the capital market ranged around 1 percent at the beginning of the year, similar to the forecasters' projections (Figure 3.9). However, with the outbreak of the crisis, they declined in March to -2.5 percent, far below the forecasters' projections at that time. Thereafter, there was a gradual increase in one-year expectations, to 0.5 percent at the end of the year.

The sharp decline in estimated inflation expectations derived from the capital market in March did not reflect a 2.5 percent decline in the investing public's inflation expectations at the time, and was in complete contrast to the forecasters' projections. This is because, as opposed to the forecasters' projections, inflation expectations derived from the capital market include a liquidity premium.[41] The liquidity premium on indexed government bonds (from which the real interest rate is derived) is higher than the premium on unindexed bonds (from which the nominal interest rate is derived). The former apparently increased due to sales pressures from mutual funds and institutional investors during the crisis, such that the real interest rate increased much more than the nominal interest rate did, leading to a dramatic decline in inflation expectations derived from the capital market (which are derived as the gap between the nominal and real interest rates). This phenomenon was also observed in other markets around the world, and during the 2008 Global Financial Crisis as well. (See Section 2 of this chapter for more discussion of the sales pressures in the government bond market during the crisis.)

[41] They also include an inflation risk premium, but that is less significant in short terms. See "Breaking Down the Periodic Yield Curve in Israel", Daniel Nathan, 2021 (forthcoming).

Despite the declines in forecasters' inflation expectations to near-zero levels, five-year forward expectations from the fifth year remained stable throughout the year, including at the peak of the crisis.[42] Central banks tend to look at estimated expectations in these ranges, since they do not reflect temporary effects (such as shocks to oil prices), but show long-term effects. Stability in the long-term forward inflation expectations around the midpoint of the target range is evidence of the credibility that the public attributes to the central bank in meeting the inflation target in the long term.[43]

Despite the declines in forecasters' inflation projections to near-zero levels, five-year forward expectations from the fifth year remained stable around the midpoint of the target range throughout the year, including at the peak of the crisis.

Figure 3.9
Inflation Expectations from Various Sources, 1-Week Moving Average, Jan.–Dec. 2020 (percent)

SOURCE: Bank of Israel.

[42] It should be noted that five-year forward inflation expectations from the fifth year in the US, derived from swap contracts, declined in March from 2 percent to 1.4 percent. In April, forward expectations returned to their precrisis levels. However, the decline in the US was apparently due to the relative lack of liquidity in real bonds compared with nominal bonds, even with long yields—a situation that is different from Israel. See, for instance, D'Amico, Kim, and Wei (2018), "Tips from TIPS: The Informational Content of Treasury Inflation-Protected Security Prices", *Journal of Financial and Quantitative Analysis*, 53(1).

[43] While the analysis presented in Section 1 shows that the Bank of Israel's purchases do have an impact on estimated inflation expectations derived from the capital market, there is far less impact on longer inflation ranges since liquidity on the nominal and real curves is similar in the longer ranges.

d. The heterogenous impact of the COVID-19 crisis on prices

The COVID-19 crisis affected the prices of various goods and services differently, based on the extent of the impact on the industries producing or providing them. The state of some of the industries even improved during the crisis as consumption was diverted to them. This section examines the heterogeneous effect of the crisis on quantities produced and on prices in 17 industries and subindustries in the Israeli economy, accounting for about 60 percent of the Consumer Price Index.
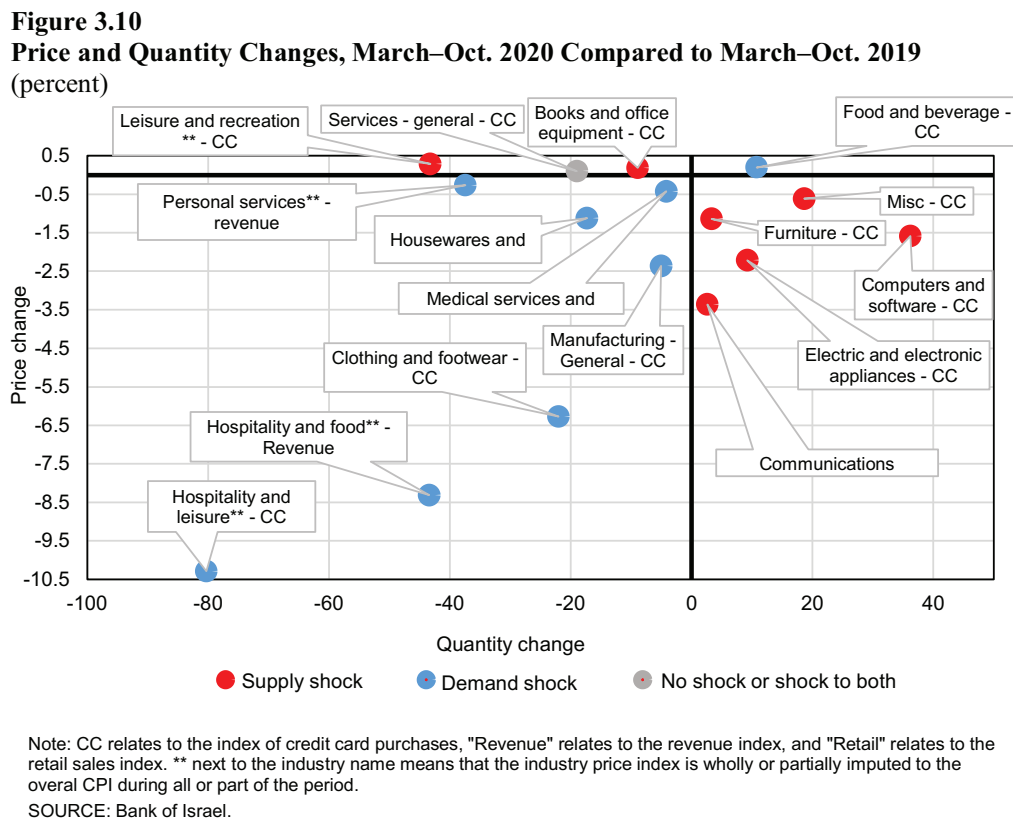
The results of the analysis are presented in Figure 3.10. The figure shows the change in prices (the vertical axis) and in quantities (the horizontal axis) in 17 industries between March and October 2020 compared with the same period in 2019.[44] The industries in the lower left quadrant of the figure experienced a negative demand shock (the blue dots reflect a negative change in prices and a decline in quantities). In contrast, the industries in the lower right quadrant experienced a positive supply shock (red dots reflect a negative change in prices and an increase in quantities).

Between one-third and one-half of the components included in the analysis, including the manufacturing, food, hospitality and leisure, and clothing and footwear industries, showed a decline in quantities and in prices, which is consistent with a negative demand shock. It should be stated that for some of the time, the Central Bureau of Statistics did not measure price changes in the hospitality and leisure and food industries, but rather imputed them to the change in the overall CPI. Since the overall CPI was negative, the change in these components may be downward biased.

In a few industries, such as electrical appliances and furniture, there were price declines with an increase in quantities, so that the increase in the supply of their products exceeded the increase in demand for them (a positive supply shock). This was apparently due to consumers' more prolonged presence at home and the need for technological tools for remote communication. It is interesting that despite the diversion of consumption and the increase in demand, the prices of such products did not increase, but actually declined. This may be due to the transition to online purchasing, where prices are lower, with the closure of stores due to lockdowns. It may also be due to the appreciation of the shekel, which may have made it easier to reduce prices. Beyond that, the reduced demand by the business sector for various products such as furniture and communications equipment may have led to an increase in supply for households and a concomitant decline in prices.

As noted at the beginning of this chapter, the COVID-19 crisis led to a change in the composition the household consumption basket. As a result, the representative basket used by the Central Bureau of Statistics may make it difficult to properly interpret the official inflation data. However, Box 3.1 in this chapter shows that despite the shock to the consumption basket in Israel, which is similar to the predominant trends in other countries, the deviation of overall inflation in Israel is relatively minor.

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[44] We compare the period of lockdowns with the same period in the previous year, and not with the 8 months preceding the crisis, in order to take seasonality of prices into account.

Figure 3.10
Price and Quantity Changes, March–Oct. 2020 Compared to March–Oct. 2019
(percent)

Note: CC relates to the index of credit card purchases, "Revenue" relates to the revenue index, and "Retail" relates to the retail sales index. ** next to the industry name means that the industry price index is wholly or partially imputed to the overal CPI during all or part of the period.
SOURCE: Bank of Israel.

3. THE MONETARY BASE AND MONETARY AGGREGATES

Interest is the price of money—the alternative cost of holding liquidity. As such, changes in the interest rate, in addition to changes in economic activity, have an impact on the demand for liquidity. When the nominal interest rate serves as a policy tool, the central bank sets a completely flexible money supply at its declared interest rate, and the monetary base—the total of banknotes and coins in circulation and the commercial banks' demand deposits with the Bank of Israel[45]—is determined by the demand for liquidity at the central bank's declared 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[46], and flows that are under its control, such as foreign exchange and bond purchases and makam issues. The Bank of Israel absorbs or injects liquidity in order to supply the demand for the monetary base in accordance

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[45] The banks are obligated to deposit money in demand deposits at the Bank of Israel as part of their liquidity requirements.
[46] Government activity has 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).

with the Bank of Israel interest rate. It adjusts the monetary base to the interest rate, taking into account the total of other flows, through interest-bearing deposits that it offers the banks by tender, which are not included in the monetary base, and by issuing makam.

In 2020, the monetary base grew by about NIS 27 billion (25.8 percent compared with 2019), after increasing by about NIS 4.7 billion in 2019 (Table 3.2). The growth reflected an increase of NIS 18.6 billion in cash (compared with NIS 1.3 billion in the previous year) and NIS 8.2 billion in the banks' demand deposits with the Bank of Israel (Table 3.3), which are held to meet liquidity requirements and reflect the increase in the public's deposits. The increase in demand for cash reflected two factors: (1) The public's demand for cash due to uncertainty created by the COVID-19 crisis. As Table 3.3 shows, there was a jump in cash held by the public after March. (2) The reduction of the Bank of Israel interest rate, which lowered the cost of holding cash.

Table 3.2 shows the Bank of Israel's large injection of shekels into the economy as part of the many programs that it put into action. These include loans to banks against their loans to small businesses (monetary loans totaling NIS 19.6 billion), bond purchases (about NIS 50 billion), and dollar purchases totaling about NIS 72 billion. The table also shows that the volume of makam issuances declined. To maintain the set level of the interest rate, the Bank of Israel absorbed the banks' surplus liquidity through short-term deposit tenders totaling NIS 171 billion.

b. The monetary aggregates

The M1 monetary aggregate includes cash held by the public and the public's demand deposits at the banks. The M1 aggregate increased by 28.3 percent in 2020, compared with an increase of 5.1 percent in 2019. Table 3.3 shows that the public's demand for liquidity during 2020 was reflected both in an increase in the volume of cash, as we showed in the previous subsection, and in an increase in the volume of current accounts. The volume of current accounts increased by 29.4 percent in 2020, compared with an increase of 5.8 percent in 2019.

Another reflection of the public's demand is provided by the M2 aggregate, which includes M1 and unindexed deposits with a duration of up to one year. The pace of annual growth of deposits with a duration of up to one year slowed throughout the year. This shows that, in view of the low interest rate, the public preferred to hold its money in highly liquid assets. In 2020, one-year deposits grew by 12.3 percent, compared with an increase of 33.2 percent in 2019. Against that, there was a sharp increase in current credit deposits (CCR)—self-renewing daily deposits that can be withdrawn at any time—and in fixed-term deposits of up to 3 months.

According to the commonly accepted framework for analyzing monetary policy, the changes in the monetary base on their own have no particular importance relating to the effect on the economy. The factor that is relevant to the economic decisions of market participants is the expected interest rate path, which the central bank influences by setting the monetary interest rate. The change in the monetary base

Table 3.2
Source of change in the monetary base, 2016–20

(NIS billion)

	2016	2017	2018	2019	2020	2020			
						I	II	III	IV
1. Injections from the government and the Jewish Agency	3.54	-3.86	1.81	7.17	21.39	-4.44	20.96	-9.09	13.96
of which: the government	3.54	-3.86	1.81	7.17	21.39	-4.44	20.96	-9.09	13.96
2. Foreign exchange conversions[a]	23.44	24.09	11.69	13.67	72.14	-6.66	27.95	28.50	22.35
of which: Bank of Israel	23.09	24.03	11.67	13.68	72.14	-6.66	27.95	28.50	22.35
3. Total (1+2)	26.98	20.22	13.49	20.84	93.53	-11.10	48.92	19.41	12.01
4. Bank of Israel injections	-15.81	-7.82	-8.69	-16.33	-66.82	22.10	-43.36	-11.88	-33.68
of which: Monetary loan	0.00	0.00	0.00	0.00	19.56	0.00	4.59	7.65	7.32
Makam	11.14	13.13	-15.77	-11.63	33.08	8.04	19.01	2.01	4.01
Swap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bank term deposits	-28.00	-22.00	6.00	-6.00	-171.00	0.00	-78.00	-34.00	-59.00
Interest[b]	0.14	0.17	0.21	0.44	0.51	0.12	0.12	0.13	0.13
Bond purchases	0.00	0.00	0.00	0.00	49.53	8.48	14.90	12.32	13.84
Repo	0.00	0.00	0.00	0.00	1.50	5.46	-3.98	-0.01	0.02
5. Total change in the monetary base	10.79	12.18	4.93	4.78	26.71	11.00	5.56	7.52	-21.68

[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.

is only a byproduct of changes to the monetary interest rate and of changes in the public's demand for cash. In a situation in which the central bank interest rate reaches the lower bound, changes in the monetary base that are not due to these factors, but rather to central bank actions such as asset purchases (quantitative easing). However, the interest rate's proximity to the lower bound is due precisely to the fact that the economy is already saturated with liquidity. It is reasonable to assume that when the interest rate rises again, the liquidity that was injected earlier will be partly reabsorbed.

Table 3.4
Rate of change in the monetary aggregates, 2017–20

	0	1	2	1+2=3	4	5		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)							
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%
2020	25.8%	23.3%	29.4%	28.3%	25.6%	12.3%	28.5%	26.2%
Jan-20	3.4%	2.1%	5.3%	4.7%	-2.5%	30.1%	3.3%	5.2%
Feb-20	3.9%	2.4%	7.1%	6.2%	-0.9%	28.0%	2.3%	6.0%
Mar-20	8.6%	3.9%	16.9%	14.4%	-0.2%	22.9%	5.7%	10.5%
Apr-20	10.4%	5.9%	23.4%	20.1%	4.1%	11.7%	15.5%	15.4%
May-20	14.7%	9.9%	23.5%	21.0%	10.9%	12.4%	16.2%	17.3%
Jun-20	14.7%	11.3%	23.3%	21.1%	18.6%	11.1%	15.0%	18.2%
Jul-20	17.1%	13.4%	25.0%	22.8%	18.7%	13.4%	15.4%	19.4%
Aug-20	19.8%	18.0%	27.5%	25.7%	19.6%	11.5%	18.8%	21.6%
Sep-20	21.5%	19.2%	28.3%	26.6%	20.4%	14.6%	17.8%	22.2%
Oct-20	22.7%	19.7%	28.0%	26.5%	22.3%	16.1%	20.8%	23.4%
Nov-20	23.1%	22.4%	30.2%	28.8%	23.8%	16.5%	21.6%	24.9%
Dec-20	25.8%	23.3%	29.4%	28.3%	25.6%	12.3%	28.5%	26.2%

SOURCE: Bank of Israel.

Box 3.1: "COVID-Basket" Inflation in Israel

- Significant shifts in the composition of consumer spending as a result of the COVID-19 crisis are liable to complicate the interpretation of the official inflation data that are calculated by the Central Bureau of Statistics (CBS) on the basis of a fixed basket.
- In this box, we use credit card expenditure data in order to construct a consumption basket that is more optimally representative of the composition of consumption during the COVID-19 period, and we use it to calculate the rate of inflation adjusted to the basket (hereafter: COVID-basket inflation).
- We find that COVID-basket inflation is not materially different from the inflation measured by the CBS. Only the contribution of the various goods and services to inflation, and in particular those of housing and transportation, changed significantly, particularly during the first and second lockdowns.
- The bias in inflation during the COVID period in Israel is small relative to that in other developed countries.

Introduction

In normal times, the Central Bureau of Statistics CPI calculation is based on fixed weights, which are updated every two years according to the average consumption basket derived from the Household Expenditure Survey.[1] The use of fixed weights that change every two years makes sense if we wish to measure the change in prices of a fixed basket rather than only temporary changes in the cost of the consumption basket, which represent adjustments in consumption patterns as a result of, for example, changes in relative prices.

The COVID-19 pandemic led to immediate changes in the lifestyles of many consumers, including significant changes in consumption habits (Chetty, et al. 2020; Goolsbee and Syverson, 2020). The lockdowns, restrictions and changes in economic behavior among the public led to a drop in the proportion of goods and services consumed outside the home and in the weight of nonessential goods. As such, the weight of expenditure on housing rose and the weight of expenditure on transportation fell within the average consumption basket (primarily during the first and the second lockdowns).[2] As a result of these changes, the CBS's fixed consumption basket used in the calculation of the CPI did not represent the actual consumption basket during this period, and is therefore liable to cause a "biased weighting", i.e.

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[1] The last update prior to the COVID-19 pandemic was in January 2019. Another update was carried out in January 2021, in which a limited number of components were adjusted to reflect the impact of the pandemic based on credit card expenditure data. See more details at: https://shorturl.at/gxMOX

[2] The expenditure on housing remained approximately fixed, but its share within the consumption basket grew due the drop in expenditure on the rest of the components. In contrast, expenditure on transportation declined in absolute terms as a result of the restrictions on movement, and also relative to the other components.

a biased calculation of inflation due to the significant shifts in the composition of the basket during that period.[3]

In order to measure the change in the composition of the household consumption basket and its effect on the measurement of inflation, this box uses data on credit card expenditure according to industry to adjust the CPI weights so that they will more accurately reflect consumption habits during the COVID-19 period.

A number of recent studies have examined the biases in the measurement of inflation during the COVID-19 crisis. This box is related to the literature on the measurement of weighting biases based on the use of dynamic weights estimated using consumer expenditure data. Cavallo (2020) uses data on credit and debit card expenditure in the US in order to estimate the changes in the consumption basket during the COVID-19 crisis, and finds a negative bias in the official rate. In other words, COVID-basket inflation is significantly higher than the official rate. On the assumption that the change in consumption in the US also took place in other countries, he finds a negative bias in inflation for the month of May in most of the other countries he examines, although the size of the bias varied. Seiler (2020) presents additional support for those findings using data on credit card expenditure in Switzerland. Reinsdorf (2020) strengthens the claim on the basis of a similar analysis, but adds a comparison to the data on changes in consumption behavior in Canada, groups countries geographically, and expands the sample period to include the period from February until May (covering the entire first lockdown in most of the world). Overall, most of the bias in inflation estimates in the majority of the examined countries was due to the increase in expenditure on food and the drop in expenditure on transportation.

Methodology and data

As part of the response to the COVID-19 crisis, the Bank of Israel created a database for monitoring various real and financial indicators.[4] In order to estimate the change in an item's weight in the consumption basket relative to the base months (January to February)[5], or in other words to obtain the adjusted weight, we used the daily volume of credit card transactions. In particular, and following Cavallo (2020), we multiply the rate of monthly change in each item (as measured by the CBS) by the adjusted weight and obtain its adjusted contribution to COVID-basket inflation.[6]

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[3] Additional biases in the CPI can occur as a result of problems in the measurement of the CPI in the locked down sectors and due to changes in the quality of consumed services due to the health risk they involve. For further details, see Box A.2 in the Monetary Policy Report for the first half of 2020 – "Inflation during the Coronavirus Pandemic: Challenges in Measurement and Interpretation".

[4] Press release regarding the creation of the database in response to the COVID-19 crisis:
https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/20-5-2020.aspx

[5] A reservation with respect to the findings is that they do not take into account changes in the volume of cash use during the crisis. If, for example, the public did not change its expenditure on one of the items, but rather switched to purchasing it in cash rather than by credit card, there will be a downward bias in the weight we have calculated.

[6] The formula for updating the weights is:

$$w^i_{COVID,t} = \frac{e^i_t}{e^i_0} w^i_{LAMAS} \Big/ \sum_i \frac{e^i_t}{e^i_0} w^i_{LAMAS}$$

where e^i_o represents the average credit card expenditure on item e^i_t during January–February 2020, represents credit card expenditure on item w^i_{LAMAS} during month and represents the official weight of item in the calculation of the CPI.

In order to translate the changes in the weights of credit card expenditure to the CPI weights, a number of modifications are necessary, since the classification of credit card expenditures is not the same as CBS classification of the CPI components.[7] Alongside these modifications, we assume that the expenditure on food (not including meals eaten out) and on fruits and vegetables changed at the same rate, that expenditure on housing remained constant[8], and that expenditure on "miscellaneous" goods and services changed at the same rate as total expenditure.

Findings

Figure 1 presents the estimated development of the CPI weights. The effect of the March–May and September–October lockdowns can clearly be seen. In contrast, there was no significant effect on the basket's composition in December. The drop in income and the severe restrictions on the consumption of many goods led to a reduction in expenditure on those goods and, as a result, a significant increase in the weight of the housing component, alongside declines in the weights of the other items, particularly transportation and entertainment.

Figure 2 presents the estimates of COVID-basket inflation alongside the official inflation rate on a monthly and annual basis. The figure shows that the decline in the use of modes of transportation as a result of the restrictions on movement and the closure of businesses and workplaces, along with the sharp drop in energy prices, led to a negligible negative bias in inflation as measured by the CBS.[9] On an annual basis, a negligible downward bias was found in the official inflation rate. Thus, the annual official inflation rate is only about 0.2 percentage points lower than the COVID basekt inflation rate. In contrast, an examination of the core index, which does not include food, fruits and vegetables, and energy (not presented), items whose consumption was highly affected (relative to the other items), shows a small positive bias in the measurement of inflation, primarily due to the exclusion of energy.
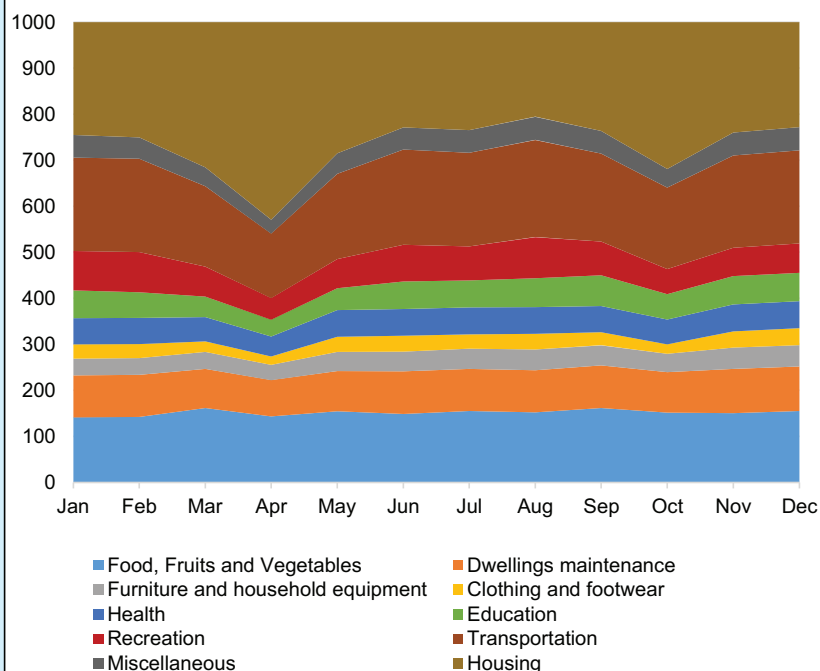
As mentioned, the COVID-19 crisis and the accompanying economic restrictions are a global phenomenon, and it can be assumed that the effects will be similar across countries. Figure 3 presents an international comparison of the weighting bias in inflation for the month of May 2020. The figure for Israel was calculated by us while the data for the rest of the countries are taken from Cavallo (2020). One can see the heterogeneity in the size of the bias and even in its direction, though the bias is usually negative (i.e. the official rate of inflation is lower than the COVID-basket inflation), which is also the case for Israel. This provides evidence that the response of the public and the government to the pandemic has had a fairly uniform effect on the consumption basket.

[7] Most of the main items in the CPI have been adjusted according to the parallel categories of the credit card data. The dwellings maintenance and furniture and household appliances items was aggregated from two categories. The sub-item of meals eaten outside the home was removed from the food component and added to culture and entertainment in order to improve compatibility with the credit card data.
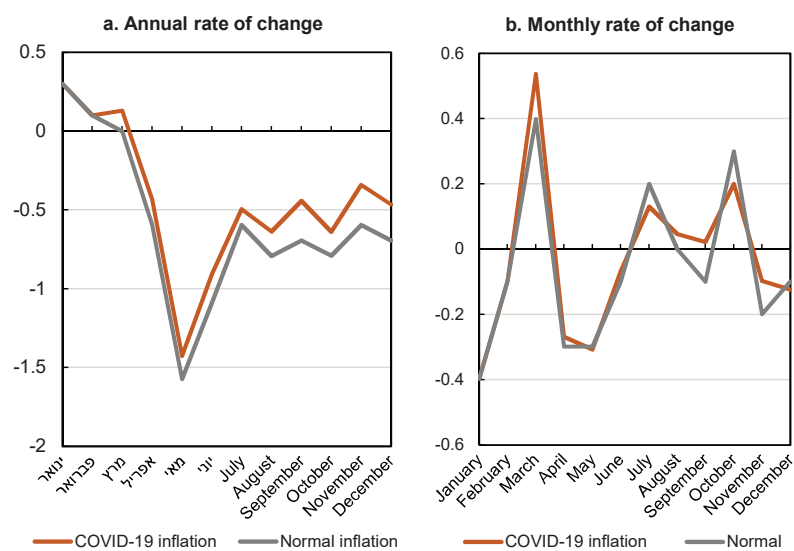
[8] In the April index, the CBS carried out an examination of reductions in rent. It found that rent was reduced in only a small proportion of the contracts (3 percent). Since then, there has not been any additional survey to determine whether rents have been reduced. However, as part of the regular checks carried out during the lockdowns, renters were asked whether their rent was reduced. In recent months, it was found that rent was reduced for only a small proportion of renters (0.3 percent).

[9] Even when constant weights are assumed over the course of the entire year according to the consumption basket for April (the month in which there was the largest shock to the consumption basket), similar results are obtained, primarily with respect to the effect of the rise in energy prices that began in June.

Figure 1
**Development of the Current Weights of CPI Components, 2020**

Legend:
- Food, Fruits and Vegetables
- Dwellings maintenance
- Furniture and household equipment
- Clothing and footwear
- Health
- Education
- Recreation
- Transportation
- Miscellaneous
- Housing

Figure 2
Monthly and Annual Changes in the Consumer Price Index, Fixed Weights vs COVID-19 Weights (percent)

a. Annual rate of change

COVID-19 inflation — Normal inflation

b. Monthly rate of change

COVID-19 inflation — Normal

SOURCE: Based on Central Bureau of Statistics.

Figure 3
Int'l Comparison of Inflation Weighting Bias in May 2020 (percentage points)
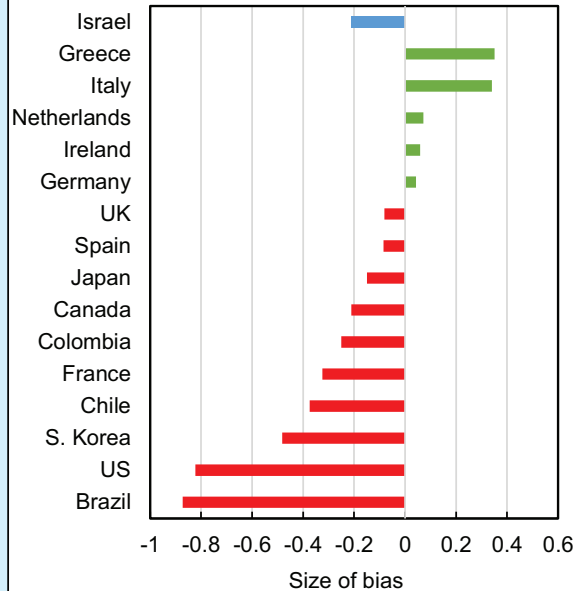
SOURCE: Based on Cavallo (2020).

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Box 3.2: Quantitative Easing - Central Bank Intervention in the Government Bond Market

1. Introduction

The reduction of the monetary interest rate to a level of near zero makes it difficult to carry out a traditional accommodative monetary policy. Therefore, in the context of the COVID-19 crisis, the Bank of Israel, like many other central banks, adopted nontraditional policy measures this year, including "Quantitative Easing (QE)", in which it purchased long-term government bonds in the secondary market.[1] Several countries implemented such programs following the 2008 Global Financial Crisis, and other countries did so in 2020, due to the COVID-19 crisis. This box will describe the purposes of using QE as a tool for monetary accommodation,[2] including quantitative findings from around the world, and will review a number of potential risks associated with such accommodation.

2. Channels of Influence

When the monetary interest rate is close to its lower bound, central banks may try to directly influence medium- and long-term yields by purchasing government bonds. The impact of the purchases is generally divided into two main channels: the "signaling channel", which mainly affects the expected path of the monetary interest rate, and the "portfolio rebalancing channel", which mainly affects the spread between the bond yield and the average monetary interest rate expected to prevail over the life of the bond.

Through the signaling channel, the purchase of long-term government bonds by the central bank lowers the yield curve because it leads the public to believe that the central bank will raise interest rates later or more slowly than previously expected. The accepted explanation is that raising the monetary interest rate faster than the rate inherent in the bond prices will lead to their devaluation and, therefore, central banks that have purchased a large amount of long-term bonds will avoid such an interest rate increase.[3]

The portfolio rebalancing channel includes several subchannels, through which the purchase of government bonds leads to a decrease in yields not due to a decline of the expected monetary interest rate path, but due to the effect on the spread above this path. One of these is the "duration risk channel": The decrease in the amount of long-term bonds held by investors in the market, after the central bank has purchased some of them, reduces the average duration risk, so the risk premium they will charge on these assets will be lower. Another subchannel through which the purchases may affect the spread is the "safety channel". One of the motives for investors to hold government bonds is to use them as collateral for many transactions in the market. When the central bank purchases government bonds, it reduces their supply in the market, and therefore leads to an increase in the price that investors are willing to pay for them, and accordingly – to a decrease in the yield required on them.

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[1] The Bank of Israel implemented a similar program in 2009. Another tool that the Bank of Israel used this year was the purchase of corporate bonds. This box will not discuss such purchases.

[2] Bond purchases may also help in cases of liquidity distress in the markets.

[3] While it is common to argue that central banks should not take profit and loss considerations into account, in practice many of them seem to attach importance to their equity level, as insufficient equity may impair their independence. (For example, a decline below a certain level may require an injection of capital from the fiscal authority.)

Whether the decline in the yield curve on government bonds is due to the signaling channel or the portfolio rebalancing channel, a number of mechanisms may intensify its impact on yields and on other interest rates in the market. First, to the extent that the decline in the curve leads to an improvement in economic activity, it will contribute to a decrease in the credit risk of firms and households. Second, to the extent that rising bond prices ease the capital constraints of various financial intermediaries, they will be able to increase the amount of credit they provide.

3. Estimated Effects of Government Bond Purchases around the World

Most of the literature finds that the purchase of assets by central banks has indeed led to a significant decline in long-term government bond yields.[4] Evidence was found for the effects of both the signaling channel and the portfolio rebalancing channel.[5]

A key question is how persistent the decline in yields is, as a short-term decline alone is not expected to significantly support activity and inflation. An empirical estimation of the persistence is not straightforward. The further away from the date of the announcement of the purchase program or from the date of its implementation, the more difficult it is to attribute the development of yields to it. Bernanke (2020) concludes, based on the overall findings in the literature, that the impact on yields has been largely permanent.

Another key question is whether bond purchases are effective only in times of financial distress in the markets, for example when yield spreads are abnormally high, or also in normal times. Since the portfolio rebalancing channel works by reducing yield spreads, purchases through this channel are likely to be less effective during normal periods, when the spreads are lower. However, D'Amico and Seida (2020) found evidence that the effect of bond purchases in the United States did not weaken when the situation in the financial markets improved, or when additional rounds of purchases were made. Similar findings were obtained in other studies, and research evidence shows that the impact of asset purchases does not weaken significantly during normal periods in the financial markets. For more information, see Bernanke (2020) and Gagnon (2016).

As for the effect on additional variables, a number of studies have found that declining government bond yields has led to a decrease in private bond yields, an increase in stock prices and a depreciation of the domestic currency.[6] Beyond that, most studies on the subject found that the various QE programs had a positive effect on activity and inflation.[7]

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[4] For example, Gagnon et al. (2011), Krishnamurthy and Vissing-Jorgensen (2011), Gagnon (2016), and Kuttner (2018). In a more recent context, see Hartley and Rebucci (2020).

[5] See Bauer and Rudebusch (2014) and Krishnamurthy and Vissing-Jorgensen (2011).

[6] See Neely (2010) and Gagnon et al. (2011).

[7] A review of 54 studies by Fabo et al. (2020) (on the US, the UK, and the Eurozone) shows that the purchase of bonds totaling 1 percent of GDP resulted in an average cumulative increase of 0.14 percent in the GDP, and of 0.12 percent in the level of prices. The results show that there is considerable variance between countries, between different programs in the same country, and sometimes also between different studies conducted regarding the same program. The main finding of the paper is that studies conducted by researchers at central banks presented stronger effects on averaged than those conducted by researchers from the academic world.

4. Possible Risks of Quantitative Easing

Along with the effects described above, the academic and public discourse also includes reference to possible risks of quantitative easing. This section addresses the main ones.[8]

Financial risks

Like conventional monetary policy, quantitative easing also lowers the yield curve, which could encourage risk-taking beyond what is desirable—for example through yield-chasing—due to lower yields on solid long-term alternatives. Encouraging risk-taking is one of the channels through which monetary policy contributes to the expansion of activity, but the policy must balance the expansion of demand and the maintenance of financial stability. In this respect, it is interesting to note a particular advantage of quantitative easing over conventional monetary policy: Unlike conventional policy, the impact of quantitative easing is focused on the long part of the curve, therefore flattening its slope (i.e. it reduces the spread between long and short returns). In doing so, it reduces the exposure of banks' balance sheets to maturity mismatch, which results from commercial banks' use of short-term liabilities to provide long-term credit. Bernanke (2020) notes that overall, quantitative easing programs have so far had a beneficial effect on financial institutions, without it being reflected in excessive risk-taking.

Impact on market functioning

Another risk is that a large-scale intervention by the central will lead to a reduction in the trading volume of private market participants, thereby impairing the "price discovery" mechanism and liquidity in the markets in which the bank has intervened.[9] For such reasons, Bernanke (2020) notes, purchase programs often also include restrictions on the amount of holdings of a given type of bond or a particular maturity date. Another effect to consider is a future contraction of the central bank balance sheet. Whether the balance sheet is automatically contracted when bonds held by the bank reach maturity[10], and whether the Bank sells the bonds in the market, it must be ensured that the scope and timing of the contraction measures will not adversely affect the functioning of the markets.

Central bank independence and the inflation targeting regime

The stability of the inflation targeting regime is based on the separation of powers that includes the independence of the central bank. The practice of quantitative easing programs is accompanied by a discussion of risks to the central bank's independence, for two reasons. First, bond purchases lead to an expansion of the bank's balance sheet. This is accompanied by exposure to interest rate and revaluation

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[8] This section is based in part on Bernanke (2020), which describes the risks that the Fed executives have addressed in their discussions on quantitative easing programs.

[9] The term 'price discovery' refers to the market participants' ability to agree on the price of an asset, and one of the ways it is expressed is the speed with which new information is embodied in the asset's price.

[10] It is customary for government bond redemption to be accompanied by a parallel issuance as part of the debt "rollover" – a new debt issue against the debt that has reached maturity. The redemption of bonds held by the central bank, and its "rollover", means a sudden increase in the volume of bonds offered in the market.

risk (i.e. capital losses due to an unexpected rise in the yield curve).[11],[12] There is concern that significant losses will require fiscal intervention, which could threaten the independence of the central bank.[13],[14] Second, quantitative easing reduces the costs of financing government deficits. Although the reduction in government financing costs may be a consequence of the central bank's striving to meet its targets, especially the inflation target, there is a risk that deficit financing will become a consideration in itself ("fiscal dominance"), confidence in the central bank's ability to maintain the value of the currency will be damaged, and the risk of an inflationary eruption will increase.

From the accumulated global experience, it appears that the use of QE programs has not, so far, undermined the stability of the financial system, significantly impaired market functioning, or led to inflationary outbursts. It also appears that neither the central banks' independence nor their ability to implement the required policy have been affected.

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[11] Such a potential loss may deter the central bank from raising interest rates even when the macroeconomic conditions justify such an increase.

[12] Despite this, it is important to understand that central bank losses do not imply losses to the public or to the economy as a whole. As Bernanke (2020) describes, the public is naturally hedged from such central bank losses, as in any case these will only be created when there is a turning point and economic activity expands. Such a development means that monetary policy has actually achieved its goal, and the expansion of economic activity is likely to be accompanied by an increase in public income and in the tax base, which will offset the central bank's balance sheet loss. In other words, the discussion of central bank losses is relevant because of the potential for various pressures on the bank, and not for purely economic considerations.

[13] Bernanke (2020) indicates explicit concerns by some Fed members of a threat to its independence resulting from large-scale asset purchases.

[14] The concern that the central bank will be forced to hold a very large amount of assets is sometimes cited as an argument in favor of an accepted approach in the implementation of QE programs—setting a quantitative target for the total bonds to be purchased. The alternative, according to which the central bank will declare a target yield and purchase the amount of bonds required to achieve it ("yield curve control") may require intervention on a very large scale.

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