Indicators for Estimating the Public's Inflation Expectations

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Summary

This document describes the key indicators used by the Bank of Israel in estimating the public's inflation expectations, including the following: expectations derived from the capital market; professional forecasters' projections; expectations derived from the banks' internal interest rates; and expectations derived from inflation contracts.

A key benefit from these data is that they allow the Bank of Israel to review the developments in the inflation environment in greater depth, and particularly to obtain an indication of inflation expectations from the public's point of view.

1. Background and objective of this document

This document is intended to present the key indicators reviewed by the Bank of Israel and used in estimating the inflation environment, including the following: expectations derived from the capital market; professional forecasters' projections; expectations derived from the banks' internal interest rates; and expectations derived from inflation contracts.

The Bank of Israel, just like other leading central banks, is an independent entity whose primary objective is to maintain price stability by means of the inflation target that the Government sets out as part of its economic policy in consultation with the Governor. The inflation target regime in Israel was set in the early 1990s, and the current target stipulates that the annual inflation rate, based on change in the Consumer Price Index, shall range between 1 and 3 percent annually.

As part of formulating its monetary policy, the Bank of Israel regularly analyzes a significant number of indicators, including developments in the inflation environment; real economic activity; the foreign currency market and financial markets; fiscal policy; and the global economy. Because this information mostly refers to past developments, whereas monetary policy has an effect on the future, there is a real challenge with regard to the information required to formulate policy measures. This challenge consists of identifying and collating information, whether directly or indirectly, which may shed light on developments with the minimum delay possible, as well as (and primarily) on expected developments.

For those who set monetary policy, the inflation environment, consisting not only of actual inflation, but primarily of expected inflation within the appropriate time ranges, is one of the areas of utmost importance in terms of information. In order to achieve the target inflation rate over time, the Bank of Israel regularly collects such information, and extensive, in-depth analysis of it is a highly important basis for setting the appropriate monetary policy.

In reviewing the indicators listed in this document, the Bank of Israel relates to them as the public's assessment of the expected inflation, and as an important input for formulating monetary policy—along with other data, information and internal assessments. Therefore, it may be the case that in retrospect, expectations may differ from actual inflation due to policy measures applied by the Bank of Israel. For example, if expectations point to an upward deviation from the inflation target range, and should the Bank of Israel apply a restraining

monetary policy beyond what the public had expected, in order for actual inflation to be within the target range, then the measured inflation expectations would be higher than actual inflation, as intended by the Bank of Israel's policy.

Because expectations affect the financial actions of the public, they may cause price changes. If the public believes that prices will increase, it may bring purchases forward, thus affecting demand and contributing to inflation. Therefore, like other central banks, the Bank of Israel attempts to use its monetary policy to influence inflation expectations.

2. Forward-looking indicators of the development of inflation

We shall now look at the four indicators collated and used by the Bank of Israel, discussing the advantages and shortcomings of each:

2.1 Inflation expectations derived from the capital market

The nominal interest rate is represented by government bonds bearing fixed interest and not indexed to the Consumer Price Index. The real interest rate is represented by government bonds bearing fixed interest and indexed to the Consumer Price Index, as traded on the Tel Aviv Stock Exchange. Based on the Fisher equation[1] and given that these are two bonds with identical credit risk and term to maturity, the marginal investor is faced with a choice as to which bond type he prefers. If the investor expects inflation to increase over the relevant investment term, he would prefer the indexed government bond, if he expects inflation to decline, he would prefer the unindexed bond. In the former case (expectation of higher inflation), the marginal investor's preference would result in higher prices and lower yield to maturity for the bonds, resulting in an increase in the difference between the nominal yield and the real yield of government bonds. This increase reflects the public's expectation of higher inflation over the relevant term, based on the Fisher equation, whereby inflation expectations for a given term equal the ratio of the nominal interest rate to the real interest rate for that term, given zero risk inherent in such interest.

Continuous daily trading on the stock exchange, which reflects a multitude of investment decisions and the level of tradability of this market, reflects the advantage in calculating the difference between yields of indexed and unindexed government bonds as an indicator of inflation expectations. However, there are a few disadvantages, namely the difference in tradability of these two markets and their variance over time. the paucity of indexed bonds making it difficult to select two bond series with identical terms to maturity, with one indexed and the other unindexed; the indexation method of indexed bonds, which does not guarantee compensation for the change in inflation over 1.5 months prior to maturity[2]; and the presence of a risk premium, which is difficult to isolate and is reflected to some extent in the difference between yields. Typically, the term to maturity of bonds traded on the stock

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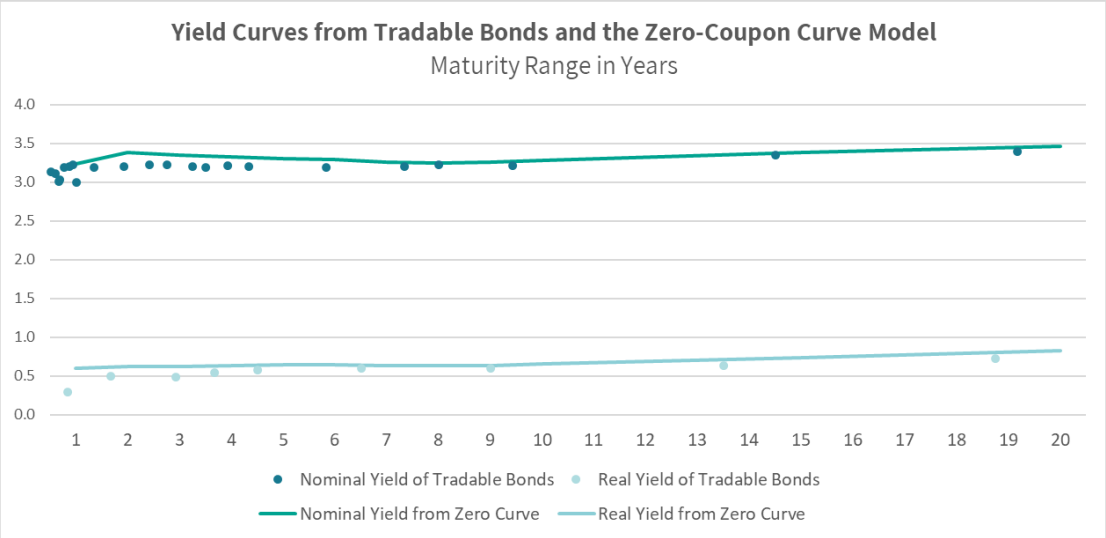
1 $1 + \pi = \frac{1+i}{1+r}$ where: r= real interest rate, i= nominal interest rate, and π = inflation expectations.

2 The calculation formula of real yield used by the Bank of Israel provides for some adjustment for this period.

exchange is not in whole years, which makes it necessary to make adjustments, such as the neutralization of seasonality, to produce yields and expectations for terms in whole years. Given these issues, the Bank of Israel estimates the yield curve based on nominal and real government bonds[3], and does not use the individual yields obtained based on actual prices during trading for its calculated inflation expectations. The model calculates the real and nominal y ield curves, with the ratio of the nominal curve to the real curve reflecting inflation expectations for various terms, including an inflation risk premium and a liquidity premium.

[3] Improving the Yield Curve Estimation Model Implemented at the Bank of Israel.

This calculation results in smoothed, continuous yield curves over long terms, with small deviations of bond prices calculated by the model from bond prices on the capital market, thus providing resolution response for issues of paucity and limited tradability of these bonds.



Data source: Stock Exchange and Bank of Israel processing

The diagram shows the continuousness of yield curves produced by the model, compared to curves based on individual tradable bonds. This is primarily evident in view of lack of real bonds on the real market yield curve.

The model estimates the risk-free yield curve more accurately, while achieving a relatively smoothed and stable curve.

The inflation expectations reflected by the model are primarily for terms of up to 10 years.

2.2 Inflation projections of financial forecasters

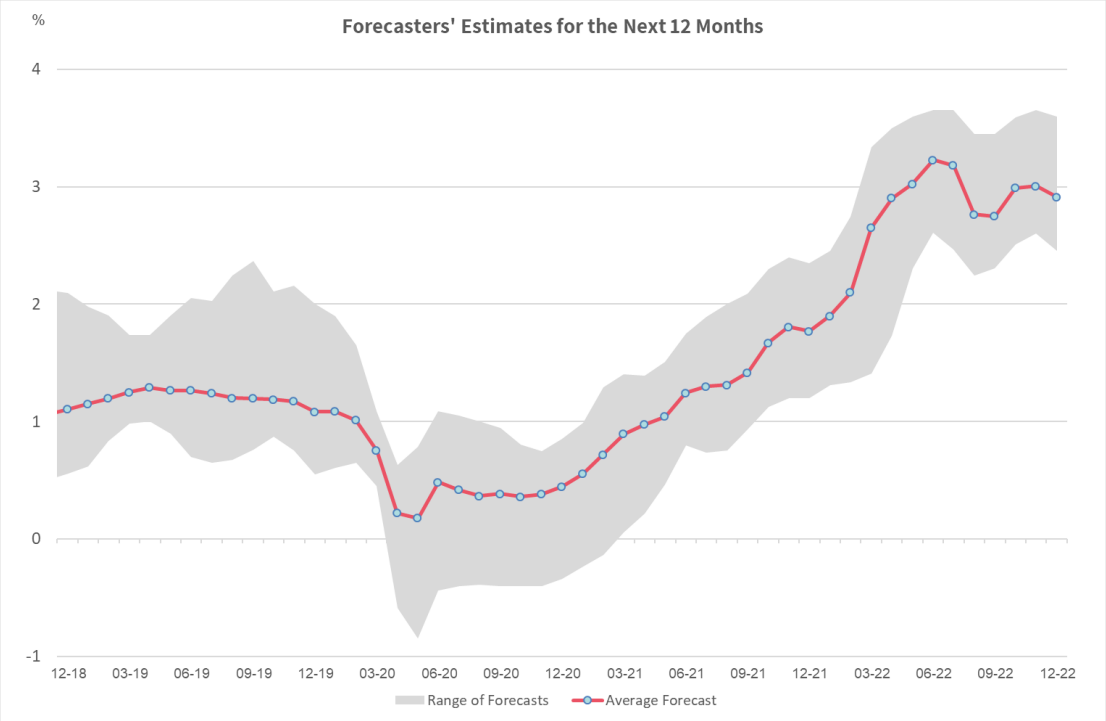
Another indicator used by the Bank of Israel, which is also used by leading central banks, is the inflation projections of financial forecasters.

Households typically rely on projections made by experts. As such, these projections affect the forward-looking economic decisions made by the public. Therefore, the mere effect of financial forecasters' projections means that they reflect the public's expectations. The Bank of Israel collects projections by financial forecasters from leading market entities, based on criteria to ensure their reliability and professional nature. In other words, it is important for these projections to be based on macroeconomic models that are independent of each other

and that provide regular projections. As part of its analysis of the implications of financial forecasters' projections, the Bank of Israel also obtains information from these forecasters about the factors that have influenced their projections.

The advantage associated with expert projections lies in the fact that they include no inflation risk premium. Their disadvantage lies in the fact that projections, by their nature, are not calculated continuously but rather at certain times during the month, typically after the Consumer Price Index reading is made public.

The Bank of Israel benefits from information derived from the spread of these projections, which the Bank of Israel considers to be an indicator of uncertainty regarding expected inflation in the market. In periods of greater uncertainty the spread of these projections increases, and it decreases during periods of less uncertainty.



Data source: Reports by financial forecasters and Bank of Israel processing

Inflation expectations reflected by financial forecasters are for the coming 12 months (for each month separately), for the current calendar year, and for the next calendar year.

2.3 Banks' internal interest rates

Internal interest rates are the marginal price calculated by each bank for raising sources (deposits) and for allocating uses (credit)—the maximum price for raising deposits and the

minimum price for allocating credit[4], both indexed and unindexed to the Consumer Price Index. Therefore, these result in a simple average nominal interest rate and a simple average real interest rate on credit and deposits for various terms for each bank. Similar to expectations derived from the capital market, the ratio of unindexed interest to indexed interest reflects each bank's inflation expectations for the different terms, and the simple average difference in internal interest rates across all banks reflects the inflation expectations of all banks.

The advantages of this calculation are that it reflects the banks' expectations, regardless of actual transactions, and there is no need to address issues of seasonality. The disadvantage is that internal interest rates are also affected by various considerations, such as the bank's asset and liability structure, liquidity considerations, competition considerations, and so forth.

The inflation expectations reflected by internal interest rates are for terms of 1, 2, 5, and 10 years.

2.4 Futures contracts on inflation

A futures contract on inflation is a future transaction on the future inflation rate for a specific term. In such a transaction, one party undertakes to pay the other party a fixed payment, in return for a future payment equal to the cumulative inflation through the expiration of the contract. Because market quotes for these futures contracts reflect the inflation expectations of traders in this market, the Bank calculates a simple average of quotes provided by banks in Israel and overseas[5] and by trading platforms.[6]

Deriving expectations from these contracts carries several advantages. It reflects the viewpoint of more sophisticated market traders; it addresses the need to eliminate seasonality; and it lacks an inflation risk premium. The disadvantage of this method lies in the low level of market liquidity, as the number of transactions is relatively small.

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4 Interest rates for end clients of each bank differ due to added margins, reflecting risk and other considerations.

5 The Bank of Israel obtains prices from domestic and foreign banks, from actual transactions with insufficient liquidity. As such, these data are not taken into account.

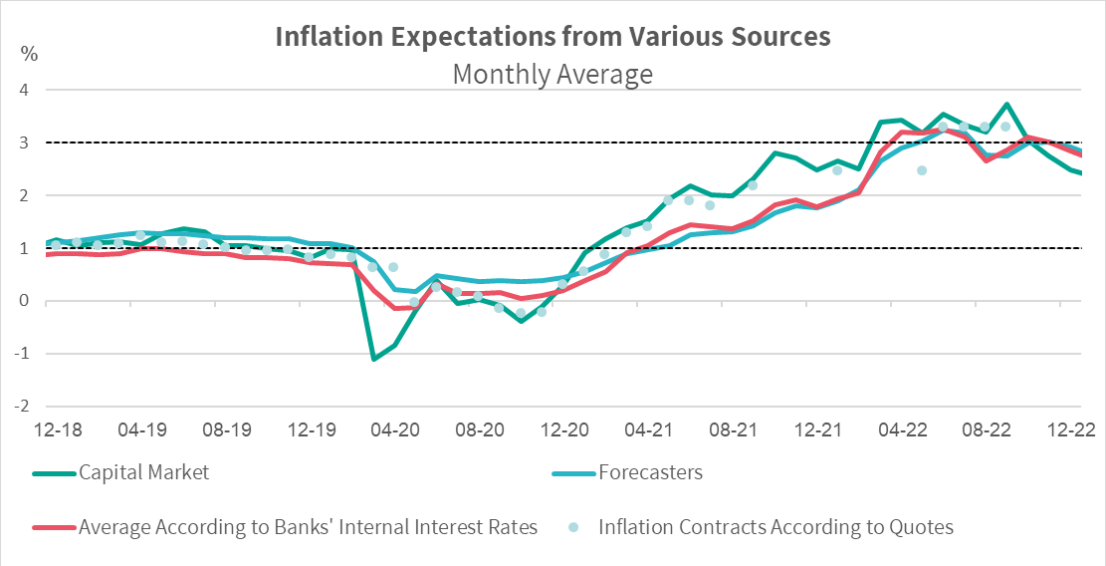
6 All quotes are provided by Bloomberg, some from quoting local banks and some from nonbank quoting entities such as brokers, for example: TFS and ILSB.

The inflation expectations reflected by these contracts are for terms of one month up to 10 years.

3. Discussion

Each of the indicators used by the Bank of Israel in formulating its monetary policy has its advantages and disadvantages. It is therefore important not to rely on any single indicator, but rather on a range of indicators with each one having an advantage that exceeds its disadvantage, and by means of an integrated overview to obtain a well-founded and holistic image that could not have been obtained by looking at any individual indicator on its own. Moreover, similar to the information obtained from the spread of projections made by various forecasters, information may be deduced from the variance between inflation expectations from the different sources surveyed.

Before looking at the information obtained from these different sources, it is important to note the difference in projection range and to take this into account. This means that one-year projections, for example, obtained from the capital market are for the next 365 days, whereas expectations from all other sources are for the next 12 index readings.



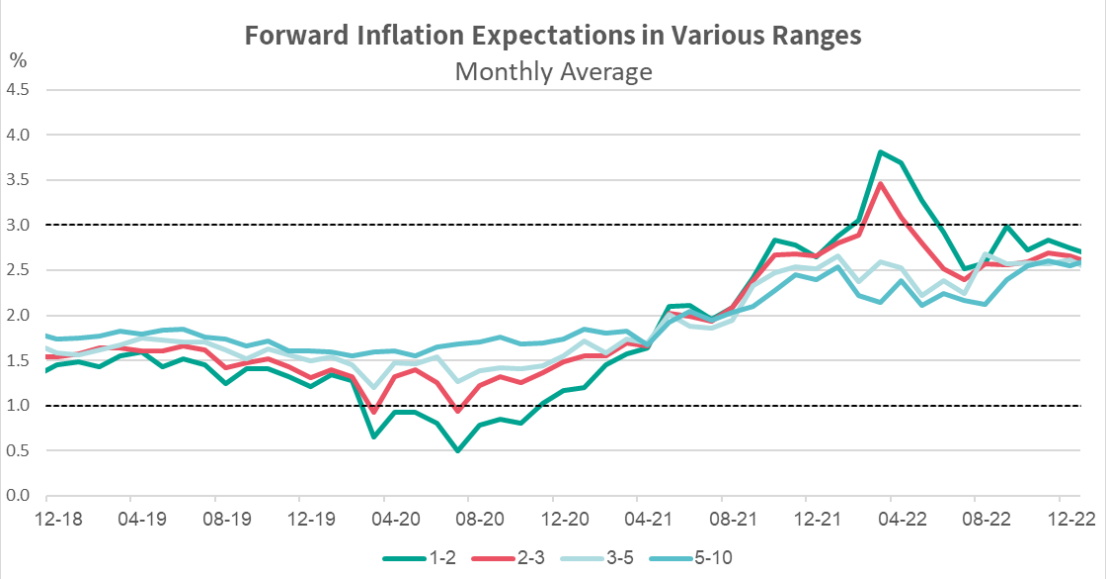
Data source: Bank of Israel processing

The diagram shows the similar trends for the different indicators. The higher the similarity between trends, the greater the certainty with regard to expected inflation, and vice-versa.

One of the key points to notice is that expectations from the capital market are more volatile than those derived from forecasters' projections and from the banks' internal interest rates. That is because expectations from the capital market reflect typical market volatility, which others do not.

The Bank of Israel also monitors inflation expectations from various sources for medium and long terms, which are less affected by temporary, short-term volatility with regard to expected inflation or the certainty regarding it. This has two major advantages. First, the Bank of Israel in its flexible inflation target regime would prefer to achieve the inflation target range over the medium and long term, even at the cost of deviation from it over the short term. Second, medium- and long-term inflation expectations that are within the target range is regarded as a benchmark for the central bank's credibility. This means that even in case of deviation from the inflation target, the Bank of Israel is determined to gradually bring inflation back within the target range, and to maintain this range over time.

This gradual approach reduces undesired side effects of the Bank's activity designed to achieve its other objectives—supporting the stability and proper functioning of the financial system and supporting other goals of the government's economic policy—if it focuses on maintaining price stability over the medium and long term. Thus, monetary policy also contributes to creating an economic infrastructure supportive of sustainable economic growth.



Data source: Bank of Israel processing

Another calculation derived from the model based on inflation expectations is that of inflation expectations for whole years. Inflation expectations for whole years present the annual expectations for each of the subsequent years, i.e. expectations for year one, expectations for year two (i.e. the one following it), expectations for year three (i.e. the one following year two) and so forth. In contrast, the current calculation of inflation expectations refers to the average expectations in annualized terms, expected from the current point in time. Thus, expectations for one year from now, expectations for the next two years from now, expectations for the next three years from now, and so forth.

The diagram shows that even if in part of 2022 there was upward deviation from the target range for expectations for one to two years, and for part of that time even for two to three years, the expectations for three years or longer were always within the inflation target range. This shows that the Bank of Israel maintained its credibility in the public view, as being determined to achieve the inflation target over time.

Summary

This document describes the key indicators used by the Bank of Israel in estimating the public's inflation expectations. Some or all of these indicators are also used by leading central banks. A key benefit from these data is that they allow the Bank of Israel to review developments in the inflation environment in greater depth, and particularly to obtain an indication of expected inflation from the point of view of the public.

The Bank of Israel makes the information regarding expectations and forecasts[7] that is available to decision makers accessible on a regular basis, as part of its intention to include the public and to generate transparency with regard to monetary policy. The transparency of leading central banks is important for two reasons. First, transparency is critical for an independent entity such as a central bank. Second, transparency that supports the market's understanding of decisions made by the central bank contributes to the efficiency of monetary policy.

[7] Selected information: Press release Series on website.