**Inflation expectations derived from the capital market, as calculated by the Bank of Israel**

**Inflation expectations derived from the capital market—the Bank of Israel’s calculation method**

​**a.      General**

Inflation expectations derived from capital market data (the break-even inflation rate) are based on a conceptual equation developed by US economist Irving Fisher. According to the equation, the nominal interest rate is equal to the sum of the real interest rate plus inflation expectations. Based on this concept, inflation expectations can be derived from market data by calculating the difference between the yield to maturity on unindexed bonds, representing the nominal yield, and the yield on CPI-indexed bonds, representing the real yield. In such a calculation, it would be best if the two bonds were as similar as possible—to the extent that the only difference between them is whether or not they are indexed to the CPI.

**b.      Complications with implementing the method**

1.      When inflation expectations are based on yield differentials, they include inflation risk premiums as well as biases deriving from differences in taxation and liquidity between different bond types.

2.      The small number of real bond series makes it difficult to assess the yield for fixed maturity ranges.

3.      Indexation lags, and other biases deriving from the indexation mechanism, affect the calculation of the yield to maturity of CPI-indexed bonds. Therefore, yields calculated based on these bonds do not necessarily represent the real yield in the market.[[1]](https://e.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx" \l "_ftn1) To illustrate, when the real yield is calculated for a particular date, e.g., May 10th, the repayment of principal and interest are priced on the basis of the known index, in this example, the one published on April 15th, which reflects the average price level in March. However, it is likely that the investors who determine the price of bonds on May 10th take into account inflation that has occurred until that date, even though it has not yet been published. This would be the case especially if in the interim period a sharp change had taken place in one of the important factors that affect prices, such as the exchange rate. Likewise, the redemption of the bond—which also takes place according to the known index, i.e., that which was published on the 15th of the month—is indexed to the average price level of the month previous to the redemption date. Hence bonds do not provide full linkage to prices, and this must be taken into consideration when calculating the real yield.

4.      The seasonality in the CPI greatly affects the pricing of CPI-indexed bonds.

**c.       Dealing with the complications**

1.      The estimate of the inflation risk premium in Israel is currently based on two studies carried out in Israel.[[2]](https://e.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx" \l "_ftn2) According to these two papers, the risk premium varies from 25 to 40 basis points (while the commonly used estimate abroad is around 20 basis points). Researchers at the Bank of Israel Research Department are developing models for ongoing assessment of the risk premium. The bank of Israel’s calculation of inflation expectations does not contain a correction for the risk premium.

2.      Inflation expectations are based on the yield on the unindexed and indexed yields obtained from a nonparametric model of yields, which enables an estimation of the yield curve to the desired horizons. These can differ from the maturities used for the bonds.[[3]](https://e.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx" \l "_ftn3)

3.      Since CPI-indexed bonds do not provide total linkage to the CPI, the yield to maturity on these bonds must be adjusted to properly reflect the appropriate real yield. That is achieved by dividing the term to maturity of each bond into three subperiods: (i) The immediate period, in which there is a change in the CPI that has not yet been published at the time the inflation expectations are calculated. The estimate of the change that occurred but has not yet been published is based on the average projections of professional forecasters that publish their forecasts on a regular basis.

(ii) The intermediate period, in which the bond affords full compensation for the change in the CPI; and

(iii) The period close to maturity, in which there is no compensation for the change in the CPI beyond the known CPI value. During this period, the bond may be defined as a nominal one and the nominal value of this short period can be subtracted from the price of the bond.

4.      The effect of seasonality in the CPI is seen when the terms to maturity of CPI-indexed bonds are not complete years. In effect, most of the time bonds do not trade with complete years to maturity, so the yields to maturity on existing series must be converted into annual terms, while taking into account the seasonal factors included in price indices that will be published over the lifetime of each bond series (the intermediate period, as defined in the previous section).[[4]](https://e.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx" \l "_ftn5)

The detailed equations used to perform the calculations appear in Zvi Wiener and Helena Pomposhko, “[The Estimation of Nominal and Real Yield Curves from Government Bonds in Israel](https://www.boi.org.il/boi_files/Statistics/mns0603e_a.pdf),” Monetary Studies 2006.03, Bank of Israel, Monetary Department Discussion Paper Series, June 2006.

[[1]](https://e.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx" \l "_ftnref1) This situation is known as the indexation lag, and is felt even more strongly in most indexed bonds traded abroad.

[[2]](https://e.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx" \l "_ftnref2) R. Stein (2004), “Estimating the Risk Premiums Inherent in Financial Asset Yields, Including in Inflation Expectations”, *Bank of Israel Survey* vol. 2; and E. Azoulay, M. Brenner, Y. Landskroner, and R. Stein (2014), “Inflation Risk Premium Implied by Foreign Exchange Options”, *Journal of Economics and Business*. There is also a study that was conducted abroad: Jens, Christensen, Jose Lopez, and Glenn Rudebusch (2010), “Inflation Expectations and Risk Premiums in an Arbitrage-Free Model of Nominal and Real Bond Yields”, FRB of San Francisco Working Paper no. 2008-34.

[[3]](https://e.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx" \l "_ftnref3) The model is based on A. Sasi-Brodesky, and N. Steinberg (2011), “Improving the Yield Curve Estimation Model Implemented at the Bank of Israel”, BOI periodic papers. <Https://www.boi.org.il/media/jotdlcsv/pp1101h.pdf> (in Hebrew); and R. Stein (2012), “The Effect of Seasonality in the CPI on Inflation Expectations”, <https://www.boi.org.il/en/economic-roles/research-and-publications/all-researches/occasional-papers/the-effect-of-seasonality-in-the-cpi-on-inflation-expectations/>.