

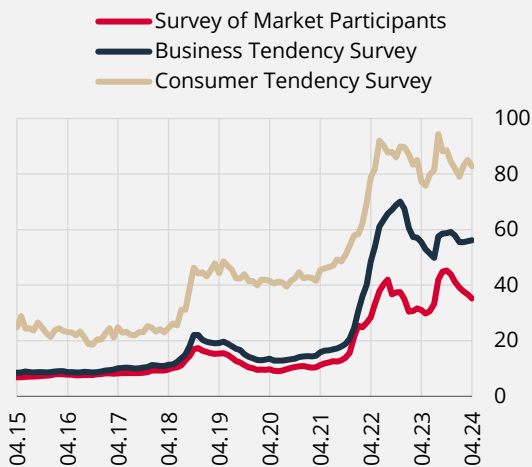
Box 3.1

Inflation Expectations of Firms

Inflation expectations of firms play an important role in understanding pricing behavior due to their price-determining role in the economy. In addition, firms take into consideration the future inflation rates when determining employee wages and forming inventory and investment strategies. Bunn et al. (2022) showed that the margin of error in firms' inflation expectations is related to low profitability and total factor productivity. The expectations of firms that hold the power to determine prices also have important consequences for monetary policy. For example, if firms expect permanent and high inflation, they may increase prices more aggressively, seeking to protect their profit margins, and if this is reflected in wage levels in the economy, it may create a self-reinforcing inflationary spiral. This may also negatively affect the effectiveness of the monetary policy transmission mechanism. Therefore, central banks closely monitor firms' inflation expectations as an important indicator of the future course of inflation. The inability to anchor expectations or any significant deviation of the central bank from its target makes it difficult to achieve the price stability goal. Therefore, from the point of view of policy makers, survey data on inflation expectations of firms have an important information value.

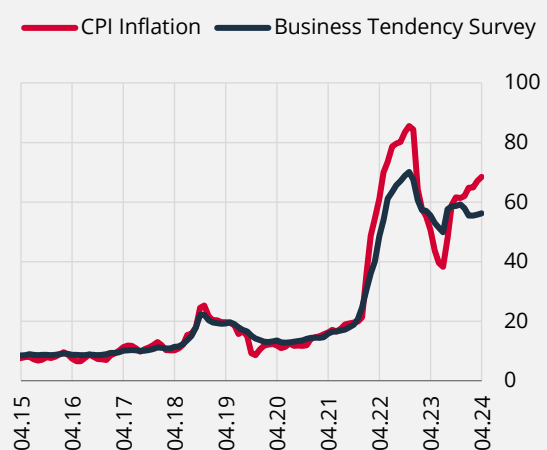
In this box, firms' CPI inflation expectations are analyzed using the micro data of the Business Tendency Survey applied by the CBRT to firms operating in the manufacturing industry in Türkiye. In this context, first of all, the average firm-based expectations are compared with the inflation expectations of market participants and consumers, and then inflation uncertainty is examined through the rounding behavior of firms to certain numbers when expressing inflation expectations. In the Business Tendency Survey, firms are asked about their "annual consumer price inflation expectations as of the end of the next twelve months".¹ In Chart 1, the sectoral weighted average values of the firms' inflation expectations calculated using the answers given to this question are compared with the appropriate averages of the inflation expectations of the Survey of Market Participants and Consumer Tendency Survey.

Chart 1: 12-Month-Ahead Inflation Expectations (%)



Source: CBRT, TURKSTAT.

Chart 2: CPI Inflation and 12-Month-Ahead Inflation Expectations of Firms (%)



Source: CBRT, TURKSTAT.

¹ Data on firms' CPI inflation expectations are not disclosed to the public and are collected regularly by the CBRT. In the Business Tendency Survey, firms are also asked about their "annual producer price inflation expectations as of the end of the next twelve months". Since there is no expectations of other economic agents regarding producer prices, this study focuses on consumer inflation expectations.

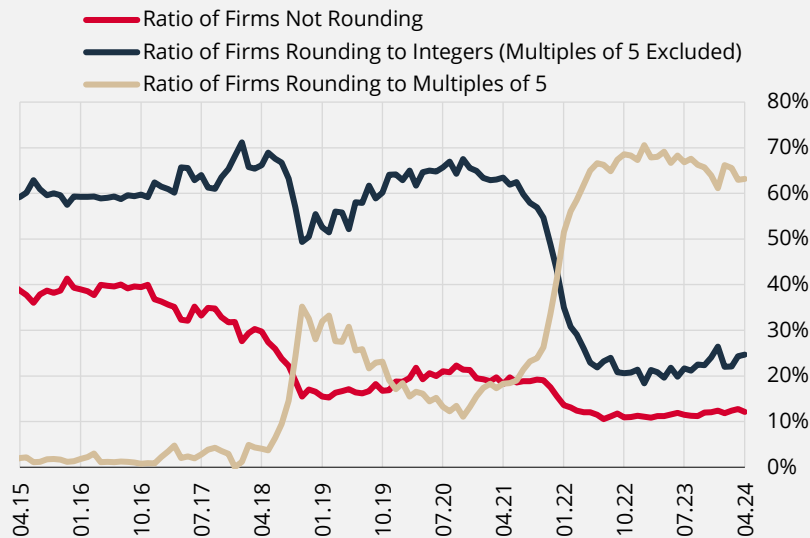
Compared to the consumer inflation expectations examined in CBRT (2024), it is seen that firms made inflation forecasts that were closer to those of market participants until the end of 2021. After the last quarter of 2021, when inflation and the exchange rate increased rapidly, the relation between the expectations of firms and market participants has weakened, and the deterioration in firm inflation expectations was more evident than the deterioration in the expectations of consumers and professionals. When the inflation expectations of the recent period are examined, while the exchange rate developments in June and July 2023 caused an increase in the expectations of all economic units, this increase remained relatively limited in firms. On the other hand, the improvement in firms' inflation expectations after the monetary tightening that started in the second half of 2023 is not as strong as that of consumers and market participants. When firms' inflation expectations and actual inflation rates are compared, it is seen that firms opt for backward-indexation when determining their consumer inflation forecasts and that the sensitivity to the previous month's annual CPI inflation is high (Chart 2). Although this close relationship weakens with the rise in inflation at the end of 2021, firms set their inflation expectations at levels closer to realized inflation rates compared to other economic agents. However, despite the recent increase in annual CPI inflation, the flat course of firms' expectations stands out as a positive development.

The rounding effect of consumer inflation expectations was analyzed in CBRT (2024). Similarly, this box investigates whether firms tend to give an approximate number that is imprecise and may include other numbers nearby to express their estimates in consumer inflation expectations shared in the Business Tendency Survey. Binder (2017) introduced a method that measures uncertainty at the micro level and time series dimension by associating the rounding effect in inflation expectations stated by consumers with inflation uncertainty. In that study, it is assumed that the inflation expectations of each consumer participating in the survey came from the subjective probability distribution and that consumers with uncertainty above a certain level round their inflation estimates to multiples of five. Thus, the uncertainty levels of survey participants can be calculated probabilistically, and the proportion of participants who round their estimates for each month can be estimated. The subjective probability mass distribution functions of consumers with low and high uncertainty groups can be written as follows:

$$\begin{aligned}\Phi_t^l &= P(\pi_{it}^e = j | i = \text{Low Uncertainty}) = \int_{f_{\min(j)}^l}^{f_{\max(j)}^l} p_d(\pi_{it}^e, \theta^l) dx, \quad j \in S_l \\ \Phi_t^h &= P(\pi_{it}^e = j | i = \text{High Uncertainty}) = \int_{f_{\min(j)}^h}^{f_{\max(j)}^h} p_h(\pi_{it}^e, \theta^h) dx, \quad j \in S_h\end{aligned}$$

For consumer i at any time t , Φ_t^l and Φ_t^h denote the probability distribution mass function of low and high uncertainties, respectively, and π_{it}^e denote the inflation expectation of consumer i . S_l and S_h indicate the response set for the relevant uncertainty groups, $S_d = \{1, 2, 3, 4, 5, \dots\}$ and $S_y = \{5, 10, 15, \dots\}$. $f_{\min(j)}$ and $f_{\max(j)}$ are used for the lowest and highest possible forecast values that can be given for the relevant uncertainty groups. Finally, p_l and p_h refer to the probability distribution function, and $\theta = \{\theta^d, \theta^y\}$ refers to the parameter set of the distributions. Since each participant who gives an expectation of five and multiples of five does not necessarily round their estimate to multiples of five, the group of consumers cannot be directly observed. Accordingly, the participants' predictions come from mixture of two distributions $\Phi_t = (1-\lambda)\Phi_t^l + \lambda\Phi_t^h$ in each month. In this equation, the parameter λ gives the proportion of consumers who round up to multiples of five, i.e. those with high inflation expectation uncertainty. Maximum likelihood estimates of the parameters of the mixture distribution, λ and θ , are estimated by the expectation maximization method. Briefly, the share of firms who responded with rounding behavior among those who answered five and multiples of five is estimated.

The method of Binder (2017) is also applied to survey results containing inflation expectations of different agents instead of consumers (Clements, 2020). In this box, the rounding effect of firm expectations included in the Business Tendency Survey is estimated. Unlike Binder (2017), instead of two different uncertainty groups, firms are analyzed in three different groups: those who give decimal estimates (those who do not round), those who round to integers (except for multiples of five), and those who round to multiples of five. Thus, the proportion of firms with low, medium and high inflation uncertainty are estimated.

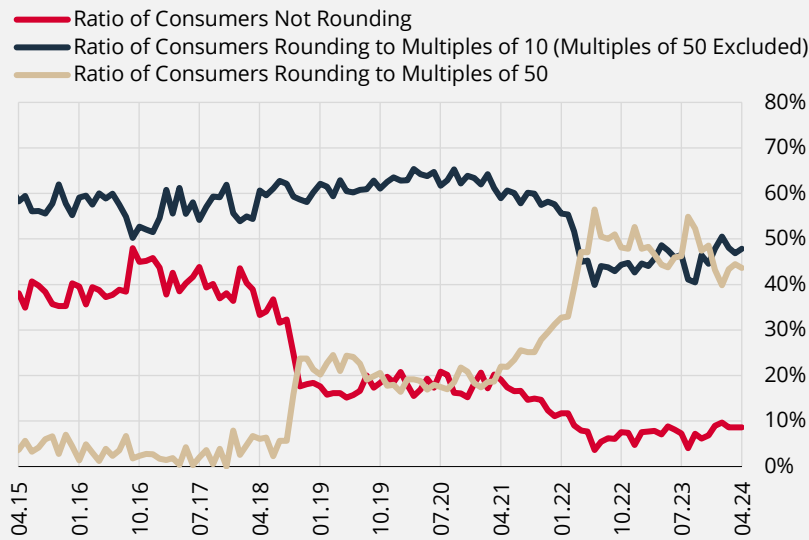
Chart 3 : Rounding Behaviour of Firms (%)

Source: CBRT.

When the uncertainty of firms' inflation expectations is analyzed through rounding behavior (Chart 3), the share of firms that do not round and those with low uncertainty (those who estimate decimal numbers) decreased in 2018 and 2021 amid sharp increase in inflation rates. On the other hand, the share of the group with high inflation uncertainty (those rounding to multiples of five) increased from 15% to 35% in the second half of 2018. With the effect of the disinflation process and the improvement in inflation expectations that followed the monetary tightening in 2018, the share of this group improved and decreased to 20% in 2019. As of the last quarter of 2021, the share of firms with high uncertainty continued to rise in line with the increase in inflation and reached 7% at the beginning of 2023. The share of this group, which reached 63% after the recent moderate decline, still remains high.

In order to compare the inflation expectations of different economic agents, the same methodology is applied to consumer inflation expectations obtained from the Consumer Tendency Survey. Consumers prefer round numbers, hence, rather than giving a precise inflation forecast value, they give the forecast, a round number, which can be called more 'categorical'. To examine these less sharp forecast values, the rounding effect in consumer expectations is calculated based on multiples of 10 (excluding multiples of 50) and multiples of 50, which are commonly observed in micro data.

Here, it is assumed that consumers with low, medium and high uncertainty round to integers (except multiples of 10), multiples of 10 (excluding multiples of 50), and multiples of 50, respectively. The course of the shares of these three groups is shown in Chart 4 and reveals that, similar to the outlook in firms' expectations, there has been an increase in the high uncertainty group after 2021. Even though uncertainty remained high in the last months of the past period, its share has decreased. However, unlike firms, consumers seem to round their forecasts to multiples of higher values. This shows that, regardless of the level of inflation, consumers express their inflation forecasts in a wider range, which is imprecise and based on products with high price increases in the consumption basket.

Chart 4: Rounding Behaviour of Consumers (%)

Source: CBRT, TURKSTAT.

In this box, firms' inflation expectations are analyzed and uncertainties regarding inflation expectations are estimated by improving the method presented in Binder (2017). The rounding behavior that exists in consumer expectations is also observed in firms' expectations, albeit at lower multiples (multiples of five instead of multiples of 50). Moreover, neither the level nor the course of uncertainty of inflation expectations for both agents have reached the desired levels for the disinflation process. The CBRT will continue to closely monitor the inflation expectations of economic agents through micro data.

References

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