

Methodological aspects of calculating median inflation expectations.

The National Bank of Kazakhstan utilizes median estimates to measure perceived and expected inflation (since January 2023, the NBK has discontinued the use of quantified inflation expectations derived via the Berk method in its communications). This methodology involves collecting both qualitative and quantitative responses from survey participants regarding their perception of the current inflation level and expectations for the upcoming period.

At the beginning of the survey, respondents are asked a qualitative question (Table 1).

Table 1. Qualitative questions regarding the assessment of price changes over the past year and expectations for price changes in the upcoming year.

In your opinion, how have the prices of goods and services changed over the past 12 months?	In your opinion, how will the prices of goods and services change overall over the next 12 months?
<ol style="list-style-type: none">1. Increased faster than before2. Increased at the same rate as before3. Increased slower than before4. Remained unchanged5. Decreased6. Do not know	<ol style="list-style-type: none">1. Will increase faster than now2. Will increase at the same rate as now3. Will increase slower than now4. Will remain at the current level / unchanged5. Will decrease6. Do not know

Respondents who selected options 1–3 are then asked a quantitative question, where they estimate in percentage terms how much, in their opinion, prices have increased or will increase over a specific period (Table 2).

Table 2. Quantitative questions on the assessment of price changes over the past year and expected price changes over the upcoming year.

By what percentage, in your opinion, have the prices of goods and services increased over the past 12 months?	By what percentage, in your opinion, will the prices of goods and services increase over the next 12 months?
<ol style="list-style-type: none">1. Increased by 1-3%2. Increased by 4-6%3. Increased by 7-10%4. Increased by 11-15%5. Increased by 16-20%6. Increased by more than 20%7. Do not know	<ol style="list-style-type: none">1. Will increase by 1-3%2. Will increase by 4-6%3. Will increase by 7-10%4. Will increase by 11-15%5. Will increase by 16-20%6. Will increase by more than 20%7. Do not know

To calculate the median estimate, responses from respondents selecting options 4 and 5 in the qualitative question (Table 1), as well as options 1 through 6 in the quantitative question (Table 2), are included. Interval-based responses are then ranked in ascending order, starting from price decreases to increases of more than 20% (Table 3). Each interval is assigned a corresponding frequency reflecting the number of observations within that range. By summing the frequencies of all intervals (totaling 100%), the median interval is identified, encompassing exactly half of all respondents' answers.

Table 3. Distribution of respondents' answers for calculating perceived and expected inflation

Perceived Inflation	Share (Frequency), %	Expected Inflation	Share (Frequency), %
1. Decreased	...	1. Will decrease	...
2. Remained unchanged	...	2. Will remain at the current level / unchanged	...
3. Increased by 1-3%	...	3. Will increase by 1-3%	...
4. Increased by 4-6%	...	4. Will increase by 4-6%	...
5. Increased by 7-10%	...	5. Will increase by 7-10%	...
6. Increased by 11-15%	...	6. Will increase by 11-15%	...
7. Increased by 16-20%	...	7. Will increase by 16-20%	...
8. Increased by more than 20%	100%	8. Will increase by more than 20%	100%

After finding the lower bound of the median interval for inflation expectations, the exact median within this interval can be calculated using the following formula:

$$Me = x_0 + i * \frac{\frac{1}{2} * \sum f_i - S_{Me-1}}{f_{Me}},$$

where x_0 – the lower bound of the median interval, for which the cumulative frequency of responses exceeds half of the total sum of frequencies, i – the width of the median interval x_0 (the difference between the upper and lower bounds of the interval), f_i – the sum of all frequencies of the intervals, S_{Me-1} – the cumulative frequency of the interval preceding the median interval x_0 , f_{Me} – the frequency of the median interval x_0 .

This formula calculates the portion of the interval width that needs to be added to its lower boundary to reach the midpoint of the entire distribution. To do this, the width of the median interval is multiplied by the proportion that reflects the position of the median within the interval. As a result, the formula takes into account both the width of the interval and the location of the median within it.

The median estimates of grouped data provide more accurate results compared to the simple median of a numerical series, helping to avoid repeated assessments of expected and perceived inflation across multiple survey rounds. These indicators provide an objective understanding of the central tendencies in public sentiment regarding perceived and expected inflation levels.