Staff Analytical Note/Note analytique du personnel—2023-18

Last updated: December 19, 2023

Finding the balance—measuring risks to inflation and to GDP growth

by Bruno Feunou and James Kyeong

Financial Markets Department
Bank of Canada
bfeunou@bankofcanada.ca, jkyeong@bankofcanada.ca

DOI: https://doi.org/10.34989/san-2023-18 | **ISSN** 2369-9639

Introduction

The Bank of Canada has increased its policy interest rate by 4.75 percentage points since March 2022. Because higher interest rates increase borrowing costs and encourage savings, Canadian economic activity has slowed, and inflation has come down from its multi-decade high. Despite this progress, sizable upside risks to inflation remain, partly due to rising global tensions that have increased the risk that supply chains could be disrupted again and energy prices could move higher. In an environment of elevated uncertainty surrounding the inflation and growth outlooks, point estimate forecasts are not as meaningful, and it is more useful to analyze the uncertainty around the forecasts, or the distribution of risks.

In this note, we show how the risks to the inflation and growth outlooks have evolved over the course of 2023.[1] In early 2023, a scenario where inflation would remain above 3% and growth would remain positive seemed the most likely outcome in 12 months. We find that upside risks to inflation have moderated since early 2023 but remain elevated, while downside risks to growth in real gross domestic product (GDP) have increased slightly. As of October 2023, a scenario where inflation is within the Bank's target range of 1% to 3% and growth is between 0% and 2% seem most likely in 12 months.

Modelling future distributions of economic outcomes

We estimate the distribution of future year-over-year (y-o-y) inflation and y-o-y real GDP growth for the Canadian economy at a daily frequency in two steps. First, we individually model the four moments[2] (mean, variance, skewness and kurtosis) of inflation and GDP growth as moving averages of economic and financial conditions. Economic and financial conditions are proxied by key macroeconomic data and financial variables such as the yield curve and the stock market index. These are in part a reflection of future economic activity and thus have linkages to future inflation and GDP growth. Second, we translate the estimated moments into the conditional distributions of future inflation and GDP growth at various forecast horizons up to 12 months. Applying this methodology over 2002–22, we find that the probabilities of inflation and GDP growth derived from the conditional distributions align with what was observed, providing us with a good degree of confidence in the methodology.

Inflation likely to fall back to the target range in 2024

Chart 1 shows the estimated distributions of y-o-y inflation in 12 months as of January 2023 (blue) and October 2023 (orange). The area underneath the distributions represents the probability that inflation will fall within a specified range in a year. The chart clearly shows that the distribution became narrower and shifted to the left between January and October 2023, indicating a higher likelihood of lower inflation and a lower likelihood of higher inflation. Specifically, panel a shows that the probability of inflation staying above 3% in 12 months fell from around 40% as of January 2023 to 20% as of October 2023, reflecting the significant moderation in inflation from 6.3% in January to 3.1% in October.

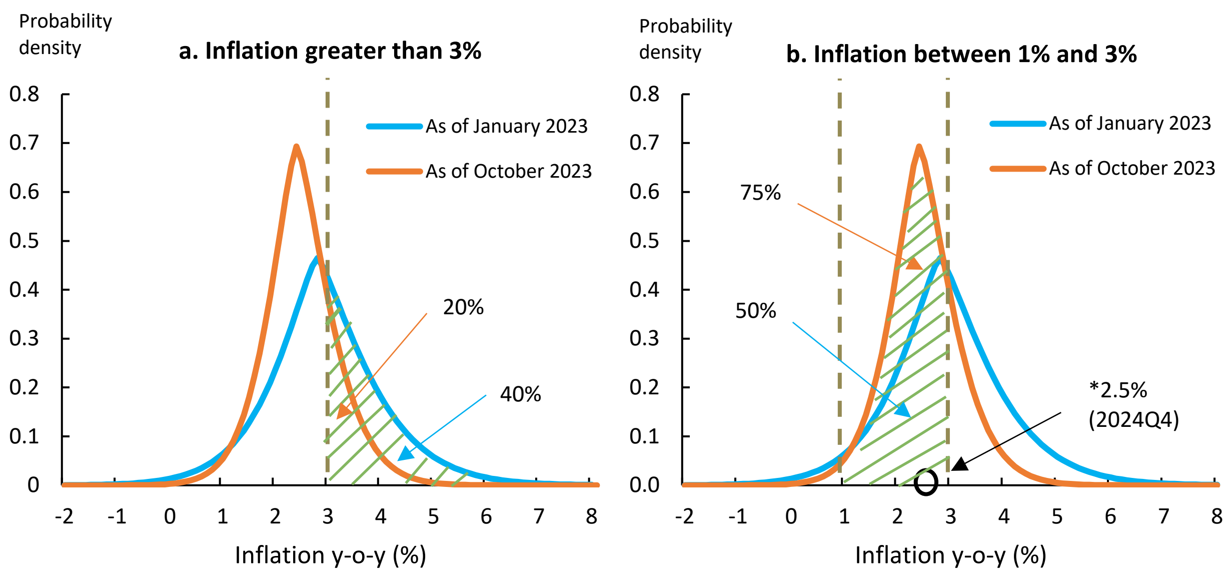
[1] We use the quantitative tool introduced in C. Azizova, B. Feunou and J. Kyeong, "Forecasting Risks to the Canadian Economic Outlook at a Daily Frequency," Bank of Canada Staff Discussion Paper No. 2023-19 (September 2023).

[2] Moments describe the characteristic of a distribution, such as its location, scale and shape.

Similarly, panel b shows that the probability of inflation being within the Bank's target range of 1% to 3% in 12 months as of October 2023 is around 75% while it stood at 50% in January 2023. This is broadly consistent with the projection in the October *Monetary Policy Report* of 2.5% inflation by the end of 2024. Despite this progress, there remains a 25% chance that inflation stays above the target range. This is significantly higher than the average of 8% before the COVID-19 pandemic, highlighting that inflation risks continue to be elevated.

Chart 1: Probability of inflation

Estimated distributions of year-over-year (y-o-y) inflation in 12 months



*This is the projection in the October 2023 *Monetary Policy Report.*

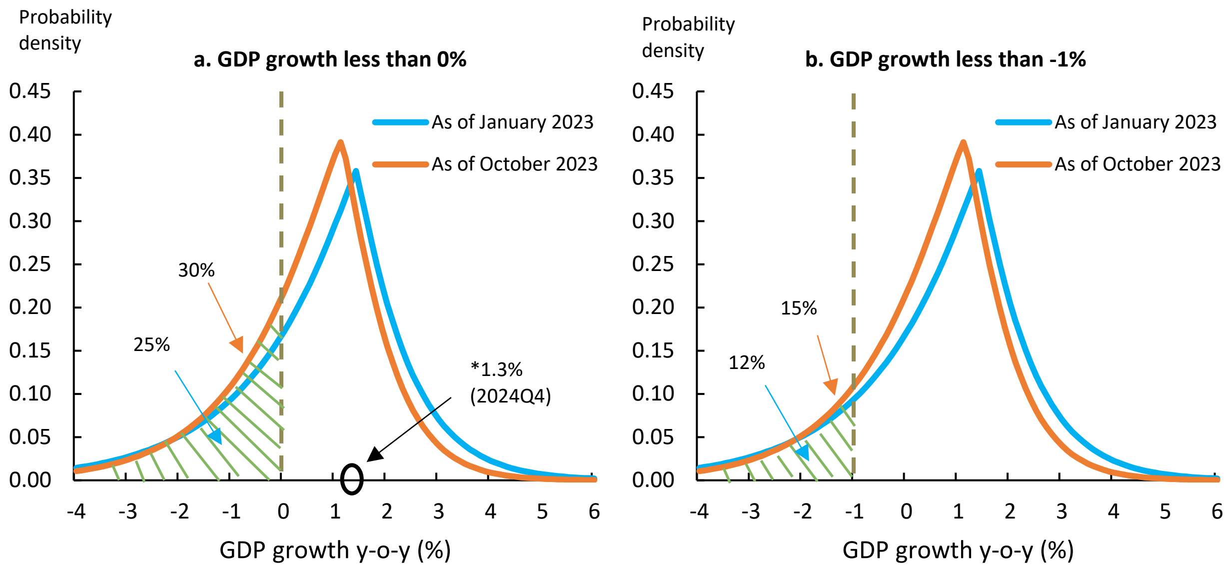
Source: Bank of Canada calculations

A severe recession unlikely in 2024

Chart 2 shows the evolution of the estimated distributions of y-o-y real GDP growth in 12 months over the course of 2023. In early 2023, the bulk of the distribution was concentrated around 1.5%, indicating that the Canadian economy will most likely grow at that pace by December 2023. The distribution shifted to the left as of October 2023, reflecting slowing activity as tighter monetary policy works its way through the economy. The shaded area underneath the distributions and to the left of the grey dotted line represents the probability of a recession. Panel a clearly shows a slight increase in the estimated probability of a recession (defined as y-o-y real GDP growth below 0%) from 25% in January (shown in blue) to 30% as of October 2023 (shown in orange). Panel b shows that the probability of a deeper recession (i.e., y-o-y GDP growth below -1%) is relatively low at 15% as of October 2023, marginally higher than earlier in the year. It is important to note that our definition of recession is expressed in y-o-y terms due to sample size constraints. Recessions are typically defined as two consecutive quarters of negative growth measured in quarter-over-quarter (q-o-q) terms. Since negative q-o-q growth is a necessary but not a sufficient condition for negative y-o-y growth, our estimate can be considered a lower bound for recession risks measured in q-o-q terms.[3]

Chart 2: Probability of growth in gross domestic product (GDP)

Estimated distribution of year-over-year (y-o-y) real GDP growth in 12 months



*This is the projection in the October 2023 *Monetary Policy Report.*

Source: Bank of Canada calculations

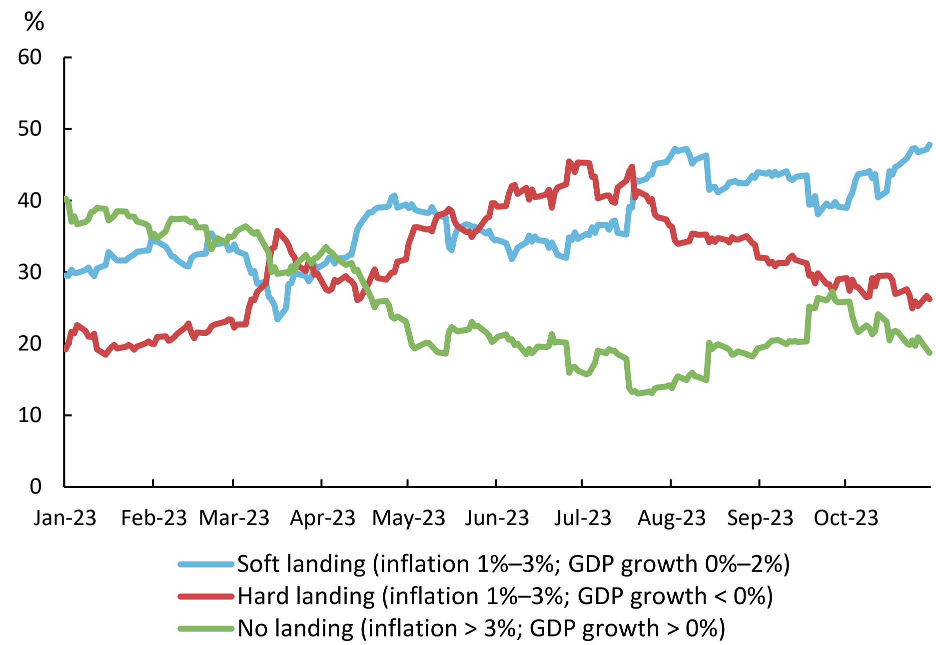
Increased probability of a soft-landing scenario in 2024

Finally, we combine the estimated probability distributions of inflation and GDP growth and assess the probabilities of different joint economic outcomes. **Chart 3** shows the evolution of these joint probabilities over the course of 2023. As of January 2023, a no-landing scenario (defined as inflation above 3% and positive growth) seemed most likely. Over the course of 2023, the probability of a soft-landing scenario (defined as inflation between 1% and 3% and growth between 0% and 2%) steadily increased and is now the most likely outcome, with a probability close to 50%. This is in line with the results of the Market Participants Survey for the third quarter of 2023, which indicate a 64% probability of inflation falling within the target range and a 67% chance of real GDP growth falling between 0% and 2% by the end of 2024.[4] Nevertheless, a 50% chance of other outcomes remains, including a hard-landing scenario (defined as inflation between 1% and 3% and growth below 0%), highlighting the uncertain outlook for GDP growth in 2024.

[3] For instance, it is theoretically possible to see a recession in q-o-q terms but not in y-o-y terms if negative q-o-q growth is sufficiently small (i.e., indicating a shallow recession).

[4] Bank of Canada, Market Participants Survey—Third Quarter of 2023 (November 2023).

Chart 3: Probabilities of various economic outcomes in 2024



Monitoring risks going forward

While significant progress has been made on the inflation front in 2023, a lot of uncertainties remain that could prolong the journey back to price stability or result in a costly trade-off between inflation and growth. Using our new quantitative tool that can be updated daily, we are able to monitor the evolution of these risks in a timely manner.