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October 2, 2025
London, Ontario

Underlying inflation: Separating the signal from the noise

Good afternoon. It's great to be here in London at the Ivey Business School.

I always enjoy having the opportunity to speak with future business leaders. And I think, in our increasingly complex world, it is more important than ever to bridge the gap between the C-suite boardroom and the work we do at the Bank of Canada. With that in mind, I'm going to talk about a concept that is useful in many domains, including both business and economics: separating the signal from the noise.

Let me put it in business terms first. Imagine you're listening to a company's earnings call. You need to be able to separate the noise—the CEO talking about "optimizing impact" or "leveraging synergies"—from the signal—say, a sustained decline in revenues.

Central bankers do exactly this with inflation. We need to strip out the noise so that monetary policy can respond to the signal. Today, I am going to explain how and why we do this. But first, let's go over some basics.

Canada has a 2% target for consumer price index (CPI) inflation, or total inflation. This target helps households, businesses and financial markets know what to expect with prices. Our job at the Bank is to keep inflation close to that target. We do this by adjusting our policy interest rate.

But interest rate changes work with lags. This means we cannot—and should not—try to react to every wiggle in the monthly inflation numbers. To achieve our 2% target, we have to cut through the noise and identify the part of inflation that is lasting. This lasting, or persistent, part of inflation is what we call "underlying inflation." It's our signal.

My speech today is all about how we assess underlying inflation. One of the ways we do so is by looking at measures of core inflation. But I want to be clear that core inflation is not the only indicator we use. We've always taken a broader approach.

So I'll begin by explaining what core inflation is and why central banks look at it. And I'll introduce you to some of the measures of core inflation we use at the Bank. Then I'll go over

I would like to thank Mikael Khan and Luis Uzeda for their help in preparing this speech.

Not for publication before October 2, 2025
1:25 PM Eastern Time

how we use core inflation and other indicators to cut through the noise and see the signal. And I'll explain how doing this helps us achieve our 2% target for total inflation.

Then I want to say a few words about the future of our inflation-targeting framework. Every five years, we review and renew our framework agreement with the federal government. Our next renewal is in 2026. One of the things we're considering this time around is how we assess underlying inflation—including how we use measures of core inflation in our analysis and in our communications. This is particularly important in a world that has become more prone to major shocks, such as the trade conflict.

Let's begin.

What is core inflation, and why do we use it?

I do a lot of outreach with Canadians as part of my job. And people often ask me: does the Bank target total inflation or core inflation? And, if we target core inflation, does that mean we ignore costs that affect people every day—like prices for food, gasoline or rent? Let me answer this right now: our target is overall inflation, not core inflation.

It might be helpful at this stage to clarify some terminology. Underlying inflation and core inflation are two commonly used—and commonly confused—terms. They're related, but distinct.

Let me start with underlying inflation. Underlying inflation is a concept, not a statistical measure. It tries to capture the persistent—or lasting—part of inflation that is related to economic fundamentals. These fundamentals can include things like imbalances between overall supply and demand in the economy and sustained cost pressures.

We care about underlying inflation because we don't want to react to noise. It can take up to two years for changes in the policy interest rate to have their full effect on inflation, so reacting to temporary movements could end up causing more volatility.

Because underlying inflation can't be observed directly, we have to use other indicators to assess it. Measures of core inflation are one way we do this.

Now, let me clarify what core inflation is. Put simply, measures of core inflation take total inflation and try to filter out short-term noise to capture the more stable, underlying trend. They typically do this by removing volatile price changes.[1] For example, one common way of measuring core inflation is to exclude food and energy because price changes in those categories are often short-lived.

Ideally, a measure of core inflation should be less volatile than total inflation, while still tracking total inflation's movements over the long term. This means that if you were to look at both measures on a chart, the core inflation line would usually be smoother than the line for total inflation, with smaller swings from one month to the next (**Chart 1**). This is because measures of core inflation tend to reflect the factors that affect inflation over time, rather than isolated shocks.

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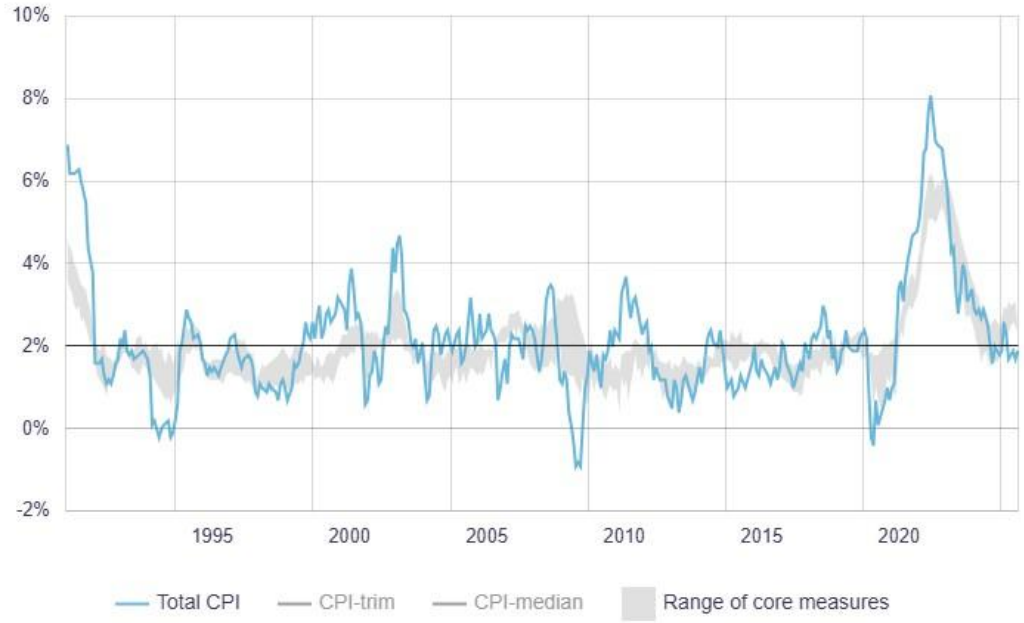
[1] For different approaches to measuring inflation persistence, see F. Pivetta and R. Reis, "The persistence of inflation in the United States," *Journal of Economic Dynamics and Control* 31, no. 4 (2007): 1326–1358.

Chart 1: Core inflation is less volatile than total inflation

Year-over-year percentage change



Note: The range of core measures includes CPI-trim, CPI-median, CPI-common, CPIXFET and CPIX. CPIXFET excludes food and energy prices. CPIX excludes eight volatile components of the consumer price index. All measures of core inflation exclude indirect taxes.
Source: Statistics Canada
Last observation: August 2025

At the Bank, we've been targeting inflation for more than three decades. And over that time, we've used several different measures of core inflation. What this experience has taught us is that there's no single, perfect measure of core inflation. Every measure, however well designed, will, at times, send misleading signals.

From 1991 to 2016, our primary gauges for core inflation simply excluded a fixed set of volatile components. Then, in 2016, we embraced a more dynamic and flexible approach. We adopted a trio of preferred core measures:

- CPI-trim, which removes the top 20% and the bottom 20% of price changes each month
- CPI-median, which lines up all the monthly price changes from lowest to highest and picks the one in the middle
- CPI-common, which aims to track price changes that are common across categories

These measures served us well in the pre-pandemic period. However, as inflation surged after the pandemic, CPI-common became difficult to use in real time due to unusually large historical revisions.[2] That's why, in 2022, we stopped including CPI-common in our set of preferred measures.

[2] E. Sullivan, "Examining Recent Revisions to CPI-Common," Bank of Canada Staff Analytical Note No. 2022-15 (October 2022).

And while our remaining two preferred measures have generally been helpful, they were less reliable during some periods. This is yet another reminder that, when assessing underlying inflation, we must look at a range of different types of indicators.

Assessing underlying inflation

Before I get into how we assess underlying inflation, I'm going to take you back to the importance of separating the signal from the noise. Imagine you're now leading the rollout of a new app. Some users are raving about the app's interface, some are complaining that the app crashes when syncing, and a few others are making jokes or posting sarcastic memes. The jokes and memes are the noise in this example, while both the positive feedback and complaints are signals.

When you go to make updates, would you tailor your response to just one complaint? It seems more likely that you'd look at many different reviews to try to build a picture of how the app is performing—and what needs to be done to improve it.

This is how we look at assessing underlying inflation. Our preferred measures of core inflation are an important input into this process, but they are only one input. Just like with the app, we can't base our entire assessment on one piece of feedback.

So let's lift the veil on our process a bit.

The starting point is, of course, total inflation. In August, total CPI inflation was 1.9%. At a glance, that seems pretty good—almost right at our 2% target. But our preferred measures of core inflation were giving us a very different signal—they were around 3%. One important reason for this difference was the removal of the consumer carbon tax.[3] Inflation excluding taxes was 2.4% in August.

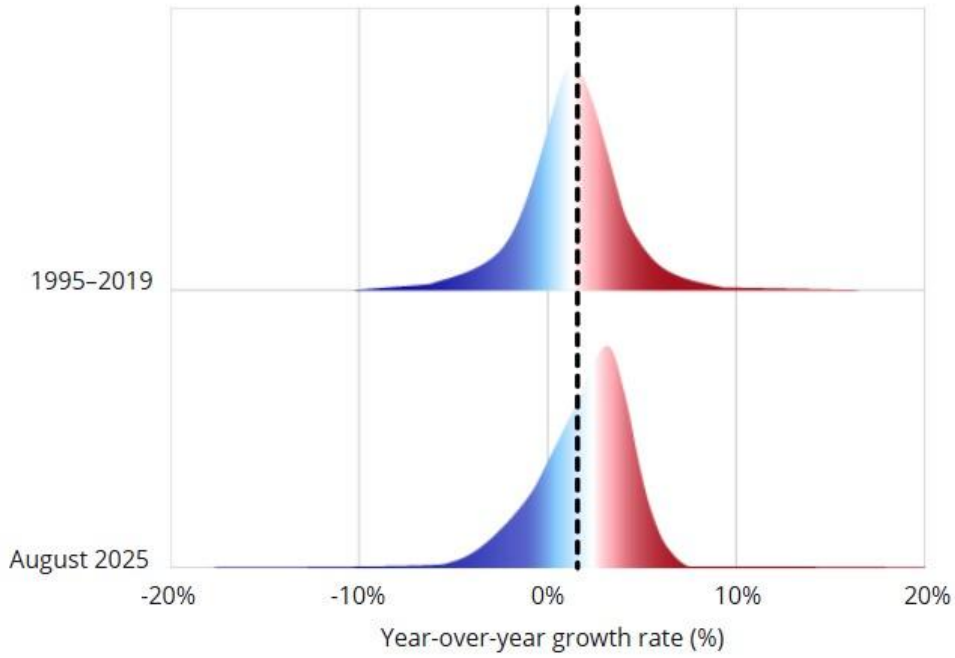
If we look more closely at core inflation, we see that all the measures we monitor rose at the start of 2025. In August, our preferred measures of core inflation were around 3%, but alternative core measures were around 2½%. So while our core measures were all telling us that underlying inflation had risen, they were giving us mixed signals on its actual level.

Beyond core inflation, measures that track the breadth of inflation—or how widespread inflationary pressures are—were consistent with inflation at around 2½%. Let me show you what this looks like. The top panel of **Chart 2** shows the distribution of inflation rates across the CPI basket in the pre-pandemic period. It looks like a perfect mountain because these rates are spread out evenly around the 2% target. Looking at the bottom panel, you can see the mountain is currently tipping to the right, meaning the distribution is tilted moderately to the upside.

[3] The consumer carbon tax was removed in April 2025. Its removal has the temporary effect of decreasing the level of the CPI by 0.6% from April 2025 to March 2026.

Chart 2: The distribution of inflation rates across the CPI basket is tilted to the upside

Density of year-over-year percentage change, monthly data

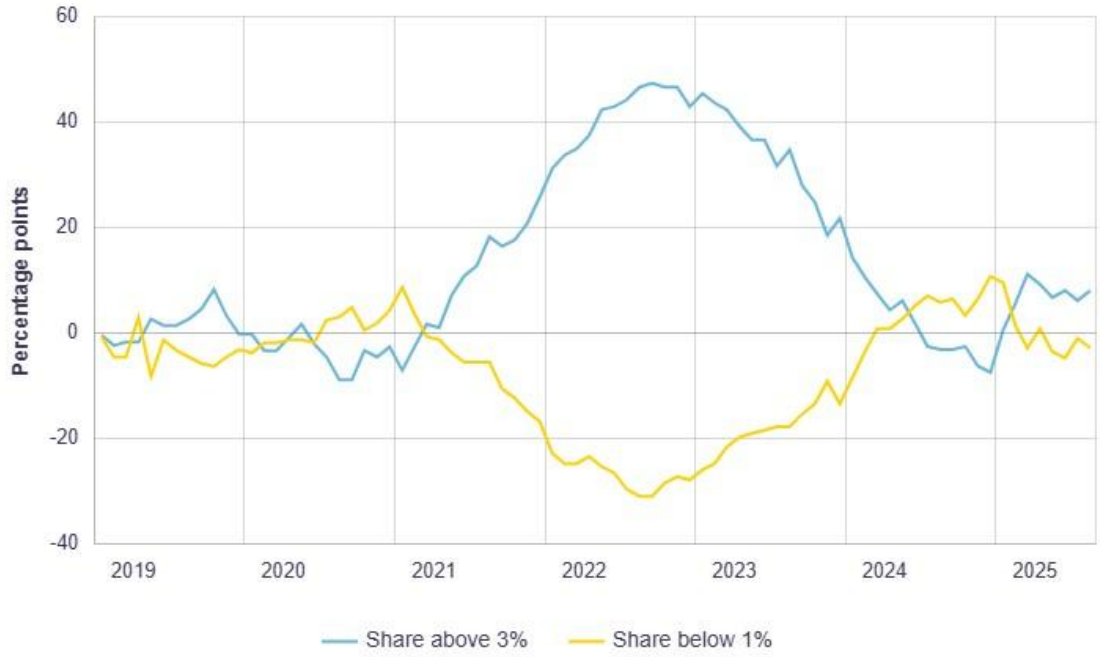


Note: This distribution displays price changes to the 55 components in the CPI basket. CPI components exclude indirect taxes and are weighted by their respective basket weights. The dashed line indicates the 2% inflation target.
Sources: Statistics Canada and Bank of Canada calculations
Last observation: August 2025

Similarly, the share of CPI components growing faster than 3% is now above its historical average, while the share of components rising by less than 1% has dipped slightly below (**Chart 3**). And **Chart 4** shows how the current breadth of inflation relates to total inflation. Where we were in August would historically have been consistent with total inflation of about 2½%.

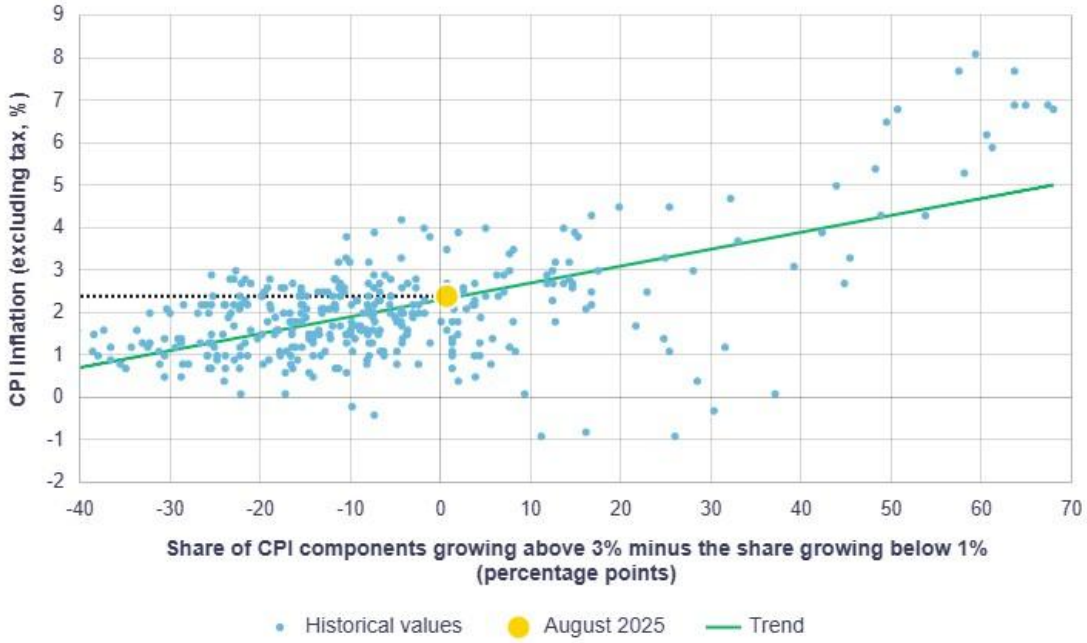
Chart 3: The share of CPI components growing above 3% has risen

Deviation from historical average



Sources: Statistics Canada and Bank of Canada calculations
Last observation: August 2025

Chart 4: The breadth of price pressures suggests inflation of around 2.5%



Note: The trend is estimated using a linear regression based on a sample from January 1995 to August 2025.
Sources: Statistics Canada and Bank of Canada calculations
Last observation: August 2025

On balance, the evidence pointed to underlying inflationary pressures above the 1.9% level of total inflation but below the 3% level suggested by the Bank's preferred core measures. Most indicators pointed to underlying inflation in the vicinity of 2½%.

I want to emphasize a couple of points about this assessment. First, it is meant to provide a rough sense of where we believe underlying inflation stands. It is not intended to be taken as a precise estimate.

Second, recalling that underlying inflation is a concept rather than a measure, we don't always put a number on it. Often, our assessment of underlying inflation leads us to conclude that it is largely consistent with the signal coming from our preferred measures of core inflation. When this is the case, we don't need to be explicit about underlying inflation.

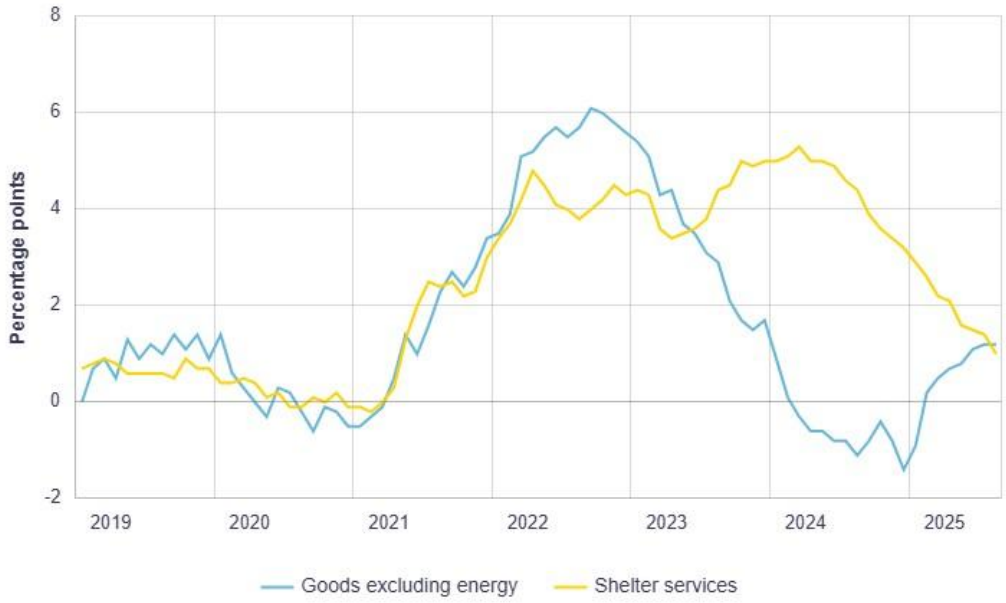
But this was not the case at the time of our July and September 2025 interest rate decisions. Underlying inflation was roughly half a percentage point lower than our preferred measures. That difference might not seem like much, but in the realm of monetary policy, it is important. Half a percentage point can mean the difference between a decision to hold interest rates steady or to cut them.

This brings me to another important point. When we assess underlying inflation, we don't just need to know its level, we also need to know what factors are behind it and how persistent those factors are likely to be. To figure that out, we look at the details of the components within the CPI basket.

Two broad categories have stood out in recent months as being responsible for much of the upward pressure on inflation (**Chart 5**). The first is inflation in prices for shelter services, which continues to trend down but is still well above its pre-pandemic average. The second is inflation in prices for goods other than energy, which has risen and is now above its pre-pandemic average.

Chart 5: A rise in inflation in prices for goods excluding energy is offsetting a decline in inflation in shelter services prices

Deviation of year-over-year percentage change from historical average (1995–2019)



Sources: Statistics Canada and Bank of Canada calculations
Last observation: August 2025

But when we looked ahead, we saw reasons to believe that underlying inflation would ease. For example, rental markets are softening, which should help keep inflation in prices for

shelter services on a downward trend. And growth in inputs costs has largely normalized, which should help cool inflation in non-energy goods prices.

As you can see, a lot more than just our preferred core measures goes into our assessment of underlying inflation.

So, I've defined underlying inflation and explained how it differs from core inflation. I've also gone over some of the indicators we look at when assessing underlying inflation. Now let's talk about the future—and the renewal of our monetary policy framework.

Underlying inflation and the renewal of our monetary policy framework

Every five years, we review and renew our monetary policy framework. These regular reviews are a strength of our system. They give us the opportunity to assess the framework's performance, reflect on what is working well and consider whether our current approach remains the best one for the future.

As I said at the start of my speech, how we assess underlying inflation—including how we use measures of core inflation—is one of the themes we are looking at ahead of our 2026 renewal. Separating the signal from the noise is never an easy thing to do when it comes to inflation. But, in the current environment, it's more important than ever.

As Governor Tiff Macklem has said, the structural tailwinds of peace, globalization and favourable demographics are turning into headwinds—and the world looks increasingly prone to shocks.[4] More frequent supply shocks could mean more variability in inflation. So we need to think about how we assess—and talk about—underlying inflation as we confront this new reality.

Before I dive in, I want to be clear that this review is still underway, so I won't have any definitive answers today. But I can share some of the questions we're exploring on this theme, along with some of our findings so far. I will break this down into three parts.

First, I'll talk about how we are re-examining some aspects of our current core measures. Second, I'll discuss some new measures and methods we're exploring as part of our broader assessment of underlying inflation. And third, I'll explain some of the work we're doing around how we talk about underlying inflation.

Can we improve our existing measures of core inflation?

I hope I've established by now that measures of core inflation are not the whole story, but they are an important element. With this in mind, we're asking ourselves if there are ways we could improve our existing measures of core inflation.[5]

Some of you have probably heard of one of the trickiest components of the CPI basket: mortgage interest costs. When we increase interest rates, we want inflation to come down.

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[4] See T. Macklem, "Flexible inflation targeting in a shock-prone world" (speech to the Bank of Mexico, Mexico City, Mexico, August 26, 2025).

[5] This work is not confined to just our preferred measures. We're looking at how all our core measures treat difficult components.

But when interest rates go up, inflation in mortgage interest costs also goes up automatically. And because many Canadians have fixed terms on their mortgages, renewal at new rates happens only gradually. So the effect on inflation can be persistent.

This poses a challenge because movements in mortgage interest costs can obscure the broader response of inflation to changes in our policy rate. It can be a source of noise.

Some of our core measures automatically exclude inflation in mortgage interest costs, while others have been designed to filter it out when its movements become extreme. While this is a good idea in theory, it hasn't always worked out in practice.

Let me give you an example. After we started raising the policy interest rate in 2022, CPI-trim correctly began to filter out mortgage interest costs. But since it's a relatively large component, its persistent exclusion limited CPI-trim's scope to exclude other, more temporary, sources of upward pressure on inflation. Because of this, CPI-trim was 2.5% in December 2024, while an alternative version that pre-excluded mortgage interest costs was 2.1%. The alternative measure was far closer to where we thought underlying inflation was at that time.

One question we are asking ourselves is whether we should revise our preferred measures and our alternative measures of core inflation so they all pre-exclude mortgage interest costs. It's something we're considering carefully, particularly as we think about how monetary policy and imbalances in the housing market interact—which is one of the other major topics we're exploring as part of our 2026 renewal.

Are there any new measures of core inflation we should look at?

Improvements to our existing measures are just the first part of this work. The second part is exploring new measures of core inflation. These would not necessarily be replacements for our existing core measures, but rather enhancements.

And we need to treat each potential new core measure like an MBA case study, asking ourselves whether there is a strong enough business case to include it in our already broad suite of indicators.

One measure that has gained attention in recent years is multivariate core trend inflation, or MCT.[6] This measure isolates the persistent part of inflation. It then decomposes that persistent part into two categories: inflationary pressures that are common across many prices in the economy and those that only affect prices in specific sectors.[7]

Initial results look promising (**Chart 6**).[8] MCT appears to be effective at telling us when the persistent part of inflation is coming from common movements across many prices. This is important because we can address these broad pressures with monetary policy.

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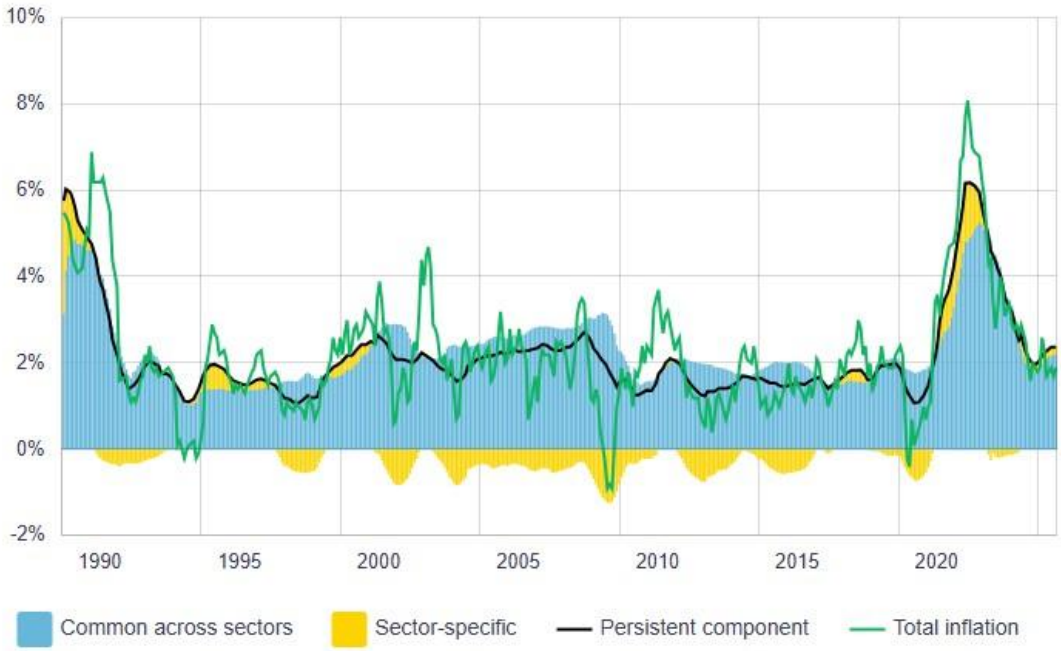
[6] J. H. Stock and M. W. Watson, "Core Inflation and Trend Inflation," *Review of Economics and Statistics* 98, no. 4 (2016): 770–784.

[7] Specifically, MCT uses a state-space approach, where the persistent component is modelled as a latent, driftless random walk—a process commonly used in the signal extraction literature.

[8] L. Uzeda, "PULSE Check: Underlying Inflation and Its Drivers," Bank of Canada Staff Analytical Note (forthcoming).

Chart 6: The multivariate core trend inflation measure breaks down the persistent component of inflation

Year-over-year percentage change



Sources: Statistics Canada and Bank of Canada calculations
Last observation: August 2025

A downside of MCT is that it will be affected by revisions, meaning the monthly estimate may change over time.[9]

Another idea we're exploring is whether artificial intelligence—specifically, using a clustering algorithm technique—can help us measure core inflation. Early results are good, but we're still assessing the robustness of this approach.

How should we talk about underlying inflation?

This brings me to the third area of work: how we talk about underlying inflation and measures of core inflation.

We've long labelled one or more measures of core inflation as our "preferred" measures. And we've said these preferred measures are "an operational guide to help the Bank achieve its inflation target." At times, this language may have led markets to place more emphasis on the preferred core measures than we do.

In practice, our preferred measures are just some of the many indicators we use to achieve our inflation target. So this raises questions. Should we broaden our list of preferred measures? Or perhaps even end the practice of identifying some measures as "preferred"?

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[9] MCT is generated using a two-sided filter approach, which makes revisions to recent estimates almost inevitable. But, unlike CPI-common, our testing suggests that large shocks don't lead to significant historical revisions. In August, MCT was slightly above 2%. This was because of persistence of sector-specific inflation while the broader component has normalized.

There are no easy answers. While all core measures sometimes give misleading signals, our preferred measures have generally proven to be helpful. And more often than not, they have provided us with a clear way to talk about underlying inflation. But we also don't want Canadians or financial markets to become overly focused on a single indicator.

Regardless of where we ultimately land, we can do more to make clear what indicators we actually look at. To this end, we're planning to start publishing an interactive dashboard next year to house our broad array of inflation indicators. While we already do this to some degree, our new inflation dashboard will include more measures and be easier to use.

Conclusion

It's time for me to wrap up. It's our job at the Bank of Canada to ensure your money retains its value. We do that by keeping inflation close to 2%. We just went through a period where inflation was much higher than 2%. This was painful for all Canadians. Our 2% inflation target served as an anchor that helped us restore price stability. So, while we are reviewing some aspects related to our inflation-targeting framework, one thing we are not reviewing this time around is the 2% target itself.

But the world around us is changing. The abrupt swings in US trade policy have shocked Canada's economy. And we're facing structural change and rising geopolitical conflict. With these shifts come the potential for more and larger shocks. That means greater volatility in prices and the possibility of higher inflationary pressures. In this environment, cutting through the noise is more important than ever.

As I said earlier, research and consultations for our 2026 renewal are ongoing. When faced with more uncertainty, we need to make sure we have the right tools to understand the factors affecting inflation. And we need to make sure we are being clear when we explain how we are using those tools.

Thank you for your time. I'd be happy to answer your questions.