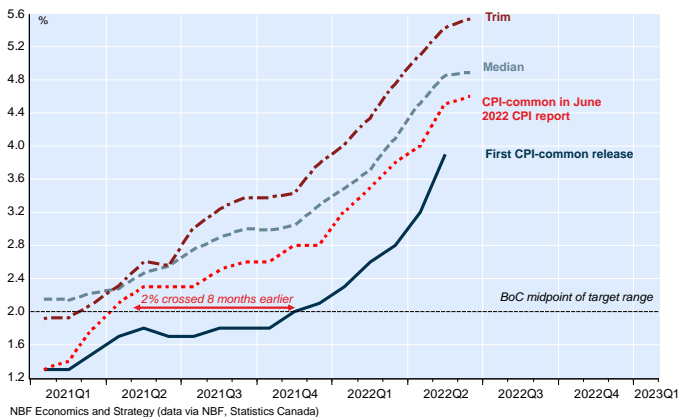


Inflation frustration: What is wrong with CPI-common?

By Taylor Schleich, Alexandra Ducharme & Matthieu Arseneau

Like us, you may have noticed a significant revision to one of the BoC's preferred core inflation measures in Wednesday's CPI report. Indeed, CPI-common, the measure the BoC has tended to favour, saw its May print revised from 3.9% to 4.5%. But there weren't just revisions to May, with significant changes over the last 15 months. While a single month's revision won't make much of a difference in the big picture, the cumulative effect over a year-and-a-half of one-way adjustments means the path for core inflation we now see is much different than we'd initially been told. Had we been armed with June 2022's estimates at the time of each month's release, we would've seen CPI-common rise above 2% in April 2021. That would've been closer in line with the trajectory of the Bank's other core measures – CPI-Trim and CPI-Median. Instead, the more tepid initial publication suggested CPI-Common didn't cross the 2% mark until December 2021. As Tiff Macklem highlighted after the BoC's 25 bp March rate hike, "CPI-common ... was only 2.3% in January". We're now told it was 3.2%.

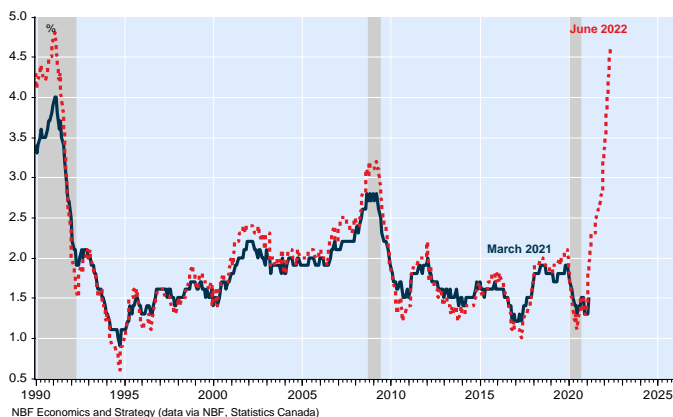
Canada: There's nothing "common" about these inflation revisions
Latest data suggests common-core inflation rose above 2% eight months earlier than first estimated



But the revisions were not limited to the recent period. We noted that data has been significantly revised for the full sample.

Revisions to CPI-common going all the way back to the 1990s

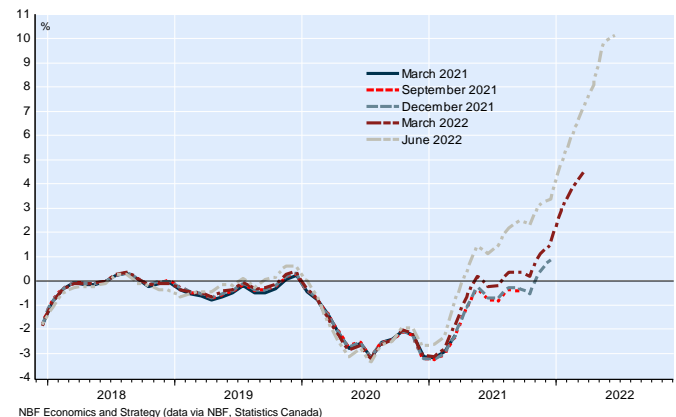
CPI-common, March 2021 vs June 2022 releases



Because the CPI-common is model-based and reevaluated over the full time series each month, small monthly revisions to the entire sample are nothing new. In 2013, [a BoC working paper](#) argued that "in the absence of significant changes to the time-series properties of inflation, we do not believe that potential future revisions to the common component of CPI are a cause for concern". It is true that revisions to the CPI-common were very limited in the past years. But frankly, the recent revisions are a cause for concern. So, what's going on here? Has there been a change in the "time-series properties of inflation"? Yes, we think you have noticed that we are experiencing a period of very high inflation compared to the last three decades. This shift has challenged the statistical method the CPI-common is based on. Sorry, but we'll need to get more technical here – we promise it will be worth it (for more details on the methodology of BoC core measures see [link](#)). The input data for CPI-common are the 55 CPI components adjusted to remove the effect of changes in indirect taxes. A first point to be aware of is that components in the CPI are never revised historically and no seasonal adjustment process is made on input data used to compute CPI-common (as opposed to CPI-trim and CPI-med). Historical revisions of input data can therefore be excluded from the cause of revisions. So, what's the next step? The 55 historical series are normalized over the entire sample. From these, a factor model is performed to pull out the first principal component that best explains the common source underlying the annual changes in the 55 series. As the below chart shows, revisions to the first principal component can be blamed for at least part of the recent revisions to CPI-common. While the result of the factor model was essentially unchanged as observations were added from March to December 2021, when annual inflation was still below 5%, the recent acceleration of inflation resulted in notable revisions to the output of the factor model for 2021 and 2022. We have pinned the first part of the problem.

The 2022 price surge has led to significant revisions to the FPC...

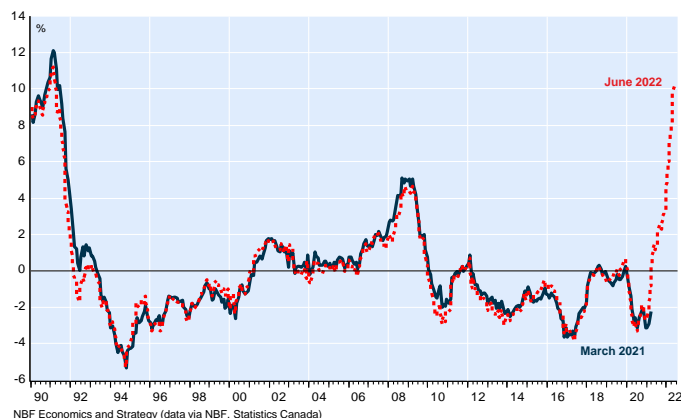
First principal component (FPC) of price variation of the 55 CPI components from March 2021 to June 2022



Still, looking at the full sample, we denote only slight historical revisions for the principal component using data until March 2021 compared to when we add the recent episode. The historical revisions to the CPI-common we recently witnessed can thus not be fully attributed to changes in the factor model. We need to continue our investigation.

... but we need to look elsewhere to explain historical revisions

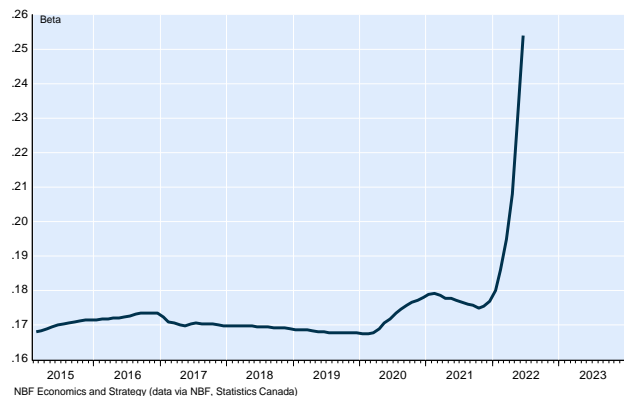
First principal component of price variation of the 55 CPI components in March 2021 and June 2022



The final step to computing CPI-common is to scale the first principal to the inflation rate with the aim to have an indicator consistent with other inflation measures. This value is obtained through a simple linear regression of the annual inflation rates of the all-items CPI excluding the effect of changes in indirect taxes against an intercept and the first principal component previously described. This is where the second part of the problem lies. It is a well-known property of linear regressions that their coefficients are highly sensitive to outliers in the data. And in terms of outliers to inflation, this past year receives the gold medal. Prices have surged, which reinforced the relation between the dependent and independent variables (leading to a higher beta after being stable over the past six years).

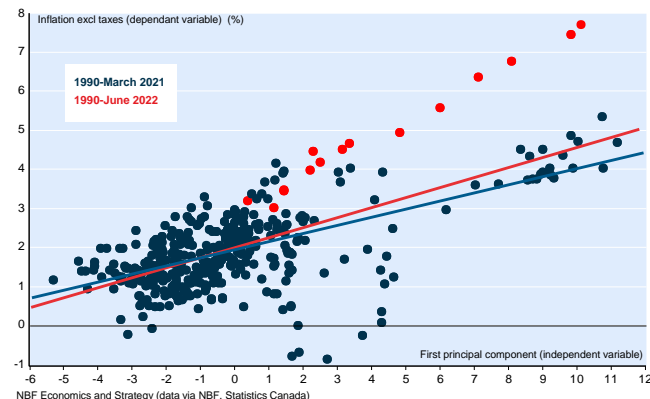
The regression coefficient has reacted to the surge in inflation

Rolling beta of : CPI excl. taxes (y/y %) = C + beta*(first principal component)



CPI-common estimations are highly sensitive to outliers

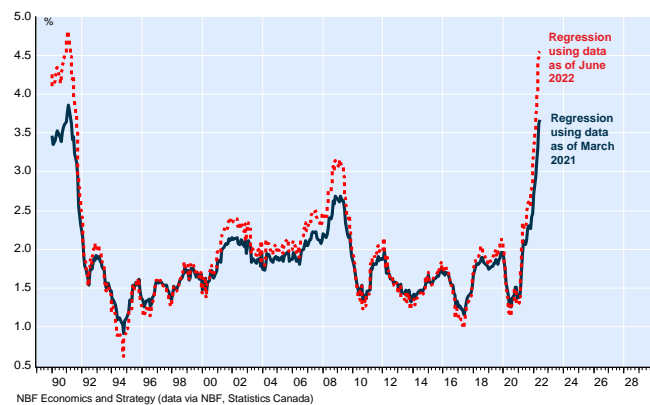
Relation between inflation excl. taxes and first principal component, 1990 to 2021M03 and 1990 to 2022M06



The beta having increased month after month means higher sensitivity to a change in the principal component over the entire sample. To illustrate this, we used the beta and the constant generated from the CPI-common regression calculated in March 2021 (before headline inflation crossed the BoC's upper range of target) and in June 2022. As per the next chart, the two simulations of resulting common inflation show significant divergence over the full sample. Had the beta and constant remained unchanged since March, CPI common would have stood at 3.7% in June 2022 instead of the 4.6% reported. Of course, this is only a means of demonstrating that the statistical method used to compute the common CPI is highly reactive to outliers in the data. We are not suggesting that the reported CPI-common was too high in June, but rather it shows how adding a minimal number of observations can change drastically the picture portrayed by this indicator.

CPI-common estimations have been sensitive to new data

CPI-common estimated until June 2022 using regressions generated in March 2021 and in June 2022



Conclusion

In the recent volatile inflationary episode, the CPI-common has not played its role of identifying the surge in underlying inflation in Canada. Given this, we're concerned that monetary policy has been set, at least partially, on a measure that has since proven unreliable and/or inaccurate. We don't want to say that today's inflation could've been fully avoided had the BoC leaned more on its

other core measures and tightened policy earlier. But tightening policy earlier—when the BoC’s other two preferred core measures were flagging stronger underlying price pressures—could’ve helped arrest some domestic demand-driven inflationary pressures (and limit the run-up in house prices that continued into 2022). An earlier start to the tightening cycle might have also meant that the Bank could’ve been more gradual in its rate hikes rather than the frantic (or “front-loaded”) pace of tightening we’re now embarking on.

In 2019, the BoC assessed the relevance of each of the core inflation components based on a list of criteria. The common CPI emerged as the winner of this assessment, receiving the top performing distinction in terms of high persistence and low volatility. But over the past year, its strengths may have become its weaknesses.

Summary of evaluation of trend-inflation measures

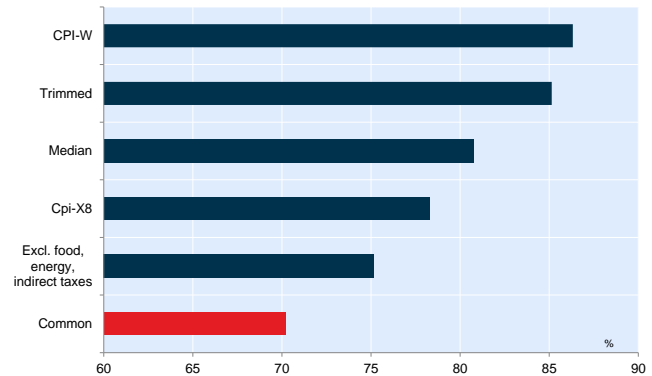


	CPI-common	CPI-median	CPI-trim	CPIX	CPIXFET	CPIW	CPIXSMIP
Unbiased	✓	✓	✓	✓	✗	✓	✗
Persistent	○	✓	✓	✗	✓	—	—
Volatile	○	✓	✓	✓	✓	✓	✓
Moves with output gap	✓	✓	✓	✗	✗	✗	✗
Looks through sector-specific shocks	✓	—	—	✗	✗	✗	✓
Methodology easily understood	✗	—	✓	✓	✓	✓	✗

Bank of Canada, “A Comprehensive Evaluation of Measures of Core Inflation in Canada: An Update,” September 2019

However, they had recognized that the methodology is not easily understood (really???). For this reason, over the past year, it has been extremely difficult for observers to raise doubts about the diverging messages sent by CPI-common compared to other core inflation measures. This past year, among all inflation measures considered by the BoC, the CPI-common has been the only one not raising flags, and even after revisions still shows the lowest annual inflation. Our confidence towards this indicator is shaken by the fact that CPI-common exhibits the weakest correlation with other core measures. Given the obvious weaknesses (and unreliability) of CPI-common, we recommend the Bank does not reiterate its confidence in this indicator going forward. Instead, we suggest focusing on CPI-Trim and CPI-median. In our opinion, these have proven better at capturing underlying inflation trends and importantly, they are easy-to-understand and are more consistent with core measures published by other central banks (i.e., the St. Louis Fed’s 16% Trimmed-Mean and the Cleveland Fed’s median CPI).

CPI common is the least correlated with other core inflation measures
Average intra-correlations with the other five measures of core inflation from 1990 to June 2022



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