Fighting Inflation after the Pandemic: Lessons for the Next Battle*

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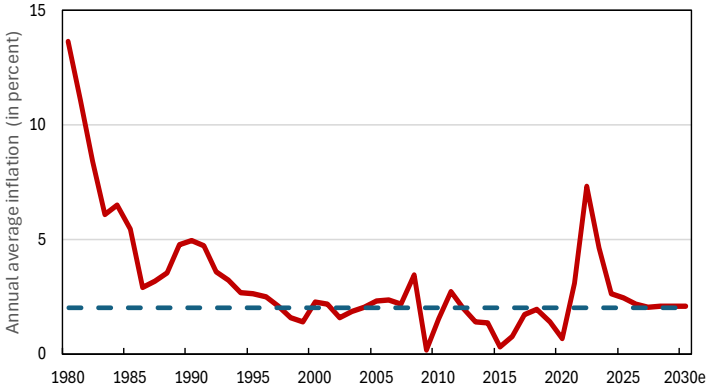
When inflation spiked in 2022 to average 7.3% in advanced economies (Figure 1)—the highest since 1982—a number of prominent economists predicted that returning inflation to targets would require sharp recessions and substantial job losses. Since then, however, inflation has fallen sharply and expected to stabilize at 2.0% in 2027[1], while unemployment rates have remained low and most advanced economies have avoided sharp recessions. In fact, some countries have avoided any recession at all.

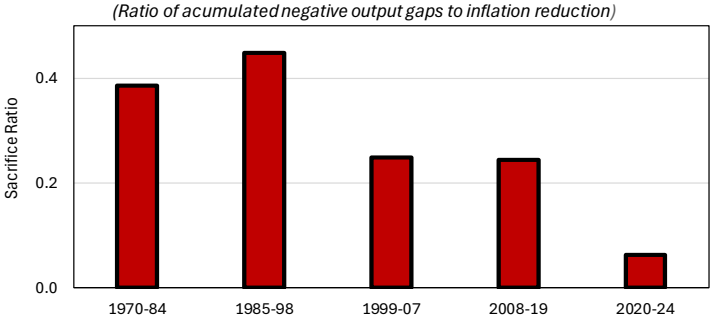
Figure 1: CPI Inflation in Advanced Economies



Note: Reports average inflation across all advanced economies.
Source: Based on data from the IMF's World Economic Outlook forecast, April 2025

Figure 2: Sacrifice Ratios during Tightening Phases

(Ratio of acumulated negative output gaps to inflation reduction)



Note: Ratio of the accumulated negative output gap to the reduction in CPI (or PCE) inflation from peak to subsequent trough over tightening phases plus 12-month lag in a sample of 24 advanced economies.
Source: From Forbes, Ha and Kose (2025).

The "Sacrifice Ratio", measured as the output losses per unit of inflation reduction, captures this apparently seamless adjustment (Figure 2); it was substantially lower during the post-pandemic period than during any historical periods of monetary policy tightening since 1970.[2] Most households, businesses and governments, however, are unlikely to agree that this was a "sacrifice free" disinflation; many were unprepared for the sharp and unexpected increases in inflation and interest rates, and continue to be unhappy with the permanent increase in prices.

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* Comments prepared for the panel "Finishing the Job and Risks Ahead" at the Hoover Monetary Policy Conference in Stanford, California on May 9, 2025. They draw heavily from research with Jongrim Ha and Ayhan Kose, both at the World Bank, and particularly our joint paper "Tradeoffs over Rate Cycles: Activity, Inflation and the Price Level" written for the NBER Macroeconomics Annual, April 2025

[1] For advanced economies, based on the IMF's forecast in the *World Economic Outlook (*April 2025*)*.

[2] See below for details on the calculation of this ratio.

What can we learn from this episode? Was the post-pandemic disinflation the unqualified success implied by the Sacrifice Ratio? Should the monetary policy strategy followed by central banks after the pandemic be a model for the next battle against high inflation?

My comments will draw three lessons from this experience, with the goal of providing insights into how central banks should respond to the next inflation shock. First, central banks should broaden their approach for defining success—taking into account the extent and duration of deviations (i.e., the impact on the price level) and not just focus on returning inflation to target with minimal output losses. Second, central banks should be wary about replicating the "start late and then sprint" approach used for tightening policy, as this involves substantial risks and costly tradeoffs. Finally, central banks should prioritize maintaining well-anchored inflation expectations and central bank credibility; these have played a critical role stabilizing inflation without larger output losses, but are weaker today and can no longer be taken for granted. This analysis and discussion draw heavily on joint research with Jongrim Ha and Ayhan Kose.[3]

While policymakers should always be cautious about drawing lessons from a recent episode (particularly when it involved a global pandemic and outbreak of war in major commodity exporters), the monetary policy response to the post-pandemic inflation provides important insights for today. Most important, central banks should be wary about reusing this playbook for the next battle with inflation. Before the pandemic, many advanced economies had a decade of inflation at—or in some cases well below—2 percent targets. This kept inflation expectations well anchored even as inflation spiked. But this is not the case today. This weaker anchoring is of most concern in countries such as the United States, where tariffs will cause inflation to pickup such that annual inflation could remain above 2% for a decade (according to a range of forecasts forecast). In this scenario, much more "sacrifice" would likely be required for central banks to fight the next battle with inflation.

Lesson 1: Define Success More Broadly to Include the Price Level

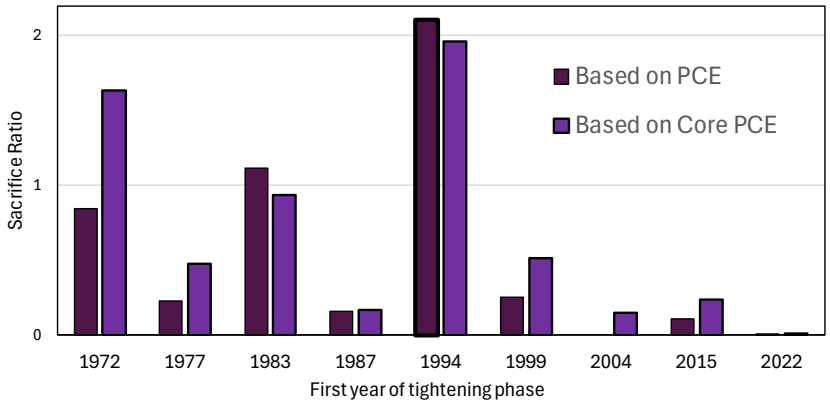
To better understand the low Sacrifice Ratios in advanced economies (Figure 2), it is useful to focus on the details for one country. I will focus on the United States, albeit the patterns are broadly shared across most other advanced economies, and the nine "tightening" phases for US monetary policy from 1970 through 2024. These are defined based on the algorithm developed in Forbes, Ha and Kose (2025), which identifies "rate cycles" as the

[3] The comments below draw heavily from Forbes, Ha and Kose (2024, 2025), including a combination of the results published in these papers as well as unpublished results from the underlying project.

tightening and easing phases for monetary policy, similar to how a business cycle includes an expansionary and contractionary phase.[4]

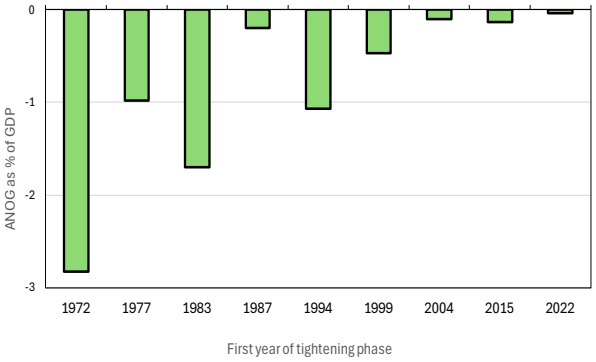
Figure 3 reports the Sacrifice Ratios for these US tightening phases, calculated as the ratio of the accumulated negative output gaps (ANOGs) relative to the reduction in PCE inflation (based on the headline or core index) from peak to subsequent trough.[5] The sharp fall in the Sacrifice Ratio during the post-pandemic period is even more striking than the average for the larger set of advanced economies (Figure 2). In the United States, the Sacrifice Ratio collapses to almost zero (0.01 to be precise)—well below the pre-pandemic average of 0.7-0.8 (based on headline and core PCE inflation, respectively) and lower than during any other tightening episode.

Figure 3: Sacrifice Ratios during US Tightening Phases
Accumulated negative output gaps to inflation reduction



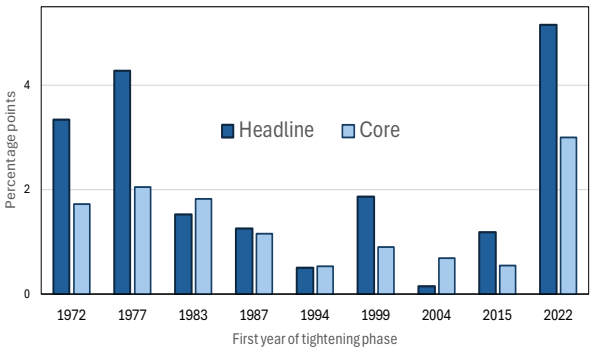
Note: The ratio of the accumulated negative output gap to the reduction in headline or core PCE inflation from peak to subsequent trough over each tightening phase plus a lag of 12 months.
Source: From Forbes, Ha and Kose (2025).

Figure 4a: Accumulated Negative Output Gaps (ANOG)
Over historical US tightening phases



Note: The accumulated negative output gap as a share of GDP over each tightening phase plus a lag of 12 months. Output gaps are based on data from Haver using an HP filter
Source: From Forbes, Ha and Kose (2025).

Figure 4b: Inflation Reduction
From peak to trough during US tightening phases



Note: Reduction in headline or core PCE inflation from peak to subsequent trough over each tightening phase plus a lag of 12 months.
Source: From Forbes, Ha and Kose (2025).

[4] This approach identifies rate cycles for 24 advanced economies based on changes in policy interest rates and major new balance sheet programs. The US tightening phases start in: 1972 (Jan), 1977 (Jan), 1983 (Mar), 1987 (Jan), 1994 (Feb), 1999 (June), 2004 (June), 2015 (Dec) and 2022 (Mar).
[5] The ratio is calculated over the tightening phase plus one year (to capture the lagged effects of monetary policy) and the output gap is calculated as a share of GDP using Haver data and an HP filter. See Forbes, Ha and Kose (2025) for details and comparable results using other measures of the output gap.

Why is the Sacrifice Ratio so much lower after the pandemic than during earlier tightening phases? To understand this sharp decline, Figure 4 breaks out the two components of the ratio. The sharp decline reflects unusual movements in both the numerator and denominator. The accumulated output loss (only -0.04% of GDP) is the smallest of any historical tightening phase, and the 5.1pp (3.0pp) reductions in headline (core) inflation, are each larger than during any US historical tightening phase since 1970.

According to these statistics, the post-pandemic disinflation appears to have been a resounding success. A quick poll of people that are not central bankers or economists, however, would likely yield a starkly different conclusion. Most surveys showed a sharp deterioration in consumer sentiment over this period and widespread dissatisfaction with the economy. This frustration was so strong that it carried over to the polls and played a key role in the turnover of many governments during this period.

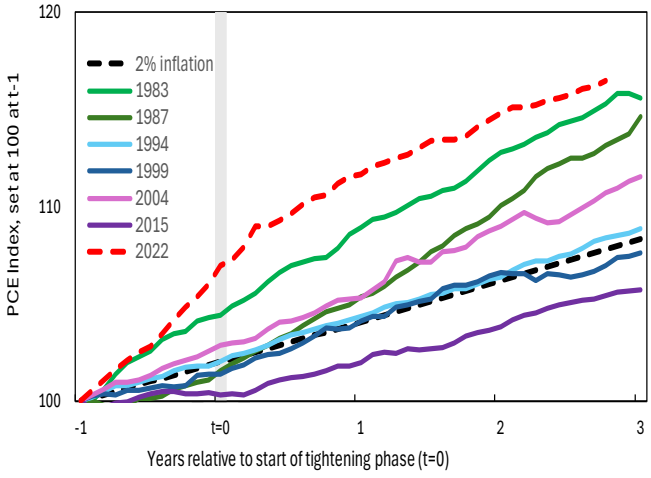
What explains this disconnect? Why were households so disenchanted with the economy during this period, despite a record low Sacrifice Ratio, avoiding the widely expected recession, low unemployment, and inflation falling quickly towards target levels?

A key factor explaining this disconnect is the concurrent increase in the price level. Figure 5 shows the evolution of the PCE price level for the United States during each tightening phase since 1980, with the post-pandemic increase in red and the path for prices if inflation was steady at 2% in black.[6]

Prices increased 17pp (cumulatively) over the four years starting in March 2021—much faster than historically occurred during tightening phases. Prices were 8 percentage points higher than they would have been if inflation had been at the target over this period. This increase in prices is even sharper than occurred during the pre-inflation targeting era in the 1980s—and undoubtedly more painful today as households and businesses had become accustomed to low inflation.

Figure 5: Price Level around US Tightening Phases

Evolution of PCE index



Source: Based on data and analysis in Forbes, Ha and Kose (2025).

[6] In each case, the price index is set at 100 one year before the start of the tightening phase. Forbes, Ha and Kose (2025) also shows these results for the two tightening phases in the 1970s, during which the price level increase during the post-pandemic period was initially larger, but then the price level increase by more to exceed that of the post-pandemic period after 2 years from the first rate hike.

While this sharp increase in the price level contributed to negative assessments of the economy and voter frustration after the pandemic, should central banks care? One of the main justifications for central bank independence is to give them the ability to make difficult decisions—e.g., "remove the punch bowl"—that may be painful and political unpopular in the short-term but benefit the economy in the medium and long run. This critique is important. Central banks should stick to their mandates and should not make decisions to be popular at one point and time.

With this caveat, large, rapid, and/or unexpected changes in the price level can have first-order effects on the transmission of monetary policy and a central bank's ability to accomplish its goals. For example, a large and/or sustained deviation of inflation from target can affect the wage- and price-setting process and can lead to the corresponding de-anchoring of inflation expectations. When inflation increased sharply after the pandemic, companies adjusted prices more often and households became more attentive to price changes, contributing to more forceful bargaining for wage increases. Even as inflation falls, these changes in behavior and attentiveness are unlikely to return to pre-pandemic levels. As a result, any inflation shock is more likely to propagate across the economy more quickly, generating larger second-round effects and further weakening the anchoring of inflation expectations (as discussed in more detail below).

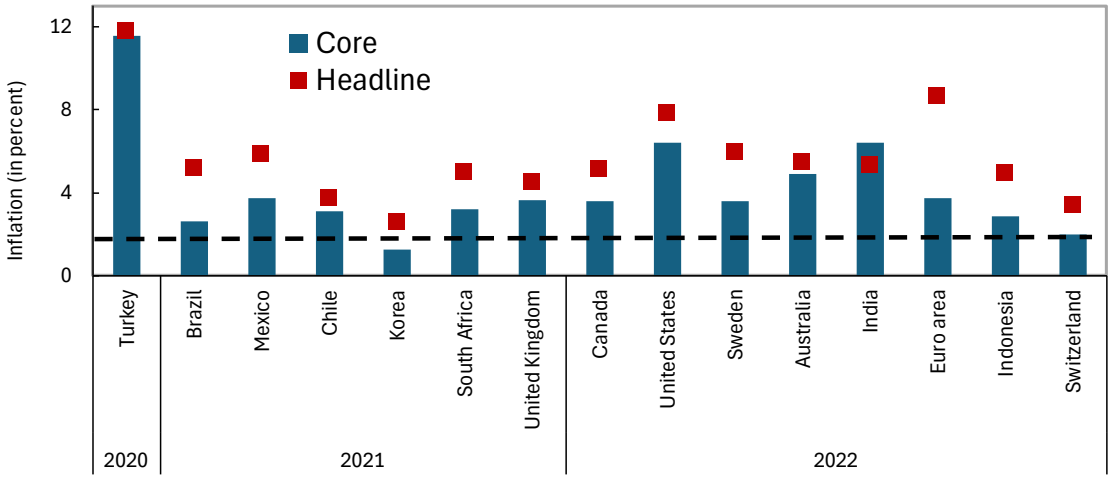
For all of these reasons, one lesson from the post-pandemic disinflation is that central banks should not just focus on returning inflation to target with minimal harm to activity, but also take into account the impact on the price level. In other words, they should evaluate the magnitude and duration of any inflation deviations when assessing different strategies to obtain their primary targets. This does not, however, imply that central banks should target the price level; the optimal response to certain types of shocks may involve large changes in relative prices and an adjustment in the overall price level. Nonetheless, even while focusing on their current targets, central banks could adjust frameworks and choose strategies that pay more attention to the price level, such as through more explicit discussion and modelling or incorporating language that they will respond "more forcefully" to larger or longer lasting deviations in inflation from targets (in both directions).

Lesson 2: Be Wary of the "Start Late and Sprint" Strategy

How could central banks adjust their monetary policy strategy if they decide to place more weight on the price level—while still prioritizing returning inflation to target with minimal output losses? A closer look at the central bank response to the post-pandemic inflation—what could be described as a "start late and then sprint" strategy—highlights the impact of decisions such as the timing of the first rate hike ("liftoff") and subsequent rate path.

When inflation picked up much faster than expected after the pandemic, central banks were slow to pivot from easing to tightening monetary policy. As a result, both headline and core inflation rates were already above central bank targets in most economies before liftoff (Figure 6). This was a sharp detour from the textbook strategy of raising interest rates well before inflation exceeds target given the "long and variable lags" for monetary policy to affect the economy. A number of factors contributed to this delay: inaccurate forecasts, belief the Phillips curve was flat so that inflation and wage growth would remain muted; caution about derailing the nascent recovery after the post-2008 stagnation; belief the inflation surge would be "transitory"; and constraints adjusting policy due to prior policy commitments through forward guidance and asset purchases.[7]

Figure 6: Inflation at Liftoff



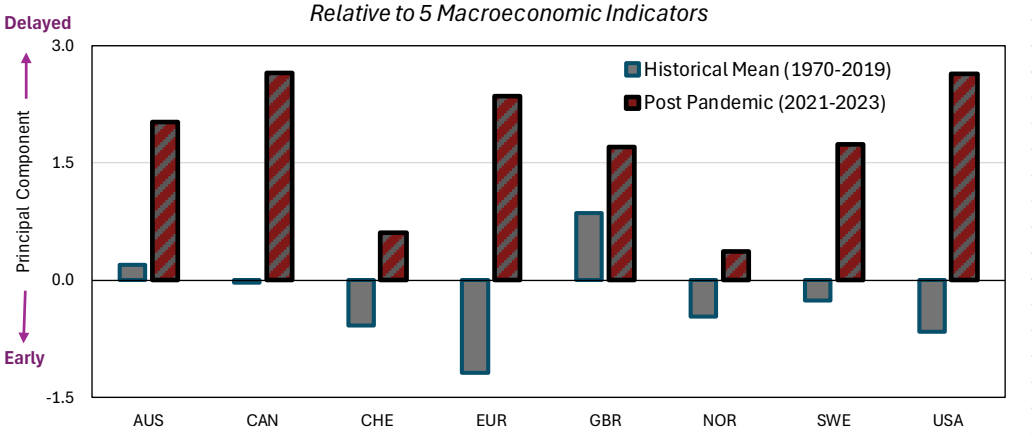
Notes: Headline and core CPI inflation rate in each country at the time of "liftoff," i.e., the first rate hike after the pandemic.
Source: English, Forbes and Ubide (2024), based on data from BIS and central bank websites.

If the spike in inflation was small, short-lived and driven by external price shocks in a way that did not affect the broader economy, this delay to liftoff may have made sense. A closer look, however, suggests that central banks were also slow to respond to the broader recovery in activity, as demand accelerated faster than expected and faster than supply. Growth bounced back, unemployment rates fell sharply, and output gaps closed. Figure 7 shows a measure quantifying the timing of liftoff based on this broader economic recovery (from Forbes, Ha, and Kose, 2025) and highlights how unusually slow central banks were to start tightening policy given the overall recovery.[8] It is also worth noting that the US stands

[7] See English, Forbes and Ubide (2024) for more discussion of these factors.
[8] This measure calculates the timing of the first rate hike during tightening phases based on a principal component of five variables: headline inflation, core inflation, output gap, unemployment gap, and GDP growth.

out as being one of the slowest (with Canada) to raise rates relative to the strength of its recovery; this likely reflected constraints from the new FAIT framework, which made it more difficult for the Federal Reserve to respond preemptively to the acceleration in inflation.

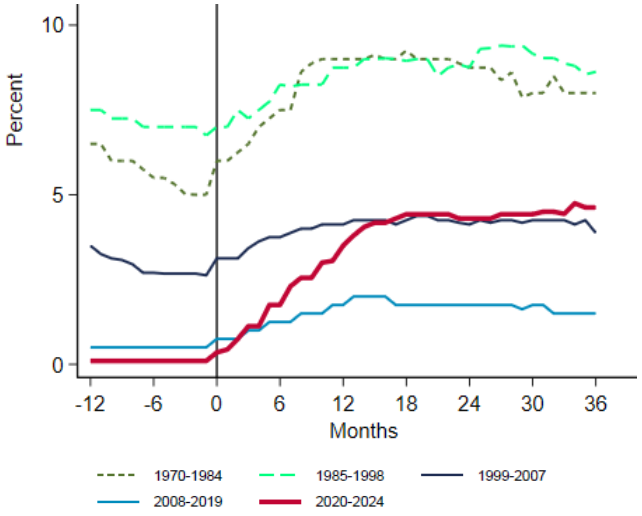
Figure 7: Timing of First Rate Hike
Relative to 5 Macroeconomic Indicators



Notes: Principal component of timing of first rate hike of each tightening phase based on: CPI (PCE) inflation, core inflation, unemployment gap, output gap and GDP growth
Source: Taken from Forbes, Ha and Kose (2025).

As central banks realized that inflationary pressures were stronger than expected and that they were late to start raising interest rates, they quickly shifted to a more aggressive strategy for tightening monetary policy. Interest rates in advanced economies were hiked much more quickly after the pandemic than any historical period since 1970-85 (based on the medians shown in Figure 8 and replicated from Forbes, Ha and Kose, 2025). These rate hikes were more aggressive than tightening phases since at least 1999 by a range of metrics, including velocity (magnitude of rate hikes over the first sixth months), amplitude (total magnitude of hikes) and pace (average hike size/months tightening). Rates were also kept at peak levels for an unusually long period of time before shifting to easing phases.

Figure 8: Policy Interest Rate During Tightening Phases
(Median across 24 advanced economies)



Note: Median policy interest rate in a sample of 24 advanced economies during tightenign phases.
Source: Forbes, Ha and Kose (2025).

How did this "start late then sprint" strategy contribute to the successes and criticisms of the post-pandemic disinflation? Regression analysis and simulations in Forbes, Ha and Kose (2025) suggests that this strategy contributed meaningfully to the low Sacrifice Ratios and large increases in the price level discussed above. More specifically, the late start contributed significantly to the large disinflations in the denominator of the Sacrifice Ratio (Figures 3 and 4b), but mainly after contributing to the larger prior increases in the price level (Figure 5). If central banks had started raising rates earlier, the price level would still have increased by more than 2% per year given the nature of the shocks hitting the economy, but by meaningfully less than actually occurred. The aggressive path of rate hikes helped bring inflation down faster, without driving up the price level, but contributed to significantly larger output losses than would have otherwise occurred.

One possible interpretation of these outcomes is that the strategy of "start late then sprint" is a model to follow in response to future inflation shocks. The delayed liftoff is with the benefit of hindsight during a period of substantial uncertainty and provided central banks with more time to ensure the recovery was on track. The output losses that traditionally result from aggressive rate hikes were mitigated in many countries through other polices—such as through fiscal policy (particularly in the United States)—and less painful due to the nature of the shocks driving inflation.

This sanguine interpretation, however, ignores three important costs for central banks (besides any fiscal costs). First, this strategy causes the price level to increase by more than would have occurred, and if this increase is large enough, it can change the transmission of monetary policy (as discussed above) and undermine support for the central bank, including the case for central bank independence. Second, more aggressive rate hikes—especially when not expected—are more likely to "break something". Households, companies, financial institutions, and even governments are unlikely to be prepared and/or hedged. In the extreme, this could generate banking collapses and undermine broader financial stability. The collapse of SVB and several regional banks in the United States shows how quickly things can "break", and although widespread contagion was contained in this episode, it was a poignant reminder of the risks from unexpected and rapid rate hikes.

Finally, this strategy of "start late then sprint" can undermine the anchoring of inflation expectations. This is such an important topic, it merits its own discussion.

Lesson 3: Do Not Take Inflation Anchoring for Granted

Over the decade before the pandemic, inflation averaged 1.5% in advanced economies and was below 2% every year from 2013 through 2020 (Figure 1). Granted, there was some

variation across individual countries, but this extended period with inflation close to (and often below) targets contributed to a strong anchoring of inflation expectations. Critical to this anchoring and window of price stability was the institutional independence and credibility of central banks in advanced economies.

This strong anchoring of inflation expectations and corresponding credibility of central banks was crucial to bringing down inflation with fairly small output losses after the pandemic. Despite the slow start to raising interest rates, and despite inflation surging to average over 7% in the advanced economies (and reaching double digits in many countries), long-term inflation expectations remained fairly close to 2% targets. This helped reduce the second-round effects to wage and price setting and avoided requiring even more aggressive rate hikes or sharp recessions to stabilize inflation. Although difficult to measure, Forbes, Ha and Kose (2025) provides estimates of how improved central bank credibility contributed significantly to the unusually low Sacrifice Ratios after the pandemic, mainly by reducing output losses (that roughly balanced the usual negative impact of the aggressive rate hikes), while mitigating even larger increases in the price level from the delayed liftoff. [9]

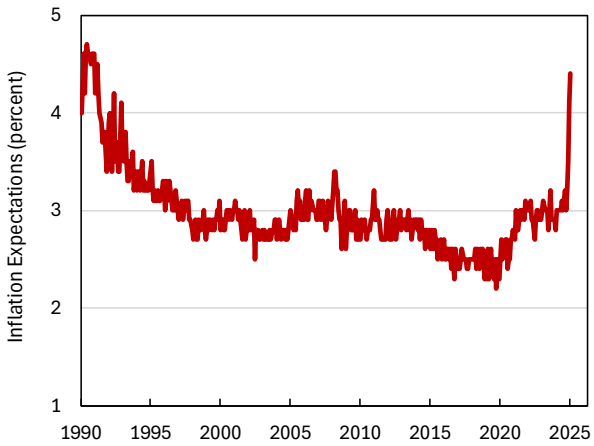
What is particularly noteworthy about central bank credibility and inflation anchoring is that they do not involve difficult tradeoffs implicit in other central bank strategies. For example, delaying liftoff has the benefit of providing central banks with more time to assess the economic outlook, but has the cost of a larger increase in the price level. More aggressive rate hikes have the benefit of reducing inflation more quickly, but the cost of larger output losses. Improved central bank credibility and more anchored inflation expectations have several benefits (lower Sacrifice Ratios, smaller output losses, and more muted increases in the price level), but no costs—at least in terms of macroeconomic outcomes.

While the post-pandemic experience highlights the importance of inflation anchoring and central bank credibility, it may also have weakened these important foundations. As discussed above, the inflation surge has made consumers and businesses more attentive to price changes and caused behavioral changes. These changes are unlikely to fade quickly even as inflation falls—from consumers' recent preoccupation with the price of eggs to businesses' faster tweaking of prices in response to changes in input costs.

[9] Forbes, Ha and Kose (2025) create a measure that is a principal component of variables measuring central bank independence and credibility from a range of sources.

As a result, long-run inflation expectations are not as well anchored as they were before the pandemic.[10] Granted, different measures often provide very different results, and in economies (such as the euro area) where inflation expectations were anchored below 2% before 2020, some of this shift may be welcome. Nonetheless, the recent upward movement to meaningfully above 2% for long-term inflation expectations in some countries is worrisome. For example, the Michigan Survey of 5-year inflation expectations in the United States has recently jumped from an average of 3.0% over 2024 to 4.4% in April 2025 (Figure 9). This is well above the peak of 3.1% during the recent inflation surge, and the highest level since 1991. Although this is just one survey in one country, there has also been an upward movement in other surveys and in other countries (such as the United Kingdom).

Figure 9: 5-year US Inflation Expectations
University of Michigan Survey



Source: Data from University of Michigan Survey of Inflation Expectations, April 2025

If inflation picks up again, and particularly if the increase is large, it will likely involve more "sacrifice" to return inflation to targets. If inflation is not as strongly anchored, even short-term or transitory increases in inflation will cause larger second-round effects on wage and price setting. Inflation will be "stickier" and slower to stabilize without even more aggressive rate hikes that cause more painful adjustments in activity. Central banks will need to be more attentive to inflation deviations and ready to respond to any inflation overshoots quickly. The "start late then sprint" strategy followed after the pandemic would be much more costly.

Conclusions

Although the battle for price stability is still ongoing in some countries, the "sacrifice" required to accomplish the large disinflation to date is much less than initially predicted. Countries adjusted to the post-pandemic inflation shocks primarily through allowing large increases in the price level and avoiding hits to activity and employment.[11] The sharp

[10] Movements in short-term inflation expectations are less worrisome as they often reflect temporary movements in gas or food prices and tend to be more volatile.
[11] Forbes, Ha and Kose (2025) proposes capturing these relative adjustments with a Price-Output Tradeoff Ratio, measured as the accumulated change in the price level relative to the accumulated output losses during tightening phases. In the United States this ratio spiked after the pandemic to well above levels during

increase in the price level, however, raised frustration with central banks and governments, made consumers and businesses more attentive to price changes, and changed wage and price setting behavior in ways that will also persist. Perhaps most disconcerting, this has likely weakened the anchoring of inflation expectations—an anchoring that was critically important in achieving the minimal output losses and low sacrifice ratios during the post-pandemic disinflation.

What are the lessons for the next time inflation picks up above target—particularly if there is an important supply-side component as occurred after the pandemic? How should the Federal Reserve—or any central banks in a country implementing tariffs—respond to the subsequent increase in import prices and inflation?

Although the impact of tariffs on inflation is different than the post-pandemic inflation surge in many important ways, there are several relevant insights. First, central banks should not focus solely on returning inflation to target at some distant point in the future while minimizing output losses; they should also consider the extent and duration of any deviations of inflation from 2%. How they balance the relative adjustments between activity and prices, however, would require a detailed welfare analysis. Second, if rate increases are necessary, central banks should try to act preemptively to avoid unexpected and aggressive rate hikes that increase the risk that "something breaks".

Finally, and perhaps most important, governments and central banks should put more weight on supporting the anchoring of inflation expectations. For governments, this implies reinforcing the independence of central banks. For central banks, this implies stronger communication and commitment to avoiding another large and/or sustained deviation of inflation from target. The anchor is weaker than in 2020 than before the pandemic and could easily break if inflation increases again before stabilizing around targets. In other words, the central bank response to the next inflation shock should be different.

historical tightening phase since 1970, and for a larger sample of 24 advanced economies, the ratio increased after the pandemic to levels not seen since 1970-84 tightening phases.

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