

Inflation reached multidecade highs in many economies in 2022. While headline inflation has since come down as supply chain disruptions have eased and commodity prices have declined, core inflation is proving stickier. The specter of high inflation becoming embedded in expectations and leading to pricing choices that keep inflation high haunts central banks. This chapter unpacks recent patterns in inflation expectations and studies their role in driving inflation, and the implications for monetary policy. Expectations from professional forecasters, financial markets, and households and a new indicator for firms' views agree about broad inflation dynamics. Historical episodes in which inflation expectations rose over a sustained period of at least a year suggest that it takes about three years for inflation and near-term (over the next 12 months) inflation expectations to come back to pre-episode levels on average, given historical monetary policy reactions. Although long-term (five years in the future) inflation expectations have generally remained anchored on average, near-term expectations have risen markedly across economies since 2022. Empirical estimates of the expectations channel point to the growing importance of near-term expectations for understanding inflation dynamics. Using a new macroeconomic model with a mix of forward- and backward-looking learners, analysis shows how economies with greater shares of more backward-looking learners prolong price pressures and diminish the potency of monetary policy, since such agents do not consider the future impacts of monetary policy. The share of backward-looking learners in the economy is estimated to be larger in emerging market than advanced economies. By fostering an increase in the share of forward-looking learners, improvements in monetary policy frameworks and central bank communication strategies can help bring inflation back to target more quickly and at a lower output cost—in other words, they can increase the chances that the economy makes a “soft landing.”

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Introduction

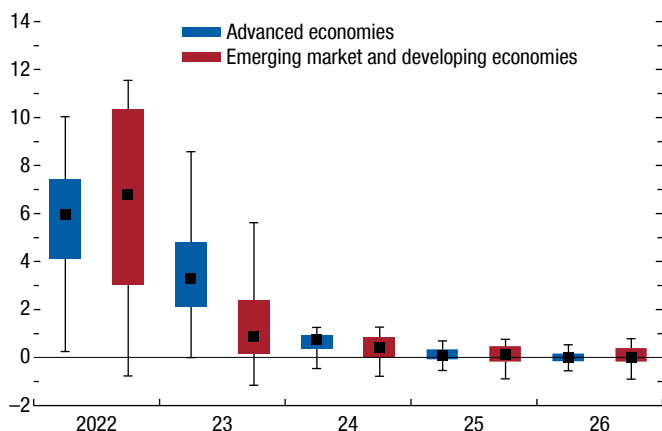
In the wake of the shocks of the COVID-19 pandemic and Russia's invasion of Ukraine, inflation around the world reached multidecade highs in 2022, well above central bank targets, particularly in advanced economies (see Chapter 1, Figure 1.7). As policy tightening gradually rebalances aggregate demand toward potential output, supply chain disruptions have eased, and commodity prices have declined, headline inflation is coming down, but underlying price pressures (as captured by core inflation) remain elevated. Professional forecasters expect inflation rates will return closer to central banks' targets in 2024, with a shift in their median deviation toward zero and a sharp narrowing of the distribution (Figure 2.1).¹ However, they also expect that, given the current contractionary stance and anticipated policy action going forward, rates will be fully back at targets only by 2026, on average.

Since consumption and investment decisions as well as price- and wage-setting processes partly reflect households' and firms' expectations about the future pace of price changes, inflation expectations play a critical role in shaping inflation dynamics. Amid the current higher inflation environment, some observers have expressed concerns that expectations could remain elevated or even rise further and long-term expectations could de-anchor from target inflation rates. In turn, expectations that future inflation will rise could feed into current inflation rates, keeping them high. If an expectations channel for inflation is important, it also means that policies that bring expectations down could help to lower inflation more quickly and easily. The idea is that the more effective monetary policy-makers are in influencing inflation expectations, the lower the cost in forgone output involved in central banks achieving their inflation objectives (Sargent 1983; Ball 1994). In other words, the expectations channel is critical to whether central banks can achieve

¹Professional forecasters are typically private sector forecasters and do not include IMF forecasters that contribute to the *World Economic Outlook* forecasts. See Consensus Economics' criteria for inclusion in their survey for further details.

Figure 2.1. Cross-Economy Deviations of Inflation Expectations from Targets
(Percentage points)

Inflation rates are expected to revert to targets, but only gradually over the next two years.



Sources: Consensus Economics; and IMF staff calculations.

Note: Inflation expectations in the figure are from professional forecasters, in order to maximize economy coverage. For each economy group, the boxes denote the upper quartile, median, and lower quartile of the distribution; the whiskers show the maximum and minimum within the boundary of 1.5 times the interquartile range.

the elusive “soft landing” of bringing the inflation rate down to target without a recession.

The relevance of inflation expectations for an economy’s inflation dynamics likely depends on the prevailing context and recent experience, as well as on the measures of inflation expectations considered (for example, near- versus long-term mean expectations). In general, when expected inflation is systematically far from actual inflation, what expectations measure is most salient for understanding inflation dynamics is an open question (Werning 2022). When inflation is low and stable at central bank targets, economic agents may become inattentive, reducing the information content of expectations (Coibion and others 2020). This may have characterized the situation in many advanced economies prior to the COVID-19 pandemic (Reis 2021). However, when inflation rises sharply or becomes volatile, then economic agents may become more attentive, and expectations may become an important driver of actual inflation.

Motivated by these considerations, this chapter aims to contribute to the large and growing literature on inflation expectations by examining alternative indicators of inflation expectations, their importance for inflation dynamics, and how their behavior may

influence monetary policy effectiveness and vice versa.² It addresses the following questions:

- How have inflation expectations across different agents and at alternative horizons behaved before and after the pandemic across economies? Are there signs of inflation expectations deanchoring since 2021? Or do the rapid interest rate hikes over 2022 appear to have contained risks?
- How important are expectations in explaining inflation dynamics, particularly since the COVID-19 shock? Does the prevailing level of inflation (high or low) affect the explanatory power of inflation expectations?
- How do expectations affect monetary policy effectiveness, and how does policy affect expectations? How does the expectations formation process affect the trade-offs that monetary policymakers face to bring inflation rates back to their targets?

Drawing on empirical and model-based analyses, the chapter’s main findings are as follows:

- *Across economic agents, movements in near-term (next-12-months) inflation expectations broadly concur, showing a sharp rise in 2022.* Survey-based measures of expectations of professional forecasters and households, financial-market-implied expectations, and this chapter’s newly constructed measure of firms’ expectations (based on the text analysis of firms’ earnings calls) fluctuate differently, but around a common trend.
- *Despite the sharp increase in inflation over 2022 across many economies, long-term (five-year-ahead) inflation expectations in the average economy have remained stable.* According to multiple metrics—including inflation target deviations, expectations’ variability, and

²Recent IMF policy contributions on the topic include Chapter 3 of the October 2018 *World Economic Outlook* (WEO), which concluded that more anchored inflation expectations improve the economic resilience of emerging market economies; Chapter 2 of the October 2021 WEO, which presented evidence that long-term inflation expectations remained anchored after the pandemic; and Chapter 2 of the October 2022 WEO, which found that the explanatory power of inflation expectations for wages after the pandemic had grown and that strong action by monetary policy to counter inflationary shocks could help ensure expectations remain anchored. Among the notable recent empirical and theoretical contributions on the topic of inflation expectations in the academic literature, see Bems and others (2021), Binder (2017), Coibion and others (2020), and Reis (2020), among many others. See also Kose and others (2019) for another overview of the literature and an examination of expectations in selected emerging market and developing economies. Note that the chapter’s focus on expectations should not be taken to suggest that they are the sole driver of inflation dynamics. They are a key contributor, but other factors are also important, as described later.

expectations' disagreement—long-term expectations have remained well anchored in most economies.

- *Historical episodes characterized by initial periods of persistently rising expectations suggest that expectations come down only slowly.* In these cases, it took about three years for inflation and near-term expectations to return to their pre-episode levels. Notably, real policy rates were lower and are now higher, on average, compared with those in past episodes, suggesting that monetary tightening since 2022 has been unusually sharp.
- *Near-term expectations are critical to understanding inflation dynamics and explain a growing share of inflation since 2022.* Using a novel causal identification strategy to estimate Phillips curves, the chapter finds a strong role for inflation expectations in the group of advanced economies. In emerging market economies, lagged inflation is also important, suggesting a greater role for more backward-looking learners. There are also signs that the pass-through from inflation expectations to inflation tends to be higher in periods of higher inflation, such as those experienced of late throughout the world.
- *The properties of the expectations formation process have a strong impact on the effectiveness of monetary policy, making central banks' understanding of them key.* A newly developed dynamic stochastic general equilibrium model with a mix of forward- and backward-looking agents that learn demonstrates that the output costs of monetary tightening rise with the share of backward-looking learners in the economy or with the prevailing level of inflation.³ The analysis also shows that both inflation expectations and inflation would decline modestly more quickly with improvements in monetary policy frameworks and communication—such as simpler and more regular messaging and better targeting of audiences—that boost the share of forward-looking learners in the economy. However, such measures may take time or be more difficult to implement than tighter cyclical policies, which come with much higher costs in terms of slowing growth.

In general, inflation dynamics depend on the shares of forward- versus backward-looking learners in the economy and their influence on expectations. If central banks

³In technical terms, the forward-looking learners form their expectations according to the standard, full-information rational expectations assumptions, whereas the backward-looking learners form their expectations through adaptive learning based on a small statistical model of the variables of interest for expectations, updating the model based on recent and past experiences only. See Online Annex 2.5 for further details.

were to focus solely on bringing inflation down quickly, they would tighten even further and reduce the time required to bring inflation rates back to targets by two years, but at the cost of a sharper economic slowdown. When policymakers choose policies to take account of the trade-offs among the objectives of inflation close to target, output at potential, and smooth policy rate paths (helping manage financial stability concerns), a scenario for a representative advanced economy facing today's inflation circumstances suggests that it is likely to take about three to four years for inflation and expectations to converge back to the central bank's target.⁴

Given the role of central banks in influencing the transmission of monetary policy, the chapter's findings suggest that they benefit from having clear understandings of the expectations formation processes at work in their economies and tailoring their communications strategies accordingly, in parallel with structural reforms to reinforce central bank independence and transparency. Managing expectations better could require investing more in data collection and monitoring of expectations, including across different agents. Technological improvements mean that alternative methods of measuring expectations—such as the text-based analysis of firms' earnings calls pioneered here—may make this more feasible.

Some caveats to the analysis and findings in this chapter should be highlighted. First, data limitations constrain the empirical analysis of inflation expectations across exercises and, especially, cross-agent comparisons. To ensure the broadest sample coverage, the chapter takes a macroeconomic perspective and focuses on mean expectations, typically among professional forecasters, rather than the distribution or behavior of individual-level expectations, which are not widely available.⁵ This may be preferable, because the analysis can provide more practical insights for

⁴Note that this conclusion is based on a stylized social welfare function (see Online Annex 2.5 for more details). See Chapter 1 of the April 2023 *Global Financial Stability Report* for a discussion of the financial stability implications of the monetary policy stance and their impact on central bank choices.

⁵Although this chapter focuses on mean inflation expectations to ensure broad country coverage, the distribution of expectations across individuals might also play an important role. See Reis (2023) and Clements, Rich, and Tracy (2023) for arguments regarding the importance for inflation of disagreements in expectations across individuals and agents. Many of the latest studies dive into the microeconomic data on inflation expectations by individuals for specific economies, contrasting their properties across agents or undertaking randomized controlled trials to identify influences on expectations. See Andre and others (2022), Candia and others (2023), D'Acunto and others (2020), Weber and others (2022), and Weber and others (2023) for recent examples.

policymakers, who likely face many of the same data constraints. Second, the causal interpretation of the Phillips curve estimates is conditional on the assumptions of the instrumental variables estimation strategy based on lags. As detailed in Online Annex 2.4, the findings are largely robust to varying the timing of the instruments, providing some comfort. However, if the underlying assumptions do not hold, then the estimates should be interpreted as associational. Third, if there have been structural breaks in the behavior of the economy, then the empirical and historical analyses may not be as informative. State dependence in the Phillips curve analysis addresses one possible form of break. The model-based analysis also affords some insurance against potential structural breaks, incorporating a limited form of structural change through learning. Fourth, the model-based analysis findings on the impact of improved monetary policy frameworks and communications on expectations and inflation are illustrative. The mapping from an increase in the share of forward- compared with backward-looking agents in the economy to monetary policy framework and communications improvements is stylized.⁶

The chapter begins by presenting patterns in inflation expectations, focusing on the postpandemic recovery. It compares them with the observed patterns after historical episodes in which expectations rose over an extended period. The chapter then uses a novel identification approach to study the channel from expectations to inflation and how well recent inflation dynamics can be explained by expectations. The penultimate section describes the results of a model-based analysis with a mix of forward- and backward-looking learning agents to examine how the expectations formation process may influence the conduct of monetary policy and vice versa. The final section suggests potential policy actions in light of the chapter's findings.

Recent Patterns in Inflation Expectations

This section first compares the recent behavior of inflation expectations across professional forecasters, financial markets, households, and firms for selected economies.

⁶Although the chapter demonstrates that improvements in monetary policy frameworks and communications are consistent with an increase in the share of forward-looking learners, it cannot exclude the possibility that other institutional or structural interventions (for example, educational attainment, fiscal frameworks, governance, and so on) could also be associated with a change in the expectations formation process. However, a full examination of these alternative interventions lies outside the scope of this chapter.

It then analyzes the evolution of near- and long-term inflation expectations of professional forecasters. Finally, it puts current macroeconomic dynamics into historical perspective by comparing them with those in past episodes in which both near- and long-term inflation expectations rose over a sustained period.

Expectations on Broad Inflation Dynamics Similar across Agents

Different economic agents may not have the same inflation expectations, reflecting their different information sets, attention, and priorities, among other factors. This subsection shows how indicators of near-term inflation expectations across agents (professional forecasters, financial markets, households, and firms) have behaved since 2017 for a selected set of four major economies for which comparable data are available (Figure 2.2).⁷ To address the scarcity of data on firm-level expectations across economies and time, a new indicator of firms' inflation expectations is constructed using text analysis of firms' earnings calls (see Box 2.1 for details). For comparability, expectations by agent type are transformed into *z*-scores.⁸

Across economies, the four agents' near-term expectations display broadly similar patterns, agreeing on the inflation upswing from 2021, but with some variation in the timing. They concur that inflation peaked in 2022 and is now on the downswing. Each of the indicators, by agent and across economies, reaches two-and-a-half to more than four standard deviations, pointing to the extraordinary size of the rise in inflation expectations during the postpandemic recovery compared with the experience since the early 2000s.

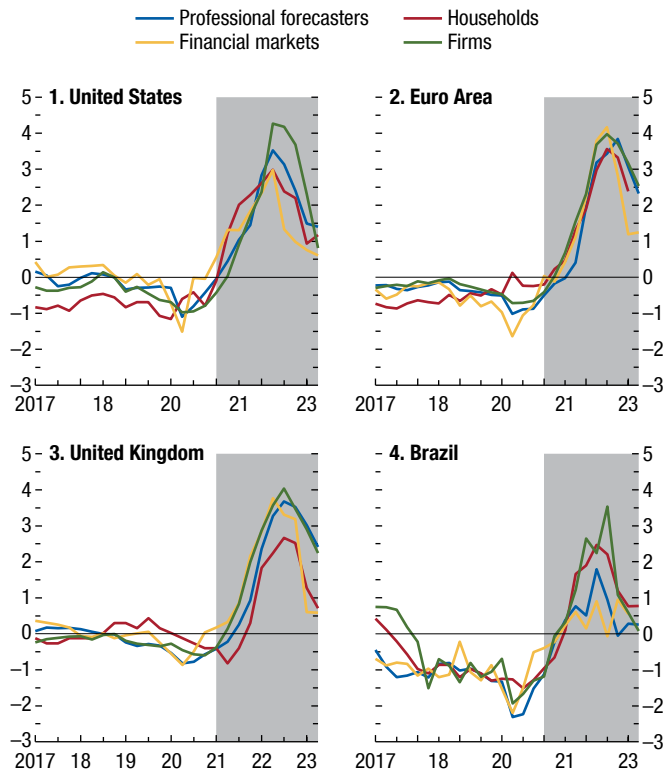
Different agents' inflation expectations exhibit slightly different properties. Households' inflation expectations appear noisier, leading and lagging movements in other agents' expectations (for the euro area and the United Kingdom, respectively). Financial-market-implied inflation expectations, derived from inflation-indexed bonds or inflation swaps, have continuous real-time availability, but disentangling the signal on expectations from the

⁷As noted in the introduction, the lack of widely available data on inflation expectations—particularly from financial markets, households, and firms—limits the economy and time coverage of the various analytical exercises undertaken in the chapter.

⁸The *z*-score transformation takes a variable and subtracts its sample mean, then divides the resulting quantity by the sample standard deviation of the variable. It is unit free and implicitly range adjusted, allowing for ready comparison of dynamics across different variables.

Figure 2.2. Next-12-Months Mean Inflation Expectations by Economic Agent
(z-score, standard deviations from the mean)

Economic agents agree on the broad dynamics of near-term inflation expectations. The sharp increases in 2022 were unusual compared to the experience of the last 20 years.



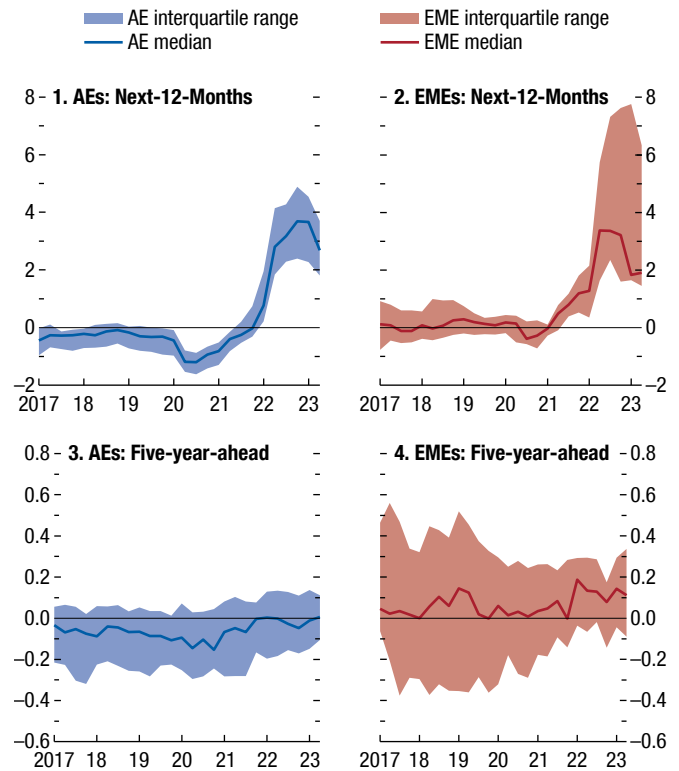
Sources: Consensus Economics; European Commission; Haver Analytics; NL Analytics; S&P Capital IQ; and IMF staff calculations.
Note: The figure shows z-scores (variable minus its mean, all divided by its standard deviation) calculated over the period 2004:Q1 to 2023:Q2 at quarterly frequency. Shaded areas in each panel highlight the period from 2021 onward, when realized inflation began notably rising.

fluctuating risk premium is challenging (Chapter 1 of April 2023 *Global Financial Stability Report*). Firms' near-term inflation expectations tend to mark the upper bound of the cross-agents expectations range during the recent inflation surge. Professional forecasters' expectations convey more signal but may suffer from herding and strategic behavior (Reis 2023).

Typically, professional forecasters' expectations fall somewhere between the more volatile, yet continuously available, market-implied and noisier household expectations. They also have the advantage of the broadest coverage among expectations measures across economies, time, and forecast horizon. As such, the analyses of the chapter mostly use the expectations of professional forecasters.

Figure 2.3. Cross-Economy Distribution of Mean Inflation Expectations over Time
(Percentage point deviation from target)

Near-term inflation expectations shot up rapidly from 2022 but are now reverting, while long-term expectations have moved only marginally, but in a narrowing range.



Sources: Central bank websites; Consensus Economics; Haver Analytics; and IMF staff calculations.
Note: Mean inflation expectations in the figure are from professional forecasters. Economies are included in the sample based on data availability. See Online Annex 2.1 for details. AEs = advanced economies; EMEs = emerging market economies.

Near-Term Inflation Expectations above Targets, Long-Term Contained

When a larger set of economies is examined, a consistent picture emerges: near-term inflation expectations in deviation from central banks' targets have risen, whereas deviations of long-term expectations have been broadly stable (Figure 2.3).⁹

For advanced economies, the period prior to the start of the COVID-19 pandemic in the first quarter of 2020 was marked by a mild undershooting of inflation expectations relative to target in both the near

⁹Central bank inflation targets are either explicit or implicit; see Online Annex 2.1 for further details on data sources. All online annexes are available at www.imf.org/en/Publications/WEO.

and long terms (Figure 2.3, panels 1 and 3). Near-term expectations rose markedly after 2021. If anything, long-term expectations in advanced economies have moved closer to inflation targets since the pandemic.

For emerging market economies, the distribution of near-term inflation expectations is somewhat wider and skewed to the upside, indicating greater variation in inflation experiences, particularly in recent quarters (Figure 2.3, panel 2). Median long-term inflation expectations have moved upward by a modest 10 basis points (Figure 2.3, panel 4). The interquartile range for long-term expectations has narrowed and shifted up somewhat. Overall, though, the patterns suggest that long-term inflation expectations have remained stable.

For both advanced and emerging market economies, multiple metrics of inflation expectations anchoring—related to the average absolute deviations from target, variability of expectations over time, and disagreement about expectations across individuals—suggest that long-term inflation expectations have stayed anchored despite recent rises in inflation (see Online Annex 2.2). Although reassuring, this anchoring of long-term expectations should not be taken for granted—it likely reflects in part the active response of policymakers to dampen price pressures.

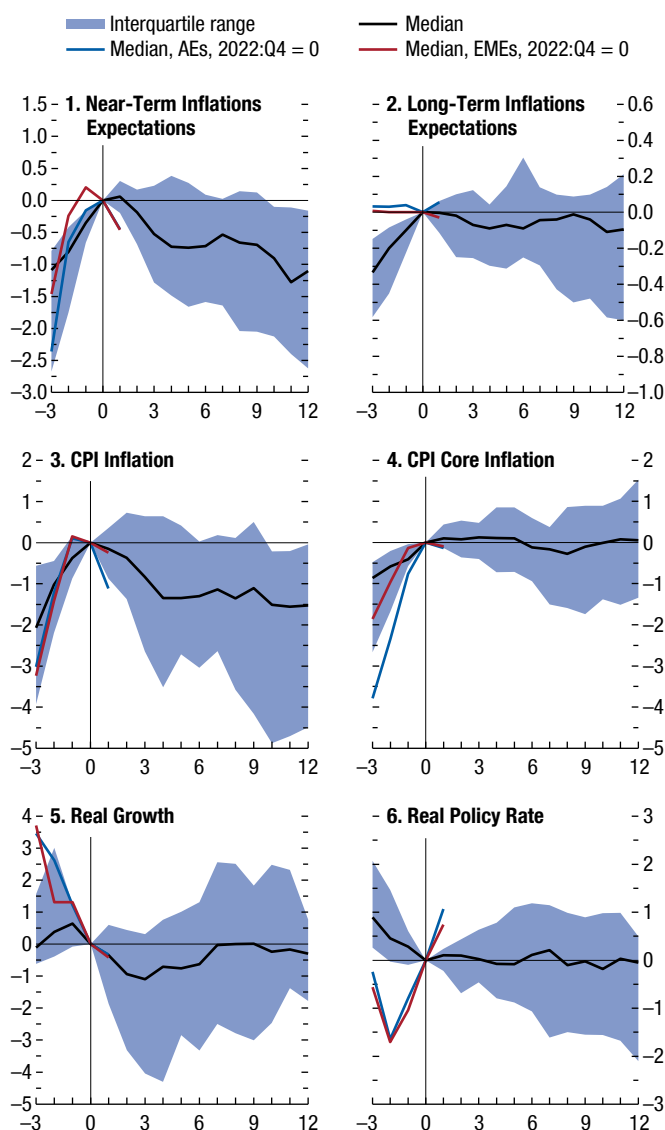
History Suggests It Can Take Time for Inflation and Near-Term Expectations to Come Down

Long-term inflation expectations have remained stable, but how unusual are the current paths of other major macroeconomic variables? To put it into historical context, the chapter compares the recent experience with that observed after historical episodes in which near- and long-term inflation expectations were rising for at least a year (Figure 2.4).

Current paths for actual inflation are so far in line with historical medians, whereas near-term inflation expectations displayed a sharper increase and a faster decline compared with those in previous episodes. After inflation expectations persistently rose over a year, economies subsequently tended to see a gradual but slow decline in headline inflation and near-term inflation expectations. Both typically take about three years to revert to their pre-episode levels, although core inflation remained stickier. However, there is a large variability across experiences, as observed in the interquartile ranges.

Figure 2.4. Historical Episodes with Persistently Rising Near- and Long-Term Inflation Expectations
(Percentage points relative to level at end of episode)

After past episodes in which inflation expectations rose persistently for a year or more, it took about three years on average for inflation and near-term expectations to come back down to pre-episode levels. Compared with those in these historical episodes, recent long-term inflation expectations have been unusually stable and real policy rate paths sharper across economy groups.



Sources: Consensus Economics; and IMF staff calculations.
Note: Horizontal axes show quarters after the end of the historical episode. All rates are expressed in annual terms. Near-term inflation expectations (panel 1) are expected inflation rates over the subsequent year on a rolling basis. Long-term inflation expectations (panel 2) are expected inflation rates in five years' time. Real policy rates are interest rates based on expected inflation. Inclusion as a historical episode requires four quarters in which both near- and long-term inflation expectations are rising. The sample spans 1989:Q4 to 2023:Q1, with exact time coverage varying by economy. A total of 32 historical episodes are identified, with 16 from AEs and 16 from EMEs. See Online Annex 2.3 for further details. AEs = advanced economies; CPI = consumer price index; EMEs = emerging market economies.

In contrast, recent paths for real policy rates and long-term inflation expectations appear different than the median paths in past episodes. On the one hand, real policy rates in 2022 were well below those in the comparative paths of earlier episodes, partly on account of the sharp and large rise in inflation. On the other hand, real rates are now well above the historical median, with the difference reflecting rapid monetary tightening and the latest falls in headline inflation. Unlike those in earlier episodes, long-term inflation expectations have been unusually stable coming into the recent high inflation regime. This is consistent with and supports the chapter’s findings on the recent stability and (so far) solid anchoring of long-term expectations.

The Role of Expectations in Inflation Dynamics

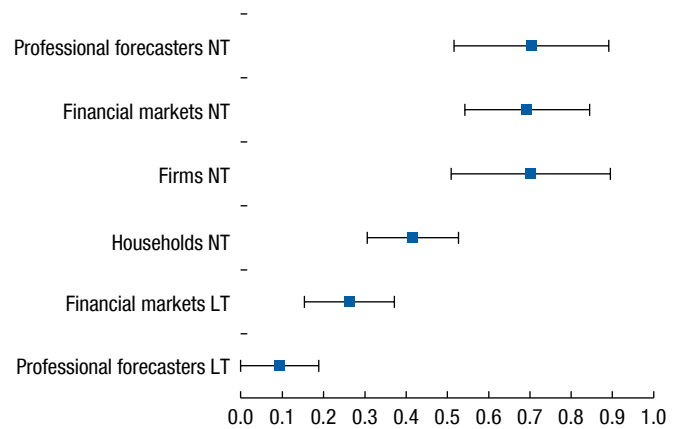
To provide a better understanding of the role of expectations in inflation dynamics, this section considers a hybrid price Phillips curve framework that relates current inflation to a set of drivers, including inflation expectations, lagged inflation, and the output gap.¹⁰ The section first assesses the explanatory power of different agents’ expectations for inflation and the relative importance of near- versus long-term expectations. Second, an instrumental variables approach is used to identify the causal impact of inflation expectations on inflation. Third, using the causal estimates, the section shows the contributions of different drivers to recent inflation dynamics for average advanced and emerging market economies. Finally, the section explores whether the effect of expectations on inflation changes with the prevailing level of inflation.¹¹

¹⁰See Chapter 3 of the October 2018 *World Economic Outlook* (WEO), Chapter 2 of the October 2021 WEO, and Chapter 2 of the October 2022 WEO for recent analyses looking at cross-economy estimates of Phillips curves (for prices and wages). Dao and others (2023) use a similar approach to analyze inflation developments in the United States and the euro area. See Online Annex 2.4 for further details on the estimation and analysis.

¹¹Other potential important dimensions in modeling the Phillips curve relationship, such as time-varying coefficients, nonlinearities, structural breaks, and the influence of higher-order moments of measured expectations, as well as alternative measures of slack, are left for future work.

Figure 2.5. Estimated Effects of Alternative Inflation Expectations Measures on Current Inflation
(Standardized regression coefficients)

Near-term measures of inflation expectations can better predict current inflation than longer-term measures. Expectations of firms, financial markets, and professional forecasters show similar performances.



Source: IMF staff calculations.

Note: The figure shows standardized coefficients from linear regressions estimated by pooled time series for the euro area, United Kingdom, and United States using quarterly data from 1991:Q2 through 2023:Q1. The dependent variable is quarterly headline inflation, seasonally adjusted at an annualized rate. See Online Annex 2.4 for details on the regression specification and additional control variables. Horizontal lines show 90 percent confidence intervals with heteroskedasticity-robust standard errors. LT = long-term (five-year-ahead; for financial markets is next-five-years) inflation expectations; NT = near-term (next-12-months) inflation expectations.

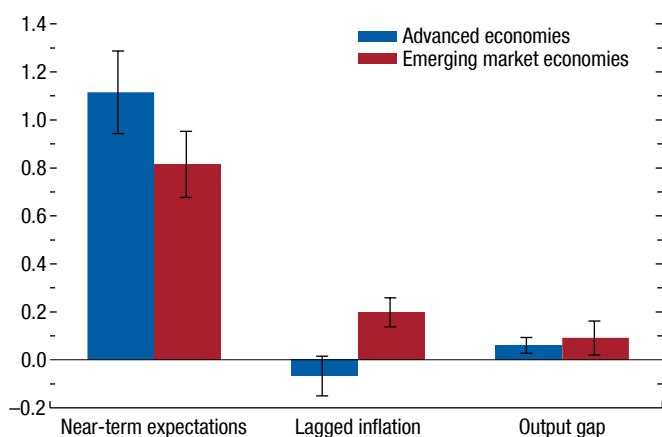
Near-Term Expectations Matter Most for Inflation

When considered one by one, alternative measures of inflation expectations (by agents or horizons) show different abilities to explain inflation when the hybrid Phillips curve model is used (Figure 2.5). The coefficient estimates represent the change in inflation associated with a one standard deviation increase in the indicated measure of expectations.¹² The first finding is that long-term inflation expectations have lower predictive power than near-term measures. Both financial-market-based and professional forecasters’ five-year-ahead inflation expectations have smaller standardized coefficients than other measures (Figure 2.5, bottom two sets of boxes and whiskers). These results are consistent with those of recent

¹²The coefficients are standardized to account for the volatility of different measures and to allow a comparison of inflation forecasts with the new index of firms’ inflation expectations, which is based on a different scale. Because of lack of data availability, this comparison can be undertaken for the United Kingdom, the United States, and the euro area.

Figure 2.6. Key Coefficients of the Hybrid Phillips Curve
(Regression coefficients)

Near-term inflation expectations play a larger role in explaining current inflation in advanced economies than in emerging market economies.



Source: IMF staff calculations.

Note: The figure shows coefficients from linear regressions estimated by pooled time series using quarterly data from 1991:Q2 through 2023:Q1. The dependent variable is quarterly headline inflation, seasonally adjusted at an annualized rate. See Online Annex 2.4 for details on the regression specification and additional control variables. Whiskers show the 90 percent confidence intervals with Driscoll-Kraay standard errors.

work that finds a small role for long-term expectations on current inflation (Werning 2022; Hajdini 2023). Second, there is remarkable consistency across professional forecasters', financial markets', and firms' near-term inflation expectations (Figure 2.5, top three boxes and whiskers). These results imply that a one-standard-deviation increase in expectations is associated with a 0.7 standard deviation increase in current inflation.¹³ Finally, the coefficient for households' near-term expectations falls somewhere between those for near- and long-term expectations of other agents.

In light of these findings and crucially because of broader economy and time coverage, the baseline specification of the hybrid Phillips curve is estimated using near-term inflation expectations from professional forecasters (Figure 2.6). The estimated relationship suggests that a 1 percentage point rise in near-term expectations is associated with a 1.1 percentage point rise in current inflation among advanced economies, whereas for emerging market economies, the rise is about

¹³Coefficients for inflation expectations unadjusted for volatility range from 1.1 to 1.4. The estimated coefficients for long-term expectations are lower than those for near-term expectations. Excluding the post-2019 period results in lower estimated coefficients, but similar patterns.

0.8 percentage point. Lagged inflation has little explanatory power in advanced economies (slightly negative but not different from zero with statistical significance), whereas in emerging market economies, the carryover from the previous quarter's inflation (about 0.2 percentage point) is statistically significant.¹⁴ Finally, the output gap has a statistically significant relationship with current inflation for both economy groups but is somewhat larger for the group of emerging market economies.

Expectations' Role for Inflation May Be Smaller Than Simple Statistical Associations Suggest

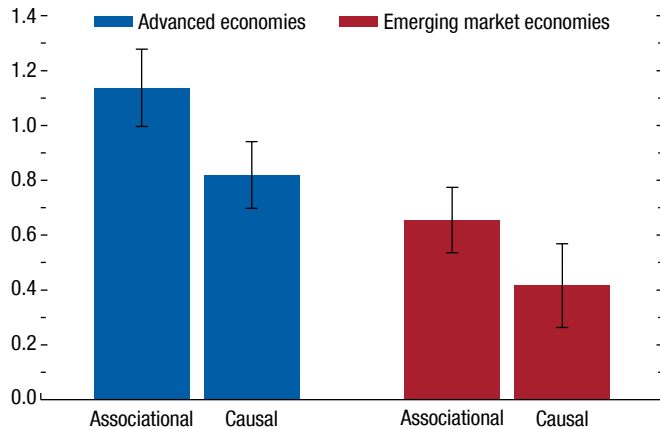
The previous results document statistical associations between current inflation and near-term inflation expectations—they do not account for the possibility that current inflation could drive expectations of future inflation or that omitted factors could be driving both. To address these shortcomings and estimate the causal effect of expectations on inflation (the expectations channel), an instrumental variables strategy based on lags of near-term inflation expectations and the output gap is used to reestimate the hybrid Phillips curve. The strategy leverages the facts that these variables display serial correlation over time (current values are strongly related to their past values) and that lags of these variables do not directly affect current inflation under the hybrid Phillips curve specification.¹⁵

¹⁴Chapter 3 of the October 2016 *World Economic Outlook* (WEO) and Chapter 2 of the October 2016 and October 2021 WEO, respectively, as well as Kamber, Mohanty, and Morley (2020), also find higher coefficients for lagged inflation in hybrid Phillips curves in emerging market economies compared with those in advanced economies. Forbes, Gagnon, and Collins (2021) demonstrate that the coefficients on lagged inflation decrease when panel estimates include only advanced economies. These studies do not explore potential causes, but the higher prevalence of price indexation in many emerging market economies may account for these findings (Céspedes and others 2005; Frankel 2010; Kganyago 2023). In addition, weaker monetary policy frameworks, on average, could also contribute to the smaller relative role of expectations. It might also be rational for adaptive learners to rely more on past inflation when indexation is more prevalent and the credibility of policymaking institutions is lower. Improvements in monetary policy frameworks and communications in emerging market economies over the past 15 years (see Box 2.2) suggest that lagged inflation could play a reduced role in these economies' inflation dynamics going forward. Finally, emerging market economies might suffer from larger measurement error on inflation expectations, which would lead to an attenuation bias and a relatively more important estimated role for lagged inflation.

¹⁵See Online Annex 2.4 for further details on the model specification, instrumental variables strategy, its performance and key results, and robustness checks. The instrumental variables estimates are stable across time periods.

Figure 2.7. Associational versus Causal Estimated Effects of Inflation Expectations on Current Inflation
(Regression coefficients)

Accounting for the influence of current inflation on expectations of future inflation in the Phillips curve reduces the estimated effects of inflation expectations on current inflation by about 30 percent across economy groups.



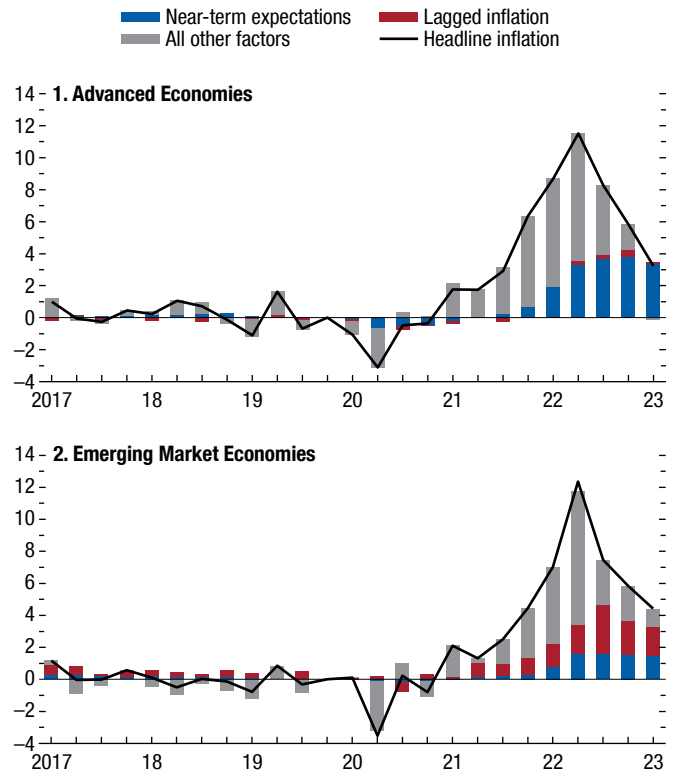
Source: IMF staff calculations.

Note: The figure shows coefficients from linear regressions estimated by pooled time series using quarterly data from 1991:Q2 through 2023:Q1. Whiskers show the 90 percent confidence interval around the estimated coefficient. The dependent variable is quarterly headline inflation, seasonally adjusted at an annualized rate. Associational estimates are computed by ordinary least squares, while causal estimates are computed using an instrumental variables approach. Models include economy and time fixed effects along with additional control variables. See Online Annex 2.4 for further details on the specification and instrumental variables strategy.

The causal estimates of the effects of near-term expectations on current inflation are about 30 percent lower in magnitude than the associational estimates (Figure 2.7). This implies that some of the observed variation in near-term inflation expectations reflects reverse causation (that is, higher current inflation drives up expectations of future inflation) or omitted factors that affect both current inflation and expectations. By removing these biases, the instrumental variables estimates provide a more accurate assessment of the expectations channel. For the average advanced economy, inflation would rise by about 0.8 percentage point for a 1 percentage point rise in near-term expectations. The pass-through estimate for the average emerging market economy is about 0.4 percentage point. The difference in magnitudes, combined with differences in the relationship of current inflation to past inflation, suggests that expectations formation in emerging market economies on average tends to be more backward looking than what is observed in advanced economies.

Figure 2.8. Contributors to Recent Inflation Dynamics
(Percentage point deviation from 2019:Q4)

A decomposition of the recent dynamics of headline inflation reveals the growing importance of near-term inflation expectations.



Source: IMF staff calculations.

Note: Bars in the figure show the contributions to average headline inflation by economy group relative to the contributions observed in 2019:Q4. Contributions are calculated using coefficients estimated by instrumental variables pooled time series with quarterly data over 1991:Q2–2023:Q1. The black lines in each panel show the average seasonally adjusted annualized quarter-on-quarter headline consumer price index inflation observed relative to 2019:Q4. The “All other factors” category includes the contributions from time fixed effects (common global factors), all other explanatory variables, and the regression residual. See Online Annex 2.4 for details on the specification and estimation.

Expectations Explain an Increasing Share of Recent Inflation Dynamics

The contribution to recent inflation dynamics of the expectations channel can be calculated using the causal estimates of the hybrid Phillips curve (Figure 2.8). For the average advanced economy, factors other than expectations and lagged inflation initially drove most of the increase in inflation that took place over 2021–22 (Figure 2.8, panel 1). These include common global factors, such as the economic disruptions caused by the COVID-19 shock, large swings in commodity prices, and global supply chain issues, as well as the economy-specific effects of energy prices and the

output gap (which may in turn reflect domestic aggregate demand measures). Even so, Figure 2.8 reveals a large and growing role for near-term inflation expectations in explaining inflation dynamics in the most recent quarters.¹⁶ In contrast, lagged inflation had a small role.

Turning to the average emerging market economy, once again factors other than expectations and lagged inflation were responsible for the peak in inflation in 2022 (Figure 2.8, panel 2). On average, expectations have played a significant but smaller role in accounting for headline inflation than among advanced economies. On the other hand, lagged inflation explained almost half of the average rise in inflation since the first quarter of 2020.

Higher Inflation Environment, Higher Pass-Through from Expectations

The final exercise in the section consists of estimating whether the pass-through from inflation expectations to current inflation varies by the level of inflation: Are there signs of a nonlinearity or state dependence in the effect of expectations on inflation? In both advanced and emerging market economies, the estimated pass-through is higher when inflation is elevated (above its economy-specific sample median; Figure 2.9). The difference is particularly large, with the coefficient increasing from 0.6 when inflation is low (below its economy-specific sample median) to 0.9 when inflation is high and statistically significant for advanced economies. These results imply that the expectations channel may be even more important in accounting for inflation dynamics at present, while inflation remains high.

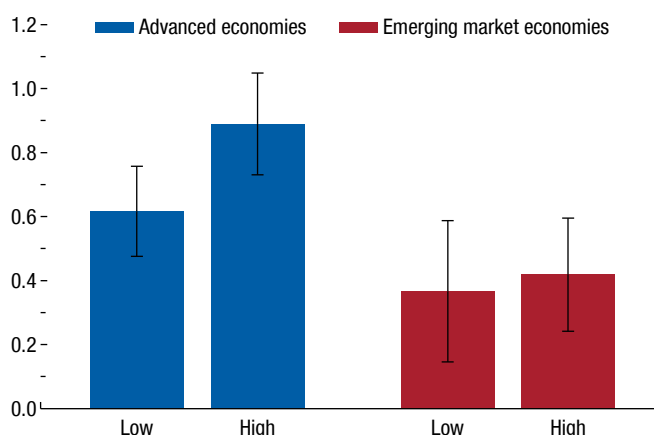
Expectations Formation and Monetary Policymaking

This section explores the question of how inflation expectations affect monetary policy effectiveness and how different policies can affect expectations. It uses a semistructural model to illustrate how the expectations formation processes in an economy

¹⁶Other factors have remained relevant in recent quarters despite a net contribution approaching zero, as shown by the gray bars in Figure 2.8, panel 1. This is because the pass-through from lower energy prices has been offset by other factors, mainly captured by quarterly fixed effects.

Figure 2.9. State-Dependent Pass-Through from Expectations to Inflation
(Regression coefficients)

The pass-through (or effect) from inflation expectations to current inflation is higher when the prevailing level of inflation is higher across economy groups. The difference in pass-through by prevailing level of inflation is larger for advanced economies.



Source: IMF staff calculations.

Note: Bars in the figure show the average estimated coefficients from regressions of headline inflation on inflation expectations by economy group, interacted with an indicator for whether lagged headline inflation was above an economy's median inflation level over the sample period. Estimation is via instrumental variables using quarterly data over 1991:Q2–2023:Q1. See Online Annex 2.4 for further details on the regression specification and estimation. The whiskers show the 90 percent confidence interval using heteroskedasticity-robust standard errors.

interact with monetary policy actions, affecting the dynamics of inflation, expectations, and economic activity.

The analysis extends the standard dynamic stochastic general equilibrium model with expectational learning by Alvarez and Dizioli (2023). The model includes price and wage Phillips curves (relating price and wage inflation to expectations, the gap between real wages and productivity, and economic slack), an IS curve (relating output to the nominal interest rate and inflation expectations), and a monetary policy reaction function.¹⁷ Two new features are incorporated into the model. First, heterogeneous agents or a mix of backward- and forward-looking learners with different information sets are added. Backward-looking learners form their expectations based on their recent experience, whereas forward-looking learners form their expectations rationally based on full information about the

¹⁷See Online Annex 2.5 for more details about the model, its structure, and its estimation.

economy, including the share of backward-looking learners. This means that forward-looking learners will behave more like backward-looking learners as the share of backward-looking learners rises in the economy.¹⁸ Second, as inspired by Blanchard and Bernanke (2023), near-term expectations are influenced by long-term expectations and vice versa. The main additional assumption is that long-term expectations have an impact on inflation only through their effect on near-term expectations. An alternative model allowing only forward-looking learners is also considered for comparison. The two models—heterogenous expectations and forward-looking learners or rational expectations only—are estimated for two representative economies (advanced and emerging market) to help capture the structural differences between the two economy groups. With heterogenous agents, the estimated shares of backward-looking learners are about 20 percent for the advanced economy and about 30 percent for the emerging market economy, with the remainder being forward-looking learners.

More Backward-Looking Learners Prolong Inflation and Weaken Monetary Policy Transmission

The propagation of shocks to the economy depends upon how expectations are formed. Following an identical cost-push shock (for example, a surprise rise in energy and commodity prices, an unanticipated supply chain disruption raising input costs, or other supply-side shocks), inflation is persistently higher when there are heterogenous agents in the economy, as compared with an economy that has only forward-looking learners. With a share of backward-looking learners in the economy, inflation expectations respond more to a cost-push shock and are stickier. Backward-looking learners assume that higher current inflation means that future inflation will be persistently higher. This prolongs the price pressures compared with those in the economy with forward-looking learners who know that the cost-push shock is transitory and do not change their inflation expectations much (Figure 2.10,

¹⁸Other expectations formation processes are possible (for example, completely anchored, unresponsive inflation expectations). The chapter does not aim to be exhaustive. It illustrates instead how a plausible mix of two highly relevant kinds of processes may affect developments.

panels 1–4). Moreover, with heterogenous agents, monetary policy has less power initially to influence inflation (Figure 2.10, panels 5–8). The main reason is that backward-looking learners do not consider the impact of monetary policy on future marginal costs, unlike forward-looking learners. Without this forward-looking component, monetary policy can influence expectations only through its direct effects on the output gap.

Higher Sacrifice Ratio with More Backward-Looking Learners or Higher Inflation

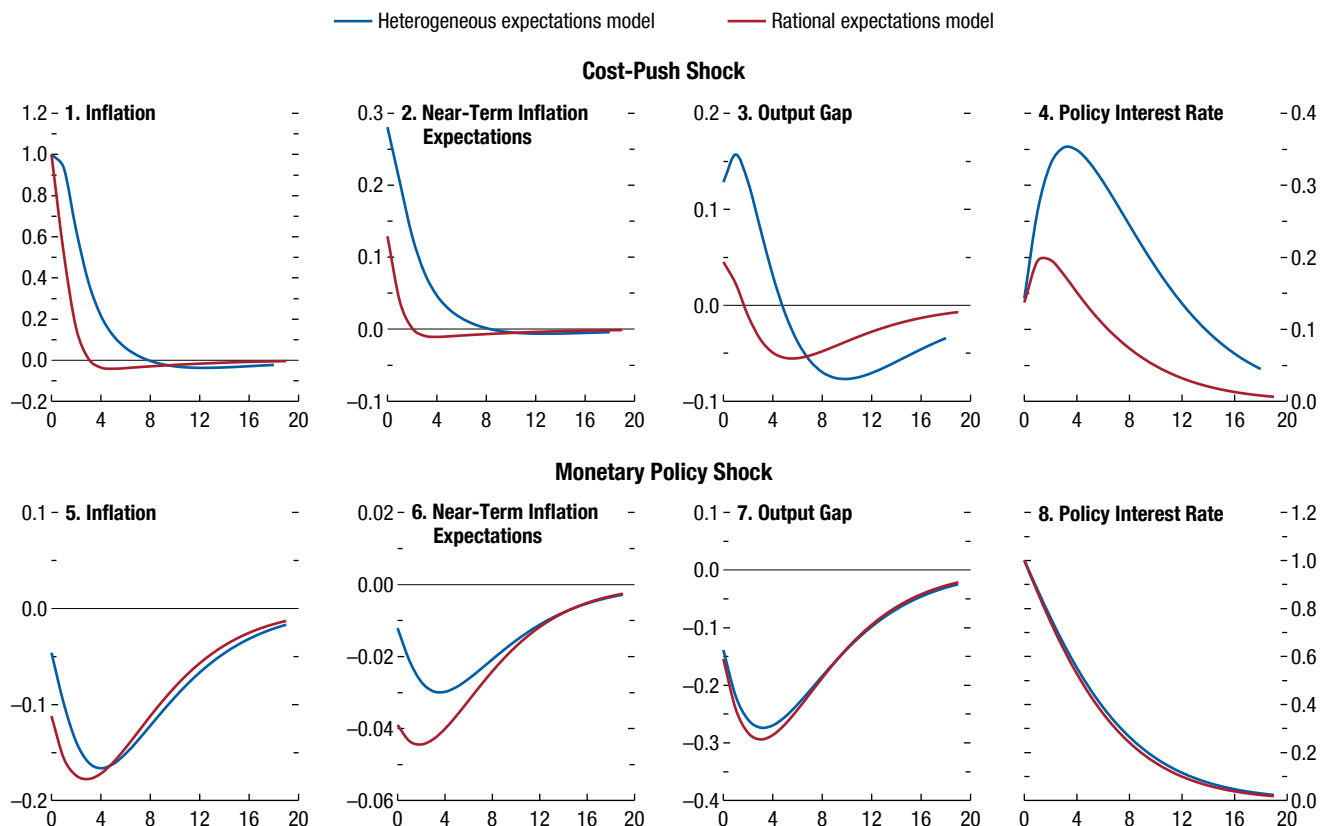
The combination of more prolonged inflationary episodes following a cost-push shock and less powerful monetary policy implies that achieving a given level of inflation reduction over a given period will be more costly in terms of output forgone. This will be reflected in the level of the sacrifice ratio, defined here as the percentage of output forgone to achieve a 1 percentage point faster reduction in the inflation rate over a three-year period (Figure 2.11).¹⁹ First, the sacrifice ratio is larger in the heterogenous agents' model than in the rational expectations model with only forward-looking learners (regardless of the economy group). The main reason for this increased sacrifice ratio is the weaker inflation expectations channel for monetary policy when there are more backward-looking learners in the economy. Second, the sacrifice ratio also tends to be higher for an emerging market than an advanced economy, as the former is estimated to have a higher share of backward-looking learners. Third, when there are heterogenous agents, the economy's dynamics become state dependent. In a high-inflation environment, backward-looking learners behave as though inflation will be permanently higher, entailing a slight endogenous inflation de-anchoring and making monetary policy's job harder (Figure 2.11, rightmost bars).²⁰

¹⁹Tetlow (2022) reports a wide range of sacrifice ratio estimates for advanced economies, with a mode of seven (similar to that presented here) across 40 different models and slightly different definitions. That said, the chapter's focus is on the qualitative comparison across cases.

²⁰To get closer to current conditions, a high-inflation environment is simulated by running the model for eight periods, with inflation 2 percentage points above target, to establish the initial conditions for the scenario.

Figure 2.10. Macroeconomic Responses to Shocks Conditional on Agents' Expectations Formation
(Percentage points)

Following a cost-push shock, inflation expectations are more sensitive when the economy has a mix of forward- and backward-looking learners (heterogeneous expectations) than when it has only forward-looking learners (rational expectations). Inflation is also more persistent. Monetary policy is less effective, as backward-looking learners do not take account of the effects of interest rate rises on future marginal costs.



Source: IMF staff calculations.

Note: Numbers on the horizontal axes in the panels represent quarters after the shock at time 0. Panels 1–4 show the impulse responses to a cost-push shock that increases inflation by 1 percentage point. Note that the output gap increases after this shock, because potential output falls by more than real GDP. Panels 5–8 show the impulse responses to a temporary monetary policy shock that increases the policy rate by 100 basis points. Note that the monetary policy shock's impact on inflation peaks after five quarters in the heterogeneous-expectations model and after three quarters in the rational-expectations model.

Monetary Policy Framework and Communications Improvements Ease Disinflation

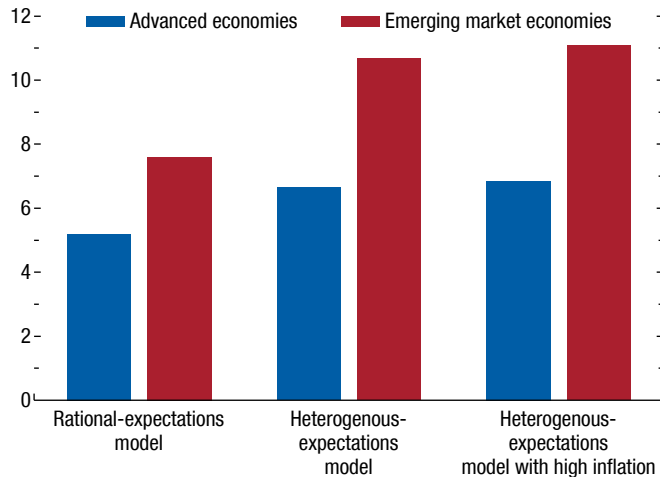
The estimated model offers a laboratory for considering how alternative policy interventions help hasten a decline in inflation. The first intervention examined is one that would lead to an increase in the share of forward-looking learners in the economy.²¹ How might such a shift be achieved?

²¹Several studies over the past several years indicate that most individuals do not understand the central bank's role in the economy and how policy rate changes affect the economy, suggesting that their expectations may be distorted. See, among others, Coibion, Gorodnichenko, and Weber (2022), ECB (2021), Kumar and others (2015), and van der Cruysen, Jansen, and de Haan (2015). Andre and others (2022) find that over a sample of 6,500 US households, households on average believe that a rise in a central bank's policy interest rate would increase inflation.

Recent studies suggest that improvements in monetary policy frameworks—encompassing central banks' independence and transparency and their communications strategies—can increase agents' attention to and understanding of monetary policy actions, helping to make inflation expectations more forward looking (Coibion and others 2020; Carotta, Mello, and Ponce 2023). Brazil's recent decision to adopt a continuous (rather than calendar year) 3 percent inflation rate target from 2025 onward is a concrete example of an improvement in operational effectiveness and communications strategy, helping to reduce uncertainty and enhance monetary policy effectiveness. Additional examples of improvements in communications strategies include actions since 2020 by the central banks of Pakistan

Figure 2.11. Sacrifice Ratios under Alternative Expectations Processes
(Percent of output forgone to lower inflation by 1 percentage point)

Sacrifice ratios are larger when economies include a mix of forward- and backward-looking learners (heterogenous expectations), as monetary policy is less effective in that case. Emerging market economies tend to have higher shares of backward-looking learners, pushing up their ratios. Higher prevailing inflation slightly worsens the ratio, as backward-looking learners raise their expectations.



Source: IMF staff calculations.
Note: The sacrifice ratios in the figure are calculated under the assumption that monetary policy is implemented to bring the inflation rate down by 1 percentage point over three years. See Online Annex 2.5 for further details on the dynamic stochastic general equilibrium model.

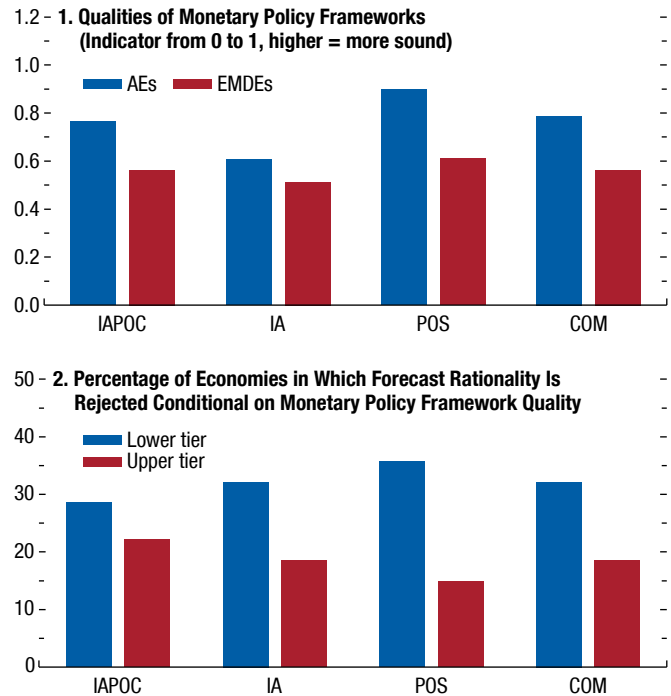
and Uruguay to announce their preset monetary policy meeting calendar in advance. Additional examples of improvements in operational effectiveness include decisions since 2019 by the central banks of Chile and Thailand to state their primary policy objective as price stability, with clearly defined numerical targets. Through the lens of the model, the chapter quantifies the potential effects of such interventions in a stylized, illustrative manner.

Moreover, an association exists between the qualities of the monetary policy framework in an economy and the likelihood that a simple forecast rationality test of mean inflation expectations is rejected (Figure 2.12; see also Online Annex 2.5). When monetary policy frameworks are weaker (in terms of central bank independence, transparency, and communications), the share of economies in which forecast rationality of expectations is rejected tends to be higher, consistent with a greater incidence of backward-looking learners.²²

²²The monetary policy framework indicators come from Unsal, Papageorgiou, and Garbers (2022). See also Box 2.2.

Figure 2.12. Soundness of Monetary Policy Frameworks and Forecast Rationality Tests across Economies

Monetary policy frameworks in advanced economies score higher along multiple dimensions, on average, than do those in emerging market and developing economies. Forecast rationality is statistically rejected more often for economies that have lower-quality monetary policy frameworks.



Sources: Unsal, Papageorgiou, and Garbers (2022); and IMF staff calculations.
Note: Panel 1 shows the mean of the indicator by economy group for which data are available (2007–21). Panel 2 of the figure shows the share of economies (among those with expectations from professional forecasters) for which a simple forecast rationality test (Lovell 1986) rejects the hypothesis of rational expectations. See Online Annex 2.7 for further details. AEs = advanced economies; EMDEs = emerging market and developing economies; IAPOC = Overall Monetary Policy Framework index, which is composed of three pillars: Independence and Accountability (IA), Policy and Operational Strategy (POS), and Communications (COM).

Further bolstering the evidence on the importance of the soundness of monetary policy frameworks, a negative association exists between the size of deviations of near-term inflation expectations (or realized inflation rates) from targets and the quality of monetary policy frameworks. As monetary policy frameworks improve, the deviations from target are smaller, implying that inflation comes back to target more quickly, on average (see Online Annex 2.7).

Although there has been a notable trend toward improving frameworks in emerging market and developing economies (Box 2.2), the quality of monetary policy frameworks and communications is higher, on average, in advanced economies than in emerging market and

developing economies. As such, the analysis of the policy intervention considers a decline in the share of backward-looking learners in the economy equal to the difference between the share of backward-looking learners in the representative emerging market versus that in the representative advanced economy.²³ With a higher share of forward-looking learners, the same monetary policy tightening path as under the baseline would have stronger effects on inflation expectations (Figure 2.13, panels 1, 3, and 5). Monetary policy is more effective not only because forward-looking learners understand the impacts on future marginal costs, but also because they know that there is a lower share of backward-looking learners in the economy and hence become even more forward looking. These results are consistent with findings highlighted in Box 2.1, in which US monetary policy is found to be more effective in shaping expectations when firms are more attentive to monetary policy than the average firm in the sector and therefore are more forward looking. The faster transmission to inflation expectations translates into a lower realized inflation path and importantly a softer landing, with only small additional output costs.

In contrast, even tighter cyclical policies (either monetary or fiscal) as additional interventions also help dampen inflation and expectations, but come with larger output costs (Figure 2.13, panels 2, 4, and 6). While the two cyclical policy interventions are not strictly comparable, they both work in part through generating lower aggregate demand initially.²⁴ Over time, then, the inflation-lowering effects of tightening feed into inflation expectations, further lowering realized inflation.

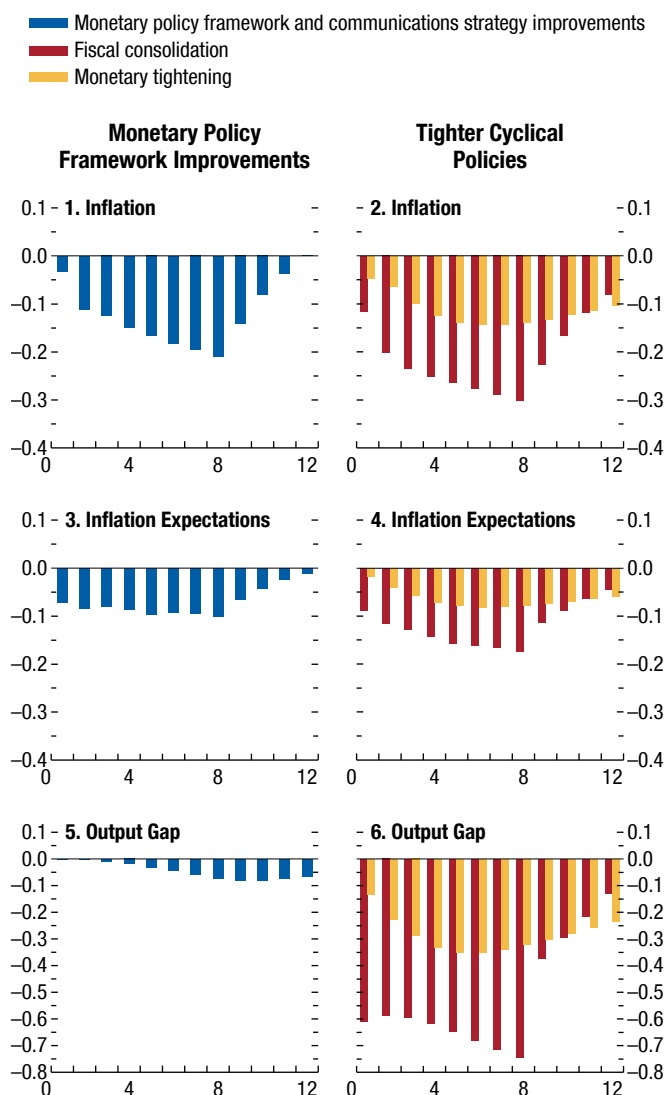
Although an improvement in monetary policy framework and communications comes with markedly lower output costs due to its primary impacts on expectations and their formation, difficulties in implementing these interventions in a timely and effective manner mean that they are not silver bullets and should be seen as complementary to usual monetary policy actions.

²³The difference in the share of backward-looking learners is about 8 percent.

²⁴Specifically, the illustration assumes standard unit policy interventions on impact, with policy persistence properties that differ across the fiscal and monetary interventions, as described in the note to Figure 2.13. Learning dynamics in the model also imply that the evolution of the system can depend on the specific properties of the intervention, as well as the prevailing context. See Online Annex 2.5 for further details.

Figure 2.13. Policy Interventions to Hasten the Reduction of Inflation and Inflation Expectations
(Percentage point, deviation from baseline)

Improvements in the monetary policy framework and communications strategy that boost the share of forward-looking learners in the economy improve the trade-off between lowering inflation and fostering growth through their effects on the expectations channel. Tighter cyclical policies—fiscal consolidation and monetary tightening—also lower inflation and inflation expectations, but at a higher output cost.



Source: IMF staff calculations.

Note: Horizontal axes show quarters since the indicated intervention at time $t = 1$. The “Monetary policy framework and communications strategy improvements” intervention assumes that the share of forward-looking learners increases, compared with the baseline, by the difference in the estimated shares in the advanced versus the emerging market economy models. The “Fiscal consolidation” intervention assumes that fiscal spending is cut by 1 percent of GDP for two years and monetary policy does not try to offset the effects of the fiscal efforts. The “Monetary tightening” intervention assumes an initial 100 basis points rise in the policy rate on impact that then declines endogenously. See Online Annex 2.5 for details on the dynamic stochastic general equilibrium model and its calibration.

Moreover, the role of fiscal policy for inflation and inflation expectations is likely more complex than what can be captured by the illustrative model here. As shown in the empirical analysis in Box 2.2, worse fiscal positions (that is, higher public debt and persistent deficits) can reduce the effectiveness of sounder monetary policy frameworks in lowering inflation expectations in emerging market and developing economies. In other words, more sustainable fiscal positions are associated with lower average inflation expectations. Even so, there may be conditions under which fiscal support measures may help to lower inflation or at least smooth out a sharp inflationary shock, as seen in Box 2.3’s analysis of the fiscal relief measures to offset the energy shock in Europe in 2022. Consumers’ perceived or expected persistence of these measures is critical to how they affect the path of inflation.

Monetary Policy Faces Inflation-Output Trade-Offs

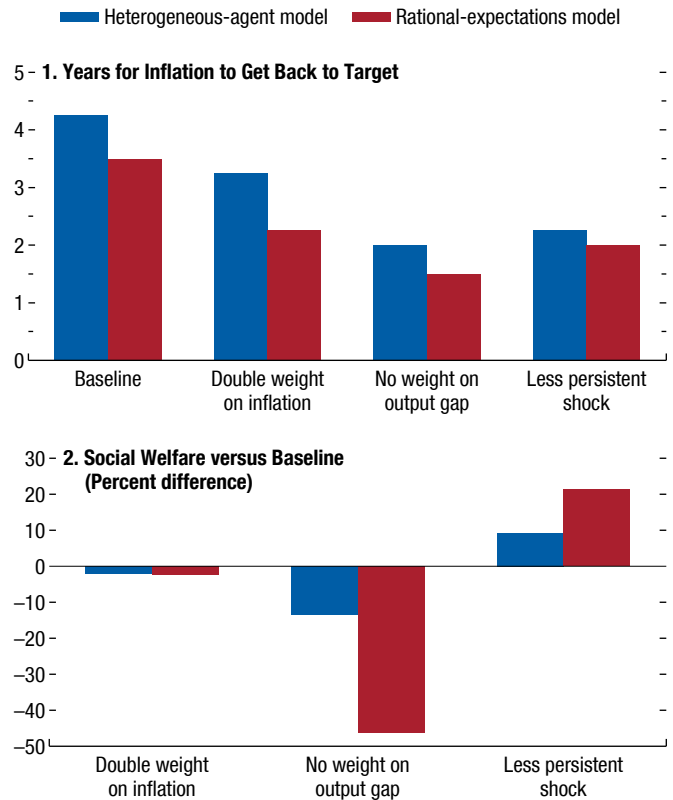
In the current context in which core inflation in many countries is more persistent than initially expected, an important question policymakers face is the timeline for bringing inflation back to target. This subsection illustrates how a central bank’s optimal choice, one that minimizes a stylized welfare loss function, would vary with its objectives and the properties of the underlying shocks in the context of the illustrative model. The baseline case assumes that the central bank seeks to minimize a function that equally weights the welfare losses from the output gap and inflation target deviations, alongside a smoother policy rate path.²⁵ In the heterogeneous agents’ model, the central bank under the baseline would opt to calibrate the policy rate path to bring inflation back to target in about four years (Figure 2.14, panel 1).²⁶ If the central bank were to accelerate this process and decided to double the weight of inflation in its objective function, then it would aim for inflation to come back to target in about three years. In a more extreme case in which

²⁵Specifically, the exercise assumes that the central bank minimizes a welfare loss function that values interest rate smoothing and equally weights output and inflation deviations (a quadratic loss function). The central bank is also assumed to know the expectations formation process in the economy and to have full information on the path of future cost-push shocks. See Online Annex 2.7 for more details on the exercise.

²⁶Since shock persistence is highly uncertain, this subsection presents two scenarios assuming different degrees of persistence. If the shock turns out to be less persistent, monetary policy will be able to bring inflation back to target in less than four years (Figure 2.14, panel 2).

Figure 2.14. Policy Objectives, Social Welfare, and Expectations Formation

After a cost-push shock, the time it takes inflation to get back to target in an economy depends on the formation of expectations and the central bank’s objectives. A greater share of backward-looking learners in the economy draws out the timeline, regardless of policy objectives. A comparison with a stylized social welfare function suggests that a faster path may come with costs unless driven by less persistent shocks.



Source: IMF staff calculations.

Note: The figure assumes that a cost-push shock raises inflation 2 percentage points above target initially. The shock has an estimated half-life of 14 quarters. In the baseline scenario, the central bank’s policy seeks to minimize welfare loss, as measured by a stylized social welfare function. The latter includes an interest rate smoothing term and weighs output gap and inflation deviations equally. Panel 2 welfare baselines differ by the expectations formation process. For an identical welfare function, social welfare is about 20 percent higher with rational than with heterogeneous expectations, reflecting enhanced policy effectiveness and lower endogenous persistence of shocks. See Online Annex 2.5 for further details on the assumed objective and social welfare functions and other aspects of the dynamic stochastic general equilibrium model. The “Less persistent shock” scenario reduces the half-life of the shock to 6.5 quarters.

the central bank cares only about inflation, it would choose to bring inflation back to target in two years. However, this latter choice entails lower welfare if society in fact values equally both minimal output gaps and inflation target deviations (Figure 2.14, panel 2).²⁷

²⁷The welfare losses clearly depend on the weights that each society would put on inflation target and output gap deviations.

Finally, if there were only forward-looking learners in the economy, then it would be optimal to bring inflation back to target in about three years. Overall, even if the cost-push shock were half as persistent as under the baseline assumptions, it would still be optimal to wait about two years to bring inflation back to target. All these scenarios show that in the presence of a persistent cost-push shock and partially backward-looking expectations, it may be optimal to use a more extended timeline over which inflation is brought to target.

Conclusions

Near-term inflation expectations rose sharply in many economies amid the economic recovery from the pandemic and after the large cost-push shocks of 2022 (from the surprise rises in energy and commodity prices and supply chain disruptions). The rise in expectations was broadly synchronous across professional forecasters, financial markets, households, and firms. In contrast, long-term expectations have remained broadly stable, on average, with no signs of de-anchoring. Past episodes with jointly rising near- and long-term inflation expectations over a sustained period indicate it took about three years on average for inflation and near-term expectations to return to pre-episode levels, although there has been wide variability across episodes.

An estimated hybrid Phillips curve suggests that near-term inflation expectations play a more prominent role in explaining current inflation than long-term expectations. Over recent quarters, the drivers of inflation have shifted from underlying cost-push shocks toward inflation expectations, particularly for the average advanced economy. For the average emerging market economy, expectations play a smaller role than lagged inflation, but still a significant one. This is particularly relevant because the pass-through of expectations to inflation increases when inflation is already elevated, as it is in the present time.

More generally, the analysis underlines the critical role of the expectations formation process for inflation dynamics and the conduct of monetary policy. With a larger share of backward-looking learners in the economy, mean expectations are more persistent and can get stuck at a higher level when inflation is higher for a sustained period. This stickiness reduces the potency of monetary policy and increases the sacrifice ratio (or cost in terms of output forgone) compared with a case in which expectations are purely forward looking.

Given the greater inflation persistence implied by having a share of backward-looking learners in the

economy, it could take up to four years to get inflation back to its target if central banks equally weigh the welfare losses from inflation deviating from target with those from output gaps. If central banks were to disregard the output gap effects of their actions and tighten more and faster, the analysis suggests they could bring inflation back to target in two years, but at the cost of lower output.

Taken together, the chapter's results and recent findings suggest that monetary policymakers benefit from having a clear understanding of the nature of expectations processes at play in their economies. Improved data on expectations could involve close monitoring and enhanced collection of information on expectations across economic agents, particularly near-term expectations which appear more important for current inflation dynamics. The performance of a novel measure of firms' inflation expectations derived from text analysis of firms' earnings calls presented in this chapter points to how technological developments have made it more feasible and cost-effective to extract timely information on expectations.

Improvements to monetary policy frameworks—particularly those that enhance central bank independence and transparency—and communication strategies have the scope to boost the share of forward-looking learners in the economy and thereby the effectiveness of monetary policy (Dincer, Eichengreen, and Geraats 2022). Recent literature suggests that exposure to news improves the precision of perceptions and expectations, increases confidence, and lowers dispersion of beliefs (Lamla and Vinogradov 2019). Haldane, Macaulay, and McMahon (2020) recommend that central bank communications strategies should start with the three Es: explanation, engagement, and education. Focusing on household and firms, other recent contributions suggest addressing inattention by taking account of audience segmentation and using sources of communication that have been identified as most relevant for people with more backward-looking expectations—for example, television in the United States and euro area (see Coibion and others 2020, D'Acunto and others 2020, and Weber and others 2022, among others). They also suggest shaping messages that are simple and repeated often, investing in financial literacy education, emphasizing the goal and not the instruments (for example, former European Central Bank President Mario Draghi's 2012 “whatever it takes” speech), and targeting the message to the conjuncture. These communication strategies can help economic agents become aware of, understand, and internalize the effects of monetary policy decisions.

Box 2.1. Firms’ Inflation Expectations, Attention, and Monetary Policy Effectiveness

The inflation expectations channel can improve when firms pay greater attention to monetary policy and develop a stronger understanding of what it means for their business prospects. However, surveys of firms’ inflation expectations are scarce and time consuming to implement (Coibion and others 2020). This box introduces a new firm-level index of near-term inflation expectations based on text analysis of firms’ earnings calls and presents preliminary findings on how firms’ attention to inflation can influence the effectiveness of monetary policy.

An index of firms’ attention to monetary policy is built in this box using a text analysis of firms’ earnings calls. Details of its construction feature in Albrizio, Dizioli, and Simon (2023) and are similar to those for the firm-level index of inflation expectations, as described in Online Annex 2.6. Specifically, an index for US firms’ attention to the Federal Reserve is constructed based on the frequency of sentences discussing monetary policy in their earnings call transcripts (see Figure 2.1.1 for an aggregate picture).

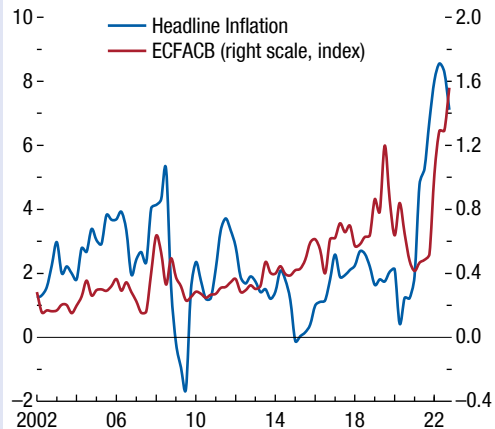
Dynamic responses are estimated using local projections to assess the effect of a monetary policy shock on a firm’s inflation expectations, conditional on the firm’s attentiveness to monetary policy.¹ Attentiveness by firm is de-measured by sectoral average attentiveness in the regression. Because of the de-meaning and the inclusion of time fixed effects, the interaction between the monetary policy shock and attention reflects the marginal effect of monetary tightening on a firm’s inflation expectations from its being more attentive. More attentive firms decrease their inflation expectations by about 1 percent of one standard deviation more than the average after four quarters (Figure 2.1.2).² This corresponds to an amplification of about one-fourth to the sector’s average negative response. The results bolster the chapter’s argument that monetary policy is more effective when monetary policy frameworks and communication strategies help improve agents’ trust in central banks and their understanding of central banks’ monetary policy decisions.

The authors of this box are Silvia Albrizio, Pedro Vitale Simon, and Allan Dizioli.

¹The specification includes an interaction between a US monetary policy shock measure (from Acosta 2023) and an attention index, firm and time fixed effects, and firm-level controls, based on Ottonello and Windberry (2020). Firm-level controls include sales growth, leverage, employment, total assets, and share of current assets in total assets. Standard errors are two-way clustered by firms and time.

²The shocks have been scaled to have unit standard deviation.

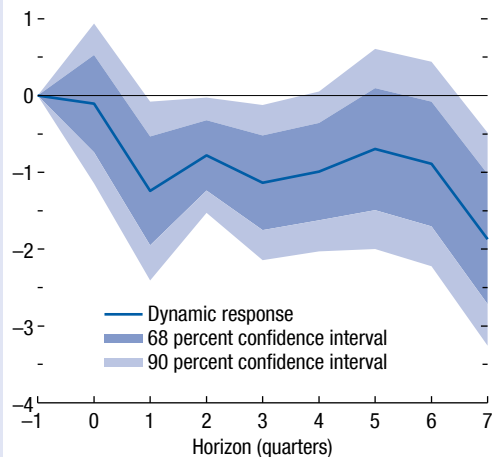
Figure 2.1.1. US Inflation and Firms’ Attention to the Federal Reserve
(Percent, unless noted otherwise)



Sources: NL Analytics; S&P Capital IQ; and IMF staff calculations.

Note: The figure shows an index of firms’ attention to the central bank (right scale), extracted from earnings call transcripts and actual inflation (left scale). The index is calculated by applying text-based analysis using transcripts of US-based companies’ earnings calls and measures the intensity of discussion related to the Federal Reserve. ECFACB = Earnings-Calls-based Firm Attention to the Central Bank index.

Figure 2.1.2. Role of Attention in Monetary Policy Effectiveness
(Percent of ECFIE standard deviation)



Sources: Haver Analytics; NL Analytics; S&P Capital IQ; S&P Compustat; and IMF staff calculations.

Note: The line in the figure is the estimated cumulative impulse response to a one-standard-deviation contractionary monetary policy shock for a firm that is one standard deviation above the average firm attentiveness in its sector. Shaded areas represent 68 (outer) and 90 percent (inner) confidence intervals. ECFIE = Earnings-Calls-based Firm Inflation Expectations index.

Box 2.2. Fiscal Imprudence and Inflation Expectations: The Role of Monetary Policy Frameworks

Fiscal imprudence—high levels of public debt to GDP—is generally regarded as having the potential to generate uncertainty and influence inflation expectations by eroding perceptions of monetary policy credibility and independence.¹ That much has been clear since the work of Sargent and Wallace (1981) and Leeper (1991). This box empirically examines how the level of inflation expectations is related to an economy’s monetary policy framework, given the level of public debt.

In the study presented in this box, the soundness of monetary policy frameworks is captured by a new index, the IAPOC index, developed by Unsal, Papageorgiou, and Garbers (2022).² It shows that even after economy-specific controls and time-invariant characteristics are accounted for, higher public debt is associated with expectations of higher inflation, given a specific level of monetary policy framework (Figure 2.2.1, panel 1).³ This heightened impact is even more evident when the focus is on the stock of public debt in foreign currency and exacerbated when fiscal deficits are persistent (Figure 2.2.1, panel 2). However, as monetary policy frameworks are improved (as seen with the shift in the IAPOC index distribution in emerging market and developing economies over the past 15 years), inflation expectations become less sensitive to the level and composition of public debt or persistent fiscal deficits.

Overall, the study findings indicate that difficulties posed by higher public debt levels for managing inflation expectations in emerging market and developing economies could be eased by adopting strong monetary policy frameworks. Whereas monetary policymaking

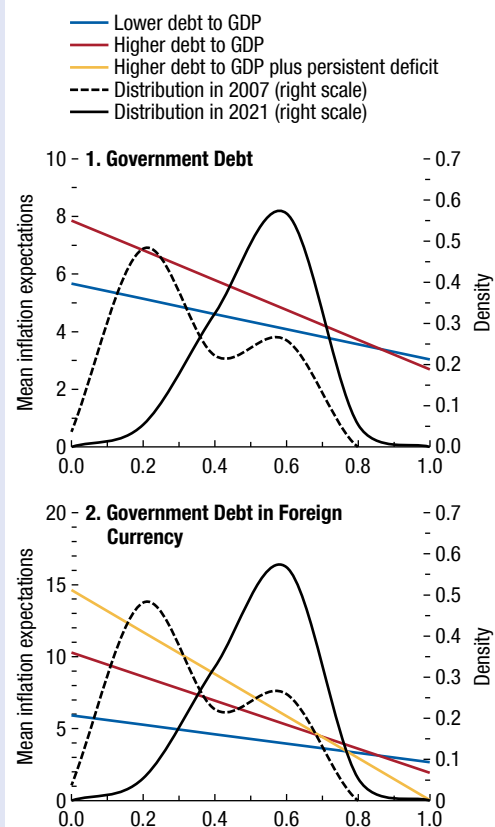
The authors of this box are Omer Akbal, Mariarosaria Comunale, Marina Conesa Martínez, Chris Papageorgiou, and Filiz Unsal.

¹See Brandao-Marques and others (2023) for a recent empirical study of the issue and Bianchi and Melosi (2022), Bianchi, Faccini, and Melosi (2022), and Cochrane (2022) for theoretical arguments.

²The IAPOC index and its subindicators quantify the soundness of monetary policy frameworks across countries through three pillars: Independence and Accountability (I and A), Policy and Operational Strategy (P and O), and Communications (C). This comprehensive index enables a multidimensional characterization of monetary policy frameworks—going beyond monetary policy or exchange rate regime classifications—across 13 advanced economies and 37 emerging market and developing economies. See Unsal, Papageorgiou, and Garbers (2022) for further details. The data set has been updated to 2021.

³Advanced economies do not show this differential sensitivity to debt levels over different IAPOC index scores.

Figure 2.2.1. Inflation Expectations in Emerging Market and Developing Economies: Monetary Policy Frameworks and Public Debt Interactions (Percent)



Sources: Consensus Economics; Unsal, Papageorgiou, and Garbers (2022); and IMF staff calculations.

Note: Horizontal axes show the IAPOC index level. The lines show the marginal effects of monetary policy framework changes (according to the IAPOC [Overall Monetary Policy Framework] index) on mean inflation expectations, conditional on the ratio of total (foreign-currency) government debt to GDP. “Higher (lower)” debt is the average debt to GDP, conditional on its being above (below) the sample mean. Estimates are from a fixed-effects panel regression across economies of mean inflation expectations on the interaction of the IAPOC index score and debt to GDP. Distributions represent the density of the IAPOC index for the assessed economies in 2007 (dashed) and 2021 (solid), with a rightward shift indicating improvement.

in many of these economies is better equipped than 15 years ago to serve as an anchor of stability, the adoption of a prudent fiscal policy approach remains key to effective preparation for challenges and to prevent the risk of fiscal dominance in the future.

Box 2.3. Energy Subsidies, Inflation, and Expectations: Unpacking Euro Area Measures

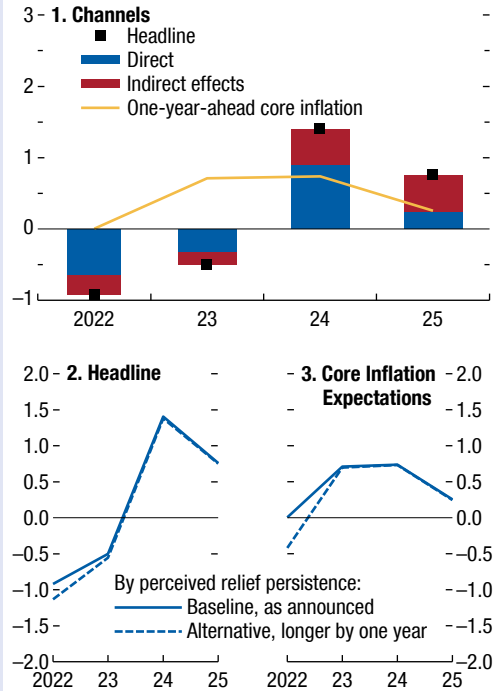
Several European economies have used energy subsidies, tax cuts, and price caps to help smooth the impact of recent shocks to energy prices on incomes and inflation. The effectiveness and desirability of such measures depends on many factors beyond the scope of this box, including their impact on energy markets, resource misallocation, and fiscal sustainability, as well as details of the policy design. One important channel is inflation expectations. Temporary energy subsidies directly lower inflation today but increase it relative to the no-measures scenario after they expire, smoothing the overall inflation path. If energy subsidies are perceived as temporary, the expectations channel may reduce their effectiveness in lowering inflation, as expectations of higher future inflation may affect price-setting today.

A model from the IMF’s Flexible System of Global Models is used in this box to simulate the impacts on expected and realized inflation of announced energy relief measures (price subsidies and caps) in the euro area.¹ The simulation assumes that the sharp upward shock to energy prices in 2022 is temporary and unwinds. It also includes the indirect effects of energy prices on core inflation through the supply chain. The model estimates that fiscal relief measures lowered euro area inflation by 0.9 percentage point in 2022 and by half a percentage point in 2023 (Figure 2.3.1, panel 1). Although additional fiscal borrowing to finance subsidies boosts demand, its effect on core inflation is more than offset by the reduction in supply-chain costs. These fiscal measures smooth out the inflation impact of the energy shock over time, leading to a rise in inflation over 2024–25 (relative to the no-measures scenario) and preventing an undershoot as energy subsidies expire and the energy shock unwinds. The measures have a net neutral effect on core inflation expectations in 2022 but increase them by 0.7 percentage point over 2023–24. These findings assume, however, that agents fully understand the temporary nature of the subsidies. What if agents misperceive and think that the subsidies will last for a year more than announced? In this alternative scenario, expectations fall more in 2022 (Figure 2.3.1, panel 2). Subsidies also lead firms to lower their

The author of this box is Chris Jackson.

¹See Dao and others (2023) for further details on the structure of the model and simulation calibration.

Figure 2.3.1. Marginal Impacts of Fiscal Measures for Relief from the Energy Price Shock on Inflation and Expectations
(Percentage point deviation from no-measures scenario)



Sources: Dao and others (2023); and IMF staff calculations. Note: Panel 1 shows the marginal impacts on inflation of announced fiscal relief measures for energy, using the IMF’s Flexible System of Global Models. The blue bars show the direct effects of measures (subsidies, tax cuts, or price caps on consumer energy prices), and the red bars show the indirect effects from changes in aggregate demand, supply chain costs, and core inflation expectations. The baseline in panel 2 assumes fiscal relief measures last in 2022 as originally announced. The alternative assumes that households misperceive and expect measures will last longer, but then in 2023 they realize their error and adjust to the announced path.

prices by more in 2022, because they now expect core inflation to be lower in 2023. The fall in inflation expectations increases the impact of fiscal policy on inflation from -0.9 to -1.1 percentage points in 2022 and from -0.5 to -0.6 percentage point in 2023. But once agents realize their error and correct, inflation and expectations bounce back, highlighting the role of the expectations channel.

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