Inflation Persistence, Noisy Information and the Phillips Curve

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For many decades, understanding expectations has been a central question in macroeconomics. However, most macroeconomic studies focus on the starkly simplified benchmark case of *full information rational expectations* (FIRE), in which agents are perfectly and homogeneously aware of the state of nature and of others' actions. In this paper, I consider instead a theory of expectation formation that incorporates significant heterogeneity and sluggishness in agents' forecasts, thus relaxing the standard FIRE benchmark. I build this expectation formation process into an otherwise standard New Keynesian macroeconomic model by introducing noisy and dispersed information, rationally processed individually by each agent. I set the information-related parameters in the model so that expectations in the model are consistent with the observed sluggishness of forecasts.[1] I use this framework to shed light on two empirical phenomena that have been much discussed in the literature: the fall in inflation persistence and the change in the dynamic relationship between output and inflation (the Phillips curve).

As for the first point, evidence suggests that the dynamics of US inflation have changed over time. In particular, inflation in the post-war period exhibits a high degree of persistence up until the mid-1980s, falling significantly since then. This fall in inflation persistence is not easily understood through the lens of monetary models, and has been called the "inflation persistence puzzle" (Fuhrer 2010).[2] This change in inflation dynamics coincides with a change in the US Federal Reserve's communication policy. Since the late 1960s, there has been a gradual improvement in the Fed's public disclosure and transparency, sending clearer signals of the Fed's actions and future intentions to the market.[3] Using survey data on US firms' inflation expectations, I document a significant sluggishness in responses to new information until the mid-1980s, but no evidence of sluggishness afterward, by regressing the ex-ante average forecast error on the average forecast revision before and after 1984 (see figure 1).[4] The theoretical framework I build is consistent with this evidence. I argue that the change in the Fed communication makes firms' information less sluggish, and I use the model to show that firms can then adjust their prices in a more agile way, explaining the fall in inflation persistence.

Diving into the details, the model explains the fall in inflation persistence through a decrease in firms' uncertainty about central bank actions. I assume that firms can observe their individual conditions —such as the output they produce given their price— but they do not have perfect information about aggregate macroeconomic variables like inflation, output, or interest rates. Instead, they observe a noisy signal that provides information on the state of the economy, and in particular about changes in monetary policy. Using this information, firms form expectations about inflation, aggregate output, and interest rates. I show that in this framework, inflation is more persistent in periods of greater forecast sluggishness. Noisiness implies that firms underreact to new information, because they distrust their signals and rely more on their prior beliefs. This endogenous anchoring of forecasts causes firms to set prices closer to their prior expectation, thus slowing the adjustment of the aggregate price level. Because the persistence of inflation depends on the speed of price adjustments, the Fed´s improved communications policy endogenously reduces inflation persistence. I find that this change in firms' forecasting behavior can explain around 90% of the fall in inflation persistence since the mid-1980s.

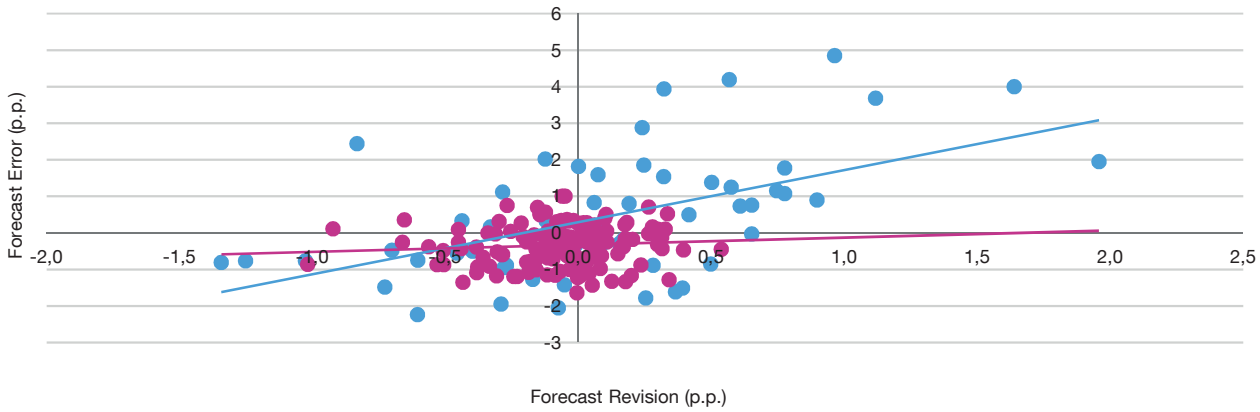
1 By sluggishness, I mean that agents do not immediately correct errors in their expectations. Following Coibion and Gorodnichenko (2015), I measure sluggishness as a positive correlation between average forecast errors at the beginning of any given period and forecast revisions in the following period.

2 Persistence determines both the strength of the effect of past shocks on today's outcome and the unconditional volatility of an autoregressive dynamic process. See Fuhrer (2010) for a literature review.

3 Before 1967 the Federal Open Market Committee (FOMC), the decision-making body of the US Federal Reserve, only announced policy decisions once a year in its Annual Report. Since January 2000 there has been an immediate announcement and press conference after each meeting, regardless of the decision taken.

4 Coibion and Gorodnichenko (2015) find evidence for an increase in the level of information frictions since the 1980s, and explain the increase from a rational inattention perspective. Using their data, I provide evidence of the decrease in information frictions *related to inflation*. I argue that this improved fidelity of expectations, about inflation in particular, is driven by changes in the Fed's communication policy.

Figure 1



NOTES: Scatter plot of ex-ante average forecast error (vertical axis) and average forecast revisions (horizontal axis). Red dots correspond to 1968-1984 observations (which show a significant positive correlation), and blue dots correspond to observations after 1984 (after which the correlation is not significantly different from zero).

Regarding the second empirical issue, recent literature documents that the dynamic relationship between output and inflation has changed in recent decades. This relationship —the Phillips curve— takes the form $\pi_t=\kappa\, y_t+\beta\, E_t\, \pi_{t+1}$ in many New Keynesian macroeconomic models. The literature suggests that the coefficient κ that links the output gap y_t with the inflation rate π_t has decreased in recent decades (Andrés et al. 2021, Costain et al., 2022 2021) —a flatter Phillips curve. Indirectly, this suggests implies that nominal interest rate changes by the central bank have become less effective in affecting inflation. In contrast, I estimate only a modest decline in the slope of the Phillips curve since the mid-1980s, once I control for the decrease in information frictions. Instead, I argue that noisy and dispersed information offers an alternative explanation for the change in the form of the Phillips curve. Under information frictions, the Phillips curve is enhanced with intrinsic persistence and myopia: $\pi_t=\omega\, \pi_{t-1}+\kappa\, y_t+\delta\, \beta\, E_t\, \pi_{t+1}$. I find evidence of intrinsic persistence ($\omega>0$) and myopia ($\delta<1$) before the mid-1980s, but not afterwards. In other words, from the perspective of the model, the change in the dynamics of the Phillips curve can be explained by a reduction in backward-lookingness (lower ω) and an increase in forward-lookingness (δ closer to one) after the mid-1980s.

This paper has only considered data up until the second quarter of 2020. The evidence provided suggests less sluggish expectations and a fall in inflation persistence since the mid-1980s. These results might lead the reader to conclude that the current inflationary episode will only be temporary (or, at least, less persistent than inflation was before the mid-1980s). However, a preliminary look at data from late 2020 to early 2022 suggests that sluggishness and inflation persistence may be coming back. Although admittedly speculative, these findings suggest that central banks should strive to be extremely clear in their communication over the coming quarters if they want to avoid a return of inflation persistence. This argument is only suggestive, however, since it abstracts from cost-push shocks and the bottlenecks arising from the economy's input-output network. This suggests avenues for follow-up research, in which belief formation frictions interact with the input-output structure of the economy.

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