Inflation Dynamics: Lessons from Past Debates for Current Policy

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Our assignment in this panel is to discuss central bank perspectives on inflation dynamics. My fellow panelists offer a current insider's perspective for small open economies. I will try to complement that with an outsider's perspective for a large and fairly closed economy. I will focus on the United States and maintain a central bank focus by drawing, in part, on material from policy research and past debates at the Federal Reserve.[1]

Let me start with a few basics, meant to serve as an organizing device to bring us to current challenges. What principles and what guides can help the central bank ensure price stability over time?[2] Two principles are fundamental: First, the central bank must accept responsibility for price stability. That is to accept that inflation is always and everywhere a monetary phenomenon. Any central bank that has the independent authority to control the currency can ensure price stability over time. Second, to acknowledge that controlling inflation is an imperfect process. Monetary policy is a blunt instrument. Fine-tuning of inflation, like fine-tuning of real economic activity, is not feasible in practice. The central bank can control inflation over time by tightening and easing monetary policy. But the transmission process is uncertain and evolving with the structure of the economy. Monetary policy transmission involves long and variable lags.

I take it for granted that the overwhelming consensus in the central banking community accepts these two principles. This was not always the case. Central banks caused great harm in the past when these principles were not respected. It is a legacy of monetarism, a legacy most often identified with Milton Friedman and his writings, to instill the importance of these two principles in the global central banking community in the second half of the 20th century. Allan Meltzer is another major contributor to instilling the message in the global central banking community, and I consider it a real treat that Allan is with us today, making it even harder for anyone else to match his record of attendance at the symposium.

As fundamental as these principles may be for monetary policy, they don't give central banks sufficient guidance on when and by how much to adjust monetary policy to achieve and maintain reasonable price stability in a dynamic economy that is constantly evolving and buffeted by shocks. Inflation at any point in time can be higher or lower than what is consistent with price stability. The presence of transient shocks is one reason. Since any monetary policy adjustment today will only be transmitted to the economy over time, with long and variable lags, forecasts of inflation can be useful for guiding the process. To the extent our knowledge of the macroeconomy can help the forecasting process, central banks would wish to have good forecasts of inflation over the next few months and quarters to assess whether monetary policy is too easy or too tight and whether it is consistent with maintaining price stability in the medium run. Central banks could also use information about how much they need to adjust policy to guide inflation a bit higher or a bit lower one or two years later, once the dynamics of the process dissipate.

Economists tend to be well versed in the laws of supply and demand. When demand rises, or when supply falters, prices would tend to rise. When demand falls, or supply becomes more plentiful, prices would tend to fall. In some markets, the most competitive ones, price adjustments occur very quickly. Unprocessed food and energy markets are examples. In markets where the suppliers set prices at occasional intervals, (markets where prices are somewhat sticky), expectations of market conditions and future prices enter into the

calculus of price determination and the dynamics of price adjustments become more important. Extrapolating this reasoning from microeconomics to the aggregate economy provides a basic analytical framework for thinking about inflation. Aggregate models of inflation, both theoretical and empirical, often are built on these three determinants as drivers of inflation: supply, demand, expectations.

Phillips curve-type models simplify things one step further: Supply and demand for the aggregate economy are collapsed into the concept of a "resource gap." When the pertinent supply and demand equals each other, the gap is zero. When demand exceeds supply, the economy is overheated and inflation pressures build. And conversely, when demand falters, price pressures ease and inflation falls relative to where it would have been otherwise.[3]

In theory and in empirical application, many concepts can serve the role of resource gaps. Proxies include the output gap (the difference between aggregate demand and some estimated notion of the normal, or potential, or natural level of output). Other versions focus on the unemployment gap (the difference between the unemployment rate and some estimate of the normal or natural rate of unemployment).

In theory, the central bank can influence inflation dynamics by adjusting monetary conditions: By creating greater credit availability at lower interest rates, easier monetary policy raises demand relative to supply, increases the output gap and puts upward pressure on inflation. And conversely, tighter monetary policy puts downward pressure on inflation.

When demand and supply are in balance, inflation should be guided toward what's expected to be normal—the inflation rate that is expected to prevail over the long run. This depends on what households and businesses perceive the central bank to consider normal and the credibility of the central bank to achieve what it views as normal.

Ideally, when the central bank is credible, inflation expectations over long horizons should correspond to the central bank's inflation objective. Inflation expectations are well anchored when the expectations formed by households and businesses (especially at longer horizons) match the central bank's communicated price stability

objective. Conversely, if the central bank is seen as unreliable, its pronouncements about price stability may well be ignored by households and businesses. Extrapolation from past experience may then serve as the guide to what's normal for planning purposes, and be embedded in decisions. Unmoored inflation expectations correspond to a situation in which the public forms views about the future by extrapolating from recent experience. As shocks hit current inflation, inflation expectations may drift with it. This theory suggests inflation expectations and resource gaps, if properly measured, could be seen as the fundamental drivers of inflation.

What about policy practice? Explicitly or implicitly policymakers must rely on models to forecast inflation and adjust policy to achieve their price stability objective. Macroeconometric modelers face many hurdles to translate theoretical concepts such as resource gaps and expectations to empirical relationships that can be estimated using observed variables. Hurdles include measurement and identification issues. These difficulties pose problems for policymakers who must judge how reliable any model can be for guiding the policy process.

How can a policymaker tell when inflation expectations are well anchored and when they are likely to stay well anchored depending on policy choices the central bank may be considering? Does it matter if the central bank is seen as maintaining a monetary policy stance that is extremely accommodative or abnormally tight for years at a time? This is the problem of understanding how inflation expectations are formed. Some research is available and survey data helps, but my reading of the literature is that our understanding about what shapes expectations and what can trigger inflation expectations to become unmoored is limited.

How confident can the policymaker be that demand exceeds normal supply or that unemployment exceeds its natural rate and by how much? That is, how is resource slack to be measured and used in practice? Are resource gaps useful in practice for forecasting inflation in real time, as opposed to merely understanding why inflation moved years after the fact? This is the problem of measuring potential output, or the natural rate of unemployment, or related concepts

in real time. Some research can help, but in practice we don't know. Assuming that we do know when we don't is a recipe for disaster.[4] Consider the FOMC's implicit views of the natural rate of unemployment, provided in the Survey of Economic Projections (SEP). The latest SEP, published in June, provided a range of point estimates from 5.0 percent to 5.8 percent. The size of this range highlights substantial disagreement, which is suggestive of the degree of uncertainty, without even incorporating the additional uncertainty surrounding each individual committee member's point estimate (which is not provided in the SEP).

Finally, how confident can a policymaker be about the effect of a policy adjustment on inflation one year or two years down the road? If developments, say a year from now, suggest that tightening of policy is required to reduce inflation by half a percentage point, by how much should the Fed plan to raise policy rates? Fifty basis points? Five hundred basis points? More? This is one aspect of the so-called multiplier uncertainty that is not always as sufficiently appreciated as it should be.

In light of this uncertainty, how should a central bank proceed? A macroeconometrician could rely on imperfect historical data, use his or her theoretical and empirical priors to make heroic identification assumptions—and hope that a model estimated over recent history would capture sufficiently well the structure of the economy and the transmission mechanism of monetary policy in the near future to be useful for policy advice. But which model? Central banks often rely on one benchmark model that the staff can use to perform analysis and inform policymakers. In some central banks, the exercises go a step further. So-called optimal paths of policy are constructed using a single model as if one can confidently say the selected model offers a good representation of reality for such purposes. Such exercises are then used to provide guidance on how policymakers who wish to engage in fine-tuning exercises can choose among alternatives and decide policy in a discretionary manner. The aim of such exercises is often stated in noble terms: to design policy that not only achieves and maintains price stability over time but also maximizes employment or minimizes deviations of GDP from some hypothesized ideal or achieves other noble goals.

This is a dangerous practice. In light of our limited knowledge of the economy, it places much more confidence on any single model than should be tolerated. It also diverts the policymaker's attention from the fundamental job of achieving and maintaining price stability over time to other goals. However, the uncertainty remains. It should not be ignored. Proper risk management should focus on assessing the risks associated with what central banks don't know and on identifying a robust framework for formulating monetary policy that achieves and maintains price stability, taking these risks into account. No single model can achieve that. In practice, differences of opinion about what is and isn't a reasonable model of the macroeconomy cannot be confidently settled. In a committee setting, different members may have quite different views that should all be treated as reasonable and inform the policy process.

Central banks, including the Federal Reserve, face important challenges today relating to inflation: in understanding inflation dynamics, in forecasting inflation, in getting a handle of the distribution of risks to the outlook, in assessing how to set policy today to improve the odds of preserving price stability going forward. These challenges are not new. They are similar, sometimes virtually identical, to challenges studied and discussed in the past. We can find examples just by looking at the not-so-distant history of the FOMC. Let me mention two such discussions from the previous decade.

The committee's debate on June 25, 2002, following research briefings by Minneapolis Fed and Board staff, revisited classic questions about the Phillips curve and its usefulness for policy (FOMC 2002). In his briefing, Art Rolnick summarized the findings he presented, which were based on earlier work by Minneapolis Fed staff, as follows: (1) the Phillips curve is not stable, (2) unemployment is not useful for predicting inflation, (3) in the long run, money growth is a reliable predictor of inflation. To some, this was heresy. To others, it was stating the obvious: The Phillips curve emperor was naked.

Defending the Board's Phillips curve-based approach to forecasting inflation, John Roberts and David Lebow explained how changes in monetary policy, productivity, labor markets and so forth complicated the task, and how the basic Phillips curve framework could be adjusted to improve its performance.

Let me repeat two of the questions addressed then:

Why did inflation remain so low in the late 1990s when unemployment was so low?

Can the recent good performance be repeated in coming years?

Adjusting only one date gives us two questions that may be as pertinent today as they were then.

The second example is more recent; indeed it comes from the latest FOMC meeting for which transcripts are currently publicly available. On Dec. 16, 2009, the Committee discussed briefings based on work by Boston, Dallas, Philadelphia and Richmond Fed staff—a fantastic example of using Fed System resources to inform an important debate (FOMC 2009). You may recall that 2009 was a trickier-than-usual period for policy, including for assessing the risks for the long-term outlook for inflation. Would the Great Recession impart such downward pressure on prices as to lead to deflation? Was the global nature of the slump adding to such risk? Or was the massive policy accommodation and balance sheet expansion that had been put in place by the Federal Reserve in response to the downturn going to lead to high inflation?

In the briefings, Mark Wynne reviewed evidence for the global slack hypothesis, Jeff Fuhrer examined the role of expectations and output in the inflation process and Mike Dotsey discussed inflation persistence, output gaps and monetary policy. Alternative views were presented and debated. Summary findings included: (1) Theoretical measures of the output gap may be useful in theory but not in practice; (2) Empirical output gap measures are not generally useful for forecasting inflation; (3) Global slack may matter for U.S. inflation; (4) Competing assumptions about how expectations are formed matter crucially for inflation dynamics; (5) Long-term inflation expectations have been evolving over time; (6) Output or unemployment gaps may not matter much for inflation when they are small but appear to matter when they are large.

My reading of the transcripts of these meetings was that the discussions were useful not because they definitively settled any of the

open questions and points of disagreement (they did not) but rather because they facilitated a better understanding of the uncertainties involved in inflation dynamics and the transmission of monetary policy. Uncertainties so profound that different ways of thinking about the economy, different viewpoints held by different members of the committee could not really be resolved by the limited empirical evidence. An important lesson from that discussion is worth repeating. As Charles Plosser said at the Dec. 16, 2009, meeting: "a little humility may be in order, in terms of our ability to truly understand particularly short-run dynamics in the inflation process." (FOMC 2009, p. 176.)

Where does this leave us in terms of how the policy process should be organized for a central bank aiming to preserve price stability? Let me return to the dangerous practice I mentioned. The tendency to rely on a single model, a single approach to construct so-called optimal policy paths—as if that model can be trusted to accurately capture inflation dynamics and worse, as if a single model can be trusted to guide policy so that the central bank can engage in fine tuning of the economy. This is a very dangerous practice.

A better alternative would be to acknowledge our uncertainty about models and the empirical translations of theories. Rather than seek optimal fine-tuning policy paths based on one model, Fed staff could be asked to offer policy advice by identifying a simple policy rule that is robust across many different models.[5]

Federal Reserve System research staff has been among the pioneers of work that identifies how simple policy rules can be evaluated to incorporate model uncertainty, including some of the specific issues discussed earlier regarding the formation of inflation expectations, ignorance regarding natural rates and multiplier uncertainty.[6] Why not direct attention to the design of a simple and robust policy rule, using the Federal Reserve System's firepower in modeling and policy research?[7] Such a simple rule could form the basis for robust decision making over time, ensuring systematic policy based on solid foundations that respect the limits of our knowledge.[8]

Recognizing that our understanding of the economy evolves, and models change, the key is to put a process in place for selecting and adjusting a rule. The FOMC could decide on a framework for evaluating simple rules, specific operational formulas that preserve price stability over time while being somewhat countercyclical. The framework would identify the preferred simple and robust rule that would guide policy on the basis of available knowledge. At the same time, recognizing that our understanding of the economy evolves, the framework should foresee periodic reviews and adaptation.

Ideally, the committee should publish its preferred simple and robust rule. This would enhance the transparency of the monetary policy process.

What lessons can be drawn for the current situation? Similar to the setting for the December 2009 FOMC discussion on inflation dynamics, the committee faces considerable uncertainty today. Has inflation been too low? Should we be concerned that recent readings of inflation below the Fed's stated definition of price stability could unmoor inflation expectations toward too low inflation, lower than what the Fed considers ideal in the long run? Or could it be that the massive expansion of the balance sheet of the Federal Reserve, which is much greater than in December 2009, could unmoor inflation expectations on the upside?

My personal assessment is that, at the moment, short-term inflation risks are well contained on both sides. In the past few years, inflation has been broadly moving sideways. The economy has recovered from the Great Recession long ago. For those who wish to place attention to resource gaps, it is also notable that the unemployment rate has fallen rather rapidly over the past several quarters and is now effectively in line with implicit estimates of the natural rate. In my reading of the data and interpretation of models in place before the crisis, inflation has been more stable over the past several years than some models would have predicted. Phillips curve-based models that put great emphasis on resource gaps would have predicted significantly lower inflation, and perhaps deflation, in light of the dramatic increase in unemployment and drop in output during 2008 and 2009. The stability of inflation was likely the result of well-anchored

inflation expectations in the United States before the crisis and the high degree of credibility enjoyed by the Federal Reserve.[9]

Is inflation too low today? By some measures it is notably below the Federal Reserve's 2 percent goal, which was defined in terms of the PCE deflator. But care is needed in interpreting the data and the role of highly volatile components. Once such volatile components are removed from the headline reading of PCE inflation, the picture looks different. For a number of years, the Federal Reserve has focused on core PCE inflation as a proxy. This removes food and energy from the headline measure. But it is neither the only nor necessarily the best proxy of underlying inflation. A useful exercise that highlights the uncertainty involved in even basic macrodata is to compare core PCE with the trimmed-mean PCE inflation measure published by the Dallas Fed. Over the 12 months ending in June, trimmed mean PCE inflation was 1.7 percent, compared to 1.3 percent for core PCE. The monthly reading for June was 2.1 percent, compared to 1.8 percent for core PCE. Judging by the trimmed mean PCE measure, inflation is not notably different from the Fed's definition of price stability.

A reasonable summary of the current situation and short-term outlook is that both inflation and the real economy are effectively back to normal. It has been a long ride since the beginning of the turbulences in financial markets eight years ago this month.

What are the risks going forward and what are the implications for monetary policy? As long as inflation expectations remain well-anchored, short-term risks are balanced. But returning to the basic principles I outlined earlier, and in light of the long and variable lags associated with the monetary policy transmission mechanism, how does this extend to the medium term? What are the risks that might materialize in the next few quarters and what do they imply for policy? Can we rely on inflation expectations continuing to stay well-anchored going forward? I am concerned that the risks of an unwelcome outcome are no longer as low as they were a year or two ago. This largely follows from concerns about inflation expectations not remaining well-anchored.

The favorable performance of inflation expectations during and since the Great Recession owe to the systematic monetary policy framework followed by the Federal Reserve and the associated reputation acquired by the Federal Reserve over a generation before the Great Recession. It would be an error to take for granted the stability of inflation expectations currently observed. Reputation is earned and expensed over time. Inflation expectations are well-anchored until they are not. It took a costly disinflation under the leadership of Paul Volcker and Alan Greenspan in the 1980s and 1990s to build this reputation and undo the damage done by the Federal Reserve to the U.S. economy in the 1960s and 1970s. Credibility was an integral part of the policy framework associated with what became known as the Great Moderation.

Since the end of Great Recession, there are concerns that the policy framework followed by the Federal Reserve may have changed. The Federal Reserve appears to be placing greater emphasis on reducing unemployment than was the case during the Great Moderation. This is not without risks to preserving price stability over time. The Federal Reserve introduced additional massive monetary policy accommodation in the economy well after the end of the recession. This additional policy accommodation, which more than doubled the size of the Federal Reserve balance sheet, only ended at the end of last year. Accounting for the long and variable lags in the monetary policy transmission mechanism, monetary policy appears to be excessively accommodative and, with unchanged policy, will likely remain so for some time. As the economy overheats, one concern is that under current policy, the Federal Reserve may soon be confronted with a costly dilemma: tighten policy abruptly to control inflation, possibly precipitating a recession? Or tolerate an upward drift in inflation to avoid recession? In one of these two scenaria, the assumption that inflation expectations would remain well-anchored is unlikely to hold.

These risks are similar to those encountered during previous recoveries from recessions, during the Great Moderation. On those past occasions, the Federal Reserve began the process of policy normalization well before the economy returned to what would be seen at the time as normal. Arguably, risks going forward could be reduced the

sooner the Federal Reserve begins the process of policy normalization, especially once it is recognized that with the current degree of monetary policy accommodation, even after multiple hikes of the federal funds rate, policy would remain accommodative.

Let me close by noting that the current environment provides an illustration of the benefits the Federal Reserve could enjoy if it had already communicated a simple robust rule for policy. Had a rule been in place, designed to ensure price stability over time and with appropriately mild countercyclical properties, the uncertainty about how the Fed would respond to a costly dilemma between recession and inflation would have been resolved. With a well-designed rule in place, the risk of unmooring inflation expectations would be greatly mitigated. Despite the uncertainties governing inflation dynamics, the Federal Reserve would then be better placed to ensure monetary stability going forward, and the economic prosperity associated with it.

Endnotes

[1]We can thank the FOMC secretariat for making so much material available to the public, and the U.S. Congress that, in 1935, included a provision for this transparency in the law that created the FOMC. Information is available on the Federal Reserve's website: *http://www.federalreserve.gov/monetarypolicy/fomc.htm.*

[2]I will assume that we define effective price stability to include low inflation rates such as a 2 percent target adopted by some inflation-targeting central banks and the Federal Reserve.

[3]This is an imperfect translation from micro to macro. In reality, markets are local. For example, the disaggregated conditions of supply and demand for labor by region would be expected to influence wages, again by region, and the aggregation properties needed to ignore these differences may not hold. This is one of many imperfections that are introduced when we try to think about aggregate inflation dynamics.

[4]See Orphanides and Williams (2002, 2013) for the economic implications of policy mistakes of this nature drawing on the history of the Federal Reserve.

[5]For many years, and at least through 2009, a period for which the information is currently available to the public, the Bluebook showed optimal control simulations based on the FRB/US model (see, e.g. Chart 7 in Federal Reserve Board 2009). However, such policies are not robust to model uncertainty. FRB/U.S. model uncertainty is a serious problem, even if attention is restricted to alternative vintages of the model, as shown by Tetlow (2015).

[6]Examples include work that appeared in the conference volume edited by Bryant, Hooper and Mann (1993), which provided the foundation for the development of the Taylor rule. A comprehensive survey of the literature on simple and robust rules appears in Taylor and Williams (2010).

[7]The development of model databases, such as that of Wieland et al. (2012), another project with roots in the Federal Reserve System, has simplified the analysis of the robustness properties of alternative simple rules across large numbers of estimated models.

[8]See Orphanides (2015) for a more detailed discussion of the desirability of this approach over the current discretionary policy framework.

[9]The importance of well-anchored expectations during the crisis was nicely illustrated by Williams (2009), who compared forecasts based on Phillips curve-type models with alternative assumptions on expectations.

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