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## The 2007 Monetary Policy Consensus in Retrospect<sup>1</sup>

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Keynes famously ends the *General Theory* with a description of the “academic scribbler” whose ideas from “a few years back” eventually find their way into policymaking. When Marvin Goodfriend wrote “How the World Achieved Consensus on Monetary Policy” in 2007, that time lag had largely disappeared, at least in central banking. For example, in the Federal Reserve System it had become the norm for a substantial fraction of those in important decision-making positions to hold PhDs in economics. Not only did these officials have advanced degrees, they often earned the stature that led them to be chosen for their position by doing cutting edge research. The most prominent example was the Federal Reserve chairman at the time, Ben Bernanke. It is also now the case that the research done by staff at the Fed and other central banks is as sophisticated as any that occurs in academia. As a result, ideas flow freely and instantly between the halls of academia and central banks. The time lag is gone.

An important theme of Marvin’s 2007 paper is how the development of this symbiotic relationship between academic research and central bank policymaking led to a consensus on a new framework for monetary policymaking, a framework that has proved highly useful and remains with us today. What Marvin leaves out is the significant role that he played in this development. To my knowledge, Marvin was the first economist to simultaneously contribute to the modern literature on monetary policy and hold a nontrivial policymaking job in the Federal Reserve System. A happy coincidence is that at Brown he was classmates with his future coauthor Bob King. The two would play an important role in developing the New Keynesian framework and

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<sup>1</sup> Thanks to Bob King and Alex Wolman for helpful comments.

making it operational for analyzing monetary policy. Being able to work with Bob kept Marvin in close proximity to academia. At the same time, Marvin's experience with the policymaking process provided him with important insights into how to make their work, as well as his other research, most useful in practice.

### **The early years: disarray and revolution in macroeconomics**

When Marvin joined the Richmond Fed in 1978, communication between central banking and academia may have been at an all-time low. The failure of the large econometric models developed more than a decade earlier to anticipate the stagflation of the late 1960s and '70s left central banks without a framework to provide guidance for monetary policy, at least one in which they could have confidence. In academia, the rational expectations revolution was heating up. Popular at the time was the Phelps/Friedman natural rate theory, which related output to unanticipated movement in inflation. It was standard to assume that expectations were formed adaptively, so that a monetary expansion in the short run would increase real output temporarily but then produce a subsequent increase in inflation. Rational expectations turned things upside down: Within the context of the Phelps/Friedman framework, predictable movements in the money supply (which produced predictable movements in inflation) had no effect on real output, as Robert Lucas (1972) famously showed. To put it mildly, central bankers were not particularly hospitable to the idea that only unpredictable movements in the money supply could affect real activity.

A more extreme development from the vantage of central bankers was the advent of real business cycle (RBC) theory, which involved the use of the stochastic competitive equilibrium growth model to explain business cycles. The virtue of the approach is the explicit use of microfoundations to build a macroeconomic framework. A striking implication, however, is the total irrelevance of monetary and financial factors. Another dramatic implication was that business cycles, while unfortunate, represented efficient responses of the economy to exogenous disturbances. Needless to say, this development did not exactly enhance academic interaction with monetary policymakers.

### **The Volcker disinflation: consequences for research and policymaking**

As Marvin emphasizes, a critical turning point was the shift to tight monetary policy in late 1979, engineered by Paul Volcker. The aim was to bring the era of high inflation to an end. As Marvin describes, the sudden and unexpected tightening can be thought of as a kind of natural experiment to study the impact of monetary policy on output and inflation. The tightening succeeded in reducing inflation, though with a lag. But in the process it induced the largest recession of the postwar period up to that point. As Marvin notes, the episode sent a clear message to central bankers: they did have the ability to control inflation. At the same time, disinflations were not costless, even if the factors that determined these costs were not clearly understood.

I would add that the Volcker disinflation also had a profound effect on the course of academic research. It was clear that neither the Phelps/Friedman model with rational expectations nor RBC theory could easily account for the effect of the Volcker tightening on output and inflation dynamics. The need for a new framework was obvious. But it was also clear that the field could not retreat from the methodological advances ushered in by the rational expectations/RBC revolution. These considerations led to an effort to rebuild Keynesian economics using microfoundations. Out of this effort would emerge a framework that could be used — and eventually would be used — in the policymaking process. No, the framework has not come anywhere close to the point where it can be used to put monetary policy on automatic pilot. But it has reached the point where it does play a significant role in helping organize thinking about policy implementation. As a result, the relationship between academic research and central bank policymaking has become highly symbiotic. Economic events influence the development of the model. The model in turn informs policymaking.

Marvin's work with Bob King (Goodfriend and King, 1997) played a significant role in the development of what is now widely known as the New Keynesian (NK) model.<sup>2</sup> Marvin and Bob perhaps more aptly refer to this paradigm as the New Neoclassical Synthesis, as it begins with an RBC model and then adds three crucial ingredients. First, money is introduced so that the model can account for nominal variables. Second, monopolistic competition is incorporated so that it is possible to characterize price setting by firms. Third, nominal rigidities are added, which gives rise to the nonneutrality of money and inefficient fluctuations in output.<sup>3</sup> Absent nominal price rigidity, the framework behaves essentially as an RBC model. With nominal price rigidity, the Keynesian features emerge.

### The interest rate as the policy instrument

Another important component of the consensus that Marvin emphasizes is the use of the short-term interest rate as the instrument of monetary policy, in keeping with actual practice at central banks. As late as the 1980s, it was still commonplace in academic work to model the money supply as the policy instrument. However, central banks have learned through practical experience that trying to directly regulate monetary aggregates was problematic. Broad monetary aggregates were difficult to control due to the endogeneity of inside money. Controlling narrow aggregates like reserves generated wild gyrations in interest rates due to fluctuations in reserve demand. These wild fluctuations in interest rates, in turn, wreaked havoc on the economy.

Given his proximity to policymaking, Marvin quickly saw that to get the attention of central bankers, academic work needed to treat the interest rate as the policy instrument. Indeed, Marvin was among the

earliest researchers to interpret monetary policy actions through the lens of interest rate decisions, not only about current rates settings, but also about communication of the paths of future rates.<sup>4</sup>

### A monetary policy framework

Overall, Marvin Goodfriend played a key role in developing a framework for monetary policy that facilitated interaction between academic researchers and policymakers at central banks. I now employ a version of this approach that, while simple, is sufficiently rich to help organize thinking about some of the key issues facing central bankers. Let  $y_t^*$  denote log real output,  $y_t$  the natural (flexible price) level of output, and  $x_t$  the output gap, where each variable is a log deviation from the state. Next, let  $i_t$  be the nominal interest rate,  $\pi_t$  inflation,  $\bar{\pi}_t$  the central bank's target inflation rate,  $r_t^*$  the natural real rate of interest, and  $u_t$  a cost push shock.<sup>5</sup> Then we can express the model as follows:

$$y_t = x_t + y_t^* \quad (1)$$

$$x_t = -\sigma(i_t - E_t \pi_{t+1} - r_t^*) + E_t x_{t+1} \quad (2)$$

$$\pi_t = \lambda x_t + \beta E_t \pi_{t+1} + u_t \quad (3)$$

$$i_t = r_t^* + \bar{\pi}_t + \phi_\pi(\pi_t - \bar{\pi}_t) + \phi_x x_t \quad (4)$$

$$i_t \geq 0 \quad (5)$$

Equation (1) decomposes output into the sum of the output gap and the natural level of output. Simply put, the New Keynesian features determine  $x_t$  while the RBC framework characterizes the variation in  $y_t^*$ . A key theme of Goodfriend-King was that there is no reason to think  $y_t^*$  should evolve as a smooth linear trend, as was the traditional approach in policy circles. Rather,  $y_t^*$  should fluctuate in a manner that RBC theory suggests. A classic application of this thinking occurred in the mid-1990s when a productivity boom ushered in a period of

<sup>4</sup> See Marvin's paper "Interest Rates and the Conduct of Monetary Policy" (1991), which is also discussed in this volume, in an essay by John Taylor.

<sup>5</sup> The cost push shock can be interpreted as a transitory fluctuation in the desired markup. See Gali (2015).

<sup>2</sup> Related work includes Rotemberg and Woodford (1997), Clarida, Gali, and Gertler (1999), Woodford (2003), Christiano, Eichenbaum, and Evans (2005), and Gali (2015). For a collection of the early contributions to the New Keynesian framework, see Mankiw and Romer (1991). For a critique, see Chari, Kehoe, and McGrattan (2009).

<sup>3</sup> The most common way to incorporate nominal rigidities is via the staggered contracting approach of Calvo (1983), which is a more tractable version of Taylor's (1980) overlapping contracts framework.

strong growth. Pressure mounted on the Greenspan Federal Reserve to raise rates to slow down growth for fear of subsequent inflationary pressures. However, Greenspan correctly perceived that supply side factors were generating the boom and wisely chose to accommodate it.<sup>6</sup>

Equation (2) is the familiar New Keynesian IS curve that relates the output gap inversely to the gap between the real interest rate and the natural rate plus the expected future output gap.<sup>7</sup> From a policy perspective, there are two key features of this formulation. First, as is recognized in both theory and practice, an important benchmark for rate setting is the natural interest rate  $r_t^*$ . The notion of a natural or “equilibrium” real rate is not new: it dates back to Wicksell. What is new is the use of  $r_t^*$  to judge the stance of policy. Of course, like  $y_t^*$ ,  $r_t^*$  is not directly observable. As the model implies, however, one can use the behavior of inflation to infer the direction of the error in the estimate. For example, if  $r_t^*$  is lower than forecast, then the central bank may be setting interest rates higher than desired, resulting in a lower than desired output gap. The net effect, as can be seen from the aggregate supply curve (3) is that inflation will be lower than expected. Hence, the surprise in inflation can be used to update the estimate of  $r_t^*$ . The use of  $r_t^*$  as benchmark in the policy process is now standard, as the theory would predict.

A second key insight from the New Keynesian IS curve, one that Marvin strongly emphasizes, is that credible communication about the future path of policy is critical. To illustrate, let’s consider the case where the central bank’s target inflation rate  $\bar{\pi}_t^*$  is zero. As any first-year graduate student knows, one can iterate equation (3) forward to obtain an expression that links the output gap inversely to the expected path of the interest rate gap. The expression makes clear that

<sup>6</sup> To be fair, the issue becomes murkier later on in the boom as inflationary pressures mounted. According to Alex Wolman, Marvin argued at the time that the high productivity growth had pushed up  $r_t^*$ , suggesting it was time to raise rates, as the Fed did shortly after.

<sup>7</sup> As is well known, the relation comes from the consumption Euler equation, given an economy with consumption goods only. Gali and Gertler (2007) show how to generalize to the case where investment is present as well.

monetary policy management is not simply about current rate setting, but also about managing market expectations of the path of future rates. To close the output gap, for example, it is not only necessary to set the nominal rate equal to the natural rate, the central bank must also credibly promise to set the future path of  $i_t$  equal to  $r_{t+1}^*$ . Communication about future policy, the importance of which comes naturally out of this simple model, indeed plays a central role in the monetary policymaking process. The framework also makes clear why communication — or “forward guidance” as it is known today — should not take the form of promising a path of rates: the natural rate is likely to vary in unexpected ways, which will affect the appropriate rate setting. Hence, as it has evolved in practice, communication must always stress the “data dependence” of rate setting.

The movement of the economy to the zero lower bound in 2008 pushed forward guidance to center stage. As the simple framework makes clear, when the natural rate becomes negative, the zero lower bound constraint, equation (5), becomes binding. Aside from unconventional policies — which we briefly mention later — the central bank’s only option for stimulating the economy at the ZLB is to use forward guidance. In particular, the central bank must promise to keep rates low after the economy has emerged from the ZLB. The tension is that since keeping rates low after the storm has passed could be inflationary, the central bank may be tempted to renege on its promise. As made clear by Eggertsson and Woodford (2003) and Werning (2012), a central bank confronting a liquidity trap must commit to keep rates “lower for longer,” which will involve some overshooting of the inflation target, once the economy leaves the liquidity trap. Again, we have another example of how theory meets policymaking in practice. Throughout the recent history of operating at the ZLB, central banks in the industrialized world have opted for forward guidance with an emphasis on a lower for longer strategy for interest rates, along with a temporary overshooting of the inflation target.

### Inflation targeting and trend inflation

As Marvin emphasizes, a critical reason for reaching consensus on monetary policy was the success in moving from high and volatile

inflation to a prolonged period of low and stable inflation. Here also the academic work provided useful insight to guide policy. Though I add the caveat that what it had to offer was not completely satisfactory, particularly with regard to how the central bank can manage private sector beliefs about trend inflation, as I discuss shortly.

At a most basic level, the challenge for a central bank in maintaining inflation is finding an appropriate nominal anchor. For this purpose, from 1944 until 1973, a number of the major central banks agreed to maintain a fixed exchange rate against the dollar while the Federal Reserve tied the dollar to the price of gold. The loss of monetary independence eventually made the system unworkable, especially as inflation pressures had been building in the US in the late 1960s/early 1970s. There was a brief flirtation with using money growth as the nominal anchor. But as noted earlier, broad monetary aggregates proved difficult to control while targeting narrow aggregates like reserves typically introduces disruptive gyrations in interest rates. The failure of these traditional nominal anchors led both central bankers and academics to view an inflation target as the most effective nominal anchor.<sup>8</sup> Indeed, in the early 1990s a number of central banks adopted an explicit inflation target. The Federal Reserve began communicating as if it had a 2 percent inflation target in the early 1990s before eventually formalizing this policy under Chair Bernanke in 2012. Now virtually all the major central banks in the industrialized world have adopted a formal inflation target.

The challenge that inflation targeting poses for both central banks and academics is twofold: First, if trend inflation differs from the desired target, what is the best way to engineer a convergence to target? Second, if indeed trend inflation is in close range of the target, how should the central bank manage policy to achieve the dual mandate of price and output stability. Both these issues have received enormous attention in the academic literature.

<sup>8</sup> See, for example, Bernanke, Laubach, Mishkin, and Posen (1998).

To sharpen the focus, it is useful to express the Phillips curve (3) in a way that allows for variable trend inflation. Let  $\bar{\pi}_t = \lim_{i \rightarrow \infty} E_t\{\pi_{t+i}\}$  be market expectations of trend inflation,  $\bar{x}_t = \lim_{i \rightarrow \infty} E_t\{x_{t+i}\}$  market expectations of the trend output gap, and  $x_t^c = x_t - \bar{x}_t$  the cyclical component of the output gap. Assume that both  $x_t^c$  and  $u_t$  obey stationary first order processes with serial correlation parameters,  $\rho_x$  and  $\rho_u$  respectively. Finally, suppose the inflation target is zero. Then following Hazell, Herreno, Nakamura, and Steinsson (2021), we can express inflation as

$$\pi_t = kx_t^c + \bar{\pi}_t + wu_t \quad (6)$$

where  $\bar{\pi}_t$  is given by

$$\bar{\pi}_t = \frac{\lambda}{1-\beta} \bar{x}_t$$

and with  $k = \frac{\lambda}{1-\beta\rho_x}$ ,  $\omega = \frac{1}{1-\beta\rho_u}$ . As equation (6) makes clear, inflation depends not only on excess demand captured by  $x_t$  and cost push shocks captured by  $u_t$ , but also on market expectations of trend inflation. Indeed, as Hazell, Herreno, Nakamura, and Steinsson and others have shown, most of the variation in inflation over the postwar has been due to the trend term.

As Marvin argues, central bank credibility is key to understanding why  $\bar{\pi}_t$  may differ persistently from target. It is also key to understanding the costs of engineering it to target (in terms of undesired output fluctuations). Here the academic literature took the lead. The classic paper by Kydland and Prescott (1977) motivates how positive trend inflation could emerge when the central bank is operating under discretion and is tempted to push output above its flexible price equilibrium.<sup>9</sup> With a credible commitment toward not generating a surprise inflation, the problem disappears. Central banks quickly adopted the idea that credibility was critical for controlling inflation. Indeed, one could argue further that this literature provided the foundation for the move toward inflation targeting.<sup>10</sup>

<sup>9</sup> In the New Keynesian framework, due to imperfect competition, the flexible price equilibrium level of output is below the efficient level, creating an incentive for the central bank to want to push output above  $y_t^*$ .

<sup>10</sup> See, for example, Bernanke, Laubach, Mishkin, and Posen (1999).

### Establishing credibility

Where the literature has been somewhat silent, however, is on exactly how a central bank establishes credibility. History suggests that central banks cannot simply announce that they are going to make a credible commitment.

Rather, they must earn the private sector's trust through experience.<sup>11</sup> Here Marvin's description of the Volcker disinflation is instructive. What the theory suggests is that if Volcker had been perfectly credible at the outset, the announcement of the monetary tightening would have induced a drop in inflation to target with minimal cost in terms of output loss. But there was little reason for the private sector to take Volcker's promises at face value. Using Marvin's terminology, the late 1960s-1970s was an era of "stop-go" policy: the central bank would periodically tighten but then let up as the economy weakened even though inflation remained high. Compounding matters for Volcker was his initial policy reversal: after the aggressive move toward tightening in October 1979, there was an equally dramatic drop in rates in 1980. This move was likely costly in terms of central bank credibility, having the practical effect of slowing the convergence of beliefs about trend inflation to target. The implication, as equation (6) makes clear, is that the disinflation would entail a costly recession before inflation reached target. Marvin's broader point, I think, is that central banks cannot simply be bestowed with credibility; they need to earn it by showing through experience that they can deliver on their promises.

Another way that the central bank can enhance its credibility is by setting the policy instrument in a way that is clearly consistent with its objectives. As Taylor (1993) notes, a policy rule that achieves this objective is the simple interest rate feedback given by equation (4) but with two key restrictions. First, the trend term  $\bar{\pi}_t$  is set equal to the inflation target (in our example zero). Second, the feedback coefficient on inflation,  $\phi_\pi$  exceeds unity. As a result, whenever inflation exceeds target, the central bank increases the nominal rate sufficiently to raise

<sup>11</sup> Erceg and Levin (2001) make some progress in analyzing how a central bank might establish credibility: they assume the private sector updates its beliefs about the central bank's time varying trend inflation rate by using the variation in the policy

the real rate. This action reduces demand, pushing inflation back to target. Taylor showed that the Greenspan Federal Reserve — a central bank determined to establish and maintain credibility — set rates in a manner consistent with this rule. From Marvin's perspective, the Taylor rule offered a practical guideline for implementing inflation targeting. To be clear, it is nowhere near the point of being a mechanical rule that central banks can use to put monetary policy on automatic pilot, especially given that two key ingredients,  $r_t^*$  and  $y_t^*$ , are not directly observable. Nonetheless, the rule does offer a guideline for framing the policy discussion in a way that connects to the general inflation targeting framework. It is not an exaggeration to suggest that at least from the early 1990s to the eve of the Great Recession in 2007, the great majority of central banks in the industrialized countries adopted the inflation targeting/Taylor rule (guideline) approach. The prolonged period of low inflation and stable output growth only served to reinforce the consensus.

### After the consensus: developments from 2007-2021

Marvin wrote "How the World Achieved Consensus..." in 2007, just before the global financial crisis of 2008-2009. Of course, the New Keynesian model could not directly capture the crisis, given the absence of financial market frictions. Nor was it useful for understanding the myriad of unconventional credit market interventions aimed at containing the crisis.

Nonetheless, in certain dimensions it provided important insights. Central bank interest rate strategy came directly out of the New Keynesian analysis of the ZLB, which featured forward guidance and "lower for longer." The establishment of a credible inflation target, as the theory prescribes should be done, helped keep inflation stable in the face of a sharp contraction in real activity. As a result, a destructive deflation was avoided.

Indeed, the inflation targeting/Taylor rule framework appears to remain intact today at many central banks, with some adjustments that

rate. Exactly why the central bank's preferred trend inflation is exogenous and time varying remains an open question, though.

take into account the experience of financial crisis: the policy toolkit now includes some of the unconventional tools employed in the financial crisis, and macroprudential policy occupies a significant role.

### Monetary policy analysis: never a dull moment

But as Marvin cautions, the monetary policy framework remains a work in progress. Perhaps the most important issue outstanding is that we still have at best only a rough idea of how central banks can effectively anchor inflation expectations.<sup>12</sup> In this regard, Japan's inability to escape low inflation/deflation after decades poses a challenge, especially since the Bank of Japan introduced a Western-style inflation targeting framework in 2013. Part of the answer surely is that since the late 1990s, the Bank of Japan had done nothing to convince the public that it could indeed engineer an escape from a deflation trap, given the persistently low inflation since the 1990s.<sup>13</sup> This could lead to hardening of long-term inflation expectations at or below zero. Nonetheless, it remains a puzzle as to why Japan appears stuck. At the core of the problem is an incomplete understanding of what determines expectations of trend inflation.

A related, though less dramatic, example involves the inability of the central banks of the industrialized economies in the West to reach the 2 percent inflation target during the recovery period following the Great Recession. In the decade-long recovery, both core PCE inflation and the five-year breakeven inflation rate hovered between a 1 and 2 percent annual rate, without ever consistently reaching the 2 percent target. The target miss was larger for Europe. The inability to consistently reach the target over such a long period is something we still don't understand. Complicating matters is that inflationary pressures have picked up considerably over the current year. Associated with this pickup has been an increase in both the five- and 10-year breakeven inflation rate from 1.5 percent annually on the eve of the pandemic to currently 2.5 percent. It appears that the increase in inflation is feeding

<sup>12</sup> See Candia, Coibin, and Gorodnichenko (2021) for evidence that the inflation expectations of US firms remain far from anchored.

<sup>13</sup> See Gertler (2017) for an analysis of this issue.

into beliefs about trend inflation. Exactly how the Federal Reserve should manage this situation is no doubt an issue Marvin would have been all over.

### Summing up

Marvin's role as a policymaker sharpened his thinking as a researcher. His active engagement in research sharpened his thinking as a policymaker. As can be seen from his example, academic scribblers are no longer so remote from the policy process. Marvin is among the central figures responsible for this development.

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