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Central Banks and Inflation: Where Do We Stand and How Did We Get Here?

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Central Banks and Inflation: Where Do We Stand and How Did We Get Here?

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Abstract: The inability of central banks to attain their target inflation rates in recent years has raised questions about the extent to which central banks can control the inflation process. This paper discusses the evolution of thought and evidence since the 1960s on the determinants of inflation and the role that should be played by central banks. The paper highlights the roles played by two streams of thought associated with Milton Friedman: Monetarist theories predicting a key role for monetary aggregates in determining inflation and the rise in popularity of the expectations-augmented Phillips curve. We discuss influence of the latter in determining the modern consensus on central bank institutions and the relative roles for fiscal and monetary policies. We conclude with a discussion of macroeconomic developments of the past decade and current policy options to stimulate the economy and restore inflation to its target levels, including the merits of "helicopter money".

Keywords: Inflation, central banks, Phillips curve, Milton Friedman

JEL Codes: E31, E52, E58

Table of Contents

1. Introduction

Do central banks control inflation? I suspect that thirty years ago, almost all central bankers and macroeconomists would have given a clear answer: Yes! They would have cited many examples in which policies pursued by central banks had clear effects on inflation. Examples could have included the Federal Reserve's failure to prevent deflation during the Great Depression, the Fed's successful disinflation campaign of the early 1980s and the fact that inflation rates in Europe prior to its monetary union were correlated negatively with the independence of the central bank.

In recent years, however, the certainty that central banks can control inflation has waned. Central banks around the world are failing to meet their inflation targets despite introducing "unconventional" monetary policies that would have been inconceivable thirty years ago. Today, the debate in the central banking community is increasingly focused on whether central banks are largely "out of ammunition" when it comes to influencing inflation.

This paper traces the evolution of thought and evidence since the 1970s on the determinants of inflation and the role that should be played by central banks, focusing in particular on the US experience. The roles played by two streams of thought associated with Milton Friedman are highlighted: Monetarist theories that suggested a key role for monetary aggregates in determining inflation and the rise in popularity during from the 1970s onwards of the expectations-augmented Phillips curve. We discuss how the implications of the expectation-augmented Phillips curve produced a new consensus on how macroeconomic policy should be conducted and how central banks should behave, a consensus that came to dominate across the world by the mid-1990s.

This 1990s consensus, however, has been challenged by macroeconomic developments of the past decade. We document how the Phillips curve has not performed well and how the current macroeconomic environment appears to be one in which the restrictions on policy options implied by the previous consensus may no longer be appropriate.

The paper is structured as follows. Section 2 reviews central bank opinions on the influence of monetary policy on inflation in the 1970s and the monetarist arguments spearheaded by Friedman that central banks needed to focus on controlling the money supply to control inflation. It also discusses the weakening link between monetary aggregates and inflation over the past 30 years.

Section 3 discusses the implications of Friedman's expectations-augmented Phillips curve and its influence on thinking about the design of central bank institutions and the relative roles of fiscal and monetary policy. These ideas lead to a consensus that by the 1990s had come to dominate macroeconomic thinking: Central banks should be the primary conductor of macroeconomic stabilisation policy and they should be highly independent and have low inflation as their primary goal.

Section 4 documents the serious challenges that have emerged to this consensus framework over the years since 2008. Section 5 discusses the policy options that are available to stimulate the economy and restore inflation to its target levels, including the merits of "helicopter money".

2. Why Central Banks? Money and Inflation

The most obvious reason to charge central banks with controlling inflation is because they are the monopoly supplier of the monetary base. The idea that the price level is linked to the supply of money has a long history but the relationship between money and prices is complex and thinking about it has evolved over the last 50 years. This period has seen monetary aggregates move from being seen as relatively unimportant for inflation to being seen as crucial to now again seen as of peripheral importance. This evolution of thought played a key role in the story of modern central banks.

2.1 Central Bank Thinking About Inflation in the 1970s

Despite the long history of theories about the supply of money determining inflation, for most of the 1970s, monetarist thinking did not have much practical influence on policy making at the world's major central banks. The loose macroeconomic policies of the 1960s had seen an increase in inflation rates which was then exacerbated by the 1970s OPEC oil shocks. However, central banks in the 1970s did not act to decisively reduce inflation.

Edward Nelson's (2004) detailed study of the "Great Inflation" of the 1970s in the US and UK concluded the key explanation was what he termed "the monetary policy neglect hypothesis." Nelson documented that central banks appear to have lost faith in the ability of monetary policy to influence aggregate demand and, given the breakdown of the Phillips curve relationship, they doubted the existence of a reliable link between economic activity and inflation. Central bankers often expressed the belief during this period that inflation was largely a "cost-push" phenomenon and the best instruments to deal with it were government-imposed wage and price controls. Christina and David Romer (2002, 2013) have also presented similar evidence.

A telling illustration of thinking inside the Fed about inflation during the early 1970s comes from the contribution of Charles Partee, the senior staff economist discussing the macroeconomic outlook at the March 1971 Federal Open Market Committee (FOMC) meeting:[1]

"*The question is whether monetary policy could or should do anything to combat a persisting residual rate of inflation … The answer, I think, is negative. … It seems to me that we should regard continuing cost increases as a structural problem not amenable to macroeconomic measures*"

Similar sentiments can be found in public statements by 1970s Federal Reserve chairs Arthur Burns and William Miller. At Miller's final FOMC meeting in 1979, the staff briefing indicated

"Developments so far this year—particularly energy price and supply disruptions and larger than anticipated food price inflation—have resulted in a considerable setback to achieving a path of moderate economic growth and substantially reduced rates of inflation. For monetary policy alone there seems to be little in the way of policy options which would yield substantially improved results during the next year or two."

[1] Transcript available at https://www.federalreserve.gov/monetarypolicy/files/fomcmod19710511.pdf
This is a longer version of a quote used by Romer and Romer (2013). It is also worth noting that Partee was subsequently appointed managing director for research and economic policy in 1973 and then served on the Board of Governors from 1976 to 1986.

This assumed helplessness was to change with the appointment of Paul Volcker to the position of Fed Chair in 1979.

2.2 The Rise and Fall of Monetarism

The years prior to Volcker's appointment as Fed chair had seen a steady rise in prominence of the monetarist school of macroeconomics thought, led by Milton Friedman. In contrast to the prevailing helplessness among central bankers, Friedman stressed the monetary origins of inflation and called for central banks to focus on controlling monetary aggregates such as M1 to grow at a low and steady rate.

Friedman's thinking was based on several "pillars", each of which were the subject of decades of careful study, most notably his 1963 *Monetary History of the United States* with Anna J. Schwartz.[2] First, Friedman believed the money multiplier was predictable enough so that central banks could use their control of the monetary base to control broader measures of the money supply such as M1.

Second, Friedman believed that monetary velocity was relatively predictable so the growth rate of nominal income could be approximately controlled by control of money growth. In technical terms, since velocity was defined as $MV = PY$, Friedman believed V was predictable enough to allow central banks to control nominal income (PY) via controlling the money supply (M).

Third, while Friedman accepted that increases in the supply of money could have short-run stimulative effects on real GDP, he emphasised long-run monetary neutrality with respect to real magnitudes. Since increases in the supply of money increased nominal GDP but not real GDP, this meant that increases in the growth rate of money ultimately only increased inflation.

Finally, Friedman undertook many studies on the demand for various types of money. He appears to have been relatively optimistic that both the demand for central bank reserves and the money multiplier would be predictable enough to allow monetary targeting to be implemented without inducing volatility in the federal funds markets and thus short-term interest rates.

Historical transcripts of FOMC meetings and subsequent interviews suggest Volcker was not a monetarist "true believer" but he did agree with Friedman that it was the Federal Reserve's responsibility to reduce inflation.[3] At the momentous October 1979 meeting in which the committee voted to change their operating procedures to focus aggressively on targeting the growth rate of the money supply, the transcript suggests a committee that was keen to just try something different. For instance, Volcker said:

"My feeling was that by putting even more emphasis on meeting the money supply targets and changing operating techniques and thereby changing psychology a bit, we might actually get more bang for the buck. … I overstate it, but the traditional method of making small moves has in some sense, though not completely, run out of psychological gas."

[2] Friedman (1970) is perhaps the most concise summary of his views.
[3] Lindsey, Orphanides and Rasche (2005) provide a detailed discussion of the change in operating procedures in 1979 that is consistent with this interpretation.

In later years, Volcker acknowledged that he viewed the focus on monetary aggregates largely as a disciplining device that would facilitate tighter monetary policy in the form of higher interest rates. In a 2008 interview with Federal Reserve officials, he said:[4]

"*It reached the point where we wanted to discipline ourselves. It was easier to nail our flag to the mast of the monetary aggregates than to continually fiddle around directly with interest rates, where you always had the danger of being too late. From the transcript, it's clear why people were hesitant about raising interest rates directly. We needed some other tool to discipline ourselves. It was also a better message to the public. The connection between interest rates and inflation is always very foggy. People said, "If interest rates are going up, that's inflationary. What are you doing?" But people understood—partly because of Milton Friedman and his constant harping on it—that too much money is inflationary."*

The practical implementation of monetarism by the Federal Reserve was both a triumph and a failure. It was a triumph because it successfully and decisively reduced inflation. From its peak of about 15 percent in early 1980, inflation fell to about 4 percent in late 1982 when the Fed moved away from using monetary targeting. The Volcker disinflation (and similar moves from other central banks around the world) firmly disproved the idea that central banks were unable to tame high inflation rates and these events played a major role in the elevation of price stability to become the principle focus for modern central banks.

On a more practical way to implement monetary policy, however, monetary targeting became viewed as a failure. The relatively stable relationships that Friedman had documented began to fall apart once money supply targeting was followed in practice.

This was partly due to bad luck. The high inflation of the 1970s had put pressure on financial institutions constrained in their operations by regulations dating back to the New Deal era. As Volcker's Fed began implementing money growth targeting, a range of financial sector deregulation measures were introduced. These included requiring all depository institutions to be Federal Reserve members and thus be part of the reserve requirements system, the lifting of interest rate ceilings on savings deposits and allowing interest payments on demand deposits. These measures changed the demand for central bank reserves and altered the characteristics of various elements of the monetary aggregates in ways that made previously stable relationships fall apart.

The result was a chaotic period for monetary policy and the economy. As Volcker put it in his 2008 interview, "*In the end, I think it worked out okay. It was a mess, that's for sure*." The messiness included extreme volatility of the federal funds rate. Because the Fed gave up on targeting the federal funds rate, mismatches between the supply of and demand for reserve balances swung wildly during the 1980-82 period. In 1980 alone, the federal funds rate swung from 10 percent to over 20 percent and back to 10 percent (see Figure 1). 1980 also saw the unusual sight of the federal funds rate increasing sharply even as the economy had clearly entered recession. Other practical problems included difficulty meeting targets for broad money due to unpredictable swings in the money multiplier and the relationship between the money supply and nominal GDP being weaker than had been expected.

[4] Federal Reserve Board (2010).

By October 1982, with high inflation defeated, Volcker had tired of monetary targeting and from that moment on, there was a gradual decrease in the Fed's focus on monetary aggregates. While the specific timing of Volcker's monetarist strategy may have been unfortunate due to financial deregulation, the data since then have further undermined the case for monetary targeting.

Looking at the US data, for example, the money multiplier has been unpredictable and plunged in value after the introduction of quantitative easing in 2009 (see Figure 2). The relative stability of monetary velocity documented by monetarists prior to 1980 has disappeared. As shown in Figure 3, the previous relatively close relationship between broad money growth and nominal income growth is not evident in the data over the past 40 years. Figure 4 shows 60 years of data on money growth and inflation: There is little here to support the idea that money growth is the key determinant of inflation.

So the idea that central banks should be uniquely responsible for controlling inflation because inflation is a function of the money supply has not held up well. But the monetarist insistence that central banks should take responsibility for using monetary policy to control inflation has had a more lasting impact.

Figure 1: The Federal Funds Rate, 1978-1985

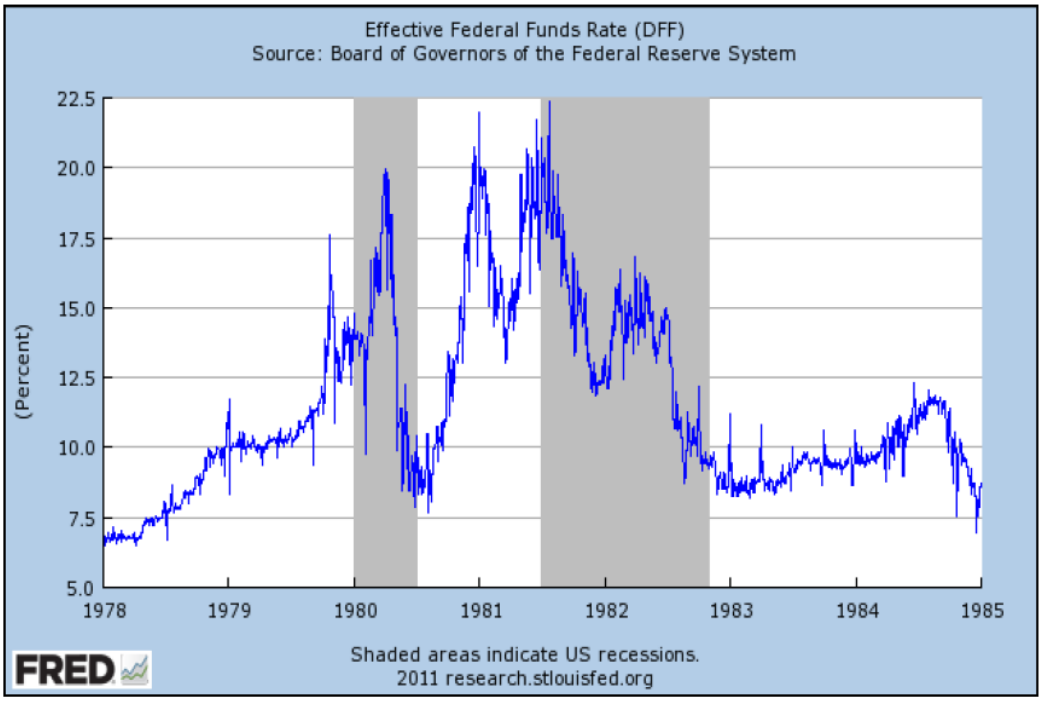


Figure 2: The US M1 Money Multiplier

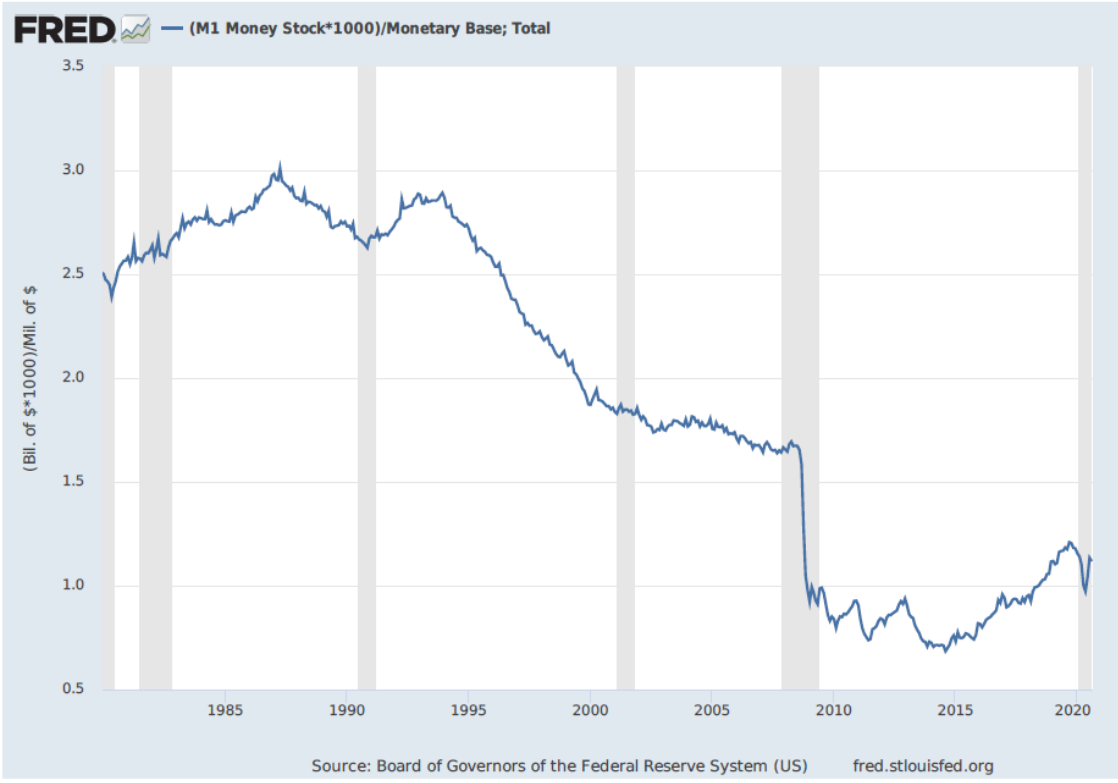


Figure 3: The Growth Rates of the M1 Money Supply and Nominal GDP for the US

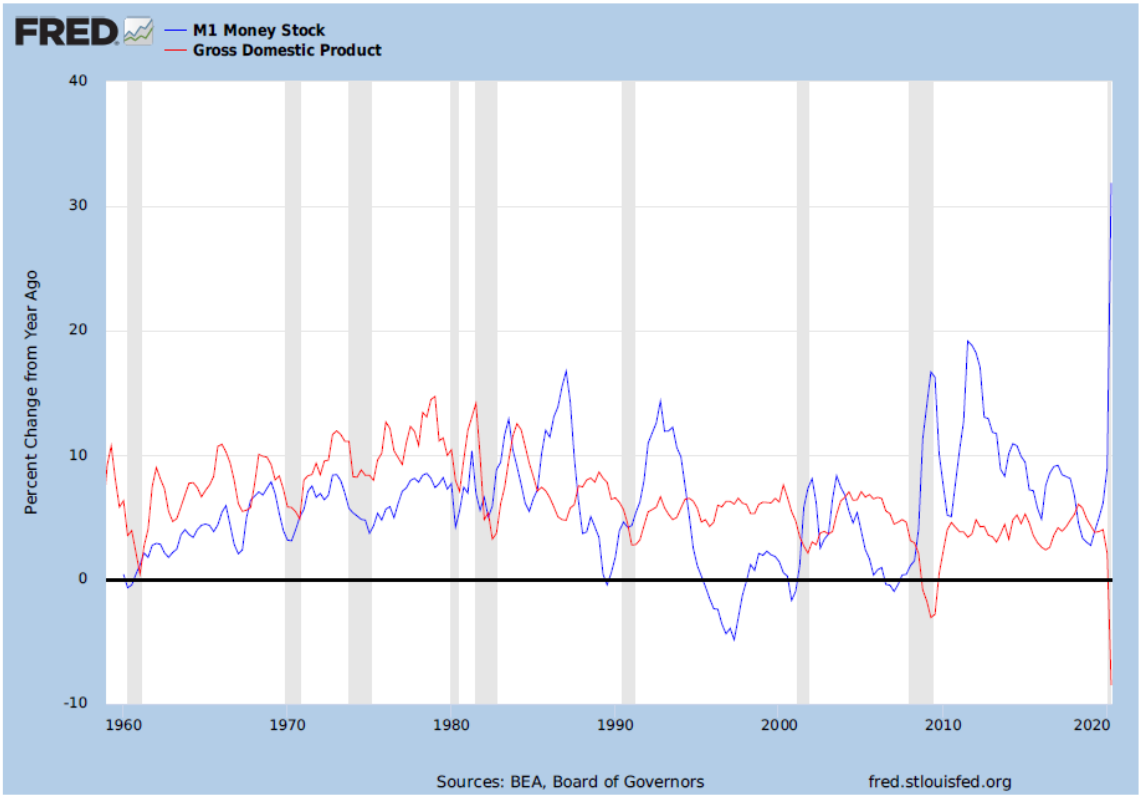
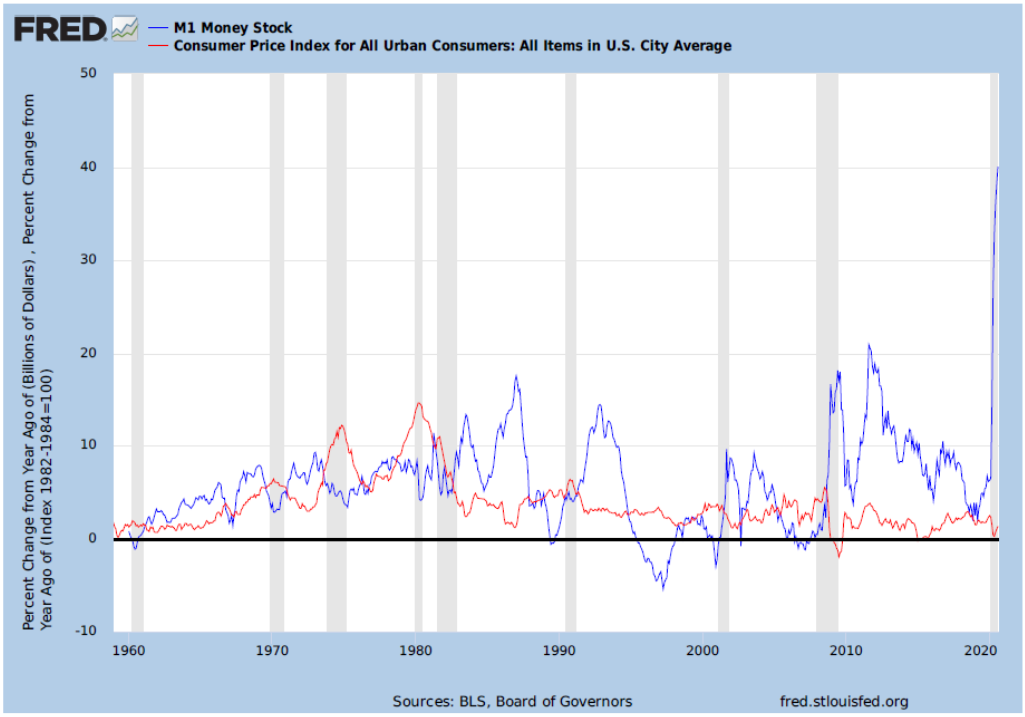


Figure 4: The Growth Rates of the M1 Money Supply and CPI Inflation in the US



3. Why Central Banks? The Phillips Curve

In addition to his work on monetarism, Milton Friedman also had a profound impact on modern macroeconomics through his comments about the Phillips curve in his 1967 American Economics Association (AEA) presidential address "The Role of Monetary Policy", published as Friedman (1968).

3.1 Friedman and the Phillips Curve

Friedman's AEA speech has often been described as a "bolt from the blue" for the economics profession but, as Nelson (2020) has described, it was not Friedman's first statement on the Phillips curve—the points about the Phillips curve made in his AEA speech were largely a repeat of comments in Friedman (1966). More generally, his views on the Phillips curve were consistent with the idea of long-run monetary neutrality that was central to monetarist thought.

After introducing the new concept of the natural rate of unemployment, the clearest statement of Friedman's views on the Phillips curve in the 1968 paper are actually in a footnote:

"Stated in terms of the rate of change of nominal wages, the Phillips Curve can be expected to be reasonably stable and well defined for any period for which the average rate of change of prices, and hence the anticipated rate, has been relatively stable. For such periods, nominal wages and "real" wages move together. Curves computed for different periods or different countries for each of which this condition has been satisfied will differ in level, the level of the curve depending on what the average rate of price change was. The higher the average rate of price change, the higher will tend to be the level of the curve … Restate Phillips' analysis in terms of the rate of change of real wages-and even more precisely, anticipated real wages-and it all falls into place."

These points can be summarised with the now-familiar expectations augmented Phillips curve which describes inflation as a function of expected inflation and the gap between unemployment and its natural rate.

$$\pi_t = \pi_t^e - \gamma(U_t - U^*) \qquad (1)$$

Friedman argued that deviations from the natural rate of unemployment were only possible if inflation differed from its expected level and since you would expect people's expectations to be correct on average, the unemployment should on average equal the natural rate.

This raised the crucial question of how inflation expectations were formed. Friedman's position was that the public's anticipated inflation rates moved relatively slowly. One simple formulation of this idea is the famous "accelerationist" Phillips curve in which we replaced expected inflation with the previous period's observed inflation rate.

$$\pi_t = \pi_{t-1} - \gamma(U_t - U^*) \qquad (2)$$

This formulation has strong implications for the dynamics of inflation and the costs associated with disinflation. It suggests that once inflation reaches high levels, the only way to reduce it is to go through a period in which unemployment is above its natural rate.

Friedman's lecture pre-dated the rise of the rational expectations school of thought. Its advocates, most notably Tom Sargent, believed the high inflation of the 1970s could be dealt with without inducing much harm to the real economy, provided there was a sufficiently credible regime change, so that inflation expectations reacted quickly to the change in policy regime.

The historical evidence has been kinder to Friedman's position on expectations than to that of the rational expectations school. While there is evidence that hyperinflationary situations can be quickly ended by a significant regime shift (Sargent, 1982) the evidence on disinflation in modern advanced economies experiencing more moderate inflation rates is less consistent with this story.

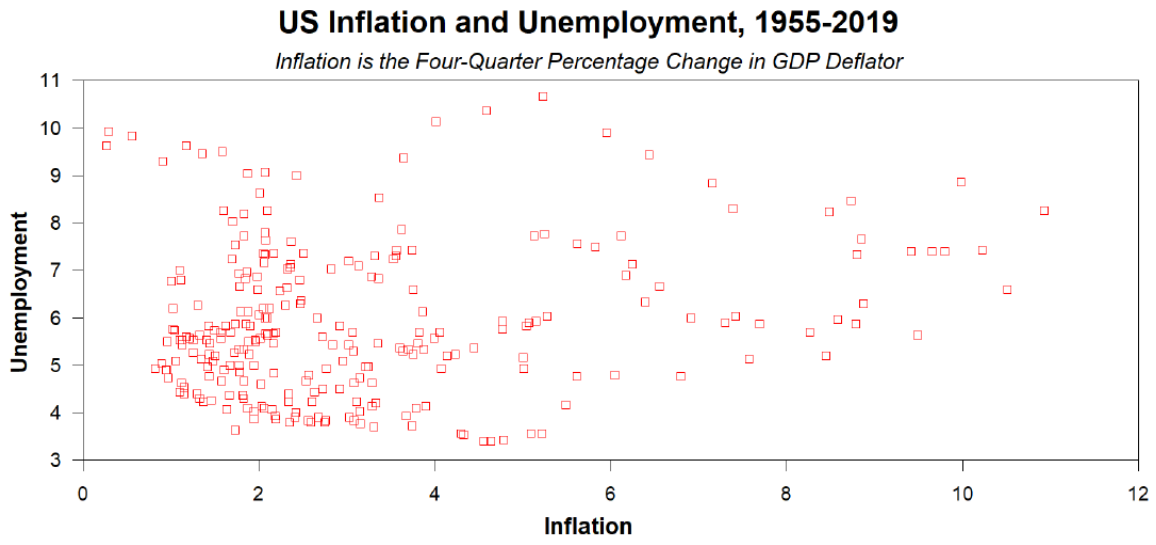
I will briefly note two types of evidence in favour of Friedman's approach. The first is the US experience during the Volcker disinflation. Despite Volcker's initial optimism that his new operational procedures would "change inflationary psychology", the fall in inflation was slow and achieved at the expense of significant output losses. By November 1982, three years after the initial change in monetary regime, high inflation had been conquered but tight monetary policy had triggered two recessions and the unemployment rate stood at 10.8 percent. In subsequent interviews, Volcker explained he was disappointed that long-term interest rates did not react much to the change in monetary regime. Financial markets only began to believe inflation and nominal interest rates would enter a new era once inflation was actually conquered.

Secondly, the data for much of the past fifty years are approximately consistent with Friedman's formulation of the Phillips curve. Figure 5 shows a scatter plot of quarterly data from 1955 to 2019 for US unemployment and inflation, measured as the four-quarter percentage change in the GDP deflator. As Friedman predicted would be the case in 1967, there is no longer any evidence for a negative relationship between inflation and unemployment. Indeed, there is some weak evidence for Friedman's conjecture in his 1976 Nobel speech that there may be a positive long-run relationship. (Friedman, 1977).

Figure 6 uses the same dataset to assess the relationship over the period 1955 to 2009 between the four-quarter change in inflation and the unemployment rate, a simple way of implementing equation 2 above. This reveals a highly statistically significant relationship and suggests a natural rate of unemployment of 5.9 percent. Of course, this is a basic implementation of the model. From at least the 1980s onwards, economists at the Fed and elsewhere would augment this basic model with additional dynamics, supply shock terms for food and energy prices and various other bells and whistles but there was widespread agreement in policy circles that the correct underlying model featured adaptive expectations and a natural rate of unemployment.[5]

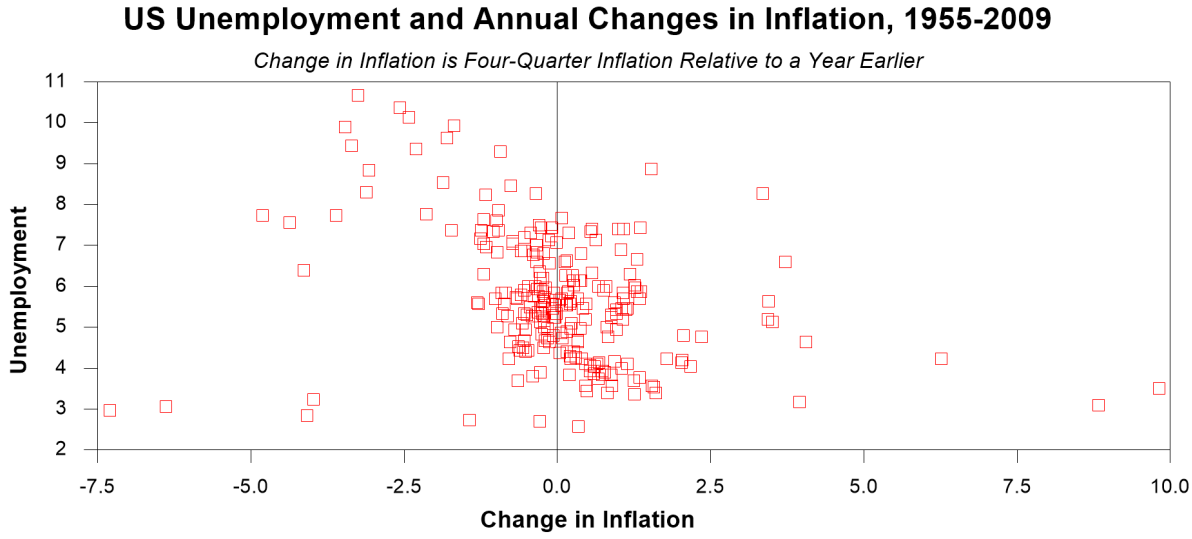
[5] Gordon (2018) was the leading academic pioneer of the so-called "triangle model" approach to modelling inflation dynamics.

Figure 5: The Failure of the Original Phillips Curve



Data Source: Author's Calculations using data from Federal Reserve Bank of St. Louis FRED Database

Figure 6: The Success of the Expectations-Augmented Phillips Curve



Data Source: Author's Calculations using data from Federal Reserve Bank of St. Louis FRED Database

3.2 The 1990s Consensus

The expectations-augmented Phillips curve suggested the existence of a short-run trade-off between inflation and unemployment but it also suggested that better outcomes would be achieved if this trade-off was not exploited. For a given level of inflation expectations, policy makers could choose to stimulate the economy and have a temporary period of low unemployment but this would raise inflation expectations and produce a less attractive short-term trade-off. Even the apparent trade-off offered by the accelerationist formulation—between the unemployment rate and the change in inflation—was unlikely to survive attempts to exploit it. If we had a sequence of inflation rates of 2 percent, 4 percent, 6 percent, 8 percent, it was unlikely the public would fail to spot the pattern and still think 8 percent was a good guess of the next figure in the sequence.[6]

The logic of the expectations-augmented Phillips curve implied that a firm commitment to low inflation would work better than allowing government to set policy on a discretionary period-by-period manner, an idea demonstrated formally in the famous work of Kydland and Prescott (1977). These insights provided the basis for a broad macroeconomic policy consensus that emerged from the mid-1970s up to the 1990s.

De-Emphasising Fiscal Policies

The implications of the expectations-augmented Phillips curve combined with the emergence of the literature on political business cycles to shed doubt on the use of fiscal policy for stabilisation purposes.[7] A consensus emerged that governments under electoral pressure were always likely to exploit the short-run trade-offs offered by the expectations-augmented Phillips curve and this would lead to higher average inflation rates and greater macroeconomic instability.

Others also stressed how the implementation problems and lags associated with activist fiscal policy made it an inappropriate tool when compared with the speed with which monetary policy decisions could be made. As such, macroeconomic stabilisation was best left for central banks. For example, in 1997, Martin Eichenbaum suggested "*There is now widespread agreement that counter-cyclical discretionary fiscal policy is neither desirable nor politically feasible*."[8] A session at the 2002 annual Federal Reserve Jackson Hole conference addressed the question "Is There a Role for Counter-Cyclical Fiscal Policy?" and the speakers largely concluded the answer was No.

Central Bank Independence

On its own, taking stabilisation policy out of the hands of governments and giving it central banks does not rule out short-termist activist policy if the central bankers were still closely aligned with politicians. So from the 1970s onwards, the idea that central banks should be highly independent from politicians gathered substantial backing among macroeconomists. In a manner reminiscent of Keynes's observation about madmen in authority inspired by academic scribblers of a few years

[6] Friedman (1977, page 459) explicitly recognised this issue: "*some substitute a stable relation between the acceleration of inflation and unemployment for a stable relation between inflation and unemployment aware of but not concerned about the possibility that the same logic that drove them to a second derivative will drive them to ever higher derivatives*."

[7] See Drazen (2001) for a summary of the literature on political business cycles.

[8] Eichenbaum (2019) has since argued that this point does not apply when monetary policy is at the lower bounds.

back, the fashion for independent central banks really took off in the 1990s. Haldane (2020) calculates that the fraction of central banks in the world that were independent in all aspects of their work grew from below 50 percent in 1990 to over 85 percent by 2008.

Inflation Targeting

Even central bank independence does not necessarily rule out overly expansionary short-termist monetary policy. For example, the Federal Reserve has always had operational independence but the closeness of 1970s Fed chair, Arthur Burns, to President Richard Nixon and the willingness of Fed officials to co-operate with overall government policy played a role in sustaining the high US inflation of the 1970s.[9]

This pointed to another lesson from the expectations-augmented Phillips curve: Monetary policy will work better if the public believes the central bank's commitment to low inflation is credible. One way to do this is to require the central bank to meet a specified inflation target. This provides a clear communication of the central bank's goal to the public and increases the credibility of commitments to low inflation, since failure to meet a target would inflict reputational damage on central bankers.

As with central bank independence, it was the 1990s that saw this idea come into force around the world. New Zealand was the first country to adopt an explicit inflation target but this approach has since been copied by many other central banks. Interestingly, despite the absence of any compelling empirical evidence for a specific "optimal" inflation target, advanced economy inflation targeters have all chosen inflation targets of about 2 percent. While not usually officially listed as an inflation targeting central bank, under Ben Bernanke (who wrote widely and positively about the benefits of inflation targeting), the Fed made clear what its preferred measure of inflation was and what its preferred rate of inflation was (2 percent naturally). [10]

Central bank legal mandates have also been used to increase anti-inflationary credibility. For example, the European Central Bank, while not given an explicit inflation target, is required by the Maastricht Treaty, written in 1991, to treat price stability as its primary goal, with other goals only being pursued to the extent that they did not prejudice price stability.

Monetary Financing

An obvious additional implication of the 1990s consensus was that monetary and fiscal policy should be kept completely independent. Hence, for example, the prohibition of monetary financing by the European Central Bank in the Maastricht Treaty. As monetary policy has expanded its tools in recent years, the linkages and inter-dependencies between monetary and fiscal policies have become more obvious. For example, central bank purchases of sovereign bonds have substantially reduced the net debt owed by governments to the private sector. But, at least for now, the 1990s consensus position against direct financing of government spending has held up.

[9] Meltzer (2010) describes the relationships between the Fed and presidency during the 1970s in detail.
[10] See for example, Bernanke and Mishkin (1997)

4. A Bad Decade for the 1990s Consensus

In retrospect, the macroeconomic and central banking communities were perhaps guilty of hubris during the period prior to the 2008 global financial crisis. There was a broad consensus on how macroeconomic policy should be implemented and the debate about the "great moderation" in the global economy generally assigned much of the credit for the successful taming of the economy to good macroeconomic policies, largely implemented by central banks.[11] A lot has changed in a decade. Here, we discuss how the 1990s consensus has been undermined by macroeconomic events and how central banks have come to believe they have limited options left to hit their inflation targets and that fiscal policy needs to play a greater role.

4.1 A Bad Decade for the Phillips Curve

The biggest problem for the 1990s consensus has been that the evidence for its key pillar—the expectations-augmented Phillips curve—has weakened over the past decade. The economic recovery that followed the global financial crisis led to low unemployment rates in most advanced economies but there was no sign of tight labour markets triggering inflation.

To illustrate the change in inflation dynamics, Figure 7 reports a scatter plot for 2010-2019 for the unemployment rate and the annual change in US inflation. The robust correlation reported in Figure 6 has disappeared. In fact, a closer look at the evidence suggests that this correlation has been gradually weakening for some time. Figure 8 reports ten-year rolling estimates of this correlation. It shows the correlation peaking in size in the early 1990s and generally weakening after this point.

The decline of the specific accelerationist formulation of the Phillips curve is perhaps not so surprising. Since Sargent (1971), it has been widely understood that if the inflation process is stationary, then it may not make sense to impose the assumption that lagged dependent variable coefficients in an inflation regression should sum to one. But, more generally, the attempts by central bankers and academics to explain the failure of inflation to take off in recent years have not been wholly convincing.

One explanation, stressed by Blanchard (2016) and others, is that the public's inflation expectations have become anchored around the 2 percent target set by central banks. However, fully anchored inflation expectations would imply the re-emergence of a relationship between the levels of inflation and unemployment and there is also no evidence of this in the recent data. Nor does this explanation suggest what it would take for inflation expectations to become de-anchored.

Other potential problems with the Phillips curve, conceded by Yellen (2017), are that the unemployment rate may be a poor measure of slack in the economy or that the natural rate of unemployment exists but has declined in recent years. Another theory, discussed for example by Forbes (2019), is that globalisation has rendered purely national measures of slack less relevant.

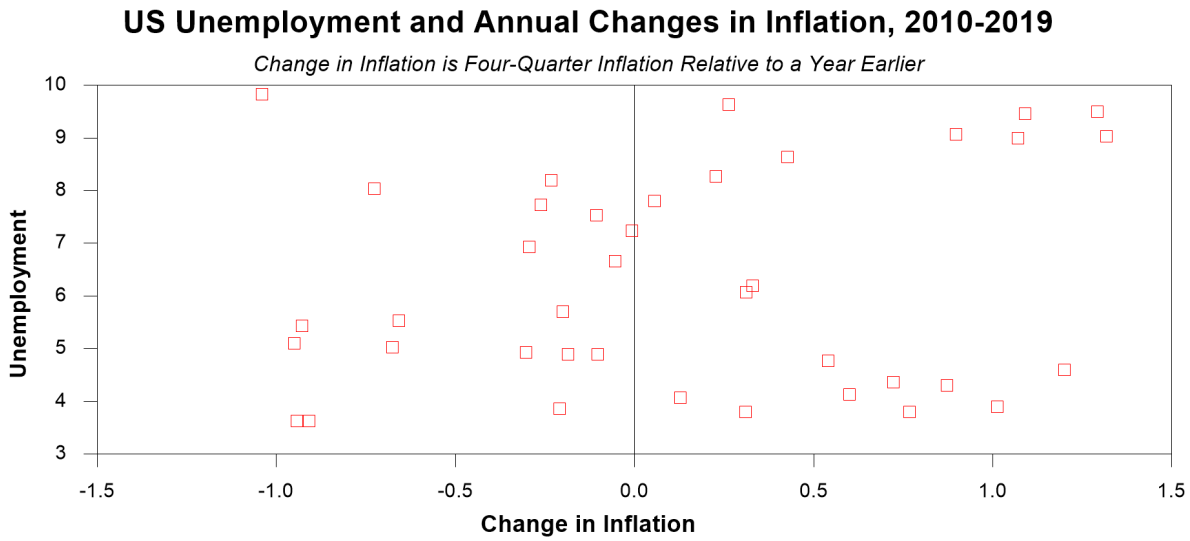
A common theme from speeches by Federal Reserve officials in recent years has been that, as Clarida (2019) put it "*price inflation appears less responsive to resource slack*." However, it is not clear the evidence supports this. The state-level evidence presented by Hazell, Herreno, Nakamura and Steinsson (2020) points to the effect of unemployment on inflation as being no lower in recent

[11] See, for instance, Ahmed, Levin and Wilson (2004).

years than previous decades. Instead, they argue this effect has always been relatively weak and point towards movements in inflation expectations as the dominant force in driving inflation dynamics.

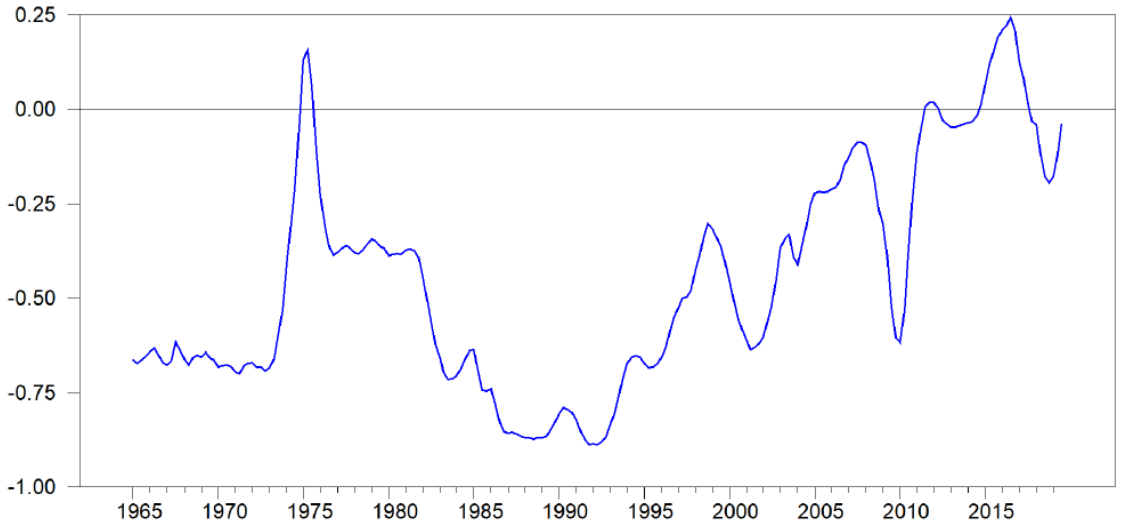
Given the reliance of so many of these explanations on unobserved parameters or unobserved variables such as the natural rate of unemployment or inflation expectations, it is questionable whether the relative merits of these different explanations can be assessed or whether explanations based on unobserved quantities will prove useful for future formulations of monetary policy.

Figure 7: A Bad Decade for the Expectations-Augmented Phillips Curve



Data Source: Author's Calculations using data from Federal Reserve Bank of St. Louis FRED Database

Figure 8: Ten-Year Rolling Correlations Between Unemployment and the Annual Change in Inflation



Data Source: Author's Calculations using data from Federal Reserve Bank of St. Louis FRED Database

4.2 The Falling Equilibrium Real Interest Rate

The failure of the Phillips curve isn't the only thing perplexing modern central bankers. An extended period of below-target inflation has occurred despite central banks providing what appear to be unprecedented amounts of monetary stimulus. Across the world, policy interest rates have been cut to zero (or below zero in some cases) and this has been combined with huge asset purchase schemes and explicit forward guidance aimed at further lowering long-term yields.

However, another theme of Friedman (1968) was that you could not judge the extent of monetary stimulus by looking only at nominal interest rates. What matters for the economy is real interest rates and subdued inflation means the unprecedented low nominal rates of recent years have not necessarily translated into unprecedented low real rates. Indeed, Friedman (1968) cited Wicksell's concept of the natural real interest rate when introducing the corresponding concept of the natural rate of unemployment. This concept of a natural or equilibrium real interest rate has been re-established in recent years as an important part of monetary policy discussions.

Meltzer's (2010) comprehensive history of the Federal Reserve reports that there was very little discussion of real interest rates by FOMC members during the 1970s but real interest rates have since become central to modern macroeconomics, partly due to Friedman's influence and in more modern times, due to the influential work of John Taylor (1993) on monetary policy rules and to Michael Woodford's (2003) work re-establishing the centrality of the idea of a natural real rate of interest.

It seems increasingly likely that the weak impact of monetary stimulus on the economy in recent years reflects not just the fact that real rates are what matter rather than nominal rate, but also that there has been a substantial reduction in the equilibrium real interest rate across the world. If the real rate of interest that stabilises the economy declines, then even low real interest rates may not be providing the stimulus they previously would have.

Whatever the potential causes (and there is no shortage of culprits—demographics, weak productivity growth, a global "savings glut") the evidence suggests the Fed believes there has been a decline in the equilibrium real rate. The New York Fed publishes regular updates of estimates of the equilibrium real rate generated by the Laubach and Williams (2003) model. They suggest this equilibrium rate has been close to zero since 2014.[12] The FOMC appears to agree with this viewpoint. In January 2012, their median estimate of the long-run real federal funds rate (in other words their long-run forecast for the federal funds rate minus their long-run forecast for inflation) was 2.25 percent. By December 2020, this estimate was 0.5 percent. This suggests the Fed does not foresee nominal interest rates returning to the levels that prevailed before the global financial crisis.

4.3 The Fed Finds Fault in the Stars

The 1990s consensus framework handed control of the macroeconomy to central banks, who could then use their estimates of the natural rate of unemployment (u*) to assess inflationary pressures and their estimate of the equilibrium real rate (usually denoted r*) to set short-term interest rates to avoid the economy overheating and to assess how aggressively to respond to recessionary shocks.

[12] These estimates are available at https://www.newyorkfed.org/research/policy/rstar

The events of the past 15 years, however, have undermined confidence in the 1990s consensus framework and policy has begun to deviate from its recommendations.

After the global financial crisis, the Fed kept interest rates close to zero for a long time but began to raise them in December 2015 under the leadership of Janet Yellen. Despite little evidence of an impending rise in inflation, the Fed's decision to increase interest rates was a response to the unemployment rate falling to 5 percent and below. These unemployment rates were below then-prevailing estimates of the natural rate and the Fed was relying on the Phillips curve in its assessment of the threat of inflation.

This was the first of several interest rate increases that continued after Jerome Powell was appointed Fed chair in early 2018 but even during this period there were signs that Fed officials were having second thoughts about their reliance on the Phillips curve. Daniel Tarullo (2017), upon finishing his term on the Federal Reserve Board, wrote that he believed the Fed was implementing "*monetary policy without a working theory of inflation*." Tarullo noted

"After eight years at the Fed (actually, well before that) my conclusion was that there is no well-elaborated and empirically grounded theory that explains contemporary inflation dynamics in a way useful to real-time policymaking."

There were signs that Janet Yellen shared these concerns by the end of her term as chair. In a speech in September 2017, she conceded:

"My colleagues and I may have misjudged the strength of the labor market, the degree to which longer-run inflation expectations are consistent with our inflation objective, or even the fundamental forces driving inflation."

Subsequently, Jerome Powell also began to express severe doubts about the usefulness of the Fed's reliance on the "star" variables, commenting at the 2018 Jackson Hole conference

"Navigating by the stars can sound straightforward. Guiding policy by the stars in practice, however, has been quite challenging of late because our best assessments of the location of the stars have been changing significantly."

In July 2019, the Fed took a historic decision. With unemployment at historically low levels but with inflation running below its 2 percent target, the Fed decided to cut its target range for the federal funds rate. Two further cuts were introduced prior to rates being cut close to zero at the outset of the COVID19 recession.

In August 2020, the Fed issued a "Statement on Longer-Run Goals and Monetary Policy Strategy". As explained by Powell at the 2020 Jackson Hole conference, the Fed had effectively walked away from basing its policy strategy around the Philips curve.

"*our revised statement says that our policy decision will be informed by our "assessments of the shortfalls of employment from its maximum level" rather than by "deviations from its maximum level" as in our previous statement. This change may appear subtle, but it reflects our view that a robust job market can be sustained without causing an outbreak of inflation.*

In earlier decades when the Phillips curve was steeper, inflation tended to rise noticeably in response to a strengthening labor market. It was sometimes appropriate for the Fed to tighten monetary policy as employment rose toward its estimated maximum level in order to stave off an unwelcome rise in inflation. The change to "shortfalls" clarifies that, going forward, employment can run at or above real-time estimates of its maximum level without causing concern, unless accompanied by signs of unwanted increases in inflation or the emergence of other risks that could impede the attainment of our goals."

Effectively, the Fed's current position is that it does not know what determines inflation but there is insufficient evidence that a tight labour market causes unwanted inflation to prevent it from pursuing its goal of maximum employment.

4.4 The Limits to Current "Unconventional Monetary Policies"

As central bankers continue to fall short of their inflation targets, it is now interesting to see increasing suggestions from central bankers that, despite a wide range of new monetary policy tools, they believe they have reached the limits of their capacity to induce higher rates of inflation. In other words, they are "out of monetary ammunition".

Policy rates have been cut to extremely low levels. Some central banks such as the ECB have introduced negative policy rates by charging fees on reserve balances, while others such as the Fed and the Bank of England are unwilling to do this at present. In any case, there are limits to how negative policy rates can go before banks and other investors choose to hold their money as cash rather than as reserves. The lower bound may not be zero but it is probably not too far below zero.

Another policy that has perhaps reached its limits is forward guidance. Central banks are now highly conscious of the impact of their statements on long-term interest rates, so commitments to keep policy rates low for a long time are a key tool used to keep long-term rates low. In the economic conditions of 2021, however, with inflation rates below target and global economies severely depressed (albeit it largely due to the hopefully temporary impacts of the global pandemic), it is unlikely that there is much more "bang to the buck" to be obtained from forward guidance. The public surely knows policy rates will be low for a long time without needing central banks to further confirm this with a new formulation of words.

Some central banks are now focusing more on "open mouth operations" aimed at preventing inflationary expectations from becoming de-anchored from their 2 percent targets. One example has been the Fed's recent commitment that its 2 percent target relates to an average inflation rate over the medium run, so that if inflation falls short of its target, it will tolerate an offsetting period of inflation above the 2 percent rate. This formulation of the price stability objective is probably an improvement on its previous approach but it is open to question whether it will have much impact on inflation expectations. Why would the public believe the Fed is going to engineer a period of inflation above 2 percent when it hasn't been able to get inflation up to 2 percent in recent years?

This leaves large-scale asset purchase programmes i.e. quantitative easing (QE). The evidence suggests these programmes have worked to reduce longer-term yields and stimulate asset prices but it is worth emphasising the relatively small size of these effects. Bernanke (2020) summarises the evidence on the impact of QE from Ihrig et al (2018) as follows: "*QE1 reduced the 10-year term*

premium by 34 basis points, the Maturity Extension Program reduced term premiums by an additional 28 basis points, and QE3 reduced term premiums yet more, by 31 basis points on announcement and more over time."

In other words, about $3.5 trillion dollars worth of money created to buy long-term bonds managed to reduce long-term yields by less than one percentage point. Bernanke's joke that ``*QE works in practice but not in theory*'' is well known but the traditional finance theory that suggested limited room for "demand" effects in financial asset pricing is only slightly wrong and the practical effects of QE on yields are small. It will be interesting to see whether the latest rounds of central bank asset purchases in response to the pandemic recession continue to have a similar impact on longer-term yields or whether "diminishing returns to QE" has perhaps set in.

5. Current Options: Helicopter Drops or Fiscal Stimulus?

With policy rates at rock bottom and little mileage left in the current set of "unconventional" monetary policies, the world's central bankers are increasingly calling for a greater role for fiscal policy to stimulate the economy. Does this pessimism imply that monetary policy cannot raise inflation anymore? I don't think so.

The debate about Phillips curve models has perhaps made the discussion about inflation more complex than it really needs to be and has painted a dichotomy between macroeconomics and microeconomics that may not be warranted. The price level is just an aggregation of many individual prices. Empirical microeconomics is an extremely successful discipline and is very good at explaining prices. Study after study confirms that prices are a function of demand, supply and market structure.

Changing market structures may play some role in determining the aggregate price level but if anything the evidence of declining competition and falling labour shares in many sectors would suggest this factor should have been increasing inflation for years.[13] It is reasonable to conclude that the dominant factor driving lower-than-expected prices in the economy in recent years has been the demand for goods and services relative to the capacity to supply them.

Perhaps complex explanations for low inflation such as mysteriously-behaving inflation expectations and unpredictable natural rates of unemployment are best replaced with a simpler alternative: The unemployment rate only captures one aspect of the mismatch between supply and demand in the economy and low inflation is always a sign of aggregate demand being weak relative to aggregate supply.

So, for example, Hazell, Herreno, Nakamura and Steinsson (2020) interpret the Volcker disinflation as largely occurring because the monetary policy regime change gradually brought inflation expectations down. But an alternative interpretation could be that the Fed's restrictive and volatile monetary policy had a much larger negative effect on aggregate demand than could be summarised via the unemployment rate. And more recently, the weakness of inflation across the advanced global economies suggests a common cause: Weak global aggregate demand relative to global supply.

From this perspective, the solution to below-target inflation is more expansionary macroeconomic policies. Central banks may claim they cannot pursue policies that are more expansionary than their current ones, but this is clearly incorrect. All monetary policies stem from the ability of central banks to create money from nothing. Creating money so that the private sector swaps assets for central bank reserves has no direct wealth effect. However, direct provision of money to households—so-called helicopter drops—would imply a direct increase in wealth similar to once-off fiscal stimulus payments. The extensive literature on these payments has convincingly concluded there is a sizeable response of consumption spending to stimulus payments with the positive response not just limited to poorer liquidity-constrained households.[14]

This suggests a clear mechanism through which central banks can boost aggregate demand more than they have been doing and thus raise inflation: Issue direct payments to households. Why have no major central banks yet considered this? One can point to several reasons.

[13] See, for example, De Loecker, Eeckhout and Unger (2020).
[14] See, for example, Kaplan and Violante (2014) for a summary.

The first is its potential legal restrictions. For example, in the euro area, there could be concerns that direct payments to households, to the extent that they look like direct payments from government, could violate legal prohibitions on monetary financing of government spending. I'm not sure this really is the case. The "founding fathers" of the euro would probably have banned helicopter money if they had considered it but it was so out of their range of experience that the Treaties are silent on the matter. A programme in which the ECB instructs its counterparty banks to credit household deposit accounts paid for by increases in the amount the banks have deposited with the Eurosystem could be considered independent of the government financing process and thus legal. But central banks are conservative institutions and any prospect of legal problems can doom a proposal.

The second set of reasons are practical. How would the payments to households be made? Should businesses also receive payments? What about people without bank accounts? Should the payments be the same for all households regardless of income? Should they depend on how many members a household has? These are all essentially political questions and it is not clear that central bankers are the right people to be making these decisions.

The third set of reasons relate to the potential impact of helicopter drops on the long-run credibility and independence of central banks. On the positive side, central banks can point to their independent choice to adopt such a policy and can argue it enhances their credibility if its impact means they attain inflation targets. But, over the longer run, a central bank that has decided to do helicopter money once will eventually come under political pressure to do so again, perhaps at a time when it would stimulate unwanted above-target inflation. When economies have reached their full-employment levels, there are real resource constraints related to government spending. A higher share of output being absorbed by the state requires a smaller share of output for the private sector, whether that is implemented by official taxes or an "inflation tax". The perception of monetary financing as a costless "magic money tree" that worked well in the past could make it a popular way to finance government spending and avoid a frank discussion of the real resource constraints that exist when the government wants the size of the state to be larger.

The final set of reasons relates to the change in central bank operational strategies over the past few decades. With QE having supplied huge quantities of reserves to the banking system, the principal tool now used by central banks to control short-term interest rates is the interest rate paid to commercial banks on the reserves they have on deposit with the central bank. While these interest rates are currently zero (or in the case of the euro area, negative), a programme that is successful in restoring inflation to its target level would see the interest rates paid on reserves rise again. This means helicopter money does not end up being a "free lunch". Relative to financing stimulus payments via issuing long-term government bonds, the helicopter drop can be seen as an option to finance once-off payments at a short-term variable rate rather than at a fixed long-term rate. While the 1990s consensus preferred to view monetary and fiscal policies as distinct areas that should be kept far apart, the reality of the consolidated government budget constraint argues against such a viewpoint.

So central banks can do more but they are probably right to resist going down the helicopter money path. Thankfully, their calls for fiscal policy to do more come at a time when the "1990s consensus" prejudice against activist fiscal policy has been fading away. Furman (2016) provides a nice summary of the "new view" of fiscal policy, in which activist policy is seen as an important macroeconomic

tool and in which “fiscal space” is far greater than previously thought, thanks to the significant reduction in real interest rates.

This newer view has received further stimulus from Blanchard’s (2018) convincing high-profile demonstration that the interest rates on advanced economy government debt are regularly lower than the growth rate of GDP. In this environment, it is possible to carry high levels of government debt relative to GDP without any problems and, indeed, it may be possible even at current levels of debt to finance a large expansionary fiscal stimulus without needing recourse to subsequent tax increase.

6. Conclusions

The past 50 years have seen many of the conventional wisdoms in macroeconomics be reversed or even come full circle. This paper started with the Federal Reserve’s scepticism in the 1970s that it could contain inflation. Today’s Fed seems unsure whether it can raise inflation to achieve its modest 2 percent target. Fiscal policy has gone from being seen as the key macroeconomic tool in the Keynesian 1960s to being seen as best avoided to now again seen as a crucial part of the policy toolkit.

In relation to inflation, macroeconomists have perhaps relied too much on simple summary relationships such as the quantity theory of money or Phillips curves of various sorts. But the laws of supply and demand have not been repealed. There is a strong body of empirical evidence telling us that macroeconomic policy can influence aggregate demand and there is little reason to doubt that stimulating aggregate demand sufficiently can raise inflation. Whether or not it is monetary or fiscal policy that provides the impetus to restore economic growth and meet inflation targets is less important than getting the overall balance of policy right. For various reasons, the potential next big step for central banks of issuing helicopter money should perhaps be avoided (at least for now) meaning it is best that expansionary fiscal policy plays a greater role over the next few years.

Much of the evolution of thought documented here has come from economists learning from previous policy mistakes. The great inflation of the 1970s can be blamed on poor monetary policies from the Federal Reserve and other central banks. The slow recovery from the 2008 global financial crisis can be partly blamed on inadequate fiscal stimulus during the recession and an excessively quick turnaround to focus on fiscal austerity. In the present moment, however, there are grounds for optimism.

The passing of the American Rescue Plan, featuring $2 trillion of in fiscal support for the US economy, is a sign that ambitious fiscal policy is again a possibility. It would be good to see this ambition copied elsewhere. In particular, in Europe, now would be a good time to substantially revise the highly restrictive (and at this point economically nonsensical) fiscal rules that apply to euro area members. Of course, we will almost certainly look back to now and find that various mistakes were made by central banks and governments. But what matters is that we learn from those mistakes and use what we have learned to do better next time.

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