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The Causes of Inflation

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The problem of inflation has been of central concern to American policymakers since the mid 1960s. Of particular concern has been the rise in the core, or sustained, inflation rate from below the 2 percent level in the early 1960s to near the double-digit level by the late 1970s. Since 1981 a rapid disinflation has occurred, bringing the current inflation rate down to below 5 percent. The recent decline in inflation has not been achieved without substantial costs: In 1982, unemployment reached the highest level in the postwar period, peaking at 10.7 percent and is currently still above the 7 percent level. At the present time we are at a crucial juncture: The inflationary fire has abated, but there remains a persistent worry that it might reignite. What should be the stance of policymakers, and in particular the monetary authorities, in the current economic environment?

This paper attempts to provide some answers to this question by exploring why sustained inflations occur and the role of monetary policy in the inflation process.[1] The conclusion reached in this paper is that in the last ten years there has been a convergence of views in the economics profession on the causes of inflation. As long as inflation is appropriately defined to be a sustained inflation, macroeconomic analysis, whether of the monetarist or Keynesian persuasion, leads to agreement with Milton Friedman's famous dictum, "Inflation is always and everywhere a monetary phenomenon."[2] However, the conclusion that inflation is a monetary phenomenon does not settle the issue of what causes inflation because we also need to

I thank Bob Cumby and participants at the Symposium for their helpful comments. This research has been supported by the Sloan Foundation. The usual disclaimer applies.

1. Temporary movements of the inflation rate have been substantial in the 1970s because of the external supply shocks due to the increase in oil prices in 1973 and 1979. This paper does not focus on these temporary movements of inflation because they are strongly influenced by external factors that are not under the control of the monetary authorities. See Blinder (1979) for a discussion of how supply shocks temporarily raised inflation in the 1970s.

2. Friedman (1963).

understand why inflationary monetary policy occurs. This paper will also examine this issue and by so doing provide some suggestions as to how monetary policy should be conducted in order to prevent the resurgence of inflation at a minimum cost in terms of unemployment and output loss.

Inflation as a monetary phenomenon

The most persuasive evidence that Friedman cites to support his proposition is the fact that in every case where a country's inflation rate is high for any sustained period of time, its rate of money supply growth is also high. This evidence for the decade spanning 1972-82 is shown in the scatter diagram in Figure 1, which plots the average rate of inflation for 52 countries against the average rate of money growth in this period.[3] The well known relation between money growth and inflation is illustrated by the regression line plotted in the figure, and the correlation between inflation and money growth is found to be 0.96. The country with the highest rate of inflation in this period, Argentina, is also found to have the highest rate of money growth, while the country with the lowest rate of inflation, Switzerland, is also the country with the lowest rate of money growth.

An important feature of this evidence is that it focuses on sustained or core inflation, that is, a situation where the price level is continually rising. Friedman's sweeping statement that inflation is always and everywhere a monetary phenomenon thus focuses on the ***long-run*** phenomenon of inflation and is ***not*** concerned with temporary inflations in which the upward movement in the price level is not a continuing process. If Friedman's proposition did refer to temporary inflations, then it could easily be refuted by numerous counter examples.

The distinction between sustained and temporary inflations is an important one in evaluating Friedman's proposition. Although articles in the popular press seem to indicate that monetarists and Keynesians have a completely different view of the inflation process, this is not the case. Keynesian macro theory as it is currently practiced, as well as monetarist analysis (and its offshoot, the new classical macroeconomics advocated by Lucas and Sargent), all support Friedman's proposition that sustained inflations are monetary phenomena.

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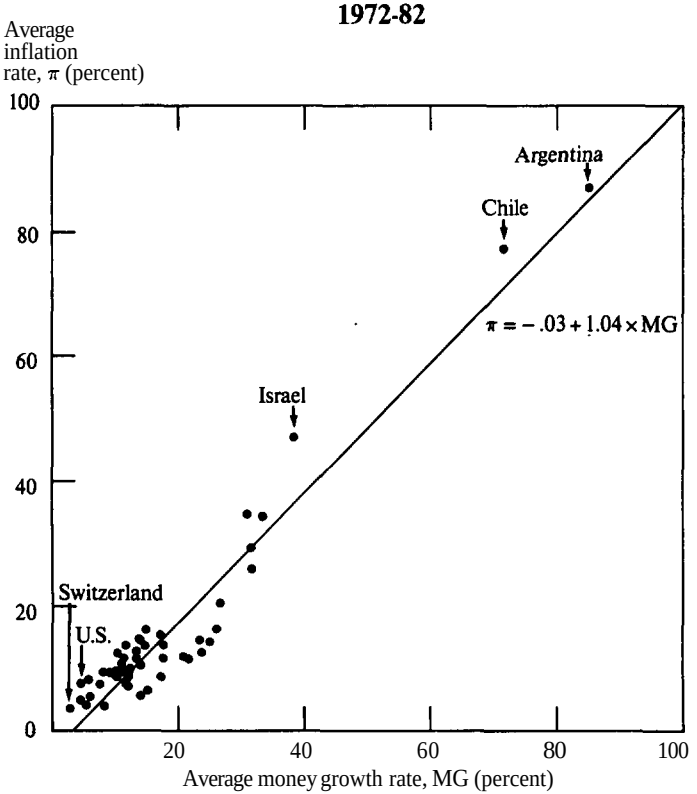
3. These are the 52 countries for which money supply, price level and real output data were available in the IMF's *International Financial Statistics*. A quantity theory view of money growth and inflation would make use of a money growth variable that is adjusted for real output growth by subtracting real output growth from money growth. As expected, the adjusted money growth measure is more highly correlated with inflation than is the unadjusted money growth variable used in the text: The correlation of the adjusted money growth variable with inflation for the 52 countries is .98.

FIGURE 1

Inflation and Money Growth in 52 Countries 1972-82

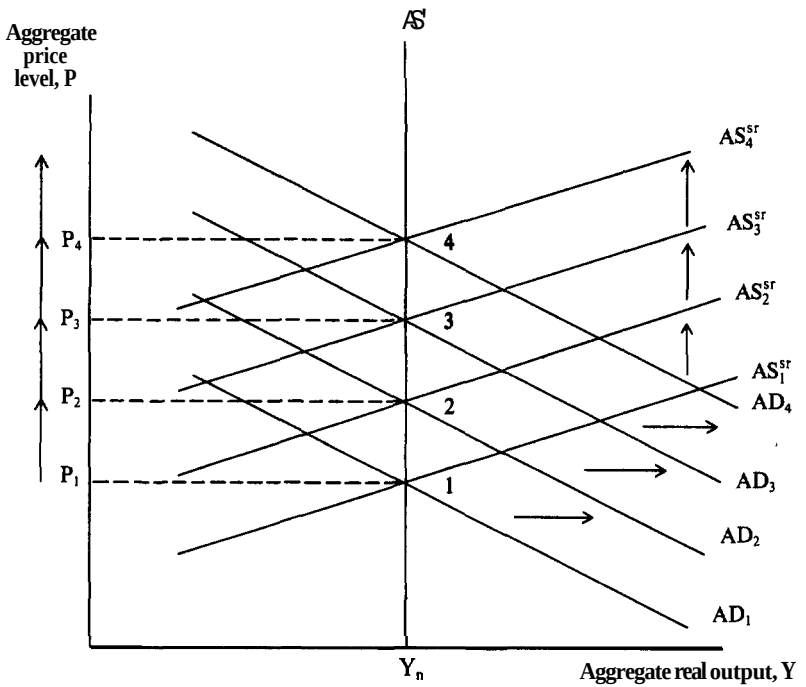


Source: The data used in constructing the inflation and money growth numbers were obtained from the IMF's *International Financial Statistics Annual Yearbook 1983.* Consumer price indices were used to calculate the inflation rates and narrowly defined money was used to construct the money growth rates. The average growth rates were calculated by taking the log of the 1982 value of the CPI or money supply, subtracting off the log of the 1972 value, and then dividing by 10. All data are at annual rates, continuously compounded.

The best way to see the wide theoretical support behind the Friedman proposition is to make use of the aggregate supply and demand framework to see how each of the three major paradigms in macroeconomic analysis view the inflationary process. Figure 2 contains the aggregate supply and demand diagram that shows the response of prices and output to a continually rising money supply,

FIGURE 2

The Response of Prices and Output to a Continually Rising Money Supply



Let us first consider how this diagram works in the context of the monetarist model. Suppose that initially we are at Point 1, where the price level is P_1 and real output is at the natural rate level of output, Y_n, which is the level of real output that corresponds to the natural rate of unemployment. The initial aggregate demand curve, AD_1, is downward sloping in the monetarist model because nominal income is fixed by the level of the money supply, and any decline in price level means that there must be a corresponding rise in output. The initial short-run aggregate supply curve, AS_1^{sr}, is upward sloping because a rise in nominal income yields a rise in both real output and the price level in the short-run. In the long run, however, real output will be at its natural rate level, Y_n; hence the long-run aggregate supply curve is the vertical line AS^{lr} at the real output level of Y_n. The diagram has been drawn so that initially the aggregate demand and short-run aggregate supply curves intersect at Point 1, which is also on the long-run aggregate supply curve.

When the money supply increases, the monetarist model predicts that nominal income will rise, thus shifting out the aggregate demand curve to AD_2. At first we might have an increase of real output above the natural rate level, but the resulting decline in unemployment below the natural rate will create upward pressure on wages and prices, thus leading to a continuing shift up in the short-run aggregate supply curve until it reaches AS_2^{sr}, where the economy is again back at the natural rate level of output. The price level has now increased to P_2 where the aggregate demand and supply curves intersect at Point 2. A further increase in the money supply next period shifts the aggregate demand curve out to AD_3, and the economy moves to Point 3 and a higher price level of P_3. Continuing increases in the money supply send the economy to Point 4 and beyond. The net result of this process is that a continuing rise in the price level, that is, a sustained inflation, results from a growing money supply. In the monetarist model, the aggregate demand curve shifts only as a result of changes in the money supply and so, in the absence of a high rate of money growth, sustained inflation cannot develop. Friedman's proposition that inflation is a monetary phenomenon then follows.

The Keynesian analysis of the response of output and prices to a continually rising money supply is almost identical to the scenario just described for the monetarist model, The Keynesian model also has a downward sloping aggregate demand curve because for a given money supply a decline in prices raises real money balances, lowers interest rates, and thereby raises aggregate demand. In addition, this downward slope in the aggregate demand curve can result from real balance effects in which the decline in the price level raises the real value of wealth, thereby increasing aggregate demand. The upward sloping short-run aggregate supply curve and the vertical long-run aggregate supply curve, AS^{lr}, are also features of the Keynesian model. The Keynesian model differs in its treatment of aggregate supply from the monetarist model in that it views the speed of adjustment of the short-run aggregate supply curve to its long-run position as being slower than in the monetarist model. While monetarists see the economy as inherently stable with a rapid adjustment to the natural rate level of output, Keynesians see the economy as inherently unstable, with a much slower adjustment to the natural rate level of output.

A rise in the money supply in the Keynesian model also leads to the aggregate demand curve shifting out to AD_2 because at a given price level real money balances rise, leading to both a decline in interest rates and a rise in the real value of wealth, thus causing aggregate demand to rise. The economy will again head to Point 2 because the short-run aggregate

supply curve will continue to rise until it reaches AS_2^{sr}, where output is at its natural rate level. Further increases in the money supply will move us to Point 3, 4, and so on. The Keynesian model thus also reaches the conclusion obtained from the monetarist model: A continuing rise in the price level, that is, a sustained inflation, will result from a rapid growth of the money supply.

The Keynesian model, in contrast to the monetarist model, does allow other factors besides the money supply to affect the aggregate demand curve, specifically fiscal policy. Thus, at first glance, it would seem that a sustained inflation might occur as a result of expansionary fiscal policy, such as increased real government spending or decreases in taxes, and that the Friedman proposition would be refuted. However, this is not the case. Even in the Keynesian model, a sustained inflation cannot result unless there is a rapid growth in the money supply.

Suppose that the economy is initially at Point 1 in Figure 2 and government spending is permanently increased, shifting out the aggregate demand curve to AD_2. Initially, output will rise above the natural rate level, leading to a rise in the short-run aggregate supply curve to AS_2^{sr}, where output is again at Y_n and the price level has risen to P_2. The net result from the permanent increase in government spending is a one-shot, permanent increase in the price level. While the economy is moving from Point 1 to Point 2, the inflation rate will be high. Once Point 2 is reached, however, the inflation rate will return to zero. Thus, the permanent increase in government expenditure leads to only a *temporary* increase in inflation.

In the absence of rapid money growth, a permanent increase in government expenditure cannot lead to a continually rising price level and hence to a sustained inflation. Only a continuing rise in government expenditure can lead to shifts in the aggregate demand curve to Points 3, 4, and so on, yielding a sustained inflation. Such a policy, however, is not a feasible one because there is a limit on the total amount of government expenditure possible: The government cannot spend more than 100% of GNP. In fact, well before this limit is reached, the political process would stop the increase in government expenditure. As is visible in recent congressional debates about the budget, the public and politicians have a particular target level of government spending that they think is appropriate for our society. Although small deviations from this level might be tolerated, large deviations will not be, imposing even tighter limits on the degree to which government expenditures can be increased.

By a similar argument, lowering taxes also cannot lead to sustained inflation in the absence of rapid money growth. A permanent decline in

taxes can shift the aggregate demand curve from AD_1 to AD_2. But further outward shifts in the aggregate demand curve can occur only if taxes are continually reduced. This process will obviously have to stop when tax collections are zero. The outward movements of the aggregate demand curve will thus eventually also have to come to a stop, and the resulting inflation will necessarily be temporary. The conclusion we have reached is the following. ***Even in a Keynesian model, fiscal policy cannot by itself be the source of sustained inflation.*** The Keynesian framework therefore also supports the Friedman proposition.

The new classical macroeconomics also can be cast in the aggregate demand and supply framework of Figure 2. The advocates of new classical macroeconomics lean to Milton Friedman's position that money is all that matters to changes in nominal income, although they are willing to entertain the possibility that other factors influence the aggregate demand curve. The principal difference between them and monetarist or Keynesian economists is in their views of aggregate supply. The new classical macroeconomics combines the assumption of market clearing (because wages and prices respond completely flexibly to the appearance of new information) with the assumption of rational expectations. Any changes in the aggregate demand curve that are anticipated will lead to changes in the short-run aggregate supply curve that leave real output unchanged. The resulting neutrality of anticipated policy does not affect any of the conclusions reached above. New classical macroeconomics is also consistent with the view that inflation is always and everywhere a monetary phenomenon.

The causes of inflationary monetary policy

To understand the process generating sustained inflation, it is not enough to know that a sustained inflation will not occur without a high rate of money growth. We also must understand why governments pursue inflationary monetary policies. Because politicians and government policymakers never advocate inflation as a desirable outcome, it must be that in trying to achieve other goals, governments end up with a high money growth rate and thus a higher inflation rate. There are two goals that may lead to inflationary monetary policy: high employment, and the desire to have high government spending with low taxes.

High employment targets and inflation

The U.S. government is required by law, in the Employment Act of 1946, as well as the more recent Humphrey-Hawkins Act of 1978, to promote high employment. It is true that both of these laws state that a high

employment level is to be achieved that is consistent with a stable price level, but in practice this has often meant that our government has pursued a full employment target with less concern about the inflationary consequences of its policies.

One result of pursuing a full employment target is that the government will engage in an activist stabilization policy to promote high employment, using monetary and fiscal policy to raise real output and employment when they fall below their natural rate levels. How this activist policy can lead to a high rate of money growth and inflation is again illustrated with the aggregate supply and demand apparatus in Figure 3. Consider a situation in which initially output in the economy is at the natural rate level at Point 1, where the aggregate demand curve, AD_1, and the short-run aggregate supply curve AS_1^{sr}, intersect. If unions and firms decide that they want to obtain higher wages and prices and so raise them, the short-run aggregate supply curve will rise to a position such as AS_2^{sr}. With government monetary and fiscal policy unchanged, the economy would move to Point A and output would decline to below its natural rate level. When unemployment rises as a result, activist policymakers with a high employment target would accommodate the higher wages and prices by implementing expansionary monetary or fiscal policy that would raise the aggregate demand curve to AD_2, thus raising output back up to its natural rate level.

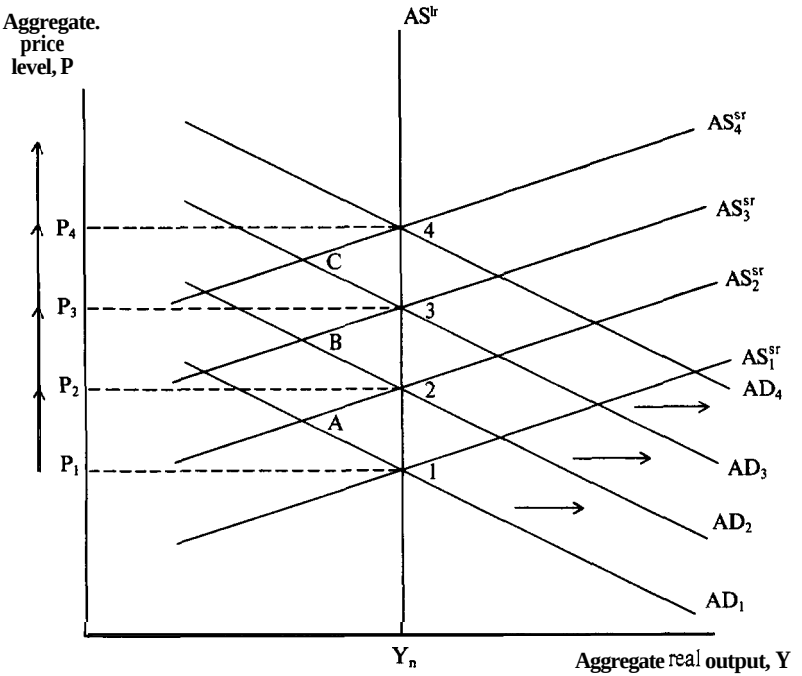
The consequence for the workers and firms is that they have achieved their goal of higher wages and prices without the appearance of too much unemployment. As a result they might want to try to raise their wages and prices again. In addition, other workers and firms might also raise their wages and prices in order not to be left behind and suffer a decline in their relative wages and prices. The net result will be that the short-run aggregate supply curve will shift up again, say to AS_3^{sr}. Unemployment would rise again when the economy moves to Point B, and accommodating, activist policy will now again be used to shift the economy to Point 3 by shifting the aggregate demand curve out to AD_3.

The above process can keep on continuing, and the price level will keep on rising, sending us to Point 4 and beyond. The sustained inflation that results is known as cost-push inflation because it has been triggered by the push of workers and firms to raise their wages and prices.

At first glance, it might appear as though the cost-push inflation provides a counter example to the Friedman proposition that inflation is a monetary phenomenon. This is not the case because in order for a sustained inflation to occur, the aggregate demand curve has to shift out continually, and as the earlier discussion indicates, this can occur only if the

FIGURE 3

A Cost-Push Inflation with an Activist Policy to Promote High Employment



money supply is continually rising. If a non-accommodating monetary policy is followed because the government is not bound to a high employment target, then the upward push of wages and prices that raises the short-run aggregate supply curve from AS_1^{sr} to AS_2^{sr} will not be followed by expansionary policy to shift the aggregate demand curve outward; instead the aggregate demand curve will remain at AD,. Now when the economy moves to Point A and unemployment develops there will be pressure on wages and prices to fall. The aggregate supply curve will begin to shift back down to AS_1^{sr}, and eventually the economy will return to Point 1, where output is at the natural rate level and the price level has returned to its initial value of P_1. A continuing rise in the price level does not occur.

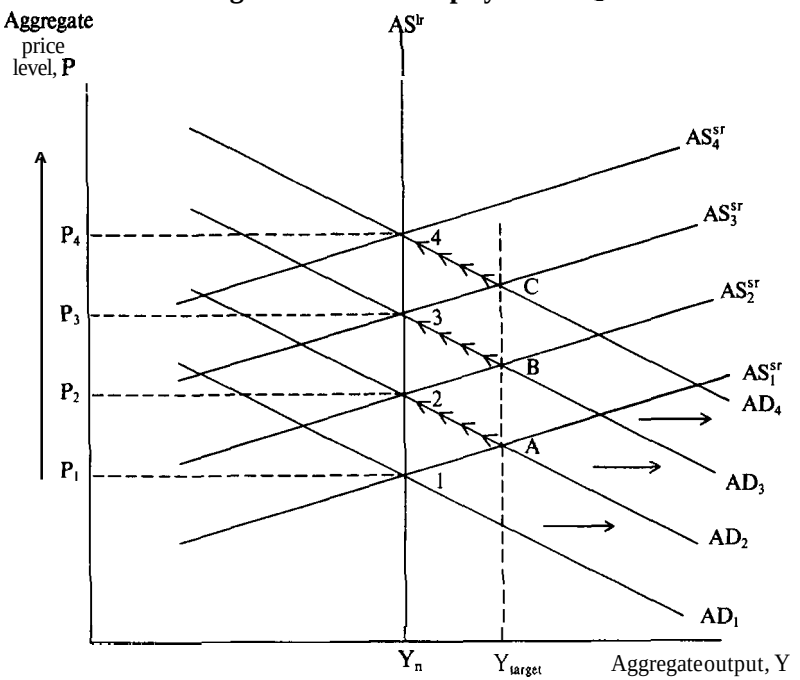
The conclusion of this analysis is that an attempt by workers and firms to push up their wages and prices cannot by itself trigger sustained inflation. Policymakers have to lend a hand by pursuing an accommodating, activist policy of eliminating high unemployment with expansionary monetary policy. Another way of stating this is the following. ***Sustained*** *cost-*

push inflation is also a monetary phenomenon because it cannot occur without the acquiescence of the monetary authorities to a higher rate of money growth.

There is a second way that pursuing the goal of high employment can lead to inflationary monetary policy: policymakers can set a target for unemployment that is too low because it is below the natural rate of unemployment. The consequences of a policy of too low an unemployment target is depicted in Figure 4.

FIGURE 4

A Demand-Pull Inflation as a Consequence of Setting Too Low an Unemployment Target



Because the policymakers target on a level of unemployment below the natural rate level, the targeted level of real output, marked as Y_{target} in Figure 4, is above the natural rate level of output, Y_n. If the economy is initially in long-run equilibrium, Point 1, the policy authorities will feel that there is too much unemployment because output is less than the target level. In order to hit their output target, the policymakers will conduct an expansionary policy that will shift the aggregate demand curve out to AD_2 and the economy will move to Point A. Because unemployment is now

below the natural rate level, wages and prices will begin to rise, shifting the short-run aggregate supply curve up to AS_2^{sr} and sending the economy to Point 2. The price level has now risen from P_1 to P_2, but the process will not stop there. The economy is still operating at an output level below the target, and so the policymakers will shift the aggregate demand curve out again, this time to AD_3. The economy will eventually head to Point 3, and policymakers will again shift the aggregate demand curve outward, sending the economy to Point 4 and beyond.

The discussion above indicates that the aggregate demand curve can be continually shifted outward only by a higher rate of money growth, and so the sustained inflation that results from too low an unemployment target (or equivalently too high an employment target) is again a monetary phenomenon. This type of inflation is characterized as demand-pull inflation because it arises from the conscious effort to shift out the aggregate demand curve. Clearly, policymakers do not intend to start demand-pull inflations because they do not gain a permanently higher level of output.[4] Demand-pull inflations can be explained, however, by the fact that policymakers may mistakenly think that the target level of output is not above the natural rate level. Before they realize their mistake, they would have started the process that we see in Figure 4.

Although theoretically we can distinguish between demand-pull and cost-push inflation, it is much harder to label particular episodes of inflation. Both types of inflation are associated with high rates of money growth so they cannot be distinguished on this basis. However, as Figures 3 and 4 indicate, demand-pull inflation will be associated with periods when output is above the natural rate level, while cost-push inflation is associated with periods when output is below the natural rate level. It would then be quite easy to distinguish which type of inflation is occurring—if we knew what the value of the natural rate of unemployment or output is. Unfortunately, the economics profession has not been able to ascertain the value of the natural rate of unemployment or output with a high degree of confidence.

In any case, the distinction between demand-pull and cost-push inflation is not important. Whether it is the government or workers and firms that initiates the inflation is irrelevant; the ultimate source of either type

4. In the aggregate supply and demand diagram above, it might appear as though a higher level of output can be achieved at the cost of a higher rate of inflation. Recent evidence that finds that the long-run Phillips curve is vertical rules out such a long-run tradeoff between inflation and unemployment.

of inflation is the commitment of the government to a high employment target.

Budget deficits and inflation

Frequently, a government cannot or does not find it politically feasible to raise taxes when it needs to increase government spending. This appears to be the situation for such Latin American countries as Argentina, and this was clearly the situation that occurred during the 1921-23 German hyperinflation. Similarly, during wartime, the need to rapidly increase military spending results in government expenditures rising faster than tax revenues. Alternatively, the desire to reduce taxes in the face of continuing high level of government spending can also lead to large budget deficits, as currently is the case in the United States.

Large budget deficits can also be the source of inflationary monetary policy. When a government is running a budget deficit, it must finance it in either of two ways: It can issue bonds, or it can resort to the printing press by expanding the amount of high-powered money. The first method of financing the deficit does not have an independent effect on the aggregate demand curve separate from any direct tax or government spending effects, and so it should not have any inflationary consequences. The second method does lead to a continually growing money supply if the budget deficit persists for a substantial period of time. In the first period, the rise in high-powered money leads to a rise in the money supply that shifts the aggregate demand curve out to the right, as in Figure 2. In subsequent periods, if the budget deficit is still present, then it has to be financed again, leading to a rise in high-powered money, a rise in the money supply, and another outward shift in the aggregate demand curve. Sustained inflation will thus occur if a large budget deficit is persistent and if it is financed by issuing high-powered money.

The key question that requires an answer in order to understand the link between budget deficits and inflation is why do governments with budget deficits finance them by creating high-powered money rather than by issuing bonds? If a government does not have access to a capital market that can absorb its bonds in substantial quantities, then the answer is straightforward. The only way the budget deficit can be financed is by printing money. This appears to be the situation in Latin American and many other developing countries, and in these countries the link between budget deficits and inflationary monetary policy is quite clear.[5]

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5. For example, see Arnold Harberger (1978).

Even in a country where well developed capital markets exist that can absorb substantial quantities of bonds, if the budget deficit is a sufficiently large fraction of GNP and is permanent, a policy of pure bond financing will be dynamically unstable, leading to an explosion in the stock of debt. Once the public recognizes that this will occur, then the government will not be able to sell enough of its bonds to completely finance the deficit and will be forced to issue high-powered money.[6]

The case for an important role of budget deficits in the inflationary process is much less clear-cut when the economy has a well developed bond market in which the government can sell its bonds, and when the size of the budget deficit is small relative to GNP Although a government may not have to finance its deficit by increasing the amount of high-powered money, it still may end up doing so because it has a goal of preventing rises in interest rates. A common view is that budget deficits, which require the issuing of a large amount of government bonds, raise the level of interest rates. This view has intuitive appeal because in a usual supply and demand analysis of the bond market, the increased supply of bonds resulting from a deficit leads to a decline in bond prices and hence a rise in interest rates. If this rise in interest rates is considered undesirable, the monetary authorities might try to prevent it by purchasing bonds to prop up their price and by so doing increase the amount of high-powered money. This monetization of the debt will then lead to a continuing rise of the money supply if the deficit persists and so will lead to inflation through the mechanism depicted in the aggregate supply and demand diagram of Figure 2.

The evidence that budget deficits have led to higher interest rates in the U.S. is not strong. This might be the result, however, of inappropriate measurement of the budget deficit. The National Income Accounts deficit, the deficit number that is most widely cited in the popular press, is a particularly flawed measure of the government budget deficit because it does not make any correction for inflation. Although in the period from 1946 to 1980 there were some substantial deficits on a National Income Accounts basis, when corrected for inflation these deficits disappear? This is reflected in the fact that the real per capita level of net federal debt has fallen steadily from 1946 to 1980. Only in the last few years have we begun to see large budget deficits (correctly measured) and a rise in the level of federal debt as a fraction of GNP Thus it is not surprising that the past search for

6. See Sargent and Wallace (1981) and McCallum (1982).
7. See Eisner and Pieper (1984).

higher interest rates as a result of budget deficits in the United States has not found strong supporting econometric evidence.

The current Reagan budget deficits, even when measured correctly, are unprecedently high for the postwar period. If these deficits persist, we then may find stronger evidence in the future that budget deficits do matter to the level of interest rates and therefore have a potentially stimulative effect on monetary policy.[8] The evidence on the link between budget deficits and inflationary monetary policy is, however, inconclusive at the present time.

The rise in core inflation in the US.

The above analysis provides us with some clues as to why the core inflation rate rose from the early 1960s to the late 1970s. Because the inflation-adjusted budget deficit was never substantial during this period, there is little support, either on a theoretical or an empirical basis, for budget deficits as the source of the rise in the core inflation rate. This leaves high employment targets as the other candidate for the underlying cause.

A likely scenario for what triggered the rise in core inflation in the 1965-73 period is that policymakers pursued an overly high employment target. In the mid 1960s, policymakers, economists, and politicians became committed to a target unemployment rate of 4 percent because they thought that this level of unemployment was consistent with price stability. In hindsight, most economists now agree that the natural rate of unemployment was above this figure and was steadily rising in the late 1960s and '70s because of demographic shifts in the composition of the labor force and increased coverage of unemployment insurance programs. The activist policy during the Johnson and Nixon administrations, which pursued unemployment targets that were too low (and thus employment targets that were too high), might then be the primary reason why a temporary inflation resulting from the Vietnam war buildup in the mid 1960s was converted into a sustained rise in inflation along the lines of Figure 4.

The attempt of workers and firms to obtain higher wages and prices could also have been a factor in the rise of the core inflation rate, but it is important to remember that these cost-push elements of inflation could not have occurred without the accommodating, high-employment policy of the monetary authorities shown in Figure 3. The persistence of the high

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8. Blanchard and Summers (1984) make the case that when viewed in an international context, the currently high budget deficits in the U.S. are not the source of the current high levels of real interest rates. Thus, their analysis casts some doubt on the position that the current U.S. budget deficits will ultimately prove to be inflationary.

core inflation rate into the late 1970s can be attributed to workers' and firms' knowledge that government policy continued to be concerned with achieving high employment; they thus continued to raise their wages and prices because they expected accommodating policy. This raises the issue that expectations are an important element in the inflationary process and leads us to the role of credibility of policymakers in eliminating and preventing inflation.

Credibility and expectations in the anti-inflation process

Monetarists have always been leery of activist policy because they see the economy as inherently stable and because there is some uncertainty about the timing of monetary policy effects (long and variable lags). They thus see activist policy as likely to do more harm than good. Keynesians, on the other hand, are much less sanguine about the stability of the economy since they view price and wage adjustment as proceeding quite slowly because of rigidities such as long-term contracts. Does this mean that an activist policy of preventing high employment is desirable? The answer depends crucially on whether expectations are important in the wage and price setting process.

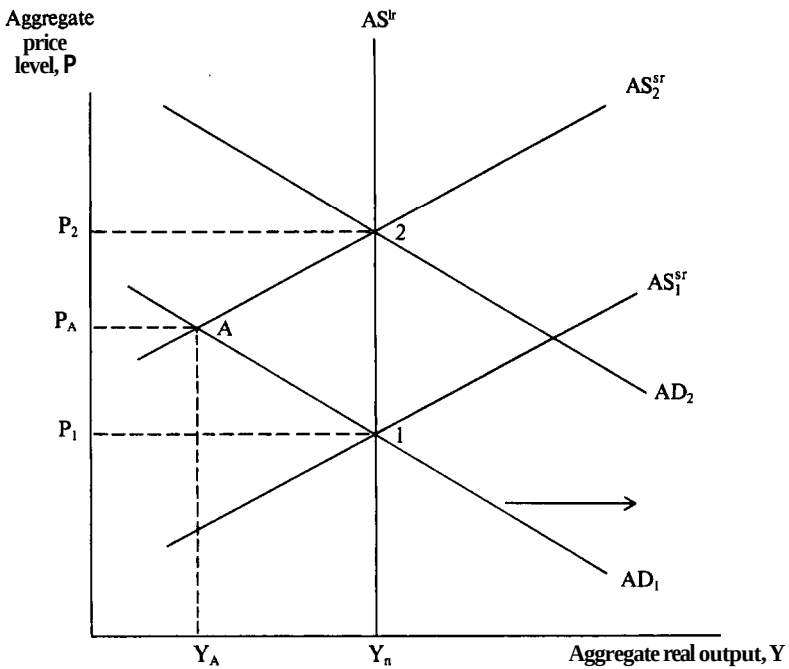
Figure 5 depicts a situation where the economy has moved to excessive unemployment at Point **A** as a result of an upward shift in the short-run aggregate supply curve from AS_1^{sr} to AS_2^{sr}. This upward shift could arise from an attempt by workers and firms to raise their wages and prices, or it could arise from a supply shock of the type we experienced in 1973 and 1979. **A** non-activist policy that left the aggregate demand curve at AD_1 and allowed high unemployment would eventually drive the short-run aggregate supply curve back down to AS^{sr}, and real output would be restored to the natural rate level. In the monetarist or new classical macroeconomic view of their world, this adjustment would take place quickly, and so the non-activist policy would have low cost. To a Keynesian, the adjustment process would be very slow, and substantial output loss would result from the non-activist policy. Since the tendency to return to the natural rate of output is too slow, the only way to eliminate the excessive unemployment quickly is to shift out the aggregate demand curve to AD_2 to move the economy to Point 2.

In an economy where expectations do not matter to wage and price setting behavior, this accommodating, activist policy is optimal if the adjustment to the natural rate of output is slow. In an economy where expectations do matter to wage and price setting, however, we must ask two questions: Will the economy remain at Point 2 after the accommodating

policy has been executed, and will the economy be any more likely to move from Point 1 to Point A in the first place if workers and firms expect this high employment policy?

FIGURE 5

An Activist Response to Unemployment



As we have seen in Figure 3, the accommodating policy that moves the economy from Point A to Point 2 may encourage workers and firms to raise wages and prices further, thus leading to a sustained inflation. In addition, if workers and firms know that an accommodating policy is going to be pursued, they will be more likely to try to raise their wages and prices in the first place, thus moving the economy to a situation like Point A with high unemployment. Because of these two possibilities, there is a hidden cost to the activist high employment policy.

The problem with the accommodating, activist policy is the dynamic inconsistency of such a policy described by Kydland and Prescott (1977). Although the first time that unemployment develops eliminating it with

an activist policy may be optimal, the expectations that this activist policy creates leads to a suboptimal outcome of higher inflation and even possibly higher unemployment as well. A hidden benefit of a non-activist, non-accommodating policy is that movements to Point A in Figure 5 may occur less often as workers and firms recognize that there will be substantial costs in terms of persistent high unemployment as a result of any attempts to raise wages and prices.

Two non-economic examples illustrate why non-accommodating policies may be optimal as a result of dynamic inconsistency of accommodating policy. First is a problem that I have recently experienced as a new father with a two-year-old son. I have an office in my house where I do much of my work. Whenever I went into this office, my son would bang on the door and cry. The first time he did this, it was optimal for me to pursue an accommodating policy of going out to him. Unfortunately, he would keep on coming back to the door and disrupting my work. Having read Kydland and Prescott's paper, I recognized that I would be better off pursuing a non-accommodating policy. (Who says economics isn't useful?) Sure enough, after not going out to him several times when he came to the door—a wrenching experience because of his crying—he stopped coming back. Now as a result of my non-accommodating policy, I can work in peace in my office.

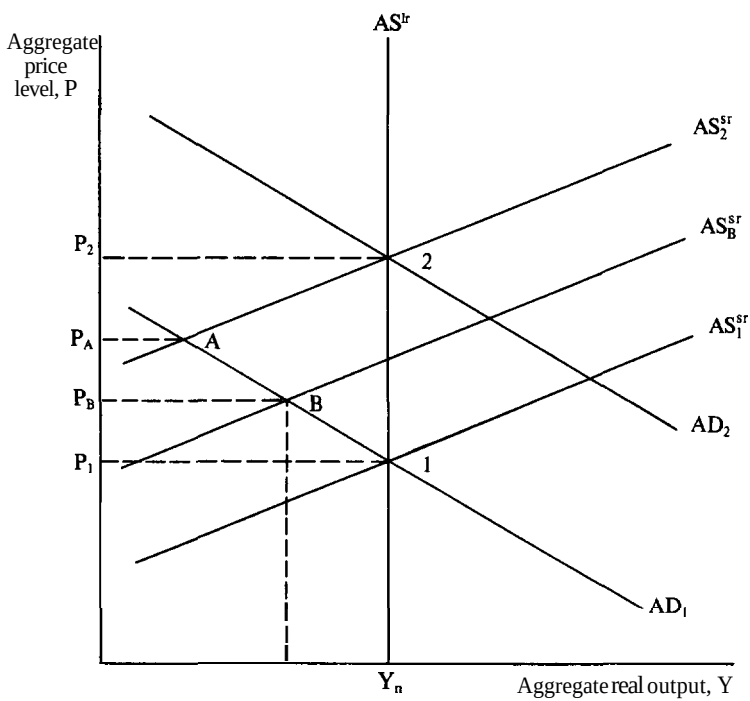
A second example is relevant to the appropriate way to conduct foreign policy. When Hitler threatened war if he were unable to dismember Czechoslovakia, it may have appeared optimal to pursue the accommodating policy of obtaining peace at any price. Unfortunately, this just whetted Hitler's appetite for more territorial acquisitions and encouraged him to invade Poland. In hindsight, the world would have been better off if the allies had pursued a non-accommodating policy and stopped Hitler earlier.

A non-accommodating policy will be most successful if economic agents expect it, that is, if the non-accommodating policy is credible. In the case of Figure 5, knowing that the aggregate demand curve will not be shifted out if the economy is pushed to Point A will make it less likely that the economy will end up at Point A; workers and firms now recognize that pushing up the aggregate supply curve will entail substantial costs. If credibility of a non-accommodating policy is not achieved and it is then actually pursued, we have the unhappy outcome of stagflation in which both prices and unemployment rise because movement to Point A in Figure 5 is a likely possibility. The undesirable outcome of a non-credible, non-accommodating policy had even more serious consequences in 1939 when World War II began.

What if we are already experiencing a rapid inflation? What role does credibility play in the success of an anti-inflation policy? Again we can use the aggregate supply and demand framework to analyze the response to an anti-inflation policy. Figure 6 depicts a sustained inflation in which the economy is moving from Point 1 to Point 2 each period and the inflation rate is built into wage and price contracts so that the short-run aggregate supply curve is rising at the same rate as the aggregate demand curve. Consider the announcement of a cold-turkey anti-inflation policy where money growth will be reduced sufficiently so that the aggregate demand curve will remain at AD_1 and will not shift out to AD_2. If this anti-inflation policy is not credible, the short-run aggregate supply curve will continue to rise to AS_2^{sr} when the policy is implemented. The result is that the economy will move to Point A, where there is some slowing of inflation (the price level does not rise all the way to P_2), but there is substantial output loss.

FIGURE 6

Anti-Inflation Policy and Credibility



If, on the other hand, the announced cold-turkey policy is believed because the policymakers have credibility, a much more desirable outcome can result. If expectations of future policy do enter into workers and firms wage and price setting decisions, then the announcement of the credible cold-turkey policy will cause the short-run aggregate demand curve to rise less than it otherwise would. In an economy where expectations of future policy do matter but wage and price contracts impose some wage and price rigidity on the economy, the aggregate supply curve will not rise to AS_2^{sr} but instead will rise only to AS_B^{sr}. Here the economy moves to Point B and does experience a loss in output, but this loss is less than is experienced when the policy is not credible; in addition, the decline in inflation is more rapid (the price level rises only to P_B rather than to P_A). Credibility is thus an important element to a successful anti-inflation policy.[9]

This conclusion is even stronger in the context of the new classical macroeconomics model. In this model, there is sufficient wage and price flexibility so that the short-run aggregate supply curve responds fully to changes in expectations about future policy: the announcement of the credible cold-turkey policy will cause the short-run aggregate supply curve to remain at AS_1^{sr}. Thus, when the cold-turkey policy is implemented, the economy will remain at Point 1, with the happy outcome of an inflation rate that has returned to zero, and it is achieved with no output loss.

The crucial element required for credibility to matter to the success of anti-inflation policy is that expectations of policy affect the position of the short-run aggregate supply curve. The notorious instability of the Phillips curve provides indirect evidence that expectations about future policy matter to aggregate supply. More direct tests such as Lucas (1973) also support the importance of expectations to aggregate supply. The evidence on whether short-run aggregate supply responds fully to changes in expectations about future policy is more mixed, however.[10]

Strong direct evidence supporting the importance of credibility to a successful anti-inflation program has been provided by Sargent (1982). In the four hyperinflations that Sargent studies, inflation was eliminated quickly with little apparent output loss. A key characteristic of these successful cases of anti-inflation policy is their credibility. The threat of intervention

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9. Taylor (1982) has shown that a more gradual approach to reducing inflation may be able to eliminate inflation without producing any output loss. One criticism of his conclusion, however, is that establishing credibility with such a gradual approach may be infeasible.

10. For example, see Barro (1977), Gordon (1982), and Mishkin (1983).

by foreign powers made credible the fiscal reforms that eliminated the huge budget deficits and ended rapid money growth. In a related but somewhat more controversial paper,[11] Sargent contends that the Poincare anti-inflation program in France in the 1920s was more successful than the Thatcher program because Poincare's program established credibility by pursuing budget reforms while Thatcher's program did not.

Does evidence from the recent disinflationary experience in the United States shed light on whether credibility is an important factor to the success of an anti-inflation program? If one assumes as in Perry (1983) that a shift to an anti-inflationary monetary policy regime did occur with the change in the Federal Reserve operating procedures in October 1979, then a believer in the importance of credibility might expect to see a more rapid decline in wage and price inflation since 1979 than would be predicted by traditional Phillips curves estimated from pre-1979 data. Several recent papers (Perry [1983], Eckstein [1984], and Blanchard [1984]) have found no evidence that traditional Phillips curve equations have undergone structural shifts in the 1979-83 period, while Cagan and Fellner (1983) and Fisher (1984) do find that wage inflation has declined more rapidly than would be predicted by a traditional Phillips curve. Does evidence that tends to show that large overpredictions by traditional Phillips curves do not occur in the 1979-83 period cast doubt on the importance of credibility to the behavior of aggregate supply? The answer is no.

An important point raised by Taylor (1984) is that the switch from interest rate targeting to reserve targeting by the Federal Reserve starting in October 1979 does not imply that there was a significant change to an anti-inflation policy regime. Taylor (1984) finds that there was some shift to a less accommodative policy regime, but the change was not dramatic. Blanchard (1984) looks at an equation describing the term structure of interest rates and he finds that there is no evidence that the financial markets believed that a change to an anti-inflation policy regime had occurred. The conclusion that arises from this evidence is that the recent disinflationary experience cannot provide a test of the importance of credibility to anti-inflationary policy because a credible anti-inflation policy never occurred. This should not be very surprising considering the budgetary policy pursued by the Reagan administration: The shift to large-budget deficits as a result of the Reagan tax cuts would not help promote confidence in a continuing anti-inflation monetary policy.

11. Sargent (1981)

A prescription for monetary policy

The discussion in this paper leaves us with the following conclusion. Since sustained inflation is a monetary phenomenon and expectations about future policy appear to have an important impact on the behavior of aggregate supply, a successful anti-inflation program must involve a credible, non-accommodating, anti-inflationary monetary policy. What does this conclusion suggest about the appropriate conduct of monetary policy?

Achieving credibility for an anti-inflationary monetary policy is no easy task, especially when accommodating policies have been pursued in the past. This is an important reason why we can not expect the disinflation process to occur without costs. As my two-year-old son understands, talk is cheap—only actions can establish credibility. The same principle has been understood by successful practitioners of foreign policy such as Teddy Roosevelt, who stated that the United States should 'talk softly, but carry a big stick." Luckily, we are currently in a situation where credibility for a non-accommodating, anti-inflation monetary policy should be easier to establish because of recent actions by the Federal Reserve. The unwillingness of the Fed to raise the rate of money growth to eliminate unemployment during the most recent recession provides some indication that it is finally willing to pursue a serious anti-inflation policy. Some slight evidence that this Fed policy is starting to establish credibility is found in Cagan and Fellner (1983), Blanchard (1984), and Eckstein (1984), who document that more rapid wage disinflation than would have been predicted by traditional Phillips curve equations seems to have taken place in 1982 and 1983.

A key feature of making a non-accommodating, anti-inflationary monetary policy even more credible is that the Fed pursue a non-accommodating monetary policy rule that can easily be evaluated by the public. If the rule is sufficiently understandable that the public can verify whether the Fed is adhering to it, then the action of adhering to the rule will more rapidly establish credibility for this policy. One suggested policy rule is the constant money growth rate rule proposed by Milton Friedman. Although this rule has the advantage of being easily understandable, it has two serious problems. First, financial deregulation and the recent large swings in velocity imply that such a rule may entail more substantial shifts in the aggregate demand curve than would be optimal. Second, the money supply cannot be precisely controlled by the Fed. This lack of control makes it harder for the public to verify whether the Fed is abandoning its

prescribed rule when the money supply deviates from its target level or is rather continuing to adhere to its rule but is sufferingsome bad luck. This difficulty in verification of Federal Reserve intentions would make credibility harder to establish.

An alternative suggested rule is that the Fed target nominal **GNP** growth. **A** serious problem with targeting nominal **GNP** growth is that it may give the Fed so much leeway in its conduct of monetary policy that the public will have no way to verify whether or not the Fed is actually pursuing a **non-accommodating** policy.

An alternative policy **rule** that is very close to a suggestion of **McCallum** (1984) involves Fed targeting the monetary base in order to hit specified values of nominal **GNP Targeting** the monetary base has the advantage that the monetary base is easily controlled by Federal Reserve actions, particularly open market operations, whiie this is not true for the money supply or nominal **GNP** With a monetary base target, the Fed can no longer have the excuse of saying that it has missed its targets because of factors outside of its control, and the public will be able to verify easily whether the Fed is adhering to its rule.

The need to choose monetary base targets so that specified values of nominal **GNP** can be achieved, rather than a constant growth rate rule, has been made necessary by the recent large swings in velocity, both for money and for the monetary base. The target level of nominal **GNP** should be chosen to coincide with a rate of nominal **GNP** growth that is consistent with price stability. **If** a large decline in base velocity occurs so that nominal **GNP** has fallen well below its target level, then the target for the monetary base next period should be raised accordingly to bring nominal **GNP** back up **to** its target level. Similarly, a too rapid rise in nominal **GNP** would result in a smaller rate of growth of the base. The targeting rule wouldobviously have to be specified more precisely than in the discussion here, and this would require econometricresearch on the link between the monetary base and nominal **GNP** This econometric analysis is unlikely to yield a tight link between these two variables, but this is just a reflection of the uncertainty inherent in any macroeconomic analysis. Designing a reasonable policy rule from this research should not present any major difficulties.

One change in the Fed's operating procedure that would make the monetary base even easier to control, and would lead to enhanced credibility of a policy rule relying on base targeting, is the tying of the discount rate to some market interest rate, such as the three-month Treasury bill rate or the Federal funds rate. Most of the uncontrolled movements in the monetary

base arise from fluctuations in borrowings from the Fed occurring as a result of large swings in market interest rates relative to the discount rate. Tying the discount rate to a market rate would keep the spread between these two rates constant and would thus eliminate this source of fluctuations in the base.

The analysis in the previous sections of this paper indicates that such a policy regime might go a long way to promoting price and even output stability. However, there is still the issue of the current large budget deficits. As noted above, the role of budget deficits in the inflation process in the United States is unclear. My personal view is that a serious attempt to balance the budget needs to be made because, at a minimum, the prospects of huge budget deficits in the future may decrease the credibility of the anti-inflationary monetary policy proposed here.

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