# 7 MONETARISM

## *Looking Forward*

Monetarism embodied and brought back the basic classical idea that in the long run the money stock and nothing else determines the price level, and therefore that the growth of the money stock determines the rate of inflation.

To arrive at this conclusion, Milton Friedman and Edmund S. Phelps developed models that incorporated *adaptive expectations* of the rate of inflation into a Phillips Curve framework. They then showed that when inflation expectations were proved correct, the Phillips Curve would be vertical, establishing a single rate of unemployment, the *natural rate of unemployment*, compatible with *any* stable rate of inflation. From this it followed that steady money growth, leading to stable inflation at the natural rate of unemployment, was the best course for monetary policy. In particular, government should never pursue stimulative policies designed to drive unemployment below the natural rate.

As you study this chapter, make sure you understand each stage of the monetarist argument:

- What is the monetarist view of inflation and how does it differ from the Keynesian view?
- How did Milton Friedman reconcile an asset demand for money (an idea introduced by Keynes, as we have seen) with the classical conclusion that money is neutral in the long run?
- How do changes in the rate of growth of the money stock lead to changes in output and employment in the short run but not in the long run, in the monetarist model?
- How do the monetarists arrive at the concept of a "natural rate of unemployment? In particular, what are adaptive expectations and what role do they play?

The chapter includes a special section on the practical administration of monetary policies.

We now begin again to consider the macroeconomic role of money. As we do so, we shall take a tack quite different from, and indeed opposed to, the LM curve framework of Chapter Five. In that framework, you recall, the shifts in the quantity of money influence the interest rate and real production. Meanwhile, the price level is left as a "missing equation." This missing equation was eventually filled in by the Phillips Curve relationship between inflation and unemployment. Yet while the Phillips Curve plugged a hole in the IS-LM framework, its weak theoretical foundation left many economists uneasy. And when the stable empirical relationship between inflation and unemployment itself collapsed after 1969, the way was open to a reformulation, and revival, of a more theoretically coherent and rigorous classical view.

In this chapter we will outline the first step in that reformulation. This first step sought to re-establish the classical direct linkage between money and the price level, while returning the interest rate and real production to the "real" or non-monetary sector. This part of the revival of classical theory, "Milton Friedman's answer to Keynes", is called *monetarism*.

## 7.1 The Old Quantity Theory

As we have seen, the classical theory before Keynes had two very distinct and separate elements. The first of these was a *barter economy*, in which, for theoretical purposes, money makes no appearance at all. The classical system is one in which commodities exchange for other commodities, and in which production is the transformation of physical inputs into physical outputs. The systems of demand and supply relations that express these conditions are written in physical terms, without reference to money.

The second distinct element in the classical system is a monetary theory. In "the longest run and in ideal models," as Paul Samuelson once put it, money affects the price level and nothing else. Double the quantity of money and you will double the price level. Nothing else will be affected. And the price level *per se* is of no importance nor even of any intrinsic interest. It merely measures, in effect, the scale of the monetary unit. It does not matter whether you measure all of the transactions of the real economy in terms of dollars, or in terms of dimes.

Classical economists before Keynes knew that money had other qualities and other purposes, that it did not exist solely and exclusively as a unit of account. But they did not incorporate these properties into their theory. And so, they did not integrate the existence of money into the real world of exchange and, especially, of production. For them, in a phrase, money was "a veil." Like a

veil, it lay lightly and irrelevantly over the face of the "real" economy. Thus money, in the classical tradition, is *neutral*.

In terms of the Quantity equation, $MV = PT$, money neutrality it means that $T$, the volume of transactions (of real commodities) is unaffected by M or by changes in $M$. In terms of Figure 7.1, it means that the labor market alone determines the level of employment and through it the volume of output. Variables affecting total spending in monetary terms can affect only the price level. These propositions are known as the *Quantity Theory of Money*.

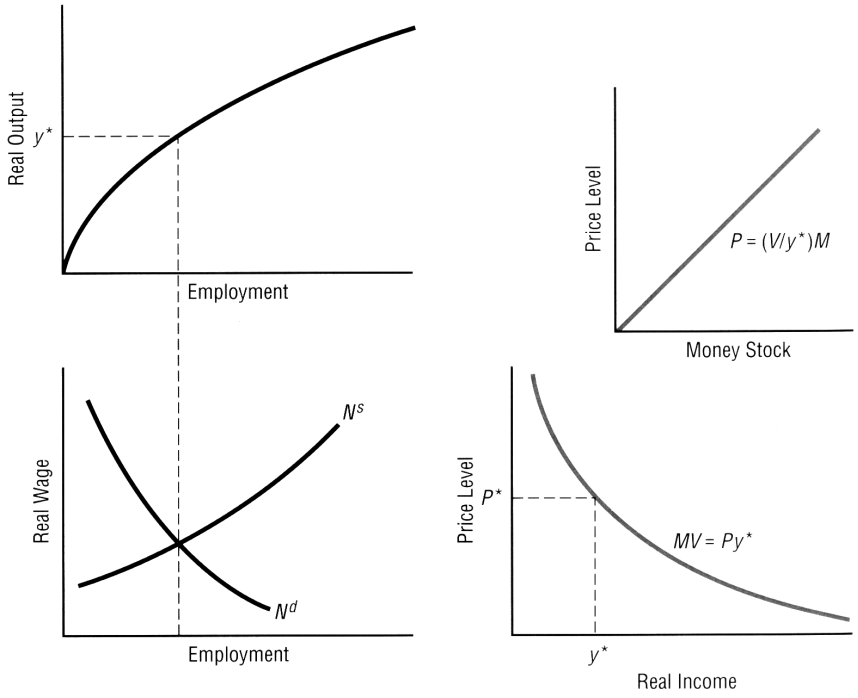


*Figure 7.1* ***The Classical Dichotomy Revisted****. Left: Real Economy, Right: Monetary Economy.*

## 7.2 Monetarism

We now re-introduce Professor Milton Friedman, Nobel Laureate in Economics, the preeminent player in the restoration of classical thinking about monetary problems that has occurred over the half-century since Keynes. In Chapter Four we encountered Friedman's early challenge to the Keynesian consumption function. Now we pass to his major thrust, his theory of money, the doctrine known as *monetarism*[1].

Milton Friedman was from Chicago.[2] His outlook and economics are linked to the University there, to its blend of Middle European theory and Middle American empiricism, in much the same way that Keynes was linked to Cambridge and its embodiment of the British elite. Both, oddly, might describe themselves as "Liberals." But where Keynes was steeped in a progressive Liberalism characteristic of Britain's emergence from the Victorian Age, Friedman's liberalism was and is classical in character, rooted in individualism and distrust of the state.[3]

Friedman was convinced that the IS-LM mdoel and the Phillips Curve, the core Keynesian propositions that established the roles of monetary and fiscal policy in stabilizing the level of output and employment, were wrong. They were wrong, in essence, because they filtered the price level through the labor market. According to the Phillips Curve, inflation would rise when unemployment was low, and fall when unemployment was high. And according to IS-LM, labor market conditions themselves depended on fiscal and monetary policies, so that fiscal and monetary policies could both indirectly determine the rate of inflation.

Friedman thought this was confused. In his often-expressed and strongly-held view, inflation was "always and everywhere a monetary phenomenon." Fiscal policy *could not* cause inflation, unless the expansion of government spending were financed by the creation of new money. And an expansionary (or "loose") monetary policy *could not fail* to cause inflation, for if the money stock grew more rapidly than the real volume of transactions required, then with stable velocity the Quantity Equation dictated that a rising price level would necessarily result.

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[1] " Monetarism Mark I" is a designation, originated by James Tobin, to describe the version of monetarism initially advanced by Friedman, incorporating "adaptive expectations" (see below) and explaining unemployment as a short-run phenomenon mainly caused by sticky wages. Monetarism "Mark II" is the version compatible with "rational expectations" and the "new classical economics," and is taken up in the next chapter.

[2] In recent years, he has moved to the Hoover Institution at Stanford University in California.

[3] This has made Friedman into a conservative on most questions of American politics. But there are notable exceptions, for example his strong stand in favor of the decriminalization of drugs, on the ground that this is an area that is properly one of individual rather than governmental responsibility.

Friedman backed this basic belief with a weighty statistical and historical argument[4], which seemed to show that changes in the growth rate of the money stock were closely associated over long periods of American history with changes in the rate of inflation, and not so closely, if at all, with changes in the level of output. Thus Friedman started from the *empirical* position that money had been, over American history as he perceived it, more or less neutral in the long run.

Friedman's theoretical task became to design a theory which was consistent with this observation. And the theoretical problem in so doing can be stated simply. Keynes and the *General Theory* had destroyed the foundations of the classical position on money. Keynes had shown the indispensable role of money as an asset, or store of value. Anyone reconsidering monetary theory after Keynes was bound to acknowledge this function, and to incorporate demand for money as an asset into their theory. But did that necessarily mean, as Keynes claimed, that the long-run neutrality of money also had to be abandoned? Milton Friedman did not think so. And so Friedman set out to construct an economic model which introduced a productive function for money holdings, but under the terms of which money would still be neutral in the long run.

### *The Basic Model*

Friedman's method, in a famous essay,[5] was to invent a highly simplified model world, as a kind of metaphor for essential features of the real world. In this model world, there is a constant population of immortal people, with fixed and unchanging tastes. They have, at their disposal, a fixed and unchanging technology and stock of resources, which they exploit by organizing perfectly competitive firms and free markets. Capital goods exist, and last forever, but they cannot be exchanged, and there is no lending or borrowing and hence no rate of interest. Thus the only exchanges that actually occur are of goods and services for money, or vice versa. The money consists of pieces of paper, marked as dollars, of which (let us say) 1000 are in circulation.

Friedman argued that life in this world would go beyond the classical quantity theory, but in only one respect. Individuals may live forever, but they do not necessarily also have the same incomes in every period of time. That is, they have a notion of permanent income (harking back to Friedman's own earlier theoretical work), and suffer occasional fluctuations of transient

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4 Milton Friedman and Anna S. Schwartz, *A Monetary History of the United States*, Chicago: University of Chicago Press, 1963.

5 Milton Friedman, "The Optimum Quantity of Money," in *The Optimum Quantity of Money and Other Essays*, Chicago: Aldine, 1971, 1-50.

income around that permanent level. To guard against the possibility of an unusually low income, Friedman argued that they would seek to hold a reserve. Since money is the only asset, he allowed money to serve the role of a store of value.

In this world, there are just two reasons to hold money. One may need money to purchase a service. Or, one may wish to have a small store of money in reserve, to purchase services in the future in the event of a fluctuation in future demand for the services one sells. These are the transactions motive and the asset motive. There is no speculative motive (see Chapter Five) for there is no capital market, no rate of interest, and so nothing to speculate on. Friedman's model thus does not take on the whole of Keynes' monetary theory; its purpose was only to ask whether the role of money *as an asset* was necessarily inconsistent with money neutrality in the long run.

To understand the logic of Friedman's argument, let us now fix in mind two essential concepts: "nominal balances" and "real balances". *Nominal Balances* ($B$) are defined as the money holdings of individuals in actual dollar terms. We are accustomed to thinking of money as a circulating medium, which exists in order to change hands in return for services and goods. At any moment however, all money is necessarily held by some individual, as a result of the preceding transaction and pending the next one. This distribution of holdings is known as the distribution of nominal balances.

*Real Balances* ($b = B/P$) are nominal balances deflated by a price level. They thus represent the purchasing power of individuals' money holdings, after adjustment for inflation.

We now state the *stock identity*, which is that the *Money Stock must equal the sum of all nominal balances* (where the subscript i denotes the holdings of each individual). This is straightforward. The community as a whole cannot hold either more or less than the total stock of money.

$$M = \sum_i B_i \tag{7.1}$$

Friedman argued that individuals would not care much about the nominal balances they held. They would, however, care about the purchasing power of those balances, about real balances, because the purchasing power of money holdings would determine just how much a given reserve would be worth. Therefore, Friedman constructed a theory of money supply in terms of nominal balances, but a theory of money demand based on the desire for *real balances*.

Real balances in terms of what? Friedman argued that the value of money holdings to an individual consisted of the length of time that such a balance could support a normal level of consumption. His device was therefore to

measure the real balances held by a community as days or weeks of "normal" income – a concept once again not unlike the notion of "permanent income" which we have already met. Real balances thus measured the reserve set aside for financing consumption in the absence of new income.

In other words, real balances are the financial wealth of the community. Any independent change in either the prices of goods or the money income levels of the community affects real balances. Inflation, particularly, drives down the real value of a given nominal income, and reduces the purchasing power of a given store of wealth. An increase in the money stock without inflation increases real balances and so financial wealth. But if it could be shown that an increase in money would always lead to a parallel increase in inflation, then real balances would be unaffected, money neutrality would hold, and there would never be any good reason for increasing the stock of money. The question therefore was: would money creation in this model world always lead to inflation?

Suppose, Friedman argued, that people choose to hold 1/10 of their annual income as a reserve for emergencies, or 5.2 weeks pay. Then, since we have a money stock of one thousand dollars (M = $1000), we know that nominal National Income must equal ten thousand dollars (Py = $10,000). Now this may seem like a puzzle: Why do we know this? Because the "reserve" is in fact equal to the whole of the money stock, the only asset which can be held in reserve. Since we therefore know that reserve balances are $1,000, and we know that individuals on average adjust their balances until they equal one-tenth of income, turnover must adjust to give us an income of ten times balances or $10,000. This merely reflects the quantity-equation rule that total money balances ($M$), multiplied by the number of times each dollar is used in each year ($V$, or velocity) must equal this total of income generated by the same transactions ($Py$): $MV = Py$.

Friedman now constructs a thought experiment. Supose that a one-time increase in nominal money stock occurs. For example, a helicopter may fly overhead, and drop, at random, an additional $1,000 in fresh one dollar bills. What happens?

There are two basic possibilities. The public could simply add the extra cash to its idle balances. In that case, prices do not change, and turnover must fall in half. But, in that case, the population is twice as rich as before. They are holding, on average, 10.4 rather than 5.2 weeks of money reserves as assets. Friedman rejects this possibility. Since people had previously chosen to reserve 5.2 weeks of income, why would they be interested in doubling that reserve to 10.4 weeks?

This leaves the second possibility, which is that people will choose to recreate the old situation by reducing their money swollen balances to the 1/10th of

income that they had previously decided was desirable. And this, Friedman argues, is indeed what rational people will want to do.

But, there is a problem. It is impossible, with a fixed stock of money, for all individuals to reduce their *nominal* balances at the same time. Indeed the average level of nominal balances cannot fall at all! The money stock has doubled, the population is unchanged. It must therefore be true that average nominal balances are twice what they were.

The supply of money has doubled. To get cash balances back to 1/10 of national income, national income must necessarily double. And, since the supply of services is fixed, there is only one way for this to happen. Prices will double. And money neutrality holds in the long run, despite the asset role of money. Friedman had nearly proved his case.

### *The Case for Stable Money Growth*

Next, Friedman examined the case where an increase in money is not simply a once-for-all event, but rather a continuing phenomenon. Suppose we assume a continuing increase in $M$ at a rate of 10 per cent per annum. Now our helicopter is returning on regular missions, dropping off additional cash in a gradual but ever-increasing crescendo.

In this case, the community must add to its nominal balances at 10 per cent per year. Once again, logic requires that individuals attempt to adjust their nominal balances to achieve the same ratio to income, the same ten percent reserve, as before. And then prices must rise at 10 per cent per year. Once more, no real magnitudes will be affected, and the neutrality of money is again observed.[6]

Why do prices rise? Here a critical assumption slips in, expressed by Friedman this way: "Because everyone confidently anticipates that prices will rise."[7] That is, we assume that the community is aware of the flights of the helicopter – it knows, or believes it knows, that the money supply is rising at 10 percent per annum. Further, individual sellers of services are aware that, on average, a 10 percent increase in the money demand for their services can be expected, simply because there is 10 percent more money to spend. They therefore *raise* prices by 10 percent. This then spares them from misregistering the purely monetary part of the increase in demand as a rise in the real demand for their services, and in any way altering on that account their real supply of services. Thus, *confident expectations* play the critical role of guaranteeing that the neutrality of money holds true.

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6 This effect – the neutrality of the rate of growth of the money stock – is sometimes known as "super-neutrality."

7 Friedman, "The Optimum Quantity of Money," page 10.

There is one crucial qualification. In the dynamic case, Friedman points out, inflation is reducing, by 10 per cent yearly, the real purchasing power of the monetary reserves that were previously being held. This is the same as imposing a 10 per cent annual tax on the real value of previously existing cash balances. It thus makes holding those balances more expensive, relative to the purchase of services with the same money. If you make cash holding decisions rationally, as Friedman assumes, then you will decide rationally in response to this price change to reduce your balances and increase your purchases.

This action pushes prices up by an additional step change. That is, inflation will rise by more than 10% for a brief time, as people adjust their real money balances downward in response to the inflation tax. This case therefore violates the neutrality of money in the short run – there is a real behavioral consequence to a change in the *rate of growth* of the money stock. Only in the long run does this effect disappear, and inflation converge to a 10 percent annual rate.

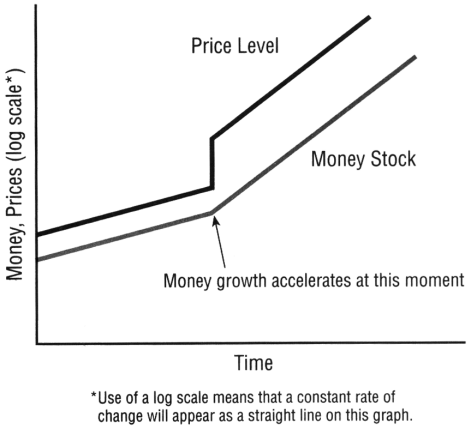


*Figure 7.2* ***A Change in the Money Growth Rate****. A rise in the money stock generates a parallel rise in the price level. An acceleration of money growth increases inflation and also causes a one-time step change in the price level as individuals cut their real balances.*

**Taking a Closer Look**

# Money, Inflation and GDP

How well does the monetarist view of money and prices hold up? One way to form a rough idea is to compare the movements of various measures of the money stock with the inflation rate in recent years.

The chart entitled "Money and Inflation" compares the growth rates of M1, the narrow money stock, and M3, a broad measure, with the rate of price inflation in the United States from 1960 to the present. As the chart shows, M1 growth tracked price inflation reasonably well for the first twenty years of this period, lending empirical support to the monetarist view that control of the money stock would effectively help to control inflation. But in the mid-1980s this relationship breaks down completely. M1 growth surged in the aftermath of the 1982 recession, and then again in 1985-87, yet there was no inflation effect and indeed inflation continued to fall.

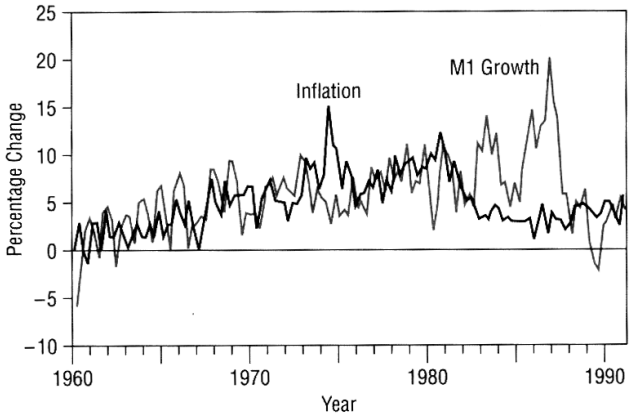


*Figure 7.B1a* ***Inflation and Money (MI).*** *he simplest versions of monetarism held that increases in transactions money, measured by M1, would lead to rising inflation. This idea seemed to draw suppo4 from the data up to 1980 (except for the oil shock in 1974-1975), but it has not done very well in the past decade.*

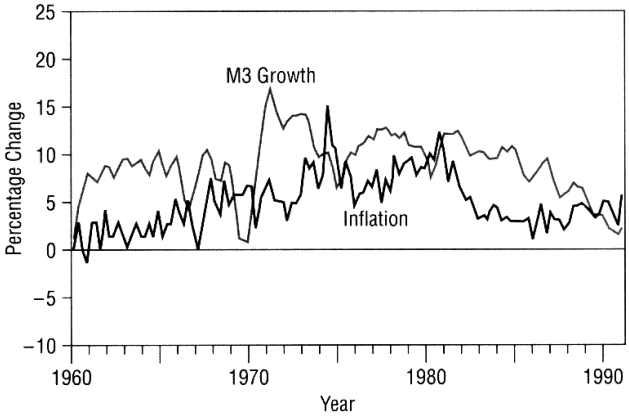


*Figure 7.B1b* ***Inflation and Money (M3).*** *M3 growth has a poor fit to the rate of inflation.*

As the chart shows, the growth rate of M3 was never a particularly close correlate of the inflation rate. But as you can see from the next chart, entitled "Money and Nominal GDP," this broad aggregate has tracked the rate of change of nominal gross domestic product, including the effects of both inflation and output changes, reasonably well over the years.

Does this mean that M3 can be used to control nominal GDP? While some economists have made that argument, most believe that the causality runs the other way: changes in either the volume or the price of output lead to changes in demands for credit, and these are supplied by the banking and financial systems and ratified, after the fact, by the Federal Reserve. Thus the M3-GDP relationship does not reflect the use of M3 as a policy instrument, and this broadly defined aggregate would probably not prove useful as a policy instrument.

As we have seen, a useful way to summarize the stability of the relationship between money and nominal GDP growth is to look at the stability of the ratio between the two. This ratio is, of course, the velocity of circulation of money. The final chart, "How Stable is Velocity?" shows the rate of change of the velocity of M1, compared to the rate of growth of M1 itself. As the chart demonstrates, M1 velocity has long tended to fluctuate opposite to the movements of M1 itself: rising when M1 falls, falling when it rises. This reflects the fact that it would take time for any change in M1 to have an effect on GDP, whether on real output or on prices.

Up until 1980, the fluctuations of M1 velocity growth remained within a fairly narrow range, and tended to reverse themselves within a year or two. But after 1980 things became much more unstable. M1 growth rose, and velocity growth fell, indicating that the growth of M1 had little impact on either money or prices.

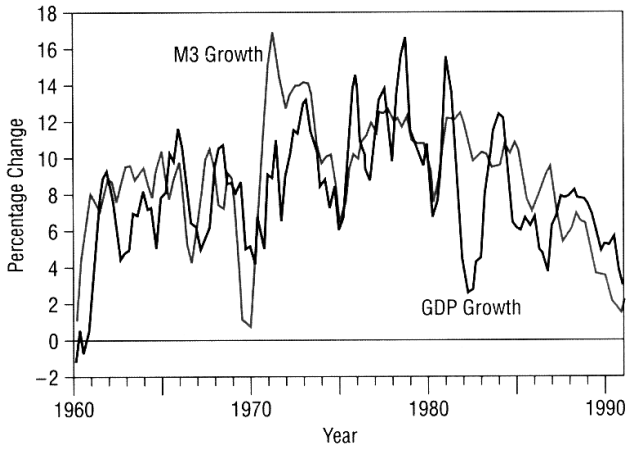


*Figure 7.B2* ***Money and Nominal GDP****. Broad monetary aggregates such as M3 track the growth of nominal gross product fairly well. But some economists argue that the causality in this case runs from economic activity to money creation, so that M3 should not be considered a policy instrument.*

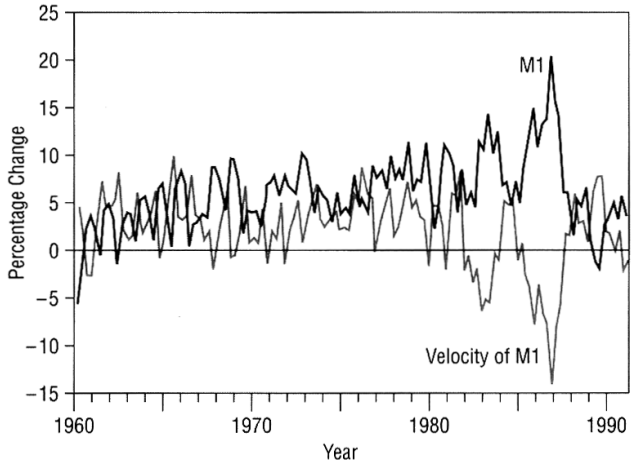


*Figure 7.B3* ***How Stable Is Velocity?*** *Strict application of the quantity theory's principle that inflation must follow high money growth would require that velocity be reasonably constant In fact, velocity has fallen in the past decade when money growth rose. One reason for this may be that, because of lower inflation, there was increasing demand for currency and low-interest demand deposits.*

Why did the stability of M1 velocity fall apart so abruptly in the 1980s? A basic explanation has been suggested. It is that with the falling rate of inflation after 1980 (itself due, perhaps, to a very high exchange rate and intense competitive pressures from low-wage manufactured imports) people became more willing to hold additional quantities of cash and demand deposits – despite very high real interest rates that would tend to induce them to put their cash into interest-bearing assets. As people demanded cash to hold, M1 rose but without major effect on either output or prices, and so velocity fell.

This qualification to Friedman's model has an important consequence for thinking about policy. It shows that changes (specifically, increases) in the rate of inflation impose a real welfare loss on the community. The reason is that real wealth, in the form of real money balances, is a smaller fraction of current income than it was before. Conversely, it must be true that cuts in inflation (or increases in deflation) must raise real wealth. They provide an increased return on real balances, and cause the community to add to its financial wealth.

Thus we have Friedman's basic theoretical conclusion. In a world of full employment, stable velocity, and "confident" expectations, the growth rate of $M$ will determine the growth rate of $P$, once initial effects of changes in the rate of growth of the money stock subside. Money is therefore neutral, despite its asset character, in the long run. It will only be non-neutral if policy behaves erratically, causing changes in the rate of inflation. And this leads Friedman to his famous, fundamental monetary policy recommendation: that the Federal Reserve should set (and publish) an unchanging rule stipulating a constant rate of growth of the money stock, year in and year out.

## 7.3 Monetarism and Unemployment

Of course, in the real world full employment is not a guaranteed condition. On the other hand, a stable money growth rule is not commonly seen in the real world either. Is there a connection between monetary instability and unemployment? In examining this question, Friedman and his followers saw the outlines of a theory of unemployment consistent with their theories of money and prices.

The classical supply-and-demand model of labor markets tells us that unemployment may occur if wages fail to adjust so that quantities demanded and supplied become equal. Unemployment results if, in a word, nominal wages are "sticky". In that case, the labor market does not clear. There will exist people who are willing to work at the prevailing wage or lower, but who nevertheless cannot find work. The actual level of employment is determined by the number of workers firms are willing to hire at the given wage (in other words, on the demand curve), while the level of unemployment is given by

the difference between this quantity and the amount of labor workers wish to supply (on the supply curve).

Why should nominal wages be "sticky?" One argument is the now-familiar relative wage hypothesis, attributed to Keynes and first presented in Chapter Two. By this line of argument, the wage bargain of any worker affects not only his real wage, but also his relative standing among fellow workers. This gives each worker a reason to resist cuts in nominal wages, even though more employment would result, and even though reductions in the real wage that might result from a price inflation would not be resisted.[8]

The monetarists accept this argument, but question how well it holds up in the real world. They note that the desire for work by the unemployed will undermine the capacity of existing workers to resist nominal wage cuts. Therefore, nominal wage stickiness, and the unemployment it produces, can only persist as long as labor markets fail to respond to the applications for work (at lower wages) which are submitted by the unemployed. And while such a situation could continue for some time (particularly if governments intervene, for example with minimum wage laws), monetarists believe that competitive forces will sooner or later cause wages to fall to levels that clear the labor market.[9]

How then can persistent unemployment occur? It must be the case that other obstacles prevent the adjustment of real wages to market-clearing levels. Under what circumstances, if at all, can such a thing happen? Why do labor markets not clear continuously at full employment?

### *The Accelerationist Hypothesis*

Monetarists have offered several answers to this question, beginning with Friedman himself in 1968. Friedman's argument, as we shall see, has an institutional flavor. It emphasizes ways in which policy can exploit forces – such as labor contracts fixed for a definite period of time – that slow down the speed of adjustment of money wages (relative to that of prices). Another argument arose at the same time from Edmund S. Phelps, which emphasizes the difficulties that individuals face in evaluating the information presented to them by the market. Phelps's argument is non-institutional and is, as we shall

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8 Note that, in contrast, apples do not care about the relative price at which they are sold, and so offer no resistance to cuts in their price!

9 You should remember that a second and much more important argument in Keynes' reasoning was that even if nominal wages do fall, markup pricing rules ensure that prices will fall by similar amounts, and so cause real wages to remain stable. Since it is real rather than nominal wages which matter to the classical labor market, nominal wage bargains will not bring about the requisite fall in real wages. Monetarists answer this argument by rejecting markup pricing in favor of a strict reliance on the quantity theory of money to explain price inflation and deflation.

see, a precursor of the modern "post-monetarist" view, known as New Classical Economics.[10]

Both Phelps and Friedman come to the same conclusion. Persistent unemployment is possible, but only if policy produces falling prices at an *accelerating rate*. Employment at levels above equilibrium is also possible, but only if policy produces inflation at an accelerating rate. When the rate of inflation is itself changing, and only then, the effects of policies on market conditions can outrun the reactions of individuals that would otherwise neutralize those effects. We call this result the *accelerationist hypothesis*.

### *Adaptive Expectations*

Why can policies run ahead of reactions to them? Because it takes *time* for workers to realize that the price increases they are seeing are connected to the wage increases they have just received. Why does it take time? Because price expectations (or more precisely, inflation expectations) in this model are *adaptive*. They depend, in a predictable way, on a stream of past prices (rates of inflation).

So long as the rate of inflation is constant, workers and other economic agents have no problem appreciating it for what it is. But when the rate of inflation changes, for example when it accelerates, then there are problems. Workers see the most recent price increases, but in forming their view of future price increases they average the most recent data with earlier data which was based on a lower rate of inflation. Expected future prices do rise, but not as much as prices are in fact going to rise. And this discrepancy – unexpectedly rapid rates of inflation – leads, in the Phelps/Friedman argument, to changes in behavior that would not otherwise occur.

Adaptive expectations are easy to model, since all the information one needs is contained in the past history of the variable. One form of adaptive expectations is the *distributed lag specification*, which was popularized by Philip Cagan in a famous study of hyperinflations[11] :

$$\mathbf{E}\dot{P}_{t+1} = \alpha_t \dot{P}_t + \alpha_{t-1}\dot{P}_{t-1} + \alpha_{t-2}\dot{P}_{t-2} + \ldots + \alpha_{t-n}\dot{P}_{t-n} \qquad (7.2)$$

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10 See Edmund S. Phelps, *Inflation Policy and Unemployment Theory*, New York: Norton, 1972 for a complete account of this thinking. The original Phelps article is "Phillips Curves, Expectations of Inflation and Optimal Unemployment", *Economica*, August 1967; Friedman's is his presidential address to the American Economics Association: "The Role of Monetary Policy," *American Economic Review*, March 1968.

11 Philip Cagan, "The Monetary Dynamics of Hyperinflation," *Studies in the Quantity Theory of Money*, Chicago: University of Chicago Press, 1956.

$$0 < \alpha_i < 1$$

$$\sum_i \alpha_i = 1$$

$$\alpha_i \geq \alpha_{t-1} \geq \ldots \geq \alpha_{t-n}$$

In this model, the inflation rate expected in the next period is treated as a weighted average of the past history of actual inflation rates, with the weights given by each $\alpha_i$. The largest weight is given to the most recently experienced rate of inflation. Therefore, the coefficients decline as the years recede into the past. The coefficients also sum to one. In this specification, individuals calculate their expectations on the basis of the present and past *n* periods' inflation rates (where *n* could be 12 months ago or 10 years ago).

If the inflation rate has been increasing in recent months or years, the forecast for next month or next year will be a further increase in prices. This approach provides a rule of thumb for the formation of expectations which may be workable under conditions where there is a fairly consistent–even if explosive–pattern of change.

Another form of the adaptive expectations approach is the *error-learning specification*.[12] Here the expected rate of inflation is adjusted upward or downward in response to the error in expectation in the most recent period observed. The expected rate of inflation in the next period would then be the current rate plus an error-adjustment term:

$$\mathbf{E}_t \dot{P}_{t+1} = \dot{P}_t + \beta[\dot{P}_t - \mathbf{E}_{t-1}\dot{P}_t] \tag{7.3}$$

If the actual rate of inflation in the current period exceeds the expectation formed in the previous period, the expectation of the inflation rate in the next period will be revised upward. If the current period inflation rate is less than the expectation formed previously, the expectation will be revised downward. The positive number $\beta$ is a *reaction-response coefficient*, indicating the magnitude and speed of adjustment of the new expectation to the expectational error.

For example, if $\beta$ is equal to one, there is a one-for-one adjustment in the expected rate of inflation in response to the error made in the current period. When $\beta$ equals one, if realized inflation equals 9 percent while expected inflation for the period equalled 7 percent, the forecast for next period will be revised upward by exactly 2 percentage points, over and above the actual inflation rate. Thus the expected inflation rate for $t + 1$ will be $9 + 2 = 11$

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12 David Meiselman, *The Term Structure of Interest Rates* (Englewood Cliffs, New Jersey: Prentice Hall, 1962).

percent. On the other hand, if $\beta$ is equal to zero we have the special case of *static expectations*, where individuals do not revise their expectations at all in response to their mistakes. In that case, they merely set their new expectations equal to the inflation they are experiencing at the moment.[13]

### *Systematic Mis-Predictions of Inflation*

If expectations are formed adaptively according to equation 7.3, the monetary authorities can cause systematic and persistent errors – underpredictions or overpredictions – to occur. If expectations do not adjust instantly ($\beta < 1$), this is especially easy. Individuals' forecasts of the inflation rate will not catch up so long as the authorities choose to generate a perpetually accelerating inflation rate.

Indeed, even if expectations do adjust fully, it is possible for the authorities to bring about systematic prediction errors.

Suppose that $\beta$ is equal to one. Suppose also that the monetary authorities pursue a set of policies that produce an inflation rate of 1 percent in year one, 3 percent in year two, 9 percent in year three, 27 percent in year four, and 81 percent in the fifth year–so that the inflation rate accelerates by a multiple of three in each year. Prior to the start of these policies assume that the inflation rate has been zero for 100 years.

In year one the expected rate of inflation will be zero since there was no expectational error in the previous century (!) of zero inflation. But the forecast for the second year will require revision since the actual rate of inflation for the first year proved to be 1 percent. The forecast for the second period will be 2 percent. However, the second year inflation rate proves to be 3 percent, which leads to a forecast for year three of a 4 percent inflation rate. That, too, proves to be wrong since the actual inflation rate turns out to be 9 percent. The forecast for the fourth year based on equation 7.3 with $\beta$ equal to unity then will be 14 percent, but the actual inflation rate proves to be nearly twice as high at 27 percent. The forecast for year five will be 40 percent, hardly a negligible inflation rate, but quite modest in comparison with the actual inflation rate of 81 percent.

In our example all free prices accelerate each year, with monetarist precision, to conform to the new rate of money creation. But individuals using the adaptive expectations machine still underpredict the actual rate of inflation. In fact, in our example the gap between their predictions and the actual rate of inflation becomes wider and wider. There is a discernible, systematic, accelerating pattern to the changes in the actual inflation rate, but individuals

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[13] Michael Hadjimichalakis, *Macroeconomics: An Intermediate Text*, Englewood Cliffs: Prentice-Hall, 1982, p. 386.

nevertheless *systematically* make errors. The *method* they use for forming expectations consistently leads them astray.

### *Generating Unemployment or Over-Employment*

To see how such a systematic underprediction of accelerating inflation can lead to falling unemployment, we need one additional assumption. And here Friedman and Phelps had differing approaches.

Friedman's argument is based on our now-familiar friend, sticky wages – wages which do not adjust as freely or quickly as product prices. Wages, he argued, are set by contract in money terms, on the basis of beliefs about expected inflation during the production period to come. In effect, employers agree to pay a given money wage, and workers agree to work for that wage if asked to do so. If the actual inflation rate is higher than the expected rate, then the money wage will lag behind the rise in the price level, and the real wage will fall. With a real wage lower than expected, employers (who make hiring decisions *after* real wage levels are known) will have an incentive to hire more workers. Since laborers have already contracted to work at the given nominal wages, they are, in effect, trapped into a downward shift of the labor supply curve (Figure 7.3). More labor is being offered at each real wage than would have been the case without the expectational error. Employment will rise, and unemployment and real wages will fall. Conversely, if the inflation rate is falling more rapidly than expected, the real wage will be higher than expected, and employees will face lay-offs. Then employment will fall, and unemployment and real wages will rise.

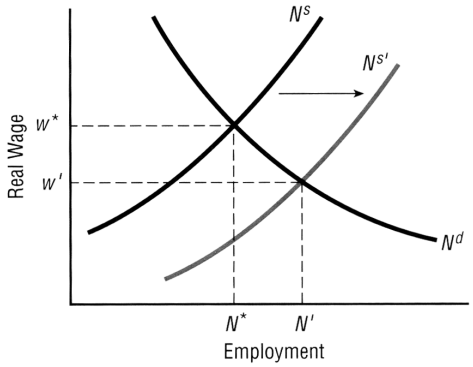


*Figure 7.3* ***Inflation Misperceptions and Labor Supply****. If workers underpredict the inflation rate, they will accept more employment at a lower real wage than they would have chosen with correct information.*

The monetary authorities have the power to cause the actual inflation rate continuously to outrun the expected inflation rate, simply by printing

additional money. By that means, they can in this model drive the rate of unemployment below the equilibrium rate. As in the simple story about desired real balances, monetary policy is not neutral if the rate of inflation is changing! But the consequence of efforts to keep unemployment continuously low is a continuous increase in the rate of inflation. Unless reversed, this can only lead dangerously toward *hyperinflation* and economic collapse.

Friedman's version of the story is easily grasped in its essentials, but it leaves some important questions hanging. First, if real wages fall in the wake of accelerating inflation, why do workers supply the additional labor that employers are demanding? Why don't workers realize that their real wages have fallen, and react in time by reducing their labor supply? And second, why are money wage contracts, alone among all prices, set in this particularly inflexible way? Why not provide workers with full indexation against inflation, thus stabilizing the labor supply curve with respect to the inflation rate and neutralizing the consequences of expectational error? Friedman's story appears to rest on the same sort of arbitrary institutional assumptions that characterized the prevailing American version of the Keynesian theory.

### *Information Asymmetry*

Phelps offered a different version of the accelerationist story, intended to be more consistent with freely functioning markets and rational individuals making well-informed decisions about how much labor to supply. The linchpin of this story is not sticky wages, but rather the difficulty that rational people have in making correct inferences about the situation in the world economy, when their only direct information comes from the events (in this case, price changes) they observe directly. We call this difficulty a problem of *information asymmetry*. In particular, important asymmetries can arise between business firms, who have good access to new information, and their workers, who may not.

To help make the problem clear, Phelps proposed a metaphor. Suppose we imagine, he said, that workers live on an archipelago. We can presume that they know just about everything that happens on their own island, but less and less about what is happening on islands that are further and further away. We might even suppose, too, that the monetary authorities, whose emissions of new paper currency determine the general movement of prices, all reside on a separate, particularly distant island.

Now suppose, that, unannounced and unpredicted, the monetary authorities decide to try to stimulate economic activity by raising the growth rate of the money supply. Eventually, the inevitable effects will be felt, and price rises will accelerate on a workers' home island. That bare fact, of course, will be no secret to the worker. But is it a sign of a general increase in inflation, which would call for a compensating rise in the rate of change of money wages? Or

is it instead a sign of changing relative prices, perhaps due to some unanticipated change in purely local conditions (a drought affecting local farming but not that on other islands, for example)?

Phelps argued that, at first, workers would be unsure. And so they would hesitate to raise their money wages. *Firms*, on the other hand, being organizations with the capacity to gather information for their own use, would be quicker to realize true situation and to act. Seeing the rising price level and the sluggish money wage, they will seize the opportunity to hire more workers while the uncertainty lasts. The final effect is the same as in Friedman's version of story: real wages fall at each level of labor supplied, and the quantity of labor demanded rises. But now we have an explanation for the two ends left loose in Friedman's version. Workers do not restore original conditions by demanding higher money wages in immediate response to higher prices, because they are not certain that they are in fact experiencing a general inflation and a concomitant decline in the general level of the real wage. It takes time to arrive at a confident understanding of what part of the price change is global, and what part merely local.

## 7.4 Monetarism and the Phillips Curve

In the short run, you will notice, the Phelps-Friedman model produces a downward-sloping Phillips curve relationship. If the inflation rate rises, unemployment falls, and vice versa. Both Phillips' and Samuelson-Solow's observations are accounted for. Since the Phelps/Friedman model appeared in the late 1960s, its ability to account for what then seemed an established empirical regularity was an important point in its favor.

What set Phelps and Friedman apart from the empirical Phillips curve were two things. First, their argument placed a seemingly rigorous foundation in individual behavior under the Phillips Curve – Tobin's "Pirandello characters" now had their authors. Second, the model yielded a set of implications for the economy in the "long run." We turn next to these implications.

### *The Natural Rate of Unemployment*

Sooner or later, if the new rate of inflation remains constant, expectations will catch up to reality. Workers observe that price inflation is permanently higher, and that real wages have fallen. Naturally, they demand a wage adjustment that will establish the unique real wage that will clear the labor market. But the inflation rate, which is determined by the new, permanently higher rate of money growth, remains at its own new, permanently higher rate!

Hence the short run Phillips curve has shifted to the right. The same equilibrium unemployment rate now corresponds to a higher rate of expected

inflation. To reduce unemployment again, it will be necessary to increase the rate of inflation once again, and once again to mis-persuade workers that real wages in the production period just ahead are higher than, in fact, they are.

The *Phelps/Friedman long run* can now be defined as those times when inflation (and therefore real-wage) expectations are shown to be correct. We can say that in the long run workers are not misled by rate-of-return misperceptions into offering either more or less work than they would, in retrospect and with complete information, have agreed to do. This happens at any time when workers correctly forecast the rate of inflation – which, with adaptive expectations, they will do when, and only when, the rate of inflation has been constant over a sustained period of time.

But notice the rate of inflation can be at any value at all, so long as it is *constant*. And, at any constant rate of inflation, the amount of labor offered and employed will be the equilibrium rate – the same rate as at any other constant rate of inflation. At that rate of unemployment, with a constant rate of inflation, the classical condition that money is neutral – the chief concern of Friedman's earlier monetary model – is satisfied. Friedman gave this special rate of unemployment a name: the *natural rate of unemployment*.[14]

### *The Vertical Long-Run Phillips Curve*

There is a clear conclusion. In the Phelps/Friedman long run, THE PHILLIPS CURVE MUST BE VERTICAL, intercepting the horizontal axis at the natural rate of unemployment. So long as inflation rates are correctly anticipated, the labor market will clear at the natural rate. It will fail to clear, or clear at a rate different from the natural rate, only if inflation is forecast incorrectly, which under adaptive expectations will occur only when the inflation rate is varying.

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[14] Subsequent Keynesian scholars have tried to rename the same concept as the Non-Accelerating Inflation Rate of Unemployment, or NAIRU. This inelegant coinage has, mercifully, not spread very far.

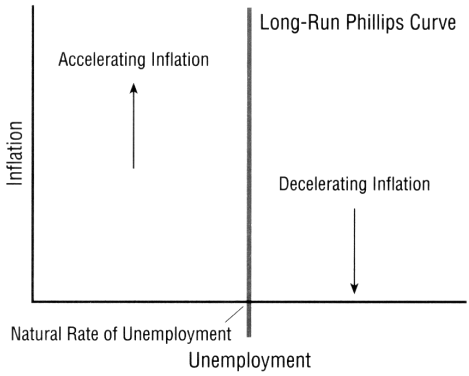


*Figure 7.4* ***The Natural Rate of Unemployment****. In the Phelps-Friedman model the Phillips curve is vertical in the long run and determines a natural rate of unemployment. Inflation can be any constant value at the natural rate of unemployment.*

To see how the vertical Phillips curve emerges analytically, we can return to a proposition we derived in Chapter 5, where we showed that the rate of inflation must equal the rate of wage increase, minus the rate of productivity growth, $\pi$:

$$\dot{p} = \dot{W} - \pi \tag{7.4}$$

The Friedman argument, in its simplest form, holds that the rate of wage increase will be determined in part by the expected rate of inflation, and in part by the actual rate of unemployment. The effect of unemployment on wage increases is negative, so that effect of rising unemployment is to depress wage increases, and vice versa. And, in the equation following, $\lambda$ is a parameter whose value lies between zero and one, indicating how rapidly a change in price expectations is incorporated into rising wages:

$$\begin{aligned} \dot{W} &= \dot{W}(U) + \lambda \mathbf{E}\dot{P} \\ \dot{W}' &< 0 \\ 0 \leq \lambda &\leq 1 \end{aligned} \tag{7.5}$$

Combining 7.4 and 7.5, we see that the rate of price inflation depends on the rate of productivity growth, the rate of unemployment, and the expected rate of inflation. This relationship is known as the *expectations-augmented Phillips curve*:

$$\dot{P} = \dot{W}(U) - \pi + \lambda \mathbf{E}\dot{P} \tag{7.6}$$

Since the first two terms of the right-hand side of 7.6 are the equation of a short run Phillips curve, one may think of this equation as representing a family of ordinary short run Phillips curves. Any change in expected inflation merely shifts the short-run curve up or down, by an amount corresponding the size of the change in the final term. Figure 7.5 illustrates such a family of curves.

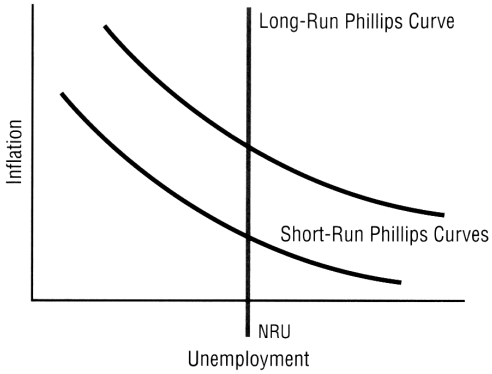


*Figure 7.5* ***Short. and Long-Run Phillips Curves****. Each short-run Phillips curve corresponds to a different expected rate of inflation when expected infiation coincides with actual inflation. The Phillips curve is vertical.*

We can now solve for the special case – the Phelps/Friedman long run – where actual and expected rates of inflation are equal. In that case we have:

$$\dot{P} = \frac{\dot{W}(U)}{1-\lambda} - \frac{p}{1-\lambda} \tag{7.7}$$

Equation 7.7 is the equation of the *Long-Run Phillips Curve*. Notice that it too is very similar to that of the regular or short-run Phillips curve – except that the intercept is different and, importantly, the slope is steeper by a factor of $1/(1-\lambda)$ As equation 7.5 demonstrates, when $\lambda$ is equal to one, a change in inflation expectations is reflected one-for-one in wages, and we have the case that interested Friedman and Phelps. The long-run Phillips Curve is vertical, and the rate of inflation does not depend on the rate of unemployment. Figure 7.6 illustrates this case, alongside the case where $\lambda < 1$ and the long-run Phillips curve is not vertical.[15]

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15 This case was once a major part of the response of Keynesians to Friedman's argument – because it continued to permit a permanent effect on unemployment of policies aimed at expanding output. However it has been hard to justify an incomplete incorporation of

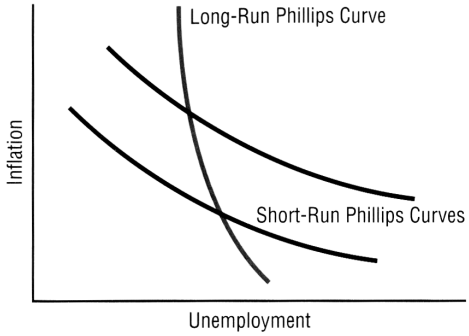


*Figure 7.6* ***The Expectations-Augmented Phillips Curve****. If adjustment of inflation expectations to reality is not complete in one period then the long-run Phillips curve may not be vertical. It will still be steeper than the short-run Phillips curve.*

We can also solve for the rate of unemployment in the long run from equation 7.7:

$$U = \dot{W}^{-1}([1-\lambda]\dot{P} + \pi) \tag{7.8}$$

(To remind, $w^{-1}$ is mathematical notation ("w-dot inverse") indicating that the effect of the function w-dot is reversed. It is analogous to taking the reciprocal of a fraction: $w^{-1}[w(\pi)] = \pi$.)

Notice that when $\lambda = 1$, once again, the rate of inflation does not influence the rate of unemployment. Unemployment then reduces to:

$$U^* = \dot{W}^{-1}(\pi) \tag{7.9}$$

This is the natural rate of unemployment. It depends only on $\pi$, the growth rate of labor productivity, and on the function that determines how a change in the actual unemployment rate is reflected in the rate of change of money wages. Since that original function has a negative slope, its inverse must also have a negative slope. Thus, the faster labor productivity grows, the lower the natural rate of unemployment, and vice versa. (This formulation underpins the idea that the rising unemployment rates of the 1970s and 1980s were due to slower rates of productivity growth, and a policy implication that only high rates of productivity growth can reduce the natural rate of unemployment.)

In this way, Friedman and Phelps provided a theoretical basis for a downward-sloping short run Phillips relation, consistent with the facts up to

price expectations into wages, and so even self-described Keynesians have come increasingly to accept a vertical Phillips curve in the long run.

that time, that simultaneously denied its usefulness as a tool for permanently affecting the rate of unemployment. At any moment, government policy could force the unemployment rate down, by persuading workers to offer more labor supply than they would do if they had full and accurate information. But the inevitable consequence would be a rising rate of inflation, and a new equilibrium could only be established by returning to the natural rate of unemployment at the new, higher rate of inflation. Thus, short of hyperinflation, there could be no permanent gains from Keynesian policies to stimulate aggregate demand – and under hyperinflation, of course, the whole economy would collapse.

### *The Collapse of the Phillips Curve*

Friedman and Phelps had thrown down the gauntlet at the American Keynesians, who were then (in 1968) at the height of their power and prestige. Unemployment had been falling continuously since the beginning of the Kennedy Administration eight years before. The price, so far, in terms of increased inflation, had been small. Friedman was warning, in effect, that there would be a larger price to pay later on.

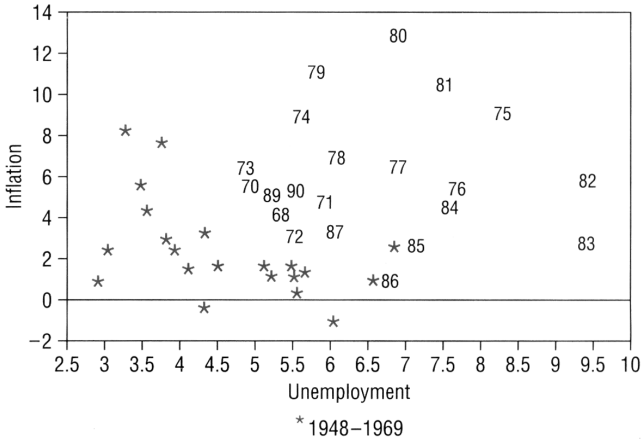


*Figure 7.7* ***The Collapse of the Phillips Curve****. The Phillips curve fell apart after 1970, seeming to confirm the argument of Milton Friedman and the monetarists.*

The Phelps/Friedman position enjoyed an enormous vindication after 1969, when the vaunted stability of the measured short-run Phillips curve collapsed. We showed in Figure 5.16 how the inflation-unemployment trade-off broke down after 1969; this figure is reproduced as Figure 7.7. With the fall of the Phillips Curve, the self-confidence of American Keynesians that they could manage the economy to produce full employment without inflation also broke

down, and the political position of politicians associated with Keynesian ideas sharply eroded.

Robert Lucas, writing in 1981, described the triumph of the anti-Keynesian view:

> "Now, Friedman and Phelps had no way of foreseeing the inflation of the 1970s, any more than did the rest of us, but the central forecast to which their reasoning led was a conditional one, to the effect that a high inflation decade should not have less unemployment on average that a low-inflation decade. We got the high inflation decade, and with it as clear-cut an experimental discrimination as macroeconomics is ever likely to see, and Friedman and Phelps were right. ..." [16]

Axel Leijonhufvud, in 1983, echoes this judgment:

> "It was a debacle. A bad enough debacle that the profession proclaimed the long controversy a Monetarist victory and, by and large, turned its interest elsewhere.[17]"

What actually went wrong? The explanation favored by Lucas and Leijonhufvud is very clear. Samuelson and Solow, they argued, failed to incorporate the effect of price expectations on wage formation, when they developed their original formulation of the Phillips curve as a simple relationship between unemployment and wage demands. Therefore, when inflation expectations grew to a noticeable size after 1968, the collapse of the stable short-run curve was inevitable. The only argument remaining was whether the actual events reflected a family of shifting short-run Phillips curves (the Keynesian fallback – Figure 7.6), or a vertical curve with temporary deviations about it due to forecasting errors (the monetarist alternative – Figure 7.4). The monetarist alternative won out, in this argument, because it provides a simpler and more coherent argument that accounts for the observed facts.

As we shall see in the next chapters, this was not the end of the story. Further theoretical developments in line of descent from Friedman and Phelps were to lead, over the next decade, to the emergence of the "New Classical" school of macro-economics, based on the idea of "rational expectations" and dedicated to the rigorous integration of aggregative analysis with micro-economic "foundations" of competitive market theory. And then, in the 1980's, the propositions of the rational expectationists were themselves to confront

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16 "Tobin and Monetarism: A Review Article," *Journal of Economic Literature*, 29:2 (June 1981), 558-585.

17 "What would Keynes have thought of Rational Expectations?" in James Worswick and David Trevithick, *Keynes and the Modern World*, Cambridge, Cambridge University Press, 1983.

reality, with results that led to still more theoretical development and controversy.

## Special Section
# The Federal Reserve and the Control of Money

In the United States, the powers of monetary policy are vested in the Federal Reserve, our central bank. In this section we provide an overview of the Federal Reserve System, and of its relationship to the rest of the government and to the banking system.

The Federal Reserve, the "bankers' bank," was created by an act of Congress in 1913 to help furnish an "elastic currency" to the nation and serve as a "lender of last resort" to the banking system. It was, in large measure, a response to the monetary crises of the late 19th and early 20th century, and in particular to the financial panic of 1907. These events had led many American observers to conclude that the gold standard, a strict version of which was then in force, was not a sufficiently flexible basis for a system of money and credit. Yet many also feared the powers that would accrue to a central bank, especially if that bank came too much under the thrall of the "hard money" men at the New York banks, or if it became a political tool in the hands of the President. The structure, governance and purposes of the Federal Reserve thus reflected a long national history of struggle over monetary matters, of popular distrust of central banking dating back to the time of Andrew Jackson, and of efforts to achieve financial stability without compromising the independence of private banking institutions.

To arrive at a workable compromise between these interests, Congress established a decentralized Federal Reserve System, dividing the country into twelve financial districts. Each district Federal Reserve Bank would be a semi-private institution, "owned" by shareholding "member" banks, and governed by a President and by a Board of Directors nominated by the local community, including especially local bankers. District Banks thus would feel a special commitment to stabilize the banks in their own regions, and would act as a voice for regional concerns with the Federal Reserve in Washington. Each district bank would manage its own discount window, and thus have the power to lend to banks within the district. Presiding over all there would be, in Washington, a Board of Governors, appointed by the President and confirmed by the U.S. Senate. The seven Governors would be appointed for fourteen-year terms, and thus be largely independent of the President of the

moment. On the other hand, the agency would remain a "creature of Congress," subject to congressional mandate, since Congress was, of course, the body that enacted and that retains the power to change the Federal Reserve Act.

Over the course of the century, actual power at the Federal Reserve has become concentrated in Washington. Perhaps the major turn in this direction occurred in the 1920s, when open market operations were devised as a means of exerting central control over a national market for bank reserves, and so over a nation-wide rate of interest (the overnight rate on deposits that banks lend and borrow to each other in order to meet their reserve requirements, known as the "federal funds rate"). Open market operations–the buying and selling of government bonds–are carried out by a desk at the New York Federal Reserve Bank, but since 1934 open market policy has been set in Washington by the Federal Open Market Committee. This is a policy-making body comprised of the seven presidentially-appointed Federal Reserve Governors and, on a rotating basis, five of the twelve district bank Presidents. The powers to set reserve requirements and discount rates, and also to take many regulatory decisions, are now also vested in the Board of Governors in Washington. The district banks no longer exercise (if they ever did) much practical autonomy in major policy matters.

The Great Crash of 1929 provided the first big test of the grand design of the Nation's central bank. And, as thousands of bank failures and the Great Depression proved, the design was not especially effective. For while the Federal Reserve was quite able to provide interim discount loans to help individual banks that might be in trouble, it was either unable or unwilling to provide the massive infusions of cash that are necessary when the entire banking system as a whole was thrown into crisis. As a result, bank runs and bank failures became epidemic from 1929 to 1933, and both the money supply and the economy itself collapsed. Only deposit insurance, a New Deal measure enacted in 1934 and embodied in the Federal Deposit Insurance Corporation, proved able to restore confidence in the banking system as a whole.

These developments spawned an interesting and persistent controversy in the history of economics. Monetarists, led by Milton Friedman and Anna Schwartz whose *Monetary History of the United States* was published in 1963, have maintained that had the Federal Reserve been attempting to control to the level of the money supply rather than interest rates, it would have been able to print enough money to forestall the banking collapse and the Depression itself. All the Federal Reserve needed to do, in this interpretation, was to buy up outstanding debts from the private sector and so flood the economy with cash.

Keynesians (you will not be surprised to learn) resist this conclusion. Their argument is that the Depression saw a large-scale collapse in effective

demand. Since people without jobs have no way of getting money, either as income or as loans, to finance their transactions, they would not have been helped by the creation of money per se. Therefore, Keynesians reply, any amount of money printing would have been largely futile, unless accompanied by measures to distribute the printed money, as incomes, to the population. Such measures – whether jobs programs or welfare – of course are described as fiscal policy.

In support of their position, Keynesians can point to the experience of 1937-38. At that time the Federal Reserve, by then itself under the influence of Keynesian ideas, attempted to fight a deepening of the Depression by aggressively creating money and reducing interest rates. In the face of a sharply more restrictive fiscal policy, brought about by the Roosevelt administration's attempt that year to balance the federal budget, the effort failed. Indeed, even though the interest rate fell almost to zero, the economy did not recover. American Keynesians drew from this the lesson that an expansionary fiscal policy was essential, and coined the phrase "pushing on a string" to describe the ineffectiveness of expansionary Federal Reserve policy during a depression.[18]

In 1942 the Federal Reserve was, in effect, "drafted" into the war effort, and given the mission of assuring that the price of US government bonds be maintained at par–100 cents on the dollar–for the duration. In practice, this meant that the Federal Reserve would have to buy government bonds from the public, and so create money, as much as necessary to assure that the long-term interest rate on government bonds did not rise above the then-prevailing rate of about two percent.

Interestingly, this step was considered necessary in order to encourage saving at low interest rates. It was felt that people would not put their money into government bonds if they felt that the price of those bonds might fall if interest rates were to rise in the future. If that happened, there would be a flight from bonds to money, and from money to goods, which which would bid up prices and generate runaway inflation. Thus an ironclad commitment to low and stable interest rates, alongside an expansionary monetary policy and price controls, became part and parcel of the successful effort to hold down inflation in wartime.

After the war, and with the dismantling of price controls in 1946, the Governors of the Federal Reserve wished to return open market operations to their conventional role of monetary control and macroeconomic stabilization.

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[18] This experience led Paul Samuelson to argue that the simple, one-variable 45° Keynesian cross diagram wasn't such a bad Depression model after all. Investment *was* insensitive to falling interest rates at this time – although another possible interpretation is that since prices were falling at the same time, *real* interest rates may not have fallen very much.

They did not achieve the power to do so until 1951, when the famous "Federal Reserve-Treasury Accord" was reached, permitting renewed movement of the government bond rate. From this point forward, monetary policy took the form that it largely retains to the present day.

As a legal matter, the Federal Reserve's mandate is to support the goals of the Employment Act of 1946, as amended by the Humphrey-Hawkins Full Employment Act of 1978, which sets as a national goal of full employment with reasonably stable prices. However, in enacting both of these measures, Congress refrained from specifying exactly how they were to be achieved. The result has been that the Federal Reserve retains very substantial discretion over its conduct of monetary policy, and in practice the oversight powers of Congress are limited.

With some significant exceptions, the basic macroeconomic operating rule of the Federal Reserve since the 1950s has been to "lean against the prevailing wind" of the business cycle. That is, when in the judgment of the Board of Governors the prevailing threat is inflation, interest rates have been driven up and the growth rate of the economy has been slowed down. If, as has happened now on five occasions since 1970, these actions result in an actual fall in GDP, a recession, then the Federal Reserve has responded by easing policy, allowing interest rates to fall, and therefore fostering renewed economic expansion.

In the middle and late 1970s, an academic debate swirled around the question of whether the operating procedures of the Federal Open Market Committee, which emphasized the control of short-term interest rates, were compatible with the basic philosophy of "leaning against the wind." In particular, monetarists argued that interest rate stabilization amounted to "leaning INTO the wind." For if the economy and the demand for money were growing rapidly, a policy of providing enough bank reserves to keep the federal funds rate stable would entail meeting all of the rising demand for money. Conversely, in a recession a policy of stabilizing the federal funds rate would mean that the Federal Reserve would "follow the economy down." While in principle the FOMC could change its interest rate targets, up or down, rapidly enough so that policy would be counter-cyclical in effect, monetarists argued that in practice they would fail to do so.

Moreover, even if officials did move quickly and presciently, the lags between the implementation of an expansionary or contractionary policy and its eventual effects were so long and variable that, as often as not, the effects would come too late. A policy intended to reverse a downturn by cutting interest rates would end up accelerating an inflationary expansion, while policies aimed at curbing inflation would end up making a recession worse. For all of these reasons, the monetarists argued, a policy of stabilizing money growth would be much more effective, since it would tend to prevent, in their view, fluctuations of demand growth from occurring in the first place.

Federal Reserve officials, alongside most theoretical Keynesians, doubted the monetarist argument for at least three practical reasons. First, they knew that the federal funds rate could be controlled precisely, day-to-day, by the means of open market operations; they knew that the linkage from open market operations to money creation was not as precise. For one thing, while they had minute-to-minute information about what the federal funds rate was, money supply data were (and are) collected only on a weekly basis, and were subject to revision in the following weeks. Thus, while interest rate control was an established art, money supply control might amount to chasing a moving target. Second, the empirical definition of the money supply was (and remains) quite imprecise, and the monetarists themselves were divided as to whether M1 or M2 should be the object of control. If effective control were sought and achieved of one aggregate, critics could always object that the target should have been the other. Third and finally, Federal Reserve officials doubted that the relationship between money growth and GDP growth, or between money and prices, was as tight as monetarists believed. There arose among central bankers an aphorism known as Goodhart's law, named after a Bank of England economist, which holds that "when you convert an econometric relationship into an instrument of policy, the relationship always changes."

Against these doubts, there emerged an unlikely coalition of theoretical monetarists, whose reasons for favoring monetary control have been described, and of liberals in Congress. This latter group (in which one of your present authors participated as a young congressional staff member) had practical reasons of its own for favoring monetary targets. Leaders of the two Banking Committees, Henry Reuss in the House and William Proxmire in the Senate, were frustrated by the secrecy that surrounded the operations of the Federal Reserve. Congress could not get even routine information about what policy was. Congressional hearings with the Federal Reserve Chairman (at that time, the imperious and crusty Arthur F. Burns) were notorious occasions for evasion and stonewalling, stoutly defended on the ground that giving out public information about future movements of the interest rate would lead to rampant speculation and financial disorder. Without information, Congress could not exercise even minimal oversight over monetary policy. And by 1975, in congressional eyes, monetary policy bore responsibility for two recent, deep and painful recessions, with no effective cure for inflation and no end in sight.

The result was legislation known as House Concurrent Resolution 133, passed in early 1975, which required the Chairman of the Federal Reserve Board to appear at regular intervals before Congress to present and explain the Federal Reserve's annual targets for the growth of the money supply. Within a short time, Congress also got the Federal Reserve to present its forecasts for the behavior of the economy itself: real growth, inflation, and unemployment.

With this information, Congress could effectively discuss and, if need be, criticize the direction that monetary policy was planning to take.

The creation, announcement, and public discussion of annual monetary targets did not, of course, give Congress power to change those targets, nor any power to force the Federal Reserve to meet them. And the Federal Reserve, having met the letter of the congressional mandate, routinely defied the spirit. High officials of the Federal Reserve were no more monetarist after H.Con. Res. 133 (or its incorporation into law in the Full Employment Act of 1978) than they had been before. Actual money growth rose above or fell below the announced targets, depending on the decisions of policymakers taken after the targets were announced, or on changes in underlying economic conditions.

In late 1979, however, the Federal Reserve found it convenient to adopt the monetarist label for purposes of its own. With the second oil shock, the inflation rate was running above ten percent, and there were strong calls from the financial community and elsewhere for decisive action to bring inflation down. In the spring of 1979, President Jimmy Carter named Paul A. Volcker, a professional central banker of conservative credentials, as Chairman of the Federal Reserve Board. Volcker, though not himself a theoretical monetarist, determined to act.

On October 6, 1979, Volcker announced that monetary policy would no longer attempt to stabilize interest rates even in the short term; monetary control would be the order of the day. The results were dramatic: short-term interest rates rose above twenty percent. These were rates that German Chancellor Helmut Schmidt described as being "the highest since Jesus Christ." And the economy slowed down.

The recession of 1980 was caused by a combination of two factors: the tight monetary policies inaugurated in October of 1979, and quantitative credit controls that were imposed briefly in March of 1980. Of the two measures, credit controls probably had the greater effect. Abruptly that spring, people simply stopped using their consumer credit cards, and the economy plunged into recession. When credit controls were lifted in the early summer, there was a rapid recovery.

In 1981, monetary policy put an end to the recovery, and with a vengeance. In March of that year, under pressure from the newly-installed Reagan administration, Chairman Volcker determined to tighten again. Money growth rates fell to zero and stayed there for six months, while the economy went into its steepest downturn since the Second World War. In vain, now, did a few congressional liberals protest that under this purported monetarism actual money growth was far *below* the announced monetary targets! In truth, the Federal Reserve was no more monetarist in the early 1980s than it had ever been; it merely found for a time that monetarist arguments could be used

to justify a severe credit crunch, and resulting recession, when these were felt necessary to bring about a rapid end to inflation.

The crisis of the Federal Reserve's commitment to monetarism came in the late summer of 1982, when the recession reached bottom amid growing signs of a financial crisis. In August, Mexico announced that it could not pay its debts, and the country's largest banks, deeply embroiled in shaky loans to Latin America and elsewhere, seemed to teeter on the brink of collapse. The Federal Reserve's response was in keeping with its larger mandate to preserve the stability of the financial system. Monetarism was abandoned, the growth rate of the money supply exploded, and the economy and the financial system were brought back from the brink.

In the years after the 1982 debacle, the Federal Reserve moved away from paying even lip service to monetarism. It has however not returned entirely to its former preoccupation with short-term interest rates. Rather, one gets the impression that the Federal Reserve moved in three different policy directions more or less at once. First, became more directly concerned with the movements of the macro-economy, and tried to stabilize the aggregate growth rate at a low level – moving the interest rate down when the growth rate is too low or falling, raising it when real growth exceeds an annual rate of three or four percent. As the recession of 1991-92 wore on, falling interest rates became the main weapon in the government's efforts to restore positive economic growth, until by the end of 1991 short-term interest rates were at their lowest levels in twenty-seven years.

Second, the Federal Reserve became ever more conscious of the role of monetary policy in setting the exchange value of the dollar. At times when the concern with growth was not overriding, U.S. interest rate policy has alternated between driving the dollar down (in the late 80s), and holding it up. Third and finally, as savings and loan and banking instabilities have grown more severe, the Federal Reserve increasingly conducted monetary policy with an eye to reinforcing the stability and profitability of its primary institutional clients, the large commercial banks. Where this tendency will lead us, in an era when bank instability is likely to get more serious rather than less, is anybody's guess.

## 7.5 Summary of Chapter 7

Monetarism is an economic point of view that shares much common ground with the classical economic theory. The leading proponent of monetarism, Milton Friedman, holds that inflation is always and everywhere a monetary phenomenon. This view is however complicated by a more sophisticated demand for money. In addition to the transactions demand for money of the classics, monetarists also posit an asset demand for money. The asset demand for money ostensibly smoothes out fluctuations in income.

The money set aside as assets is measured in real balances. Conceptually this is the length of time that the assets could be used to maintain a person's normal spending habits. With inflation real balances will fall, for a given money supply. Friedman argued that people hold a constant percent of their income as real balances. With this assumption he was able to show that the set demand for money was consistent with the classical theory of money. To be exact he showed that if the nominal money supply doubled then prices would double. When this argument is made with a steadily growing money supply monetary policy is shown to be ineffective and money is neutral in its impact on the economy..

In the short run monetary policy can have some effect as people will spend a bit more money before the value of their nominal balances fall. This will cause inflation to be somewhat higher than would be otherwise expected, but in the loner run the rate of inflation would converge with the growth rate of money.

The monetarists' have a sticky nominal wage theory of unemployment. Wage bargains are struck based on an expected rate of price inflation. Expectations of inflation are assumed to be formed adaptively. If inflation accelerates then it is possible to increase employment because, under adaptive expectations, the acceleration cannot be anticipated and real wages will fall. With the adaptive expectations framework, stabilization policy is effective in raising employment as long as the actual rate of inflation outruns the adaptively formed expected rate of inflation. This is, of course, a receipt for indefinitely accelerating inflation.

In the long run however, the monetarists argue that the Phillip's curve is vertical at the natural rate of unemployment. Two arguments are advanced for deviations from the Phillip's curve. The first is that the Phillips curve is actually a series of several short run Phillips curves. Because the adjustment to a new short run curve is not instantaneous, deviations from the natural rate is possible. The second argument rests on forecasting errors within the adaptive expectations framework.

## 7.6 Questions

1. Is it possible to create an adaptive expectations framework that would perfectly predict an accelerating inflation rate? How?

2. Describe two justifications for the long run vertical Phillips' curve. In particular discuss how each justification change the content of policy discussions.

3. Discuss how a superior way of forming expectations than adaptive expectations could be implemented.

4. Friedman came to results very similar to the classical economists. How is the argument of Friedman better than the simple quantity equation of the classical economists?

5. Does Friedman restrict his analysis of real balances to any one kind of money (M1, M2, etc.)? Explain.

6. Discuss how monetarists explain the persistence of unemployment. In particular highlight the similarities and differences of their view with the Keynesians as they have been thus far characterized.

## 7.7 Problems

1. Consider equation 7.2 which describes an adaptive expectation framework for predicting future inflation. Assume only three periods are used for predicting. The present period is weighted .5, one period back is weighted .25 and two periods back is weighted .25. The inflation in the present period is 10%, one period back it was 15% and two periods back it was 8%. What is the prediction of inflation for the next period?

2. Repeat the same exercise with the following information. The weightings are exactly the same. The inflation in the present period is 100%, one period back it was 50% and two periods back it was 25%. Does the inflation predicted by equation make what you would consider a good guess? What is a better guess?

3. Create an adaptive expectations equation that would better predict the series of inflation in problem 2.

4. Suppose workers expect an inflation rate of 10% and they expect this to be fully incorporated into wages. If productivity growth is 2.5% per year what will be the inflation rate? Does your result pose any problems as regards consistency?

5. Continue to use the numbers in problem 4. Now suppose further that workers cut back their wage demands by .5% for every 1% of inflation. What would be an equilibrium level of unemployment? Is there a rate of

inflation that would generate no unemployment? (Assume that eventually the workers expectations of inflation would converge to the actual level of inflation.)

6. Suppose that productivity doubled what would happen tot he results in problem 5. Explain why this makes sense intuitively.