

Rational Expectations —
Fresh Ideas That Challenge
Some Established Views
of Policy Making



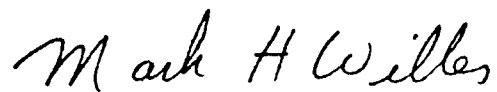
Rational Expectations —
Fresh Ideas That Challenge
Some Established Views
of Policy Making

1977 Annual Report
The Federal Reserve Bank of Minneapolis

About This Issue

Fundamental questions are being asked about the Federal Reserve System: who we are, what our mission is and how we go about accomplishing that mission.

Presumably, we exist because we help things to be better than they would be if we did not exist. Our most significant opportunity to make things better is in our monetary policy role. This Bank has done pioneering research in the rational expectations theory — a theory that has profound implications for the conduct of monetary policy. But that research has not really begun to penetrate policymakers' discussions or decisions. If we are to "make things better," it will be necessary not only to turn out significant research, but to make the results of that research understandable to wider audiences. "Rational Expectations — Fresh Ideas That Challenge Some Established Views of Policy Making," leads our 1977 Annual Report and represents our effort to share, with an informed public and with elected officials and policymakers, our view of what rational expectations means in the real world.



Mark H. Willes
President

Contents

Rational Expectations — Fresh Ideas That Challenge Some Established Views of Policy Making	1
Statement of Condition	14
Earnings and Expenses/Volume of Operations	15
Directors and Officers	16, 17

Rational Expectations — Fresh Ideas That Challenge Some Established Views of Policy Making

“Monetary policy cannot systematically stimulate the economy to lower unemployment rates.”

That startling claim is one of the consequences of a new view of economic policy that has been termed, “rational expectations.” This new view attacks widely held beliefs about how the economy works and challenges many prevailing theories about what economic policy can achieve.

These new ideas are so fundamentally important to the current predicament facing our nation’s economy and to the future course of national economic policy that policy makers — and the general public affected by policy makers’ choices — need to understand the logic and evidence that support the rational expectations view.

But most recent work in the theory and in the analysis of past economic experience — including major contributions made by the Research Department of this Bank — has been too technical to be understood by a more general audience. Hopefully this article will explain the essential ideas of the rational expectations challenge in fairly simple language. By doing that, we hope to encourage discussion of rational expectations among elected officials, policy makers, and a wider public.

We’ll begin by briefly defining what we mean by “rational expectations” and by identifying the kind of policy to which it applies. Our discussion will then address the following points:

- (I) Why traditional views about how economic policy works are wrong,
- (II) why rational expectations is a valid view of the world,
- (III) what happens when current methods of policy making are used in a rational expectations world, and
- (IV) in the light of rational expectations ideas, what can macroeconomic policy really hope to achieve?

“Rational expectations”: what it means.

When the term “rational expectations” first appeared in an economic journal article in 1961, it was given a specific technical meaning connected with economic models. In an everyday, practical sense rational expectations is simply an assumption about people’s behavior. The assumption claims that people make economic decisions in a way that tends to take into account all available information bearing significantly on the future consequences of their decisions. And they tend to use that information in a way so as not to repeat their past

mistakes. The information we’re talking about can include, among other things, knowledge about government policy actions already taken and about strategies or approaches government policy makers regularly take when economic signals begin to change. So, rational expectations attributes to people a reasonably thorough, broad-view approach to appraising the future on matters that are going to make a big dollars-and-cents difference to them.

Put that way, there’s certainly nothing startling about the rational expectations idea. Most of us have believed all along that rationality in that sense is a reasonable thing to attribute to economic decision makers — business people, labor leaders, workers, investors, or consumers. What is startling is that the ideas underlying current policy views deny such rationality. Current views about how policy achieves its effects depend on people *failing* to act in their own best interests. When we recast the decision-making process to allow people to act with “rational expectations,” policy no longer has the same effects. And that’s the heart of the problem we’re examining in this article.

The importance of expectations in decision making.

All economists agree that people’s beliefs about the future affect their decisions today. Employers and employees negotiate wage contracts with some picture in mind about what will happen to the cost of living or to other related wage rates over the life of a contract. Consumers deciding whether to purchase a car have expectations about future income, job prospects, future cash outlays, and perhaps sources of credit in an emergency — if only to judge whether the automobile installment payments can be met. Similarly, a business firm deciding whether to invest in new factories must form expectations about such things as future sales, future labor and other input costs, and future tax rates.

According to the rational expectations view, people use in the best way possible whatever information they have; and they do not tend to repeat previous errors. People are forward looking, and prospective government actions play an important part in their picture of the future. The myriad of commercially available newsletters, analytical reports, and forecasting services reminds us that forecasting government actions has become big business. And even though people must

make plans in an environment of considerable uncertainty (and, therefore, are likely to make some mistakes), they do learn to avoid repeatedly misusing information that will bear on their future. That's because the economic process rewards those who make good forecasts and penalizes those who don't.

Types of policies under question.

We should emphasize that the kind of policy making we're looking at embraces attempts to manage, or influence, demand for goods and services in order to smooth out the business cycle. Sometimes these kinds of policies are called *demand management* policies, *aggregate demand* policies, or simply *countercyclical* policies. (We'll use these terms interchangeably.)

Virtually everyone who reads the newspapers is aware of the continuing public discussion of these policies. Government choices regarding how much it will spend in relation to how much it will tax, when used as deliberate countercyclical measures, are called *fiscal* policies. Decisions by the Federal Reserve to increase or decrease bank reserves, directed similarly, are called *monetary* policies. When the federal government deliberately takes action to spend more than it taxes away from businesses and individuals, fiscal policy is said to be *expansionary*. When the Federal Reserve acts to increase bank reserves — a kind of starter kit for expanded money and credit growth in the private economy — monetary policy is said to be *expansionary* and is viewed to be either a complement to expansionary fiscal policy or a stimulus in its own right. Both of these types of economic policy are commonly thought to be potent ways to help get a weak economy moving again.

I. What's wrong with traditional views of the policy process?

Since rational expectations ideas have developed as criticism of some prevailing ways of viewing the economy and the role of policy, the case for rational expectations is, to a large extent, the case against these current views. The traditional views we're talking about are those claiming that routinely applied fiscal and monetary stimulus in times of recession, and restraint in times of boom, will improve the general performance of the economy over the longer term and make people, on the whole, better off. What we want to show in the next few sections is that people's expectations, when formed "rationally," will generally frustrate government's attempts to successfully pursue activist demand management policies.

We'll do this by outlining the process through which activist policies are widely believed to get results and show how they depend on people behaving in ways inconsistent with their own best interests. Next we'll offer a rational expectations version of the policy process as a more realistic representation of people's decision making and indicate how that representation seems

consistent with some evidence from recent experience. We think the rational expectations view is persuasive.

Two stories of how activist countercyclical fiscal and monetary policies are believed to work will be traced out. In the first story policy has its effect through the labor market and hinges on the way labor reacts to changes in wages and prices. The other story has policy working via financial markets and hinges on the way changes in interest rates induce (or discourage) new investment. These two perceptions of the channels connecting policy with the economic outcome aren't mutually exclusive; they could easily be combined into a single, more general story. The stories, though, are often told separately, and since some of our readers will be more familiar with one or the other it will be useful to consider each of them in turn. The two perceived policy channels we are about to consider probably contain the essence of what most legislators and policy maker's views depend on in order for activist policies to get results.

Story one: policy that takes effect through wage decisions.

Central to some widely held views of the policy process are wage-setting decisions in the labor market. This story, a rather standard Keynesian one, depends very much on labor *not* rationally forming expectations about future conditions at the time wage contracts are set.

We start with an economy in recession. Government policy makers want to stimulate hiring and producing by private business firms. They know the way to get business firms to expand *more* than already planned is to take policy actions that will cause business to see additional profit opportunities. So government increases the amount of money it spends for goods and services relative to the amount of money it draws in from the private economy in the form of taxes. And it creates money to pay for the difference. Prices move up as business experiences the effects of added spending for its products. All this time labor is not supposed to look ahead to the end of the story with its promise of rising prices, and so it continues to work at very nearly the same old wage. That's what creates new profit opportunities for business—prices for business output go up, but its major input cost, wage rates for labor, does not. The outcome: business expands, and as it does it hires more labor.

In this scenario, workers go along with unchanged wage rates in the face of prospectively higher prices. They find themselves in the peculiar situation of offering more labor at lower "real-wage rates," that is, wage rates measured in terms of the amount of goods they'll buy. That shortsightedness on the part of labor is crucial if this channel for policy action is to work as claimed. For if workers bargained for their wages in full anticipation that prices would rise, or if wages were "indexed" to

automatically follow general price level increases, then that perceived policy channel would fail to work.

This simplified Keynesian story does no particular violence to the mechanism many policy activists believe enables government to start the economic ball rolling. It requires that workers in the labor market be oblivious to (or largely tolerant of) the prospect that an unchanging wage along with a rising general price level will progressively erode the amount of real goods and services their wages will buy. Since that kind of decision making hardly seems rational, it's easy to guess the forthcoming rational expectations criticism.

First, the process will work only if labor does not, in the course of its wage-bargaining and job-seeking behavior, anticipate the consequent general rise in prices. It's clear that fiscal and monetary policies deliberately attempting to stimulate total dollar spending in the

economy would not be able to operate through this price- and wage-setting disparity if those policies were fully predicted or expected. That's because labor wouldn't willingly or knowingly enter into a contract that dooms workers to a shrinking real income when no changes in technology or productivity have occurred that force upon the whole of the economy—owners and managers of business as well—such a real loss in living standards. And in the absence of that kind of self-diminishing agreement, business would have no net expansion in profit opportunities to exploit.

Second, any policy process that operates by fooling people—as this Keynesian mechanism certainly requires—may work the first time, but cannot be expected to go on fooling people repeatedly. That's axiomatic from the rationalists' point of view. Any logical story of the policy process must grant labor in general and workers in

Rational Expectations

Background to Our Involvement at the Federal Reserve Bank of Minneapolis

While "rational expectations" had appeared as a technical term in economics literature as early as 1961, the rational expectations challenge to activist macroeconomic policy theory is much more recent. And a key element of the challenge was developed at the Federal Reserve Bank of Minneapolis.

The Bank had, in 1970, launched a major research program exploring how best the Federal Open Market Committee (FOMC) should make monetary policy. In 1970 and 1971, respectively, Neil Wallace and Thomas Sargent, professors of economics at the University of Minnesota, joined the Bank's research department as economic advisors to assist in that program. While the program was underway, a seminal result appeared in a 1972 paper by economist Robert E. Lucas. Lucas, then at Carnegie Mellon University, had developed a rational expectations model of the business cycle. The theoretical importance of his work can hardly be overstated: for the first time, business cycles could be explained using a model consistent with the core of standard economic theory.

Rational expectations was quickly seen by Sargent and Wallace to be of great importance to the research program being carried on at the Federal Reserve Bank of Minneapolis, particularly as they began to flesh out the policy implications of Lucas' model. They found that rational expectations could deprive activist macroeconomic policy of any systematic real effects. Their findings meant that activist monetary policy by the Federal Reserve—tightening the money supply to cool an overheated economy or expanding the money supply to stimulate a lagging economy—might not work in the

way it had long been believed to be effective. Subsequent research by Sargent and Wallace has established them, with Lucas, as the leading theorists of the new view.

To extend discussion of the rational expectations view, the Bank has sponsored a number of conferences and seminars, publishing papers and proceedings from those conferences and seminars. In 1974, the Bank sponsored a conference on the rational expectations challenge to current policy-making procedures, inviting several of the leading scholars on both sides of the emerging debate. In June of 1975 we published Sargent and Wallace's paper, *Rational Expectations and the Theory of Economic Policy*, from the 1974 conference as the second edition in our Studies in Monetary Economics (SME) Series. The third publication in our SME Series, *Rational Expectations and Theory of Economic Policy: Arguments and Evidence* by Sargent and Wallace, came out of a series of seminars on FOMC policymaking conducted in 1975 by the Bank's research staff. Further work by various research staff members on the rational expectations challenge was published in 1976 as *A Prescription for Monetary Policy*. In 1977, the Bank published proceedings of a 1975 conference on business cycle research, *New Methods in Business Cycle Research*, that related to our rational expectations work.

The Bank is continuing its program of fundamental studies of requirements for optimal monetary policy, with current emphasis on clarifying the foundations of money in rational expectations models. A conference of leading scholars dealing with that topic has been planned for the fall of 1978.

particular at least reasonable acumen when it comes to making commitments affecting their personal economic interests. That much is granted to other actors in the story, of course. Our conclusion then is that the activist policy process we've been describing will not bring about any overall real expansion in the private economy—*unless it catches people by surprise.*

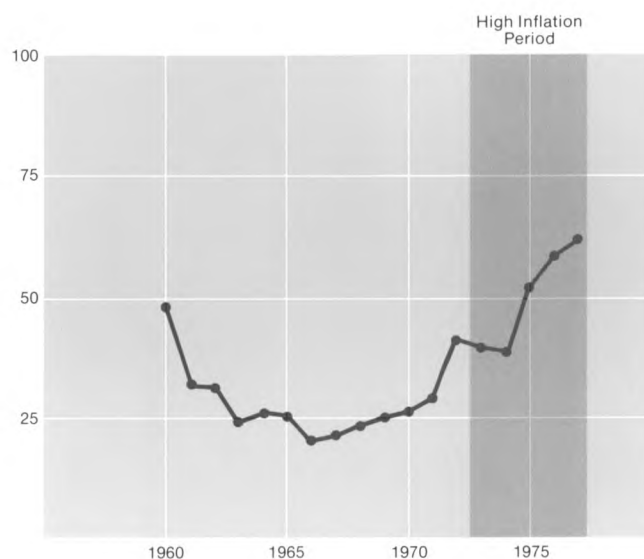
Some indications of labor market response to prospective inflation. One of the arguments supporters of activist countercyclical policy make against the rational expectations view starts with the observation that labor frequently locks itself into contracts by fixing the course of wages for as much as three years into the future. That fact, plus perhaps some slowness on the part of workers in recognizing what's happening to prices in general, means there's a built-in delay in wage adjustments. But, so the story goes, product prices can respond quickly to a policy stimulus, and therefore temporary profit opportunities, at least, can be created by policy action. That provides incentive for business to expand, if only temporarily, and thus some potency is retained by activist policy.

That fragile loophole cannot be relied on in the pursuit of any systematic countercyclical policy. Contracts are periodically rewritten and can certainly take into account any earlier misreading of government policy strategy on the practical principle of "once burned, twice cautious." One possible response by labor to being caught short in midcontract because of unpredictable policy moves by government is simply to shorten the contract period the next time. That course was pointed out in 1971 by United Auto Workers President Leonard Woodcock when he said, ". . . if labor contracts can be torn up based upon the stroke of a pen [a reference to the Wage-Price Freeze on August 15, 1971], then obviously we can no longer in the future negotiate contracts for any longer than one year."

An alternative response by labor is to stay with longer-term contracts but base them on a better forecast of inflation. In fact, the closer labor can come to having wages fully adjusted for changes in cost-of-living indexes, the closer it comes to making a "perfect" forecast. That situation, from labor's point of view, would be the ultimate in rational expectations and would obviously frustrate the Keynesian policy mechanism described earlier.

A telling illustration of the way labor has moved to protect its real earnings in the recent environment of high price inflation is the data on the percentage of workers covered by cost-of-living clauses in their contracts. We've plotted that data in Figure 1. It suggests that labor is in fact responding in a "rational" way to government's continuing failure to deliver on its announced policy goals for containment of inflation.

Figure 1. Percent of Workers Under Contract Covered by Cost-of-Living Escalation



Source: Monthly Labor Review

Story two: countercyclical policy that takes effect by way of interest rate channels.

Now let's look at another commonly held notion of how monetary-fiscal stimulus makes things move. This one operates through a different market, the market for investment funds, and seems to depend on a kind of shortsightedness by suppliers of funds regarding their prospective "real" interest earnings. The earnings-versus-inflation discrepancy that policy appears to exploit here parallels labor's "illusion" about its wage in the first story. According to this policy story, policy makers' actions to expand the rate of money growth will influence business expansion decisions and consumer spending decisions through interest rates.

The story goes as follows.

Start with the perception that the economy is in, or going into, a recession. Policy authorities act to expand the money supply growth rate. The Federal Reserve does this by stepping up its buying of securities from the public (through a network of dealers in New York). By that deliberate action the public ends up with a flow of new cash, and banks end up with a flow of new reserves

that enable them to expand loans to businesses, if they can find customers, by several times the amount of the new reserves.

Other things being equal, the buying action of the Fed drives securities *prices* up, and that means interest rates are driven down on those securities. The subsequent action by banks seeking to make loans at a faster pace than they would have done otherwise, or to buy bonds in greater volumes than they would have done otherwise, helps move still other interest rates down.

In the next step, business firms expand investment in new production facilities. One way to imagine why they would do so is to consider interest on borrowed business funds as simply another cost of doing business, just as wages for labor inputs are a cost of doing business. As expectations adjust to the prospect of lower interest costs, some investment possibilities not previously viewed as profitable will suddenly appear profitable—expected revenues don't change, but expected costs go down because the interest cost component has gone down. Thus, plant and equipment investments are undertaken, new workers are hired, and new output is produced.

The last step in the story simply recognizes that the added new workers start some new spending of their own, which further raises demand, causing additional businesses to expand their output, and so on. Thus, national product expands by some multiple of the initial investment stimulus, and we've succeeded in bringing about large real effects on the economy through small changes in monetary policy.

Once this process gets underway (plant expansion, new hiring, and all that), the increased private spending would, just as in the first story, likely bring forth some mixture of price increases and real quantity increases in the flow of goods and services. This story seems even to allow wage rates to be bid up approximately in line with prices as expansion moves along. The prospect of wage rate increases can be a part of business firms' expectations — as long as the necessary capital funds have been or can be acquired through borrowing at bargain interest rates.

Interest rate responses to monetary-fiscal actions appear to be the crucial link in the story we've just told. Interest rate responses also seem to provide the main channel through which monetary policy actions affect employment and output in the large macroeconomic models of the United States economy currently used by government to assist in determining policies and by business to assist in determining its strategies. The large multi-equation "MPS" model developed by the Federal Reserve, Massachusetts Institute of Technology, University of Pennsylvania, and the Social Sciences Research Council has five directly defined channels that

depend on interest rate movements. Some dozen different interest rates appear in the equations to help generate quarter-by-quarter predictions of total spending for such categories as consumer durables, automobiles, producers' durable equipment, and residential construction. The interest rate linkage seems also to be a key part of the looser and more generalized anecdotal story that you might get if you asked some policy makers how their decisions affect the economy.

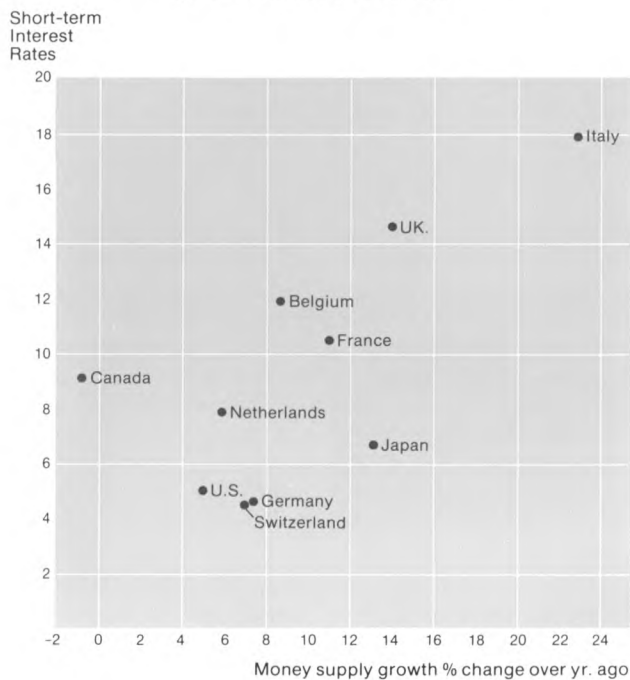
In the rational expectations view, however, those stories are wrong. The interest-rate-link story doesn't take a broad enough perspective and doesn't adequately accommodate the way people rationally form their expectations. While it's undeniable that Federal Reserve action to buy securities and expand bank reserves results in bidding interest rates down, that response is temporary and fleeting. The point is that rational lenders and investors, who look ahead to later chapters of the story, see that any Federal Reserve push to expand money growth rates will ultimately raise the growth in the general price level. Foreseeing that outcome, lenders won't want to tie up funds in long-term loans at rates of interest which they had calculated to be acceptable under an outdated view of future inflation. If they were to commit their funds with no upward adjustment of their lending rate, they would be agreeing to accept a lower rate of return in terms of the goods and services they would subsequently be able to buy. And nothing in the outlook has changed that should lead them to want to do that.

Instead, they would add an "inflation premium" to the interest rates they are willing to settle for — a little insurance policy against the heightened prospects for inflation. And interest rate levels finally settled on in the financial markets have got to reflect that premium. Finally, if the long-term interest rates relevant for business capital expansion go up by the full amount of expected inflation, as the rationalists argue would occur with any foreseen inflation, all costs — including interest as a cost — will go up proportionately to the expected price rise so that nothing will have changed in terms of exploitable profit opportunities. In short, when policy moves are anticipated or quickly sensed in market signals, this financial market channel to policy results we've been describing won't work either.

So what's the evidence that interest rates don't behave as the conventional policy view would argue they should? Any simple look at the relationship between money growth and interest rate levels in the historical record is bound to ignore a lot of other factors also influencing how those two things behave. Yet the fact that economic data just don't show high rates of money growth regularly associated with low levels of interest rates must, at the very least, raise doubts about the dependability of that perceived route for policy actions.

Figure 2a. Interest Rate vs. Money Growth for OECD Countries

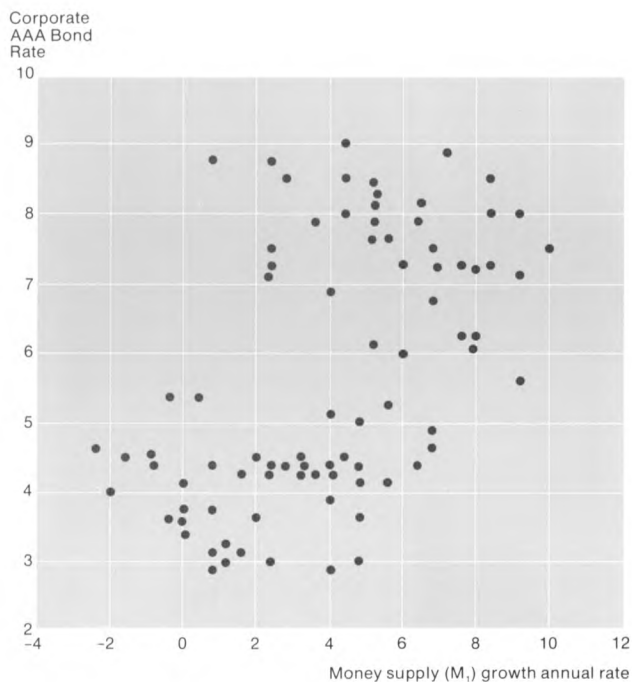
Nov. 1976 short term interest rates vs. rate of money growth Nov. 1976 over Nov. 1975



Source: Federal Reserve Bank of New York

Figure 2b. Interest Rate vs. Money Growth

Quarterly average U.S. data 1954 through 1977



You can look at experience across countries [Figure 2a] or over a period of time within the United States [Figure 2b] and see that *higher* interest rates, not lower, appear, if anything, to go along with higher rates of money expansion — probably reflecting higher actual and expected inflation rates.

To sum up, the rational expectations view argues that conventionally perceived policy channels — whether operating through wage costs, interest costs, or any other market-responsible variable — are wrong because they depend on having people behave contrary to their own clear best interests, repeatedly neglecting important information they have or can have about any systematically applied policy.

II. How valid is rational expectations as a representation of people's behavior?

Some critics argue that rational expectations demands too much wisdom and perceptiveness of people to be believable. But the validity of rational expectations does not require that *every* consumer or worker or business manager be the “complete seer” of future prices and other economic events. For example, in the case of wage bargaining by organized labor, only the union leadership actually engaged in the bargaining process — not each

and every rank-and-file member — need have an informed view about what government policy is and what its consequences for future price levels are likely to be. Today's union leadership, as we pointed out in our review of policy channels in the previous section, does, in fact, acknowledge its concern about prospective “real” earnings. Small agricultural enterprises or commodity dealers need not have specialized resources of their own to forecast supply and demand movements and the effects of government policies. All they need do to learn what the experts are expecting in future market situations is pick up the newspaper, or the phone, and check on quoted futures prices — or subscribe at modest price to one of many private newsletters. In the case of small borrowers and investors, the information possessed by large and sophisticated borrowers and suppliers of funds becomes very quickly and widely reflected in publicized interest rates. Studies have shown that financial markets, including the stock markets, are efficient users of information in the sense that prices quickly adjust to reflect expert information on all the factors — government policy included — bearing on future profitability.

Clearly the major industrial and commercial firms in the economy have a crucial financial stake in correctly

forecasting how they will be affected by changes in government policy. Any actions they take, because of changed expectations, in product or resource markets will quickly carry the message of their reappraisal to other participants, large and small, on both sides of the market.

Finally, when wage rates of a particular firm get out of line with other firms competing for the same labor pool, reaction by only a few workers is necessary, in general, in order to cause the firm to adjust its wage rates to the prevailing market. Perhaps none of the workers need take direct action if the firm monitors the market and adjusts its salary structure, as many firms do, using projections based on market surveys. Such surveys will reflect what's happening at the more responsive firms, including the effects of escalator provisions and other union bargaining results. In sum, the rational expectations argument is that information about the likely future is transmitted in the marketplace in the same way as information about the present. A given individual or firm need not be the "complete seer" of the future any more than of the present.

Some evidence from economic data.

The rational expectations view argues that existing economic models and theories that have dominated activist policy thinking for years fail to properly capture the true responsiveness of real-life decision makers to government policy actions. If that's true, then the forecasts generated by such models ought to betray that defect during a period in which policy abruptly changes. Although traditional models have not been subject to this test directly, they have been found to be unstable outside the sample period over which they were estimated [4].

The fact that standard models fail in this way suggests that something is seriously wrong with them. In particular, that "something" may well be the way in which the economic actors are represented as forming the expectations on which economic decision making is based. Traditional models seem to limit too rigidly the capacity granted to their implicit decision makers to judge and react to new information.

But what does the test of recent history have to say about how well rational expectations performs as a model of people's real-life decision process for the economy as a whole? The technical definition of rational expectations can be viewed as a very strict assumption — "extreme," as some critics contend — about the knowledge and perceptiveness people have regarding what's happening in the economy. Yet, in another study, Thomas Sargent [6] has shown that a rational expectations version of a macroeconomic model, even though built upon extreme assumptions about the way people see through policy actions, was not at all inconsistent with data from the United States economy. The data

used reflected, of course, expectations people actually held and decisions people actually made. From a scientific point of view, passing such a test doesn't prove that the rational expectations view is the correct one. The strict form of rational expectations model used by Sargent merely survives as one legitimate candidate in a contest that may never be fully decided from the historical data.

But other new research has extended in a broader framework the basic rational expectations insights into economic policy making and the policy-neutralizing effect of people's economic decision-making behavior.

Support from developments in theory: the new view and the Phillips curve.

Significant support for the credibility of rational expectations comes from new work incorporating rational individual agents into a more broadly integrated economic model that exhibits business cycles and explains the so-called Phillips curve. No previous theory in economics has managed to perform that job satisfactorily. Since the Phillips curve is part of activist policy lore, we want to briefly sketch what the new view has to say about it.

In the long historical record, high rates of inflation have tended to go with high rates of employment, and low rates of inflation have tended to go with low rates of employment. That kind of relationship is often referred to as a Phillips curve after economist A. W. Phillips, who in 1958 first described a connection between unemployment rates and wage-inflation rates in British data.

To many policy activists the Phillips relationship offers some hard empirical data tracing out various combinations of labor market conditions and inflation pressures that correspond to and support the Keynesian policy stories we've discussed. In a famous 1960 article, economists Paul Samuelson and Robert Solow [5] described the observed relationship in the United States data as a "menu of choice" available to the policy maker. Until recently the Phillips curve has been widely accepted and defended as a practical measure of the "trade-off" between national employment objectives and inflation objectives.

But the Phillips curve relationship is no longer regarded as a stable or dependable one. If a regular trade-off can even be deciphered in recent unemployment-inflation data, the inflation "price" for buying lower unemployment appears to have gone up substantially: high unemployment rates now go hand in hand with high inflation rates. Proponents of "rational expectations" interpret the broad pattern of these results — the historical Phillips relationship (such as it has been) and the recent deterioration of the supposed trade-off — as evidence supporting a model of the economy in which rational expectations operates.

The new theory being built around rational expectations and some related ideas does in fact account for historical Phillips curve-like relationships. And those relationships, as pointed out by Robert Lucas [3], turn out simply to be the observed facts of the business cycle. The general price level, output, and employment tend to move up together as people respond to a rather general misreading of unanticipated price and demand changes. In the inherently uncertain environment in which decisions are made, people at first take these as signals of expanded profit opportunities. Subsequently, the same three quantities tend to move down together when expansion is discovered to have overstretched the real level of economic demand. *But even though these economic variables do move together in a more or less regular way — hence the Phillips curve in the historical data — the rational expectations view says this relationship cannot be regularly exploited for government policy purposes.* For if government tries to raise employment rates by adding to aggregate demand and expanding the flow of money, people will quickly incorporate into their expectations the fact that a more rapidly rising level of prices and wages will surely follow. Business firms will not then be likely to mistake the price and demand pressures that soon occur as signals of profit opportunities (*a la* the channels described earlier) beckoning them to expand output and employment.

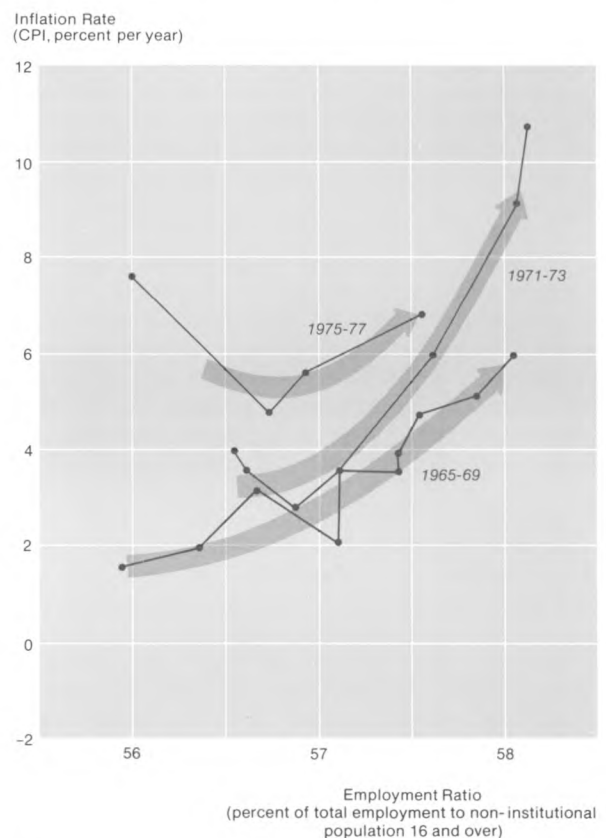
Although actual data from the economy is very “noisy” — meaning it jumps around a lot from one month or quarter to another in ways that seem to defy explanation — it’s possible to see that longer-term movements in inflation rates and employment rates do conform in a loose way. Data in Figure 3, taken from the period 1965 to 1977, show three major upward swings, each of several quarters, that, loosely speaking, trace a kind of Phillips curve expansionary relationship. The chart also indicates the deteriorating nature of that relationship. Each successive upswing seems on average to require higher rates of general inflation to “recapture” the same level of the employment rate as observed in the previous swing. That, according to the rationalists, may be evidence that people have incorporated into their expectations the government’s inflationary bias of the past decade or longer.

III. What happens to activist macro policy in a rational expectations world?

In earlier sections we reviewed arguments for disbelieving that macro policy actions can work the way conventional perceptions say they do, and we presented reasons for thinking that the kind of world policy makers must deal with is something very close to a rational expectations world.

The serious problem, then, is the following: If people really do behave as rational expectations models their behavior, then many existing beliefs about the

Figure 3.
Generalized Employment-Inflation Upswing
for U.S. since mid-sixties
(Plotted points are semiannual averages)



results policy can achieve are incorrect. As we’ve abundantly stressed already, macro policy initiatives that people anticipate will be frustrated by the changes people will then make in their plans. More particularly, any policy move to stimulate aggregate spending will be largely dissipated by price rises.

We will graphically illustrate what rational expectations does to conventional macro policy actions through some comparative simulations produced by a well-known, small econometric model.

An illustration of the effects of rational expectations on economic policy.

Econometric models are constructed of mathematical equations, often designed to be solved on computers in a way capable of simulating the future course of an economy. Results can then be cranked out quarter-by-quarter to produce numerical forecasts of employment, prices, or whatever economic variables are contained in the model. It’s now a commonplace that models of this

sort — some with as many as several hundred equations — have since the mid-1960s become increasingly important information bases for business decision making and for government policy decision making.

Conventional policy transmission channels, such as the wage illusion described in section I, are also built into traditional econometric models often used as a basis for evaluating alternative policy actions. Those models, of course, were not designed to reflect rational expectations, but there generally is a way to impose on them a form of rational expectations. *When that's done, the revised macro model reveals that activist economic policy does not have much of an impact on the economic outcome — apart from what it does to prices.* We'll illustrate that important result in this section.

Getting a handle on expectations.

Structural econometric models are essentially compact ways of summarizing a particular view of the way people behave. Some of the equations in a model will therefore attempt to represent the things people take into account in making decisions to produce, to work, or to buy — and that means their *expectations*. Interest rates, for example, are presumably a factor in business decisions to build new production plants. So an equation designed to predict how much new plant will be built next quarter or next year will include variables representing expectations of business managers and others about future interest rates as one of the quantities that must be fed into it.

Finding a measure to reflect people's *expectations* in a model poses a problem. We know the model will eventually generate its own results for the path of future values of its economic variables — including, in particular, those variables for which expectations need to be formed.

One very simple way to program the model to form expectations for, say, future interest rates is to have the model use its own most recent quarterly value as the expectation for values in all future quarters. A less simple approach is to use some average of several recent quarters as a proxy expectation for future interest rates. That's exactly what most currently used models, including the large macro models, do — sometimes explicitly but often implicitly. That procedure is termed "adaptive expectations" because of the way the expectation slowly adjusts after an abrupt change occurs in the level of actual rates being generated.

One of the consequences of using adaptive expectations is that values produced for use as the model's expectations about each successive quarter's interest rate are usually not equal to the interest rates eventually produced by the model when it has been run.

Economist John Muth had this discrepancy between adaptive expectations and model results in mind when

he used the term rational expectations in 1961. He chose to set the expectations values for variables needed as inputs to various equations so as to be equal to the final predictions eventually coming out of the model. And, from a technical standpoint, that's what the strict form of rational expectations means. Literally, that definition of rational expectations credited the model's implicit decision makers with knowing as much about the way the economy works as is captured in the model itself and with having full current information about all other economic variables as well as settings of the policy instruments (government deficit, size of the money stock, etc.) under policy makers' control. As we pointed out in section II, that may seem to be asking a lot, but subsequent ways of incorporating rational expectations into models have preserved the essential policy consequences of rational expectations while requiring agents to be less completely knowing and informed than outlined above.

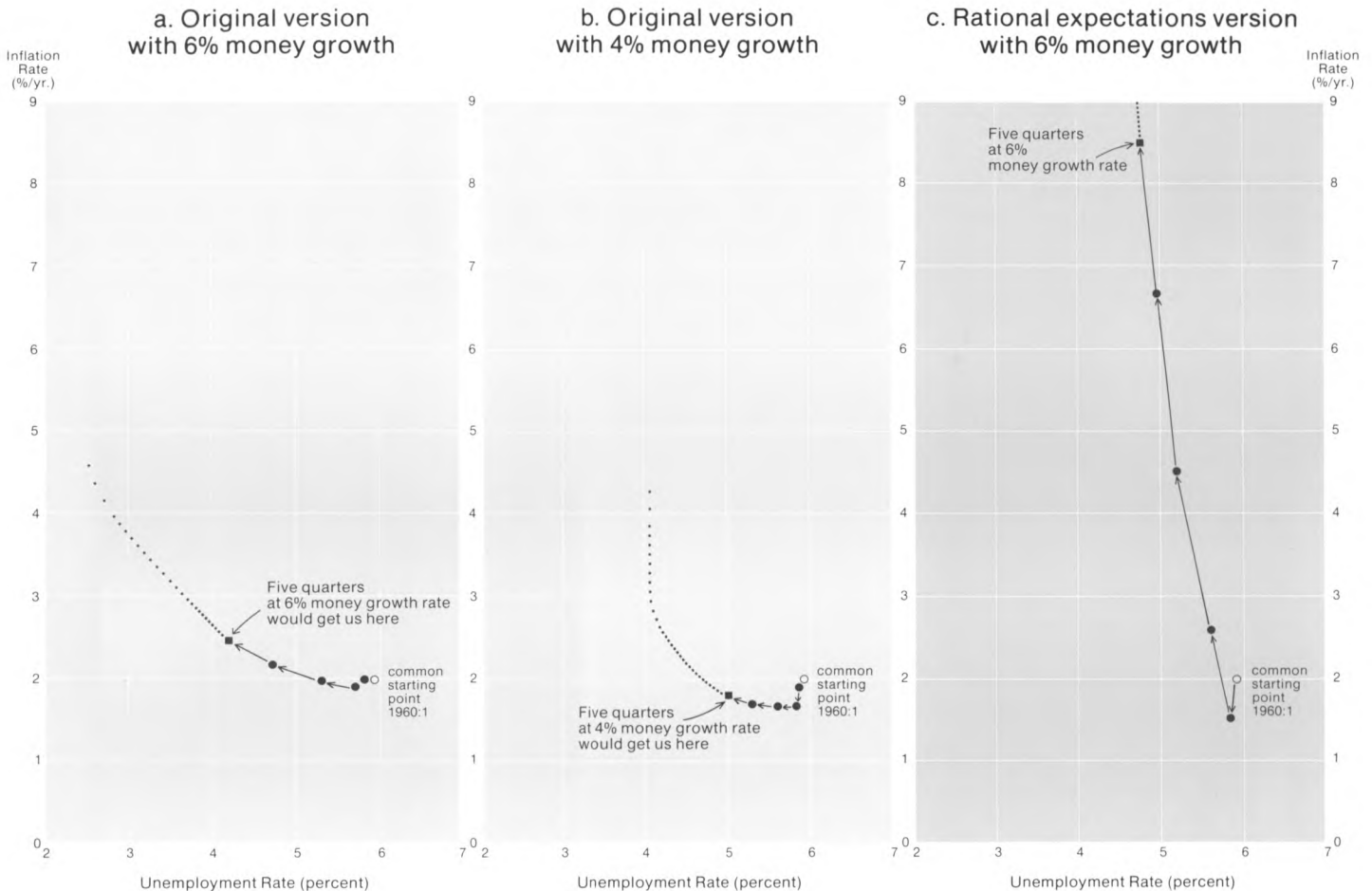
Now that we've described what rational expectations does technically in economic models, we'll look at some indicated results of policy that come from simulations of a version of the St. Louis Federal Reserve Bank model — with and without rational expectations.

In the diagrams [Figures 4a and 4b] we show what the original model says will happen to the unemployment rate and the inflation rate as two alternative choices for monetary policy are pursued. The period spanned is first-quarter 1960 through third-quarter 1963, and the common starting observations (unemployment at 5.8 percent and inflation at 2 percent) were approximate values for early 1960. To obtain the sequence plotted in Figure 4a, we imposed a 6 percent annual growth rate for money as an expansionary policy measure and let the model generate the things it determines internally, including the unemployment rate and inflation rate. The model then traced out the quarter-by-quarter path for the two variables as shown in the diagram. That path is suggestive of a standard Phillips curve policy "trade-off" that associates lower unemployment rates with higher rates of inflation.

The curve in Figure 4b was similarly obtained, the only difference being that we used a less expansionary monetary policy assumption by setting the annual money growth rate at 4 percent.

A policy activist who accepted this standard version of the St. Louis model as a good representation of the economy might feel encouraged at the outset of the simulation period that the unemployment rate could be "engineered" to a lower level by pursuing expansionary money growth. Moreover, that result apparently could be achieved fairly quickly at minimal cost in terms of extra inflation. With a 6 percent money growth rate, for example, we'd get the unemployment rate down very close to 4 percent in about five quarters, and that would

Figure 4. Policy Simulation Results using St. Louis Federal Reserve Bank Model



add only about half a percentage point to the inflation rate. Using a 4 percent money growth rate over the same five quarters as depicted in Figure 4b, we would not do quite as well for the unemployment rate (cutting it only to the 5 percent level), but the inflation rate would even decline a little. Thus the “menu of choice” open to the policy maker would be a menu of alternative paths through time for the economy, and two of the selections are illustrated in Figures 4a and 4b. A policy maker considering just these two options might well decide that it’s better to take the faster route toward a 4 percent unemployment objective — given the small additional inflation that would be caused. (Of course, the policy authority might then need to be prepared to shift gears to lower money growth rates as the economy neared the chosen unemployment objective in order to avoid much higher inflation rates later on.)

Unfortunately, in a world of rational expectations that attractive kind of policy menu doesn’t exist, as we illustrate in Figure 4c.

The last panel in Figure 4 repeats the same Policy simulation as in the first panel — money growth rate at 6 percent — but with the model adjusted so that price expectations are “rational.” (These simulations are taken from a study prepared by Paul Anderson [1] of this Bank’s staff.) The resulting path, traced out by the simulation, shows dramatically accelerating inflation as the main achievement of expansionary policy. After five quarters, unemployment is still in the neighborhood of 5 percent, but the inflation rate has soared to 8.5 percent, and that seems clearly an unacceptable “trade-off” for public policy.

While this illustration is constructed through the use of one specific, small econometric model, the same

general outcome would occur using other well-known macroeconomic models, large and small. These results vividly portray that rational expectations has a dramatic effect on what economists' models predict the impact of policy decisions to be on the economy. In a rational expectations world, economic policy actions simply don't work the way many people have believed them to work.

Let's be clear about what has been ruled out by the results we've shown: They rule out any net gains in employment and output from routine countercyclical policy. That's because people, on average, can recognize the incipient stages of recession as well as government policy makers can, and so people will anticipate the government's stimulative actions as long as those actions are applied consistently and systematically from one business cycle to the next.

But not only is that kind of consistent, orderly application of countercyclical policy ruled out as incapable of improving levels of real activity in the economy overall, so also are *any* aggregate stimulative policy measures that are readily predictable or are publicly announced. For they, too, will become a part of people's expectations.

Surprise moves in policy can of course get people to do things they hadn't otherwise planned to do. Therefore, activist demand management policy can, if the magnitude of the policy stimulus exceeds people's expectations, cause an addition to employment beyond what would have occurred without policy action. But that qualification should offer no particular encouragement to supporters of activist policy. For even the theoretical possibility of repeated escalations of government stimulus must be limited: First, because people will catch on that escalation has been adopted as a strategy and build that strategy into their expectations; and second, because escalating inflation rates and loss of confidence in government would pose increasingly troublesome problems to the continuity of government and its policies. The rationalists see no constructive role for policies that depend on "surprising" or "fooling" people into doing things. We'll consider that issue a bit more in the last section.

Conventional policy stimulus in a slack economy.

There is a widely held view that says, if the economy is operating with a great deal of slack, or "excess capacity," any policy-spending stimulus will have little effect on prices and will mainly result in an increased real quantity of output. Only when the economy nears "capacity" output, claims that view, will extra stimulus spending fail to bring forth much new physical output and instead be largely dissipated on price increases. Neither economic theory nor empirical evidence supports that view.

There is no compelling theoretical reason to believe that some kind of critical point exists in the economy's overall scale of operation that abruptly distinguishes

price-quantity responses taking place above that point from those taking place below. That doesn't mean that physical constraints or bottlenecks might not occur at the individual plant or industry level to temporarily block output increases from occurring in response to stronger demand. But for the economy as a whole, substitution possibilities are enormous, so spending can shift to other lines or services where bottlenecks or constraints will not, in general, be reached at the same time. Thus, the economic concept of aggregate production suggests only gradual transition of cost, price, and profitability relationships over the full range of operating levels for the economy as a whole.

The observed Phillips relationship (see, for example, Figure 3), which does not in general exhibit a sharp bend, provides a rough, practical verification that such is the case. And that ought to indicate, to those who still believe in an exploitable Phillips curve, that the policy maker gets no "free ride" as the economy expands from its low points in relative operating levels.

There is further empirical evidence to that point: one of our studies [2], using data for the United States economy, has shown that the reported capacity utilization rate does not help explain inflation rates when the effects of other factors bearing on price changes are analytically separated out. That is, whatever the cause of price level changes, that cause doesn't appear to act any differently when excess capacity is high than when it is low.

It's true that a government monetary or spending stimulus sometimes will be dissipated nearly totally in price increases. At other times it will bring forth greater physical quantities of goods and services but *only* when accompanied by an increase in prices. The determining factor between these two alternatives has nothing to do with "capacity utilization," but instead depends on whether or not the stimulus has been *anticipated* by people who make buy-and-sell decisions in the economy.

In summary, there is no activist policy — at any level of excess capacity — that does not bring forth price increases at the same time it causes output expansion, and nowhere does the relative amount of output vs. price response change greatly as "excess capacity" is used up.

IV. Some conclusions: given the new view — what can macroeconomic policy really do?

The policy view built around rational expectations ideas does not argue that monetary actions by the Federal Reserve and fiscal actions by Congress and the Administration can't have an effect on production and employment. They can and do, but only when they surprise people.

As we've repeatedly emphasized, a crucial distinction required by the new view is that between policy actions that are expected and policy actions that are

surprises — only the latter cause people to alter their expectations about opportunities for gain and hence to adjust their planned behavior.

In the case of policy actions that are expected, the new view argues there is neither an empirical nor theoretical basis for believing they can be exploited by policy makers for any beneficial real effect. Included in this category are predictable policies such as the Federal Reserve's traditional "leaning against the wind" (which is to say being "extra" restrictive in supplying reserves when the economy approaches high operating rates and being "extra" liberal when the economy has begun to slump), as long as that leaning is done consistently. The only economic effect of expected policy actions, if on the stimulus side, would be to boost general inflation.

Policy actions that come as a surprise to people, on the other hand, will, in general, have some real effects. Policy surprises cause people to change their plans, because the expectations on which they based those plans have been jolted. In the technical literature, much of the defense of activist policy against the rational expectations attack has hinged on preserving ways in which surprise could continue to provide workable leverage for the policy maker, even though decision agents are granted rational expectations. We've already discussed a few of these arguments — for one, the idea that people lock themselves into contracts on prices or wages. This, activists argue, enables policy makers to use surprise when needed, by catching people in midcontract, to foster a particular policy objective. We pointed out in section II why that argument is faulty. Another activist idea is that government policy makers have better information or superior knowledge about how the economy works, and so they can take an action that people won't catch on to, at least for a long enough time to enable some policy results. The premise about superior knowledge in the government sector is clearly faulty, and section II talked a bit about the efficiency of private sector information.

These arguments are at best attempts to patch up questionable policy theory by finding special conditions under which the policy of "surprise" can be routinely used by government to smooth out swings in the business cycle. Rationalists doubt, at one level of questioning, that stabilization efforts based on surprise really give the policy maker much to work with. To the extent surprise policy involves a deliberate strategy of fooling people (in the sense that had the people only known the truth they wouldn't have done what the government's action got them to do) it may easily work the first time, but then fail to be effective the second or third time because people have escalated their awareness of what government is likely to do in any given situation. And unless the "surprise-that-works" is later repeated, under similar conditions and in a consistent

and logical way, it is not possible to distinguish government policy making from a random, or even perverse, game.

At a deeper level, rationalists doubt that it would be wise, or fair, for the government to attempt "policy by surprise" even if policy makers were sufficiently resourceful to invent unendingly new surprise ways to boost the money supply and government spending.

One of the most important ideas emerging from the new view, as we pointed out in section III, is that the "business cycle" might at last be adequately explained as a property of a properly working market economy. In such a view, individuals are thought to react to profit incentives and to imperfectly extract information about those incentives from changes in price signals that are in part useful information and in part meaningless "noise." An economic system doing the most efficient possible job of reading the information being reflected in price signals will still experience some irreducible business cycle swings. That's because the economic process contains inherent mechanisms that convert random shocks on prices into a more persistent, short-term misreading of changing profit opportunities. When misread by enough people, that action can stimulate a cumulative swing in output that will continue until the misreading is realized and retrenchment sets in. Random shocks to prices and markets are always with us. Some arise from natural catastrophes or man-made embargos, but Lucas [3] argues that an important source of shocks to prices may have been erratic "surprise" actions by policy makers themselves.

The new view conjectures that some amount of cyclical swing in production and employment is inherent in the *micro* level processes of the economy that no government *macro* policies can, or should attempt to, smooth out. *Expected* additions to money growth certainly won't smooth out cycles, if the arguments in this paper are correct. *Surprise* additions to money growth have the potential to make matters worse. That's because surprise policies, and the prospect of other future surprise policies, lead to greater uncertainty in people's expectations about future prices, wages, and interest rates — and those are prime ingredients in people's ongoing decision making. These new theories say the information value of price signals is *eroded* by erratic and unpredictable government policy action. Given the importance to an efficiently working market economy of information conveyed by prices, the potential of activist general demand policy to do costly mischief must be considered a serious one. Government's potential to systematically exploit surprise shocks is drastically limited in a rational expectations world.

The road ahead . . .

If it's true that traditionally perceived activist policy

goals are unattainable through macroeconomic policy channels, what goals should guide monetary and fiscal policy? What should monetary policy try to do?

One strategy that seems consistent with the significant, though largely negative, findings of rational expectations would have monetary policy focus its attention on inflation and announce, and stick to, a policy that would bring the rate of increase in the general price level to some specified low figure. To be sure, merely to announce such a policy at this point in time would be a "surprise" — perhaps a rather large one given the past history of policy — and is therefore likely to have, for a period of time, some effects on the planned level of output and employment. But there's no way to avoid some lurching when a trajectory is changed. After a period of adjustment, so we've argued here, a steady and consistent pursuit of some publicly known, modest growth for the money supply would not have detrimental effects on employment levels because the general price level impact of monetary policy would be built into people's expectations.

Given that sort of primary dedication to a lower inflation path, the general objective of monetary policy suggested by rational expectations ought to be elimination or reduction of uncertainty about the future general price level — to make it as predictable and dependable as possible around some low average rate of growth. That course, rationalists argue, would do more than any alternative macro policy posture to contribute to long-term steady economic growth and high employment rates.

While we might have reasonable confidence in the wisdom of that general strategy, the rational expectations view can offer little on the question of how best to implement such a policy operationally. That's one of the unfinished tasks for research. In the meantime, the broader issues we've raised are topics for deep reflection and debate by those responsible for designing and controlling the economic policies of this nation. That's a responsibility that ought also to concern informed citizens who, after all, will reap the benefits of good policies and pay the costs of poor ones.

References Cited

- [1] Anderson, Paul A. "Rational Expectations Forecasts From Nonrational Models," *Journal of Monetary Economics*, forthcoming.
- [2] Bryant, John, James Duprey, and Thomas Supel. Unpublished memorandum, November 14, 1977, Federal Reserve Bank of Minneapolis.
- [3] Lucas, Robert E., Jr. "Understanding Business Cycles," Carnegie-Rochester Conference Series on Public Policy, Volume 5, supplement to *Journal of Monetary Economics*. North Holland Publishing Company, 1977.
- [4] Muench, Thomas J., Arthur J. Rolnick, Neil Wallace, and William Weiler. "Tests for Structural Change and Prediction Intervals for the Reduced Forms of Two Structural Models of the U.S.: The FRB-MIT and Michigan Quarterly Models." *Annals of Economic and Social Measurement*. Vol. 3, No. 3 (July 1974):491-519.
- [5] Samuelson, Paul A., and Robert M. Solow. "Problem of Achieving and Maintaining a Stable Price Level," *American Economic Review*. Vol. 50, No. 2 (May 1960):177-222.
- [6] Sargent, Thomas J. "A Classical Macroeconometric Model for the United States," *Journal of Political Economy*. Vol. 84, No. 2 (April 1976):207-37.

Statement of Condition
(In Thousands)

<i>December 31</i>	1977	1976
Assets		
Gold Certificate Account	\$ 225,007	\$ 221,457
Interdistrict Settlement Fund	12,659	229,951
Special Drawing Rights Certificate Account	25,000	24,000
Coin	9,109	13,863
Loans to Member Banks	900	—
Securities		
Federal Agency Obligations	195,940	155,333
U.S. Government Securities	2,470,538	2,132,514
Total Securities	2,666,478	2,287,847
Cash Items in Process of Collection	572,661	454,022
Premises and Equipment —		
Less Depreciation of \$7,009 and \$5,326	30,468	31,580
Other Assets	47,206	42,370
Total Assets	<u>\$3,589,488</u>	<u>\$3,305,090</u>
Liabilities		
Federal Reserve Notes	\$1,999,312	\$1,722,536
Deposits		
Member Bank Reserve Accounts	720,178	604,185
Due to Other Federal Reserve Banks — Collected Funds	—	42,337
U.S. Treasury — General Account	276,165	398,245
Foreign	7,995	6,600
Other Deposits	12,772	19,657
Total Deposits	1,017,110	1,071,024
Deferred Availability Cash Items	482,400	432,483
Other Liabilities	29,206	21,867
Total Liabilities	3,528,028	3,247,910
Capital Accounts		
Capital Paid In	30,730	28,590
Surplus	30,730	28,590
Total Capital Accounts	61,460	57,180
Total Liabilities and Capital Accounts	<u>\$3,589,488</u>	<u>\$3,305,090</u>

Earnings and Expenses (In Thousands)

<i>For the Year Ended December 31</i>	1977	1976
Current Earnings		
Interest on Loans to Member Banks	\$ 521	\$ 173
Interest on U.S. Government Securities and Federal Agency Obligations	162,187	144,368
All Other Earnings	<u>336</u>	<u>821</u>
Total Current Earnings	163,044	145,362
Current Expenses		
Salaries and Other Benefits	15,674	14,782
Postage and Expressage	2,952	2,845
Telephone and Telegraph	577	474
Printing and Supplies	949	874
Real Estate Taxes	1,577	1,587
Furniture and Operating Equipment — Rentals, Depreciation, Maintenance	1,679	1,629
Depreciation — Bank Premises	1,567	1,566
Utilities	461	425
Other Operating Expenses	1,745	1,782
Federal Reserve Currency	<u>1,549</u>	<u>1,522</u>
Total Current Expenses	28,730	27,486
Expenses Reimbursed or Recovered	<u>(1,910)</u>	<u>(1,437)</u>
Net Expenses	26,820	26,049
Current Net Earnings	136,224	119,313
Net Profit (or Loss)	(4,766)	374
Assessment for Expenses of Board of Governors	1,383	1,176
Dividends Paid	1,777	1,643
Payments to U.S. Treasury	<u>126,158</u>	<u>114,371</u>
Transferred to Surplus	<u>\$ 2,140</u>	<u>\$ 2,497</u>
Surplus Account		
Surplus, January 1	\$ 28,590	\$ 26,093
Transferred to Surplus — as above	<u>2,140</u>	<u>2,497</u>
Surplus, December 31	<u>\$ 30,730</u>	<u>\$ 28,590</u>

Volume of Operations*

<i>For the Year Ended December 31</i>	Number		Dollar Amount	
	1977	1976	1977	1976
Loans to Member Banks	326	223	\$591 million	\$466 million
Currency Received and Verified	147 million	145 million	1.2 billion	1.1 billion
Coin Received and Counted	613 million	538 million	83 million	75 million
Checks Handled	649 million	614 million	212 billion	177 billion
Collection Items Handled3 million	.3 million	2 billion	1.4 billion
Issues, Redemptions, Exchanges of U.S. Government Securities	8.9 million	9.0 million	57.7 billion	52.4 billion
Securities Held in Safekeeping	478,720	449,526	10.2 billion	9.4 billion
Transfer of Funds	897,386	785,331	762 billion	576 billion

*Minneapolis and Helena combined.

Directors of the Federal Reserve Bank of Minneapolis

January 1978

Term expires December 31 of indicated year

James P. McFarland, Chairman and Federal Reserve Agent
Stephen F. Keating, Deputy Chairman

Class A—Elected by Member Banks

John S. Rouzie, President (1978)
First National Bank, Bowman, North Dakota

Nels E. Turnquist, President (1979)
National Bank of South Dakota, Sioux Falls, South Dakota

James H. Smaby, President (1980)
Commercial National Bank & Trust Company, Iron Mountain, Michigan

Class B—Elected by Member Banks

Russell G. Cleary, Chairman and President (1978)
G. Heileman Brewing Company, Inc., La Crosse, Wisconsin
Warren B. Jones, Secretary-Treasurer & General Manager (1979)
Two Dot Land & Livestock Company, Harlowton, Montana
Donald P. Helgeson, Secretary-Treasurer (1980)
Jack Frost, Inc., St. Cloud, Minnesota

Class C—Appointed by Board of Governors

James P. McFarland (1978)
4900 IDS Center, Minneapolis, Minnesota
Charles W. Poe, Jr., President (1979)
Metropolitan Economic Development Association (MEDA)
Minneapolis, Minnesota
Stephen F. Keating, Chairman (1980)
Honeywell Inc., Minneapolis, Minnesota

Member of Federal Advisory Council

Richard H. Vaughan, President and CEO (1978)
Northwest Bancorporation, Minneapolis, Minnesota

Directors of the Helena Branch

Patricia P. Douglas, Chairman
Norris E. Hanford, Vice Chairman

Appointed by Board of Directors

Federal Reserve Bank of Minneapolis
William B. Andrews, President (1978)
Northwestern Bank of Helena, Helena, Montana
George H. Selover, President & General Manager (1978)
Selover Buick-Jeep, Inc., Billings, Montana
Lynn D. Grobel, President (1979)
First National Bank, Glasgow, Montana

Appointed by Board of Governors

Patricia P. Douglas, Professor and Special Assistant to President (1978)
University of Montana, Missoula, Montana
Norris E. Hanford, Wheat and Barley Operator (1979)
Fort Benton, Montana

**Officers of the
Federal Reserve Bank of Minneapolis**

January 1978

Mark H. Willes, President
Clement A. Van Nice, First Vice President
Thomas E. Gainor, Senior Vice President
Roland D. Graham, Senior Vice President
John A. MacDonald, Senior Vice President
Melvin L. Burstein, Vice President and General Counsel
Leonard W. Fernelius, Vice President
Lester G. Gable, Vice President
Bruce J. Hedblom, Vice President
Douglas R. Hellweg, Vice President
Howard L. Knous, Vice President and General Auditor
David R. McDonald, Vice President
Clarence W. Nelson, Vice President
and Director of Research
Robert W. Worcester, Vice President
Sheldon L. Azine, Assistant Vice President
and Assistant Counsel
Earl O. Beeth, Assistant Vice President
James U. Brooks, Assistant Vice President
Phil C. Gerber, Assistant Vice President
Gary P. Hanson, Assistant Vice President
Richard C. Heiber, Assistant Vice President
William B. Holm, Assistant Vice President
Ronald E. Kaatz, Assistant Vice President
Michael J. Pint, Assistant Vice President
and Assistant Secretary
Ruth A. Reister, Assistant Vice President
and Secretary
Charles L. Shromoff, Assistant Vice President
Colleen K. Strand, Assistant Vice President
Richard B. Thomas, Assistant Vice President
Joseph R. Vogel, Chief Examiner

Officers of the Helena Branch

John D. Johnson, Vice President
Ronald O. Hostad, Assistant Vice President
Betty J. Lindstrom, Assistant Vice President