

RATIONAL EXPECTATIONS

by Thomas J. Sargent

The theory of rational expectations was first proposed by John F. Muth of Indiana University in the early sixties. He used the term to describe the many economic situations in which the outcome depends partly upon what people expect to happen. The price of an agricultural commodity, for example, depends on how many acres farmers plant, which in turn depends on the price that farmers expect to realize when they harvest and sell their crops. As another example, the value of a currency and its rate of depreciation depend partly on what people expect that rate of depreciation to be. That is because people rush to desert a currency that they expect to lose value, thereby contributing to its loss in value. Similarly, the price of a stock or bond depends partly on what prospective buyers and sellers believe it will be in the future.

The use of expectations in economic theory is not new. Many earlier economists, including A. C. Pigou, John Maynard Keynes, and John R. Hicks, assigned a central role in the determination of the business cycle to people's expectations about the future. Keynes referred to this as "waves of optimism and pessimism" that helped determine the level of economic activity. But proponents of the rational expectations theory are more thorough in their analysis of—and assign a more important role to—expectations.

The influences between expectations and outcomes flow both ways. In forming their expectations, people try to forecast what will actually occur. They have strong incentives to use forecasting rules that work well because higher "profits" accrue to someone who acts on the basis of better forecasts, whether that someone be a trader in the stock market or someone considering the purchase of a new car. And when people have to forecast a particular price over and over again, they tend to adjust their forecasting rules to eliminate avoidable errors. Thus, there is continual feedback from past outcomes to current expectations. Translation: in recurrent situations the way the future unfolds from the past tends to be stable, and people adjust their forecasts to conform to this stable pattern.

The concept of rational expectations asserts that outcomes do not differ systematically (i.e., regularly or predictably) from what people expected them to be. The concept is motivated by the same thinking that led Abraham Lincoln to assert, "You can fool some of the people all of the time, and all of the people some of the time, but you cannot fool all of the people all of the time." From the viewpoint of the rational expectations doctrine, Lincoln's statement gets things right. It does not deny that people often make forecasting errors, but it does suggest that errors will not persistently occur on one side or the other.

Economists who believe in rational expectations base their belief on the standard economic assumption that people behave in ways that maximize their utility (their enjoyment of life) or profits. Economists have used the concept of rational expectations to understand a variety of situations in which speculation about the future is a crucial factor in determining current action. Rational expectations is a building block for the "random walk" or "efficient markets" theory of securities prices, the theory of the dynamics of hyperinflations, the "permanent income" and "life-cycle" theories of consumption, the theory of "tax smoothing," and the design of economic stabilization policies.

The Efficient Markets Theory of Stock Prices

One of the earliest and most striking applications of the concept of rational expectations is the efficient markets theory of asset prices. A sequence of observations on a variable (such as daily stock prices) is said to follow a random walk if the current value gives the best possible prediction of future values. The efficient markets theory of stock prices uses the concept of rational expectations to reach the conclusion that, when properly adjusted for discounting and dividends, stock prices follow a random walk. The chain of reasoning

goes as follows. In their efforts to forecast prices, investors comb all sources of information, including patterns that they can spot in past price movements.

Investors buy stocks that they expect to have a higher-than-average return and sell those that they expect to have lower returns. When they do so, they bid up the prices of stocks expected to have higher-than-average returns and drive down the prices of those expected to have lower-than-average returns. The prices of the stocks adjust until the expected returns, adjusted for risk, are equal for all stocks. Equalization of expected returns means that investors' forecasts become built into or reflected in the prices of stocks. More precisely, it means that stock prices change so that after an adjustment to reflect dividends, the time value of money, and differential risk, they equal the market's best forecast of the future price. Therefore, the only factors that can change stock prices are random factors that could not be known in advance. Thus, changes in stock prices follow a random walk.

The random walk theory has been subjected to literally hundreds of empirical tests. The tests tend to support the theory quite strongly. While some studies have found situations that contradict the theory, the theory does explain, at least to a very good first approximation, how asset prices evolve (see Efficient Capital Markets).

The Permanent Income Theory of Consumption

The Keynesian consumption function holds that there is a positive relationship between people's consumption and their income. Early empirical work in the forties and fifties encountered some discrepancies from the theory, which Milton Friedman successfully explained with his celebrated "permanent income theory" of consumption. Friedman built upon Irving Fisher's insight that a person's consumption ought not to depend on current income alone, but also on prospects of income in the future. Friedman posited that people consume out of their "permanent income," which can be defined as the level of consumption that can be sustained while leaving wealth intact. In defining "wealth," Friedman included a measure of "human wealth"—namely, the present value of people's expectations of future labor income.

Although Friedman did not formally apply the concept of rational expectations in his work, it is implicit in much of his discussion. Because of its heavy emphasis on the role of expectations about future income, his hypothesis was a prime candidate for the application of rational expectations. In work subsequent to Friedman's, John F. Muth and Stanford's Robert E. Hall imposed rational expectations on versions of Friedman's model, with interesting results. In Hall's version, imposing rational expectations produces the result that consumption is a random walk: the best prediction of future consumption is the present level of consumption. This result encapsulates the consumption-smoothing aspect of the permanent income model and reflects people's efforts to estimate their wealth and to allocate it over time. If consumption in each period is held at a level that is expected to leave wealth unchanged, it follows that wealth and consumption will each equal their values in the previous period plus an unforecastable or unforeseeable random shock—really a forecast error.

The rational expectations version of the permanent income hypothesis has changed the way economists think about short-term stabilization policies (such as temporary tax cuts) designed to stimulate the economy. Keynesian economists used to believe that tax cuts would boost disposable income and thus cause people to consume more. But according to the permanent income model, temporary tax cuts would have much less of an effect on consumption than Keynesians had thought. The reason is that people are basing their consumption decision on their wealth, not their current disposable income. Because temporary tax cuts are bound to be reversed, they have little or no effect on wealth, and therefore, they have little or no effect on consumption. Thus, the permanent income model

had the effect of diminishing the expenditure "multiplier" that economists ascribed to temporary tax cuts.

The rational expectations version of the permanent income model had been extensively tested, with results that are quite encouraging. The evidence is that the model works well but imperfectly. Economists are currently extending the model to take into account factors such as "habit persistence" in consumption and the differing durabilities of various consumption goods. Expanding the theory to incorporate these features alters the pure "random walk" prediction of the theory (and so helps remedy some of the empirical shortcomings of the model), but it leaves the basic permanent income insight intact.

Tax-Smoothing Models

How should a government design tax policy when it knows that people are making decisions partly in response to the government's plans for setting taxes in the future? That is, when participants in the private sector have rational expectations about the government's rules for setting tax rates, what rules should the government use to set tax rates? Robert Lucas and Nancy Stokey, as well as Robert Barro, have studied this problem under the assumption that the government can make and keep commitments to execute the plans that it designs. All three authors have identified situations in which the government should finance a volatile (or unsmooth) sequence of government expenditures with a sequence of tax rates that is quite stable (or smooth) over time. Such policies are called "tax-smoothing" policies. Tax smoothing is a good idea because it minimizes the supply disincentives associated with taxes. For example, workers who pay a 20 percent marginal tax rate every year will reduce their labor supply less (that is, will work more at any given wage) than they would if the government set a 10 percent marginal tax rate in half the years and a 30 percent rate in the other half.

During "normal times" a government operating under a tax-smoothing rule typically has close to a balanced budget. But during times of extraordinary expenditures—during wars, for example—the government runs a deficit, which it finances by borrowing. During and after the war the government increases taxes by enough to service the debt it has occurred; in this way the higher taxes that the government imposes to finance the war are spread out over time. Such a policy minimizes the cumulative distorting effects of taxes—the adverse "supply-side" effects.

Barro's tax-smoothing theory helps explain the behavior of the British and U.S. governments in the eighteenth and nineteenth centuries, when the standard pattern was to finance wars with deficits but to set taxes after wars at rates sufficiently high to service the government's debt.

Expectational Error Models of the Business Cycle

A long tradition in business cycle theory has held that errors in people's forecasts are a major cause of business fluctuations. This view was embodied in the Phillips curve (the observed inverse correlation between unemployment and inflation), with economists attributing the correlation to errors that people made in their forecasts of the price level. Before the advent of rational expectations, economists often proposed to "exploit" or "manipulate" the public's forecasting errors in ways designed to generate better performance of the economy over the business cycle. Thus, Robert Hall aptly described the state of economic thinking in 1973 when he wrote:

The benefits of inflation derive from the use of expansionary policy to trick economic agents into behaving in socially preferable ways even though their behavior is not in their own interest.... The gap between actual and expected inflation measures the extent of the trickery.... The optimal policy is not nearly as expansionary [inflationary] when expectations

adjust rapidly, and most of the effect of an inflationary policy is dissipated in costly anticipated inflation.

Rational expectations undermines the idea that policymakers can manipulate the economy by systematically making the public have false expectations. Robert Lucas showed that if expectations are rational, it simply is not possible for the government to manipulate those forecast errors in a predictable and reliable way for the very reason that the errors made by a rational forecaster are inherently unpredictable. Lucas's work led to what has sometimes been called the "policy ineffectiveness proposition." If people have rational expectations, policies that try to manipulate the economy by inducing people into having false expectations may introduce more "noise" into the economy but cannot, on average, improve the economy's performance.

Design of Macroeconomic Policies

The "policy ineffectiveness" result pertains only to those economic policies that have their effects solely by inducing forecast errors. Many government policies work by affecting "margins" or incentives, and the concept of rational expectations delivers no "policy ineffectiveness" result for such policies. In fact, the idea of rational expectations is now being used extensively in such contexts to study the design of monetary, fiscal, and regulatory policies to promote good economic performance.

For example, extensions of the tax-smoothing models are being developed in a variety of directions. The tax-smoothing result depends on various special assumptions about the physical technology for transferring resources over time, and also on the sequence of government expenditures assumed. These assumptions are being relaxed, with interesting modifications of the tax-smoothing prescription being a consequence. Christophe Chamley reached the striking conclusion that an optimal tax scheme involves eventually setting the tax rate on capital to zero, with labor bearing the entire tax burden. To get his result, Chamley assumed that "labor" and "capital" are very different factors, with the total availability of labor being beyond people's control while the supply of capital could be affected by investment and saving. When Chamley's assumptions are altered to acknowledge the "human capital" component of labor, which can be affected by people's decisions, his conclusion about capital taxation is different.

The idea of rational expectations has also been a workhorse in developing prescriptions for optimally choosing monetary policy. Important contributors to this literature have been Truman Bewley and William A. Brock. Bewley and Brock's work describes precisely the contexts in which an optimal monetary arrangement involves having the government pay interest on reserves at the market rate. Their work supports, clarifies, and extends proposals to monetary reform made by Milton Friedman in 1960 and 1968.

Rational expectations has been a working assumption in recent studies that try to explain how monetary and fiscal authorities can retain (or lose) "good reputations" for their conduct of policy. This literature is beginning to help economists understand the multiplicity of government policy strategies followed, for example, in high-inflation and low-inflation countries. In particular, work on "reputational equilibria" in macroeconomics by Robert Barro and by David Gordon and Nancy Stokey has shown that the preferences of citizens and policymakers and the available production technologies and trading opportunities are not by themselves sufficient to determine whether a government will follow a low-inflation or a high-inflation policy mix.

Instead, reputation remains an independent factor even after rational expectations have been assumed.