

## Chapter 7 The Rational Expectations Hypothesis

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As economists have increasingly recognized the importance of expectations in determining economic behaviour, they have attempted to incorporate within their behavioural models some representation of the mechanisms by which economic agents form their expectations. The psychological literature on expectations tends to suggest that peoples' expectations are intimately connected to their particular situations and no general theory seems to hold. Economists on the other hand argue that expectation schemes must have consistent properties across economic models as with other assumptions in economics such as the profit maximization assumption in areas relating to financial transactions. Various proposals have been put forward to explain expectation formation, such as that expected price is equal to the latest known price, or that expectations are formed adaptively, the forecast being determined by recently observed forecast error. This gives the price expectation as a geometrically weighted moving average. These models assume that individuals only learn from past experiences and mistakes. However it was suggested that given that a lot of theory in economics is based upon utility maximization, where it is assumed that economic agents do the best they can with what they have, that expectations should be assumed to be formed in a similar manner, that is in a rational manner. Rational expectations is such a theory which by Muth's definition yields predictions of future events which differ from the corresponding eventual outcome only by errors which are themselves independent of the variables used to generate the predictions. So rational expectations is a concept concerned with the interaction between expectations and reality. If one considers economic agents to be rational then its consistent to consider information gathering and expectation formation as determined by the same procedures for all agents.

In order to explain simply how rational expectations are formed Muth advances the hypothesis that they are essentially the same as the predictions of the relevant economic theory, that is the hypothesis suggests that the economy does not generally waste information and that expectations depend specifically upon the structure of the entire system. Muth claimed then that what kind of information was used and how it was put together to frame an estimation of future conditions is very relevant because the character of the dynamic process is typically very sensitive to the way expectations are influenced by the actual cause of events. He also claimed that it was very important to make predictions about the way expectations would change when either the amount of available information changes and/or the structure of the system changes. He claimed that dynamic models do not make adequate allowance for rationality; i.e. that the subjective probability distribution of outcomes tends to be distributed for the same information set about the prediction of theory of the objective probability distribution of outcomes.

Rational expectations then asserts:

- (1) that information is scarce and that the economic system does not generally waste it,
- (2) the way expectations are formed depends specifically on the structure of the

relevant system describing the economy.

(3) a public prediction will have no substantial effect on the operation of the system unless it is based on inside information.

Assertion (1) implies that all the available and relevant information must be examined and analysed, indeed many theorists have criticized rational expectations in that it seems to suggest that the marginal cost of gathering and using information is equated to the marginal benefit and that information is implicitly assumed a free good, if all the available information is to be used by everyone. Since expectations are informed predictions of future events they are essentially the same as the predictions of the relevant economic theory. So the suggestion is that people are able to gather, analyse and form accurate predictions of outcomes from the available information. But according to Muth rational expectations does not assert that the search work of the entrepreneur resembles the system of equations in any way nor does it state that the predictions of entrepreneurs are perfect or that their expectations are all the same. What rational expectations does suggest is that the expected value of formal expectations equals the true value. We do not require that all individuals respond to price signals in order to maintain a vibrant price system. Instead we recognize that only a handful of individuals are required to arbitrage the market. Individuals will use the information that they have analysed which in most cases will represent only part of the information available and trade accordingly. If enough arbitrage takes place the equilibrium market price will behave as if it is rational even though many individuals in the market will remain passive. As Rawls puts it the rationality of a person's choice depends not upon how much he knows but upon how well he reasons from whatever information he has, however incomplete.

When arbitrage activities are costly the amount of information dealt with by each agent will be less as he equates the marginal benefit of information gathering to the marginal cost, so that it will have more adjustments (as each adjustment contains a smaller quantity of information) before the equilibrium price is settled.

Muth did not suggest that people initially formed the correct rational expectations; rather that he said :

- (1) what information there is can be rationally used, and
- (2) it is not necessary for each individual to analyse it all.

So he outlined the station and left the dynamics on the side line. Claiming that the activity of the entrepreneur need not mirror that of the economy implies recognition of arbitrage and a dynamic learning process. A continuous time model, in which agents know all aspects of the economic system and accept the values of some of the parameters in an equation describing the behaviour of the economy is necessary to make the model plausible and realistic. This is perhaps a forward market approach to rational expectations in which trading on the basis of future events and outcomes takes place in the present with regard to expectation.

We live in a dynamic economy in which economic activity offers agents a succession of ambiguous and unanticipated opportunities which cannot be expected to stay fixed, while more information is collected and one characterized by externalities, information problems and market imperfections which clog the formation of rational expectations. If there is a role for arbitrage we cannot be sure that expectations will converge on the true value. The real economy may never be close to a rational expectations equilibrium.

Rational expectations should not be seen as the finale of the monetarist or

Keynesian theories, but rather as a prologue for a revitalization of the theory of expectations, information and policy, in economics; and perhaps even, of the power of the market, and of consumer sovereignty. If an economy operates with Keynesian rational expectations, the impact of monetary expansion will be immediately understood by economic agents, and output will be increased in anticipation of its effects, without going through the usual channels. On the other hand, if an economy operates with monetarist rational expectations, they will cause output to deviate only randomly from its natural level, whatever policy is introduced. But although a policy ineffectiveness result is derived in this case it is claimed that the variability (but not the mean) of output may be affected by the authorities.

To further understand the implications of Muth's concept one should distinguish between the problems of forecasting variables that are exogenous to the system and those that are endogenous to the system. Expectations about variables that are exogenous to the system do not affect the variables within the system. On the other hand expectations or forecasts of endogenous variables will effect the dynamics of the endogenous variables. It has been suggested that for expectations to be rational in this light and to conform with the theoretical model requires that people must be able to see indefinitely into the future. Rappoport challenges this on the grounds that it is inconsistent with a broader definition of rationality. But hypotheses are maintained until some evidence dictates that the hypothesis be rejected; so only information available at a point in time need be processed rationally until some further information arises which is inconsistent with this.

What I propose to do now is to examine the theoretical insights into various areas of economics that the rational expectations hypothesis has given us.

Friedman proposed an adaptive expectations process and hence a vertical long run Phillips curve while accepting the existence of a short run trade off between inflation and unemployment. For rational expectations theorists deviations in unemployment from its natural rate are purely random, so there is no trade-off between inflation and output, even in the short run. Here rational expectations clash with empirical observation; it does not allow for the persistence of the business cycle.

Lucas analyses variations in the price level by classing them as (a) real or nominal and (b) temporary or permanent. Given that an individual only has partial information he cannot distinguish with certainty between a movement in all prices from a movement in his own. Since the economy is awash with information we rationalize further the assumption that people only use part of it as gathering accurate economy wide relevant information takes time, money and resources; moreover it is difficult to get precise information at short notice. Lucas also argues that profit opportunities depend on being able to react quickly to possible "bargains" in the economy so that by the time an individual produces units for an economy wide measure his profit opportunity may have gone. The realistic need for a quick response mitigates against the advantages of trying to obtain an accurate economy wide information set.

With the possibility of a confusion between aggregate and relative price levels, economy wide business fluctuations can easily develop. Changes in the money supply may then be attributed in part to aggregate price changes and in part to relative price changes. To the extent that the perceived price change is thought to be temporary/relative employment will increase as leisure is now thought more

expensive. Recessions and decreases in employment occur when the aggregate price level is lower than anticipated and workers perceive this to be in part a temporary fall in their relative price level.

It has been shown in countries with a volatile inflation history that output will not respond very much to unanticipated inflation. We can start in an economy with a stable inflation history where policy makers can engineer booms rather easily by causing some unanticipated inflation but this will become increasingly difficult. The invariance model I will now use, proposed by Lucas, stated that the public is assumed to form expectations in period  $t$  about the price level that will prevail in  $t+1$ . If no actual price level is greater than anticipated representative producers will attribute part of this to an increase in their relative price level, increasing output. What this model then proposes is a downward sloping aggregate demand function reflecting the fact that with a given money stock higher prices must lead to lower output to keep nominal demand constant. The aggregate supply function is assumed upward sloping drawn for a given level of expected price reflecting the fact that at higher prices the gap between actual and expected prices increases leading to a higher level of output. With fixed price expectations an increase in the money supply will through the transmission mechanism raise output and prices. But this result is not consistent with rational expectations; what rational expectations suggests here is that the money supply in time  $t$  is a function of the last period level of output plus a random error.

It has been suggested by rational expectation critics that high amounts of money growth even if they are anticipated can lead to real effects. This is because higher money growth causes inflation which leads to a shift out of money into real capital, and a higher steady state capital stock. Thus the rate of monetary expansion is likely to have an effect on real variables quite apart from any expectational error. Environmental features also play an important role in the neutrality of money. Market imperfections such as interest rate ceilings and regulations serve to diminish the likelihood of the neutrality of money. One should therefore not expect to complete neutrality of money but the above arguments are so insignificant in their impact on the economy that we can safely maintain the neutrality assumption.

Critics of rational expectations claim that it fails to explain the business cycle as errors of price expectation. The main source of departure from the rational state are short lived and random. They claim that under rational expectations there could not be persistent unemployment above the rational rate as this would imply a high serial correlation between the successive error of expectations which is inconsistent with rational expectations. What he suggests the model says is that if output is greater than the full employment level (boom) in this period there is nothing in the model to predict that next period's output will be anything but full employment. The error term  $E_t$  contains no information about  $E_{t+1}$ . Further-

more this interpretation of the model is rejected by the data, that is if an economy is in a boom period, this period it will most likely be in a boom period next period. Rational expectations explains this in a very plausible manner.

(1) Given market imperfections etc. individuals do not become aware of forecast errors until several periods later. That is for  $x$  periods the duration of one wave of the cycle individuals have no easy way of knowing their mistakes and have no way of correcting it until it is known fully.

(2) Random shocks occur in successive periods each hitting from a different

angle but are such that a series of them causes output to remain above or below full employment for a number of periods.

(3) There may be unavoidable lasting side effects from a shock. If a firm sees an unanticipated rise in its money stock which causes a rise in the price level, the firm perceiving that part of its price change may be a change in relative price will increase production lowering inventories. Once firms realize that they were fooled they will wish to resume normal production except that its stock of inventories is below normal so it will maintain a high level of production in subsequent periods to build inventories back up.

(4) If agents respond to an unanticipated price movement which causes them to increase output this will cause some firms to make investment in capital stocks and to gear up. When they realize they have been fooled they can either scrap the new equipment or use it. Given now that investment and capital stock is above its desired level they will allow it to depreciate but at the same time the output this capital stock turns out is higher than normal so the boom period continues until it depreciates to its normal value.

What we have now learnt then is that while the theory implies that forecast errors which are the aggregate demand impulses are serially uncorrelated it is certainly logically possible that proportions mechanisms are at work that convert these impulses into serially correlated movements in real variables like output and employment. What we have been discussing is one extreme point of a radically distinct vision or description of prices markets and their functions in the economy. The Keynesian position suggests that markets respond slowly to excess demand and supply which makes the economy susceptible to prolonged periods of unemployment and excess capacity. Investment decisions are often governed by intangible factors such as the state of long term expectations. Even if markets were feasible, price adjustment may in fact be destabilizing given it promotes expectations about future price movements and may cause a postponement of action/investment in search of a time when it will reach a minimum. The alternative is rational expectations. Markets are viewed as sensitive barometers and indicators of current and future developments and are efficient possessors of information in the economy. Too much is at stake for expectations of future events to be irrational. The economy devotes substantial resources to gathering information about future events and forecasting. Rational expectations is also backed up by one simple fact, inflation. If we're in an inflationary environment it becomes more and more difficult to sustain a Keynesian notion of wage and price inflexibility. There is much logical and empirical evidence to show that wage and price setting does invade the formation of rational expectations.

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