

Rational Expectations

Lecture 6: On the Rational Filtering of Information

(U. Bayreuth, Spring 2006)

I. Introduction

A. During the 1980s and 1990s a group of macro-economists developed what came to be called the rational expectations hypothesis.

- i. The rational expectations approach in the words Abraham Lincoln, as quoted by Thomas Sargent, assumes that:
 - "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."
- ii. In other words, even though information is scarce and a variety of unreliable signals are available,
 - there is generally sufficient information available
 - that the "average" person can form **unbiased** estimates of the likely course of events
 - and consequences of his or her actions,
 - and therefore can successfully maximize expected utility.

B. Thus, at one level, the rational expectations approach simply affirms the rational choice model.

- i. If individuals actually can maximize their expected utility, then they must have reasonably accurate expectations about cause and effect, and about their own preferences.
- ii. It is partly for this reason that the term "rational" has expanded to include assumptions about information in the past decade or two.
 - Some theorists use the term rational to mean consistent (transitive) preferences, unbiased (rational) expectations, and expected utility maximizing choices in settings of uncertainty.
 - The last two are, of course, different than those associated with the "old" consistent behavior interpretation of "rationality" long used by

micro-economists, but is more or less consistent with ordinary usage of the term "rational."

- (I tend to use the older definition in my work--since I don't think that expectations are always rational, nor that unbiased expectations are ones that individuals will always attempt to form--more on that later--but I can understand its attraction for many rational choice model theorists.)
- iii. On the other hand, there is clearly something more specific about the rational expectations approach than the assumption that persons are "rational," otherwise it would not have set off a minor revolution in macro-economics--since most economists already believed that people were more or less rational (although they also believed that people occasionally make systematic mistakes).

II. Usefulness of Rational Expectations Models

A. Beyond the assumption that expected utility maximizing behavior is possible, there is the assumption that people do not make systematic mistakes because they have a sufficiently clear understanding of the way the world works, that they: (a) can make unbiased estimates of the future, (b) of the consequences of their choices, and so (c) never make systematic mistakes.

- i. Each of these has strong informational assumptions behind them, some of which are not consistent with informational scarcities of the sort we often confront in both economic and non-economic settings.
- ii. Notice that these assumptions do not imply that persons with rational expectations never make mistakes.
 - Mistakes are possible, because the error term has positive variance.
 - In this respect, the RE approach clearly moves beyond the assumptions of the "perfect information" assumption of text book models of perfect competition.
 - People do not always know exactly what will happen.
- iii. On the other hand, if systematic errors are never made, **either people have rather complete information**--at least about the dimensionalities of the decision and event spaces they confront--or the nature of the universe must be such that whatever information limitations people have are such that they never affect their "expected values."

- That is to say, **any imperfect information problems that exist can only affect the variance of a person's estimates** rather than mean or expected value of their estimates or expectations.
 - Notice that if "ignorance" were always "orthogonal" to the issues of interest to RE theorists, this could be the case even in a setting where information is somewhat incomplete.
 - That is to say, any missing variables in a person's model could not affect expected values of the dependent variable (that value to be explained or estimated) nor the expected values of other variables in the model.
 - (Otherwise, the rational expectations approach would not work very well as a scientific model of decision making, except when information is fairly complete. It would make biased predictions about individual behavior!)
- B.** There are many cases in which the "essentially complete" information and "orthogonal" assumptions are reasonable, and thus many settings in which the RE assumptions and predictions are quite accurate.
- i. For example: one may have "essentially complete" information about
 - the products sold in a store that one shops at frequently
 - the prices of products that one shops for frequently
 - about the "best" method for doing some frequently repeated task in a setting where other people's performance of similar tasks can be easily observed
 - about the tastes and talents of ones friends, family, and close colleagues
 - ii. On the other hand, it is clear that "essentially complete" means that other information that you might not have would not materially improve your understanding of the people, tasks, of theories of interest.
 - iii. That is to say "essentially complete" **means** that other information is "orthogonal" to the estimates and decisions at hand.
 - For example, knowing the color of a particular rock musician's eyes will typically not make you a better gardener, brick mason, taxicab driver, scholar or statesman.
 - The same tends to be true of many specialized forms of knowledge. Knowledge from specialty A may not improve your understanding of specialty B.
 - In other words, one's information is "essentially complete" if the information that one missing does not improve ones understanding, estimates or decisions in the choice environment of interest.
- iv. It is also true that in cases in which the effects of missing information "slightly" reduce the accuracy of one's estimates, the RE assumptions may generate predictions that are good "first approximations" of actual behavior.
 - v. In macro-economics, for example, it will often be true that professional bond and stock sellers will know a good deal about economics models and take account of predicted effects when they make buy and sell stocks and bonds.
 - Such professionals have rational expectations, if the models they use to make their estimates are unbiased.
 - And many of the predictions that come our of RE models have worked reasonably well.
 - Stock and bond markets do tend to move essentially **randomly** (at least as a first approximation), because traders all have similar information and expectations--at least at the margin.
- C.** Another reason why RE models are useful is that they are often simpler to write down than other "less than fully rational" models.
- i. Although this is not normally true of their macro economic models, it often true of game theoretic models of rational choice.
 - ii. It is simply easier to assume that players know the rules of the game, the strategy sets, the payoffs, are able to calculate expected values, know elementary game theory than it is to make somewhat weaker informational assumptions.
 - iii. Such **rationality assumptions by game theorists**, for example, provide allow relatively easy calculation of and demonstrations of the existence of mixed strategy equilibria, as well as many other Nash equilibria in settings where no pure dominant strategy exists.
 - iv. (In such cases, the predictions of RE models may themselves be biased, but are accepted, because they reduce calculation and modeling costs!)
- D.** Still another reason why rational expectations models tend to be useful, is that they allow one to identify "non rational" behavior, as well as the source of the non rational behavior.
- i. Without a clear definition of what "rational" means, it would be difficult to distinguish "rational" from "irrational" behavior.
 - ii. Without the a clear informational definition of "rationality" it would be difficult to distinguish between "informationally bounded" rationality and "full" rationality.

- iii. To the extent that rationality is itself a hypothesis, the RE assumptions are easier to test than are the weaker transitivity assumptions of neoclassical microeconomics.
- iv. (Unfortunately, at the level of introspection, **most of us would have to reject the RE hypothesis as a complete model of rationality and human behavior**, because we know that in the past we have had "systematically biased expectations" before we learned some new more complete theory etc--including paradoxically the RE models themselves!)

E. One last reason to use the RE model is simply that it is a somewhat optimistic model of the ability of human decision making.

- i. It certainly makes us feel better about ourselves if we believe that most time "we" get it "right" on average.
- ii. Thus if the benefits of "feeling good about ourselves" are greater than the costs of errors that we make by using the RE theory--we are better off.
- iii. (Of course, such a demand for "pleasant bias" turns RE theory on its head--indeed it would disprove its core assumptions--although it may explain part of its popularity among economists.)

III. Problems with the Rational Expectations representation of information

A. There are a number of interesting paradoxes in the RE approach.

- i. First, (a joke) no RE theorist should have won the Nobel Prize in Economics (although they have) because the assumption of their models is that "everyone" already knows them, and applies them in ordinary life.
 - Thus, it is only a few confused economists who learn something new from such research.
 - They are evidently among the few people who can be fooled all the time.
- ii. Second, the RE theories must assume that their main contribution will affect estimation variances rather than expected values.
 - That is to say, it must not have been the case that monetarists and Keynesians were systematically wrong before the RE models were developed--or those using the earlier models would have had systematically biased expectations.

- (This had to be the case, even in cases where the two older models had quite different predictions, as regarding the endogeneity of money, the length of the long run, etc.)

iii. Similarly, other scientific "breakthroughs" could not correct "significant" errors in previous science, but should only reduce the variance of a particular science's error term.

- This, by the way, was often true, but not always true.
- When heliocentric astronomy replaced geocentric astronomy, most of the earlier careful predictions of Claudius Ptolemy were maintained.
- On the other hand, many of the predictions of Galileo and Aristotle regarding the effects of gravity, were significantly different--**objects of the same shape and density did not fall faster if they were heavier.**

iv. And, public education (and training in economics) should not systematically change expectations, but only reduce the variance or errors.

- Bryan Caplan's recent research using survey data suggests that neither of these hypotheses are correct.
- Economists have systematically different beliefs about how the public policies affect the economy than other individuals.

B. Overall, the problems with the RE hypothesis and approach imply that it is an incomplete theory that can be improved upon--at least in some areas of decision making.

- i. That is to say, there are areas of human decisionmaking that can be better explained as consequences of biased expectations and changes in bias than in unbiased ones.
 - Such biases does not appear to be something that affects only a few confused people, but everyone.
 - On the other hand, as a first approximation and as a support for mutual respect, the RE hypothesis is often a very useful point of departure.
- ii. (I have argued in several papers that adding "ignorance" to the RE model, provides useful insights and explains rational behavior that is non-compatible with the RE model.)