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RECENT STUDIES OF SPECULATIVE MARKETS IN THE CONTROVERSY OVER RATIONAL EXPECTATIONS

by

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The causes and effects of expectations in social life were originally the province of the historians who wrote lively accounts of manias and panics more than a century ago. A classic work of this genre is the 1841 book by Charles Mackay with the grand title Extraordinary Popular Delusions and the Madness of Crowds. Whether or not it was too sensational, the subject was apparently too uncongenial for classically-minded economic theorists.

The term expectations began to appear in economics only in the 1920s. Friedrich Hayek and Gunnar Myrdal took up the problem arising when some activity in the present has consequences in the future and hence conditions in the future determine the benefits of the activity. Analysis of the decisions of the private actors involved in such an intertemporal problem had to bring in their expectations of the future. What determines these expectations? The early intertemporal theorists were content to examine the special case of correct expectations - as if decision makers were endowed with perfect foresight. For these theorists, an equilibrium path meant a correct-expectations developments, a surprise-free scenario.

1. In the work of John Maynard Keynes we find the first writing among scholarly economists on expectations as a distinct and active force on the economy. Keynes' lifelong thinking about the nature of beliefs goes back to his early views on probability. However, by the 1930s, it was the uncertainty, and therefore the non-objectivity, of social knowledge that Keynes focused upon. An oft-quoted passage indicates his view:

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> By uncertain knowedge...I do not mean merely to distinguish what is known for certain and what is only probable. The game of roulette is not subject, in this sense, to uncertainty...Even the weather is only moderately uncertain. The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth owners in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply don't know.[1]

Such uncertainty is generated by the unpredictability of discovery and the continual flux in the economy's structure. Society cannot have complete (or even extensive) objective knowledge for that would imply knowledge of all (or most) of society's future knowledge and future values, much of which is presumably yet to come. It would be like knowing what we do not yet know. In addition, actual structural shifts are too frequent to allow econometricians to obtain tight estimates of the recent structure. Something always upsets their reduced-form equations.

Keynes and his followers proceeded to argue on behalf of a radical conclusion: The prices of equity shares in the stock market, interest rates in the bond market, and the values of currencies in the foreign exchange markets (at least if not subject to government fixing) reflect the beliefs of speculators about what <u>other</u> speculators are going to believe (in subsequent days or hours) about the future.[2] The situation reminded Keynes of a peculiar beauty contest held by a British newspaper in which the prize went not to the right entry - after all, there could be no right answer - but to the entry that (over several weeks) best forecast the entries of the others playing the game. As a result, these markets are apt to display unfounded, or irrational, movements and non-movements. Further, investment activity (i.e., capital formation) may fall, pulling employment down with it, not because the firms have lost confidence in the prospective returns from continued investment in their enterprises but because speculators, betting that speculative markets will value these investments less in the future, have driven down the prices of these investment goods in the present, thus

discouraging their production, or have driven down the associated stock prices, thus discouraging firms from new issues with which to finance the investments. The term "casino economy" was coined by the Keynesian radicals to indicate that acquiring superior economic understanding of the underlying objective factors at work would not help to "make it" in this economy as much as being plugged into the smart-money crowd who have their fingers on the pulse of the market.

If it was suggested that casino considerations figure little in reality since investors can bank on the law of averages and invest for the more distant future, Keynesians replied that in long-term accumulation the risks cumulate as much as the returns. In a world beset by uncertainty the long term offers no haven.

This break away from classical thinking in economics, it might be noted, was one revolt in the intellectual revolution of those times. The introduction of uncertainty and subjectivity into economics strikingly paralleled what was being done in art and philosophy - the cubism of Picasso and Bracque, the atonalism of Schoenberg and Berg, the fragmented poetry of Pound and Eliot, and some of the themes of Nietzsche and Sartre. Keynes was carrying over to economics the twentieth century outlook called modernism: the consciousness of the distance of the self from others, the multiplicity of perspectives, the end of objective truth [3].

This parallel continues, for in economics as in some other fields there is a post-modern inclination to retrenchment back toward classical values. The battle in economics between the modernists and the post-modernists, or new classicists, is, in fact, the story of this paper.

2. In the 1970s a revolt spread through all of economics under the banner of "rational expectations". The notion of everyone's having rational expectations is an extension of the older notion of everyone's having

perfect foresight-- an extension to an economy commonly struck by disturbances, randomly determined yet with known probabilities of occurrence. The world of rational expectations is always in equilibrium, in drought or flood, cold wave or hot. All the participants in the economy in all the various states in which the economy from time to time finds itself use all the available information - and know how to use it - to make the best possible forecast of the future. Forecasts are correct up to the limits set by the irreducible randomness in nature.

Clearly the rational expectations vision postulates that all the participants in the marketplace think alike: they are all fundamentalists using the same model of how the fundamentals operate to determine the various prices and quantities in the economy. Any market participant pausing to think about it realizes that the others are using (whether giving or receiving) the same forecast as he is using. In the Keynesian casino economy, people also read the papers to acquire the latest available information. But every forecaster is undoubtedly aware that in his statistical time-series analysis of the effect of rainfall, capital stock, and public debt, for example, the expectations of others in past years were not generally identical to his own forecast. He is presumably aware that his forecasting could be correct (up to the limits of inherent randomness) only if he could read the differently-thinking minds of the others in the economy.

Soon rational expectations was elevated into a prescription for model builders and forecasters, an ethical precept. Any economist or forecaster working with a model ought to suppose all persons to know his model and to use it to form their expectations of the variables in the model. The rationale for that injunction? It was that if you do not ascribe rational expectations to the actors in your model you imply that they are making systematic errors in their forecasts while by contrast you the modeller are not, which is an indefensible asymmetry - a sin of pride. It is wisest not to suppose that you are smarter than they are.

Notice that this doctrine is rooted in the classical idea of absolute truth objectively knowable. Looking back, it seems incredible and marvellous that the inventor and the apostles of rational expectations had the audaciousness to think they might turn back the clock to pre-modern, to pre-Vienna, to pre-20th-century.

3. The present decade has witnessed reactions against rational expectations doctrine, both theoretical and empirical. It has been asked how it can be theoretically justified to pretend that each modeler has "the" model, true and immutable. If somewhere in the economy a modeler changes his model, why should he suppose that everyone else has likewise changed in lock-step? If there are two modelers with conflicting models reflecting contrasting schools of thought, how can each model reasonably assume that all the participants in the economy use his model, no one using the other guy's? Even if everyone in the economy uses the same theory in some basic sense, why should it be supposed that they all agree on the toughness of the government over some current negotiation or the outcome of a struggle between two branches of the government etc. and, moreover, that every participant knows that the others estimate the probabilities of these exogenous events exactly as he does? [4] Rational expectations theory is applicable only where there is no need or no further need for economic research, all doubts and disputes having been resolved.

There is also a grave difficulty for rational expectations theory at the statistical level. Even without the foregoing sort of problem, which seems to disqualify rational expectations, there is the question of how the individual participants in the economy can manage, each one looking at the data every day and making new inferences, to estimate the objective rational-expectations relationships between the "fundamentals" and the price-quantity variables that people want to forecast in connection with their decisions (as producers, investors, and so forth). The young econometric theorist Roman Frydman has shown that there are no

grounds for concluding that the inferences of all the participants, simultaneously estimating relationships and at the same time muddying those relationships by acting on the basis of their current estimates, will in time converge to the true rational-expectations relations.[5] The rational expectations mode is unreachable. If accidentally hit upon, it would slip away as people, not knowing they were right before, drew wrong inferences from subsequent disturbances.

Recently the vulnerability of expectations to (presumably or postulatedly) erroneous beliefs, such as the belief that sunspots matter for economic behavior, has been demonstrated in work by Michael Woodford.[6] He shows that the economy may converge to a "sunspot equilibrium", in which sunspot activity influences expectations, even if the economy's members did not initially believe that sunspots made a difference.

Few would disagree with the conclusion, which seems only prudent, that rational expectations is not, and cannot be, exactly right; at best, it can only be approximately right. But the advocates of the rational-expectations method counsel that we can and should proceed with that method nevertheless - modeling the economy as if governed by rational expectations, no matter that there are methodological and epistemological defects in that assumption. So there arises a question: How inaccurate and unreliable an assumption is it? Recent research on the behavior of the stock market, the bond market, and the foreign exchange market has turned up much interesting evidence on that question.

Pioneering work on the behavior of American stock prices by Robert Shiller[7] threw support to Keynes' feeling that share prices were the product of "the mass psychology of a large number of ignorant individuals".[8] Shiller argued that if rational expectations theory is right, the variability, or variance, of stock prices will bear a certain relation to the variance of the underlying factors, particularly the stream of dividends on the stocks over the future. It turned out that the variance of stock prices was twenty

times greater than the variance predicted by rational expectations theory, according to the test devised by Shiller.

The finding of "excess volatility" in the stock market has received a thousand cuts from the counter-attacking rational expectationists. One of the most persuasive of these attacks, by a new combatant, Allan Kleidon, proposes that stock prices appear volatile from Shiller's perspective because he does not recognize that stock market participants perceive dividends as subject to a random walk rather than subject to the stationary ups-and-downs around an unchanged mean assumed by Shiller; when dividends go up, that increase is best predicted to be permanent, not transient, so it is no wonder the stock price reacts so strongly.[9] The other attacks raise fine points of statistics. It is clear, however, that the jury of experts has not yet reached a verdict on the indictment of rational expectations brought by Shiller.

The evidence from bond markets is rather different. Early suggestions that long-term interest rates are, like stock prices, excessively volatile seem now to have been rejected. Instead, there is recent evidence that long-term interest rates place insufficient weight on information about current disturbances, as shown in research by Gregory Mankiw and Lawrence Summers.[10]

An obvious interpretation of this tendency is that the costs of recalculating the optimum decisions induces firms to resist recording and confronting a major change in their forecast. Another interpretation goes back to the Keynesian emphasis on the importance of the expectations of others: If a disturbance creates the rational-expectations forecast of a sharp fall of long-term bond prices, I will adjust my own expectations of bond prices tomorrow by a much smaller amount unless and until I have some corroboration that the others in the market likewise expect the same drop in bond prices that I do; with everyone reasoning this way, contrary to the rational-expectations version of things things, the price of bonds today will

under-respond to the information of the current disturbance. The analysis is similar to the argument that an announced change toward disinflation by the government will not at first deter further price increases until the consensus that exists (if it exists) about the government's credibility is apparent to the individual price setters.[11]

Yet it appears that the underresponsiveness of forecasts extends to other settings. A tendency to place too little weight on current events has also been detected by Matthias Mors and Colin Mayer in their study of company forecasts complied by the Conference of British Industry.[12] A company's forecast of its own future production level is too sluggish, much as forecasts of bond prices are. This instance appears to require a different explanation.

The behavior of foreign exchange markets has been of great topical interest ever since the Smithsonian Agreements inaugurated the postwar era of fluctuating exchange rates vis-à-vis the American dollar. There have been studies of the excess volatility of exchange rates as well as stock prices and interest rates.[13] We can anticipate, however, that the econometricians will be wrangling over the significance of these variance tests for years to come. It is perhaps more persuasive to examine the anatomy of particular real-life episodes. The gyrations of Britain's pound sterling provide examples. The real value of the pound plummeted in 1976, only to revive as mysteriously a year later. It shot way up in 1980, and proceeded to lose about half of the ground gained within a couple of years. One suspects that speculators were the victims of mistaken theory or the attribution of mistaken theories to others. The standard rational-expectations overshooting model of the exchange rate, published by Rudiger Dornbusch in 1976, predicted the reverse: a real appreciation of the pound in 1976 and stability over 1980 and 1981, according to a recent study by Sushil Wadhwani.[14] The stupefying rise of the dollar in the first half of the 1980s is another example. Some calculations by Paul Krugman showed that the height of the dollar in early 1985 could only be predicated on a

return to normal so very slow that the American payments balance on current account would never be able to pay the interest on the funds borrowed abroad except by more borrowing.[15] Of course, it could not be proved, then or later, that Krugman had the right model, and the participants in the market were failing to heed the fundamentals. The subsequent pronounced decline of the dollar has strengthened the impression that the dollar had previously reached heights that were not justified by the fundamentals - by real interest rate differentials, contrary to rational-expectations doctrine.

There have been suggestions in recent years that, besides fundamentals, there are also factors at work called "bubbles". When a bubble is growing in, say, the foreign exchange market, the currency is seen by all to be over-valued in relation to the fundamentals; but there is no "free money" to be made by instantly selling the currency, expecting to buy it back later at a more realistic price, because there is some recognized chance that the bubble will have grown to even larger size the next day, and still larger size the day after, and so forth. Yet it is hard to see how this interesting theory of deviations from fundamentals, whatever its plausibility, constitutes a defense or strengthening of rational-expectations doctrine, which claims that prices reflect information, optimally utilized, about fundamentals - not simply that there is no "free money".

A more effective defense of the rational expectations doctrine is the contention that market prices often go up or down in anticipation of the chance that an exogenous disturbance will occur, such as the government's decision to devalue the currency, or monetize the public debt, or balance the budget. This has come to be known as the peso problem. If the disturbance never actually occurs and the public gives up hope or fear of it, the market price or prices under examination will return to normal. It will appear that they have deviated erratically from fundamentals, thus refuting rational expectations theory. But such a conclusion would

not be justified from such evidence. Perhaps everyone knew the correct probability of the disturbance, and knew that everyone else knew them too! Unfortunately for rational expectations doctrine, however, one cannot imagine what was the disturbance the chance of which could be thought to have buoyed up the dollar above its apparent fundamental. Of course, one can always postulate something out of thin air - the economist's phlogiston - such as fear of World War III, which would have made the dollar the least dangerous haven, the fear of which receded in 1985. But such a conjuring trick is rather like a "free parameter" in a model; it can be manipulated arbitrarily, without any discipline or restraint. Unless there is real evidence that the market had some such worry or hope which held up the dollar, it would be better to infer that the market was simply not rational than to say that (as far as we know) it was rational but psychotic.

4. If it is agreed that fundamentalist rational-expectations theory is not an adequate description of all markets, what are we - the economic analyst and business forecaster - to do? We might proceed by keeping the most attractive feature of rational-expectations theory - that a person's expectations are not mechanical and autonomous, but instead are the product of his or her model and information - while jettisoning the most unattractive feature of that theory - that everyone in the economy has the same model, i.e., the same basic theory and the same estimate of the economic relations and the same forecast of the exogenous factors affecting the economy.

As a primitive example, consider the analyst's forecast of the response of the price level to a new disinflation policy. The analyst can and ought to take into account the typical price-setter's expectations of the expectations of the other price setters, for it is on those expectations that their prices will depend and his own price will depend partly on his expectation of the prices these others price-setters set.

A more elaborate example is the problem of forecasting the effects of the government's decision to balance the budget, following a large deficit. In attempting to forecast the near-term effects on domestic output and the price level, the analyst will do well to try to capture the effects on this outcome of the expectations held by the various schools of thought. The Keynesians will expect both output and the price level to fall; the monetarists will expect output to rise and the price level to fall (relative to trend); the supply siders will expect output to fall and the price level to rise. No one, so far as I know, will expect both output and the price level to rise (but perhaps this gap in doctrine points to a future theoretical innovation).

All that is rather obvious, I suppose. The plot gets thicker, however, once it is recognized that, as the outcome unfolds, beliefs will be revised, and there may be conversions of some people from membership in one school of thought to membership in another.

I happen to have seen a recent development of that kind of theory in a recent paper by Jeffery Frankel and K. Froot.[16] They portray an economy containing three types of participants: (1) fundamentalists, who act on a fundamentalist overshooting model of the exchange rate, which would be the correct model (from which to calculate rational expectations) if there were no chartists in the world, (2) chartists, who extrapolate recent trends based on information about things besides the fundamentals, and (3) portfolio managers - they effectively determine the exchange rate - whose forecast is a weighted average of the fundamentalist forecast and the chartist forecast, in which the weight changes over time in favor of the school of thought that has been performing better. In this model, if the fundamentalists underforecast the return from investing in dollar assets, the portfolio managers then put less weight on their forecast, more weight on the chartists'. This causes the dollar to rise again in relation to the fundamentals. The authors show that the dollar must eventually run out of steam, at which point there beings to be a shift back toward the fundamentalist view.

Forecasters, like test pilots and torreadors, have always led a dangerous career. But forecasters can now begin to say that they are fulfilling the hope expressed by the Chinese toast, "May you live in interesting times".

FOOTNOTES

1. J.M. Keynes, "The general theory of employment", Quarterly Journal of Economics, August 1937.

2. Somewhere I saw this view expressed in an epigram: Two trappers being chased by a bear are trying to anticipate each other's speed as much as the bear's. In most markets, of course, there are many trappers, not two. In the bear race the aim is to stay ahead of the slowest trapper, in the market race to stay near the front of the pack.

3. The presence in economics of strains of thought that can be seen as classical, romantic and modern is pointed to (perhaps for the first time) in my textbook Political Economy : An Introductory Text and this classification is used as a device to organize the presentation of the conflicting theories and doctrines pervading economics today.

4. Some problems of this sort with rational expectations doctrine are catalogued in Roman Frydman and Edmund Phelps, eds., Individual Forecasting and Aggregate Outcomes, New York, Cambridge Press, 1983. Most of that conference volume, however, is devoted to exploring models that, in averting these problems, go beyond rational expectations.

5. Roman Frydman, "Toward an understanding of market processes", American Economic Review, September 1982.

6. Michael Woodford, "Learning to believe in sunspots", Starr Center Discussion Paper 86-16, October 1986.

7. Robert J. Shiller, "Do stock market prices move too much to be justified by subsequent changes in dividends?", American Economic Review, June 1981.

8. J. Maynard Keynes, General Theory of Employment, Interest and Money, London, Macmillan, 1936, Chapter 12.

9. Allan W. Kleidon, "Variance bounds tests and stock price valuation models", Journal of Political Economy, 1986. See also Terry A. Marsh and Robert C. Merton, "Dividend variability and variance bounds tests for the rationality of stock market prices", American Economic Review, June 1986.

10. N.Gregory Mankiw and Lawrence H. Summers, "Do long-term interest rates overreact to short-term interest rates?", Brookings Paper, Spring 1984.

11. E.S. Phelps, "The trouble with rational expectations", in Frydman and Phelps, op. cit. Translated to the price, P_t, of long term bonds, the argument is that

$$P_t = F_t P_{t+1} + i_t P_t$$

where i is the short-term interest rate and $F_t X_s$ denotes the forecast at t of any future variable X at s. But, by the same logic,

$$F_t P_{t+1} = F_t F_{t+1} P_{t+2} + F_t i_{t+1} P_{t+1},$$

which implies that the forecast of the market's future forecasts influence P_t.

12. M. Mors and C. Mayer, "Company expectations and new information", Centre for Economic Policy Research Disscussion Paper n° 62, April 1985.

13. S.B. Wadhwani, "Are exchange rates 'excessively' volatile?", Centre for Labour Economics, London School of Economics, D.P. 198, July 1984.

14. Wadhwani, op. cit.

15. P.R. Krugman, "Is the strong dollar sustainable?", National Bureau of Economic Research, Working Paper n° 1644, June 1985. Is it not evidence against rational expectations that currency markets were not jolted by the publication of Krugman's calculations?

16. J. Frankel and K. Froot, "The dollar as an irrational speculative bubble", forthcoming.

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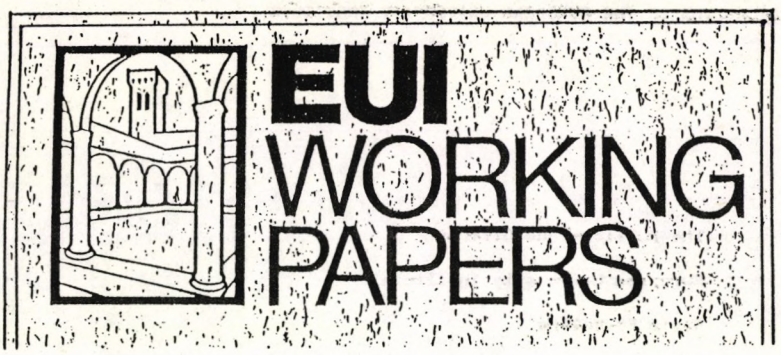

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