

Evans, G. W., and Honkapohja, S.: *Learning and Expectations in Macroeconomics*. XVIII, 421 pp. Princeton University Press, Princeton, 2001. Hardcover \$ 49.50.

Expectations matter in a very wide variety of economic models. The standard modern approach is to assume that expectations are “rational”, meaning that agents’ expectations are formed as if they knew the correct model of the world in which they function. Suppose for example that agents’ beliefs about the relationship between current weather conditions and future prices affects the supply of a commodity. This induces an actual relationship between weather conditions and future prices, which gives a mapping from the believed relationship into the actual relationship. A rational expectations equilibrium is a fixed point of that mapping. In the rational expectations equilibrium there is a mathematical relationship between the weather and expected future prices. If agents are to form rational expectations they need to know what that relationship is. The central question which Evans and Honkapohja address is how can agents learn the relationship.

The answer which Evans and Honkapohja pursue is that agents learn using the tools of the economist’s trade; econometrics. They use data from past years to estimate the relationship between weather and prices, perhaps by using ordinary least squares. We know from econometrics textbooks that if the underlying relationship between weather and prices is unchanging the ordinary least squares estimates of parameters will converge to their true value. These conditions would apply if an econometrician took a data set of repeated realisations of the rational expectations equilibrium, and published the results in the decent obscurity of a journal which no one in the market saw. But suppose the market is not in the rational expectations equilibrium, because agents do not know the numerical values of the parameters of the weather prices relationship. The agents may estimate the parameters for themselves, or let an econometrician do it for them. In either case the data are not the same as in the rational expectations equilibrium. As agents learn they change their beliefs, as their beliefs change the relationship between weather and prices changes, agents learn this, and change their beliefs again, which in turn changes the weather-price relationship, and so on. Standard results on the asymptotic properties of estimates do not apply. Nevertheless the accumulated results of twenty years of research, much of it by Evans and Honkapohja themselves, have established a methodology for setting up learning problems, and an array of tools for solving them. Evans and Honkapohja’s book is a masterly survey of what has been achieved.

Much of the literature and the book works with the assumption that agents use a model specification which would be correct in the rational expectations

equilibrium. When agents are learning the model is incorrectly specified. Agents therefore display a form of bounded rationality; this literature has been an important demonstration that interesting results can be obtained in models with bounded rationality. If the estimates converge to the rational expectations equilibrium value of parameters the mis-specification is transient. The dynamics under learning are complicated. The key results which make it possible to say something about these dynamics come from the control theory literature on stochastic recursive algorithms. The results are complicated to state, and hard to prove. Evans and Honkapohja do a good job of exposition on a knotty piece of mathematics, which is kept manageable in length by referring back to the original research literature for some details of proofs. The essence of these results is that much can be learnt about the asymptotic behavior of the complicated nonlinear stochastic difference equations generated by the learning process, by looking at the stability conditions for a related but much simpler ordinary differential equation. This gives a condition which they call expectational stability. Intuitively a model is expectationally stable if the new data generated by one more observation under learning is on average closer to the rational expectations equilibrium than the current belief derived from past data. Failure of expectational stability implies under quite general conditions a probability of zero of convergence to a rational expectations equilibrium, because every new data point tends to move the estimate further from rational expectations equilibrium. Under stronger conditions expectational stability implies convergence to rational expectations equilibrium.

The bulk of the book is an excellent wide ranging and detailed survey of what is known about the stability under learning of a wide variety of models. The discussion of linear univariate models starts with the cobweb model and moves on to models where the value of a variable y_t date t depends linearly on expectations of y_t and y_{t+1} formed at $t - 1$, and sometimes an exogenous variable. The Sargent and Wallace model of inflation and the Taylor real balance model fit this framework. Varying the lag structure, and including expectations at different dates gives many other macroeconomic models. The treatment of nonlinear models starts with the over-lapping generations model. In these models y_t is a nonlinear function of the expectation at t of y_{t+1} , and random shocks. Models of this type can have multiple rational expectations equilibria, and generate cycles and equilibria which depend upon a sunspot variable which matters only because people think it matters. Evans and Honkapohja show that not all of these equilibria are stable under learning, but requiring expectational stability does not eliminate all multiple equilibria, cycles or sunspots.

The book is an essential reference for researchers who want the tools to investigate stability under learning. Graduate students with a good technical background and knowledge of macroeconomics will find a fascinating mine of information on recent research.

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Hendry, D. F., and Ericsson, N. R. (eds.): *Understanding Economic Forecasts*. XVII, 207 pp. MIT Press, Cambridge, Mass., 2001. Hardcover £17.95.

To a large degree, forecasting is the “bread and butter” of the economic profession. What would make up a good forecast to earn money on? Ideally, a forecast should run some 20–30 years ahead and, since only bad news is good news, it should predict some development or event harmful to either the present generation in their old age or their children’s generation. The Club of Rome and some environmentalists were remarkably successful in advancing this business. Sadly, the economist usually finds himself in a much more uncomfortable situation. Typically, he will be asked for short-run to medium-run forecasts that, in general, will turn out to be more or less inaccurate before the public memory has faded. A major reason for the intrinsic fallibility of forecasting is that “because of the things we don’t know [that] we don’t know” (M. Singer) there is hardly a chance to detect the true source of the misspecification of the model or framework underlying the forecast. Thus, even today, it remains true that the economic future is largely unpredictable.

Nevertheless and quite understandably, there is a huge demand for economic forecasts, and the general public should have an idea what an economic forecast is, how it is done, who constructs it, who uses it, how its reliability is measured, what forecast uncertainty means and how much confidence can be placed in a forecast. The present book is concerned with this set of problems. The volume consists of some nine papers, framed by an introduction and an epilogue by the editors. The papers, considerably revised and edited, are the fruit of the proceedings of Sect. F (the Economics Group) of the British Association for the Advancement of Science at their 1999 Annual Festival of Science. The book is thus addressed to the nonspecialist and is inspiring reading for the general economist and the undergraduate student. Several contributions by experienced practitioners are highly enjoyable if not exhilarating, such as Diane Coyle’s, “Making Sense of Published Economic Forecasts”, on The Independent newspaper’s Golden Guru award (chap. 4), Lord Terence Burns’, “The Costs of Forecast Errors” (chap.