Monetary Policy Analysis when Planning Horizons are Finite

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The paper will argue for the desirability of a form of bounded rationality in which economic decision makers are not assumed to form complete state-contingent plans extending indefinitely into the future, but instead only to think forward a finite distance into the future. The particular departure from the standard assumption of fully model-consistent expectations proposed here is one that, it will be argued, does not represent a failure of people to be rational so much as a practical response to inherent limitations of computational capacities; for example, it is characteristic of current state-of-the-art artificial intelligence approaches to playing games such as chess or go, despite the fact that these programs are generally regarded as engineering triumphs, and demonstrably perform as well or better than the best expert human players. Even though the kind of fully rational behavior assumed in standard DSGE models would require the player of such a game to formulate a complete plan for the how the game will be played, under any contingency that might arise, up until the end --- and to make initial moves that can be shown to be correct by working back from the anticipated possible endgames --- this is not the case, because it is not feasible, even in artificial environments in which the possible moves from any given situation are finite and easily listed, and in which the possible situations are themselves strictly finite (even if large).

At the same time, deductive reasoning has an important role to play in expert play (and the best programs), at least in such cases: state-of-the-art programs do consider alternative possible finite sequences of moves starting from a current position (though not sequences long enough to reach an end to the game), and then use an approximate value function to evaluate the positions that are anticipated to be reachable through those finite sequences of moves, in order to select a short-horizon plan that is then the basis for selecting a current move. The process is repeated again each time another move must be made, looking forward a finite distance from whatever position has been arrived at at that point. Crucially, the approximate value function that is used to evaluate the positions at which the forward planning is truncated must classify positions based on only a partial description of them, because it is only in this case that it is possible to have learned average values for positions (described in terms of a small number of features) on the basis of a "training dataset" of available prior experience (which of necessity is not extensive enough to have shown from experience what all of the things are that can happen after having been in all of the possible positions that can occur).

The paper will show how it is possible to formulate macroeconomic models for purposes of counterfactual policy analysis in which households and firms are assumed to be capable of finite-horizon forward planning of this kind, though not of formulating and implementing fully-rational infinite-horizon state-contingent plans (as commonly assumed). In the particular, the proposed approach will be applied to an otherwise standard New Keynesian DSGE model of the kind often used to analyze the effects of alternative monetary policies. The proposed approach provides a tractable example of an intermediate ground between the standard assumption of full infinite-horizon optimization (which surely exaggerates the forward planning capabilities of both households and firms) on the one hand, and models that assume behavior based on purely backward-looking expectations (such as common models of "adaptive

learning", which do not allow any way for behavior to take account of sources of information such as policy announcements, and in this respect surely assume too much naivety) on the other.

The paper will then discuss in detail a particular application of the proposed approach, to the analysis of the predicted consequences of forward guidance. Under the boundedly rational analysis, it will be shown that a commitment to maintain a lower nominal interest rate for a fixed period of time (and then return to the central bank's normal inflation target) will necessarily increase both real activity and inflation during the period while nominal interest rates are low, regardless of both the length of the policy commitment and the length of people's planning horizons. However, the quantitative magnitude of the predicted effects are smaller than under a rational-expectations analysis of this kind of policy commitment (especially in the case of a long-lasting commitment), providing a possible resolution of the "forward guidance puzzle."

In fact, the boundedly rational analysis implies that the stimulative effects of forward guidance remain bounded even as the length of the commitment is made indefinitely long, rather than growing explosively as predicted by the rational-expectations analysis. This answers an objection raised by John Cochrane to the REE analysis (under a standard equilibrium selection criterion), which is that this standard analysis implies that changes in a monetary policy commitment that apply only very far in the future (lengthening the commitment from 500 years to 501 years, say, which changes nothing about policy for the next 500 years) should have large effects on equilibrium outcomes now --- a "failure of continuity at infinity" that seems implausible. The boundedly rational analysis gives qualitatively similar conclusions to the REE analysis with the standard equilibrium selection (namely, the effect of such a policy is necessarily inflationary, rather than deflationary), yet there is no failure of continuity at infinity; the model makes a well-defined prediction in the case of a commitment to a permanent interest-rate peg, which is quite similar to its prediction in the case of a commitment lasting for several years.

The failure of "neo-Fisherian" results to be obtained from the boundedly rational analysis, even in the case of a commitment to a permanent interest-rate peg, and even in the case of long (though finite) forward-planning horizons for households and firms, indicates that in some cases of policy relevance, the assumption of rational expectations equilibrium cannot be regarded as even an approximation to what would happen in an economy with boundedly-rational decision makers, at least in the case that their cognitive capacities are sufficiently great. This provides an important reason for caution in the use of rational-expectations analyses in analyzing the effects of contemplated monetary policies.