Quasi-Hyperbolic Utility Function in Dynamic General Equilibrium Models

Gianmarco Corradini

2019

Abstract

Modern dynamic models of optimal growth assume a consumer who is rational in his or her economic choices. However, empirical evidence has shown that this is often not the case. In my paper, I have tried to answer the following question:

Can dynamic models assume a consumer who is not rational?

And, if so:

What are the macroeconomic effects?

I answered the first question in the affirmative, using a particular type of utility function called the *Quasi Hyperbolic*. Briefly, it describes an economic agent that has an excessive propensity for payoffs close to the present time. It was taken than as a postulate in Ramsey's (1928) and Overlapping Generations (OLS; Samuelson, 1958) models. With respect to the former, I showed how it does not affect the results of the model because a particular type of utility function does not change the steady-state capital-consumption levels.

For the OLG model, three variants were proposed. The first is the benchmark case. The second and third are called *Multiple-Selves* and *Precommitment*, respectively (Dhami, 2019). In short, they describe strategies, more or less effective, by which consumers try to overcome their bias in economic choice.

The result is as follows: in the reference case the results are the same as in Ramsey's model, thus an output identical to a "rational" economy. In the second and third variants we have that different degrees of rationality affect the output of the economy negatively and differently. Specifically, the greater the irrationality of consumer choices, the greater the distortion from traditional models. To make the analysis more precise, numerical values were then assigned to the exogenous variables: the result tended to confirm what was seen above.

Further analysis of the speed of convergence of the steady-state economy also added that the economy proceeds faster toward an equilibrium situation the more rational the consumer is in his choices.

A comparative statics analysis was then conducted on the parameters of the system to measure how the exogenous variables affect the steady state. Considering each parameter would have been cumbersome work that would not have added remarkable results. So we focused on the growth rate of the economy g. We showed by Taylor approximation that an increase (decrease) in g increases (decreases) the rate of convergence to the steady state in each of the three models; moreover, the variations among the different models do not differ much from each other.

However, Taylor's approximation is reliable only if we consider a point sufficiently close to the steady state. How, then, to be sure that what is seen is confirmed in general? For this purpose, 100 numerical iterations were run with Wolfram Mathematica after a change in g. The parameter is also a measure of the technological growth of the system. We therefore assumed two effects, one temporary and one permanent. The first can be seen as the discovery of a single invention that makes the economy more efficient. The second as an acceleration of technological growth.

In the case of a temporary variation, capital deviated from the equilibrium state and then converged to it, and the faster the greater the consumer's rationality. In the second of a permanent variation, capital initially increased and then converged to a new equilibrium level lower than the previous one.

In light, then, of the analysis performed, both theoretical and numerical, we can conclude that given neoclassical models of optimal growth, lower (higher) consumer rationality implies lower (higher) growth in the economy.