Analysis of Economic Fluctuations: a contributions from Chaos Theory

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Abstract

The nature of business cycles is a central and conflicting question in macroeconomics. The debate arises around basically two conflicting fundamental approaches: the exogenous-shocks-equilibrium and the endogenous-cycles-disequilibrium.

The first approach considers the fluctuations as deviations from a steady state caused by exogenous "shocks" like fiscal and monetary policy changes, and changes in technology. Viceversa, according to the second one the deviations are consequences of internal shocks. Nevertheless both approaches, often, base their analysis on various and different models characterised by linearity assumptions. The linearity assumption serves both to simplify analysis and to allow an easy separation of business cycle and growth theory, because growth can be represented by a linear or log linear trend. But the real time-series of economic data do not show the kind of regularity that is predicted by the linear dynamical mechanistic systems. In fact, contrary to the results obtained by equilibrium theory, irregular frequencies and amplitudes of economic fluctuations are often persistent and do not show clear convergence or steady oscillations.

Properties like long memories and endogenized dynamic and persistent shocks put nonlinear modeling in a position to improve business cycle models. This is the power of nonlinear systems. They allow researchers to model more realistic systems. The most exciting feature of nonlinear systems is their ability to display chaotic dynamics.

Chaos theory can explain this irregularity using simple nonlinearities and may become more common as economists increasingly familiarize themselves with nonlinear techniques of mathematical and statistical analysis. But there are some difference between physics and other hard sciences in which these techniques are largely used and economics. This implies a difficulty about a direct and uncritical use of them in economics. In some case topological and not metric instruments must be used.

There are important policy reasons to understand the impact of nonlinearities and chaos in social systems. At first it is possible to have a more realistic description of economic phenomena and the control of chaotic systems can actually be easier than the control of linear ones, because it might take only a small push to engender a big change in the system. In other words, small, low-cost policy changes could have a large impact on overall social welfare.

Therefore, in the paper, starting from a description of results of traditional approaches to business cycles we will highlight how the chaos theory could contribute to improve the description and control of economic phenomena.

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