Topological entropy and the controlled motion of profits in a chaotic economic model

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Abstract: The study of economic systems has generated deep interest in exploring the complexity of chaotic motions in economy. In this work we study a system of ordinary differential equations representing the dynamical behavior of three variables: profits, reinvestments and financial flow of borrowings in the structure of a firm. To start with, we use the symbolic dynamics theory to characterize the topological entropy and the kneading sequences that occur in the parameter space, associated with one-dimensional Poincaré return maps which mimic relevant aspects of the model behavior. Finally, we show that complicated behavior arising from the chaotic firm model can be controlled without changing its original properties and the dynamics can be turned into the desired attracting time periodic motion (a stable steady state or into a regular cycle). The orbit sabillization is illustrated by the application of a feedback control technique. This work provides another illustration of how our understanding of economic models can be enhanced by the theory of dynamical systems.

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