Abstract of the bachelor’s thesis

Differential Equations with Applications in Economics

Today, the theory of dynamic systems has become an essential tool in economic analysis, especially due to the modern computers. Some who lack the basic notions and the understanding of modern results from the theory of dynamic systems might find difficult to digest economic models.

Many economic models which depend on the temporal dimension involve the relationship between the exchange rate of a variable and its value at a certain time. When time is discreetly modeled (i.e. takes the values 1,2,3,…), relationships like this can modelled using difference equations. When time is modeled as a continuous variable, they can be described using differential equations.

The present bachelor’s thesis proposes to present some results from the theory of discrete and continuous dynamic systems and to justify their use in the real world through the description of some economic models like: price and demand (microeconomics), Keynesian model and IS-LM (macroeconomics). The purpose of the thesis is to recall some results from the theory of differential equations and the theory of difference equations. This will be considered from the theory of discrete and continuous dynamic systems point of view and some theoretical and practical examples (applies in economy) will be given for a better understanding of the notions.

The first chapter presents a few classes of differential equations: equations with separable variables, linear equations of first order and linear systems of differential equations. Hereinafter, the notion of dynamic system will be presented and this theory’s auxiliary concepts: fixed point, limit sets and attractors, dynamic systems in real space, phase portraits and representations of trajectories described by dynamic systems of differential equations generated using Maple. The chapter ends with the presentations of the IS-LM dynamics.

The second chapter presents difference equations of first order. The general classes of equations will be described, and also the particular cases of the general form. Later, some dynamic systems generated by difference equations will be presented, as well as dynamics generated by difference equations, stability criteria and Cobweb diagram. In the examples section, some mathematical models which use difference equations can be found, which are: depreciation, a demand and supply model, the linear Cobweb model and the Keynesian cross diagram.

Our contributions at the realization of this thesis consist in the selection and structure of the whole scientific material, the selection and solving the examples and the problems at the end of each chapter. For this aim, all the bibliographic sources mentioned at the end of the work were used.

This work is a result of my own activity.

Pâncă Delia