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The Solution of the system of differential equations with delays as a model of economic equilibrium in Maple

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Abstract

Purpose of the article lies in describing a method for modeling and simulation of economic phenomena, their non-trivial solutions and analyzes; is based on the implementation of differential calculus in a modern concept; is exclusively solved using advanced means of information and communication technology as a support of economic decision-making. A brief description of the software used is also a partial goal of this paper.

Methodology/methods The economic equilibrium on the individual perfect competition market is described as a continuous dynamic model (demand and supply functions in time), ie. a system of two differential equations with two unknowns. For refinement, a delayed argument is used to reflect the current state and past development. This iteration (model solution) can only be simulated by implementing appropriate software. We use the advanced Maple system with built embedded libraries.

Scientific aim This approach to solutions and analyzes of economic issues can be understood as a synergy of economic, mathematical and information areas supporting the concept of the information society and the vision of the digital economy.

Findings The method discusses outputs depending on the different levels of model input parameters. By doing so, it offers the sources for the management, economists or the entrepreneurs. The deployment of information and communication technologies will allow a quick and clear visualization of iterative steps (the model diverges, oscillates, converges, constant), because deterministic static solutions cannot be obtained by standard calculations. Usually the market is stable - model converges to equilibrium. Computer visualization also shows the rate of convergence.

Conclusions Our modeling and relevant analyzes are done as a modern way through differential equations with a delayed argument on the basis of the implementation of the Maple system as part of the project named GA16-03796S. Implications: practical applications of the theoretical proofs of the research team members.

Keywords: demand, economic equilibrium, Maple, price, quantity, supply, system of differential equations with delay

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