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The pyramidal life cycle of economic structures

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Abstract

The pyramidal character of life cycles of economic structures is empirically confirmed on the basis of official statistical data of the years 2003 and 2004. The ergodic hypothesis is applied as one of methods of economic forecasting in evolutionary economics, econophysics and applied researches.

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Keywords: Econophysics; Economic life cycle; Ergodic hypothesis

1. Introduction

Forecasting the life cycle of economic structures (companies, banks, etc.), technologies, business cycles, the product life cycle is the modern task of economic science. Similar researches open opportunities for forecasting the life cycle of companies, banks, any economic structure, national economic systems and world economic system as a whole. Researches of nonequilibrium processes at the microlevel are also important for forecasting the evolution of economic structures and determination of interrelations between macro- and micro-economic levels. Nonequilibrium economic processes are really shown in as long waves (Kondratyev's cycles, K-cycles), Elliott's waves [1], macrogenerations [2–6], ''development tree''

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(“bifurcation tree”) [7], the business cycles [8], the industrial cycles [9], the life cycles of economic structures [10–17], etc.

The concept of nonequilibrium processes, including economic, are related to a concept of irreversibility and nonlinearity of evolutionary processes, to the concept of chaos and ordering, the second law of thermodynamics, the principle of the maximum of entropy [18,19]. Nonequilibrium economic processes depend on a set of hardly formalized socio-economic factors, parameters influencing evolution, the life cycle of economic structures. Nevertheless, there are many modern economic-mathematical models, allowing to formalize nonequilibrium economic processes. One of the economic-mathematical models is the evolutionary model of economic macrosystems—“macrogenerations” [2–6]. Another modern evolutionary model is the model of economic growth in conditions of limited resources on the basis of a method of cellular automation (KA) in paper [20] and multi-agent model on the basis of the competition life cycle (CLC) concept [21–23] that allows to make computer modeling and simulation of evolution of economic agents.

Evolution of companies is a subject of scientific researches, e.g. in papers [24,25]. In paper [24] annual growth of companies sizes in the USA during the 19-year period from 1974 to 1993 has been investigated. Also, the calculated distribution function of probability density in dependence on empirically received annual growth rate of the companies is specified. The distribution function was obtained as a distribution with power-law tails.

In the present paper the life cycles of economic structures have been obtained in economic coordinates (turnover, duration of life cycle) and (capitalization, duration of life cycle) for more than 200-years. It also empirically confirms the pyramidal character of the life cycle of economic structures predicted in published papers [13–15,17]. The life cycle of economic structures passes eventually via an absolute peak, a maximum, a limit that can be understood as a peak of the “pyramid”, which depends on existing resources and socio-economic factors, influencing the life cycle of economic structures; so the character of life cycle over rather long periods of time has been called as “pyramidal” in papers [13–15,17]. The pyramidal process is similar to the growth of a sandy pyramid. Let us carry out the elementary mental or real experiment with a sandy pyramid. Separate sands represent microconditions, by means of which there will be realized a given macrocondition as the sandy pyramid. In case of further addition of sands, the height of the pyramid reaches a relative maximum at the fixed base of the pyramid, and there are two main further alternatives: continuation of the growth of the pyramid at an expansion of the area of its basis or completion of the growth of the pyramid at the present fixed base of the pyramid with its subsequent destruction. In case of completion, the relative maximum becomes an absolute maximum for the process. A similar elementary process underlies physical, biological, chemical, economic evolutionary processes. In case of economic processes economic states of the companies can be understood as microstates, by means of which there will be realized a given economic macrostate of the system of the companies. The idea of economic microstates, the concept of evolution of economic structures at macro- and micro-economic levels from the point of view of statistical physics were introduced in papers [13,14].