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# An elementary information macrodynamic model of a market economic system

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## Abstract

Information represents a common and universal substance, actively participating in a diversity of physical or virtual interactions, including various forms of economic interaction. The information *regularities* of economical dynamics and the mathematical *evaluation* of the economical system's processes are studied by building the *information systemic models*, based on *Informational Macrodynamics*. Study focuses on an elementary *production–organization*, the production's *interaction* and *management*, and different *market dynamics*, with modeling an organization by the *hierarchical structure* of information, cooperative, dynamic space-distributed *network*.

The system's cooperative dynamics coordinate and mutually connect the micro- and macroeconomical processes, which include both the dynamics within each basic economic element and the cooperative integration between the system's elements. The models use a common mathematical formalism and the information as a universal equivalent of money and a common models' language. The found formalized information *mechanisms* govern market's cooperative dynamics and the information *restrictions*

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on these processes. The considered systemic mechanisms of self-control, adaptation, and evolution, represent a general *attribute* of an economical system.

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## 1. Introduction—information science approach and information systems modeling

In the modern economy, the main exchanges occur through the transfer of information between customers, producers, banks, investors, and across the market, utilizing many different signals, physical signs, coded communications, etc. Even a business with a diversity of goods can be represented by an exchange of corresponding information structures and values, expressed particularly by their code substitutes. In such a virtual and/or real *information business*, all participants produce, transmit, exchange, or consume information.

Information appears as a *universal* equivalent of money, directly exchangeable with different commodities, including human labor. Because exchanges exist in a social system, the quantitative and qualitative values of information also represent a measure of *social* relations. Since modern economics become an *information system*, it is imperative to *apply the information science's systems theory for understanding the systemic regularities* of the information economy. This includes a joint consideration of the economic system's *components* to expose their *inter relations*, which are necessary not only for the component's coordinated *dynamic cooperation*, but also to detect the inner components' *regularities* as a part of the *systemic relations for the whole system*. The first problem in this direction is developing the *information models* for each *particular* economic object, such as a local business production and organization, markets, banks, etc., to describe both inner information dynamics and the information relations between them. The second is modeling the *specific cooperative dynamics and phenomena*, essential for the economic object. The third is *unifying the models into the information system* using a *common* information language and modeling methodology, applied to a variety of the object's interactions and communications.

The goal is to reveal the main *information regularities* of a market economic system, based on a mathematical formalism of *cooperative dynamics*, a model of the system's information *structure*, and an analysis of the information exchange flows and communications throughout the whole system. Since the *production and transformation* of information are the basics of any information object, we focus on the dynamic regularities of their economic analogies: an elementary production system and market, with the conditions of free

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