



## CYBERNETIC MODEL OF THE ECONOMIC AGENT

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### **Abstract**

*The paper is based on the synthesis of the economic systems and processes management. It analysis the cybernetic characteristics of the economy, it defines in a system manner the market and analysis its characteristic traits and synthesizes the cybernetic characteristics of the economic agent.*

*In the first part of the paper the systemic and cybernetic traits of the market that determines the behaviour and functionality of the economic systems are identified. In the second part are presented the economic agents, categorized in elementary agents and aggregate agents. At the end the economic agents are shown from the systemic, cybernetic perspective.*

**Key words:** *economic system; cybernetic traits; economic agent; elementary agents; aggregated agents.*

**JEL Classification:** E20, C51

### **Introduction**

The cybernetic systems, as optimal regulating systems, have a series of common properties to all systems, irrespective of their nature, physical, biological, economic, social, human, etc. Thus may be emphasized characteristics of general concepts, such as: *the elements of the system, the structure, the interconnection and interactions, the fundamental objective, the disturbing factors, the surrounding environment, the input variables and the output parameters* (performance), as well as *the strategy and the regulating elements, perfecting, opening and adjustment.*

The description of a real system, from this perspective of the systemic and cybernetic characteristics, does not exclude the natural



## Issue 2/2016

physical characteristics of the systems, but includes and emphasizes the structural and functional particularities.

Similarly an economic system also, for example a company, may be described in relation with the processes of transforming the raw materials and the materials in finished products (technologies), but also as cybernetic system, having a development in time, a basic objective, interdependence relations with the environment (market, money), a certain structural and functional complexity given by the relationships between people, by the complexity of the decisions adopted [Negulescu, 2014] by the strategies of economic benefit making and by the technological, structural and economic regulations.

### **Definition and Systemic Traits of the Market**

*The market* means *the place where the economic agents* – consumers, companies, government, banks, etc. – *meet and adopt important decisions for the society*. On the market the exchange of goods is made, the prices, salaries, interest and profit are formed. The multitude of circumstances that accompany the process of exchange of products and services determines the structure, the behaviour and the price of the market. *The structure of the market* refers to the *nature and degree of competition*, therefore, both to the multitude and the specialization of economic agents and to the interdependences that are established between these. If the multitude and the specialization of economic agents depend on the demand and offer of product, the interdependences depend also of laws, regulations, contracts, traditions, etc.

*The behaviour of the market* represents, in essence, *its performance*, the results that are obtained as consequence of functioning. It refers to a multitude of quality and quantity characteristics, such as quantity and quality of products and services, the degree of satisfaction of the offer, habits, tradition, tastes, presentations, demonstrations, publicity and, last, prices.

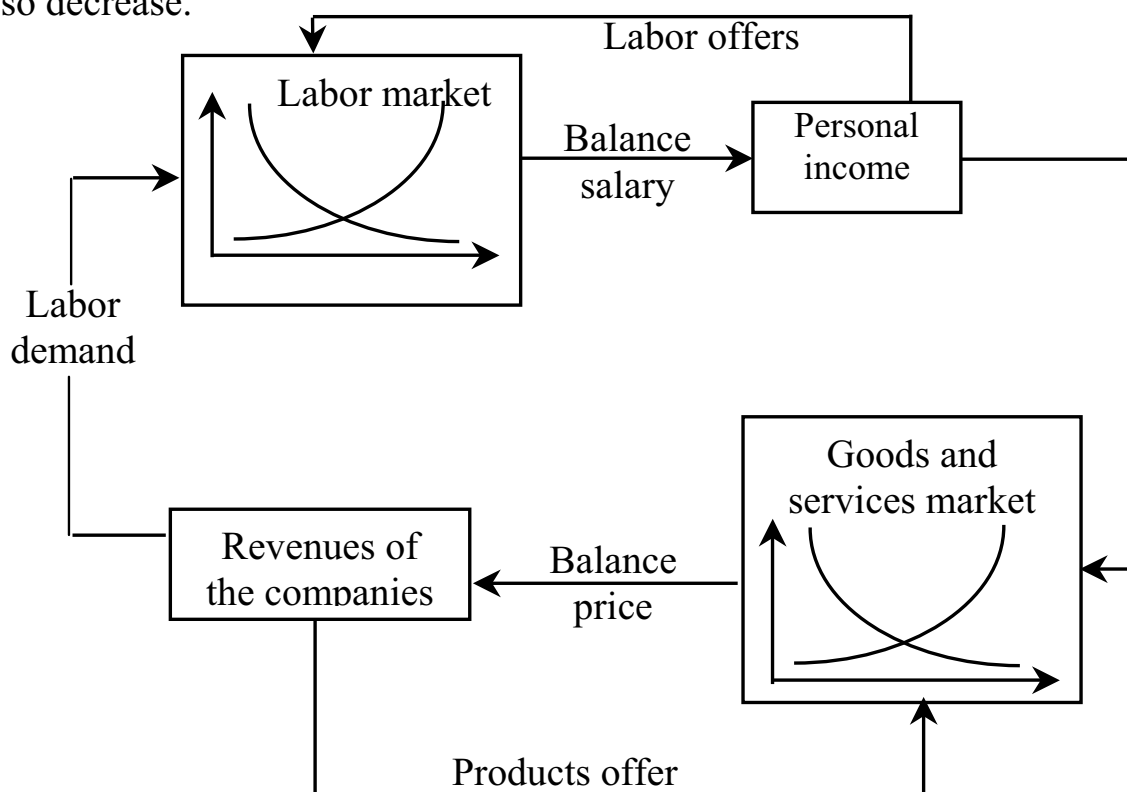
*The prices of the market* represent a *performance and regulating feature*, being, on any type of market – of goods and services, of raw materials, materials, financial, currency, foreign etc. – the main element of regulating and determining the profit. Irrespective of their nature, the prices fulfil the following basic:

- *Information bearers* – are the signs that assure the consistency of the decisions of the consumers and companies; may guide the production and the consumption;



- **Protect the rare resources** – by an increased price, of balance between demand and offer;
- **Determine the distribution of incomes** – they achieve a balance between the price of the labour and the price of the consumption goods and services.

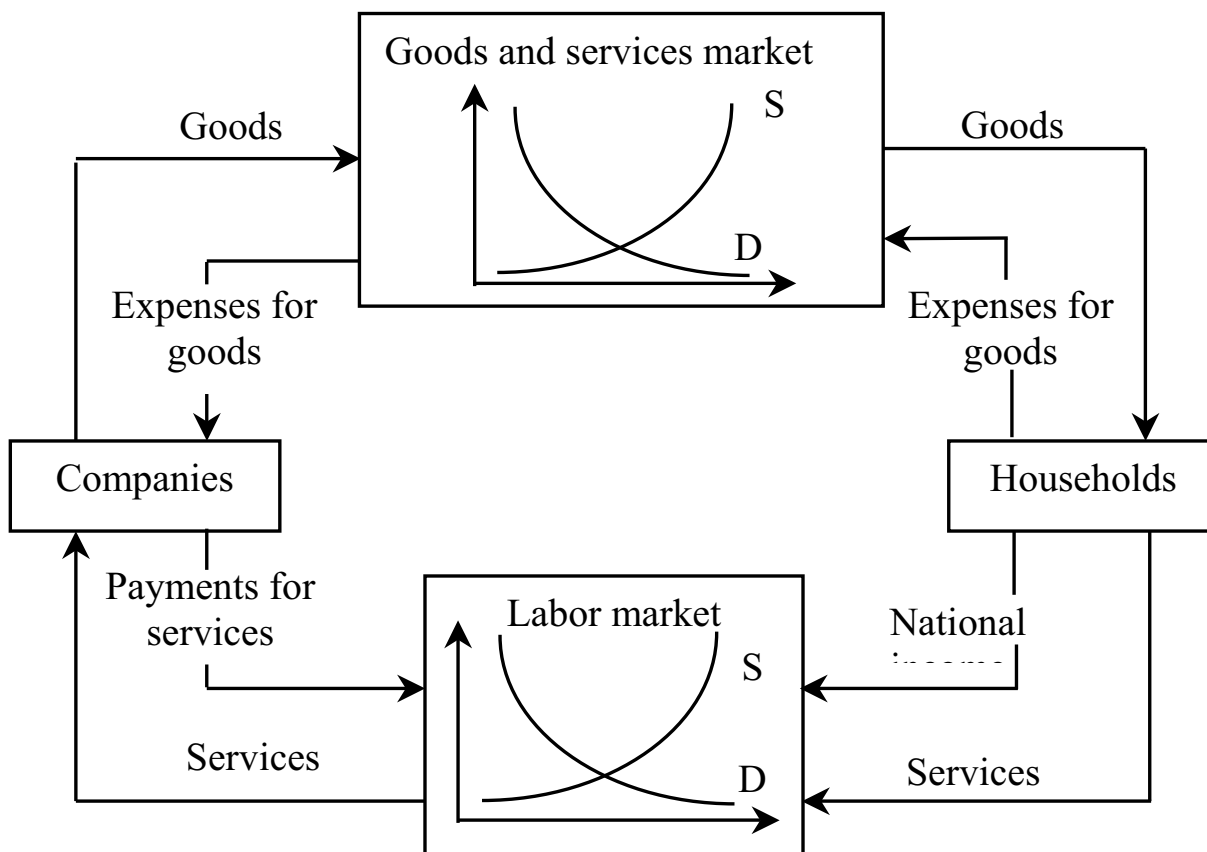
A simple structure of the market economy, based only on two sectors, households and companies, is shown in *figure no. 1*. The sectors are connected by two market shares: the labour and the goods and services. There is a direct proportionality between the two sectors, in the meaning that if the labour market increases the goods and services market will also increase. If the labour market decreases, the goods and services market will also decrease.



**Figure no. 1. The economic structure on two sectors**

Source: designed by me

In *figure no. 2* the circular (closed) flow in the economy consisting of two sectors is shown.



**Figure no. 2. The circular flow in the economy with two sectors**

Source: designed by me

The balance relation is represented by the equality:

***Expenses for goods (for the national product) = national income***

(1)

In real economy, however, not everything that is produced is consumed, existing needs of investment for resuming production and for its modernization as well as availabilities of savings at the population by financial market (*figure no. 3*).

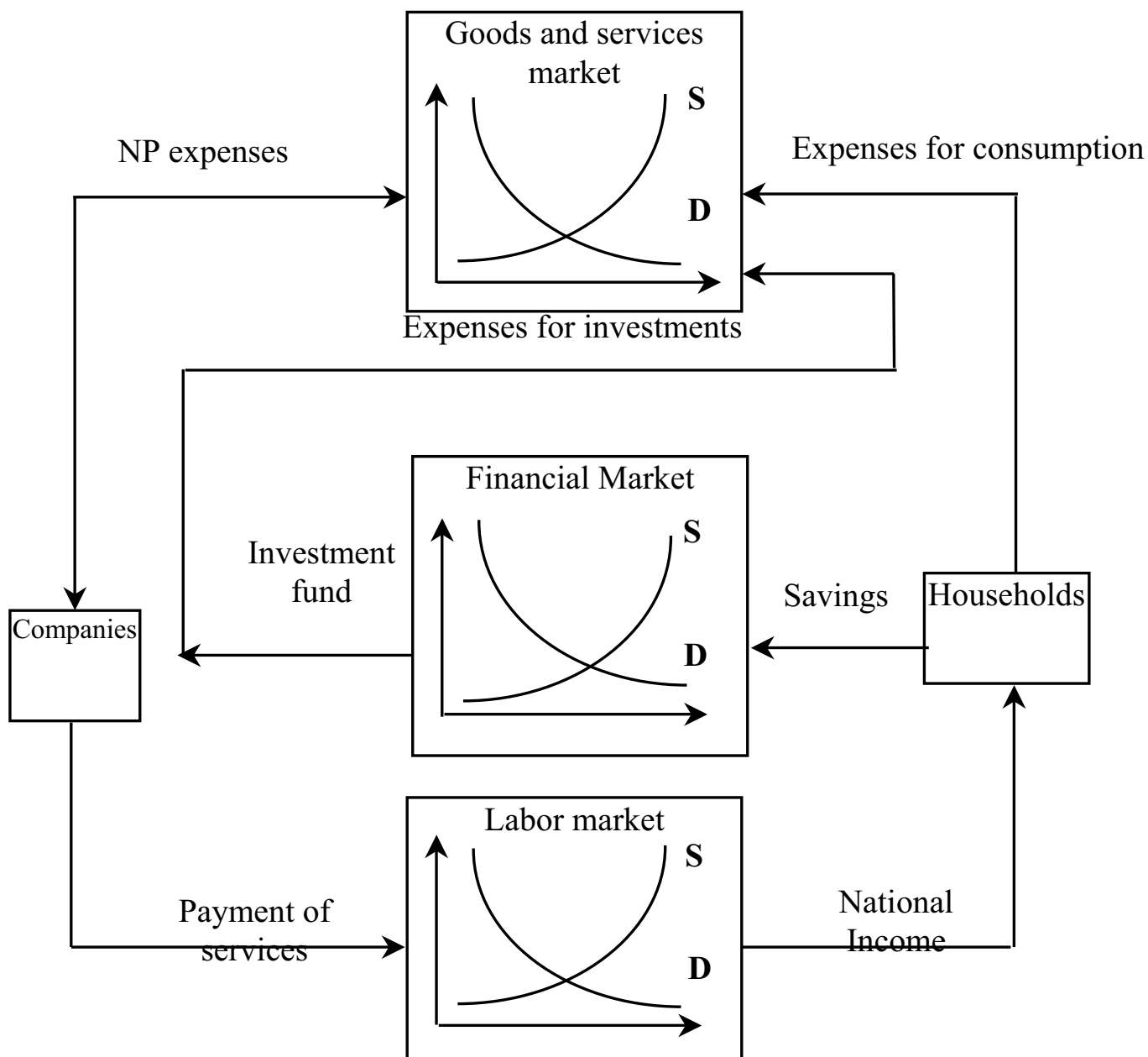


Figure no. 3. Economic structure with three sectors

Source: designed by me



Issue 2/2016

The households provide funds on the financial market, while the companies borrow for investments. The households, at their turn, receive funds from companies, through the labour market, national income, and return them as payment for goods, services. The investment expenses create income for the companies that produce goods and services meant to households.

In *figure no. 4*, the circular flow with savings and investments is shown.

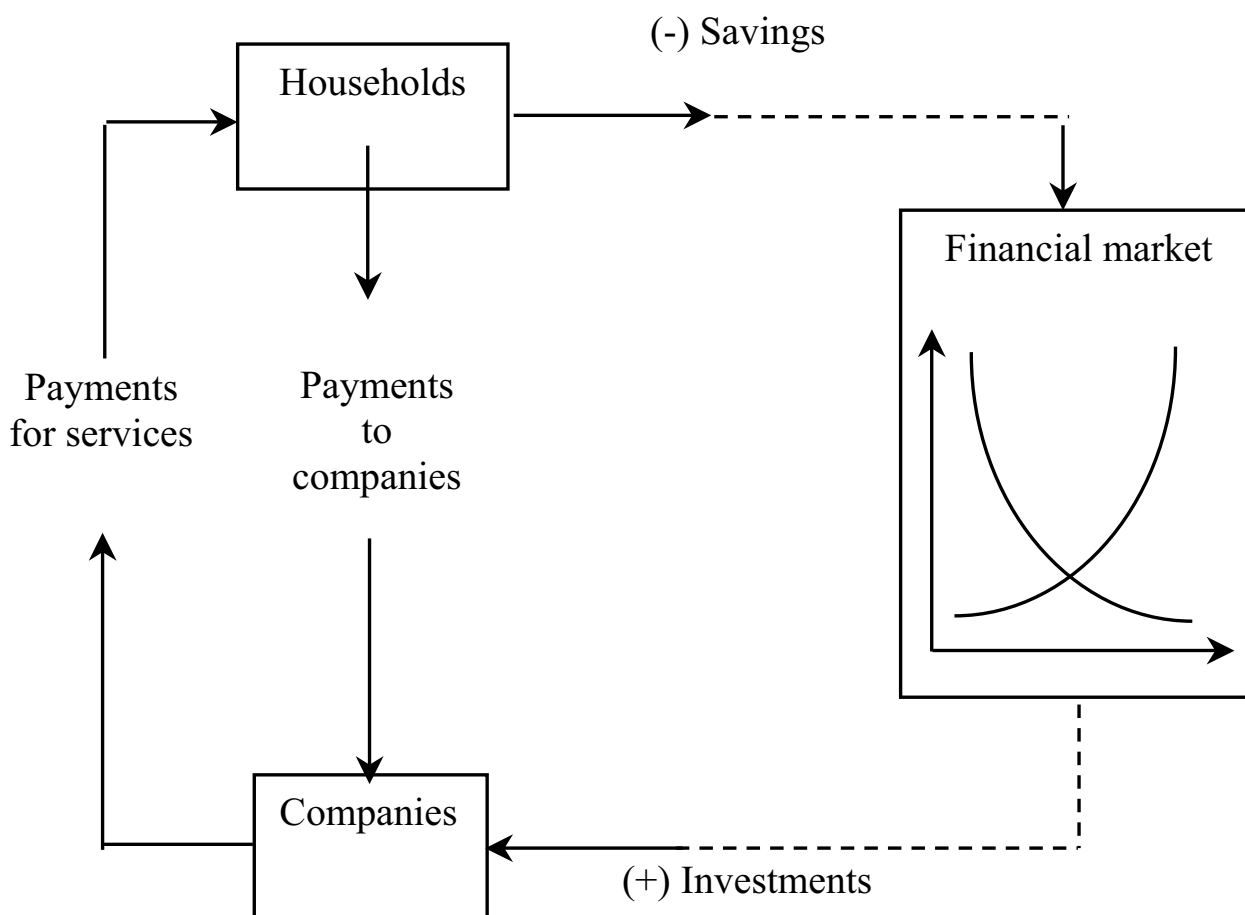


Figure no. 4. The circular flow with savings and investments

Source: designed by me



The structure, the behaviour and the functionality of the real economic systems are determined by the following systemic and cybernetic properties:

- *The market economy is a large system*, both as *geographic extent* (global), and as *number of subsystems*: companies, households, public sector, banking sector as well as *a multitude of markets*: goods and services, labour force, real estate, land, financial (currency and capital) etc.; at the large size of the market economy system contributes, however, also the *multitude and diversity of interdependences between subsystems, the multitude of organizations, relations and functional technologies, the multitude of interdependences of external factors*, subjective and disturbing, as well as *the different nature of the interdependences*: organizational, material, monetary and informational.

- *The market economy is an open system by the multitude of its relations with the surrounding environment, the population system, the political and social system*, as well as with the *external sector* (multinational).

- *The market economy is a complex system by the variety and diversity of interdependences and processes, by multitude of material, energetic, technological, informational, labour force relations* (including its education), *decisions, balances, distributions, protections, regulations and consumptions or investments*

- *The market economy is a dynamic system by its temporal development and by the dependence of all its evolving elements by the time factor.*

### **Cybernetic Model of the Economic Agent**

As subsystem of the cybernetic model of the market economy, the economic agent may, at its turn, be represented by a cybernetic model.

Generically, *an economic agent may be considered a person (natural or legal) or a group of persons that fulfils economic functions.*

Any economic agent may be identified by the couple *subject-function*.



## Issue 2/2016

Depending on the exercised functions, economic agent may be divided thus:

- producers of goods and services – *companies*;
- consumers – *households*;
- financial – *financial and credit institutions*;
- *administrations*.

The producers and consumers agents represent the category of *non-financial agents*, which are occupied with transactions between the bearers of the offer and the bearers of the demand.

*The financial agents* carry on a strictly specialized activity for forming and using monetary, currency and financial resources.

*The administrations* represent the category of agents that supply goods and provide services of public utility, by collecting and redistributing resources from the other agents and their allocation according to the public interest.

Depending on the level of aggregation, the economic agents may be categorized in *elementary agents* and *aggregated agents*.

*The elementary agents* are distinguished by the following traits:

- They represent a distinct subject of the economic life, both as natural persona and as group of natural persons and as legal persons.
- They are their own, irreducible interest bearers, which they convert in the purposes of their actions.
- They make decisions and carry on actions spontaneously.
- They have own resources and capacities.
- They have the capacity of initiating and keeping relations with other economic agents.

Making decisions represent for the elementary economic agents a continuous process that is submitted to the principle of rationality.

*The aggregated agents* represent *classes of elementary economic agents* who fulfil similar functions. The existence of these agents is pure virtual and is based on behavioural similitude, thus:





– **enterprises (companies)** – group all agents that produce material goods and services (non-financial) intended to the market, being of the following types:

- capital companies;
- cooperatives;
- partnerships with legal personalities;
- individual or public enterprises.

– **households (housekeeping)** – represent economic agents bearers of the capacity of consumer, thus:

- families;
- individuals;
- communities.

– **financial, credit institutions and insurance companies** – reunite all the institutions (private, public and mixed), which function is of financial intermediary:

- banks;
- monetary issuing institutions;
- insurance companies.

– **public administrations** – perform the function of redistribution of the income and of the wealth based on the non-merchandise services:

- central administrations;
- local administrations;
- public education;
- social protection;
- justice;
- public infrastructure.

– **private administration** – groups the private non-profit bodies:

- organizations;
- associations;
- foundations.

**The multitude of operations and transactions** that take place between the economic agents form, in their development, a **circuit**.

The elements that define the economic circuit are:



## Issue 2/2016

– *the economic activities* represent the premise of the economic transactions and refer to the totality of operations that follow the satisfaction of the economic goods needs and may be categorized thus:

▪ *operations with goods and services* that concerns the production, exchange and use of goods;

▪ *operations of distribution* by which the distribution of incomes is achieved related to the process of production: payment of salaries, taxes, subsidies, etc. and of those of property: interests, annuities and dividends;

▪ *financial operations* that refer to the change of the volume and structure of assets and/or liabilities of the economic agents.

– *The subjects of transactions* are economic agents grouped according to the institutional criterion: enterprises (companies), households (housekeeping), financial-banking institutions, public and private administrations.

– *The transactions* have as object the goods, products, services and currency; the overwhelming part of the economic transactions are carried on through the market, but there are economic activities which are not made through the market (stocks, goods and households, free of charge services); the market transactions are:

▪ *bilateral transactions* in which any transfer has a correspondent counterparty;

▪ *transactions* without equivalent service, of the following type:

• *current transfers* that are systematically performed (payments, taxes, subsidies etc.);

• *assets transfers* that determine a change of assets.

In order to achieve the transactions under conditions of profit, an economic agent (irrespective of the size and nature of its activity) shall be organized assuring:

- the business management;
- the needed technological implementations;
- testing and homologation of products or services;
- production of goods or services;
- financial, human, material and informational resources;
- offer and sale capacities;
- sales analysis capacities.



Depending on the confrontation with the competition and the direct results of the sale (profit), the agent establishes the development strategy, the operational management, the rhythm of production, the most favourable market shares, the change or the renewal of technology, the size of resources (investments) etc.

It worth to notice that an economic agent operates as *a cybernetic system with learning*, having a main input, the **market requirements**, and a main output, the *offer*. Analyzing the existence of the other inputs, including of the disturbing factors (fluctuations of the market, monetary plays, technological perishability, etc.), the agent appears as a *mono variable system in output* (offer of its goods and services) and a *multivariable system in input*. At least two main reaction loops may be also emphasized: *the loop of confrontation with competition* and *the loop of obtained profit*.

### Conclusion

This paper begins from the object of study of economic cybernetics and namely the management, control, regulation and self-regulation of the processes and phenomena that are carried on in economy. This is dealing with the study of informational, decisional mechanisms, offering both a unitary representation of the economy as a complex dynamic system and an approach of its subsystems (control, households, industrial branches etc.).

In all economic systems complex regulation and self-regulation, increase or disappearance, restructuring and structuring, adjustment and self-adjustment processes take place in very diverse shapes. These processes are carried on according to objective laws, are ran and controlled by mechanisms that act for reaching predetermined or implicit objectives and purposes.

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