EMPIRICAL MODELING OF PUBLIC UTILITIES

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Empirical methods do not negate simple, traditional methods, but help to further develop them and to analyze objectively variable outcome indicators through other indicators .

The real object is presented in the form of two systems: control and controllable (control object) in econometric modeling of the development of service sectors, in the description of management processes.

The general structure of control systems in econometric modeling of the multidisciplinary service sector is shown in Figure 1. It includes endogenous variables: $\vec{x}(t)$ - vector of input influences (task); $\vec{\upsilon}(t)$ - vector of external environment influences; $\vec{h}'(t)$ - vector of errors signal; $\vec{h}''(t)$ - vector of control influences; exogenous variables: $\vec{z}(t)$ - vector of S system state; $\vec{y}(t)$ - vector of the output variables, it is usually $\vec{y}(t) = \vec{z}(t)$.

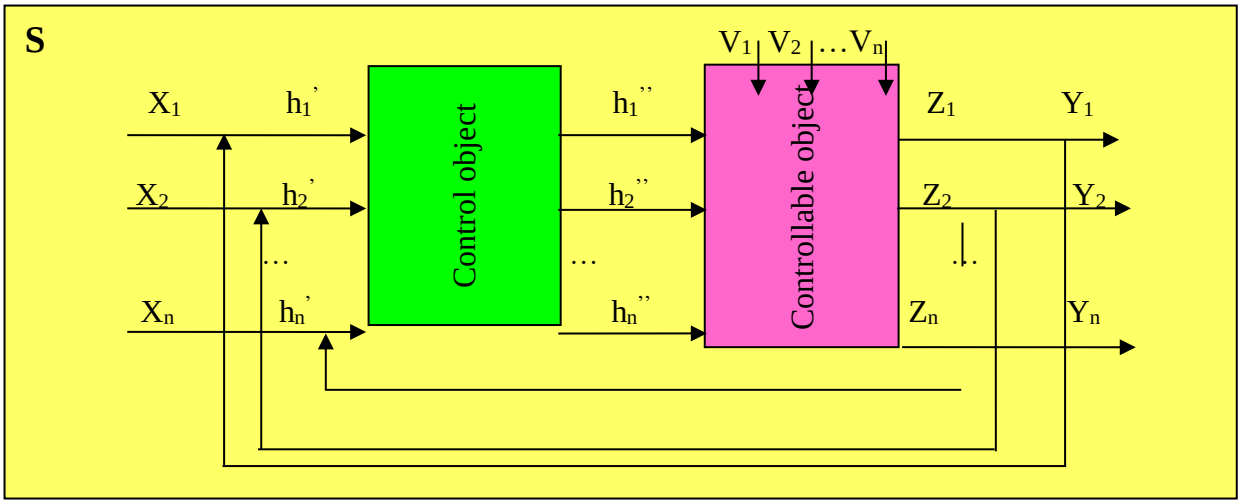

Figure 1. The structure of the management system in the econometric modeling of the development of service sectors

In the present case, the control system of econometric modeling is considered a set of software and hardware which provides a specific target control system. It is possible to make a decision on the *y(t)* state coordinate for a one-dimensional system depending on how far the control object reaches the target. The difference between the task value $y_{zad}(t)$ and the real value *y(t)* of the control quantity change law is considered $h'(t) = y_{zad}(t) - y(t)$ control error. If the given control quantity change law coincides with the input influences (task) change law, namely, if it is $x(t)=y_{zad}(t)$, then it will be $h'(t)=x(t)-y(t)$.

A system with a control error $h'(t)=0$ for all time moments is called an ideal system. In practice, it is not possible to develop ideal systems. Therefore, the error in automatic control should be reduced on the basis of the principle of reserve connection (giving as information about the deviation between them with using the output variable *y(t)* and its task values).

In econometric modeling, the task of control systems is considered change of the variable *y(t)* in given accuracy (with permitted error) in accordance with the law. When projecting and operating automatic control systems, it is necessary to select the parameters which can ensure the required control accuracy of the *S* system, as well as its stability during the transition process.

If the system becomes stable, then its behavior by time, the maximum deviation of the adjustment variable *y(t)* in the transient process, the transient process time, and others are of practical interest. The properties of different classes of automatic control systems can be concluded by the types of differential equations which most closely describe the processes in the system. The order of the differential equations and the value of the coefficients completely determine the static and dynamic parameters of the system.

Using Figure 1. gives opportunity to accept analytical or imitation approaches which are developed in the form of appropriate language for modeling continuous systems or using analog and hybrid computational techniques in forming the process of continuous-determined *S* systems activity and evaluating their basic characteristics [23].

The importance of econometric modeling of innovative public utilities is reflected in the followings:

The material, labor and monetary resources are rationally used;

It serves as a leading tool in the analysis of economic and natural processes;

it will be possible to make some adjustments during the forecasting of the development of innovative public utilities;

It gives opportunity not only in-depth analyzing innovative public utilities, but also discovering their unexplored new laws. They can also be used to predict the future development of service sectors;

It facilitates mental work along with the automation of computational work, creates the opportunity to organize and manage the work of personnel of innovative public utilities on the scientific basis.

In our opinion, there are the following actual issues which are waiting for their solution, in the development of the service sector: identifying classification of the types of services which are provided to the population, evaluating the nature of the service sector, developing a system of indicators of service sectors in current situation, improving the process of econometric modeling of development of public service sectors and forecasting it through them.