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MODELING THE DYNAMICS OF THE FOREIGN EXCHANGE MARKET IN CONDITIONS OF TRANSFORMATION ON THE BASIS OF THE INTEGRATION OF THERMODYNAMICS AND FRACTAL ANALYSIS

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Abstract. *The modeling of the dynamics of the foreign exchange market in the conditions of transformation based on the adaptation of thermodynamic potentials and fractal analysis methods is proposed. The first one allows you to establish stable relationships, get kinetic models for the functioning of the foreign exchange market, in particular the equation of state, analogues of Maxwell's relations, the Gibbs-Helmholtz equations and the laws of thermodynamics. The second one is to identify the possibilities for their changes, to diagnose the type of dynamics, and how to organize the process. Integration of methods allows you to set intervals of dynamic equilibrium and simulate dynamics as piecewise-continuous, at each interval with its potential function.*

Keywords: *foreign exchange market, transformation, dynamics, modeling, external influences, thermodynamics, fractal analysis.*

The method of thermodynamic potentials is adapted for the analysis of the transformational processes of the foreign exchange market on the basis of interaction with the external environment. On the basis of the thermodynamic approach, the potential of the functioning of the foreign exchange market, analogous to the internal energy in thermodynamics, has been introduced, has the dimension of financial resources and is based on the defining parameters, volumes of acquisition and realization of resources. The equations of state, which establish the connection of the rates of purchase and sale with the marginal cost of managing processes for the purchase and sale of resources, are obtained. According to the method of thermodynamic potentials, by changing the determinants, we obtain analogues of free energy, Gibbs energy and enthalpy for the functioning of the foreign exchange market, and using analogous equations of state for new determinants, using the mnemonic method of Radushkevich-Bourne.

Using the formulas for the potentials of the functioning of the foreign exchange market of Ukraine and the Radnushkevich-Born method of mnemonic reception, we obtain analogues of Maxwell's relations for financial processes and analogs of the Gibbs-Helmholtz equations that allow one to calculate one another.

On the basis of Maxwell's equations for financial processes and the equality of mixed derivatives of functions of many variables, a model describing the behavior of the behavior of the change in the rate of acquisition of resources in relation to the change in the rate of realization of resources at a constant volume of acquisition of resources, as the identity is equal to the change in the volume of realization of resources in relation to changes in the volume of purchasing resources at a steady rate of realization of resources.

In the process of analysis of the simulation results analogues of the laws of thermodynamics are obtained, which are the basis for formulating the laws of dynamics of the foreign exchange market.

The influence of the environment creates certain stable relationships, establishing which, it is possible to make a forecast and build a strategy, but when the environment changes, these connections can be broken and after some time form a new kind of communication. Therefore, to predict the changes, that is, the diagnosis of the transformational processes of the foreign exchange market, it is proposed to apply fractal analysis.

Based on the combination of thermodynamics and fractal analysis, it is possible to analyze more complex financial and economic processes, and the results get more accurate. The combination of approaches makes the technique more flexible, sensible to the variability of processes, the complexity of the dynamics of the nature and provides an opportunity for a comprehensive assessment of the dynamics of the foreign exchange market, taking into account transformational changes and external influences.

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