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Development and investigation of the methods for adaptive forecasting and statistical identification based on non-linear dynamic models of physical and economic processes

1. State registration - 0109U000428.

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3. Results

The method of GARCH model synthesis (Generalized autoregressive conditional heteroscedasticity) was developed for prediction of maximal sample conditional variances of output coordinates of multidimensional heteroscedastic processes with multirate discretization. To achieve maximal prediction accuracy the algorithm of adaptive adjustment of GARCH model coefficients was devised. The prediction technique of state vectors and output measurements was developed by means of applying Diophantine equations in matrix polynomials in conditions of measurable and non-measurable disturbances providing minimization of prediction error variance. The algorithm was developed to minimize generalized variance of output coordinate of financial — economical processes. New approach to create adaptive nonlinear stochastic models of short and medium term prediction was proposed that allows effectively taking into account uncertainty and unpredictability of different type dynamical processes development in future. Modification of identification algorithms of a priori unknown noise statistic of state disturbances of nonlinear dynamical system model according to heterogeneous and non synchronized measurements was proposed.

The complex technique of treatment of arterial pressure monitoring data on basis of developed adaptive nonlinear stochastic model was proposed that allowed revealing regularities of its chronobiological change for different age groups and fulfillment of medium term prediction of arterial pressure and timely decision-making about giving of effective medical assistance to concrete patient. Experimental data treatment in the conditions of limited experimental information was proposed to combine with procedure of imitating modeling that simulates continuation of experiment in the same conditions. This gave opportunity to increase effectiveness of exponent estimation procedure of energy distribution of solar flares according to satellite data.

Research results were implemented in Alpha-bank as software to minimize variances of conditionally stable residuals of client's deposits to the bank, which they contributed on indefinite time and will be able to withdraw from accounts in any moment on request. Minimization of residuals fluctuation gives opportunity to minimize liquidity risks (certificate of implementation).

Back