Wavelet-Based Nonlinear Prediction and Control of Exchange Currency Rates

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The main difficulty when using linear and/or nonlinear prediction methods based on the least squares approach is to correctly parameterize the prediction model in reference to the real-world data. The experimental data that frequently reveals specific features (fractal noise, non-stationarity, abrupt jumps, weak trend, singularity, etc.) behave in different ways on time scales. One of unique properties of nonlinear systems is a change for their evolutionary regimes at various control parameters. These systems demonstrate deterministic chaos, bifurcations and catastrophes. It is necessary to use a multiscale mathematical tool for modeling, prediction and control of nonlinear systems.

We develop a regularized prediction method based on the wavelet analysis and the statistical regularization method with nonlinear constraints for short-term predicting chaotic time series. Without loss of generality we deal with financial data coming from the exchange foreign market. A preliminary nonlinear analysis is made to determine parameters (embedding dimension and lag time) for a nonlinear regression model. It is shown that the method achieve improved prediction compared to well-known ones for synthetic noisy data from the Lorentz dynamical system.

The method correctly predicts a trend and a relative number of changes in exchange currency rates for a short-term period. It is important that the wavelet-based prediction technique allows us simultaneously to utilize the technical and fundamental analysis for predicting future prices. The developed algorithm represents a flexible instrument for going in and going out of a market, and gives a possibility to estimate a magnitude of future profits/losses.