OPTIMIZATION OF THE PORTFOLIO OF FINANCIAL ASSETS

Gomozov Y.P., Grinberg G.L., Melnikov M.A.
National technical university "Kharkiv polytechnic institute", Kharkiv city

As you know, the basis of most financial markets are stocks. The largest pyramid of derivatives is built on them, and therefore the task of forecasting the future share price is now very important. There are now two main hypotheses about the functioning of various asset markets - the classic EMN and the fairly new FMH; and three different approaches to forecasting different parameters of financial instruments based on these hypotheses: fundamental analysis, technical analysis and mathematical modeling.

Among the most common methods of such mathematical modeling are: classical and fractal analysis of time series, general fractal analysis, methods of differential equations in partial derivatives, artificial neural networks, multifactor regression analysis, genetic algorithm and those. But perhaps the only method described above that results in a mathematical model acceptable to traders, requires no data other than the time series of courses, and can combine elements of technical analysis is classical and fractal time series analysis. Therefore, we will use them for further research. Formulation of the problem. Based on the classical and fractal analysis of time series to obtain a model for estimating and forecasting the share price. Check the suitability of the obtained model for use in portfolio theory. Within the EMN hypothesis, an attempt to use ARIMA models to further forecast stock prices seems quite acceptable. This model allows you to simulate the behavior of a number of residues and obtain a final series of residues close to white noise. ARIMA is a homogeneous non-stationary system that is reduced to a stationary one due to consistent "discrete differentiation" of observations. The parameter of this differentiation d is a natural number. To model the forecast price of shares and their returns under the FMH hypothesis (which is global, measures unconditional variance and deals with all investment horizons), it seems acceptable to use Pareto-Levy-type processes that have fractal properties. R / S analysis is stable to chaotic noise, so it is acceptable for studying chaotic systems.

Using the terminology of technical analysis, we can identify trends of three types: "bearish", "bovine" and "lateral". The appearance of all these trends is usually described by a linear relationship. But their main feature is that they change from time to time, thus forming the breaking point of the trend. Therefore, for the purposes of our study, the most acceptable solution is to construct trends based on a piecewise linear function using the following approximation of the Heaviside function.

An alternative could be a model that would change the look of the trend based on other sources of information than just a series of prices. Such data can be stock indices, oil prices, gold, inflation in the country, and so on.

Based on the obtained forecast and with the help of portfolio theory of both Markowitz and some fractal modification of the Sharpe model, two dynamic models of optimal portfolio management were built.