

## MODERN METHODS OF MEASURING FINANCIAL RISKS

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Financial risk is further understood as the so-called dynamic risk – possible losses or profits of investors in stock markets. The increasing complexity of the structure of such markets has caused the evolution of mathematical modeling of risk analysis. In problems with slowly changing current asset values, certain methods of analysis, calculation and risk management have developed. In the classical Efficient Market Theory, the main methods of risk analysis are optimization of the objective function, the main methods of solution are various methods of mathematical statistics, simulation modeling, and game theory. Further complication of the market structure and the emergence of new financial instruments made it impossible to determine the probabilities of possible states; an acceptable solution is sub optimization of the objective function; the main solution methods are stochastic programming methods, criteria methods (such as Pareto, Wald, Savage), and the VAR method.

Next came the Fractal Market Theory using methods of extrapolation forecasting in "continuous real time" – fractal geometry, fractal analysis of time series, R/S analysis, filtering methods and methods of cycle theory.

The real practice of recent years gives an increase in erroneous forecasts – the basic situation in the world differs significantly from the basic conditions even 10 years ago. Modern stock markets are included as nodes in the network of the world economy functioning in real time. New financial risks have also appeared. These risks can be called "stochastic information-behavioral".

In this regard, recently there have been works (for example, [1], [2]) that use Big Data, Machine Learning and Neural Networks to predict financial risks.

However, it follows from the general theory of dynamic systems that any such process has irremovable areas of chaos. In this case, this means the irremovable presence of structurally unstable markets.

Therefore, the methods of chaotic dynamics and bifurcation theory are more adequate mathematical apparatus than the methods mentioned above.

Using the approaches of econophysics and mathematical ecology, a p-adic analogue of the Kolmogorov-Sinai entropy and an analogue of the Hutchison-Wright equations in fractional derivatives were obtained as a risk measure.

### References (translated):

1. M. Senthil Murugan, Sree Kala T. Large-scale data-driven financial risk management & analysis using machine learning strategies. [doi.org/10.1016/j.measen.2023.100756](https://doi.org/10.1016/j.measen.2023.100756)
2. Arshi Naim. Application of Machine Learning Techniques to identify the Business Financial Risks. African Journal of Accounting, Economics, Finance and Banking Research Vol. 16 No. 16 2023.