

ZASTOSOWANIE METOD MATEMATYCZNYCH W EKONOMII I ZARZĄDZANIU

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STRESZCZENIA

ALTERNATIVE WAYS OF STRUCTURING THE SECURITIES PORTFOLIO

Summary

In the article we presented the portfolio analysis issues that show the alternative methods of the securities portfolio investment structures. By analysing the investment process, in particular the problem of the capital venture risk, we paid attention to the risk estimators. The very important problem mentioned in the article is the connection of the risk together with the size of the entry. This is the determination of the adequate volume of the given share groups included in the investment portfolio.

The article also presents the comparison of the securities portfolio creation models, concentrating in particular on both the equity and borrowed capitals. We have also included examples of the borrowed capital influence on the final outcome, which resulted from the usage of models based on the percentage and variable risks.

The article includes the analysis of the possible results gained depending on the preferred approach to the analysis of the securities portfolio creation and the assets allocated for the investment.

The study includes a theoretical description of risk estimation issues through variance, standard deviation and the true average range of changes. Thanks to the description of the portfolio analysis issues, examples presentation and description we have solved the problem of the securities portfolio creation by means of models other than that of Markowitz.

MULTI-STAGE PROGRAMMING AND N-PERSON GAMES WITH COALITIONS

Summary

In the paper an n -stage decision process has been used to model an n -person game with coalitions. As an n -stage decision process the multi-stage programming method has been considered. The multi-stage programming method bases on the ideas of branch and bound and dynamic programming methods. The fundamental construction elements of these programming algorithms are: a state of decision process, a value of the state, state generation procedures and rules of elimination of the unperspective states.

MODEL BASED ON CELLULAR AUTOMATA TAKING INTO CONSIDERATION THE READINESS OF A COMPANY TO INTERACTION

Summary

In this paper a model of interaction between companies has been described. In the considered model interacting companies can transmit various signals indicating their probable behaviour during the interaction (e.g. advertisements).

In order to perform the simulation the cellular automata are used. Simulations are performed using the functions available in the program Mathematica 4.0.

It turns out that if the number of interactions of a company with other companies is small, the range of information they have got on it is also insignificant, which lowers its chance for interaction. Higher values of the signal sent by the company increase the probability of interaction. Moreover, the higher the value of the signal is the more significant the importance of a given company behaviour is. Companies known in the market have greater chance for interaction but during the interaction, they have to be careful about their behaviour as it will be assessed in a more critical way.

The results of the simulation were confirmed by the surveys conducted among people running small and medium-size companies.

TOPOLOGICAL ENTROPY AND HURST EXPONENT COMPARED WITH CLASSIC RISK MEASUREMENT

Summary

In the literature covering the fields of financial mathematics, portfolio theory or econometrics there is a great number of different methods to measure the risk of the exchange securities. The article describes an unconventional method of measuring risk – entropy and Hurst exponent. It shows that risk measurement using entropy gives results comparable to those achieved due to the classic methods.

GROUP EXPERTS' VALUATION – SELECTED HEURISTIC TECHNIQUES OF THE OBJECTS GROUPING

Summary

In the article the conditions of appealing the experts opinions have been presented. The two techniques of group experts' valuation have been described: of comparing objects in pairs and of relative importance of objects. The theorem about the equality of the objects ranks obtained via above presented techniques has been formulated and introduced.

GENERALIZED SOLUTIONS OF SOME NON-LINEAR OPTIMIZATION PROBLEMS

Summary

In the paper we suggest particular, author's generalizations of the chosen classical theoretical methods to be used to the aid of the treatment of the optimal economic and managerial decisions with the use of some ideas applied to the end of methods of the generalized inverse matrices in the linear optimization.

THE „NEAREST NEIGHBOURS“ METHOD VERSUS „LEM METHOD“ – COMPARISON OF THE EFFECTIVENESS OF THE METHODS PREDICTING THE ECONOMIC PHENOMENA DESCRIBED BY TIME SERIES

Summary

This paper describes two methods of time series prediction. First method uses composite neighbours. A predicted value is defined by some weighted combination of the actual nearest neighbours in the reconstructed state space. Second method is based on the fundamental characteristic behavior that a sensitive dependence upon initial conditions (SDUIC) and Lyapunov exponents are measure of the SDUIC in chaotic systems. This is done firstly by reconstructing a phase space using time series, then using Lyapunov exponents as qualitative parameter to predict an unknown phase space point. After transferring the phase space point, the predicted time series data can be obtained. The numerical example has shown that the first method is effective.

THE FRACTIONAL SUPPORT OF RESERVES MANAGEMENT

Summary

In the paper the fractional method of risk analysis (ARRS) as the support of reserves management has been presented. Turbulence of the contemporary market is the reason for the application of the fractional methods (as derived from chaos theory) into enterprises. The main element of the ARRS analysis is the rescaled range analysis – via one the fractional dimension is assessed. The fractional dimension is very susceptible measure to heterogeneity. The results of the researches carried out in a productive enterprise as an exemplary case of the proposed method have been presented. The demand for blank, which is the main resource in the enterprise, was examined. The importance and high risk concerned with the management of blank resources have been stressed. All of the examined sets of data had chaotic character and variation higher than in random walk which indicated high risk level.

SELECTED APPLICATIONS OF THE RSA CRYPTOSYSTEM

Summary

Possibilities of using computer technology become larger and larger. Nowadays, sending e-mails, e-commerce or Internet banking are more and more popular not only among the institution representatives but also among private users. One of the most important elements connected with these activities is safety of such transactions. In this case, advanced mathematical and computer tools, such as modern cryptography, are of crucial importance.

The purpose of the article is to present one of the public-key cryptography (asymmetric cryptography) algorithms – RSA algorithm. It is based on number theory. It uses a pair of cryptographic keys – a public key (which may be distributed) and a private key (which is secret). A message encrypted with the public key can be decrypted only with the corresponding private key. The keys are related mathematically but the private key cannot be practically derived from the public key.

Public-key cryptography are used in two main branches: public-key encryption and digital signatures. The article contains examples of the two mentioned above applications of the RSA cryptosystem.

ALGORITHM OF CHOOSING EXPLANATORY VARIABLES OF THE UNSTABLE RELATIONSHIP POWER

Summary

The article is a continuation of the research begun in author's earlier work. It deals with the problem of changes that affect relationships between explanatory variables themselves and between explanatory variables and the explained variable. It means that in case of using time variables, different values of correlation coefficients may be obtained for different lengths of sample and for different periods taken from the sample.

Considering this fact there is an algorithm of choosing variables method presented in this article on exemplary data. Four explanatory variables are used to explain number of children in refugees. These are: the general number of people, a number of divorces, the general number of demises, and a number of children per woman. This sample includes fifteen observations from years 1986-2000.

In order to observe when a change of the correlation direction or strength took place, ten correlation diagrams were built. This kind of visual presentation contains points which coordinate corresponding adequate values of the analysed variables. In this article there were also labels of time marked on the diagrams which helped to distinguish for which observation the relationship could be described with one measure of correlation. After the correlation coefficients had been calculated, the sample was divided in order to provide one value of correlation coefficient in every part of it. In this article the sample was divided into five parts containing observations number 1-5, 6, 7, 8 and 10-15. The ninth observation was an exception from the relationships between explanatory and explained variables, so it was excluded from further research. Then for each part of the sample the best combination of variables was indicated by applying Hellwig method.

Final results proved the necessity of considering relationships' changes in the methods of choosing variables. This research revealed some difficulties and new problems that have to be investigated. They deal with the classification of the correlation diagrams' points and minimum number of the samples which justify interpreting the measures of the variables' relationships.

VARIOUS REGULARIZATION ISSUES OF REGRESSION

Summary

It is well known in statistics, that fitting the training data too well can increase prediction risk on the future predictions. In other words too large flexibility of the regression function would cause a learner to overfit the data, i.e. the learner would be able to model the noise in the data as well as the generating process and it leads to poor generalization. The process of finding the balance between minimizing the training error and controlling capacity is called regularization. The paper presents the issue and gives two examples of regularization technique in case of MARS and MART.

SUPPORT VECTOR CLASSIFICATION AND ITS SENSITIVITY TO THE PRESENCE OF NOISE IN THE TRAINING DATA

Summary

The Support Vector Machines have been developed as a robust tool for classification in noisy, complex domains. The paper presents a comparison of some selected classification methods by the means of classification test set error depending on the presence of noise in the training data.

COMPUTATIONAL ASPECTS OF CALCULATING THE INTERNAL RATE OF RETURN FOR INVESTMENTS WITH DENSE SUPPORT OF CASH FLOWS

Summary

In order to find an internal rate of return of investment (IRR) in case of the dense supports of cash flows, we have to solve for ξ an equation:

$$\int_0^T cif_x(t) \xi^t dt = - \int_0^T cof_x(t) \xi^t dt$$

where $T > 0$ denotes the time of living of the project (investment) and functions $cif_x : [0, T] \rightarrow R^+$ and $cof_x : [0, T] \rightarrow R^-$ denote intensities of cash inflows and outflows respectively. It turns out that even in simple cases, integrals that occur in this equation are non elementary integrals and the equation alone is a transcendental equation. In this article we look more closely at two of such cases when intensities of cash flows are exponential or power functions.

BDS STATISTIC AND R/S ANALYSIS – THE METHOD DISTINGUISHING RANDOM AND DETERMINISTIC SYSTEMS

Summary

In this paper we discuss some recent techniques used in distinguishing between probabilistic and deterministic behavior in stock price: the BDS statistic and R/S analysis. Our data set is composed of daily data obtained from GPW in Warsaw for index WIG and seven company.