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STATISTICAL ANALYSIS OF RANDOM COEFFICIENT PERIODIC AUTOREGRESSION AND ITS APPLICATION FOR SHORT-TERM ELECTRICITY CONSUMPTION FORECASTING

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Authors
M. Fryz[1]*, L. Scherbak[2]**

[1] – Ternopil Ivan Puluj National Technical University,
str. Ruska, 56, Ternopil, 46001, Ukraine,
e-mail: mykh.fryz@gmail.com
[2] – Kyiv International University,
str. Lvivska, 49, Kyiv, 03179, Ukraine,
e-mail: prof_scherbak@ukr.net
* ORCID ID : http://orcid.org/0000-0002-8720-6479
** ORCID ID : http://orcid.org/0000-0002-1536-4806

Abstract

A conditional linear random process (CLRP) has been defined as the stochastic integral of a random function with respect to a process with independent increments. When the process with independent increments is Poisson then CLRP represents the signal as a sum of a large amount of stochastically dependent impulses whose times of occurrence are the times of a Poisson process. For example, the electricity loads of the electrical power systems, also the processes of gas and water consumption, electrophysiological signals et al. can be modelled using CLRP. Moreover, the stochastic periodicity of the signals can be taken into account. A random coefficient autoregressive model has been shown to be a member of the class of discrete-time CLRP and suitable for estimation purposes. The main goal of the paper is to

develop the procedure for the parameter estimation of random coefficient periodic autoregressive (RCPAR) model. The model has periodic parameters and consequently periodic probability distribution. The estimations have been obtained as a result of applying the least squares method to the set of L (where L is a period) stationary and jointly stationary subsequences of RCPAR model. The simulation results have been presented which confirm the consistency of the developed estimations, that is, the precision of the estimates increases with the increase in the sample size. The results of short-term electricity consumption forecasting of the enterprise (which belongs to the class of small and medium-sized) have been presented and analyzed using RCPAR model. References 16, figures 4, tables 2.

Key words: mathematical model, conditional linear random process, period, random coefficient autoregression, parameter estimation, computer simulation, forecasting, electricity consumption.

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