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Petr Lachout

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CONVERGENCE OF STOCHASTIC PROCESSES

P. LACHOUT, Institute of Information Theory and Automation, Pod vodárenskou věží 4, 182 08 Praha 8, Czechoslovakia
(19.4.1988, supervisor J.Dupačová)

The thesis is devoted to the proper definition and the possible applications of the concept of convergence of stochastic processes. The main aim consists in treating the case when the trajectories of processes do not create a metric space.

The new results of the work are contained in Section D. Section D.1 gives a martingale central limit theorem which can be used for proving convergence of finite–dimensional distributions of processes. The definition and main properties of the convergence are studied in Section D.2. General results are applied in Section D.3, D.5 and D.6 for the case where the index set M is a given subset of d–dimensional Euclidean space. The most interesting is the situation when M is d–dimensional interval 0,1 and the trajectories of processes are functions with the II.type discontinuity only (Definition D.6.1). This case is studied in Section D.6 where this generalized Skorochod space and the convergence are introduced.

Section D.7 provides tightness criterion which represents a generalization of the criterion proved by Bickel and Wichura (1971). The theoretical results of Section D are used for investigating the convergence of empirical processes in Section E.

CONFIDENCE BANDS FOR SPECTRAL CHARACTERISTICS

L. TOMÁŠEK, Institut hygieny a epidemiologie, Šrobárova 48, Praha 10
(19.4.1988, supervisor J.Anděl)

In the thesis, simultaneous confidence bands for autoregressive spectral density are derived. The joint asymptotic normality of all the parameters is the basis for solving the problem. In the literature, it has been done only for the autoregressive coefficients and the innovation variance separately. The inverse of the spectral density function in the form

$$1/f(\omega) = (1, \cos\omega, \ldots, \cos p\omega)(g_0, g_1, \ldots, g_p)' = h'(\omega)g$$

is studied next. The vector g here is a function of the autoregressive parameters. The spectral density estimator is given when replacing the parameters by their estimators. It is shown that the estimator $\widehat{g}$ is asymptotically normal. Then the critical values c_α satisfying the inequality

$$P(\max_{\omega}((\widehat{g}'h(\omega) - g'h(\omega))^2 / \operatorname{var}\widehat{g}'h(\omega)) \le c_\alpha^2 \ge \alpha$$

are derived. For this purpose, it is taken into account that the maximum stated in this expression can be attained in utmost $4p$ points ω. Using Šidák's inequality and Bayes's theorem, it is shown that the above inequality holds for

$$c_\alpha = \Phi^{-1}(\frac{1}{2}\alpha^{1/4p} + \frac{1}{2}).$$