Martynov G. V., Application of the Kramér-von-Mises and Kolmogorov-Smirnov statistics to the test of hypothesis about the forms of mixtures of Weibull distributions. (IPPI RAS).

Let a sample from a mixture of two unknown distributions be obtained. It is necessary to test the hypothesis that this sample has a distribution which is a mixture of two Weibull distributions with possibly different unknown parameters. The family of such distributions is

$$\{F(x;\theta)\} = \rho W(x;\lambda_1,k_1) + (1-\rho)W(x;\lambda_2,k_2),$$

where $\theta = (\lambda_1, k_1, \lambda_2,\ k_2,\ \rho),\ 0 < x < \infty,\ \lambda_1 > 0,\ k_1 > 0,\ \sigma_2 > 0,\ k_2 > 0,\ \rho > 0$ and $G(x;\lambda,\ k)$ is the standard Weibull distribution function.

Theorem 1. *The limit covariance function of an empirical process, obtained from a finite number of observations if some regularity conditions are fulfilled is of the form*

$$C(t,\theta) = \min(t,\tau) - t\tau - q^\top(t;\theta)I^{-1}(\theta)q(\tau;\theta),$$

where $q(s;\theta) = ((d/d\theta)F(x;\theta))|_{x=F^{-1}(s;\theta)}$, *and* $I(\theta)$ *is the Fisher information matrix. Additionally, it is assumed, that the empirical processes use the OMP of all five unknown parameters.*

The limit distribution depends on the five unknown parameters. Therefore, when determining critical levels, an estimate of the θ is used instead of the unknown value of the parameter.