E1-23 Estimating parameters of a mixture of two exponential distributions

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The problem of estimating parameters of finite mixtures, is one of the oldest estimation problems. Due to the lack of a completely satisfactory solution, this problem still attracts a great deal of attention.

Other than the mixtures of normal components, the most widely used mixture distributions are the mixtures of exponential components. (Equation (1))

Such mixtures are frequently applied in life statistics and failure data. In this paper, the problem of estimating parameters of a mixture of two exponential components is studied.

Our first effort using the method of moments did not give us satisfactory solutions. The simulation study has shown that the resulting estimates deviated drastically from the actual parameters. The method of maximum likelihood was applied with the following optimization techniques: (1) Nelder and Mead's method (unconstrained); (2) Newton-Raphson method (unconstrained); (3) Sequential Unconstrained Minimization Technique (SUMT) (constrained).

It was found that, SUMT is suitable to find maximum likelihood estimates of the parameters of the mixture. When the parameters of the components of the mixture are well-separated and the mixture contains not more than 70% of the observations from the component with larger mean, then the estimates seem to be accurate and precise.