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Several Convexity Statements in Stochastic Programming (Ⅱ) *

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Peter kall discussed the convexity statement if $a_{i1}(\omega),\cdots,a_{in}(\omega),b_i(\omega)$ are independent random variables with known normal distributions [1]. In theorem 1, we discuss the convexity statement if $a_{ik}(\omega)\sim N(m_k,\sigma_k)$ $(k=1,\cdots,N;\ 1\le N\le n)$ and others are fixed.

Theorem 1 If $a_{ik}(\omega)\sim N(m_k,\sigma_k)$ $(k=1,\cdots,N;\ 1\le N\le n)$ and $a_{ik}(\omega)$ $(k=1,\cdots,N$ are independent and others are fixed, then

(i) Suppose $a_i\ge\frac{1}{2}$, then $X_i(a_i)$ is convex.

(ii) Suppose $X\subset\{(x_1,\cdots,x_n)\mid\sum_{k=1}^{N}m_kx_k+\sum_{k=N+1}^{n}a_{ik}x_k\ge b_i\}$, then $X_i(a_i)$ is convex $(0\le a_i\le 1)$.

Besides, Yan Tiecheng discussed the convexity statement if $a_{i1}(\omega)$ is random variable and others are fixed and $X\subset\{x_1\ge 0\}$ or $X\subset\{x_1\le 0\}$ [2], In theorem 2, we deal with the convexity statemant for $X\subset\{-\infty<x_1<\infty\}$ (i.e. $X\subset R^n$).

Theorem 2 If $a_{i1}(\omega)$ is random varible and others are fixed and $a_i\ge\frac{1}{2}$, then $X_i(a_i)$ is convex.

References

[1] Peter Kall, Stochaslic Linear Programming, Springer-Verlag, Berlin-Herdolberg-New-York, 1976.
[2] 颜铁成，机会约束问题的几个凸性命题，北京工业大学学报，1981,4.

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