TESTING FOR STOCHASTIC DOMINANCE: PROCEDURES INVOLVING FOUR HYPOTHESES

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Let $X$ and $Y$ be random variables with survival functions $S_X(t) = P(X > t)$ and $S_Y(t) = P(Y > t)$. We say that $X$ stochastically dominates $Y$ if $S_X(t) \geq S_Y(t)$ for all $t$ with strict inequality for at least some $t$. Four possible hypotheses about $X$ and $Y$ can be distinguished: (i) $X$ and $Y$ have the same distribution, (ii) $X$ dominates $Y$, (iii) $Y$ dominates $X$, and (iv) the survival functions of $X$ and $Y$ cross one another. Employing a decision rule with four hypotheses, we suggest dominance testing procedures suitable for two independent samples and for paired samples. The procedures are based on a permutation test approach. We use one-sided Cramér–von Mises and Kolmogorov–Smirnov statistics but the general idea may be utilized with other test statistics. The different types of wrong decisions and the power to detect dominance are investigated in an extensive simulation study.

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