ST 705 Linear models and variance components

Lab practice problem set 10

March 28, 2023

1. Construct two random variables that have zero correlation, but are *not* independent.

2. Let U and V be independent $\mathrm{N}(0,1)$ random variables, and define $Y := V$ and

$$X := \begin{cases} U & \text{if } UV \geq 0 \\ -U & \text{if } UV < 0 \end{cases}$$

   (a) Show that X and Y each follow the standard normal distribution, but that (X, Y) is not bivariate normal.

   (b) Show that X^2 and Y^2 are independent.