

Reliability Analysis with User-defined Script Model

Re-consider the following explicit reliability problem:

$$g(\mathbf{x}) = 1 - \frac{x_2}{1000 \cdot x_3} - \left(\frac{x_1}{200 \cdot x_3} \right)^2$$

where X_1 is a lognormal random variable with mean 500 and standard deviation 100; X_2 is a lognormal random variable with mean 2000 and standard deviation 400; and X_3 is a uniform random variable with mean 5 and standard deviation 0.5. The correlation matrix for these random variables is

$$R = \begin{bmatrix} 1 & 0.3 & 0.2 \\ 0.3 & 1 & 0.2 \\ 0.2 & 0.2 & 1 \end{bmatrix}$$

- a) Estimate the reliability index and failure probability by FORM by using direct differentiation to obtain the gradient vector of the limit-state function. A script model is available in **Rt** that can be employed to write expressions and algorithms, such as for the derivatives of the limit-state function.