SLang - the Next Generation

Tutorial

Christian Bucher, Sebastian Wolff
Center of Mechanics and Structural Dynamics
Vienna University of Technology

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0.1 Monte Carlo simulation

Consider two random variables X_1 and X_2. Assume that X_1 is log-normally distributed with a mean value of $\bar{X}_1 = 10$ and a standard deviation $\sigma_{X_1} = 3$. The variable X_2 is assumed to be Gaussian with parameters $\bar{X}_2 = 5$ and $\sigma_{X_2} = 2$. Furthermore, we assume that the variables are correlated with $\rho_{12} = 0.7$. The following *SLangTNG*-script shows the procedure to generate Monte Carlo samples for these random variables.

```
--[[
SLangTNG
Simple test example for Monte Carlo simulation
and statistics
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--]]

-- Create lognormal random variable
rv1=stoch.Ranvar(stoch.LogNormal)
-- set mean value to 10, standard deviation to 3
rv1:SetStats(10, 3)

-- Create normal random variable
rv2 = stoch.Ranvar(stoch.Normal)
-- set mean value to 5, standard deviation to 2
rv2:SetStats(5, 2)

-- Produce samples for both random variables
NSIM = 1000
sample1 = rv1:Simulate(NSIM)
-- Estimate mean value and standard deviation
m1 = stoch.Mean(sample1)
s1 = stoch.Sigma(sample1)

-- print statistics and target
print("mean value is", m1[0], "should be", 10)
print("standard deviation is", s1[0], "should be", 3)

-- Assemble both random variables into a random vector
vec=stoch.Ranvec()
vec:AddRanvar(rv1)
vec:AddRanvar(rv2)
-- Define correlation matrix
rho = 0.7
corr = tmath.Matrix({
  {1, rho},
  {rho, 1}
  })


-- Assign correlation to random vector
vec:SetCorrelation(corr)

-- Simulate random vector
sample = vec:Simulate(NSIM, stoch.Sobol)
mean = stoch.Mean(sample)
print("mean vector", mean)
sigma = stoch.Sigma(sample)
print("standard deviation", sigma)

scorr = stoch.Correlation(sample)
print("correlation matrix", scorr)

-- Draw scatterplot
vis=tnggraphics.TNGVisualize(20, 20, 700, 700, "Scatter Plot")
vis:SetLabels("Two correlated random variables", "Variable 1", "Variable 2")
vis:Plot(sample:GetRows(0), sample:GetRows(1), -0.01, 3)
vis:File("scatter.pdf")
```

The resulting samples are plotted in Fig. **??**.

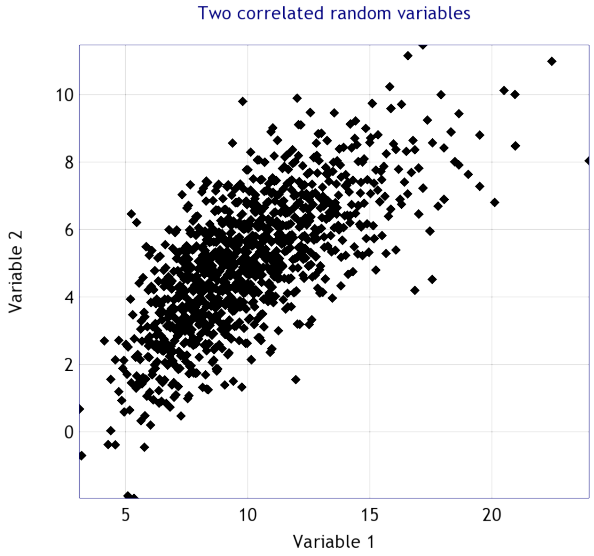

Figure 1: Scatter plot of simulated correlated random variables