gerar variáveis correlacionadas:

1º) gerar números aleatórios $N(0,1)$. ok! → $\underset{\sim}{y}_k$

2º) Matriz de correlação $\underset{\sim}{R}_z = [\rho_{ij}]$ ✓

3º) Decomposição de Cholesky da matriz de correlação $\underset{\sim}{L} \longrightarrow \underset{\sim}{J}_{zy}$

4º) gerar um vetor normal correlacionado $\underset{\sim}{z}_k$

$$\underset{\sim}{z}_k = \underset{\sim}{L}\,\underset{\sim}{y}_k = \underset{\sim}{J}_{zy} \cdot \underset{\sim}{y}_k$$

5º) Calcular as probabilidades acumuladas do vetor $\underset{\sim}{z}_k$:

$$\underset{\sim}{u}_k = \Phi(\underset{\sim}{z}_k)$$

6º) Cálculo das variáveis com distribuição $F_X(x)$

$$\underset{\sim}{x}_k = F_X^{-1}(\underset{\sim}{u}_k)$$

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gumbel

$$\underbrace{F_{X_n}(x_n)}^{u_k} = \exp\left[-e^{-\alpha_n(x_n-u_n)}\right]$$

$$\ln u_k = -\exp\left[-\alpha_n(x_n-u_n)\right]$$

$$\ln\left[\ln\left(\frac{1}{u_k}\right)\right] = -\alpha_n(x_n-u_n)$$

$$x_n = u_n - \frac{1}{\alpha_n}\cdot\ln\left[\ln\left(\frac{1}{u_k}\right)\right]$$

Frechet

$$\underbrace{F_{X_n}(x_n)}_{u_k} = \exp\left[-\left(\frac{v_n}{x_n}\right)^{k}\right]$$

$$\ln(u_k) = -\left(\frac{v_n}{x_n}\right)^{k}$$

$$\left[\ln\left(\frac{1}{u_k}\right)\right]^{1/k} = \frac{v_n}{x_n}$$

$$x_n = \frac{v_n}{\left[\ln\left(\frac{1}{u_k}\right)\right]^{1/k}}$$

Weibull distribution

$$F_{Y_1}(y_1) = 1 - \exp\left\{-\left[\frac{(y_1-\varepsilon)}{(\omega_1-\varepsilon)}\right]^k\right\}$$

$$\exp\left\{-\left[\frac{(y_1-\varepsilon)}{(\omega_1-\varepsilon)}\right]^k\right\} = 1 - \underbrace{F_{Y_1}(y_1)}_{\mu k}$$

$$-\left[\frac{(y_1-\varepsilon)}{(\omega_1-\varepsilon)}\right]^k = \ln(1-\mu k)$$

$$\left[\frac{(y_1-\varepsilon)}{(\omega_1-\varepsilon)}\right]^k = -\ln(1-\mu k)$$

$$(y_1-\varepsilon) = (\omega_1-\varepsilon)\left\{\ln\left[\frac{1}{(1-\mu k)}\right]\right\}^{1/k}$$

$$y_1 = (\omega_1-\varepsilon)\left\{\ln\left[\frac{1}{(1-\mu k)}\right]\right\}^{1/k} + \varepsilon.$$

Lognormal

$$z_{fk} = \frac{\ln re_{fk} - \lambda_x}{\xi_x}$$

$$z_{fk} \cdot \xi_x + \lambda_x = \ln re_{fk}$$

$$re_{fk} = np.exp\,(\lambda_x + z_{fk}\,\xi_x)$$

Normal

$$x_m = \mu_x + \underbrace{z_m} \cdot \sigma_x$$