Stock price simulation

- $S_{t+\Delta t} = S_t\,[1 + N(r\Delta t, \sigma^2\Delta t)]$

- $S_{t+\Delta t} = S_t \exp\left\{\left(r - \frac{1}{2}\sigma^2\right)\Delta t + N(0, \sigma^2\Delta t)\right\}$

Excel

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Bivariate normal distribution simulation

- $X_1 \sim N(0,1)$
- $X_2 \sim N(0,1)$

- $Y_1 = X_1$
- $Y_2 = \rho X_1 + \sqrt{1-\rho^2} X_2$

Excel

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Cholesky decomposition

- $\begin{bmatrix} Y_1 \\ Y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ \rho & \sqrt{1-\rho^2} \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$

- $\begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ \rho & \sqrt{1-\rho^2} \end{bmatrix} \begin{bmatrix} 1 & \rho \\ 0 & \sqrt{1-\rho^2} \end{bmatrix}$

- $\begin{bmatrix} 1 & \rho_{12} & \rho_{13} \\ \rho_{21} & 1 & \rho_{23} \\ \rho_{31} & \rho_{32} & 1 \end{bmatrix} = ?$