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Montecarlo Simulation - Brownian Motion

One of the most common ways to estimate risk is the use of a Monte Carlo simulation (MCS). For example, to calculate the value at risk (VaR) of a portfolio, we can run a Monte Carlo simulation that attempts to predict the worst likely loss for a portfolio given a confidence interval over a specified time horizon (we always need to specify two conditions for VaR: confidence and horizon).

We will review a basic MCS applied to a stock price using one of the most common models in finance: geometric Brownian motion (GBM).

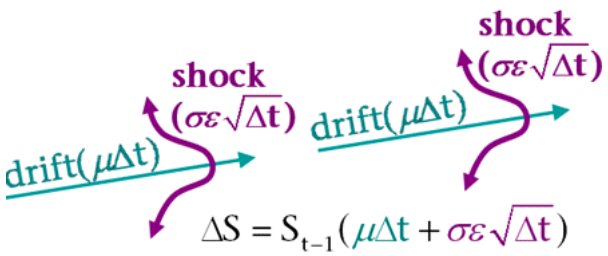
Geometric Brownian Motion (GBM):

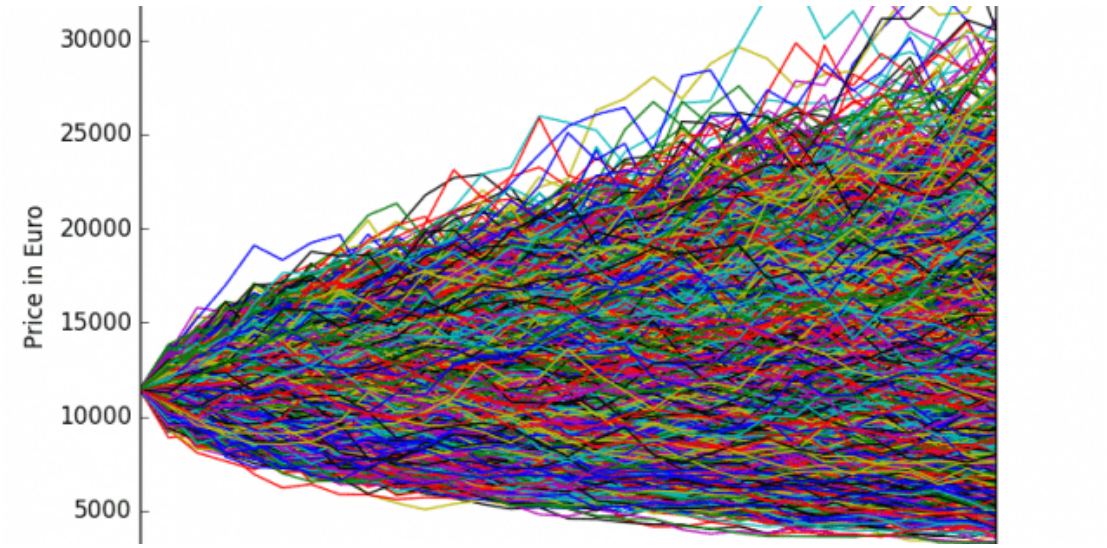
Geometric Brownian motion is technically a Markov process. This means the stock price follows a random walk and is consistent with (at the very least) the weak form of the efficient market hypothesis (EMH) past price information is already incorporated, and the next price movement is çonditionally independent.ºf past price movements.

$$\frac{\Delta S}{S} = \mu \cdot \Delta t + \sigma \cdot \epsilon \cdot \sqrt{\Delta t}$$

Where:

S : Stock price.
ΔS : The change in stock price.
μ : The expected return.
σ : The standard desviation of returns.
ϵ : The random variable.
Δt : The elapsed time return.

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