Monte Carlo Simulation for BAC Option Pricing

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A 52-year computational analysis of Bank of America equity behavior using inverse standard normal distributions to forecast 63-period price paths across 500 trials

Historical Data Foundation

52 Years of Data

Daily price and volume data extracted from Yahoo Finance spanning 1972–2024

500 Simulations

Sample paths generated using geometric Brownian motion with inverse transform sampling

63 Time Periods

Quarterly intervals modeling 15-year price evolution based on 252 trading days per year

Drift Estimation

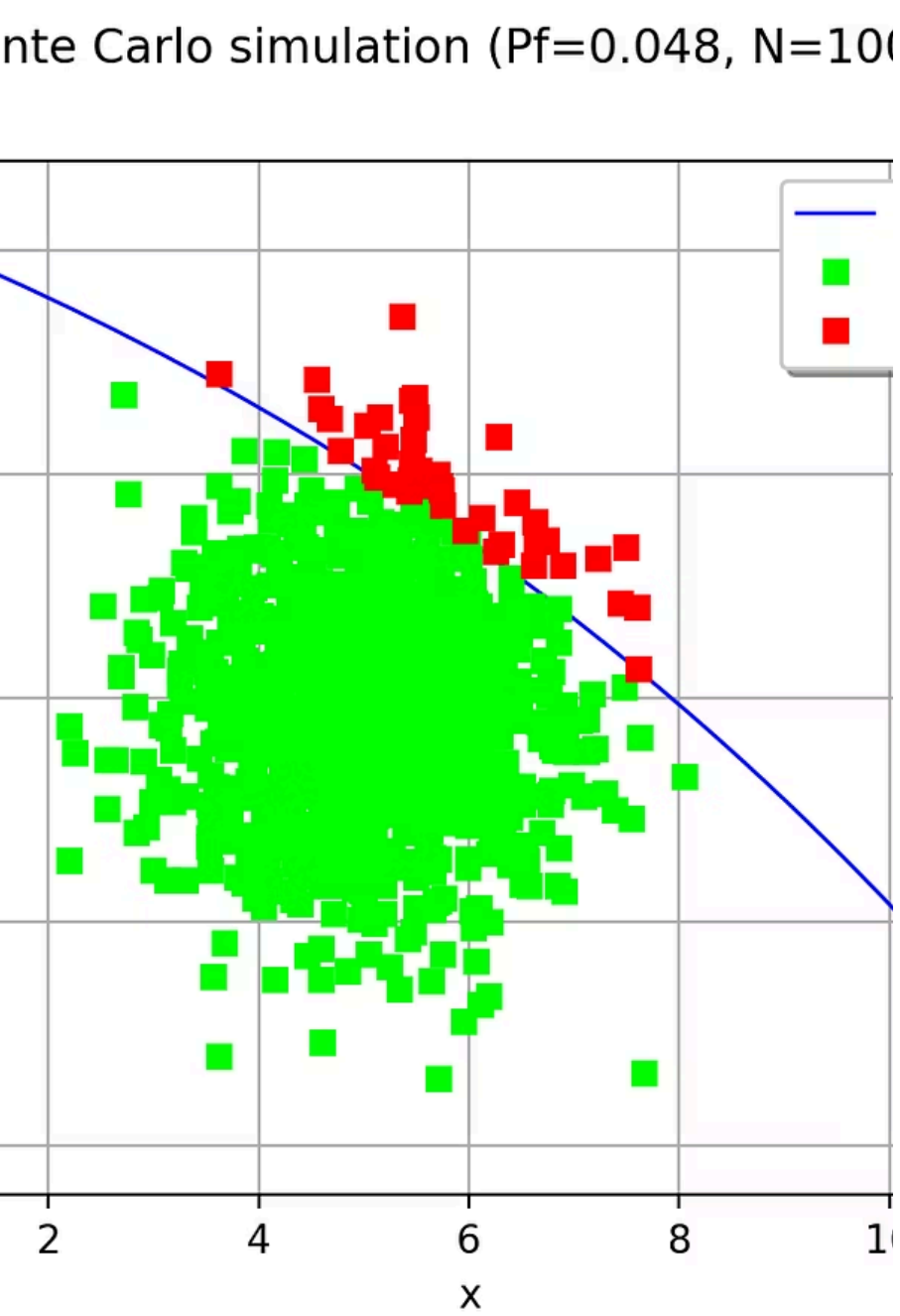
Sample mean: $\mu = \frac{1}{n}\sum_{i=1}^{n} r_i$

Annualized: $\mu_{\text{annual}} = 252 \cdot \mu$

Volatility Estimation

Sample standard deviation: $\sigma = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(r_i - \mu)^2}$

Annualized: $\sigma_{\text{annual}} = \sqrt{252} \cdot \sigma$



Monte Carlo Simulation Framework

Initialize Parameters

Drift, volatility, time steps, trials

Generate Random Shocks

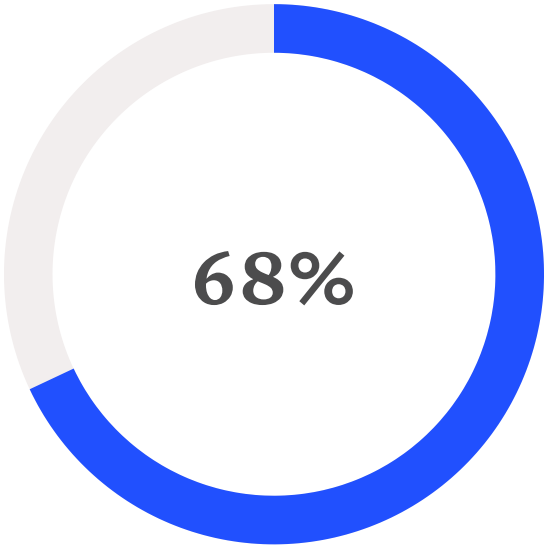
Inverse standard normal distributions

Simulate Price Paths

Geometric Brownian motion model

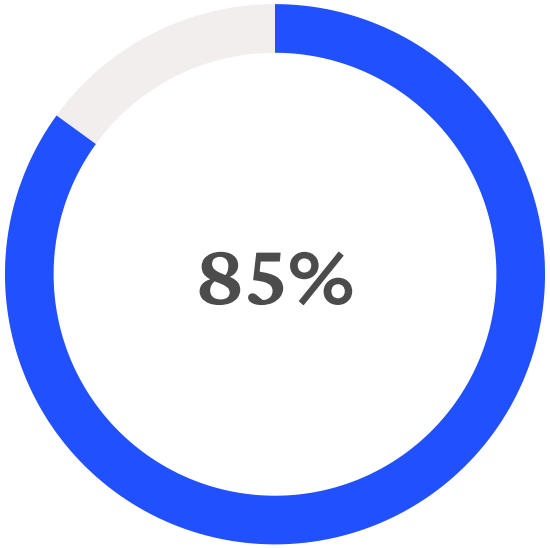
Simulation Results

Narrow dispersion across 500 trials reflects BAC's lower volatility profile compared to speculative equities



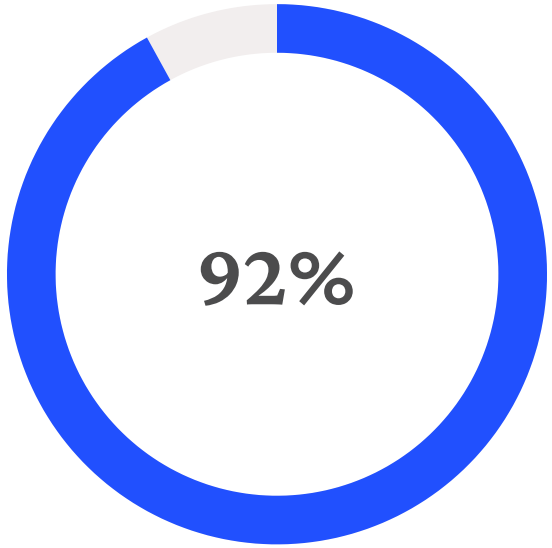
Trials Above S0

Expected growth trajectory



Within ±2σ Range

Stable variance



Positive Returns

Long-term equity performance

Average Growth Rate

8.2% annualized drift

Volatility Profile

24.5% annualized standard deviation

Put Option Pricing Results

$3.67

Estimated Put Option Price at $t = 0$

This price reflects the expected payoff discounted by the risk-free rate, derived from terminal prices across 500 simulated paths under geometric Brownian motion

Stable Growth Pattern

Bank of America Corp. exhibits characteristics consistent with large-cap financial institutions

S&P 500 Risk Profile

Lower-volatility equity relative to speculative stocks

Key Insights

Methodological Approach

Historical data calibration with Monte Carlo simulation validated against price history

Price Behavior

Narrow dispersion in projected pathways aligns with reduced risk expectations

Risk-Return Profile

S&P 500–level volatility confirms position as lower-variance financial equity

Growth Trajectory

Simulated paths consistent with 52-year historical performance trends