

Fitch Solutions: Monte Carlo Simulation for Beginners

This is a half day beginners' class for Excel users, for someone who is familiar with but never actually performed a Monte Carlo simulation. The emphasis is on the applied practical simulation issues rather than theoretical simulation problems. The course is split into 2 individual sections of about 2 hours each, totalling to 4 hours.

TARGET AUDIENCE

This is a beginners' class for Excel users. Junior quants, as well as risk managers, who have been exposed to the concept but never had the opportunity to perform it are navigated through the basics so that at the end of the brief course they can conduct Monte Carlo simulations on Excel. Everything will be done in Excel so that no other software is necessary. This is a hands-on class so participants are encouraged to bring a laptop.

COURSE OBJECTIVES

To facilitate and teach basic Monte Carlo techniques to audiences with no prior background in simulation.

CONTENT

INTRODUCTION

- Generating random numbers using Excel functions
- Differentiate between discrete versus continuous random numbers
- Setting up an interactive worksheet with "live" numbers
- Looping the simulation and populating a data table with results
- Applying basic probabilities to a gambling simulation
- Review of probability distributions – uniform, normal, lognormal

REAL WORLD FINANCIAL APPLICATIONS

Application 1 – Geometric Brownian Motion

- Generate portfolio returns for a two asset portfolio
- Discuss concepts of portfolio theory, the efficient frontier, and return optimization
- Create a random walk simulation to estimate portfolio returns over a multi-period horizon

Application 2 – Portfolio credit default model

- Use of probability based default indicators
- Estimate period specific portfolio defaults
- Incorporate recoveries to calculate loss given default

Application 3 – Single Factor Gaussian Copula credit default model

- Use of credit default swap spreads as default indicator
- Idiosyncratic versus systematic risk
- How to incorporate correlation
- Review how correlation impacts the results

Application 4 – Incorporating correlation when simulating portfolio returns

- Generating correlated random numbers
- Simulate portfolio returns for a three asset portfolio
- Incorporating a Cholesky factorisation into a correlation matrix
- Further discussion of portfolio theory, the efficient frontier, and return optimisation

Application 5 – Option pricing

- Review of Black-Scholes formula
- Sensitivity analysis of put / call price to strike, volatility, term
- Option pricing with Ito process.