ADVANCE APPLICATION OF EXCEL
FINANCIAL ENGINEERING – I

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Introduction
Monte Carlo Simulation

The basis of a Simulation involves assigning multiple values to an uncertain variable to achieve multiple results and then averaging the results to obtain an estimate.

Assumption

Perfectly efficient market

Uses

To predict the probability of different outcomes when the intervention of random variables is present.

Explains the impact of risk and uncertainty in prediction and forecasting models.

Introduction
Binomial Model

The binomial option pricing model values options using an iterative approach utilizing multiple periods to value European Options. With the model, there are two possible outcomes with each iteration—a move up or a move down that follow a binomial tree.

The probability* of up-move is calculated based on size of the up-move and risk free rate using the formula, Exp(r-d)/(u-d).

*This is a risk neutral pseudo probability of an up-move.

Assumptions of Binomial Model

1 Only two possible prices for the underlying asset , i.e., Up or Down

2 The underlying asset does not pay any dividends

3 The rate of interest (r) is constant throughout the life of the option

4 Markets are frictionless i.e. there are no taxes and no transaction cost

5 Investors are risk neutral i.e. investors are indifferent towards risk

6 There are no maximum and minimum units of trading

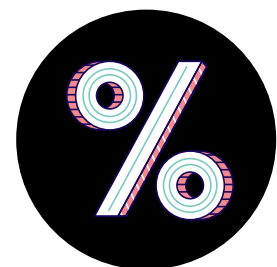**7** The shares are divisible

Introduction to our Model

Underlying Asset
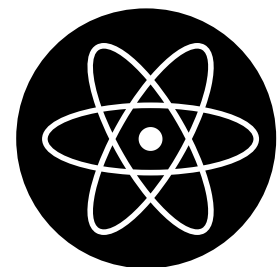Reliance Industries, with a strike price of Rs. 2,500

Time
1 year European Call Option

Risk Free Rate
4.4%

Model
12 Step Binomial Pricing Model, where each step is 1 month

Methodology

These are the primary Macros that we have built.

List of Macros Used
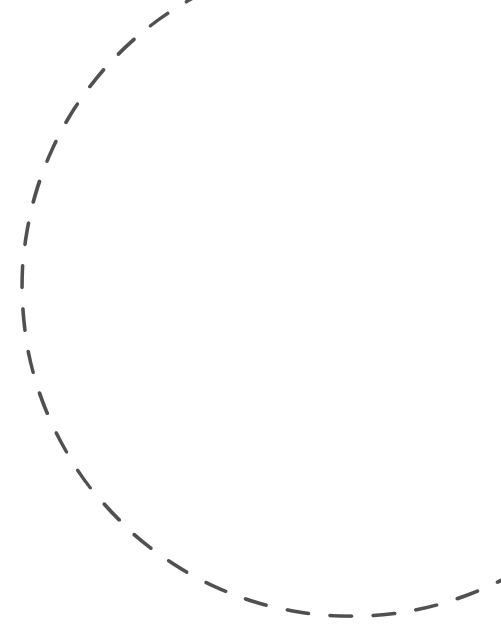
FinalBinomial101
For a given set of input, it makes a 12 step binomial tree.

ProbabilityCalculator
It uses the binomial distribution to calculator the probabilities of each branch.

PayoffGenerator
Given the binomial tree, it calculates the payoff for each branch.

Methodology

These are the final Macros that use the primary macros

List of Macros Used

OutputGeneratorFinal
It uses all the three functions above to give the final output for each iteration.

Simulation
Explained in the next slide.

EPVGenrator
It runs OGF through multiple simulations using a loop and gives us the EPV in each case.

The Simulation

Genrating Values

The variable we randomly simulated was sigma. We did this using the built-in RandBetween function to simulate sigma between 1 and 10 percent.

Formulas

U = Exp (sigma*sqrt(T))
D= 1/U

Finding U & D

Using the full-normal model approach we were able to compute values for u and d
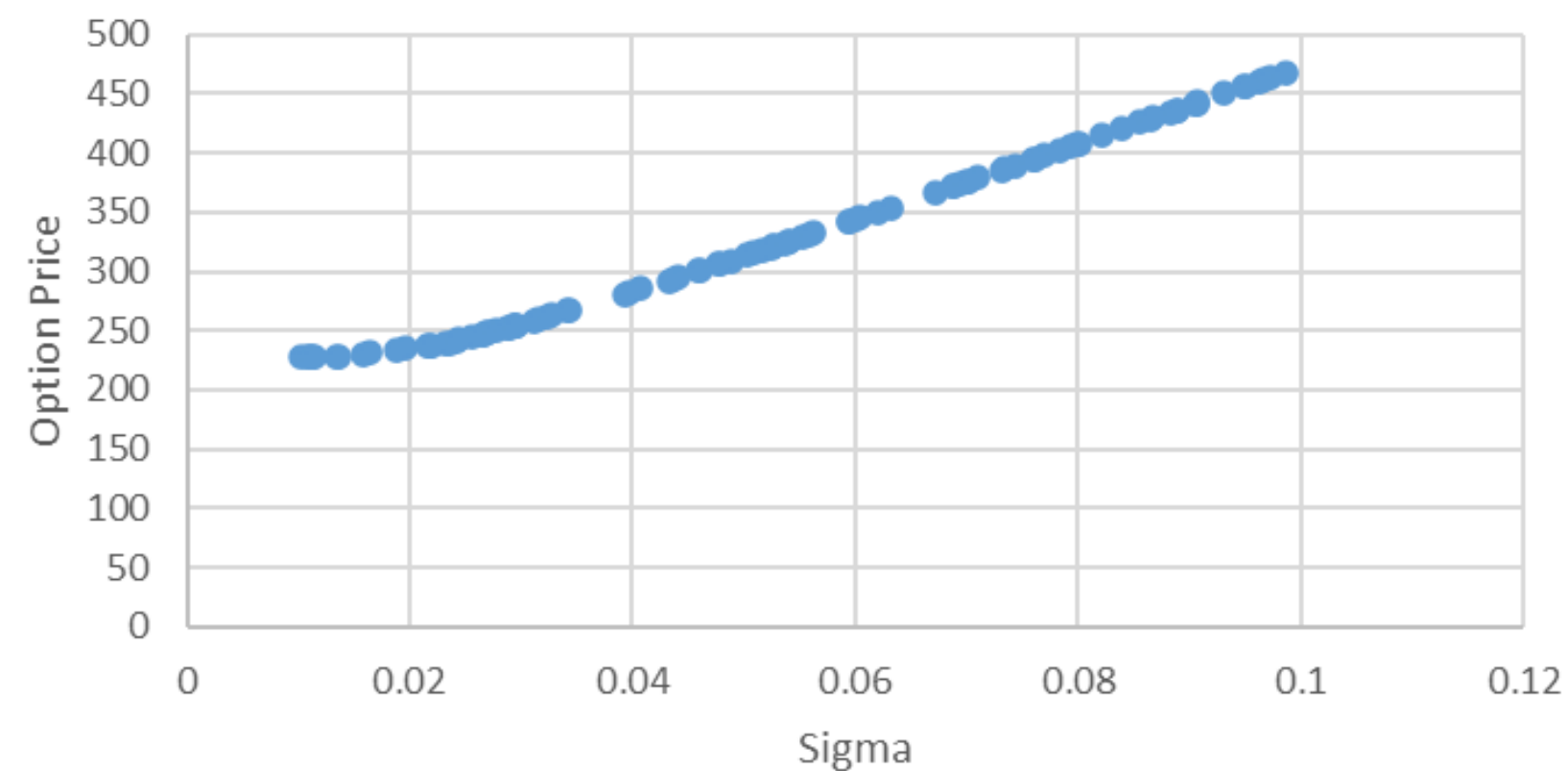
Iterations

100 iterations were run

Final Result

01 **Mean Value**
325.55

02 **Range**
(227.75, 468.44)

03 **Graph**

Volatility and Price of a European Call

Insights

- The output differs vastly as per changes in the variance of the underlying. Narrowing down the range would be necessary in order to derive more accurate estimates
- Our model is subject to the limitations and flaws of the Binomial model
- The model we have made is generally flexible since input variables can be altered and the final model consists of multiple smaller modules making it easy to operate

Reference

- http://www.investopedia.com/
- http://www.simplilearn.com/
- CM2 Combined Materials Pack IFOA

Thank-You