

**CQF January 2009**  
**Module 2.5**  
**Live Class: February 20**  
**Lecturer: Paul Wilmott**

**Binomial Model**

In this lecture:

- A simple model for an asset price random walk
- Delta hedging
- No arbitrage
- The basics of the binomial method for valuing options
- Risk neutrality

By the end of this lecture you will be able to

- Understand how hedging is used to eliminate risk
- Use the binomial method to price simple options
- Explain the concept of risk neutrality

The Framework.....	4
Why should this 'theoretical price' be the 'market price'?.....	23
The role of expectations.....	24
How did I know to sell $\frac{1}{2}$ of the stock for hedging?.....	26
The general formula for $\Delta$ .....	28
How does this change if interest rates are non zero? .....	33
Complete markets.....	40
The real and risk-neutral worlds.....	44
Non-zero interest rates.....	52
Symbols.....	54
How should we choose $u$ , $v$ and $p$ ? .....	57
An equation for the value of an option.....	63
Hedging.....	65
Present Valuing.....	67
Expected Shortfall.....	73
Estimating Sigma.....	76
Simplest Volatility Estimate: Constant Vol/Moving Window.....	79
Exponentially Weighted Moving Average.....	86

**Summary**

Please take away the following important ideas

- Delta hedging can be used for the elimination of risk
- The binomial method is a simple way to value options
- The concept of risk neutrality, its meaning and use
- The continuous-time limit of the binomial model is the Black–Scholes equation