



Derivative Mathematics - Day

This course will explore the mathematical relationships that govern relative pricing of derivative contracts versus the underlying instrument and related derivatives. These arbitrage relationships are the basis for analyzing and valuing listed and over-the-counter derivatives. Course discussion will focus on the trading and risk management applications of these relationships in evaluating and determining the viability of alternative trading and hedging strategies as well as assessing their relative attractiveness.

The program begins with a survey of the two basic types of derivative contracts: first futures/forward contracts and then options. These will be explored in greater detail as they are the building blocks of all the more complex derivative instruments. The program will then proceed with a similar approach applied to a range of derivative contracts to include: swaps, caps and floors, swaptions, and other exotic options.

Targeted Audience

Traders, treasury managers, comptrollers, brokers, credit analysts, financial analysts and financial planners.

Special Offer

Clients who register for this course will receive a complimentary 4-month subscription to FT.com. The Financial Times is the world's most respected financial newspaper, providing a broad assessment on finance, business and the industrial sector. The move to the electronic version follows an ongoing review of our environmental responsibilities as a global business and as part of the Pearson group. FT.com also has features that are not available in hard copy, such as: Special Reports, Alphaville, editor blogs, education sections and much more! Subscriptions will start within 6-8 weeks of the start of class and are limited to one subscription per client. (Please note: as of May 1, 2011, the electronic subscription replaces the hard-copy 3-month Financial Times subscription.)

Advance Preparation

No advance preparation required.

Prerequisites

Basic understanding of the terminology and characteristics of options and futures contracts

Learning Objectives

Students will be able to:

- . Compare and contrast characteristics and risks of securities versus derivatives as well as between the types of derivatives
- . Explain trading and risk management applications
- . Analyze arbitrage pricing relationships, when and why they hold and why they sometimes do not
- . Describe the basic characteristics of exotic options: caps and floors, swaptions, barriers, binary, and more

Level: Basic

CPE Credits: 14.0

Instructional Method: Group-Live

Detailed Outline

DAY 1 - FUTURES CONTRACT

Nature Of Futures Contracts

- . What is a futures contract?
- . Confusion over terms 'commodities' and 'futures'
- . Contracts for future purchase and sale
- . Forward contracts versus futures
- . Comparison to trading "cash market" securities
- . Securities buyers/sellers versus futures longs/shorts
- . Comparative cash flows cash versus futures positions
- . Different meaning of margin
- . Role of the clearinghouse in futures trading

Day 2 - OPTION PRICING

Brief Review of Option Basics

- . Types of options and contract specifications
- . Static (intrinsic value/value at exercise) gains, losses and
- . Profit/loss diagrams
- . Minimum and maximum values
- . Effect of interest rates on call and put option values
- . Effect of volatility on call and put option values
- . Early exercise considerations

Characteristics of Futures Contracts

- . Standardized contract specifications
- . Daily settlement
- . Margins
- . Futures margins, initial and maintenance
- . Comparison to securities margins

Types of Futures Contracts

- . 'Traditional' commodities
- . Precious metals - gold, silver and platinum
- . Grains - wheat, soybeans, corn
- . Energy - crude oil, heating oil, natural gas
- . Others - cattle, lumber, cotton, coffee

Financial futures

- . Interest rate - t-bond, t-note, Eurodollar
- . Stock index - S&P 500, NASDAQ 100, DJIA
- . Currencies - Yen, Sterling, Peso

Characteristic of interest rate futures contracts

- . Contract specifications
- . Conversion factors - t-bonds and bunds
- . Cash settlement - Eurodollars

Characteristic of index futures contracts

- . Contract specifications
- . Index points and cash values
- . Cash settlement

Futures (Forward) Pricing - Cost Of Carry

- . Generalized carry models
- . Intuition
- . Where it applies
- . Where it breaks down

Carry considerations

- . Storage
- . Insurance

Option Pricing Dynamics

- . The 'Greeks'
- . Delta, Gamma, Theta and Vega
- . Definitions
- . Mathematical derivations and graphical manifestations
- . Trading and hedging applications

Black-Scholes Model

- . Implied volatility
- . Historical volatility into B-S = B-S price
- . Market price of option into B-S = implied volatility
- . B-S assumes all have same volatility
- . Actually all differ - volatility smile
- . Volatility Smile Versus The Volatility Curve
- . Term structure of volatility
- . Market experience

Introduction to Arbitrage Pricing Relationships

- . Synthetic Positions
- . Arbitrage Trading Strategies
- . Conversions
- . Reverse conversions (reversals)
- . Put/Call Parity
- . Using Conversions, Reversals and Box Spreads
- . The options market as a bank
- . Locking in mispricings with synthetic positions

Black-Scholes Option Pricing Model

- . Black-Scholes - Limiting Case Of Binomial Model
- . The formula
- . What the formula means

- . Interest
- . Income - interest or dividends

Application to pricing 'traditional' commodities

- . Negative carry - normal markets
- . Inverted markets
- . The role of expectations

Application to pricing financial futures

- . Positive versus negative carry
- . Income yield versus opportunity cost of capital

Hedging With futures contracts

- . Review of fundamental of hedging
- . Concept
- . Risk and return of hedged positions
- . Simple applications

Hedging with financial futures

- . Hedge ratios - duration or beta
- . Basis - cash minus futures
- . Dealing with margin finance risk - tailing a hedge

Other Risk Management Applications

- . Index arbitrage
- . Portfolio management

- . Computing an option price
- . A Generalized Option Pricing Formula
- . Adjustment for cash flows on the underlying instrument
- . Options on dividend paying stocks
- . Bond and Foreign Exchange Options
- . Options On Futures

Binomial Pricing Models

- . Binomial Trees
- . Nodes
- . Intervals
- . Centering proposition

Two Step Process

- . Project stock prices to expiration, determine intrinsic values
- . Step back process to find option value

Flexible Versus Standard Binomial Trees

Mathematics Of Binomial Trees

- . General considerations
- . One period pricing/arbitrage relationships
- . Two period pricing/arbitrage relationships
- . Multi period model

Determination Of 'Greeks' On Binomial Trees